FACULTY OF SCIENCES

SYLLABUS
of
BACHELOR OF SCIENCE (Medical)
(Semester I-VI)

(Under Continuous Evaluation System)

Session: 2021-22

The Heritage Institution

KANYA MAHA VIDYALAYA
JALANDHAR
(AUTONOMOUS)

Kanya MahaVidyalaya, Jalandhar (Autonomous)

CURRICULUM AND SCHEME OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM

Bachelor of Science (Medical)

Session-2021-22

Bachelor of Science (Medical) Semester - I								
Course Code		**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
				Total	**Ext.**		**CA**	
					L	**P**		
BSML-1421 BSML-1031 BSML-1431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History & Culture	C	50	40	-	10	3
BSML-1212		English (Compulsory)	C	50	40	-	10	3
BSMM-1483	(I)	**Zoology** (Cell Biology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Zoology** (Biodiversity-I)						
	(P)	**Zoology** (PRACTICAL–I -Related To Cell Biology & Biodiversity-I)						
BSMM-1343	(I)	**Microbiology** (Fundamentals of Microbiology)	E	100	60	20	20	3+3
	(P)	**Microbiology** (PRACTICAL- Related to Fundamentals of Microbiology)						
BSMM-1084	(I)	**Chemistry** (Inorganic Chemistry–I)	C	100	60 (30+30)	20	20	3+3+3½
	(II)	**Chemistry** (Organic Chemistry–II)						
	(P)	**Chemistry** (Practical)						
BSMM-1075	(I)	**Botany** (Diversity of Microbes)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Botany** (Diversity of Cryptogams)						
	(P)	**Botany** (PRACTICAL–I -Related To Diversity of Microbes & Diversity of Cryptogams)						
BSMM-1255	(I)	**Food Science and quality control (Vocational)** (Food Chemistry and Nutrition)	E	100	60	20	20	3+3
	(P)	**Food Science and quality control (Vocational)** (PRACTICAL- Related to Food Chemistry and Nutrition)						
AECD-1161		*Drug Abuse: Problem, Management and Prevention (Compulsory)	AC	50	40	-	10	3
SECF-1492		*Foundation Programme	AC	25	25	-	-	2
Total								

C-Compulsory
E-Elective
AC- Audit Course
[1]Special paper in lieu of Punjabi (Compulsory).
[2] Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.
***Marks of these papers will not be added in total marks and only grades will be provided.**

Kanya MahaVidyalaya, Jalandhar (Autonomous)
CURRICULUM AND SCHEME OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM
Bachelor of Science (Medical)
Session-2021-22

Bachelor of Science (Medical) Semester – II								
Course Code		**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
				Total	**Ext.**		**CA**	
					L	**P**		
BSMM-2421 BSMM-2031 BSMM-2431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History & Culture	C	50	40	-	10	3
BSMM-2212		English (Compulsory)	C	50	40	-	10	3
BSMM-2483	(I)	**Zoology** (Ecology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Zoology** (Biodiversity –II)						
	(P)	**Zoology** (Practical-II- related to ecology and Biodiversity-II)						
BSMM-2343	(I)	**Microbiology**(Basic Food Microbiology)	E	100	60	20	20	3+3
	(P)	**Microbiology** (PRACTICAL- Related to Basic Food Microbiology)						
BSMM-2084	(I)	**Chemistry** (Inorganic Chemistry–I)	C	100	60	20	20	3+3+3½
	(II)	**Chemistry** (Physical Chemistry–II)						
	(P)	**Chemistry** (Practical)						
BSMM-2075	(I)	**Botany** (Cell Biology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Botany** (Genetics)						
	(P)	**Botany** (Practical-II- Related to Genetics and Cell Biology)						
BSMM-2255	(I)	**Food Science and quality control (Vocational)** (Food Plant Hygiene and Sanitation)	E	100	60	20	20	3+3
	(P)	**Food Science and quality control (Vocational)** (PRACTICAL- Related to Food Plant Hygiene and Sanitation)						
AECD-2161		*Drug Abuse: Problem Management and Prevention (Compulsory)	AC	50	40	-	10	3
SECM-2502		*Moral Education Programme	AC	25	20	-	5	2
Total								

C-Compulsory
E-Elective
AC- Audit Course
[1]Special paper in lieu of Punjabi (Compulsory).
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Kanya MahaVidyalaya, Jalandhar (Autonomous)
CURRICULUM AND SCHEME OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM
Bachelor of Science (Medical)
Session-2021-22

Bachelor of Science (Medical) Semester – III								
Course Code		**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
				Total	**Ext.**		**CA**	
					L	**P**		
BSML-3421 BSML-3031 BSML-3431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History & Culture	C	50	40	-	10	3
BSML-3212		English (Compulsory)	C	50	40	-	10	3
BSMM-3483	(I)	**Zoology** (Evolution)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Zoology** (Biodiversity - III)						
	(P)	**Zoology** (Practical –III- related to Evolution and Biodiversity-III)						
BSMM-3343	(I)	**Microbiology** (Microbial Nutrition and Metabolism)	E	100	60	20	20	3+3
	(P)	**Microbiology** (Practical- Microbial Nutrition and Metabolism)						
BSMM-3084	(I)	**Chemistry** (Organic Chemistry–I)	C	100	60	20	20	3+3+3½
	(II)	**Chemistry** (Physical Chemistry–II)						
	(P)	**Chemistry** (Practical)						
BSMM-3075	(I)	**Botany** (Structure, Development and Reproduction in Flowering Plants-I)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Botany** (Structure, Development and Reproduction in Flowering Plants-II)						
	(P)	**Botany** (Practical-III- Related to Structure, Development and Reproduction in Flowering Plants – I & II)						
BSMM-3255	(I)	**Food Science and quality control (Vocational)** (Food Processing and Packaging)	E	100	60	20	20	3+3
	(P)	**Food Science and quality control (Vocational)** (Practical –related to Food Processing and Packaging)						
AECE-3221		*Environmental studies	AECC**	100	60	20	20	3
SECP-3512/ SECG-3531		*Personality Development Programme (Skill Based)/ Gender Sensitization Programme	AC	25	25	-	-	2
Total								

C-Compulsory
E-Elective
AC- Audit Course

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** **Ability enhancement compulsory course**

Kanya MahaVidyalaya, Jalandhar (Autonomous)
CURRICULUM AND SCHEME OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM
Bachelor of Science (Medical)
Session-2021-2022

Bachelor of Science (Medical) Semester – IV								
Course Code		**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
				Total	**Ext.**		**CA**	
					L	**P**		
BSML-4421 BSML-4031 BSML-4431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History & Culture	C	50	40	-	10	3
BSML-4212		English (Compulsory)	C	50	40	-	10	3
BSMM-4483	(I)	**Zoology** (Biochemistry)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Zoology** (Animal Physiology)						
	(P)	**Zoology** (Practical –IV- related to Biochemistry and animal physiology)						
BSMM-4343	(I)	**Microbiology** (Microbial Ecology)	E	100	60	20	20	3+3
	(P)	**Microbiology** (Practical – related to Microbial Ecology)						
BSMM-4084	(I)	**Chemistry** (Inorganic Chemistry–I)	C	100	60	20	20	3+3+3½
	(II)	**Chemistry** (Organic Chemistry–II)						
	(P)	**Chemistry** (Practical)						
BSMM-4075	(I)	**Botany** (Diversity of Seed Plants and their Systematics-I)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Botany** (Diversity of Seed Plants and their Systematics-II)						
	(P)	**Botany** (Practical-IV- Related to Diversity of Seed Plants and their Systematics I & II)						
BSMM-4255	(I)	**Food Science and quality control (Vocational)** (Quality Assurance)	E	100	60	20	20	3+3
	(P)	**Food Science and quality control (Vocational)** (Practical –related to Quality Assurance)						
SECS-4522		*Social Outreach	AC	-	-	-	-	-
Total								

C-Compulsory
E-Elective
AC- Audit Course
[1]Special paper in lieu of Punjabi (Compulsory).
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Kanya MahaVidyalaya, Jalandhar (Autonomous)
CURRICULUM AND SCHEME OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM
Bachelor of Science (Medical)
Session-2021-22

Bachelor of Science (Medical) Semester – V								
Course Code		**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
				Total	**Ext.**		**CA**	
					L	**P**		
BSMM-5421 BSMM-5031 BSMM-5431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History & Culture	C	50	40	-	10	3
BSMM-5212		English	C	50	40	-	10	3
BSMM-5483	(I)	**Zoology**(Development Biology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Zoology** (Genetics)						
	(P)	**Zoology** (Practical –V- related to development biology and genetics)						
BSMM-5343	(I)	**Microbiology** (Applied Microbiology-I)	E	100	60	20	20	3+3
	(P)	**Microbiology** (Practical – Related to Applied Microbiology-I)						
BSMM-5084	(I)	**Chemistry** (Inorganic Chemistry–I)	C	100	60	20	20	3+3+3½
	(II)	**Chemistry** (Physical Chemistry–II)						
	(P)	**Chemistry** (Practical)						
BSMM-5075	(I)	**Botany** (Plant Physiology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Botany** (Biochemistry &Biotechnology)						
	(P)	**Botany**(Practical-V-Related to Plant Physiology, Biochemistry & Biotechnology)						
BSMM-5255	(I)	**Food Science and quality control (Vocational)** Food Analysis	E	100	60	20	20	3+3
	(P)	**Food Science and quality control (Vocational)** (Practical –Related to Food Analysis)						
SECJ-5551		*Job Readiness course	AC	2credit	-	-	-	-
SECI-5541		*Innovation, Entrepreneurship and Venture Development	AC	2credit				
Total								

C-Compulsory
E-Elective
AC- Audit Course

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[2] **Special paper in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab.**
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Kanya MahaVidyalaya, Jalandhar (Autonomous)
CURRICULUM AND SCHEME OF EXAMINATIONS OF THREE YEAR DEGREE PROGRAM
Bachelor of Science (Medical)
Session-2021-22

Bachelor of Science (Medical) Semester – VI								
Course Code		**Course Name**	**Course Type**	**Marks**				**Examination time (in Hours)**
				Total	**Ext.**		**CA**	
					L	**P**		
BSMM-6421 BSMM-6031 BSMM-6431		Punjabi(Compulsory) [1]Basic Punjabi [2]Punjab History & Culture	C	50	40	-	10	3
BSMM-6212		English	C	50	40	-	10	3
BSMM-6483	(I)	**Zoology** (Medical Zoology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Zoology** (Medical laboratory Technology)						
	(P)	**Zoology** (Practical –VI- related to Medical Zoology & Medical laboratory Technology)						
BSMM-6343	(I)	**Microbiology** (Applied Microbiology-II)	E	100	60	20	20	3+3
	(P)	**Microbiology** (Practical – Related to Applied Microbiology-II)						
BSMM-6084	(I)	**Chemistry** (Organic Chemistry–I)	C	100	60	20	20	3+3+3½
	(II)	**Chemistry** (Physical Chemistry–II)						
	(P)	**Chemistry** (Practical)						
BSMM-6075	(I)	**Botany** (Ecology)	E	100	60 (30+30)	20	20	3+3+3
	(II)	**Botany** (Economic Botany)						
	(P)	**Botany** (Practical-VI- Related to Ecology & Economic Botany)						
BSMM-6255	(I)	**Food Science and quality control (Vocational)** Food plant layout and management	E	100	60	20	20	3+3
	(P)	**Food Science and quality control (Vocational)** (Practical –Related to Food plant layout and management)						
Total								

C-Compulsory
E-Elective
AC- Audit Course
[1]Special paper in lieu of Punjabi (Compulsory).
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SEMESTER – I

Bachelor of Science (Medical) Semester–I
Session 2021-22
ZOOLOGY
Course Title: CELL BIOLOGY
Course Code: BSMM-1483 (I)
(THEORY)

Course Outcomes

- CO1. Develop deeper understanding of what life is and how it functions at cellular level.
- CO2. Describe cellular membrane structure and function, fine structure and function of cell organelles.
- CO3.Perform a variety of molecular and cellular biology techniques

Bachelor of Science (Medical) Semester–I
Session 2021-22
ZOOLOGY
Course Title: CELL BIOLOGY
Course Code: BSMM-1483 (I)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Methods in Cell Biology

(a) Principles of light and phase contrast microscopy
(b) Electron microscopy (TEM and SEM)
(c) Fixation and fixatives
(d) Staining techniques.

UNIT-II

Organization of Cell: Extra nuclear and nuclear, ultrastructure and functions of cell organelles

(a) Plasma Membrane: Structure, osmosis, active and passive transport, endocytosis and exocytosis.
(b) Endoplasmic reticulum: Structure, types and associated enzymes.
(c) Mitochondria: Structure, mitochondrial enzymes and role of mitochondria in respiration and mitochondrial DNA.

UNIT-III

Organization of Cell:

(a) Golgi complex: Structure and functions.
(b) Ribosomes: Types of ribosomes, their structure and functions.
(c) Lysosomes: Polymorphism and their function.
(d) Centrosome: Structure and functions.

UNIT-IV

Nucleus: Structure and functions of nuclear membrane, nucleolus and chromosomes.

An elementary idea of cell transformation in cancer

An elementary idea of cellular basis of immunity

Suggested Readings:

1. Cooper, G. M. (2004), The cell, A Molecular Approach, ASM press, Washington, D. C.
2. Karp, G. (1984). Cell Biology (4th ed), McGraw Hill, New York.
3. Pawar, C.B (1999), Cell Biology, Himalaya Publishing House, Bombay.
4. Dhami P. K. (2000) Zoology I, Pradeep Publishers.

Bachelor of Science (Medical) Semester–I
Session 2021-22
ZOOLOGY
Course Title: BIODIVERSITY-I
Course Code: BSMM-1483 (II)
(THEORY)

Course Outcomes

- CO1: Familiar with the non-chordate world that surrounds us.
- CO2: Able to appreciate the process of evolution (unicellular cells to complex, multicellular organisms)
- CO3: Able to identify the invertebrates and classify them up to the class level with the basis of systematic
- CO4: Understand the basis of life processes in the non-chordates and recognize the economically important invertebrate fauna.

Bachelor of Science (Medical) Semester–I
Session 2021-22
ZOOLOGY
Course Title: BIODIVERSITY-I
Course Code: BSMM-1483 (II)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Detailed Type study of the following animals

UNIT-I

Protozoa: *Amoeba proteus,*

Paramecium caudatum (with special reference to Kappa particles in *P. aurelia*)

Plasmodium vivax.

UNIT-II

Parazoa (Porifera): *Sycon*,

Cnidaria (Coelentrata): *Obelia*

UNIT-III

Platyhelminthes: *Fasciola hepatica,*

Taenia solium

Larvae of *Fasciola hepatica* and *Taenia solium*

UNIT-IV

Aschelminthes: *Ascaris,* Parasitic adaptations in Helminthes

Annelida: *Pheretimaposthuma* (Earthworm)

Suggested Readings:

1. Dhami, P.S. &Dhami, J. K(2001), Invertebrates, R. Chand & Co., New Delhi.

2. Brusca, R. C. and Brusca, G. J. (2003), Invertebrates (2nd ed). Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.
3. Engemann, J. G. and Hegner, R. W. (1981), Invertebrate Zoology (3rd ed.) Macmillan, New York.
4. Gardiner, M. S. (1972), The Biology of Invertebrates, McGraw Hill, New York.
5. Meglitsch, P. A. and Schran, F. R. (1991), Invertebrate Zoology (3rd ed). Oxford University Press, New York.
6. Pechenik, A. Jan. (2000), Biology of the invertebrates, (4th ed), McGraw Hill Book Co. Singapore.

Bachelor of Science (Medical) Semester–I
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-I (Related to Cell Biology & Biodiversity-I)
Course Code: BSMM-1483 (P)
(PRACTICAL)

Course Outcomes

- CO1. Familiar with Scientific method
- CO2.Recognise the importance of conservation
- CO3. Ability to observe chromosomal arrangements during cell division

Bachelor of Science (Medical) Semester–I
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-I (Related to Cell Biology & Biodiversity-I)
Course Code: BSMM-1483 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

Guideslines for conduct of practical Examination:-

1. Identifiy and classify the specimens upto order. Write a note on their habit, habitat, special features and economic importance. 4
2. Identify the slides/micrographs and give two reasons for identification. 4
3. Make a temporary mount of protozoa. 2
4. Draw a well labelled sketch of the given system of the organism and explain to the examiner. 3
5. Write down the theory and procedure of gel electrophoresis/ paper chromotogaphy/thin layer chromatography/ SEM & TEM. 2
6. Report 2
7. Viva-voce & Practical file. 3

I. Classification up to orders with ecological notes and economic importance (if any) of the following animals (Through Specimens or slides):

A. Protozoa. *Amoeba, Euglena, Trypanosoma, Noctiluca, Eimeria, Monocystis, Paramecium Opalina, Vorticella, Balantidium, Nyctotherus*and *Polystomella.*

B. Parazoa. *Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia.*

C. Cnidaria. *Porpita, Velella, Physalia, Aurelia, Rhizostoma, Metridium, Millipora, Alcyonium, Tubipora, Zoanthus, Madrepora, Favia, Fungia and Astrangia.*

Hydra (W.M.), *Hydra* with buds, *Obelia* (colony and medusa), *Sertularia, Plumularia, Tubularia, Bougainvillea* and *Aurelia*

D. Platyhelminthes.

Dugesia, Fasciola, Taenia, Echinococcus.

Miracidium, Sporocyst, Redia, Cercaria of *Fasciola,* scolex and proglottids of *Taenia* (mature and gravid).

E. Aschelminthes. *Ascaris*(male and female), *Trichinella, Ancylostoma.*

F. Annelida. *Pheretima, Nereis, Heteronereis, Polynoe, Eunice, Aphrodite, Chaetopterus, Arenicola, Tubifex* and *Pontobdela*

2. **Study of the following permanent stained preparations**:

A. L.S. and T.S. *Sycon,* gemmules, spicules and spongin fibers of a sponge.

B. T.S. *Hydra* (Testis and ovary region)

C. T.S. *Fasciola*(Different regions)

D. T.S. *Ascaris* (Male and Female)

E. T.S. *Pheretima*(pharyngeal and typhlosolar regions), Setae, septal nephridia, spermathecae and ovary of *Pheretima*(Earthworm).

3. **Preparation of the following slides**:

Temporary permanent preparation of freshwater Protozoan culture.

4. **Demonstration of** digestive, reproductive and nervous systems of earthworm with the help of charts/videos/models.

5. **Cell Biology:**

A. Paper chromatography.

B. Gel electrophoresis through photographs or through research laboratories

C. Familiarity with TEM & SEM.

D. Study of different ultra structures of cell organelles through photographs.

6. Visit to a vermi–composting unit and submission of report.

Note:- Some changes can be made in the practicals depending on the availability of material.

Bachelor of Science (Medical) Semester–I
Session 2021-22
MICROBIOLOGY
Course Title: FUNDAMENTALS OF MICROBIOLOGY
Course Code: BSMM-1343 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand the history of microbiology and their characterization and identification.

CO2: Learn the different principlesand applications of microscopy and methods of sterilization,preparation of a culture media, pure culture concept and different staining techniques of bacteria.

CO3: Understand the fine structure of bacterial cell and nutrition and nutritional requirements ofmicroorganisms. Preparation of different types of media and control of microorganisms by physical and chemical agents.

CO4: Understand the reproduction and growth of microorganisms and epidemiology of common bacterial and viral diseases in human.

Bachelor of Science (Medical) Semester–I
Session 2021-22
MICROBIOLOGY
Course Title: FUNDAMENTALS OF MICROBIOLOGY
Course Code: BSMM-1343 (I)
(THEORY)

Examination Time: 3 Hrs.

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

1. **Introduction and Scope of Microbiology:** Discovery of microorganisms, history of microbiology, controversy over spontaneous origin or microorganisms, discovery of anaerobic life, germ theory of fermentation as life without oxygen, germ theory of disease.
2. **Characterization and Identification of Microorganisms:** Place of microorganisms inliving world, Hackel's and Whittaker's system of classification, prokaryotic and eukaryotic cells, characteristics of main groups of microorganisms.

UNIT–II

3. **Microscopy:** Principles and applications of Bright field microscopy, Dark field phase contrast, Fluorescence and Immunofluoresence, Electron microscopy.
4. **Methods in Microbiology:** Methods of sterilization, preparation of a culture media, pure culture concept, staining of bacteria such as simple, negative and differential methods. Antibiotics, properties and mode of action: drug resistance and its significance, antibiotic sensitivity test.

UNIT–III

5. **Structure of Bacteria:** Fine structure of bacterial cell, cell wall, cell membrane, capsule, pili, flagella, ribosomes, Cytoplasmic inclusions, Bacterial movement, Endospore and physiology of endospore formation.
6. **Nutrition:** Nutritional requirements of microorganisms, nutritional types of bacteria, autotrophs, heterotrophs, parasites, types of culture media, differential media, selective media and enrichment media. Control of microorganisms by physical and chemical agents.

UNIT–IV

7. **Reproduction and Growth in Microorganisms:** Modes of cell division, growth curve of bacteria, continuous culture, synchronous growth, quantitative measurement of bacterial growth, Effect of various factors on growth of bacteria.
8. **Clinical Microbiology:** Epidemiology reservoirs and modes of transmission of infectious diseases. Pathogenesis, diagnosis and treatment of common bacterial and viral diseases (including COVID 19) in humans.

Books Recommended:

1. Pelczar, M.I., Chan, E.C.S. and Krieg, N.R. 2011, 5th edition, Microbiology. Tata McGraw Hill Publishing Co., Ltd.,New Delhi.
2. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 2005, 5th edition, General Microbiology, MacMillan Education Ltd. Publisher.
3. Powar, C.B. and Dagniwala, H.F. 2012, General Microbiology, Volume I and II, Himalaya Publishing House, Delhi.
4. Sharma, P.D. 2010, Microbiology, Rastogi Publications, Meerut. 142.
5. Clinical microbiology by Usman Waheed, Asim Ansari, Anwar Ullah and Ihsan Ali., 1st Edition, 2013. **(Online available)**
6. General Microbiology by Linda Bruslind, 1st Edition. **(Online available)**
7. General Microbiology by H.G. Schlegel, 6th Edition. **(Online available)**

Bachelor of Science (Medical) Semester–I
Session 2021-22
MICROBIOLOGY
Course Title: PRACTICAL – (Related to Fundamentals of Microbiology)
Course Code: BSMM-1343 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. To study the essentials of a microbiology laboratory.
2. To study various parts of a laboratory microscope.
3. To study various sterilization techniques.
4. To prepare the cultures media for the cultivation of various microorganisms.
5. To study various laboratory techniques for the cultivation and isolation of pure cultures of microorganisms.
6. To perform the simple staining of bacterial cell.
7. To perform the differential staining of bacterial cell.
8. To study the typical growth curve of bacteria.

