

FACULTY OF LIFE SCIENCES

SYLLABUS

Of

Bachelor of Science Bio-Technology (Semester: I-VI)

(Under Continuous Evaluation System)

Session: 2020-21



The Heritage Institution
KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)

Upon successful completion of this course, students will be able to:

PSO1. gain and apply knowledge of Biotechnology and Science concepts to solve problems related to field of Biotechnology.

PSO2: design, perform experiments, analyze and interpret data for investigating complex problems in the field of biotechnology.

PSO3: apply ethical principles and commit to professional ethics and responsibilities and norms of the Biotechnological practices.

PSO4: design and develop solution to Biotechnology problems by applying appropriate tools while keeping in mind safety factor for environment & society.

PSO5: to undertake any responsibility as an individual and as a team in a multidisciplinary environment.

PSO6: contribute to the field of biotechnology and allied industries designing, developing and providing solutions for product/processes/technology development.

PSO7: able to justify societal, health, safety and legal issues and understand his responsibilities in biotechnological engineering practices.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE
PROGRAMME**

Bachelor of Science (Bio-Technology)

Session: 2020-21

Biotechnology Semester I							
Course Code	Course Name	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTL -1421	Punjabi (Compulsory)	C	50	40	-	10	3
BBTL -1031	¹ Basic Punjabi						
BBTL -1431	² Punjab History & Culture						
BBTL-1102	Communication Skills in English	C	50	40	-	10	3
BBTM-1483	Cell Biology	C	60	30	18	12	3+3
BBTM-1074	Botany-I	C	60	30	18	12	3+3
BBTM-1085	Biochemistry-I	C	60	30	18	12	3+3
BBTM-1346	General Microbiology-I	C	60	30	18	12	3+3
BBTM-1087	Chemistry-I	C	60	30	18	12	3+3
AECD-1161	³ Drug Abuse: Problem Management and Prevention (Compulsory)	AC	50	40	-	10	3
SECF-1492	³ Foundation Programme	AC	25	15	5	5	1
Total			400				

¹ Special Course in lieu of Punjabi (Compulsory)

² Special Course in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab

³Marks of these papers will not be added in total marks and only grades will be provided.

C-Compulsory

AC- Audit course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE
PROGRAMME**

Bachelor of Science (Bio-Technology)

Session: 2020-21

Bachelor of Science (Bio-Technology) Semester II							
Course Code	Course Name	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTL -2421	Punjabi (Compulsory)	C	50	40	-	10	3
BBTL -2031	¹ Basic Punjabi						
BBTL -2431	² Punjab History & Culture						
BBTL-2102	Communication Skills in English	C	50	25	15	10	3+3
BBTM-2333	Biostatistics	C	40	32	-	8	3+3
BBTM-2484	Zoology-I	C	60	30	18	12	3+3
BBTM-2065	Genetics	C	60	30	18	12	3+3
BBTM-2086	Biochemistry-II	C	60	30	18	12	3+3
BBTM-2347	General Microbiology-II	C	60	30	18	12	3+3
AECD-2161	³ Drug Abuse: Problem Management and Prevention (Compulsory)	AC	50	40	-	10	3
SECF-2492	³ Moral Education	AC	25	15	5	5	1
Total			380				

¹ Special Course in lieu of Punjabi (Compulsory)

² Special Course in lieu of Punjabi (Compulsory) for those students who are not domicile of Punjab

³Marks of these papers will not be added in total marks and only grades will be provided.

C-Compulsory

AC- Audit course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE
PROGRAMME**

Bachelor of Science (Bio-Technology)

Session: 2020-21

Bachelor of Science (Bio-Technology) Semester-III							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTM-3081	Physical Chemistry-A	C	60	30	18	12	3+3
BBTM-3482	Zoology-C	C	60	30	18	12	3+3
BBTM-3083	Biochemistry-C	C	60	30	18	12	3+3
BBTM-3484	Cell Biology	C	60	30	18	12	3+3
BBTM-3065	Immunology-A	C	60	30	18	12	3+3
BBTM-3066	Genetics	C	60	30	18	12	3+3
BBTM-3067	Agro and Industrial Applications of microbes-A	C	60	30	18	12	3+3
AECE-3221	³ Environmental Studies (Compulsory Paper)	AC	100	60	20	20	3
SECP-3512	³ Personality Development Programme	AC	25	15	5	5	1
Total			420				

³Marks of these papers will not be added in total marks and only grades will be provided.