Bachelor of Science (Medical) Semester–I
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY-I
Course Code: BSMM-1084 (I)
(THEORY)

Course outcomes

Students will be able to:

- **CO1**: Predict electronic properties of atoms using current models and theories in chemistry
- **CO2**: Explain de-Broglie's dual behaviour of matter and Heisenberg's uncertainty principle and solve numerical problems
- **CO3**: Explain the significance of quantum numbers
- **CO4**: Sketch the probability density curves , boundary surface diagrams and shapes of s, p ,d and f orbitals and write the electronic configuration of atoms
- **CO5**: Identify the periodic trends in physical and chemical properties of elements.
- **CO6**: Describe VSEPR theory and predicts the geometry of simple molecules
- **CO7**: Explain the valence bond approach for the formation of covalent bonds and the different types of hybridization involving s, p and d orbitals of simple covalent molecules
- **CO8**: Describe the molecular orbital theory of homonuclear diatomic molecules
- **CO9**: Explain the structures simple compounds.
- **CO10**: Differentiate the types of van der waals' forces such as London forces, dipole - dipole interactions and dipole - induced dipole interactions and explain the concept of hydrogen bonding

Bachelor of Science (Medical) Semester–I
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY-I
Course Code: BSMM-1084 (I)
(THEORY)

Time: 3 Hrs. **Max.Marks:30**

Instructions for the Paper Setter

Eight questions of equal marks (six each)are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

I. Atomic Structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of ψ^1 and ψ 2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s,p,d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions.

UNIT–II

II. Periodic Properties

Position of elements in the periodic table; effective nuclear charge and its calculations. Atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

UNIT–III

III. Chemical Bonding

Covalent Bond –Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridizationand shapes of simple inorganic molecules and ions. BeF_2 , BF_3,CH_4, PF_5, SF_6, IF_7, $SnCI_2$, XeF_4, BF_4, $SnC1_6$. Valence shellelectron pair repulsion (VSEPR) theory to NH_3, H_3O+, SF_4,CIF_3, ICl_2 and H_2O. MO theory, homonuclear (elements and ions of 1st and 2nd row), and heteronuclear (BO, CN^-, CO, NO^+, CO^+, CN),

diatomic molecules, multicenter bonding in electron deficient molecule (Boranes). Percentage ionic character from dipole moment and electronegativity difference

UNIT–IV

IV. Ionic Solids

Concept of close packing, Ionic structures, (NaCI type, Zinc blende, Wurtzite, CaF_2 and antifluorite, radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born–Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond– free electron, valence bond and band theories.

Weak Interactions –Hydrogen bonding, Vander Waals forces

Books Suggested:

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.
3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.
4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.
5. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
6. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.
7. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
8. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.
9. University General Chemistry, C.N.R. Rao, Macmillan.
10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
11. Inorganic Chemistry, A.G. Sharpe, ELBS.

Bachelor of Science (Medical) Semester–I
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY-II
Course Code: BSMM-1084 (II)
(THEORY)

Course outcomes

Students will be able to:

CO1:explain the bonding between different organic compounds

CO2:explain the various reaction mechanisms and different electron displacement effects

CO3: explain the various methods of formation and chemical reactions of alkanes,alkenes and alkynes

CO4: compare the reactivities of various alkyl and aryl halide

CO5: differentiate between aromatic,anti aromatic and non aromatic compounds

CO6: compare the stability of various cycloalkanes

CO7: explain the effect of various substituents on the reactivity of aromatic compounds

Bachelor of Science (Medical) Semester–I
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY-II
Course Code: BSMM-1084 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks(six each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

I. Structure and Bonding

Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Vander Waals interactions, resonance, hyperconjugation, aromticity hydrogen bonding and Inductive and electrometric effects.

II. Mechanism of Organic Reactions

Curved arrow notation, drawing electron movements with arrows, half–headed and double–headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations.

Reactive intermediates –Carbocations, carbanions, free radicals, carbenes, arenes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species.

UNIT-II

III. Alkanes

Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey–House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

IV. Alkenes and Alkynes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-

oxidation, oxymercuration reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$.

Substitution at the allylic and vinylic positions of alkenes.

Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.

UNIT–III

V. Alkyl and Aryl Halides

Nomenclature and classes of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reaction of alkyl halides, SN2 and SN1 reactions with energy profile diagrams. Nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

VI. Cycloalkanes:

Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring : banana bonds.

UNIT-IV

VII. Arenes and Aromaticity

Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene: Molecular formula and Kekule structure. Stability and carbon carbon bond lengths of benzene, resonance structure, MO picture.

Aromaticity : the Huckel's rule, aromatic ions.

Aromatic electrophilic substitution–general pattern of the mechanism, role of σ and π complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkylbenzenes.

Books suggested:

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.
3. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson education, 2008.
4. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985.

5. Carey, F.A., Sundberg, R.J., Advanced Organic Chemistry Part B: Reactions and Synthesis.
6. Fundamentals of Organic Chemistry, Solomons, John Wiley.
7. Introduction to Organic Chemistry, Sireitwieser, Heathcock and Kosover, Macmilan.

Bachelor of Science (Medical) Semester–I
Session 2021-22
CHEMISTRY
CHEMISTRY (PRACTICAL)
Course Code: BSMM-1084 (P)
(PRACTICAL)

Course outcomes

Students will be able to:

- **CO1**:Separate and identify the various ions present in the mixture
- **CO2**: Accurately note down the melting and boiling point of organic compounds

Bachelor of Science (Medical) Semester–I
Session 2021-22
CHEMISTRY
CHEMISTRY (PRACTICAL)
Course Code: BSMM-1084 (P)
(PRACTICAL)

Time: 3½ Hrs. **Max. Marks: 20**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya,Jalandhar.

Inorganic Chemistry: Semi Micro analysis. Cation analysis, Separation and identification of ions from groups I, II, III, IV, V, and VI. Anionic analysis. Four ions with no interference.

Organic Chemistry Laboratory Techniques

Determination of Melting Point

Naphthalene 80–82^{o}C	Cinnamic acid 132.5–133^{o}C
Benzoic acid 121.5–122^{0}C	Salicylic acid 157.5–158^{o}C
Urea 132.5–133^{o}C	Acetanilide 113.5–114^{o}C
Succinic Acid 184.5–185^{o}C	m–dinitro benzene 90^{o}C
P–dichlorobenzene 52^{o}C	Aspirin 135^{o}C

Determination of Boiling Point

Ethanol 78^{o}C	Cyclo Hexane 81.4^{o}C,
Benzene–80^{o}C	Toluene 110°C

Practical Examination

1) Inorganic Mixture	12
2) Melting Point/Boiling point of organic substance	03
3) Viva–Voce	03
4) Note Book	02

Books suggested:

1. Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.
2. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge. Standard Methods of Chemical. Analysis, W.W. Scott: The Technical Press.
3. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
4. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
5. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press**.**

Bachelor of Science (Medical) Semester–I
Session 2021-22
BOTANY
Course Title: DIVERSITY OF MICROBES
Course Code: BSMM-1075 (I)
(THEORY)

Course outcomes: -

After passing this course the course the student will be able to:

CO1: Understand diversity in microscopic living organisms and their associations with other organisms.

CO2: Understand evolutionary history and time scale of non-vascular plants.

CO3: Develop basic knowledge about the variations in life cycle pattern of different organisms.

CO4: Interpret the structure and functional anatomy of plants belonging to the principal groups of living and fossil land plants.

Bachelor of Science (Medical) Semester–I
Session 2021-22
BOTANY
Course Title: DIVERSITY OF MICROBES
Course Code: BSMM-1075 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Algae: General characters, classification and economic importance, range of thallus organization, important features and life history of Chlorophyceae– *Volvox, Oedogonium, Coleochaete;* Xanthophyceae– *Vaucheria;* Phaeophyceae– *Ectocarpus, Sargassum;* Rhodophyceae– *Polysiphonia.*

UNIT-II

General account of viruses and mycoplasma with special reference to SARS and Covid-19. Bacteria–structure, nutrition, reproduction and economic importance; general account of cyanobacteria.

UNIT-III

General account, classification and economic importance of fungi. Important features and life history of Mastigomycotina– *Pythium, Phytophthora;* Zygomycotina– *Mucor*, Ascomycotina– *Saccharomyces, Eurotium, Chaetomium, Peziza*.

UNIT-IV

Basidiomycotina– *Puccinia, Agaricus;* Deuteromycotina– *Cercospora, Colletotrichum*. General account of Lichens.

Suggested Readings:

1. Dube, H.C., 2007, A Textbook of Fungi, Bacteria and Viruses (3rd edition), Scientific Publishers, India
2. Dube, H.C., 2013, An Introduction to Fungi (4th edition), Scientific Publishers., India.
3. James W. Brown. (2015). Principles of Microbial Diversity.ASM press, USA.
4. Ogunseitan, O. (2008). Microbial Diversity: Form and function in Prokaryotes. Wiley Publishers, USA.
5. Sharma, O.P., 2004, Text Book of Thallophytes. McGraw Hill Publishing Co., India.
6. Sharma, P.D., 2004, The Fungi, (2nd Edition) Rastogi Publication, India
7. Srivastava, H.N., 2018, Diversity of Microbes and Cryptogams, Vol. I, Pradeep's Publication.

Bachelor of Science (Medical) Semester–I
Session 2021-22
BOTANY
Course Title: DIVERSITY OF CRYPTOGAMS
Course Code: BSMM-1075 (II)
(THEORY)

Course Outcomes:

After passing this course student will be able to:

- CO1: Demonstrate knowledge of similarities and differences between vascular and nonvascular plants.
- CO2: Build up a sound foundation in the subject of Cryptogamic Botany in general and Bryophytes in particular so that the students may be able to apply the acquired knowledge while interacting into the other fields of Botany.
- CO3: Acquaint the students about the classification, morphology, biology and economic importance of various pteridophytic plants
- CO4: Recognize different plants and flora that come under cryptogams.

Bachelor of Science (Medical) Semester–I
Session 2021-22
BOTANY
Course Title: DIVERSITY OF CRYPTOGAMS
Course Code: BSMM-1075 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

UNIT-I

Bryophyta: Amphibians of plants kingdom displaying alternation of generations; structure, reproduction.

UNIT-II

Classification of Hepaticopsida (e.g. *Marchantia*); Anthocerotopsida (e.g. *Anthoceros*), Bryopsida (e.g. *Funaria*).

UNIT-III

Pteridophyta: The first vascular plant; important characteristics of Psilopsida, Lycopsida, Sphenopsida and Pteropsida; Structure, reproduction in *Rhynia*

UNIT-IV

Structure and reproduction in *Lycopodium, Selaginella, Equisetum, Pteris and Marsilea.*

Suggested Readings:

1. Goffinet B. (2008). Bryophyte Biology. Cambridge University Press, UK.
2. Sambamurty, S.S. (2013). A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. I K International Publishing House Pvt Ltd., India
3. Sharma, O.P. (2014). Bryophyta. McGraw Hill Education Pvt Ltd., India.
4. Srivastava, H.N., 2018, Diversity of Microbes and Cryptogams, Vol. I, Pradeep's Publication.
5. Vashishta, P.C, Sinha, A.K, Kumar, A., (2010). Botany for Degree Students Pteridophyta (Vascular cryptogams). S.S. Chand Publications.

Bachelor of Science (Medical) Semester–I
Session 2021-22
BOTANY
Course Title: PRACTICAL – I – (Related to Diversity of Microbes & Diversity of Cryptogams)
Course Code: BSMM-1075 (P)
(PRACTICAL)

Course Outcomes

After passing this course student will be able to:

- CO 1: Ability to evaluate different sources of phylogenetic information (e.g. molecular sequence data, ultrastructure, morphology) for understanding algal, fungal.
- CO 2: Knowledge of the evolutionary history and time-scale of non-vascular plants, including the development of the first terrestrial plants from green algae.
- CO 3: Knowledge of the history and time-scale of land plant evolution, and evaluation of the principal types of evidence underlying.
- CO 4: Basic understanding of algal and fungal diversity (incl. morphology, cell structure and level of organization) to phylum level, and their association as lichens.

Bachelor of Science (Medical) Semester–I
Session 2021-22
BOTANY
Course Title: PRACTICAL – I – (Related to Diversity of Microbes & Diversity of Cryptogams)
Course Code: BSMM-1075 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the paper setter: question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

Suggested Laboratory Exercises

Teachers may select plants/material available in their locality/institution.

1. Gram staining of bacteria.
2. Observation of disease symptoms in hosts infected by fungi, viruses and mycoplasma. Section cutting of diseased material and identification of the pathogens as per the theory syllabus.
3. Study of the genera included under algae and fungi.
4. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta.
5. Types of Bacteria to be observed from temporary /permanent slides /electron micrographs.

Suggested Readings:

- Lee, R.E. **(2018).** Phycology, Fifth Edition, Cambridge University Press, USA.
- Agrios, G.N. **(2005).** Plant Pathology, 5th edition, Academic Press, U.K.

Bachelor of Science (Medical) Semester–I
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD CHEMISTRY AND NUTRITION
Course Code: BSMM-1255 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:** Understandfood, its functions,food groups, food digestion, absorption, transport and utilization of nutrients in the body.
- **CO2:** Understand nutrition, malnutrition and nutrient requirement for adultmen and women as per ICMR.
- **CO3:** Understand the composition and nutritional significance of cereals, milk and milk products, egg, meat, fruits and vegetables.
- **CO4:**Understand the chemistry underlying the properties of various food components.

Bachelor of Science (Medical) Semester–I
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD CHEMISTRY AND NUTRITION
Course Code: BSMM-1255 (I)
(THEORY)

Examination Time: 3 Hrs. **Max. Marks: 100**

Theory Marks: 60

Practical Marks: 20

CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT– I

1. **Introduction to nutrition**–food as a source of nutrients, function of foods, definition of nutrition, nutrients, adequate, optimum and good nutrition, malnutrition.
2. **Inter–relationship between nutrition and health**–parameters of good health.
3. **Food guide**–basic five food groups – Importance, uses.
4. **Food Metabolism** –digestion, absorption, transport, utilization of nutrients in the body.
5. **Recommended dietary Requirements**- Nutrient requirement for adult men and women asper ICMR.
6. **Water**–function, sources, requirement, water balance, effect of deficiency on health.

UNIT-II

7. **Carbohydrate**—composition, classification, food sources, storage in body, reaction, structure,functions of mono, oligo and poly-saccharides in foods.
8. **Fat and oils**—composition, saturated, unsaturated fatty acids, food sources, functions of fats.Nomenclature and classification, emulsions and emulsifiers, role of fat and oil in food processing.
9. **Proteins** — composition, essential and non–essential amino acids, sources of protein, functions, protein deficiency diseases, physico–chemical properties, modification of food protein during processing and storage.
10. **Energy** —unit of energy, food as a source of energy, calorific value of food, need for energy,basic metabolic role, utilization of fat, energy requirement.
11. **Minerals**- function, sources, bio–availability and deficiency of macro and micro minerals.
12. **Vitamins**- classification, sources, functions and deficiency diseases of fat and water solublevitamins.

UNIT– III

13. **Cereals**: Composition and Nutritional aspects, breakfast cereals and cereal products: Bread and pasta.

14. Milk and Milk Products: Composition, classification, storage, uses, and nutritional significance of milk, curd, butter, paneer, khoa, cheese, ice–cream and various kinds of processed milk.

UNIT -IV

15. Egg and Poultry: Composition and nutrition significance.

16. Meat and Fish: Structure, composition and nutritional significance, post mortem changes, changes in meat during cooking.

17. **Fruits and Vegetables**: Nutritive value of fruit and vegetables and their products- jam, jelly, marmalade and canned products.

Books Recommended:

1. Food Chemistry, 2007,4th Edition, Owen R. Fennema**. (Online available)**
2. Food Chemistry, 2003,2nd Edition, Connie M. Weaver, James R. Daniel.
3. Food Chemistry, 1974,3rd Edition, Mian Hoagland Meyer.
4. Principles of Food Chemistry, 2018,4th Edition, deMan.
5. Basic Food Chemistry, 2012, 4th Edition, Frank A. Lee.
6. Fundamentals of Foods and Nutritions, 2018,6thEdition, Mudambi S.R., M.V. Rajgopal.
7. Advanced text book of Foods Nutrition, 1985, 2nd Edition, Swaminathan S.
8. Dairy technology: principles of milk properties and processes, 1995, 1st Edition, P. Walstra, T.J Guerts, A. Noomen, A. Jellema and M.A.J.S Van Boekel.
9. Cereal processing technology, 2001, 1st Edition, Gavin Owens.
10. Preservation of Fruit and Vegetables, GirdhariLal, G.S. Siddappaa and G.L. Tandon, ICAR, New Delhi.
11. Analysis and Quality Control for Fruit and VegetableProducts, S Ranganna, McGraw Hill Education (India) Private Limited, Chennai, India.
12. Essentials of Food Science, 2013, 4th Edition, Vickie A. Vaclavik, Elizabeth W. Christian. **(Online available)**
13. Food Chemistry, 2009, 4th Edition, H.-D. Belitz, W. Grosch, P. Schieberle. **(Online available)**

Bachelor of Science (Medical) Semester–I
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: PRACTICAL – (Related to Food Chemistry and Nutrition)
Course Code: BSMM-1255 (P)
(PRACTICAL)

Time: 3 Hrs. **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals

1. Determination of moisture content of wheat flour.
2. Calculation of BMI and BMR
3. Determination of ash content of food sample.
4. Qualitative tests of proteins and lipids in different foods.
5. Estimation of Vitamin C.
6. Determination of salt content in food products.
7. Estimation of volatile and nonvolatile acids in vinegar.
8. Estimation of fat in food sample by Soxhlet apparatus.
9. Grading and quality evaluation of eggs.
10. Dehydration of common fruits and vegetables.

SEMESTER – II

Bachelor of Science (Medical) Semester–II
Session 2021-22
ZOOLOGY
Course Title: ECOLOGY
Course Code: BSMM-2483 (I)
(THEORY)

Course Outcomes

After passing this course the student will be able to:

- CO1. Construct the food web.
- CO2. Familiarise with ecological adaptations.
- CO3. Know about the characteristics of population & biotic community.
- CO4. Know about the conservation of resources.

Bachelor of Science (Medical) Semester–II
Session 2021-22
ZOOLOGY
Course Title: ECOLOGY
Course Code: BSMM-2483 (I)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Ecology: Definition, Subdivisions and scope of ecology.

Ecosystem: Components, ecological energetics, food web, major ecosystems of the world.

Ecological factors: Temperature, light and soil as ecological factors.

UNIT-II

Nutrients: Biogeochemical cycles and concept of limiting factors.

Ecological Adaptations: Morphological, physiological and behavioural adaptations in animals in different habitats.

UNIT-III

Population: Characteristics and regulations of population. Inter and Intra Specific relationship: Competition, Predation, Parasitism, Commensalism and Mutualism.

Biotic community: Characteristics, ecological succession, ecological niche.

UNIT-IV

Natural resources: Renewable and nonrenewable natural resources and their conservations.

Environmental Issues: Causes, impact and control of environmental pollution.

Suggested Readings:

1. Anderwartha, H.G. and Birch, L. C. (1970), The distribution and abundance of animals, University of Chicago Press, Chicago London.
2. Beeby, A. (1992), Applying Ecology, Chapman and Hall Madras.
3. Begon, M., Harper J. L. and Townsend, C. R. (1995), Ecology – Individuals, populations and communities, Blackwell Science, Cambridge UK.

4. Brewer, R. (1994), The science of Ecology, Saunders College of Publishing, New York.
5. Chapman, J. L. and Resis, M. J. (1995), Ecology- Principles and applications, Cambridge University Press, Cambridge UK.
6. Kaeighs, S. C. (1974), Ecology with special references to animal and Man, Prentice Hall Inc.
7. Kormondy, E.J. (1975), Concept of Ecology, Englewood Cliffs, N.J. Prentice Hall Inc.
8. Kreb C.J. (1982), Ecology, Harper & Row, New York.
9. Putmann, R. J. and Wratten, S. D. (1984), Principles of Ecology, Crown Helm, London.

Bachelor of Science (Medical) Semester–II
Session 2021-22
ZOOLOGY
Course Title: BIODIVERSITY-II
Course Code: BSMM-2483 (II)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- CO1. Familiarize with the non-chordate world that surrounds us.
- CO2. Appreciate the process of evolution (unicellular cells to complex, multicellular organisms).
- CO3. Identify the invertebrates and classify them up to the class level with the basis of systematic.
- CO4. Understand the basis of life processes in the non-chordates and recognize the economically important invertebrate fauna.

Bachelor of Science (Medical) Semester–II
Session 2021-22
ZOOLOGY
Course Title: BIODIVERSITY-II
Course Code: BSMM-2483 (II)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Arthropoda: Type study- Periplaneta americana (Cockroach),

Social organizations in insects (Honey bee and Termite)

UNIT-II

Mollusca: Type study-Pila globosa, Tortion, Pearl formation

UNIT-III

Echinodermata: Type study - Asterias (Star fish), Study of Echinoderm larvae

UNIT-IV

Hemichordata: Type study - Balanoglossus (External characters only).Affinities of Hemichordates with Non-Chordates and Chordates

Suggested Readings:

1. Barnes, R.D.(1999), Invertebrate Zoology. W.B. Saunder, Philadelphia.
2. Dhami, P.S. & Dhami, J. K., Invertebrates, R. Chand & Co., New Delhi, 2001.
3. Barth, R. H. and Broshears, R. E (1982), The Invertebrate world. Holt Saunder, Japan.
4. Brusca, R. C. and Brusca, G. J. (2003), Invertebrates (2nd ed), Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.
5. Engemann, J. G. and Hegner, R. W. (1981), Invertebrate Zoology (3rd ed), Macmillan, New York.
6. Gardiner, M. S. (1972), The Biology of Invertebrates, McGraw Hill, New York.
7. Meglitsch, P. A. and Schran, F. R. (1991), Invertebrate Zoology (3rd ed), Oxford University Press, New York.
8. Pechenik, A. Jan. (2000), Biology of the invertebrates, (4th ed), McGraw Hill Book Co. Singapore.

Bachelor of Science (Medical) Semester–II

Session 2021-22

ZOOLOGY

Course Title: PRACTICAL-II (Related to Ecology and Biodiversity-II)

Course Code: BSMM-2483 (P)

(PRACTICAL)

Course Outcomes:

After passing this course the student will be able to:

- CO1. Know about the morphological, physiological & behavioural adaptations of different animals in different habitats
- CO2. Familiarise with the classification & ecology of invertebrates
- CO3. Identify different zoogeographical realms with fauna.
- CO4. Know about the different nest of birds.

Bachelor of Science (Medical) Semester–II
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-II (Related to Ecology and Biodiversity-II)
Course Code: BSMM-2483 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the Practical Examiners:

Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

1. Classification up to orders with ecological notes and economic importance (if any) of the following animals :

Arthropoda : Peripatus, Palaemon (prawn), Lobster, Cancer (crab), Sacculina, Eupagurus (hermit Crab), Lepas, Balanus, Cyclops, Daphnia, Lepisma, Periplaneta (cockroach), Schistocerca (locust), Poecilocerus (ak grasshopper), Gryllus (cricket), Mantis (praying mantis), Cicada, Forficula (earwig), Dragonfly, Termite queen, Bug, Moth, Beetles, Polistes (wasp), Apis (honey bee), Bombyx, Pediculus (body louse) Millipede and Centipede, Palamnaeus (scorpion), Aranea (spider) and Limulus (king Crab).

Mollusca: Anodonta, Mytilus, Ostrea, Cardium, Pholas, Solen (razor fish), Pecten, Haliotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus shell (Complete and T.S.), Chiton, Dentalium.

Echinodermata : Asterias, Echinus Ophiothrix, Antedon.

Hemichordata : Balanoglossus.

2. **Study of the following permanent stained preparations:**

Trachea and mouth parts of Insects
Radula and osphradium of Pila
T.S. Star fish (Arm).

3. **Demonstration of digestive and nervous systems of Periplaneta (cockroach) with the help of charts/models/videos.**

4. **Ecology:**

Study of animal adaptations with the help of specimens, charts and models.

Study of abiotic and biotic components of an ecosystem.

Study of different types of nests of birds.

Study and preparation of Zoogeographical charts.

5. **Assignment**

Note:- Some changes can be made in the practicals depending on the availability of material.

Guideslines for conduct of practical Examination:-

1.	Identifiy and classify the specimens upto order. Write a note on their habit, habitat, special features and economic importance.	**4**
2.	Draw a well labelled sketch of the given system of the animal & explain it to the examiner.	**3**
3.	Identify the slides/models and give two reasons for identification.	**3**
4.	Identify the adaptive feature/nest.	**2**
5.	Mark the distribution of animals of a realm on the map.	**2**
6.	Assignment	**2**
7.	Viva-voce & Practical file.	**4**

Bachelor of Science (Medical) Semester–II
Session 2021-22
MICROBIOLOGY
Course Title: BASIC FOOD MICROBIOLOGY
Course Code: BSMM-2343 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand the intrinsic and extrinsic factors affecting the growth of various microorganisms in foods and microorganisms important in food microbiology.

CO2: Learn about the origin and preparation of fermented foods (bread, dosa, idli, warri, tempeh, miso).

CO3: Understand the Principles of food preservation and various methods of preservation (high temperature, low temperature, drying, chemical preservatives) and applications of prebiotics and probiotics.

CO4: Understand the spoilage of food (milk and milk products, cereal and cereal products, vegetable and fruits, meat and meat products, canned foods) and food poisoning and infection.

Bachelor of Science (Medical) Semester–II
Session 2021-22
MICROBIOLOGY
Course Title: BASIC FOOD MICROBIOLOGY
Course Code: BSMM-2343 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 100**
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

1. Food as a substrate for microorganisms, intrinsic and extrinsic factors affecting the growth of various microorganisms in foods. Microorganisms important in food microbiology–bacteria, yeasts and molds, sources of contamination in foods.

UNIT–II

2. Fermented foods, origin of fermentation as a method of preparing indigenous foods, bread, dosa, idli, warri, tempeh, miso

UNIT–III

3. Principles of food preservation and spoilage, asepsis, anaerobic conditions, aseptic packaging, preservation methods, high temperature, low temperature, drying, chemical preservatives. Applications of prebiotics and probiotics.

UNIT–IV

4. Spoilage of various milk and milk products, cereal and cereal products, vegetable and fruits, meat and meat products, canned foods. Food poisoning and food infection. *Staphylococcal*, *Clostridium* and *Salmonella* intoxications.

Books Recommended:

1. Frazier. W.C. and Westhoff, D.C. 2006, 26th edition, Food Microbiology, Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Banwart, G.J., 2012, Basic Food Microbiology, Springer Verlag, New Delhi.
3. Powar, C.B. and Dagniwala, H.F. 2012, General Microbiology Volume II. Himalaya Publishing House, New Delhi. 128

Bachelor of Science (Medical) Semester–II
Session 2021-22
MICROBIOLOGY
Course Title: PRACTICAL - (Related to Basic Food Microbiology)
Course Code: BSMM-2343 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

LIST OF PRACTICALS

1. To enumerate the total microbial cells in a suspension by serial dilution and pour plating.
2. To enumerate the total bacteria in milk by direct microscopic count.
3. To measure the size of microbial cells by ocular micrometer.
4. To study the morphology of bacteria, yeasts and molds.
5. To check the bacteriological quality of raw milk by methylene blue reduction test.
6. Baking of bread and making of dhokla&idli.
7. To study the spoilage of microorganisms present in spoiled bread and raw milk.

Bachelor of Science (Medical) Semester–II
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY – I
Course Code: BSMM-2084 (I)
(THEORY)

Course outcomes

Students will be able to:

CO1: Explain the atomic, physical and chemical properties of alkali metals and alkaline earth metals

CO2: Recognise the anomalous properties of Li and compares the properties Li with those other alkali metals

CO3: Recognises the anomalous properties of Be and compares the properties of Be with those other alkaline earth metals

CO4: Explains the trends in atomic and physical properties of group 13, 14, 15, 16, 17 elements explains chemical properties of above group elements

CO5: Describe allotropic forms of elements

CO6: Exhaustive understanding of d–block elements belonging to 4^{th},5^{th} and 6^{th} period.

CO7: Understand the simple concepts of pH and complete and balance simple acid-base reactions.

Bachelor of Science (Medical) Semester–II
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY – I
Course Code: BSMM-2084 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setter
Eight questions of equal marks(6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

I. p–Block Elements–I

Comparative study (including diagonal relationship) of groups 13–17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13–16, hydrides of boron–diborane and higher boranes, Borazine, borohydrides, fullerenes.

UNIT-II

II. s-Block Elements

Comparative studies, diagonal relationship, salient features of hydrides, solvation and complexation tendencies.

III. Acids and Bases
Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

UNIT-III

IV. p–Block Elements-II

Carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalide,Silicones and phosphazenes as examples of inorganicpolymers, nature of bonding in triphosphazenes.

UNIT-IV

V. Chemistry of Transition Elements
Characteristic properties of *d*–block elements.Properties of the elements of the first transition series, their simple compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.General characteristics of elements of Second and Third Transition Series, comparative treatment with their *3*d analogues in respect of ionic radii, oxidation states, magnetic behaviour.

Books Suggested:

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman & Hall Ltd., 1991.
3. Shriver, D.E., Atkins, P.W., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.

4. Douglas, B., Medaniel, D., Atenander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994,
5. Porterfeild, W.W., Wesky, A., Inorganic Chemistry; Pubs: Addison-Wesky Publishing Company, 1984.
6. Miessler, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004,
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.K., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.
10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
11. Inorganic Chemistry, A.G. Sharpe, ELBS.

Bachelor of Science (Medical) Semester–II
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY – II
Course Code: BSMM-2084 (II)
(THEORY)

Course outcomes:

Students will be able to

CO1: Acquire the knowledge of structure and intermolecular forces present between solids, liquids and gases.

CO2: Demonstrate an understanding of basic principles of colligative properties

CO3: Understand the basic concepts of colloidal state of matter and applications of colloids.

CO4: Explain various gaseous laws and their applications.

Bachelor of Science (Medical) Semester–II
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY – II
Course Code: BSMM-2084 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Note: Log table and Non-Programmable calculators are allowed

Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from UNITs I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

I. Gaseous States

Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waal's equation of state.

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waal's equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases.

UNIT –II

II. Liquid State

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquids crystal, solid and liquid.Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

UNIT –III

III. Colloidal State

Definition of colloids, classification of colloids. Solids in liquids (Sol): kinetic, optical and electrical properties, stability of colloids,protective action, Hardy Schulze law, gold number. Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifiers.general applications of colloids.

UNIT –IV

IV. Solutions, Dilute Solutions and Colligative Properties

Ideal and non–ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, Law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties.Abnormal molar mass, degree of dissociation and association of solutes.

Books suggested:

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.

2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.

3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.

4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.

5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.

6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc.,1992.

7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.

8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 2002.

9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.

10.University General Chemistry, C.N.R. Rao, Macmillan.

Bachelor of Science (Medical) Semester–II
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-2084 (P)
(PRACTICAL)

Course outcomes:

Students will be able to

CO1: Understand the technique of crystallisation

CO2: Compare the viscosity and surface tension of different liquids and solutions

CO3: Determine the rate of the reactions

CO4: Efficiently use of calorimeter in various experiments

Bachelor of Science (Medical) Semester–II
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-2084 (P)
(PRACTICAL)

Time: 3½ Hrs. **Max. Marks: 20**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Crystallisation:

Concept of indication of crystalisation. Phthalic acid from hot water (using fluted filter paper & stem less funnel)

Acetanilide from boiling water.

Naphthalene from Ethanol

Benzoic acid from water

Physical Chemistry

1. To determine the specific reaction rate of hydrolysis of ethyl acetate catalysed by Hydrogen ions at room temperature.
2. To study the effect of acid strength on hydrolysis of an ester.

Viscosity, Surface Tension (Pure Liquids)

3. To study the viscosity and surface tension of CCl_4, glycerine solution in water.
4. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
5. To determine the enthalpy of neutralisation of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
6. To determine the enthalpy of dissolution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

Practical Examination:		**Marks**
1)	Crystallisation	05
2)	Physical Experiment	10
3)	Viva–Voce	03
4)	Note Book	02

Books suggested :

1. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
2. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
3. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
4. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
5. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
6. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
7. Advanced Experimental Chemistry, Vol. I, Physical, J.N. Guru and R. Kapoor, S. Chand & Co.
8. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh & Sons.
9. Experiments Physical Chemistry, J.C. Ghosh, Bharati Bhavan.

Bachelor of Science (Medical) Semester–II
Session 2021-22
BOTANY
Course Title: CELL BIOLOGY
Course Code: BSMM-2075 (I)
(THEORY)

Course outcomes:

After passing this course the course the student will be ableto:-

CO1: Explain cellular processes and mechanisms that lead to physiological functions as well as examples of pathological state.

CO2: Describe the intricate relationship between various cellular structures and their corresponding functions.

CO3: Describe cytological, biochemical, physiological and genetic aspects of the cell, including cellular processes common to all cells, to all eukaryotic cells as well as processes in certain specialized cells.

CO4: Relate normal cellular structures to their functions.

Bachelor of Science (Medical) Semester–II
Session 2021-22
BOTANY
Course Title: CELL BIOLOGY
Course Code: BSMM-2075 (I)
(THEORY)

Time: 3Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

An Overview: prokaryotic and eukaryotic cells, cell size and shape and *Escherichiacoli*. Structure and Function of Nucleus; Ultrastructure; nuclear membrane; nucleolus.

UNIT-II

Extranuclear Genome: Presence and function of mitochondrial and plastid DNA; plasmids. Structure and Function of other Organelles: Golgi bodies, Endoplasmic reticulum, Peroxisomes, Vacuoles.

UNIT-III

Chromosome Organization: Morphology; centromere and telomere; chromosome alterations; deletions, duplications, translocations, inversions; variations in chromosome number, aneuploidy, polyploidy; sex chromosomes.

UNIT-IV

The Cell Envelopes: Plasma membrane; bilayer lipid structure; functions; the cell wall.

Suggested Readings:

1. Gupta, P.K. (2017). A Text–book of Cell and Molecular Biology (5th edition). Rastogi Publications, Meerut, India.
2. Johnson, A., Raff, L. and Walter, R. (2008). Molecular Biology of the Cell (5th Edition). Taylor and Francis Group, USA.
3. Karp, G. (2013). Cell and Molecular Biology: Concepts and Experiments (7th Edition). Wiley Publishers, USA.
4. Kleinsmith, L.J. and Kish, V.M. (1995). Principles of Cell and Molecular Biology (2nd edition). HarperCollinsCollege Publishers, New York, USA.
5. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A. and Ploegh, H. (2016). Molecular Cell Biology (5th edition) , W.H. Freeman & Co., New York, USA.
6. Snustad, D.P. and Simmons, M.J. (2012). Principles of Genetics (8th Edition). John Wiley and Sons Inc., U.S.A.

Bachelor of Science (Medical) Semester–II

Session 2021-22

BOTANY

Course Title: GENETICS

Course Code: BSMM-2075 (II)

(THEORY)

Course outcomes:

After passing this course the course the student will be ablefor:-

CO1: Comprehensive, detailed understanding of the chemical basis of heredity

CO2: Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.

CO3: Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.

CO4: Understanding the role of genetic mechanisms in evolution. The knowledge required to design, execute, and analyze the results of genetic experimentation in animal and plant model systems.

CO5: The ability to evaluate conclusions that are based on genetic data. Insight into the mathematical, statistical, and computational basis of genetic analyses that use genome-scale data sets in systems biology settings.

Bachelor of Science (Medical) Semester–II
Session 2021-22
BOTANY
Course Title: GENETICS
Course Code: BSMM-2075 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

DNA the Genetic Material: DNA structure; replication; DNA–protein interaction; the nucleosome model; genetic code; satellite and repetitive DNA.

UNIT-II

Cell Division: Mitosis; meiosis.Genetic Inheritance: Mendelism; laws of segregation and independent assortment; linkage analysis; allelic and non–allelic interactions.

UNIT-III

Gene expression**:** Structure of gene; transfer of genetic information; transcription, translation, protein synthesis, tRNA; ribosomes; regulation of gene expression in prokaryotes and eukaryotes; proteins, ID, 2D, and 3D structure.

UNIT-IV

Genetic Variations: Mutations, spontaneous and induced; transposable genetic elements; DNA, damage and repair.

Suggested Readings:

1. Brown, T.A. (2011). Genetics: A Molecular Approach (3rd Edition). BIOS Scientific Publishers, UK.
2. Fletcher, H., Hickey, I. and Winter, P. (2010). Instant Notes on Genetics (3rd edition) Taylor and Francis Group, USA.
3. Gardner, E.J., Simmons, M.J. and Snustad, D.P. (2012). Principles of Genetics (8th Edition). Wiley Sons, USA.
4. Gupta, P.K. (2017). Cell and Molecular Biology (5th edition), Rastogi Publications, Meerut, India.
5. Kleinsmith, L.J. and Kish, V.M. (1995). Principles of Cell and Molecular Biology (2nd Edition).Harper Collins College Publishers, New York, USA.
6. Krebs, B. E., Goldstein, E.S. and Kilpatrick, S.T. (2014). Lewin's Genes XI. Jones and Bartlett Publishers, LLC, UK.

7. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A. and Ploegh, H. (2016). Molecular Cell Biology (5th edition), W.H. Freeman & Co., New York, USA.
8. Singh, B.D. (2018). Molecular Genetics.Kalyani Publishers, India.
9. Snustad, D.P. and Simmons, M.J. (2012). Principles of Genetics (5th Edition). John Wiley and Sons Inc., U.S.A.

Bachelor of Science (Medical) Semester–II
Session 2021-22
BOTANY
Course Title: PRACTICAL – II (Related to Genetics and Cell Biology)
Course Code: BSMM-2075 (P)
(PRACTICAL)

Course outcomes:

After passing this course the course the student will develop:

CO1: A critical awareness of how genetics techniques can be applied to biological problems.

CO2: A critical awareness of current thinking in a specialist area of cell biology and genetics.

CO3: the ability to evaluate methodologies in the design of experimental procedures.

CO4: The ability to critically evaluate experimental data.

CO5: The ability to synthesize hypotheses from a wide range of information sources.

CO6: The ability to design and implement a wide range of experimental procedures.

CO7: to be able to make sound judgments on the significance of incomplete data sets.

CO8: Demonstration of independence and originality in solving problems.

CO9: The ability to exercise initiative and personal responsibility.

CO10: The development of independent learning skills required for continuing professional development.

Bachelor of Science (Medical) Semester–II
Session 2021-22
BOTANY
Course Title: PRACTICAL – II (Related to Genetics and Cell Biology)
Course Code: BSMM-2075 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the paper setter: question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Laboratory Exercises

Teachers may select plants/material available in their locality/institutions.

1. To study cell structure from onion leaf peels; demonstration of staining and mounting methods.
2. Comparative study of cell structure in onion cells, *Hydrilla*and *Spirogyra.* Study of cyclosis in *Tradescantia*Staminal Cells.
3. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, *Lycopersicon*and *Capsicum*).
4. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
5. Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.
6. Microscopy- Theoretical knowledge of Light and Electron microscope.
7. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
8. Preparation of karyotypes from dividing root tip cells and pollen grains.
9. Cytological examination of special types of chromosomes: bar body, lampbrush and polytene chromosomes.
10. Working out the laws of inheritance using seed mixtures.
11. Working out the mode of inheritance of linked genes from test cross and/or F2 data.

Suggested Readings: -

1. Fukui, K. and Nakayama, S. 1996. Plant Chromosomes; Laboratory Methods, CRC Press, Boca Raton, Florida.
2. Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology; Structure and Function, Jones AndBarllett Publishers, Boston, Massachusetts.
3. Harns, N. and Oparka, K.J. 1994. Plant Cell Biology, A Practical Approach. IRL Press,at OxfordUniversity Press, Oxford, UK.
4. Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes; Analysis. Manipulation and Engineering, Harwood Academic Publishers, Australia.
5. Plopper, G. (2016). Principles of Cell Biology. Jones and Barnett Learning, Boston, Massachusett

Bachelor of Science (Medical) Semester–II
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD PLANT HYGIENE AND SANITATION
Course Code: BSMM-2255 (I)
(THEORY)

Course Outcomes: After passing this course the student will be able to:

- **CO1:** Understand hygiene, sanitation and importance of personal hygiene of food handler in food industries.
- **CO2:** Learn various methods, basic principles and practices of cleaning and sanitation in food processing industries.
- **CO3:** Understand requirements of waste management, waste disposal and treatment in food industries
- **CO4:** Understand requirements of water utilization and hygiene of water used for processing.

Bachelor of Science (Medical) Semester–II
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD PLANT HYGIENE AND SANITATION
Course Code: BSMM-2255 (I)
(THEORY)

Examination Time: 3 Hrs. **Max. Marks: 100**

Theory Marks: 60

Practical Marks: 20

CA: 20

Instructions for the Paper Setter: Eight questions of equal marks(12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT - I

Importance of personal hygiene of food handler- habits, clothes, illness, education of handler in handling and service. Cleaning agents and disinfectants.Uses of different cleaning and sanitizing agents, GLP, GHP, CIP and COP.

UNIT - II

Cleaning methods– sterilization, disinfection, heat & chemicals, chemical tests for sanitizer strength.

UNIT - III

Food sanitation- principles & methods, control and inspection, sanitation in fruits & vegetables industry, cereals industry, dairy industry, meat, egg & poultry units.

UNIT - IV

Control of infestation, rodent control, vector control, use of pesticides, hygiene of water used for processing, Analysis of total plate count and E.*coli*, planning & implementation of training programmes for health personnel, waste disposal and treatment.

Books Recommended:

1. Principles of Food Sanitation by Norman G. Marriott
2. Food Poisoning and Food Hygiene by Hobbs, B. C. and R. J. Gilbert
3. Quantity food sanitation by Longree K
4. Environmental Sanitation in India by Kawata K

Bachelor of Science (Medical) Semester–II
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: PRACTICAL – (Related to Food Plant Hygiene and Sanitation)
Course Code: BSMM-2255 (P)
(PRACTICAL)

Time: 3 Hrs. **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals:

1. Sterilization of equipments used in the laboratory by using heat and chemicals.

2. Determination of B.O.D& C.O.D

3. Determination of sanitary status of plant equipment.

4. Chlorination of water.

5. To study the bacteriology of water.

6. Determination of Total dissolved solids (TDS) of water.

7. Determination of Hardness of water.

8. Determination of alkalinity and acidity of water.

9. Determination of organic matter of water.

10. Determination of chlorides and sulphates in water.

SEMESTER – III

Bachelor of Science (Medical) Semester–III
Session 2021-22
ZOOLOGY
Course Title: EVOLUTION
Course Code: BSMM-3483 (I)
(THEORY)

Course Outcomes:

- CO1. Familiar with ecological adaptations.
- CO2. Identify the contributions of various Evolutionists.
- CO3. Understanding the process and theories in evolutionary biology.
- CO4. Develop an interest in the debates and discussions taking place in the field of evolutionary biology.

Bachelor of Science (Medical) Semester–III
Session 2021-22
ZOOLOGY
Course Title: EVOLUTION
Course Code: BSMM-3483 (I)

(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Units I

Introduction to evolution
Evidences of organic evolution

Theories of organic evolution

Units II

Origin of life
Concept of micro, macro and mega-evolution
Concept of Species
Speciation

Units III

Fossils, its types and significance
Evolutionary rate
Origin & Extinction of reptiles
Evolution of man (in Brief)

Units IV

Migration & Parental Care in Pisces
Flight adaptation & Bird migration
Adaptive radiations like scales & fins in fish, poison apparatus in snakes and dentition in Mammals.

Suggested Readings:

1. Avers, C. J.(1989). Evolution Process and Pattern in Evolution, New York Oxford Oxford university press.
2. Bhamarah, H.S.(1993), Juneka K., Cytogenetics & Evolution, Anmol Publication Pvt. Ltd.
3. Brookfield, A. P. (1986). Modern aspects of Evolution. Nelson Thornes publishers
4. Colbert. E.H.(2002), Evolution of Vertebrates, cbspd publishers
5. Freeman, S. and Herron, Jon C. (2007). Evolutionary analysis, Pearson Prentice Hall, New Jersey.
6. Futuyma, D. J. (1998), Evolutionary Biology, Sinauer Assoc. Inc. Pub. USA.
7. Meglitsch, P. A. (1991), Invertebrate Zoology (3rded), Oxford University Press.
8. Wen-Hsiung Li (1997), Molecular Evolution, Sinauer associatesInc.Pub. USA.
9. Rastogi, V.B(2003) Organic evolution, Medtech publishers
10. Strickberger, M.N(2000) Evolution , Jones and Bartlett publishers.
11. Tomar, B.S. and S.P.Singh(2000)Evolutionary Biology, Rastogi publishers.

Bachelor of Science (Medical) Semester–III
Session 2021-22
ZOOLOGY
Course Title: BIODIVERSITY-III
Course Code: BSMM-3483 (II)
(THEORY)

Course Outcomes:

- CO1. Describe the diversity in form, structure and habits of vertebrates.
- CO2. Explain general characteristics and classification of different classes of vertebrates.
- CO3. Positive attitude towards Biodiversity Conservation.

Bachelor of Science (Medical) Semester–III
Session 2021-22
ZOOLOGY
Course Title: BIODIVERSITY-III
Course Code: BSMM-3483 (II)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Units I

Brief Introduction to Protochordata

Urochordata: Type study- *Herdmania*
Cephalochordata: External features and affinities of *Amphioxus*

Units II

Cyclostomata: External Characters of *Petromyzon*

Affinities of Cyclostomata

Pisces: Type study-*Labeo*

Units III

Amphibia: Type study-Frog

Reptilia: Type study-*Uromastix*

Units IV

Aves: Type study-Pigeon
Mammals: Type study-Rat

Suggested Reading Material.

1. Dhami, P.S. &Dhami J.K. (1998), Vertebrates, R. Chand & Co., New Delhi.
2. Hildebrand, M. & Goslow. Jr. G.E. (2001), Analysis of Vertebrates Structure, John Wiley, N. Y.
3. Jollie, M. (1968), Chordate Morphology, Reinhold, New York.
4. Kardong, K. V. (1995), Vertebrates – Comparative Anatomy, Function, Evolution. W.B.C. Pub., Oxford.
5. Kent, G. C. and Carr, R. K. (2001), Comparative Anatomy of the Vertebrates (9thed), McGraw Hill Higher Education, New York.
6. Linzey, D. (2001), Vertebrate Biology, McGraw Hill Publishing Company, New York.
7. Pough, F. H., Heiser, J. B. and McFarland, W. N. (1990), Vertebrate Life (3rd ed), Macmillan Pub. Co., New York.
8. Young, J. Z. (1982), The Life of Vertebrates, New York.
9. Parker, T.J. and Haswell, W.A (1981) Text Book of Zoology, Vol. II (Vertebrates), ELBS and Macmillian Press Ltd.