C-Compulsory

AC- Audit Course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE
PROGRAMME

Bachelor of Science (Bio-Technology)

Session: 2020-21

Bachelor of Science (Bio-Technology) Semester-IV							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTM-4081	Physical Chemistry-B	C	60	30	18	12	3+3
BBTM-4072	Botany-C	C	60	30	18	12	3+3
BBTM-4083	Biochemistry-D	C	60	30	18	12	3+3
BBTM-4064	Skill Development in Biotechnology-A	C	60	30	18	12	3+3
BBTM-4065	Immunology-B	C	60	30	18	12	3+3
BBTM-4066	Molecular Biology	C	60	30	18	12	3+3
BBTM-4067	Agro and Industrial Applications of microbes-B	C	60	30	18	12	3+3
BBTM-4068	Enzymology	C	60	30	18	12	3+3
SECS-4522	³ Social Outreach Programme	AC	25	15	5	5	-
Total			480				

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

**SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE
PROGRAMME**

Bachelor of Science (Bio-Technology)

Session: 2020-21

Bachelor of Science (Bio-Technology) Semester-V							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTL-5061	Patent Laws in Biotechnology	C	40	32		08	3
BBTM-5062	rDNA Technology-A	C	60	30	18	12	3+3
BBTM-5063	Concepts of Plant Tissue Culture	C	60	30	18	12	3+3
BBTM-5064	Animal Tissue Culture	C	60	30	18	12	3+3
BBTM-5065	Bioprocess Engineering-A	C	60	30	18	12	3+3
BBTM-5066	Biophysical & Biochemical Techniques-A	C	60	30	18	12	3+3
BBTM-5087	Physical, Organic & Inorganic Aspects of Spectroscopy-A	C	60	30	18	12	3+3
BBTS-5068	Term Paper	C	-	-	20	-	-
Total			420				

³Marks of these papers will not be added in total marks and only grades will be provided.

C-Compulsory

AC- Audit course

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
SCHEME AND CURRICULUM OF EXAMINATIONS OF THREE YEAR DEGREE
PROGRAMME

Bachelor of Science (Bio-Technology)

Session: 2020-21

Bachelor of Science (Bio-Technology) Semester-VI							
Course Code	Course Name	Course Type	Marks				Examination Time (in Hours)
			Total	Ext.		CA	
				L	P		
BBTL-6061	Intellectual Property Rights & Entrepreneurship	C	40	32		08	3
BBTM-6062	rDNA Technology-B	C	60	30	18	12	3+3
BBTM-6063	Applications of Plant Tissue Culture	C	60	30	18	12	3+3
BBTM-6064	Animal Biotechnology	C	60	30	18	12	3+3
BBTM-6065	Bioprocess Engineering-B	C	60	30	18	12	3+3
BBTM-6066	Biophysical & Biochemical Techniques-B	C	60	30	18	12	3+3
BBTM-6087	Physical, Organic & Inorganic Aspects of Spectroscopy-B	C	60	30	18	12	3+3
Total			420				

³Marks of these papers will not be added in total marks and only grades will be provided.

C-Compulsory

AC- Audit course

B.Sc. Bio-Technology Semester-I

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1421

Punjabi (Compulsory)

COURSE OUTCOMES

CO1: ਆਤਮ ਅਨਾਤਮ' ਪੁਸਤਕ ਦੇ ਕਵਿਤਾ ਭਾਗ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਕਵਿਤਾ ਪ੍ਰਤੀ ਦਿਲਚਸਪੀ, ਸੂਝ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਤਾਂ ਕਿ ਉਹ ਆਧੁਨਿਕ ਦੌਰ ਵਿਚ ਚੱਲ ਰਹੀਆਂ ਕਾਵਿ ਧਾਰਾਵਾਂ ਅਤੇ ਕਵੀਆਂ ਬਾਰੇ ਗਿਆਨ ਹਾਸਿਲ ਕਰ ਸਕਣ।

CO2: ਇਸ ਦਾ ਹੋਰ ਮਨੋਰਥ ਕਵਿਤਾ ਦੀ ਵਿਆਖਿਆ, ਵਿਸ਼ਲੇਸ਼ਣ ਤੇ ਮੁਲੰਕਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਤੋਂ ਜਾਣੂ ਕਰਾਉਣਾ ਵੀ ਹੈ ਤਾਂ ਕਿ ਉਹ ਸਮਕਾਲੀ ਸਮਾਜ ਦੀਆਂ ਸਮੱਸਿਆਵਾਂ ਨੂੰ ਸਮਝ ਸਕਣ ਅਤੇ ਆਲੋਚਨਾਤਮਕ ਦ੍ਰਿਸ਼ਟੀ ਬਣਾ ਸਕਣ।

CO3: ਗੱਦ ਪ੍ਰਵਾਹ (ਰੇਖਾ ਚਿਤ੍ਰ ਤੇ ਹਲਕੇ ਲੇਖ) ਪੁਸਤਕ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਿਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਮੁੱਲਵਾਨ ਇਤਿਹਾਸ ਤੋਂ ਜਾਣੂ ਕਰਵਾਉਣਾ ਹੈ।