Bachelor of Science (Medical) Semester–III
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-III (Related to Evolution and Biodiversity-III)
Course code: BSMM-3483 (P)
(PRACTICAL)

Course Outcomes:

- CO1. Familiarize organ systems.
- CO2. Aware about economically important specimens(preserved).
- CO3. Understanding of evolutionary phenomena.

Bachelor of Science (Medical) Semester–III
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-III (Related to Evolution and Biodiversity-III)
Course code: BSMM-3483 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar

Guidelines for conduct of Practical Examination:

1.	Draw a labelled sketch of the system of the given animal & explain it to the Examiner.	3
2.	Identify and classify the specimensupto order level. Write a short note on habitat, special features, feeding, habits and economic importance of the specimens.	8
3.	Idendify and write a note on the evolutionary phenomenon in the given specimen.	2
4.	Identify the slides/specimens, give two reasons for identification.	3
5.	Viva-voce & Practical file.	4

I. Classification up to order level, except in case of Pisces and Aves where classification up to subclass level, habits, habitat, external characters and economic importance (if any) of the following animals is required :

Urochordata **:** *Herdmania, Molgula, Pyrosoma, Doliolum, Salpa&Oikopleura.*

Cephalochordata : *Amphioxus.* Study of the following prepared slides:

T.S. *Amphioxus* through various regions, Pharynx of *Amphioxus*

Cyclostomata : *Myxine*, *Petromyzon &Ammocoetes*Larva.

Chondrichthyes : *Zygaena*(hammer head shark), *Pristis* (saw fish), *Narcine (electric ray), Trygon, Rhinobatus and Chimaera* (rabbit fish).

Actinoptergii : *Polypterus, Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Tetradon, Echeneis and Solea.*

Dipneusti (**Dipnoi**) : *Protopterus*(African lung fish)

Amphibia : *Uraeotyphlus, Necturus, Amphiuma, Amblystoma*and its Axolotl Larva, *Triton, Salamandra, Hyla, Rhacophorus*

Reptilia : *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Vipera, Crocodilus, Gavialis, Chelone*(turtle) and *Testudo* (tortoise),Differences in nonpoisonous and poisonous snakes.

Aves : *Casuarius, Ardea, Anas, Milvus, Pavo, Eudynamics, Tyto* and *Alcedo.*

Mammalia : *Ornithorynchus, Echidna, Didelphis, Macropus, Loris, Macaca, Manis, Hystrix, Funambulus, Panthera, Canis, Herpestes, Capra, Pteropus.*

II. Study of the following systems with the help of charts/models/videos:

Herdmania	**:**	General anatomy
Labeo	:	Digestive and reproductive systems, heart, afferent and branchial arteries, cranial nerves and internal ear.
Pigeon	:	Digestive, arterial, venous and urino-genital systems.
WhiteRat	:	Digestive, arterial, venous and urino-genital systems.

Study of permanent slides of whole mount of Pharynx of *Herdmania*and *Amphioxus.*

Cycloid scales of *Labeo,* blood smear of mammal, Histology of rat/rabbit (compound tissues)

Demonstration of evolutionary phenomena like homology, analogy, mimicry, crypsis.

Note:- Some changes can be made in the practicals depending on the availability of material.

Bachelor of Science (Medical) Semester–III
Session 2021-22
MICROBIOLOGY
Course Title: MICROBIAL NUTRITION AND METABOLISM
Course code: BSMM-3343 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:** Understand the nutrition and requirements for growth of microorganisms, mediumdesigning and types of microorganisms on the basis of nutrition.
- **CO2:** Understand the transport of nutrients across the cell membrane.
- **CO3:** Learn about the laws of thermodynamics and electron transport chain of bacteria.Alsounderstand the growth and metabolic pathways for breakdown of glucose (glycolysis,Kreb's cycle fermentation, pentose phosphate pathways) and gluconeogenesis.
- **CO4:** Learn about the enzymes, kinetics and biosynthesis of nucleic acids.

Bachelor of Science (Medical) Semester–III
Session 2021-22
MICROBIOLOGY
Course Title: MICROBIAL NUTRITION AND METABOLISM
Course code: BSMM-3343 (I)
(THEORY)

Examination Time: 3 Hrs.

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

1. Nutrition, requirements for growth of microorganisms, nutrients and accessory constituents, medium designing. Nutritional types of microorganisms (photolithotrophs, photoorganotrophs, chemolithotrophs and chemoorganotrophs)

UNIT–II

2. Transport of nutrients across the cell membrane, diffusion, passive transport, active transport, and group translocation for the transport of nutrients across the membrane.

UNIT–III

3. Bioenergetics; Laws of thermodynamics, entropy, enthalpy and free energy of reaction standard, oxidative phosphorylation, electron transport, respiratory chains of bacteria, energy metabolism in aerobic and anaerobic microorganisms, pathways for breakdown of glucose (glycolysis, Kreb's cycle fermentation, pentose phosphate pathways), gluconeogenesis, metabolism of starch & cellulose by bacteria.

UNIT–IV

4. Assimilation of nitrogen, biosynthesis of nucleic acids, for synthesis of purine and pyrimidine nucleotides. Enzymes, kinetics, Michaelis Menten equation and allosteric enzymes.

Books Recommended:

1. Pelczar, M.I., Chan, E.C.S. and Krieg, N.R. 2011, 5th edition, Microbiology. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Stanier, R.Y., Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 2005, 5th edition, General Microbiology, MacMillan Education Ltd. Publisher.
3. Powar, C.B. and Dagniwala, H.F. 2012, General Microbiology, Volume I and II, Himalaya Publishing House, Delhi.
4. Sharma, P.D. 2010, Microbiology, Rastogi Publications, Meerut. 142.
5. Bacterial physiology and metabolism by Byung Hong Kim and Geoffrey Michael Gadd. **(Online available**

Bachelor of Science (Medical) Semester–III
Session 2021-22
MICROBIOLOGY
Course Title: PRACTICAL (Microbial Nutrition and Metabolism)
Course code: BSMM-3343 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. Isolation and enumeration of total bacteria from soil by pour plating and spread plating.
2. Comparison of growth on complex medium and defined or minimal medium.
3. Distinction between fermenting and non-fermenting microorganisms.
4. Effects of various concentrations of carbon source on bacterial growth.
5. Effects of various concentrations of nitrogen source on bacterial growth.
6. Effect of temperature on bacterial growth.
7. Effect of pH on bacterial growth.

Bachelor of Science (Medical) Semester–III
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY - I
Course code: BSMM-3084 (I)
(THEORY)

Course outcomes:

Students will be able to

- CO1: to resolve the different enantiomers and differentiate between dextrorotatory and laevorotatory compound.
- CO2: understand the concept of isomerism
- CO3: differentiate between chiral and achiral compounds, configuration and conformation
- CO4: understand the concept of axial and equatorial bonds and draw the various projection formulae
- CO5: understand the methods of formation, chemical reactions, acidic character of alcohols
- CO6: understand structure and bonding, preparation of phenols, acidic character of phenols
- CO7: understand structure and bonding in phenols and carbonyl compounds
- CO8: compare reactivity of aliphatic and aromatic aldehydes and ketones
- CO9: understand the various reactions given by carbonyl compounds

Bachelor of Science (Medical) Semester–III
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY - I
Course code: BSMM-3084 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions,selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Stereochemistry of Organic Compounds

Concept of isomerism,types of isomerism, Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogeniccentre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccentres, diastereomers, threo and erythrodiasteremers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism–determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism–conformational analysis of ethane and n–butane; conformation of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

Unit–II

Alcohols

Classification and nomenclature.Monohydric alcohols—nomenclature, Acidic nature, Reactions of alcohols, Dihydric alcohols—nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$] and [HIO_4] and pinacol-pinacolone rearrangement.

Unit–III

Phenols

Nomenclature, structure and bonding, preparation of phenols, physical properties and acidic character, Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion.Reactions of phenols—electrophilic aromatic substitution, acylation and carboxylation.Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Reimer Tiemann reaction.

Unit–IV

Aldehydes and Ketones

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties.Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations.Condensation with ammoniaand its derivatives. Witting reaction,Mannich reaction.Use of acetals as protecting group.Oxidation of aldehydes, Baeyer-Villiger oxidation of Ketones, Cannizzaro

reaction.MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketones. Halogenation of enoliable ketones

Books suggested:

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.
3. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: Wiley Eastern Limited, 1985, Vol. I, II, III.
4. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.
5. Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.
6. Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs:Macmillan Publishing Company, 1989.
7. University General Chemistry, C.N.R. Rao, Macmillan.

Bachelor of Science (Medical) Semester–III
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY - II
Course code: BSMM-3084 (II)
(THEORY)

Course outcomes:

Students will be able to

- CO1: understand and evaluate thermodynamic property of any system and its applications to various systems.
- CO2: acquire the knowledge of phase equilibria of various systems.
- CO3: understand completely miscible, partially miscible and immiscible liquids.
- CO4: understand concept of spontaneity of a reaction in terms of free energy change.
- CO5: demonstrate Vant' Hoff equation and relationship between equilibrium constants.
- CO6: demonstrate Clausius-Clapeyron equation.

Bachelor of Science (Medical) Semester–III
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY - II
Course code: BSMM-3084 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions,selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Thermodynamics-I

Definition of thermodynamic terms: System, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics:

Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law-Joule-Thomson coefficient and inversion temperature, Calculation of w,q,dU&dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry:

Standard state, standard enthalpy of formation-Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

Unit–II

Thermodynamics-II

Second Law of Thermodynamics: Need for the law, different statements of the law, Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature.

Concept of Entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Unit–III

Thermodynamics-III

Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change, Variation of G and A with P,V and T.

Chemical Equilibrium

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Determination of K_p, K_c, $K_a$and their relationship, Clausius-Clapeyron equation, applications.

Unit–IV

Introduction to Phase Equilibrium

Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system-water, CO_2 and S systems. Phase equilibria of two component systems-solid-liquid equilibria, simple eutectic-Bi-Cd, Pb-Ag systems, desilverisation of lead. Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent melting point, ($NaCl-H_2O$), $FeCl_3-H_2O$) and $CuSO_4-H_2O$) system. Freezing mixtures, acetone-dry ice. Non-ideal system-azeotropes-$HCl-H_2O$ and ethanol-water system. Partially miscible liquids Phenol-water, trines-thylamin-water, Nicotine-water System. Lower and upper consulate temperature, Effect of impurity on consolute temperature, immiscible liquids, steam distillation. Nernst distribution law-thermodynamic derivation and applications.

Books Suggested:

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 2002.
9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book company, 1989.

Bachelor of Science (Medical) Semester–III
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course code: BSMM-3084 (P)
(PRACTICAL)

Course outcomes:

Students will be able to

- CO1: understand and master the technique of volumetric analysis
- CO2: to understand and analyze an acidic & alkali content in different samples.
- CO3: to understand and analyze the calcium content in various samples permanganometrically
- CO4: to understand the concept of hardness of water and its analysis by EDTA method
- CO5: understand and master the technique of gravimetric analysis
- CO6: to understand the concept of TLC and its applications.

Bachelor of Science (Medical) Semester–III
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course code: BSMM-3084 (P)
(PRACTICAL)

Duration: 3½ Hrs. **Max. Marks: 20**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

Quantitative Analysis

Volumetric Analysis

a. Determination of acetic acid in commercial vinegar using NaOH.

b. Determination of alkali content-antacid tablet using HCI.

c. Estimation of calcium content in chalk as calcium oxalate by permanganometry.

d. Estimation of hardness of water by EDTA.

e. Estimation of ferrous and ferric by dichromate method.

f. Estimation of copper using sodiumthiosulphate.

Gravimetric Analysis

Analysis of Cu as CuSCN and Ni as Ni (dimethylgloxime)

Organic Chemistry Laboratory Techniques

Thin Layer Chromatography

Determination of R_f values and identification of organic compounds.

(a). Separation of green leaf pigments (spinach leaves may be used).

(b). Preparation and separation of 2, 4. dinitrophenylhydrazones of acetone, 2-butone, 2-Butanone, hexan-2 and 3-one using toluene and light petroleum (40 : 60).

(c). Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).

Practical Examination:

1) Volumetry / Gravimetry 11

2) Thin Layer chromatography 04

3) Viva-Voce 03

4) Note Book 02

Books suggested:

1. Vogel Textbook of Quantitative Inorganic Analysis (revised), J. Bassett, R.C. Denney, G.H. Jeffery and J. Mandham, ELBS.
2. Standard Methods of Chemical. Analysis, W.W. Scott: The Technical Press.
3. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
4. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
5. Vogel Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
6. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
7. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill

Bachelor of Science (Medical) Semester–III
Session 2021-22
BOTANY
Course Title: STRUCTURE, DEVELOPMENT AND REPRODUCTION IN FLOWERING PLANTS-I
Course Code: BSMM-3075 (I)
(THEORY)

Course outcomes:

After passing this course the student will develop:

- CO1: Understanding of basic body plan of a flowering plant, Diversity in plant form branching pattern and canopy architecture trees.
- CO2: Understanding of shoot apical meristem and its histological organization. Cambium and its function and formation of secondary xylem.
- CO3: Understanding of wood in relation to water and minerals, growth rings and structure of secondary phloem and periderm.
- CO4: Understanding of origin, development, arrangement and diversity in size and shape of leaf, internal structure in relation to photosynthesis and water loss, senescence and abscission.

Bachelor of Science (Medical) Semester–III
Session 2021-22
BOTANY
Course Title: STRUCTURE, DEVELOPMENT AND REPRODUCTION IN FLOWERING PLANTS-I
Course Code: BSMM-3075 (I)
(THEORY)

Time: 3Hrs **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

The basic body plan of a flowering plant-modular type of growth. Diversity in plant form in annuals, biennials and perennials; trees-largest and longest-lived, branching pattern; monopodial and sympodial growth; canopy architecture.

Unit II

The Shoot System: The shoot apical meristem and its histological organization; meristematic and permanent tissue, formation of internodes. Cambium and its functions; formation of secondary xylem.

Unit III

A general account of wood structure in relation to conduction of water and minerals; characteristics of growth rings, sapwood and heart wood; role of woody skeleton; secondary phloem-structure function relationships; periderm.

Unit IV

Leaf: Origin, development, arrangement and diversity in size and shape; internal structure in relation to photosynthesis and water loss; adaptations to water stress; senescence and abscission.

Suggested Readings:

- Beck, C.B. (2010). An Introduction to Plant Structure and Development: Plant anatomy for the Twenty First Century (2nd Edition). Cambridge University Press, UK.
- Cutler, D. F., Botha, T. and Stevenson, D. M. (2007). Plant Anatomy: An Applied Approach. Blackwell Publishing, Oxford, UK.
- Dickison, W.C. (2000). Integrative Plant Anatomy. Academic Press, California, USA.
- Mauseth, J.D. (1988). Plant Anatomy, The Benjamin/Cummings Publishing Company Inc., Menlo Park, California, USA.
- Raven, P.H., Evert, R.F. and Eichhorn, S.E. (1999). Biology of Plants, 5th edition. W.H. Freeman and Co., Worth Publishers, New York.
- Rudall, P. J. (2007). Anatomy of Flowering Plants: An Introduction to Structure and
- Development (3rd Edition). Cambridge University Press, UK.
- Thomas, P. (2000) Trees: Their Natural History, Cambridge University Press, Cambridge.
- Srivastava, H.N. (2018) Diversity of Seed Plants and Their Systematics, Vol. III, Pradeep's Publication.

Bachelor of Science (Medical) Semester–III
Session 2021-22
BOTANY
Course Title: STRUCTURE, DEVELOPMENT AND REPRODUCTION IN FLOWERING PLANTS-II
Course Code: BSMM-3075 (II)
(THEORY)

Course outcomes:

After passing this course the student will be able to:

- CO1: Recognize the major groups of vascular plants and their phylogenetic relationships.
- CO2: Know the structure and development of monocot and dicot embryos.
- CO3: Understand different means of vegetative reproduction.
- CO4: Understand physiology of seed germination.

Bachelor of Science (Medical) Semester–III
Session 2021-22
BOTANY
Course Title: STRUCTURE, DEVELOPMENT AND REPRODUCTION IN FLOWERING PLANTS-II
Course Code: BSMM-3075 (II)
(THEORY)

Time: 3 Hrs. **Max Marks. 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

The Root System: The root apical meristem; differentiation of primary and secondary tissues and their roles; structural modification for storage, respiration, reproduction and for interaction with microbes.

Unit II

Vegetative Reproduction: various methods of vegetative propagation. Detailed study and types of grafting and budding, economic aspects. Flower: A modified shoot; structure, development and varieties of flower; functions

Unit III

Structure of anther and pistil; the male and female gametophytes; types of pollination; attractions and reward for pollinators; (sucking and foraging types); pollen-pistil interaction self incompatibility.

Unit IV

Double fertilization: formation of seed endosperm and embryo: fruit development and maturation Significance of Seed: Suspended animation; ecological adaptation; unit of genetic recombination with reference to reshuffling of genes and replenishment; dispersal strategies.

Suggested readings:

- Bhojwani, S.S., Bhatnagar, S.P. and Dantu P.K. (2015). The Embryology of Angiosperms, 6th edition. Vikas Publishing House, Delhi.
- Hartmann, H.T. and Kestler, D.E. (1976). Plant Propagation: Principles and Practices, 3rd edition, Prentice Hall of India Pvt. Ltd., New Delhi.
- Mauseth, J.D. (1988). Plant Anatomy, The Benjamin/Cummings Publishing Company Inc., Menlo Park, California, USA.
- Peau, K. (1977). Anatomy of Seed Plants, 3rd edition. John Wiley & Sons, New York.
- Pegeri, K. and Vander Pijl (1979). The Principles of Pollination Biology, Pergamon Press, Oxford.
- Raven, P.H., Evert, R.F. and Eichhorn, S.E. (1999). Biology of Plants, 5th edition. W.H. Freeman and Co., Worth Publishers, New York.
- Srivastava, H.N. (2018) Diversity of Seed Plants and Their Systematics, Vol. III, Pradeep's Publication.

Bachelor of Science (Medical) Semester–III
Session 2021-22
BOTANY
Course Title: PRACTICAL (Related to Structure, Development and Reproduction of Flowering Plants-I & II)
Course Code: BSMM-3075 (P)
(PRACTICAL)

Course outcomes:

After passing this course the student will be able to:

- CO1: Develop knowledge about the role of herbarium techniques in plant identification.
- CO2: Understand different life forms exhibited by flowering plants.
- CO3: Understand anatomy of different plant parts using free hand razor technique.
- CO4: Examine flower and their mode of pollination.

Bachelor of Science (Medical) Semester–III
Session 2021-22
BOTANY
Course Title: PRACTICAL (Related to Structure, Development and Reproduction in Flowering Plants-I & II)
Course Code: BSMM-3075 (P)
(PRACTICAL)

Time: 3 Hrs. **Practical: 20**

Instructions for the paper setter: question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Laboratory Exercises

1. Study of any commonly occurring dicotyledonous plant (for example *Solanum nigrum* or Kalanchoe) to the body plan, organography and modular type of growth.
2. Life forms exhibited by flowering plants (by a visit to a forest or a garden, Study of tree like habit in cycads, bamboo, banana, traveller's tree (*Revenalamadagascariensis*) and Yucca and comparison with true trees as exemplified by conifers and dicotyledons.
3. L.S. Shoot tip to study the cytohistological zonation and origin of leaf primordia.
4. Monopodial and sympodial types of branching in stems (especially rhizomes).
5. Anatomy of primary and secondary growth in monocots and dicots using free hand razor technique (*Solanum*, *Boerhavia*, *Helianthus*, *Mirabilis*, *Nyctanthus*, *Draceana*, Maize) hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood, Microscopic study of wood in T.S., T.L.S. and R.L.S.
6. Field study of diversity in leaf shape, size, thickness, surface properties. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf).
7. Anatomy of the root. Primary and secondary structure.
8. Examination of a wide range of flowers available in the locality and methods of their pollination.
9. Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using in vitro pollen germination.
10. Structure of ovule and embryo sac development using serial sections from permanent slides.
11. Nuclear and cellular endosperm. Embryo development in monocots and dicots (using permanent slides/dissections).
12. Simple experiments to show vegetative propagation (leaf cuttings in *Bryophyllum*. *Sansevieria*, *Begonia*; stem cuttings in rose, *Salix*, money plant, Sugarcane and *Bougainvillea*).
13. Germination of non-dormant and dormant seeds.

Suggested Readings (for laboratory exercises):

1. Bhojwani, S.S. and Bhatnagar, P. (2000). The Embryology of Angiosperms (4th revised and enlarged edition), Vikas Publishing House, New Delhi.
2. Mauseth, J.D. (1988). Plant Anatomy, The Benjamin/Cumminas Publishing Co., Inc., Mehlo Park, California, USA.

3. Raven, P.H., Evert, R.F. and Eichhorn, S.E. (1992). Biology of Plants (5th Edition). Worth Publishers, New York.
4. Steeves, T.A. and Sussex, I.M. (1989). Patterns in Plant Development (2nd Edition).

CambridgeUniversity Press, Cambridge

Bachelor of Science (Medical) Semester–III
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD PROCESSING AND PACKAGING
Course Code: BSMM-3255 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:** Understand the reasons of spoilage and basic principles of food preservation methods.
- **CO2:** Understand different types of packaging materials, their properties and packaging machinery used in packaging of food.
- **CO3:** Understand processing of fats, oils, sugar, salt, tea, coffee, chocolate and cocoa powder, spices and flavor andextruded foods.
- **CO4:** Learnmanufacturing offermented products: wine, vinegar, beer, fermented milks, yoghurt, etc.

Bachelor of Science (Medical) Semester–III
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD PROCESSING AND PACKAGING
Course Code: BSMM-3255 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 100**
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Physical principles underlying food processing operations including thermal processing, ionizing radiation, refrigeration, freezing, dehydration.
2. Chemical preservation in food processing.
3. Fats and Oils: Types and sources of fats and oils (animal and vegetable), processing, uses, storage and nutritional aspects.
4. Sugar and Sugar Products: Different forms of sugar (sugar, jaggery, honey syrup), manufacture, selection, storage and use.

UNIT-II

5. Salt: preparation of brine and pickling.
6. Processing of: Tea, coffee, chocolate and cocoa powder.
7. Extruded foods.
8. Enzymes: Definition, factors affecting enzyme activity, role of enzymes in food processing.

UNIT-III

9. Fermentation technology, manufacturing of fermented products: Wine, vinegar, beer, yoghurt, etc.
10. Spices and flavors.
11. Food additives, classes of food additives, role in food processing.