CO4: ਪੈਰ੍ਹਾ ਰਚਨਾ ਅਤੇ ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ ਦੇਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨ੍ਹਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।

CO5: ਧੁਨੀ ਵਿਉਂਤ ਪੜ੍ਹਣ ਨਾਲ ਵਿਦਿਆਰਥੀ ਧੁਨੀਆਂ ਦੀ ਉਚਾਰਨ ਪ੍ਰਣਾਲੀ ਤੋਂ ਵਾਕਫ਼ ਹੋਣਗੇ।

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTL-1421
Punjabi (Compulsory)

ਸਮਾਂ : 3 ਘੰਟੇ

Maximum Marks: 50

Theory : 40

CA : 10

ਪਾਠ ਕ੍ਰਮ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

ਯੂਨਿਟ-I

ਆਤਮ ਅਨਾਤਮ (ਕਵਿਤਾ ਭਾਗ), (ਸੰਪ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਡਾ.ਜਸਵੰਤ ਸਿੰਘ ਨੇਕੀ, ਡਾ.ਜਗਤਾਰ ਸਿਲੇਬਸ ਦਾ ਹਿੱਸਾ ਨਹੀਂ ਹੈ)

(ਸਾਰ, ਵਿਸ਼ਾ ਵਸਤੂ)

08 ਅੰਕ

ਯੂਨਿਟ-II

ਗੱਦ ਪ੍ਰਵਾਹ (ਰੇਖਾ ਚਿਤ੍ਰ ਤੇ ਹਲਕੇ ਲੇਖ), ਸੰਪਾ. ਬਿਕਰਮ ਸਿੰਘ ਘੁੰਮਣ, ਜਸਪਾਲ ਸਿੰਘ ਰੰਧਾਵਾ, ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਰੇਖਾ ਚਿਤ੍ਰ 1 ਤੋਂ 5) (ਨੰਗੀ ਮੁਸਕਾਨ ਰੇਖਾ ਚਿਤ੍ਰਤਰ ਸਿਲੇਬਸ ਦਾ ਹਿੱਸਾ ਨਹੀਂ ਹੈ)

(ਸਾਰ, ਵਿਸ਼ਾ ਵਸਤੂ)

08

ਅੰਕ

ਯੂਨਿਟ-III

(ੳ) ਪੈਰਾ ਰਚਨਾ

(ਅ) ਪੈਰਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ।

08 ਅੰਕ

ਯੂਨਿਟ-IV

(ੳ) ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ : ਪਰਿਭਾਸ਼ਾ ਤੇ ਉਚਾਰਨ ਅੰਗ

(ਅ) ਸਵਰ, ਵਿਅੰਜਨ

8 ਅੰਕ

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਸੈਕਸ਼ਨ ਹੋਣਗੇ। ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 08 ਅੰਕ ਹਨ।

4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1031

Basic Punjabi

In lieu of Punjabi (Compulsory)

Course outcomes

CO1:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨੂੰ ਸਿਖਾਉਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਵਿਚ ਪਾ ਕੇ ਇਕ ਹੋਰ ਭਾਸ਼ਾ ਸਿੱਖਣ ਦਾ ਮੌਕਾ ਪ੍ਰਦਾਨ ਕਰਨਾ ਹੈ।

CO2:ਇਸ ਵਿਚ ਵਿਦਿਆਰਥੀ ਨੂੰ ਬਾਰੀਕਬੀਨੀ ਨਾਲ ਭਾਸ਼ਾ ਦਾ ਅਧਿਐਨ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO3:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO4:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ ਬਾਰੇ ਦੱਸਣਾ ਹੈ।

CO5:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦਾ ਸ਼ਬਦ ਘੇਰਾ ਵਿਸ਼ਾਲ ਕਰਨਾ ਹੈ।

CO6:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਵਿਚ ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ਸਿਖਾਉਣਾ ਹੈ।

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1031

Basic Punjabi

In lieu of Punjabi (Compulsory)

ਸਮਾਂ : 3 ਘੰਟੇ

Maximum Marks: 50

Theory : 40

CA : 10

ਪਾਠ ਕ੍ਰਮ

ਯੂਨਿਟ-I

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ, ਪੈਰ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ ਅਤੇ ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ ਅਤੇ ਮਾਤ੍ਰਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ) ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ ।

08ਅੰਕ

ਯੂਨਿਟ-II

ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ (ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ, ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ)

08ਅੰਕ

ਯੂਨਿਟ-III

ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਿਸ਼ਤੇਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਆਦਿ ਨਾਲ ਸੰਬੰਧਤ।

08

ਅੰਕ

ਯੂਨਿਟ-IV

ਹਫ਼ਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਂ, ਇਕ ਤੋਂ ਸੌ ਤਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿਚ ।

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਸੈਕਸ਼ਨ ਹੋਣਗੇ। ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।

3H jo/e gqPB d/ 08 nze jB.

4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1431

PUNJAB HISTORY AND CULTURE

(Special paper in lieu of Punjabi Compulsory)

(For those students who are not domicile of Punjab)

COURSE OUTCOMES

After completing Semester I and course on Punjab History and Culture students of History will be able to identify and have a complete grasp on the sources & writings of Ancient Indian History of Punjab.

CO1: Identify and describe the emergence of earliest civilizations in: Indus Valley Civilization and Aryan Societies.

CO2: Identify and analyses the Buddhist, Jain and Hindu faith in the Punjab

CO3: Analyses the emergence of Early Aryans and Later Vedic Period, their Society, Culture, Polity and Economy

CO4: To make students understand the concepts of two faiths Jainism and Buddhism, its principles and their application and relevance in present times

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1431

PUNJAB HISTORY AND CULTURE

(Special paper in lieu of Punjabi Compulsory)

(For those students who are not domicile of Punjab)

Examination Time: 3 Hours

Max. Marks: 50

Theory: 40

C A: 10

Instructions for the Paper Setters

1. Question paper shall consist of four Units
2. Examiner shall set 8 questions in all by selecting **Two Questions** of equal marks from each Unit.
3. Candidates shall attempt **5 questions in 600 words**, by at least selecting **One Question** from each Unit and the **5th question** may be attempted from any of the **four Units**.
4. Each question will carry 8 marks.

Unit-I

1. Physical features of the Punjab
2. Sources of the ancient history of Punjab

Unit-II

3. Harappan Civilization: social, economic and religious life of the Indus Valley People.
4. The Indo-Aryans: Original home

Unit-III

5. Social, Religious and Economic life during Early Vedic Age.
6. Social, Religious and Economic life during Later Vedic Age.

UNIT-IV

7. Teachings of Buddhism
8. Teachings of Jainism

Suggested Readings

- L. M Joshi (ed.), *History and Culture of the Punjab*, Art-I, Patiala, 1989 (3rd edition)
- L.M. Joshi and Fauja Singh (ed.), *History of Punjab*, Vol.I, Patiala 1977.
- Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.
- B.N. Sharma, *Life in Northern India*, Delhi. 1966.
- Chopra, P.N., Puri, B.N., & Das, M.N.(1974). *A Social, Cultural & Economic History of India*, Vol. I, New Delhi: Macmillan India.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1102

Communication Skills in English

COURSE OUTCOMES

At the end of this course, the students will develop the following Skills:

CO 1: Reading skills that will facilitate them to become an efficient reader

CO 2: The ability to realise not only language productivity but also the pleasure of being able to articulate well

CO 3: The power to analyse, interpret and infer the ideas in the text

CO 4: The ability to have a comprehensive understanding of the ideas in the text and enhance their critical thinking

CO 5: Writing skills of students which will make them proficient enough to express ideas in clear and grammatically correct English

CO 6: Ability to plan, organise and present ideas coherently on a given topic

CO 7: The skill to use an appropriate style and format in writing letters (formal and informal)

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTL-1102

Communication Skills in English

Time: 3 Hours

Max. Marks: 50

Theory: 40

C A: 10

Instructions for the paper setter and distribution of marks:

The question paper will consist of four sections. The candidate will have to attempt five questions in all selecting one from each section and the fifth question from any of the four sections. Each question will carry 8 marks.

Section-A: Two questions of theoretical nature will be set from Unit I.

Section-B: Two comprehension passages will be given to the students based on Unit II.

Section-C: Two questions will be given from Unit III.

Section-D: Two questions will be set from Unit IV.

(8 x 5 = 40)

Unit I

Reading Skills: Reading Tactics and strategies; Reading purposes–kinds of purposes and associated comprehension; Reading for direct meanings.

Unit II

Reading for understanding concepts, details, coherence, logical progression and meanings of phrases/ expressions.

Activities:

- Comprehension questions in multiple choice format
- Short comprehension questions based on content and development of ideas

Unit III

Writing Skills: Guidelines for effective writing; writing styles for application, personal letter, official/ business letter.

Activities

- Formatting personal and business letters.
- Organising the details in a sequential order

Unit IV

Resume, memo, notices etc.; outline and revision.