UNIT-IV

12. Definition and functions of Packaging
13. Types of packaging materials: metal, glass, wood, paper and plastics and their importance.
14. Types of packages and their evaluation: bottle, pouch, tetra-pack and cans.
15. Packaging machinery
16. Shelf life testing.

Books Recommended

1. Post Harvest Technology of Cereals, Pulses and Oilseeds, 2019, 3rs Edition,Amalendu Chakraverty.
2. Technology of Cereals, 1994,4th Edition, Norman Leslie Kent and A.D. Evers.
3. Preservation of Fruits & Vegetables, 2009, Girdhari Lal, G.S Siddappa and G.L Tandon.
4. Principles of Food Packaging, 1980,2nd Edition, Stanley Sacharow and Roger C. Griffin.
5. Chemistry of food additives and preservatives, 2012, 1st Edition, Titus A.M. Msagati.
6. Food Preservation, 2nd Edition, M. Shafiur Rahman. **(Online available)**
7. Food Packaging – Principles and practice , 3rd Edition, 2012, Gordon L. Robertson. **(Online available)**

Bachelor of Science (Medical) Semester–III
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: PRACTICAL (Related to Food Processing and Packaging)
Course Code: BSMM-3255 (P)
(PRACTICAL)

Time: 3 Hrs. **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals:

1. Determination of physical characteristics of cereals.
2. Milling of wheat into flour.
3. Determination of wet and dry gluten contents.
4. Identification of packaging materials.
5. To estimate the shelf life of packaged food.
6. To determine the strength of different packaging material.
7. To find out the tin coating weight.
8. To find out the uniformity and amount of wax on wax paper.
9. To check the chemical resistance of packaging materials.
10. To check the adequecy of blanching.
11. Visit to various industries dealing with food packaging material like, paper board and metal.

SEMESTER – IV

Bachelor of Science (Medical) Semester–IV
Session 2021-22
ZOOLOGY
Course Title: BIOCHEMISTRY
Course Code: BSMM-4483 (I)
(THEORY)

Course Outcomes:

- CO-1. Familiar with various biochemical pathways.
- CO-2. Understand the chemical nature of life and life process.
- CO-3. Get an idea on structure and functioning of biologically important molecules.
- CO-4. Help to explore new developments in biochemistry.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
ZOOLOGY
Course Title: BIOCHEMISTRY
Course Code: BSMM-4483 (I)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit I

Biochemistry and its scope
Classification and functions of:
- Carbohydrates
- Proteins
- Lipids
- Nucleic acids

Unit II

Enzymes:
- Nature and their classification
- Coenzymes.

Lipid Metabolism:
- B-Oxidation of fatty acid
- Ketosis

Unit III

Carbohydrate Metabolism:
- Glycolysis
- Tricarboxylic acid cycle
- Hexose monophosphate shunt
- Glycogenesis
- Glycogenolysis
- Gluconeogenesis
- Oxidative Phosphorylation

Unit IV

Protein Metabolism:
- Metabolism of amino acids
- Oxidative deamination
- Transamination
- Decarboxylation
- Hydrolysis of proteins
- Ornithine cycle

Suggested Reading Material:-

1. Conn, E.E., Stump. P.K. Bruening, S. and Doi R.H. (2006), Outlines of Biochemistry (5th ed), John Wiley and Sons Inc., New York.
2. Fischer, J. and Arriold, J.R.P. (2001). Instant notes in Chemistry for Biologists, Viva Books Pvt. Ltd.
3. Harper, H.A. (2018): Harper's Biochemistry (31st ed).
4. Holde, K.E.V., Johnson, W.C. and Shing, P. (2005). Principles of Physical Biochemistry Prentice Hall, Inc., USA.
5. Lehninger, A (2017). Principles of Biochemistry, (7th ed).

6. Morris, H. Best, L.R., Pattison, S., Arerna, S. (2013). Introduction to General Organic Biochemistry, (11th ed), Wadsworth Group.
7. Robert, K., Murray, Mayes Daryl, K. Granner, Victor, W., Woodwell (1990), Harper's Biochemistry, 22nd Edition, Prentice Hall International Inc.
8. Sheehan, D (2013). Physical Biochemistry: Principles and Applications – John Wiley & Sons Ltd., England.
9. Stryer, L. (2019). Biochemistry (9th ed), San Francisco W.H. Freeman.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
ZOOLOGY
Course Title: ANIMAL PHYSIOLOGY
Course Code: BSMM-4483 (II)
(THEORY)

Course Outcomes:

- CO1.Understand the functioning of various systems.
- CO2.Apply the knowledge to lead a healthy life.
- CO3.Familiarize with various biochemical pathways.
- CO4. Compare the functioning of organ systems across the animal world.
- CO5. Learn more about human physiology and anatomy.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
ZOOLOGY
Course Title: ANIMAL PHYSIOLOGY
Course Code: BSMM-4483 (II)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit – I

Digestion : Digestion of dietary constituents, regulation of digestive processes and absorption. Extra and intra cellular digestion, enzymatic digestion and symbiotic digestion.

Respiration : Transport of O_2 and CO_2, Oxygen dissociation curve of haemoglobin, Bohr effect, chloride (-) shift, Haldane effect and control of breathing.

Unit – II

Heart : Origin and regulation of heart beat, cardiac cycle, electrocardiogram, cardiac output, Blood pressure and micro-circulation.

Blood : Composition and functions of blood and lymph. Blood clotting. Blood groups including Rh factor, haemopoiesis

Excretion : Urine formation and osmoregulation.

Unit – III

Muscles : Ultrastructure, chemical and physical basis of skeletal muscle contraction.

Neural Integration: Structure of neuron, resting membrane potential, Origin and propagation of impulse along the axon, synapse and myoneural function.

Unit – IV

Physiology of Behavior: Taxes and reflexes, instinctive and motivate learning and reasoning

Endocrine : Structure and physiology of thyroid, parathyroid, adrenal, hypothalamus, pituitary, pancreas and gonads.

Suggested Reading Material:

1. Guyton, and Hall, (2015), Text Book of Medical Physiology, 15th Edition, Elsevier.

2. Hill, R. W., Wyse, G. K. and Anderson, N. 3 edi (2012), Animal physiology, Sinauer Associate, INC. Pub. Saunderland, Massachusettes, USA.
3. Hoar, W. S. (1984), General and Comparative Physiology, Prentice Hall of India Pvt. Limited, New Delhi, India.
4. Prosser, C.L.4th Edi (1991), Comparative Animal Physiology, Satish Book Enterprise Books seller & Publishers, Agra.
5. Purves, W. K., Oriane, G. H., Space, H. C. and Salava, D. (2001), Life – The Science of Biology (6th ed), Sinauer Assoc. Inc., USA.
6. Randall, D., Burggren, K.L. and French, K. (2002), Eckert Animal Physiology: Mechanisms and Adaptations, W.H. Freeman and Company, New York.
7. Taneja, S.K.(1997), Biochemistry & Animal Physiology, Trueman Book Co.
8. Willmer, P. Stone, G. and Johnston, I (2000). Environmental Physiology of Animals, Blackwell Science.
9. Withers, P.C. (1992), Comparative Animal Physiology, Saunder College Publishing, New York.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL -IV (Related to Biochemistry and Animal Physiology)
Course Code: BSMM-4483 (P)
(PRACTICAL)

Course Outcomes:

- CO-1. Learn clinical procedures for blood & urine analysis.
- CO-2. Develop skill in simple biochemical laboratory procedures.
- CO-3. Skill in observing and to some extent in analysing various Biological Data.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL -IV (Related to Biochemistry and Animal Physiology)
Course Code: BSMM-4483 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

1. Study of the skeleton of *Scoliodon*, *Rana*, *Varanus*, *Gallus* and *Oryctolagus*.
2. Identification of food stuffs: starch, glucose, proteins and fats in solution.
3. Demonstration of osmosis and diffusion.
4. Demonstrate the presence of amylase in saliva, denaturation by pH and temperature.
5. Determination of coagulation and bleeding time of blood in man/rat/rabbit.
6. Determination of blood groups of human blood sample.
7. Recording of blood pressure of man.
8. Analysis of urine for urea, chloride, glucose and uric acid.
9. Estimation of haemoglobin content.
10. Field study: Visit to a fossil Park/Lab/ Science City and submit a report / Familiarity with the local vertebrate fauna.

Guidelines for conduct of Practical Examination:

1.	Identify the given bones, make labeled sketches of their respective–views	8
2.	Write down the steps and determine the constituents in the given sample.	3
3.	Write the procedure and perform the given physiology experiment.	3
4.	Report on visit to a fossil park/lab/Science City/study of local vertebrate fauna.	2
5.	Viva-voce & Practical file.	4

Note:- Some changes can be made in the practicals depending on the availability of material.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
MICROBIOLOGY
Course Title: MICROBIAL ECOLOGY
Course Code: BSMM-4343 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:** Understand the Diversity of various microbial habitats.
- **CO2:** Understand the various microbial interactions and competition for survival in nature (for nutrients, space and oxygen).
- **CO3:** Understand the role of microorganisms in geochemicals cycles, concept of microbial toxins, biofertilizers and bioinsecticides.
- **CO4:** Understand the microbiological aspects of pollution and concept of BOD and COD, effluent treatment, bioremediation and bioleaching.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
MICROBIOLOGY
Course Title: MICROBIAL ECOLOGY
Course Code: BSMM-4343 (I)
(THEORY)

Time: 3 Hrs. **Max Marks:100**
Theory Marks:60
Practical Marks: 20
CA: 20

Instructions for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

1. Diversity of microbial habitats: Environmental selecting factors:- physical, chemical and biological types of microbial habitats:- atmospheric, aquatic and terrestrial environments.

UNIT–II

2. Microbial interactions, antagonism, commensalism, symbiosis, parasitism miscellaneous associations in nature. Competition for survival in nature (for nutrients, space, oxygen).

UNIT–III

3. Role of microorganisms in geochemicals cycles: Carbon cycle, nitrogen cycle, phosphorus cycle and sulphur cycle, microbial toxins in the environment: Types of Microbial toxins, ecological consequences of microbial toxins as insecticidal agents, bioinsecticides, biofertilizers.

UNIT–IV

4. Concept of BOD and COD, Sewage and effluent treatment by primary, secondary and tertiary methods. Role of microbes in bioremediation of persistent pollutants and bioleaching of metals.

Books Recommended: (Edition of books updated)

1. Edmonds, P., 1978, Microbiology: An Environmental Perspective, MacMillan Publishing Co., Inc., New York.
2. Powar C.B. and Danginwala, H.F., 2017, General Microbiology, Volume II, 2nd ed. Himalaya Publishing House, New Delhi.
3. Sharma, P.D., 2010, Microbiology, Rastogi Publication, Meerut.
4. Pleczar, M.J., Chan, E.C.S. and Krieg N.R., 2011 (reprint), Microbiology, 2nd ed. Tata McGraw Hill Publishing Co., Ltd., New Delhi.
5. Patel, A.H., 2011, Industrial Microbiology, 2nded. Macmillan India Ltd., Delhi.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
MICROBIOLOGY
Course Title: PRACTICAL (Related to Microbial Ecology)
Course Code: BSMM-4343 (P)
(PRACTICAL)

Time: 3 hrs **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

LIST OF PRACTICALS

1. Isolation and enumeration of fungi from air and soil by pour plating and spread plating.
2. Determination of dissolved oxygen content (DO) of the given water sample by Titrimetric method.
3. Determination of COD of the given water sample by Titrimetric method.
4. To conduct bacteriological examination of water sample by MPN method.
5. To isolate symbiotic nitrogen bacteria from root nodules.
6. To perform crowded plate method for studying microbial interactions.
7. Determination of B.O.D.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY-I
Course Code: BSMM-4084 (I)
(THEORY)

Course outcomes:

- CO1: understand the key features of coordination compoundsviz. variety of structures, oxidation numbers and electronic configurations, coordination numbers and explain the bonding and stability of complexe.
- CO2: understand the magnetic properties of coordination compounds by using CFT.
- CO3: describe the shapes and structures of coordination complexes with coordination numbers ranging from 4 to 12.
- CO4: do nomenclature of coordination compounds.
- CO5: write both reduction and oxidation half reactions for a simple redox reaction
- CO6: identify the oxidation number (charge) on a neutral metal, metal and non-metal ion
- CO7:carry out the common applications of the activity series of metals
- CO8: understand the Latimer, Frost and Pourbaix diagram.
- CO9: understand the positions,electronicconfigurations,relativestability,preparation, properties, structures and characteristics of the f-block elements in the periodic table;
- CO10:understand the role of metal ions and other inorganic elements in biological systems.
- CO11:understand the properties and reactions of non-aqueous solvents.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY-I
Course Code: BSMM-4084 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Note: Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Coordination Compounds

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

Non-AqueousSolvents

Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Unit–II

Oxidation and Reduction

Use of redox potential data-analysis of redox cycle, redox stability in water, Frost, Latimer and Pourbaix diagrams

Chemistry of Lanthanide Elements

Electronic structure, oxidation states and ionic radii and lanthanide contraction. Electronic absorption and magnetic properties of lanthanides

Unit–III

Chemistry of Actinides

General features and chemistry of actinides, similarities between the later actinides and the later lanthanides. Electronic and magnetic properties of actinides and their general comparison with the lanthanide elements

Unit–IV

Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins and special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}

Books Suggested:

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.
3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.
4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.
5. Porterfield, W.W., Wesley, A., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.
6. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.
10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
11. Inorganic Chemistry, A.G. Sharpe, ELBS.
12. University General Chemistry, C.N.R. Rao, Macmillan.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY-II
Course Code: BSMM-4084 (II)
(THEORY)

Course outcomes:

Students will be able to

- CO1: understand structure and bonding in carboxylic acids and carboxylic acid derivatives
- CO2: Compare the acidity of alcohols,phenols and acids
- CO3: understand the effect of various substituents on the acidity of acids
- CO4: describe preparations, physical properties,and reactions of carboxylic acids and carboxylic acid derivatives
- CO5: understand preparations and reactions of ethers and epoxides
- CO6: understand various cleavages in ethers
- CO7: understand the ring opening reactions of epoxides
- CO8:understand preparation and reactions of nitroalkanes and nitroarenes
- CO9: understand nomenclature, structural features, and methods of formation and chemical reactions of Organomagnesium, Organolithium, Organozinc and Organocopper compounds.
- CO10: know the various methods of synthesis and compare electrophilic substitution,reactions of pyrrole, furan, thiophene and nucleophilic substitution reactions of pyridine.
- CO11: compare the basicity of pyridine, piperidine and pyrrole.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY-II
Course Code: BSMM-4084 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Note:Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Carboxylic Acids

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength.Reactions of carboxylic acids.Hell-Volhard-Zelinskyreaction.Synthesis of acid chlorides, esters and amides.Reduction of carboxylic acids.Mechanism of decarboxylation.

Carboxylic Acids Derivatives

Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides, Relative stability & reactivity of acyl derivatives.Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.Preparation of carboxylic acid derivatives, chemical reactions.Mechanisms of esterification and hydrolysis (acidic and basic).

Unit–II

Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties.Chemical reaction- cleavage and autoxidation, Ziesel'smethod.Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

Unit-III

Organic Compounds of Nitrogen

Preparation of nitroalkanes and nitroarenes.Chemical reactions of nitroalkanes, Mechanisms of nucleophilc substitution in nitroarenes and their reduction in acidic, neutral and alkaline media.Reactivity, Structure and nomenclature of amines, Methods of preparation of amines by Reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction and Hoffmann bromamide reaction.Physicalproperties.Stereochemistry of amines.separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Amine salts as phase-transfer catalysts.

Unit–IV

Organometallic Compounds

Organomagnesium Compounds: The Grignard reagentsformation, structure and chemical reactions.Organolithium Compounds: Formation and chemical reactions.Organozinc and Organo copper Compounds: Nomenclature, structural features, Methods of formation and chemical reactions.

Heterocyclic Compounds

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution.Mechanism of nucleophilic substitution reactions in pyridine derivatives.Comparison of basicity of pyridine, piperidine and pyrrole.

Books Suggested:

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.
3. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: Wiley Eastern Limited, 1985, Vol.I, II, III.
4. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.
5. Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.
6. Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs: Macmillan Publishing Company, 1989.
7. Introduction to Organic Chemistry, Sireitwieser, Heathcock and Kosover, Macmilan.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-4084 (P)
(PRACTICAL)

Course outcomes:

Students will be able to analyze the given organic compound through

- CO1:detection of elements (N, S and halogens) in organic compounds.
- CO2:detection of functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines,amides, nitro and anilide) in simple organic compounds
- CO3: preparation of their derivatives

Bachelor of Science (Medical) Semester–IV
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-4084 (P)
(PRACTICAL)

Duration: 3½ Hrs. **Max. Marks: 20**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE office, KanyaMahaVidyalaya, Jalandhar.

Qualitative Analysis

Detection of elements: N, S and halogens

Detection of functional groups:phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide in simple organic compounds and preparing their derivatives.

Practical Examination

1) Detection of Elements, functional group and derivative preparation	15
2) Viva-Voce	03
3) Note Book	02

Book Suggested:

1. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
2. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
3. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
4. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
BOTANY
Course Title: DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS-I
Course Code: BSMM-4075 (I)
(THEORY)

Course outcomes:
After passing this course the student will develop:

- CO1: Understanding of characters of seed plants, origin and evolution of seed habit, angiosperms and gymnosperms
- CO2: Understanding of general characters of gymnosperms, their classification and evolution including fossil and living gymnosperms.
- CO3:Understanding of morphology of vegetative and reproductive parts of *Pinus* and *Cycas*
- CO4: Understanding of morphology of vegetative and reproductive parts of *Ephedra* and *Ginkgo*

Bachelor of Science (Medical) Semester–IV
Session 2021-22
BOTANY
Course Title: DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS-I
Course Code: BSMM-4075 (I)
(THEORY)

Time: 3Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Characteristics of seed plants; Evolution of the seed habit; Distinguishing features of angiosperms and gymnosperms. Angiosperms: Origin and evolution. Some examples of primitive angiosperms.

Unit–II

General features of gymnosperms and their classification; evolution and diversity of Gymnosperms including fossil and living gymnosperms; Geological time scale and fossilization.

Unit–III

Morphology of vegetative and reproductive parts; Anatomy of root, Stem and leaf; reproduction and life cycle of *Pinus*, *Cycas*.

Unit–IV

Morphology of vegetative and reproductive parts; Anatomy of root, Stem and leaf; reproduction of life cycle of *Ephedra* and *Ginkgo*.

Suggested Readings

1. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms, New Age Internationl Limited, New Delhi.
2. Gifford, E.M. and Foster, A.S. (1988). Morphology and Evolution of Vascular Plants, W.H.Freeman& Company, New York.
3. Pellant, C. (1994). Fossils, Dragon's World, Great Britain
4. Sporne, K.R. (1965). The Morphology of Gymnosperms, Hutchinson & Co. (Publishers) Ltd., London.
5. Taylor, T. N., Taylor, E. L. and Krings, M. (2008). Paleobotany: The Biology and Evolution of Fossil Plants (2nd Edition). Elsevier Inc. Netherlands.
6. Vashistha, P. C. (2016). Botany for degree students. S.Chand and Company, New Delhi.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
BOTANY
Course Title: DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS-II
Course Code: BSMM-4075 (II)
(THEORY)

Course outcomes:
After passing this course the student will develop:

- CO1: Plant description, describe the morphological and reproductive stretch of plant and also identify the different families.
- CO2: Understanding of Botanical Nomenclature, classification of angiosperms and Salient features of the systems proposed by Bentham and Hooker, Engler and Prantl
- CO3:Understanding diversity of flowering plants in families like Ranuculaceae, Brassicaceae, Rutaceae, Fabaceae, Apiaceae, Acanthaceae.
- CO4: Understanding diversity of flowering plants in families like Apocynaceae, sclepiadaceae, Solanaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae, Orchidaceae and Poaceae.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
BOTANY
Course Title: DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS-II
Course Code: BSMM-4075 (II)
(THEORY)

Time: 3Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Angiosperm taxonomy; Brief history, Aims and fundamental components (alpha-taxonomy, Omega-taxonomy, Holotaxonomy); Identification, keys. Taxonomic literature. Botanical nomenclature: Taxonomic ranks; Type concept; Principle of priority.

Unit–II

Botanical nomenclature: Taxonomic ranks; Type concept; Principle of priority. Major contribution of cytology, Phytochemistry and taximetrics to taxonomy. Classification of angiosperms; Salient features of the systems proposed by Bentham and Hooker, Engler and Prantl

Unit–III

Diversity of flowering plants as illustrated by members of the families Ranuculaceae, Brassicaceae, Rutaceae, Fabaceae, Apiaceae, Acanthaceae.

Unit–IV

Diversity of flowering plants as illustrated by members of the families Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae, Orchidaceae and Poaceae.

Suggested Readings

1. Bendre, A. (2007). Practical Botany, Rastogi Publications, Meerut.
2. Davis, P.H. and Heywood, V.H. (1963). Principles of Angiosperm Taxonomy, Oliver and Boyd, London.
3. Gifford, E.M. and Foster, A.S. (1988). Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.
4. Jeffrey, C. (1982). An Introduction to Plant Taxonomy, CambridgeUniversity Press,
Cambridge, London.
5. Jones, S.B., Jr. and Luchsinger, A.E. (1986). Plant Systematics (2nd edition). McGraw- Hill Book Co., New York.
6. Radford, A.E. (1986). Fundamental of Plant Systematics, Harper and Row, New York

Bachelor of Science (Medical) Semester–IV
Session 2021-22
BOTANY
Course Title: PRACTICAL – IV (Related to Diversity of Seed Plants and Their Systematics – I & II)

Course Code: BSMM-4075 (P)

(PRACTICAL)

Course outcomes:

After passing this course the student will able to:

- CO1: Identify different plants from different families through their vegetative and reproductive characters.
- CO2: Understanding different types of placentation system.

Bachelor of Science (Medical) Semester–IV
Session 2021-22
BOTANY
Course Title: PRACTICAL – IV (Related to Diversity of Seed Plants and Their Systematics – I & II)

Course Code: BSMM-4075 (P)

(PRACTICAL)

Time: 3Hrs. **Practical: 20**

Instructions for the paper setter: question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Laboratory Exercises

1. Angiosperms The following species are suitable for study.
2. This list is only indicative. Teachers may select plants available in their locality. Teachers may select plants/material available in their locality/institution.
1. Ranunculaceae: *Ranunculus, Delphinium*
2. Brassicaceae: *Brassica, Alyssum, Iberis, Coronopus.*
3. Malvaceae*: Hibiscus, Abutilon.*
4. Rutaceae: *Murraya, Citrus*.
5. Fabaceae: Faboideae: *Lathyrus, Cajanus, Melilotus, Trigonella,* Caesalpinioideae*: Cassia, Caesalpinia*, Mimosoideae: *Prosopis, Mimosa, Acacia*.
6. Apiaceae: *Coriandrum. Foeniculum, Anethum*.
7. Acanthaceae: *Adhatoda, Peristrophe*.
8. Apocynaceae: *Vinca, Thevetia, Nerium.*
9. Asclepiadaceae: *Calotropis*.
10. Solanaceae: *Solanum, Withania, Datura*.
11. Euphorbiaceae: *Euphorbia, Phyllanthus*.
12. Lamiaceae: *Ocimum, Salvia*.
13. Chenopodiaceae: *Chenopodium, Beta*.
14. Liliaceae: *Asphodelus, Asparagus*.
15. Poaceae: *Avena, Triticum, Hordeum, Poa, Sorghum*.
The Students should be made familiar with the use of identification keys including use ofcomputers in taxonomy. The teachers should prevent students from collecting plants fromthe wild and submitting them for the practical examination. Instead, the student should be asked to prepare field reports.