Activities:

- Converting a biographical note into a sequenced resume or vice-versa
- Ordering and sub-dividing the contents while making notes.
- Writing notices for circulation/ boards

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *Business Communication*, by Sinha, K.K. Galgotia Publishers, 2003.
3. *Business Communication* by Sethi, A and Adhikari, B., McGraw Hill Education 2009.
4. *Communication Skills* by Raman, M. & S. Sharma, OUP, New Delhi, India (2011).
5. *English Grammar in Use: A Self Study Reference and Practice Book Intermediate Learners Book* by Raymond Murphy, Cambridge University Press.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1483

Cell Biology

(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Understanding the basic unit of life – cell and broad classification of cell types.

CO2. Understanding the structure and functions of cell organelles.

CO3: Understand Cell Division and Cell Cycle.

CO4. Understanding the biological membranes along with membrane transport mechanism.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1483

**Cell Biology
(Theory)**

Time: 3 Hours

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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

Cell as a basic unit of living systems. The cell theory Broad Classification of Cell Types: PPLO's, bacteria, eukaryotic microbes, plant and animal cells. A detailed classification of cell types within an organism. Cell, tissue, organ and organism as different levels of organizations of otherwise genetically similar cells.

Unit-II

Structure and function of cell organelles, ultrastructure of cell membrane, cytosol, Golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes, cytoskeletal structures (actin, microtubules etc.), Mitochondria, chloroplasts, lysosomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus, chromatin).

Unit-III

Cell Division and Cell Cycle: mitosis, meiosis, stages of cell cycle, binary fission, amitosis and its regulation. Cell-cell interaction, Cell locomotion (amoeboid, flagellar and ciliar).

Unit-IV

Biological Membranes: Supramolecular architecture of membranes; Solute transport across membranes; Model membranes and Liposomes.

Books Recommended:

1. De-Robertis, F.D.P. and De-Robertis Jr. E.M.F. (2017) Cell and Molecular Biology, Saunders, Philadelphia.
2. Lodish, Berk, Kaiser, Krieger, Scott, Bretscher, Ploegh and Matsudaira (2007) Molecular Cell Biology 6th Edition, W.H.Freeman& Co Ltd.
3. Geoffrey, M. Cooper & Robert E. Hausman (2013) The Cell: A molecular approach 6th Edition, Sinauer Associates.
4. Alberts, Johnson, Lewis, Raff, Roberts and Walter (2008) Molecular Biology of the Cell, 5th Edition, Garland Science.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1483(P)
Cell Biology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Perform a variety of molecular and cellular biology techniques.

CO2. Describe cellular membrane structure and function, fine structure and function of cell organelles.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1483 (P)

**Cell Biology
(Practical)**

Time: 3 Hours

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

1. Study of Cells:
 - (a) Prokaryotic cells: Lactobacillus, E. coli. Blue green algae.
 - (b) Eukaryotic cells: Testicular material (for studies of spermatogenesis)
2. Study of electron micrographs of various cell organelles-plasma membrane, Mitochondria, Golgi complex, Lysosomes, Endoplasmic Reticulum (smooth and granular), Cilia, Centrioles, inclusions like glycogen, lipids, etc.
3. Preparation of Permanent Slides: Principles and procedures- Section cutting of tissues and staining of tissues with Haematoxylin/eosin method.
4. Study of permanent slides of various tissues (gut region, liver, lung, spleen, kidney, pancreas, testis, ovary, tongue, skin etc.).
5. Preparation of Buccal Smear for microscopic examination.
6. Barr body observation in human squamous epithelial cells.
7. Microtomy of Plant Tissue specimens (Stem & Root)

Books Recommended:

1. Shah, V.C., Bhatavdekar, J., Chinoy, N.J. and Murthy, S.K. (1988). Essential techniques in Cell Biology. Anand Book Depot, Ahmedabad.
2. Celis, J.E. (1998) Cell Biology: A Laboratory handbook. Vol. 1-3. Academic Press, UK.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1074

Botany-I

(Theory)

Course outcomes:

After passing this course the student will be able to

CO1: Understand the diversity of plants.

CO2: Understand the structure of root and stem.

CO3: Understand structure and development of anther, male gametophyte, ovule and female gametophyte.

CO4: Understand different aspects of Pollination, fertilization and sterility.

CO5: Understand terminology related to floral descriptions.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1074

Botany-I

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Diversity in plants: General characters of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms. Concepts of species, hierarchical taxa and biological nomenclature.

Unit -II

Anatomy of flowering plants: Meristems, simple and complex permanent tissues, internal structure of stem, root and leaf, secondary growth in stem and root of *Helianthus*.

Unit -III

Reproduction in flowering plants: Structure and development of anther and male gametophyte, Structure and development of ovule and female gametophyte; Pollination (self and cross) and fertilization; structure and function of endosperm and embryo (dicot and monocot), polyembryony, self-incompatibility.

Unit -IV

Taxonomy of flowering plants: Artificial (Linnaeus), natural (Bentham & Hooker) and phylogenetic (Engler and Prantl) systems of classification; Terminology pertaining to floral description, General characteristics (including economic importance) of following families of angiosperms; giving examples of few important genera: Solanaceae: *Solanum/Petunia*, Rutaceae: *Citrus, Murraya*, Cruciferae- *Brassica*, Apiaceae (Umbelliferae) – *Coriander*, Asteraceae - *Helianthus*, Leguminosae –*Cassia/Acacia/Sweet pea*, Poaceae (Graminae)- *Triticum*

Books Recommended:

1.Bhojwani, S.S. and Bhatnagar, S.P. (2000). The Embryology of Angiosperms, 4th

revised and enlarged edition. Vikas Publishing House, Delhi.

2. Peau, K. (1977). Anatomy of Seed Plants, 3rd edition. John Wiley & Sons, New York.
3. Pegeri, K. And Vander Pijl (1979). The Principles of Pollination Biology, Pergamon Press, Oxford.
4. Dickinson, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
6. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA and UK.
7. Hopkins, W.G. and Huner, P.A. (2008). Introduction to Plant Physiology. John Wiley and Sons.
8. Taiz, L. and Zeiger, E. (2006). Plant Physiology, 4th edition, Sinauer Associates Inc .MA, USA

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1074 (P)

**Botany-I
(Practical)**

Course outcomes:

After passing this course the student will be able to:

CO1: Understand anatomy of root, stem and leaves.

CO2: Understand structure and development of anther, male gametophyte, ovule and female gametophyte.

CO3: Understand the floral identification and descriptions.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1074 (P)

**Botany-I
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

Plant Anatomy:

Anatomical studies of stem, root and leaf in *Helianthus* and maize plant.

Embryology:

Study of the permanent slides pertaining to micro and megasporogenesis and female gametophytes and endosperms.

Taxonomy:

- a) Description of flowers including floral diagram, floral formula, V.S. of flower of the representative genera of families mentioned in syllabus.
- b) Identification and short morphological economic note on the specimens included in Unit IV of the theory paper.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1085
Biochemistry-I
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain basic knowledge about water and pH.

CO2: Understand the basic concept of Carbohydrates and lipids and their classification.

CO3: Understand the structure and function of lipids and their subclasses.

CO4: Understand the structure, function and classification of proteins.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1085
Biochemistry-I
(Theory)

Time: 3 Hrs.

Max. Marks: 60
Theory: 30
Practical: 18
CA: 12

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

Water and its Properties: Role of water in life, Structure of water molecules, Physico-chemical properties of water, Dissociation and association constants, pH and buffers. pI, pKa, Hasselbach Hendersson equation and its implications.

Unit-II

Carbohydrates: Introduction, Monosaccharides: Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses, epimers, and anomers of glucose. Furanose and pyranose forms of glucose and fructose, Mutarotation, Structure and functions of monosaccharide derivatives, Disaccharides; concept of reducing and non-reducing sugars, Haworth projections of Maltose, lactose, and sucrose, Structural and functional properties of Polysaccharides: storage polysaccharides - starch and glycogen; Structural Polysaccharides - cellulose, and chitin; Heteropolysaccharides: Peptidoglycan, Proteoglycan, glycoproteins

Unit-III

Lipids: Classification of lipids and fatty acids. General structure and function of major lipid subclasses, acylglycerols, phosphoglycerides, Sphingolipids, glycosphingolipids and terpenes, sterols, steroids: Prostaglandins.

Unit-IV

Proteins: Structure of amino acids, non-protein and rare amino acids and their chemical reactions. Structural organization of proteins (Primary, Secondary, Tertiary, Quaternary, A310 and domain structure, protein classification and function. Forces stabilizing Primary, Secondary and Tertiary protein structures

Books Recommended:

1. Voet, D., Voet, J.G. and Prait, C.W. (2018). Principles of Biochemistry, 5th Edition, Wiley.
2. Stryer, L. (2015). Biochemistry, 8th Edition, W.H. Freeman and Company, New York
3. Berg, J.M., Tymoczko, J. L. And Stryer, L. (2019). Biochemistry, 9th Edition, Freeman.
4. Mathew, C.K., Van, K.E. and Anthern, K.G. (2012). Biochemistry 4th Edition, Addison Wesley.
5. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2017). Principles of Biochemistry, 7th Edition, CBS Publishers and Distributors, New Delhi.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1085 (P)
Biochemistry-I
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Perform Beer Lamberts Law

CO2: Determine pKa value.