Gymnosperms

Cycas (i) Habit, armour of leaf bases on the stem (if specimen is not available show photography), very young leaf (circinate vernation) and old foliage leaves, scale leaf, bulbils, male cone (specimen); Microsporophyll, megasporophyll mature seed. (ii) Study through permanent slides—normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.). (iii) Study through hand sections or dissections-coralloid root (T.S.), rachis (T.S.), leaflet (V.S.), microsporophyll (V.S.) pollen grains (W.M.).

Pinus (i) Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year and 3rd year female cones, winged seeds. (ii) Study through permanent slides-root (T.S.), female cone (L.S.) ovule (L.S.), embryo (W.M.) showing polycotyledonous condition. (iii) Study through hand sections or dissections-young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S. male cone (L.S.), male cone (T.S.), Pollen grains (W.M.).

Ephedra(i) Habit and structure of whole and female cones. (ii) Permanent slides-female cone (L.S.). (iii) Hand sections/dissections-node (L.S.), internode (T.S.), macerated stem to see vessel structure; epidermal peel mount of vegetative parts to study stomata, male cone (T.S. and L.S.), pollen grains.

Ginkgo (i) Habit and structure of whole plant. (ii) Permanent slides-male and female reproductive parts. (iii) pollen grains

Suggested Readings:

1. Angiosperm Phylogeny Group (2003). An update of the Angiosperm Phylogeny Group classification for the orders and families of the flowering plants: APG
2. Botanical Journal of the Linnaean Society 141: 399-436. 2. Cronquist, A. (1981). An Integrated System of Classification of Flowering Plants. ColumbiaUniversity Press, New York.
3. Simpson, M.C. (2006). Plant Systematics. Elsevier, Amsterdam

Bachelor of Science (Medical) Semester–IV
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: QUALITY ASSURANCE
Course Code: BSMM-4255 (I)
(THEORY)

Course Outcomes

After passing this course the student will be able to:

- **CO1**: Understand principles and methods of quality control and quality attributes(Colour, texture, size, shape and flavour).
- **CO2**: Understand principles of HACCP and GMP.
- **CO3:** Understand the principles of sensory evaluation, sampling.
- **CO4:** Learn food laws and regulations (FSSAI, PFA, AGMARK, FPO, MFPO, BIS, ISO)

Bachelor of Science (Medical) Semester–IV
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: QUALITY ASSURANCE
Course Code: BSMM-4255 (I)
(THEORY)

Examination Time: 3 Hrs. **Max. Marks: 100**

Theory Marks: 60

Practical Marks: 20

CA: 20

Instructions for the Paper Setter: Eight questions of equal marks(12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Objectives, importance and functions of quality control
2. Quality attributes
3. Quality control in food industry-methods of evaluation and control of the various aspects of quality of raw materials, manufacturing process and the testing of finished products.

UNIT-II

4. Methods of quality assessment of food materials: fruits, vegetables, cereals, dairy products, meat, egg and processed products.
5. Color: Definition, importance, different color measuring instruments used in food industries.
6. Texture: Definition, importance, different texture analyzing instruments used in food industries to analyze texture.

UNIT-III

7. Sampling, specifications of raw materials and finished products
8. Sensory evaluation.

UNIT-IV

9. Concept of HACCP and GMP.
10. Food Laws and Regulations- FSSAI,AGMARK, FPO, PFA, MFPO, BIS, ISO.

Recommended Books:

1. Quality Control for Food Industry by A. Kramer and B.A. Twigg
2. Handbook of analysis and quality control for fruits and vegetable products by S. Ranganna
3. Food Science by N.N. Potter

Bachelor of Science (Medical) Semester–IV
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: PRACTICAL (Related to Quality Assurance)
Course Code: BSMM-4255 (P)
(PRACTICAL)

Time:3 Hrs. **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

List of Practicals:

1. Determination of acidity and pH of milk.

2. Platform tests for determining the quality of milk.

3. Determination of cooking quality of rice.

4. Determination of iodine value of oil/fat.

5. Determination of saponification value of oil/fat.

6. Determination of reducing and non-reducing sugars.

7. Determination of interior and exterior quality of eggs.

8. Determination of alcoholic acidity of flour.

9. Adulterants in milk, cereals, oils and fats and their detection.

10. Cut out analysis of canned fruits and vegetable.

SEMESTER – V

Bachelor of Science (Medical) Semester–V
Session 2021-22
ZOOLOGY
Course Title: DEVELOPMENT BIOLOGY
Course Code: BSMM-5483 (I)
(THEORY)

Course Outcomes:

After successfully completing this course, students will be able to:

- CO1: Identify the developmental stages.
- CO2: Describe the key events in early and systematic embryological development.
- CO3: Describe the process of gametogenesis.
- CO4: Describe the chick development up to 96 hours of incubation and extra embryonic membranes.
- CO5: Explain the theories of preformation, and concepts like growth, differentiation and reproduction.
- CO6: Explain the principles and process of fertilization and cleavage.

Bachelor of Science (Medical) Semester–V
Session 2021-22
ZOOLOGY
Course Title: DEVELOPMENT BIOLOGY
Course Code: BSMM-5483 (I)
(THEORY)

Examination Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Gametogenesis with particular reference to differentiation of spermatozoa, vitellogensis; role of

follicle/subtesticular cells in gametogenesis

Egg maturation; egg membranes; polarity of egg

Parthenogenesis

Fertilization

UNIT-II

Cleavage and its patterns

Gastrulation

Determination and differentiation

Tissue interactions, basic concepts of organizers and inductors and their role

Embryonic development of Herdmania

UNIT-III

Development upto three germinal layers and their fate in frog and chick

Fate maps of chick and frog embryos

Metamorphosis in Frog

UNIT-IV

Embryonic development of Rabbit

Foetal membranes, their formation and role

Mammalian placenta–its formation, types and functions

Suggested Readings:

1. Balinsky, B.I. (2007), An Introduction to Embryology, Saunders, Philadelphia.
2. Bellairs, R. (1971), Development Processes in Higher Vertebrates, University of MiamiPress, Miami.

3. Berrill. N.J. (1971), Developmental Biology. McGraw Hill, New Delhi.
4. Gilbert, F. (2017), Developmental Biology, Sinaur.
5. Goel, S.C. (1984), Principles and Animal Developmental Biology, Himalaya, Bombay.
6. Karp. G. &Berrill, M.J. (1981), Development. McGraw Hill, New Delhi.
7. Pritchard, D.J. (1986), Foundation of Development Genetics, Taylor and Francis, London.
8. Saunders, J.W. (1982), Developmental Biology, Patterns, Principles, Problems, MacMillan,New York.
9. Waddigton CH. (1966), Principles of Development and Differentiation, MacMillan, NewYork.
10. Miller, W.A. (1997), Developmental Biology Springer Verlag, New York.

Bachelor of Science (Medical) Semester–V
Session 2020-21
ZOOLOGY
Course Title: GENETICS
Course Code: BSMM-5483 (II)
(THEORY)

Course Outcomes

Upon successful completion, students will have the knowledge and skills to:

- CO1: Comprehensive, detailed understanding of the chemical basis of heredity.
- CO2: Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
- CO3: Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.
- CO4: Understanding the role of genetic mechanisms in evolution.
- CO5: The knowledge required to to design, execute, and analyze the results of genetic experimentation in animal and plant model systems.
- CO6: Explain the key concepts in population,
- CO7: Evolutionary and quantitative **genetics** including: the basis of **genetic** variation; heritability; Hardy-Weinberg Equilibrium, roles of migration, mutation
- CO8: The ability to evaluate conclusions that are based on genetic data.
- CO9: Insight into the mathematical, statistical, and computational basis of genetic analyses.

Bachelor of Science (Medical) Semester–V
Session 2020-21
ZOOLOGY
Course Title: GENETICS
Course Code: BSMM-5483 (II)
(THEORY)

Examination Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Modification of Mendelian Ratios: Non-allelic gene interaction, Modified F2 ratios. (9:7;9:3:4;12:3:1;13:3;15:1;9:6:1), Gene modifications due to incomplete dominance; lethal factors(2:1); Pleiotropic genes.

Multiple Alleles: Blood group inheritance, eye colour in *Drosophila,* pseudoallelism.

Multiple Factors: Qualitative and quantitative characters, inheritance of quantitative traits (skin colour in man).

Linkage: Linkage, sex-linked characters

Crossing Over and Recombination: crossing over, frequency of crossing over, cytological basis of crossing over, synaptonemal complex. Recombination in Fungi (Tetrad analysis).

UNIT-II

Gene and Genetic Code: Structure of nucleic acids **(DNA & RNA).**

Replication & transcription of DNA

Expression of gene (Protein synthesis in Prokaryotes and Eukaryotes).

Genetic code: Properties of genetic code, codon assignment, wobble hypothesis, split and overlapping Genes.

UNIT-III

Mutations: Spontaneous and induced mutations, physical and chemical mutagen. Detection of mutations in Maize and *Drosophila.* Inborn errors of metabolism in man (Phenylketonuria, Alcaptonuria, Albinism). Somatic mutations and carcinogenesis.

Regulation of gene expressions in prokaryotes (Operon model) in eukaryotes.

Extranuclear inheritance: Chloroplast with special reference to *Mirabilis jalapa*and kappa particles in *Paramecium.*

UNIT-IV

Population genetics: Equilibrium of gene frequencies and Hardy-Weinberg law.

Genetic recombination in bacteria (conjugation, transduction and transformation) and in

plasmids.

Applied Genetics: Recombination DNA, Genetic cloning and its applications in medicine and agriculture, DNA finger printing.

Suggested Readings:

1. Klug ,Cummings, Spencer, Palladino, Killian(twelth edition),Concepts of Genetics
2. Gardener, E.J., Simmons, M.J. &Sunstad, Principles of Genetics, (8th ed), D.P. John Wiley & Sons, New York.
3. Benjamin A. Pierce ,Genetics: a conceptual approach(6th edition)
4. P.S Verma and V.K Aggarwal ,Genetics(9th edition) S.Chand publications.
5. Veer BalaRastogi, Genetics (4th edition) ,Knrn publications.
6. Prof P. K. Gupta(5th revised edition 2018-19), ,Genetics Rastogi publications.
7. C. B Powar (2018) ,Cell Biology Himalayan publishing house.
8. Miglani, G.S(2000),Basic Genetics ,Narosa publishing house, New Delhi.
9. Weaver, R.F. and Hedrick, P.W. (1992), Genetics, Wm. C. Brown Publishers Dubuque.

Bachelor of Science (Medical) Semester–V
Session 2020-21
ZOOLOGY
Course Title: PRACTICAL – V (Related to Development Biology & Genetics)
Course Code: BSMM-5483 (P)
(PRACTICAL)

Course Outcomes:

- CO1:Understanding of development patterns of frog, chick and Larva of *Herdmania*.
- CO2:Knowledge of process of gametogenesis.
- CO3:Understanding of pedigree analysis and preparation of family charts
- CO4:Understanding of inheritance of morphogenetic human characters.
- CO5:Understanding of finger tip patterns.

Bachelor of Science (Medical) Semester–V
Session 2020-21
ZOOLOGY
Course Title: PRACTICAL – V (Related to Development Biology & Genetics)
Course Code: BSMM-5483 (P)
(PRACTICAL)

Examnation Time: 3 Hrs. **Marks: 20**

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

Guideslines for Conduct of Practical Examination:-

1.	Two Numericals based on Mendel/Hardy Weinberg Law.	6
2.	Perform the experiment for Dermatoglyphics/ Random mating/ Pod Length.	**3**
3.	Identification of given spots/slides.	**3**
4.	Make a pedigree chart from the given data.	**2**
5.	Chart/Assignment.	**2**
6.	Viva-voce and practical file.	**4**

1. Demonstrate the Law of segregation and independent assortment (use of coloured beads capsulesetc.).
2. Numericals for Segregation, Independent assortment,Epistasis&Hardy-Weinberg Law.
3. Demonstration of segregation in preserved material (Maize).
4. Demonstration of cytoplasmic inheritance in snails.
5. Inheritance of human characteristics.
6. Comparison of variance in respect of pod length and number of seeds/pods.
7. Calculation of gene frequencies and random mating (Coloured beads, capsules).
8. Pedigree analysis
9. Dermatoglyphics: Palm print and Finger tip patterns.
10. Study of the following permanent slides :
    - Polytene Chromosomes of *Chironomus.*
    - Stages of gametogenesis, structure of egg and sperm of a mammal.
    - Larva of *Herdmania.*
    - Developmental stages offrog-upto tadpole, chick-upto 96 hr.
11. Preparationof slide for Barr body from cheek cells.
12. **Assignment**: Preparation of charts showing developmental stages of any vertebrate.

Note:- Some changes can be made in the practicals depending on the availability of material.

Bachelor of Science (Medical) Semester–V
Session 2021-22
MICROBIOLOGY
Course Title: APPLIED MICROBIOLOGY-I
Course Code: BSMM-5343 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:** Understand the history and scope of industrial microbiology, culture collection and preservation of stock cultures
- **CO2:** Understand the screening methods of isolation, fermentation media, its composition and characteristics of ideal production medium.
- **CO3:** Learn about the fermentation processes, types of fermentation, design of fermentor and batch, fedbatch and continuous culture.
- **CO4:** Understand the principles of recovery and purification of fermentation products, fermentation economics and patent.

Bachelor of Science (Medical) Semester–V
Session 2021-22
MICROBIOLOGY
Course Title: APPLIED MICROBIOLOGY-I
Course Code: BSMM-5343 (I)
(THEORY)

Examination Time: 3 Hrs.

Max Marks:100
Theory Marks:60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT- I

Microorganisms in Industry: Historical development, definition and scope of industrial microbiology; contribution of Louis Pasteur in fermentation; sources of industrial microorganisms and their essential characteristics, natural habitats, cultural collections and preservation of stock cultures.

UNIT- II

Screening of Microorganisms: Isolation of industrially important microorganisms, primary and secondary screening methods for isolating useful Yeast, Bacteria and Fungi. Fermentation media, composition of production media, characteristics of an ideal production medium, raw materials.

UNIT- III

Fermentation and Fermentation processes: Fermentation as biological activity, Types of industrial fermentations (submerged, solid state and continuous fermentation). Designof fermentor (body construction, aeration, agitation and control of septic conditions), Basics of batch culture, fedbatch culture and continuous culture.

UNIT- IV

Recovery and Purification of Fermentation Products: General principles of separation of fermentation products, solid particles, foam separation, separation by filtration, centrifugation, cell disruption, liquid - liquid chromatography, ion exchange chromatography. Fermentation economics; planning, fermentation designing, process designing, market potential and recovery costs for the industrial set up. Patent (composition, subject matter, characteristics, protection of rights of inventor, cost).

Books Recommended:

1. Casida, L.E. 2016, 2nd Edition.*Industrial Microbiology*. Wiley Eastern Ltd., New Delhi.
2. Stanbury, P.F. Whittaker, A. and Hall S.J. 2016, 3rd Edition. Principles of Fermentation Technology. Elsevier Science Ltd., U.K.
3. Patel, A.H. 2011, 2nd Edition. *Industrial Microbiology,* Macmillan India Ltd., Delhi.
4. Trevan M.D., Saffey, S., Goulding, K.H. and Stanberry, P. 2007. *Biotechnology: The Biological Principles,* Tata McGraw Hill Publishing Co. Ltd., New Delhi.
5. Freifelder, D. 2006, 2nd Edition. Microbial Genetics. Jones and Barttett Publishers Inc., Boston.
6. Applied Microbiology by Corinne Whitby and Torben Lund Skovhus. **(Online available)**
7. Applied Microbiology by Perlman. **(Online available)**

Bachelor of Science (Medical) Semester–V
Session 2021-22
MICROBIOLOGY
Course Title: PRACTICAL (Related to Applied Microbiology-I)
Course Code: BSMM-5343 (P)
(PRACTICAL)

Time: 3 Hrs. **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals:

1. Isolation of various types of microorganisms from (a) soil (b) fruits.

2. Screening of some industrially important microorganisms.

    a. Amylase producers

    b. Protease producers

3. Protein estimation by Lowry method.

4. Preservation of industrially important microorganisms by various methods (a) storage in 10% glycerol (b) storage in mineral oil.

5. Determination of % viability of yeast cells by haemocytometer.

Bachelor of Science (Medical) Semester–V
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY-I
Course Code: BSMM-5084 (I)
(THEORY)

Course outcomes:

Students will be able to:

- CO1: Understand structure and bonding in molecules / ions and predict the structure of molecules / ions.
- CO2: Use Crystal Field Theory to understand the structure, hybridisation, geometry and predict the colour of the complexes.
- CO3: Describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.
- CO4: To describe the magnetic properties of coordination compounds.
- CO5: Familiar with applications of coordination compound.
- CO6: To draw Orgel diagrams for d^1 to d^{10} systems and predict the possible transitions.
- CO7:To calculate number of microstate and ground state term symbols.
- CO8: Understand preparations, properties and applications of alkyls aryls of lithium and aluminium, bonding in metal-ethylenic complexes, mechanism of homogeneous hydrogenation.

Bachelor of Science (Medical) Semester–V
Session 2021-22
CHEMISTRY
Course Title: INORGANIC CHEMISTRY-I
Course Code: BSMM-5084 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

1.Metal-ligand Bonding in Transition Metal Complexes
Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

Unit-II

2. Magnetic Properties of Transition Metal Complexes
Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for characterization of 3d-metal complexes.

3. Thermodynamic and Kinetic Aspects of Metal Complexes
A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

Unit-III

4. Electronic Spectra of Transition Metal Complexes
Term Symbols for p^2& d^2 systems, spectroscopic ground states for d^1-d^{10} electronic configurations. Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, Orgel diagram for d^1-d^5.

Unit-IV

5. Organometallic Compounds
Definition, nomenclature and classification of organometallic compounds. EAN rule, preparation, properties, and applications of alkyls aryls of lithium and aluminium, bonding in metal-ethylenic complexes, Mechanism of homogeneous hydrogenation reactions.

Books Suggested:

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.
3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford
Publisher: Oxford University Press, 2006.
4. Porterfield, W.W., Wesley, A., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.

5 .Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
6. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

Bachelor of Science (Medical) Semester–V
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY-II
Course Code: BSMM-5084 (II)
(THEORY)

Course outcomes:

Students will be able to:

- CO1: get knowledge about various electrochemical phenomena.
- CO2: get the theoretical knowledge of the various spectroscopic methods on the basis of the examples from the science and industry.
- CO3: use spectroscopic equipment such as MS, IR, NMR spectrometers.
- CO4: identify organic compounds by analysis and interpretation of spectral data.
- CO5: explain common terms in NMR spectroscopy such as chemical shift, coupling constant, and anisotropy and describe how they are affected by molecular structure.
- CO6: identify and define various types of nuclear transmutation including fission, fusion and decay reactions.
- CO7: define binding energy and mass defect and be able to calculate each for a given nucleus.
- CO8: understand and explain the concept of ionizing radiation and distinguish between the three different types of radiation.
- CO9: understand the concept of rate of change and half-life in the context of nuclear decay
- CO10: understand the basics of nuclear chemistry applications
- CO11: identify an oxidation – reduction (redox) reaction based on changes in oxidation numbers across the chemical change
- CO12: recognize degrees of reactivity based on an activity series table or a standard reduction potential table
- CO13: describe fully the relationship between the free energy and the cell potential
- CO14: explain thermodynamically the operation of a concentration cell and be able to predict the concentration in the cell based on the cell potential.

Bachelor of Science (Medical) Semester–V
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY-II
Course Code: BSMM-5084 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section.

Unit-I

1. Electrochemistry-I

Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution, migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

Unit-II

2. Electrochemistry – II

Types of reversible electrodes-gas metal ion, metal ion, metal insoluble salt-anion and redox electrodes. Electrode reactions. Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells -reversible and irreverisible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computation of cell. EMF, Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), polarization, over potential and hydrogen overvoltage. Concentration cells with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.Definition of pH and pK_a, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric methods. Buffers-mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts. Corrosion-types, theories and methods of combating it.

Unit-III

3. Nuclear Chemistry

Introduction: Radioactivity, Nuclear Structure, Size of Nucleus, Mass Defects and Binding Energy, Nuclear Stability, Nuclear Forces, Nuclear Spin and Moments of Nuclei, Nuclear Models, Nuclear Decay Processes, The Laws of Radioactive Decay, Soddy-Fajans Group Displacement Law, Rate of Nuclear Decay and Half Life Time (Kinetics of Radioactive Decay), Induced Nuclear Reactions, Types of Nuclear Processes, High Energy Nuclear Reactions, Nuclear Reaction Cross-Section, Artificial radioactivity, Detection and Measurement of Radioactivity, Nuclear Fission, Nuclear Fusion, Applications of Radioactivity.

Unit-IV

4. Spectroscopy

Introduction: Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

5. Rotational Spectrum

Diatomic molecules. Energy levels of a rigid rotor (semiclassical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

6. Vibrational Spectrum

Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

7. Electronic Spectrum

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle. Qualitative description of s, p, and n M.O., their energy levels and the respective transitions.

Books Suggested:

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Companies Inc, 1996.
4. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
5. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.
6. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd,2002.

Bachelor of Science (Medical) Semester–V
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-5084 (P)
(PRACTICAL)

Course outcomes:

Students will be able to:

- CO1: synthesize and analyse the coordination compounds
- CO2: determine the end point of various conductometric titrations
- CO3: know the principle and working of Abbe's Refractometer
- CO4: determine the composition of unknown mixture of two liquids by refractive index measurements.
- CO5: learn the technique of Rast's methods
- CO6: learn phenomenon of adsorption of acetic acid and oxalic acid on charcoal
- CO7: learn distribution coefficient of of iodine between CCl_4 and water

Bachelor of Science (Medical) Semester–V
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-5084 (P)
(PRACTICAL)

Duration: 3½ Hrs. **Max. Marks: 20**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE office, Kanya Maha Vidyalaya, Jalandhar.

(I) Synthesis and Analysis

(a) Preparation of Sodium trioxalatoferrate (III)
(b) Preparation of Ni-DMG Complex
(c) Preparation of Copper tetrammine complex
(d) Preparation of cis-bisoxalatodiaquachromate (III) ion

(II) Physical Chemistry
(a) Conductometric Titrations
(i) Determine the end point of the following titrations by the conductometric methods.
Strong acid-Strong base
Strong acid-Weak base
Weak acid-Strong base
Weak acid-Weak base
(ii) Determine the composition of a mixture of acetic acid and the hydrochloric acid by conductometric titration.
(b) (i) Molecular Weight Determination of acetanilide, napthalane, using camphor as solvent **(Rast's methods).**
(ii) To determine the molecular weight of a polymer by viscosity measurements.
(c) Adsorption (i)To study the adsorption of acetic acid oxalic/acid from aqueous solutions by charcoal.
(d) Phase Equilibria (i) To determine the distribution coefficient of iodine between CCl_4 and water.
(e) Refractometry
(i) Determination of refractive index of a liquid by Abbe refractometer, and hence the specific and molar refraction.
(ii) To determine the composition of unknown mixture of two liquids by refractive index measurements.
Practical Examination
1) Inorganic Synthesis 07
2) Physical experiment 08
3) Viva- Voce 03
4) Note Book 02

Books Suggested:

1. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.