CO3: Estimate carbohydrates and sugars

CO4: Estimate proteins and fats

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1085(P)

Biochemistry-I

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

1. Verification of Beer Lamberts Law for p-nitrophenol or cobalt chloride.
2. Determination of pKa value of p-nitrophenol
3. Estimation of carbohydrate in given solution by anthrone method.
4. Study the presence of reducing/non-reducing sugar in biological samples.
5. Protein estimation by Lowry's method
6. Protein estimation by Bradford method.
7. Protein estimation by Biuret method.
8. The determination of acid value of a fat.
9. The determination of saponification value of a fat

Books Recommended:

1. Plummer D.T. (2017). An Introduction to Practical Biochemistry, 3rd Edition Tata McGraw Hill Education.
2. Sawhney, S.K. and Singh, R. (2014). Introductory Practical Biochemistry, Narosa Publishing House.
3. Wilson, K. And Walker, J. (2018). Principles and Techniques of Biochemistry, 8th Edition, McGraw Hill Education.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1346
General Microbiology-I
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain basic knowledge about Microbiology and general features of microbes and those living in extreme environments

CO2: Gain knowledge about microbial growth and sterilization techniques

CO3: Understand the concept of microscopy.

CO4: Understand bacterial classification. Understand bacterial classification and microbial preservation methods.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1346

General Microbiology-I

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Introduction to Microbiology- Historical Perspective and Important discoveries related to Microbiology. Relationship between Microbiology and Biotechnology- The Microbial Biotechnology. General Features- Bacteria, Fungi, Neurospora, Yeast and Viruses. Microbes in extreme environments- the thermophiles, halophiles, acidophiles, psychrophiles and alkalophiles.

Unit-II

Basic concept of Microbial growth & culture media and its components, Sterilization-Basic concept, physical and chemical methods of sterilization. Bacterial Nutrition-Introduction, Nutritional forms of bacteria, Basic concept of Transport mechanisms of nutrients across microbial cell membranes: Facilitated diffusion, Active transport and Group translocation

Unit-III

Principles and application of bright field, dark field, phase contrast, fluorescence & immunofluorescence, electron microscopy (Scanning electron microscopy & transmission electron microscopy). Gram positive and Gram negative bacteria: Introduction, Structure and anatomy of bacterial cell walls and Nature of the Microbial Cell Surface. Types of bacterial flagella. Different types of bacterial staining.

Unit-IV

Bacterial Classification: Bacterial classification and taxonomy based on Bergey's Manual of Determinative bacteriology– General outline only. An introduction to Bacterial Serotypes. Microbial culture collection centres, Methods of Microbial preservation: Refrigeration, Cryopreservation, lyophilization, Paraffin method

Books Recommended:

1. Davis, B.D., Dulbecco. R., Eisen, H.N. and Ginsberg, H.S. (1990). Microbiology: 4th Edition, Harper & Row, Publishers, Singapore.
2. Stanier, R.Y. (1995). General microbiology, MacMillan Press, London.
3. Tortora, G.J., Funke, B.R. and Case, C.L. (2015). Microbiology: An introduction, 12th Edition, Pearson College Div.
4. Willey, J., Sherwood, L. And Wooverton, C. J. (2017). Prescott's Microbiology, 10th Edition, McGraw-Hill Education/ Asia
5. Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. (2010). Microbiology: An application based approach, Tata McGraw Hill.
6. Purohit, S.S. (2006). Microbiology: Fundamentals and Applications, 7th Edition, Agrobios (India).

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1346(P)
General Microbiology-I
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Sterilize glassware & plastic ware while performing experiments.

CO2: Prepare media and cotton plugs.

CO3: Isolate, Identify, purify and preserve microbes.

CO4: Study motility of microbes.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1346(P)

General Microbiology-I

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Note: The question paper will be set by the examiner based on the syllabus.

1. Aseptic techniques of sterilization.
2. Cleaning of glassware.
3. Preparation of media, cotton plugging and sterilization
4. Isolation of micro-organism from air, water and soil samples. Dilution, spread plating and pour plating, Colony purification.
5. Identification of bacteria by simple staining, negative staining and Gram staining.
6. Detection of specific bacteria by Wet mount preparation method and Hanging drop mount method.
7. To preserve bacteria by short term preservation methods like direct transfer to subculture, Immersion in oil, cryopreservation.

Books Recommended:

1. Cappuccino, J.G. and Sherman, N. (2014). Microbiology: A Laboratory Manual 10th Edition, Pearson Education India.
2. Dubey R.C. and Maheshwari (2012). Practical Microbiology 5th edition: S. Chand and company ltd.New Delhi.
3. Leooffee, M.J. and Pierce, B.E. (2015). Microbiology: Laboratory Theory and Application, 3rd Edition, Morton Pub. Co.
4. Sastry, A.S. and Bhat, S. (2018). Essentials of Practical microbiology. Jaypee Brothers Medical Publishers.
- 5.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1087

Chemistry-I

(Theory)

Course outcomes:

Students will be able to:

CO1: understand the key features of coordination compounds viz. variety of structures, oxidation numbers and electronic configurations, coordination numbers and explain the bonding and stability of complexes along with their nomenclature and structure.