2. Handbook of preparative Inorganic Chemistry, Vol. I & II, Brauer, Academic Press.

3. Inorganic Synthesis, McGraw Hill.

4. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press

5. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.

6. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.

7. Advanced Experimental Chemistry, Vol. I, Physical, J.N. Guru and R. Kapoor, S. Chand & Co.

8. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh & Sons.

9. Experiments Physical Chemistry, J.C. Ghosh, Bharati Bhavan.

Bachelor of Science (Medical) Semester–V
Session 2021-22
BOTANY
Course Title: PLANT PHYSIOLOGY
Course Code: BSMM-5075 (I)
(THEORY)

Course outcomes:
After passing this course the student will be able to:

- CO1. Understand the plants and plant cells in relation to water.
- CO2. Understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C3 and C4 pathways.
- CO3. Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.
- CO4. Learn about the movement of sap and absorption of water in plant body

Bachelor of Science (Medical) Semester–V
Session 2021-22
BOTANY
Course Title: PLANT PHYSIOLOGY
Course Code: BSMM-5075 (I)
(THEORY)

Examination Time: 3Hrs **Max. Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Plant-Water Relation: Importance of water to plant life, physical properties of water, (imbibition) diffusion and osmosis, absorption, transport of water and transpiration, physiology of stomata.

Unit-II

Mineral Nutrition: Essential macro-and micro-elements and their role, mineral uptake, deficiency and toxicity symptoms (hydroponics).
Transport of Organic Substances: Mechanism of phloem transport, source-sink relationship, factors affecting translocation.

Unit-III

Photosynthesis: Significance, historical aspects, photosynthetic pigments, action and absorption spectra and enhancement effects, concept of two photosystems, z-scheme, photophosphorylation, Calvin cycle, C4 pathway, CAM plants, photorespiration.

Unit-IV

Growth and Development: Definitions, phases of growth and development, kinetics of growth, seed dormancy, seed germination and factors of their regulation, plant movements, the concept of photoperiodism, physiology of flowering, florigen concept, biological clocks, physiology of senescence, fruit ripening.

Plant growth regulators - auxins, gibberellins, cytokinins, abscissic acid andethylene, history of their discovery, biosynthesis and mechanism of action, general account ofsalicylic acid, jasmonates and brassinosteroids, photomophogensis, phytochromes andcryptochromes, their discovery, physiological role and mechanism of action.

Suggested Readings:

1. Bhatia, K.N. (2019). Plant Physiology I and II. Trueman Book Company. New Delhi
2. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology (4th Edition).JohnWileyand Sons. U.S.A.
3. Jain, V.K. (2017). Fundamentals of Plant Physiology. S. Chand Publishing. New Delhi.
4. Mandavia, C., Patel, S. V., Mandavia, M. K., Golakiya, B. A. and Chovatia, V. P.(2009).Glimpses in Plant Physiology.International Book Distributing Co., Lucknow, India.
5. Mohr, H. and Schopfer, P. (1995). Plant Physiology. Springer-Verlag, Berlin, Germany.
6. Pandey, S.N. and Sinha, B. K. (2005). Plant Physiology. Vikas Publishing. New Delhi.
7. Salisbury, F.B. and Ross, C.W. 2006. Plant Physiology (4th Edition). Wadsworth PublishingCo.,California, USA.
8. Srivastava, H. N. (2019). Plant Physiology, Biochemistry and Biotechnology. Pradeep Publications, Jalandhar.
9. Taiz, L. and Zeiger, E. (2010). Plant Physiology (5th Edition).Sinauer Associates Inc. USA.

Bachelor of Science (Medical) Semester–V
Session 2021-22
BOTANY
Course Title: BIOCHEMISTRY & BIOTECHNOLOGY
Course Code: BSMM-5075 (II)
(THEORY)

Course outcomes

After passing this course the student will be able to:

- CO1. Understand the properties of Monosaccharide, Oligosaccharides and Polysaccharides.
- CO2. Understand the Properties of saturated and unsaturated fatty acids.
- CO3. Understand lipid metabolism and its significance in plants.
- CO4. Understand structure and classification and protein biosynthesis in prokaryotes and eukaryotes. They will learn about the nucleic acid metabolism.
- CO5. Understand the fundamentals of Recombinant DNA Technology. Know about the Genetic Engineering. Understand the principle and basic protocols for Plant Tissue Culture.

Bachelor of Science (Medical) Semester–V
Session 2021-22
BOTANY
Course Title: BIOCHEMISTRY & BIOTECHNOLOGY
Course Code: BSMM-5075 (II)
(THEORY)

Examination Time: 3Hrs **Max. Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Basics of Enzymology: Discovery and nomenclature, characteristics of enzymes, concept of holoenzyme, apoenzyme, coenzymes and cofactors regulation of enzyme activity, mechanism of action.

Respiration: ATP-the biological energy currency, aerobic and anaerobic respiration, Kreb's cycle, electron transport mechanism (chemiosmotic theory), redox potential, oxidative phosphorylation, pentose phosphate pathway.

Unit-II

Nitrogen and Lipid Metabolism: Biology of nitrogen fixation, importance of nitrate reductase and its regulation, ammonium assimilation, structure and function of lipids, fatty acid biosynthesis, β-oxidation, saturated and unsaturated fatty acids, storage and mobilization of fatty acids.

Unit-III

Genetic Engineering: Tools and techniques of recombinant DNA technology, cloning vectors, genomic and cDNA library, transposable elements, techniques of gene mapping.

Unit-IV

Biotechnology: Functional definition, basic aspects of plant tissue culture, cellular totipotency, differentiation and morphogenesis, biology of Agrobacterium, vectors for gene delivery and marker genes, salient achievements in crop biotechnology.

Suggested Readings:

1. Bhojwani, S.S. (1996). Plant Tissue Culture: Applications and Limitations. Elsevier Science Publishers, New York, USA.

2. Dennis, D.T., Turpin, D.H. Lefebvre, D.D. and Layzell (eds.) (1997**).** Plant Metabolism (2nd Edition). Longman, Essex, England.

3. Galston, A.W. (1994). Life Processes in Plants. Scientific American Library, Springer-Verlag, New York, USA.

4. Glick, B.R., Pasternak, J.J. (2010). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

5. Lea, P.J. and Leegood, R.C. (1999). Plant Biochemistry and Molecular Biology. John Wiley Sons, Chelichester, England.

6. Old, R.W. and Primrose, S.B. (2006). Principles of Gene Manipulation, Blackwell Scientific Publishers, Oxford, UK.

7. Snustad, D.P. and Simmons,M.J. (2010). Principles of Genetics (5th Edition). John Wiley and Sons Inc., U.S.A.

8. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques

And Applications. John Wiley & Sons Inc. U.S.A.

9. Vasil, I.K. and Thorpe, T.A. (2012). Plant Cell and Tissue Culture. Kluwer Academic

Publishers, The Netherlands

Bachelor of Science (Medical) Semester–V
Session 2021-22
BOTANY
Course Title: PRACTICAL-V (Related to Plant Physiology, Biochemistry & Biotechnology)
Course Code: BSMM-5075 (P)
(PRACTICAL)

Course outcomes:

After passing this course the student will be able:

- CO 1: determine the osmotic potential of cell sap by plasmolytic method.
- CO2: determine the Diffusion Pressure Deficit (DPD) of plant cells.
- CO3: determine the effect of time period on the rate of imbibition in different types of seeds.
- CO4: determine the relation between absorption and transpiration.

Bachelor of Science (Medical) Semester–V
Session 2021-22
BOTANY
Course Title: PRACTICAL-V (Related to Plant Physiology, Biochemistry & Biotechnology)
Course Code: BSMM-5075 (P)
(PRACTICAL)

Time: 3Hours **Practical: 20**

Instructions for the paper setter: question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Laboratory Exercises

1. To study the permeability of plasma membrane using different**:** concentrations of organicsolvents.
2. To study the effects of temperature on permeability of plasma membrane.
3. To prepare the standard curve of protein and determine the protein content in unknown samples.
4. To study the enzyme activity of catalase and peroxidase as influenced by pH and temperature.
5. Separation of chloroplast pigments by solvent method.
6. Determining the osmotic potential of vacuolar sap by plasmolytic method.
7. Determining the water potential of any tuber.
8. Separation of amino acids in a mixture by paper chromatography and their identification bycomparison with standards.
9. Bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant material.
10. Demonstration of the technique of micropropagation by using different explants, e.g. axillarybuds, shoot meristems.
11. Demonstration of the technique of another pollen culture.
12. Demonstrate the ascent of sap using a dye.
13. Demonstration of root and shoot formation from the apical and basal portion of stem segments in liquid medium containing different hormones.
14. Demonstrate the transpiration pull by mercury method.
15. Demonstration of osmosis by potato osmoscope.
16. Comparison of loss of water from two surfaces of leaf by CoCl2 method/four leaf method.
17. Demonstration of imbibition by plaster of peris method.
18. Demonstration that O2 is evolved during photosynthesis.
19. Separation of pigments by paper chromatography/TLC method.
20. Demonstration of phototropism movements.
21. Demonstration the measurements of growth by arc auxanometer.
22. Requirements for setting up the tissue culture laboratory.
23. Preparation of nutrient medium.
24. Sterilization of glassware and plant material.
25. Preparation of explant for aseptic manipulation.

Suggested Readings (For Laboratory Exercises)

1. Bajracharya D. (1999).Experiments in Plant Physiology-A Laboratory Manual.NarosaPublishing House, New Delhi.
2. Devi, P. 2000. Principles and Methods of Plant Molecular Biology, Biochemistry andGenetics.Agrobios, Jodhpur, India.
3. Dixon, R.A. (Ed.) 1994. Plant Cell Culture: A Practical Approach, IRL Press, Oxford.
4. Kochhar, S. L. and Gujral, S. K. (2016). Comprehensive Practical Plant Physiology.MacmillanPublishers India Ltd., Delhi.
5. Moore, T.C. 2012. Research Experiences in Plant Physiology: A Laboratory annual. Springer-Verlag. Berlin.
6. Plummer, D.T. (2001). An Introduction to Practical Biochemistry (3rd Edition). Tata McGraw-Hill Publishing Co. Ltd. New Delhi.
7. Roberts, J. and Tuckar, G.A. (Eds.) 2000. Plant Hormone Protocols.Human Press, NewJersey,USA.
8. Scott, R.P.W. 1995. Techniques and Practices of Chromotography. Marcel Dekker, Inc.,NewYork.
9. Smith, R.H. 2000. Plant Tissue Culture: Techniques and Experiments. Academic Press,NewYork.

Bachelor of Science (Medical) Semester–V
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD ANALYSIS
Course Code: BSMM-5255 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:** Understand the chemical and biochemical composition& nutritional importance of foods and their importance for health and safety of consumers
- **CO2:** Understand physical characteristics of foods with special reference to rheological behavior and textural characteristics.
- **CO3:** Understand the basics of chromatography techniques to separate and identify various biological molecules with special reference to amino acids, carbohydrates, lipids, nucleic acid, and proteins.
- **CO4:** Understand the importance of legal standard, quality assurance, nutritional value determination and adulterants detection.

Bachelor of Science (Medical) Semester–V
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD ANALYSIS
Course Code: BSMM-5255 (I)
(THEORY)

Examination Time: 3 Hrs.

Max. Marks: 100
Theory Marks: 60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter: Eight questions of equal marks (12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Food composition and factors effecting food composition.

2. Proximate composition analysis of food.

UNIT-II

3.Analysis ofMicro nutrients and minerals.

UNIT-III

4. General physical methods of analysis of foods: Refractrometry&polarimetry.

5. Introduction and principles of Food rheology, types of viscosity, equipments used to check the viscosity.

UNIT-IV

6. Basic principles and working of Column chromatography, Gas chromatography and High Pressure Liquid Chromatography

Reference Books:

1. Manuals of Food Quality Control additions contaminants techniques, 1980.

2. The Chemical Analysis of Food and Food Products by Morries B Jacob, 3rd Edition.,Roberte, Krieger. **(Online available)**

3. Food Analysis, 2019, 5th Edition, S. Suzanne Nielsen. **(Online available)**

4. Analysis and Quality Control for Fruit and VegetableProducts, S Ranganna, McGraw Hill Education (India) Private Limited, Chennai, India.

Bachelor of Science (Medical) Semester–V
Session 2021-22
FOOD SCIENCE AND QUALITY CONTROL (VOCATIONAL)
Course Title: PRACTICAL (Related to Food Analysis)
Course Code: BSMM-5255 (P)
(PRACTICAL)

Max. Marks: 20

Instructions for the practical examiner: Question paper is to be set on the spot jointly by theInternal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals:

1. Determination of milk quality by lactometer
2. To find out the TSS of food sample by refractrometer.
3. Determination of surface tension of food sample by using drop number method.
4. Determination of viscosity index of food sample.
5. Proximate composition of different types of food.
6. Estimation of different minerals in food.
7. Estimation of vitamins in food.

SEMESTER – VI

Bachelor of Science (Medical) Semester–VI
Session 2021-22
ZOOLOGY
Course Title: MEDICAL ZOOLOGY
Course Code: BSMM-6483 (I)
(THEORY)

Course Outcomes:

After successfully completing this course, students will be able to:

- CO-1. To study and understand the scope and branches of Medical Zoology.
- CO-2. To aware the students for various parasites and diseases which spreads in human with the help of study of host-parasite relationship.
- CO-3. To increase awareness for the health in students.
- CO-4. Understand the various disease-causing vectors like Mosquitoes
- CO-5. To aware about the typhoid, cholera likes disease.
- CO-6. Provides basics knowledge about immune system and allows the student to create insight as how to improve their immune system and good health.
- CO-7. Types of immunity, antigens-antibodies and their properties
- CO-8. Complement system, MHC's and immune response.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
ZOOLOGY
Course Title: MEDICAL ZOOLOGY
Course Code: BSMM-6483 (I)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Introduction of Parasitology (various terminologies in use).
2. Brief introduction to pathogenic microbes, viruses, Rickettsiae, spirochaetes and bacteria.
3. Brief accounts of life history, mode of infection and pathogenicity of the following with reference to man; prophylaxis and treatment:
   A) Pathogenic protozoa: *Entamoeba, Trypanosoma, Leishmania, Giardia, Trichomonas* and *Plasmodium.*
   B) Pathogenic helminthes: *Fasciola, Schistosoma, Echinococcus, Ancylostoma, Trichinella, Wuchereria, Dracunculus* and *Oxyuris.*

UNIT-II

4. Life cycle and control measures of arthropod vectors of human disease: Malaria *(Anopheles stephens, A.culicifaces,* Yellow fever, Dengue, Dengue haemorrhagic fever and Chickengunea. *(Aedes aegypti A. Albopicuts)*; Filariasis *(Culex pipien satigeans) Mansonia* sp. Japanese Encephalitis *(C. trinanelorhynchus);* Plague *(Stenophalide cheopis)* and Epidemic Typhus *(Pediculus spp).*
5. Epidemic diseases, such as Typhoid, Cholera, Small pox; their occurrence and eradication programs.

UNIT-III

6. Brief introduction to human defence mechanisms.
7. Humoral and cell mediated immune response. Physical & chemical properties of antigens. Antibody structure and function of M, G, A, E and D immunoglobulins.

UNIT-IV

8. Antigen and antibody interactions-Serodiagnostic assays (Precipitation, agglutination immunodiffusion, ELISA,RIA)
9. Vaccines

Suggested Readings:

1. Baker,F.J.andSilverton,R.E.(1985)IntroductiontoMedicalLaboratoryTechnology,(6th ed), Butlerworth and Co.Ltd.
2. Chatterjee, K.D. (2019), Parasitology, Protozoology and Helminthology (13thed).
3. Cheesborough, M. (1991), Medical Laboratory Technology for Tropical countries, Butlerworth and Co.,Ltd.
4. Garcia, L.S. (2001), Diagnostic Medical Parasitology, (4th ed), ASM Press Washington.
5. Kimball,J.W.(1987),Introduction of Immunology, (2nd ed),MacMillian Publishing Co.,NewYork.
6. Kuby, J. (2013), Immunology, 7th Edition W.H. Freeman & Co.,USA.
7. Roitt, I. (2017), Essential Immunology, 13th Edition, Blackwell Scientific Publications, Oxford.
8. Talib, V.H. (2019), Essential Laboratory Manual,2nd edition, Mehta Publishers, New Delhi.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
ZOOLOGY
Course Title: MEDICAL LABORATORY TECHNOLOGY
Course Code: BSMM-6483 (II)
(THEORY)

Course Outcomes:

After successfully completing this course, students will be able to:

- CO-1. Apply knowledge and **technical** skills associated with **medical lab technology**.
- CO-2.Perform routine **clinical laboratory** procedures within acceptable quality control parameters in haematology, chemistry, immunohematology, and microbiology.
- CO-3.Perform basic laboratory techniques on biological specimens.
- CO-4 Comply with safety regulations and universal precaution.
- CO-5. Apply basic scientific principles in learning new techniques and procedures.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
ZOOLOGY
Course Title: MEDICAL LABORATORY TECHNOLOGY
Course Code: BSMM-6483 (II)
(THEORY)

Max. Time: 3 Hrs. **Max Marks: 30**

Instructions for the Paper Setter

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Laboratory safety rules, hazards and precautions during sample collection and laboratory investigations.

Laboratory Techniques: Colorimetry, Microscopy, Autoclaving, Centrifugation and Spectrophotometry

UNIT-II

Collection, transportation and preservation of different clinical samples.

Haematology: collection of blood (venous and capillary), anticoagulants (merits and demerits), Romanowsky's stains, total RBC count, erythrocyte sedimentation rate, TLC, DLC, platelet count.

UNIT-III

Bacteriology: sterilization (dry heat, moist heat, autoclave, filtration), disinfection, staining techniques,(gram stain, AFB stain,etc),culture media (defined and synthetic media & routine laboratory media), bacterial culture (aerobic and anaerobic) and antibiotic sensitivity.

UNIT-IV

Histopathology: Common fixatives and staining techniques.

Biochemistry: Principal/theory and significance of estimation of urea, sugar, cholesterol, creatinine, enzymes (transaminase, phosphatase, amylase and lipase), uric acid in blood, estimation of proteins, sugar, bile salts, ketone bodies in urine and liver function test.

Suggested Readings:

1. Baker, F.J. and Silverton, R.E. (1985) Introduction to Medical Laboratory Technology,(6th ed), Butlerworth and Co.Ltd.

2. Chatterjee, K.D.(2019), Parasitology, Protozoology and Helminthology (13thed).

3. Cheesborough, M.(1991), Medical Laboratory Technology for Tropical countries,Butlerworth and Co.,Ltd.

4. Garcia, L.S.(2001), Diagnostic Medical Parasitology, (4th ed), ASM PressWashington.

5. Kimball,J.W.(1987),IntroductionofImmunology, (2nd ed),MacMillianPublishingCo.,NewYork.

6. Kuby, J.(2013), Immunology, 7th Edition W.H. Freeman & Co.,USA.

7. Roitt, I. (2017), Essential Immunology, 13th Edition, Blackwell Scientific Publications,Oxford.

8. Talib, V.H.(2019), Essential Laboratory Manual,2nd edition, Mehta Publishers, NewDelhi.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-VI (Related to Medical Zoology & Medical Laboratory Technology)
Course Code: BSMM-6483 (P)
(PRACTICAL)

Course Outcomes:

- CO1: Apply knowledge and **technical** skills associated with **medical laboratory technology** for delivering quality **clinical** investigations support.
- CO2: Perform basic clinical laboratory procedures using appropriate laboratory techniques and instrumentation in accordance with current laboratory safety protocol
- CO3: Recognize the role of medical laboratory technology in the context of providing quality patient health care.
- CO4:Understanding of sterilization techniques
- CO5: Students will learn about various histotechniques, handling and processing of tissue specimens as well as staining procedures.
- CO6: Understanding of estimation of protein & sugar

Bachelor of Science (Medical) Semester–VI
Session 2021-22
ZOOLOGY
Course Title: PRACTICAL-VI (Related to Medical Zoology & Medical Laboratory Technology)
Course Code: BSMM-6483 (P)
(PRACTICAL)

Time: 3 Hrs. **Max. Marks:20**

Instructions for the Practical Examiners: Question paper is to set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar

1. Demonstration of safety rules in laboratory like proper handling of patients, specimens and disposal of syringes, needles etc.
2. Demonstration of the use of autoclave, centrifuge and spectrophotometer.
3. Cleaning and sterilization of glass ware, using hot air oven, autoclave etc.
4. Physico-chemical examination of urine.
5. Preparation of thick and thin blood smear.
6. Counting of WBC, RBC and DLC.
7. Study of permanent slides and specimens of parasitic protozoans, helminthes and arthropods mentioned in the theory syllabus.
8. ESR and haematocrit.
9. Estimation of blood sugar, protein.
10. Demonstration of fixation, embedding, cutting of tissue sections, and their staining (routine haematoxylin and eosin).
11. Visit to a pathology Lab and preparation of report.

Guidelines for conduct of Practical Examination:

1.	Write down the principle and working of the given equipment.	4
2.	Write down the procedure, precautions and perform the experiment for physico-chemical examination of urine/ haematology.	4
3.	Identification, pathogenicity and host of parasitic organism.	4
4.	Estimation of blood sugar / protein in the given sample.	4
5.	Viva-voce and practical file	4

(Note:-Some changes can be made in the practicals depending on the availability of material.)

Bachelor of Science (Medical) Semester–VI
Session 2021-22
MICROBIOLOGY
Course Title: APPLIED MICROBIOLOGY-II
Course Code: BSMM-6343 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1:**Understand the processing and microbiology of different fermented foods.
- **CO2:** Understand the role of yeast in fermentation process and the production of different industrial chemicals.
- **CO3:** Understand the role of microorganisms in preparation of alcoholic beverages and industrial enzymes.
- **CO4:** Understand the role of microorganisms in the production processes of vitamins, amino acids and antibiotics.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
MICROBIOLOGY
Course Title: APPLIED MICROBIOLOGY-II
Course Code: BSMM-6343 (I)
(THEORY)

Time: 3 Hrs. **Max Marks:100**
Theory Marks:60
Practical Marks: 20
CA: 20

Instructions for the Paper Setters: Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

1. Fermentation Process of Fermented Foods: Fermented cereal, legume and milk products. Microbiology of natural fermentation. Sauerkraut, Yoghurt, Soya sauce, Cheese.

UNIT-II

2. Microbial Cell as Fermentation Products: Baker's and brewer's yeast, single cell protein, mushroom farming. Production of industrial chemicals: Acetic acid, Citric acid, Acetone and Butanol.

UNIT-III

3. Production of alcoholic Beverages: Beer, wine and distilled beverages – Whisky, Brandy, Vodka, Gin production and applications of industrial enzymes: Amylases, Proteases, immobilization of enzymes.

UNIT-IV

4. Vitamins and Amino acids production by Microorganisms: Riboflavin (B2) and Cyanocobalamin (B12), Glutamic acid. Production of antibiotics: Penicillin and Streptomycin.

Books Recommended:

1. Read, G. 1982. Prescott and Dunn, *Industrial Microbiology.*CBS Publishers & Distributers, New Delhi.
2. Casida, L.E. 1991. *Industrial Microbiology*. Wiley Eastern Ltd., New Delhi.
3. Patel, A.H. 1984. *Industrial Microbiology*. Macmillan India Ltd., Delhi.
4. Trevan, M.D. Saffey, S., Goulding, K.H. and Stanberry, P. 1988. *Biotechnology: The Biological Principles*, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
5. Wiseman, A. 1995. *Handbook of Enzyme Biotechnology*. Ellis Harwood Ltd., London.
6. Wood, J.B.B., 1998. *Microbiology of Fermented Foods*, Volumes 1 and 2, Blackie Academic and Professional, London.
7. Power C.B. and Dagniwala, H.F.1992. *General Microbiology*. Volume-2. Himalaya Publishing House, New Delhi.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
MICROBIOLOGY
Course Title: PRACTICAL (Related to Applied Microbiology-II)
Course Code: BSMM-6343 (P)
(PRACTICAL)

Time: 3 Hrs **Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

LIST OF PRACTICALS:

1. Production of amylases and proteases in liquid medium using the selected organisms.
2. Assay of various crude enzymes preparations
    a. Amylase
    b. Protease
3. Production of alcohol from molasses and cereal grains.
4. Immobilization of microbial cells and enzyme preparations by calcium alginate entrapment method.
5. Comparison of submerged and solid state fermentation techniques for amylase production.
6. To study the production of wine and vinegar.
7. To study the kinetics of growth of yeast in batch/continuous culture.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY-I
Course Code: BSMM-6084 (I)
(THEORY)

Course outcomes:

Students will be able to:

- CO1:learn about the Principle and applications of ultraviolet and Woodward Fisher Rule
- CO2: understand the infra-red spectroscopy in organic structure determination
- CO3:know about the Nuclear magnetic resonance spectroscopy,proton chemical shift,spin-spin coupling, coupling constants and applications to organic structures
- CO4: learn about the different mechanisms involved in the polymer preparation
- CO5: learn about the different polymerization techniques
- CO6:Familiarize with structure, classification and the biological functioning of carbohydrates,amino acids and nucleic acids.
- CO7:understand the types and reactions given by organosulphur compounds

Bachelor of Science (Medical) Semester–VI
Session 2021-22
CHEMISTRY
Course Title: ORGANIC CHEMISTRY-I
Course Code: BSMM-6084 (I)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Note: Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

1. Spectroscopy

Nuclear Magnetic Resonance (NMR) spectroscopy,Proton Magnetic Resonance (1H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

2. Electromagnetic Spectrum: Absorption Spectroscopy

Ultraviolet (U.V.) absorption spectroscopy introduction- (Beer-Lambert law), molar absorptivity, analysis of UVspectra, types of electronic transitions effect of conjugation.Conceptofchromophores and auxochrome, Bathochrome, hypsochrome, hyperchrome, hypochromic shifts-UVspectra of conjugated compounds

UNIT–II

Electromagnetic Spectrum: Absorption Spectroscopy

Infrared (IR) Absorption spectroscopy-introduction, Hooke's law, Selection rules, intensity and IR bands, measurement of IR spectrum time characteristic absorptionof various fundamental band interpretation of IR spectra of simple organic compounds.

3. Problems based on spectroscopy

Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

4. Organosulphur Compounds

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers,sulphonic acids, sulphonamides and sulphaguanidine.

UNIT-III

5. Synthetic Polymers

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers.Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.Natural and synthetic rubbers.

6. Organic Synthesis *via* Enolates

Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.Alkylation of 1,3-dithianes. Alkylation and acylation of enamines.

UNIT–IV

7. Carbohydrates

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides.Erythro and threodiastereomers.Conversion of glucose into mannose.Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides.Cyclic structure of D(+)-glucose. Mechanism of mutarotation.

Structures of ribose and deoxyribose

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

8. Amino Acids, Peptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids.Acid-base behaviour, isoelectric pointandelectrophoresis.Preparationand reactions of α-amino acids.Structure and nomenclature of peptides and proteins.Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis.Structures of peptides and proteins.Levels of protein structure.Proteindenaturation/renaturation.Nucleic acids : Introduction. Constituents of nucleic acids.Ribonucleosides and ribonucleotides.Thedouble helical structure of DNA.

Books Suggested :

1. Spectrometric Identification of Organic Compounds by Robert M. Silverstein, Francis X. Webster, David J. Kiemle, David L. Bryce; Publisher : Wiley, 1981.
2. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
3. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.
4. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry ; Pubs: New Age International, 1985, Vols.I, II, III.
5. Carey, F.A., Organic Chemistry ; 4th edition, Pubs: McGraw-Hill, 2000.
6. Solomons, T.W., Fundamentals of Organic Chemistry ; 5th edition, Pubs: John Wiley & Sons, 1997.
7. Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry ; 3rd edition, Pubs: Macmillan Publishing Company, 1989.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY-II
Course Code: BSMM-6084 (II)
(THEORY)

Course outcomes:

- CO1: Understand wave mechanics in three dimensions;
- CO2: describe the structure of the hydrogen atom and show an understanding of quantisation of angular momentum.
- CO3: understand and explain the differences between classical and quantum mechanics
- CO4: understand the idea of wave function
- CO5: understand the uncertainty relations
- CO6: solve Schroedinger equation for simple potentials
- CO7: spot, identify and relate the eigen value problems for energy, momentum, angular momentum and central potentials explain the idea of spin
- CO8: apply the knowledge about photochemical and photophysical processes
- CO9: acquire knowledge about the unit cell, space lattice, miller indices, symmetry operations , Bragg equation etc.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
CHEMISTRY
Course Title: PHYSICAL CHEMISTRY-II
Course Code: BSMM-6084 (II)
(THEORY)

Time: 3 Hrs. **Max. Marks: 30**

Note:Instructions for the Paper Setter

Eight questions of equal marks (6 each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

1. Quantum Mechanics-I

Black-body radiation, Planck's radiation law, Photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect. de Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box, quantization of energy levels, extension to two and three dimensional boxes, degeneracy.

UNIT–II

2. Quantum Mechanics-II

Simple harmonic oscillator model of vibrational motion, setting up Schrodinger equation and discussion of solution and wave functions. Rigid rotator model of rotation of diatomic molecules transformation to spherical polar coordinates spherical harmonics and their discussion. Qualitative investigation H-atom, setting up Schrodinger equation, radial and angular part, radial distribution functions of 1s, 2s, 2p, 3s, 3p and 3d.

UNIT–III

3. Solid State

Definition of space lattice and unit cell, Law of crystallography- (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Symmetry elements in crystals. X-ray diffraction by crystals.Derivation of Bragg’s Law in Reciprocal space.Determination of crystal structure of NaCl, KCl by use of Powder method; Laue’s method.

UNIT-IV

4. Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus–Drapper law, Stark–Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of flourescence, phosphorescence, non–radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions–energy transfer processes (simple examples).

Books Suggested :

1. Atkins, P., Paula, J.de, Atkins, Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.

3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Company Inc., 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; I edition, Pubs: John Wiley & Sons Inc., 1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems, Pubs: Wiley Eastern Ltd., 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs : Tata McGraw Hill Publishing Co. Ltd., 2002.
9. Moore, W.J., Basic Physical Chemistry; Pubs : Prentice Hall of India Pvt. Ltd., 1983.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs:McGraw-Hall Book Company, 1989.
11. Banwell, C.N., McCash, E.M., Fundamentals of Molecular Spectroscopy; 4th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 1999.
12. Atkins, P. Friedman, R., Molecular Quantum Mechanics; 4th edition Pubs: Oxford University Press, 2007.
13. Levine, I.N., Quantum Chemistry; 5th edition, Pubs: Prentice Hall International Inc., 2000.
14. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
15. Inorganic Chemistry, A.G. Sharpe, ELBS.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-6084 (P)
(PRACTICAL)

Course outcomes:

Students will be able to:

- CO1:separate the various mixtures by Column Chromatography technique
- CO2:synthesize different Organic Compounds
- CO3:synthesise the different compounds by Green Approach
- CO4:prepare the different dyes

Bachelor of Science (Medical) Semester–VI
Session 2021-22
CHEMISTRY
Course Title: CHEMISTRY (PRACTICAL)
Course Code: BSMM-6084 (P)
(PRACTICAL)

Duration: 3½ Hrs. **Max. Marks: 20**

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE office, KanyaMahaVidyalaya, Jalandhar.

(I) Organic Chemistry Laboratory Techniques

(a) Column Chromatography

Separation of o & p nitrophenol

Separation of Leaf pigments from Spinnach leaves

Separation of o & p nitro aniline

Separation of dyes.

(b) Synthesis of Organic Compounds

Preparation of p-nitroacetanilide

Preparation of p-bromoacetanilide

Green Chemistry Experiment: Preparation of benzilic acid from Benzyl-using green

approach.

Preparation of Methyl Orange, Methyl Red

Preparation of benzilic acid from benzyl-using green approach

Practical Examination

1) Column Chromatography= 07

2) Organic Synthesis =16

3) Viva-Voce =04

4) Note Book= 03

Books suggested:

1. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai,

Tata McGraw Hill.

2. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.

3. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.

4. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
BOTANY
Course Title: ECOLOGY
Course Code: BSMM-6075 (I)
(THEORY)

Course outcomes:

After passing this course the student will develop:

- CO1.Demonstrate practical fieldwork skills.
- CO2.Demonstrate an understanding of key ecological interactions and processes:
- CO3.Explain scales and patterns in ecology and biodiversity
- CO4.Appreciate the relationships between ecology and society

Bachelor of Science (Medical) Semester–VI
Session 2021-22
BOTANY
Course Title: ECOLOGY
Course Code: BSMM-6075 (I)
(THEORY)

Examination Time: 3Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:
Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.
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Unit-I

Plants and Environment: Atmosphere (gaseous compositions), water (properties of watercycle),light (global radiation, photosynthetically active radiation), temperature, soil (development, soil profiles, physico-chemical properties), and biota.
Morphological, anatomical and physiological responses of plants to water (hydrophytes andxerophytes), temperature (thermoperiodicity and vernalization), light (photoperiodism, heliophytes and sciophytes) and salinity.

Unit-II

Community Ecology: Community characteristics, absolute and relative frequency, density anddominance, basal area and importance value index (IVI), Whittaker's classification ofbiodiversity,indices of alpha, beta and gamma diversity, life forms, biological spectrum, ecologicalsuccession.

Unit-III

Population Ecology: Growth curves, ecotypes, ecads.
Ecosystem: Structure, abiotic and biotic components, food chain, food web, ecologicalpyramids,energy flow, biogeochemical cycles of carbon, nitrogen and phosphorus.

Unit-IV

Biogeographical Regions of India
Vegetation types of India: Forests and grasslands
Landscape Ecology: Definition & concept, effect of patch size and shape on biodiversity, dynamics of land use.

Suggested Readings:

1. De, Debapriya and De, Debasish (2014). Fundamentals of Environment and Ecology. S. Chand Publishing, New Delhi
2. Kumar, H.D. (2018). Modern Concepts of Ecology 8thedition.Vikas Publishing House, New Delhi.
3. Mackenzie, A., Ball,A. and Virdee, S. (2001). Instant Notes in Ecology. Taylor & Francis, London, United Kingdom
4. Odum, E.P. and Barrett, G.W. (2012). Fundamentals of Ecology.Cengage Learning India Pvt.Ltd., New Delhi.
5. Saini, A. (2019). Plant Ecology. Trueman Book Company. New Delhi.
6. Sharma, P.D. (2017). Environmental Biology and Toxicology. 3rd edition. Rastogi Publications, Meerut.
7. Srivastava, H. N. (2020). Botany Vol VI, Ecology and Utilization of Plants. Pradeep publications, Jalandhar.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
BOTANY
Course Title: ECONOMIC BOTANY
Course Code: BSMM-6075 (II)
(THEORY)

Course outcomes:

After passing this course the students will be able to:

- CO1: - Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems.
- CO2: -Develop critical understanding on the evolution of concept of organization of apex new crops/varieties, importance of germplasm diversity, issues related to access and ownership.
- CO3: -Develop a basic knowledge of taxonomic diversity and important families of usefulplants.
- CO4: -Increase the awareness and appreciation of plants& plant products encountered in everyday life.
- CO5: -Appreciate the diversity of plants and the plant products in human use.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
BOTANY
Course Title: ECONOMIC BOTANY
Course Code: BSMM-6075 (II)
(THEORY)

Examination Time: 3Hrs. **Max. Marks: 30**

Instructions for the Paper Setters:

Eight questions of equal marks (6 marks each) are to be set, two in each of the four Sections (I-IV). Questions of Sections I-IV should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Food Plants: *Oryza sativa* (Rice), *Triticum aestivum*(Wheat), *Zeamays* (Maize), *Solanumtuberosum* (Potato), *Saccharum officinarum* (Sugarcane).

Fibres: *Gossypium hirsutum*(Cotton) and *Chorchorus capsularis* (Jute).

Vegetable Oils: *Arachis hypogea* (Groundnut), *Brassica campestris* (Mustard) and *Cocos nucifera* (Coconut).

Unit-II

Spices: General account of *Piper nigrum* (Black pepper), *Eugenia caryophyllum*(Cloves),*Cinnamomum verum* (Cinnamomum), *Elettaria cardamomum* (cardamom), *Zingiber officinalis*(Ginger), *Curcuma longa* (Turmeric), *Coriandrum sativum* (Coriander), *Foeniculum vulgaris*(Fennel) and *Mentha arvensis* (Mint).

Unit-III

Medicinal Plants: General account of *Terminalia chebula*(Harar), *Terminalia belerica*(Bahera), *Azadirachta indica* (Neem), *Phyllanthus emblica*(Amla), *Aconitum napellus*(Aconite), *Rauwolfiaserpentina* (Sarpagandha), *Atropa belladonna* (Belladonna), *Datura stramonium*(Datura),*Withaniasomnifera*(Ashwagandha) *and Papaver somniferum*(Poppy).

Unit-IV

Beverages: *Camellia sinensis* (Tea) and *Coffea arabica* (Coffee).

Rubber: Morphology of *Hevea brasiliensis*(Rubber), Processing and Uses.General account of sources of firewood, timber and bamboos.

Suggested Readings:

1. Verma, V. (2016). Textbook of Economic Botany, ANE Books, New Delhi.
2. Das, K. (2014). Medicinal plants- Their importance in Pharmaceutical Sciences, Kalyani Publishers, New Delhi.
3. Kocchar, S.L. (2016). Economic Botany of the Tropics, Macmillan India Pvt. Ltd., New Delhi.
4. Prinentel, D. and Hall, C.W. (Eds.) (2001). Food and Natural Resources. Academic Press,London, New York.
5. Reddy, K. et al. (2015). Advances in Medicinal plants, Universities Press, Hyderabad.
6. Sharma, O.P. (1996). Hill's Economic Botany. Tata McGraw Hill Co. Ltd., New Delhi.
7. Swaminathan, M.S. and Kocchar, S.L. (Eds) (2009). Plants and Society. Macmillan Publications Ltd., London.
8. Council of Scientific & Industrial Research (1986). The Useful Plants of India. Publications and Information Directorate. CSIR, New Delhi.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
BOTANY
Course Title: PRACTICAL-VI (Related to Ecology & Economic Botany)
Course Code: BSMM-6075 (P)
(PRACTICAL)

Course Outcomes:

On completion of this course, the students will be able to:

- CO1. Determination of abundance and frequency of species by quadrate method.
- CO2. To measure the dissolved oxygen content in polluted and unpolluted water samples.
- CO3. Study of anatomical peculiarities with reference to ecological adaptations.
- CO4. Preparation of different stains, solutions and reagents as per theory paper.
- CO5. To understand the economic importance of plants.
- CO6. To acquire knowledge in the preparation of herbarium techniques. Submission of field report and practical records.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
BOTANY
Course Title: PRACTICAL-VI (Related to Ecology & Economic Botany)
Course Code: BSMM-6075 (P)
(PRACTICAL)

Time: 3Hrs. **Max. Marks: 20**

Instructions for the paper setter: question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Laboratory Exercises

1. To determine minimum number of quadrats required for reliable estimate of biomass ingrasslands through species area curves.
2. To study the frequency of herbaceous species in grassland and to compare the frequency
3. distribution with Raunkiaer's Standard Frequency Diagram.
4. To estimate Importance Value Index for grassland species on the basis of relativefrequency,relative density and relative dominance in protected and grazed grassland.
5. To measure the vegetation cover of grassland through point frame method.
6. To measure the above ground plant biomass in a grassland.
7. To study the morphological anatomical features of hydrophytes (*Hydrilla, Eichhornia*)
8. Xerophytes (*Nerium, Calotropis*).
9. To determine diversity indices (richness, Simpson, Shannon-Weaver) in grazed and protectedgrassland.
10. To estimate bulk density and porosity of grassland and woodland soils.
11. To determine moisture content and water holding capacity of grassland and woodland soil.
12. To study the vegetation structure through profile diagram.
13. To estimate transparency, pH and temperature of different water bodies.
14. To measure dissolved oxygen content in polluted and unpolluted water samples.
15. To estimate salinity of different water samples.
16. To determine the percent leaf area injury of different leaf samples collected around polluted sites.
17. To estimate dust-holding capacity of the leaves of different plant species.
18. **Food Plants:** Study of the morphology, structure and simple microchemical tests of thefoodsstoring tissues rice, wheat, maize, potato and sugarcane. Microscopic examination ofstarchinthese plants (excepting sugarcane).
19. **Fibres:** Study of cotton flowers, sectioning of the cotton ovules/developing seeds to trace theorigin and development of cotton fibers. Microscopic study of cotton and test for cellulose.
20. Sectioning and staining of jute stem to show the location and development of fibers.
21. Microscopic structure.Tests for lignocelluloses.
22. **Vegetable Oils:** Study of hand sections of groundnut, mustard and coconut and staining ofoildroplets by Sudan III and Sudan Black.
23. **Field Visits:** To study sources of firewood (10 plants)/timberyielding trees (10trees)/bamboos,list to be prepared mentioning special features, collection of plant based articlesofcommonuse.
24. **Spices:** Examine black pepper, cloves, cinnamon (hand sections) and opened of cardamomanddescribe them briefly.
25. Preparations of an illustrated inventory of 10 medicinal plants used in indigenous systems of medicine or allopathy: Write their botanical and common names parts used anddiseases/disorders for which they are prescribed.
26. **Beverages:** Section boiled coffee beans and tea leaves to study the characteristic structuralfeatures.
27. Visit to *in situ* conservation site/Botanical Garden.

Suggested Readings (for laboratory exercises)

1. Council of Scientific & Industrial Research. (1986). The Useful Plants of India. PublicationsandInformation Directorate. CSIR, New Delhi.
2. Kocchar, S.L. (2016). Economic Botany of the Tropics, Macmillan India Pvt. Ltd., New Delhi.

3. De, Debapriya and De, Debasish (2014). Fundamentals of Environment and Ecology. S. Chand Publishing, New Delhi
4. Kumar, H.D. (2018). Modern Concepts of Ecology 8th edition. Vikas Publishing House, New Delhi.
5. Mackenzie, A., Ball,A. and Virdee, S. (2001). Instant Notes in Ecology. Taylor & Francis, London, United Kingdom
6. Prinentel, D. and Hall, C.W. (Eds.) (2001). Food and Natural Resources. Academic Press,London, New York.
7. Sharma, O.P. (1996). Hill's Economic Botany. Tata McGraw Hill Co. Ltd., New Delhi.
8. Swaminathan, M.S. and Kocchar, S.L. (Eds.) **(2009).** Plants and Society. MacmillanPublicationsLtd., London.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
FOOD SCIENCE & QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD PLANT LAYOUT AND MANAGEMENT
Course Code: BSMM-6255 (I)
(THEORY)

Course Outcomes:

After passing this course the student will be able to:

- **CO1**: Understand the importance of plant layout and learn how to set up the proper plant layout to reduce the production cost and increase the productivity.
- **CO2**: Learn how market research helps to understand the consumers,their needs and their satisfaction level.
- **CO3:** Understand the societal changes and their impact on food consumption trends.
- **CO4:** Learn about different types of food product and study the different steps involve in the product development.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
FOOD SCIENCE & QUALITY CONTROL (VOCATIONAL)
Course Title: FOOD PLANT LAYOUT AND MANAGEMENT
Course Code: BSMM-6255 (I)
(THEORY)

Examination Time: 3 Hrs.

Max Marks:100
Theory Marks:60
Practical Marks: 20
CA: 20

Instructions for the Paper Setter:

Eight questions of equal marks(12 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT-I

Importance of a plant layout selection of site and layouts of different food industries, selection of equipments, machinery and building material, selection and planning of manufacturing process and service facilities, maintenance and replacement, depreciation of machinery, management set up in a plant.

UNIT-II

Market and Consumer Research.Economic, Psychological, Anthropological and Sociological dimensions of food consumption pattern.Food situation in India and outside.

UNIT-III

Needs and types of Food consumption trends. Trends in social change and its role in diet pattern using social trends as a framework in new product innovation. Trapping the unconventional post-harvest losses and prospects of food processing for export.

UNIT –IV

Traditional foods-Status and need for revival in the context of westernized non-traditional foods, urbanization and such factors. Product development: Primary Processing, Secondary Processing, Types of products e.g. Quick cooking, fast foods, fabricated food , convenience foods.

Recommended Books:

1. Principle of Food Sanitation by Marriott, 5th ed., 2006, CBS Publishers, New Delhi.
2. Food Processing Waste Management by Green JH and Kramer A, 1979, AVI Publishers, USA.
3. Food Science by Potter NN, 5th ed., 2006, CBS Publishers, New Delhi.

Bachelor of Science (Medical) Semester–VI
Session 2021-22
FOOD SCIENCE & QUALITY CONTROL (VOCATIONAL)
Course Title: PRACTICAL (Related to Food Plant Layout and Management)
Course Code: BSMM-6255 (P)
(PRACTICAL)

Time:3Hrs. **Max. Marks: 20**

Instructions for the practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE office, KanyaMahaVidyalaya, Jalandhar.

List of Practicals:

1. Calculation of depreciation and processing costs.
2. Preparation of layout and Process diagram of potato chips manufacturing plant.
3. Preparation of layout and Process diagram of jam/marmalade manufacturing plant.
4. Preparation of layout and Process diagram of bread making plant.
5. Preparation of layout and Process diagram of dairy industry.
6. Preparation of layout and Process diagram of wine making unit.
7. Preparation of layout and Process diagram of modern slaughter plant.
8. Preparation of layout and Process diagram of confectionary unit.
9. Determination of sanitary status of plant equipment.
10. Visit to various food industries.