CO2: describe the shapes and structures of coordination complexes with coordination numbers ranging from 1 to 12.

CO3: recognize, name and draw the structures of isomers in coordination compounds.

CO4: explain the valence bond approach for the co-ordinate complex.

CO5: describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them.

CO6: understand macrocyclic effect, crown ethers, cryptands.

CO7: understand Crystal field Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planer fields of ligands.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1087

Chemistry-I

(Theory)

Time: 3 Hrs.

Max. Marks: 40

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit-I

Introduction, Werner's coordination theory, naming of co-ordinate complexes.

Co-ordination numbers 1-12. Factors affecting co-ordination numbers and stereo-chemistry, Isomerism in coordination compounds.

Unit-II

Valence bond theory for co-ordinate complexes, inner and outer orbital complexes, electro-neutrality and back bonding, limitations of V.B. theory.

Unit-III

Stability of co-ordination compounds

Introduction Factors affecting the stability of metal ion complexes with general ligands

Alkali metal and alkaline earth metal chelators: Definition and few examples of macrocyclic ligands, macrocyclic effect, crown ethers & cryptands.

Unit-IV

Crystal field theory-Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planar fields of ligands, calculations of C.F.S.E. in high spin and low spin octahedral and high spin tetrahedral complexes, factors affecting the $10 Dq$ value.

Books Recommended:

1. G.L. Eichorn, Inorganic Biochemistry, Vol. I Elsevier,
2. J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th ed. Pearson Education, Singapore, 1999.
3. D.F.C Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, ELBS Oxford, 1991.
4. Cowan, J.A. (1997) – Inorganic Biochemistry – An Introduction, Wiley- VCH

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: BBTM-1087 (P)
Chemistry-I
(Practical)

Course outcomes:

Students will be able to:

CO1: understand the technique of volumetric analysis

CO2: understand Iodimetry, Iodometry

CO3: understand Redox titrations using $\text{K}_2\text{Cr}_2\text{O}_7$ and KMnO_4 .

CO4: identify the various ions present in the mixture.

Bachelor of Science (Bio-Technology) Semester-I

Session: 2020-21

Course Code: BBTM-1087 (P)

Chemistry-I

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments

Volumetric Analysis:

Iodimetry, Iodometry, Redox titrations using $K_2Cr_2O_7$ and $KMnO_4$.

Inorganic qualitative analysis:

Four ions (Two cations two anions).

A. Preliminary tests: Physical examination, Dry heating test, charcoal cavity test,

$Co(NO_3)_2$ test, flame test, borax bead test.

B. Acid radical analysis:

Dil. H_2SO_4 group: CO_3^{2-} , NO_2^- , S^{2-} , SO_3^{2-}

Conc. H_2SO_4 group: Cl^- , Br^- , I^- , NO_3^- , CH_3COO^-

Individual group: SO_4^{2-} , PO_4^{3-} , BO_3^{3-}

C. Basic radical analysis:

NH_4^+ Pb^{2+} , Cu^{2+} , Cd^{2+} , Fe^{2+} or Fe^{3+} , Al^{3+} , Co^{2+} , Ni^{2+} , Mn^{2+} , Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+} Mg^{2+} , Na^+ , K^+ and their confirmation.

Book recommended:

G. Svehla, B. Sivasankar, Vogels Qualitative Inorganic Analysis 7 Edition, 2012

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: AECD-1161
Drug Abuse: Problem, Management and Prevention (Compulsory)
(Theory)

Time: 3 Hrs

Max. Marks: 50

Theory: 40

CA: 10

Instructions for the Paper Setter

Eight questions of equal marks(8 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

Meaning of Drug Abuse: Meaning, Nature and Extent of Drug Abuse in India and Punjab.

Unit-II

Consequences of Drug Abuse for:

Individual : Education, Employment, Income.

Family : Violence.

Society : Crime

Nation : Law and Order problem.

Unit-III

Management of Drug Abuse

Medical management : medication for treatment and to withdrawal effects.

Unit-IV

Psychiatric Management: Counselling, Behavioural and Cognitive therapy. Social Management: Family, Group therapy and Environmental Intervention.

Suggested readings:

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.

6. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
7. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
8. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
9. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
10. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.

Bachelor of Science (Bio-Technology) Semester-I
Session: 2020-21
Course Code: SECF-1492
Foundation programme
(Theory)

Time: 3 Hrs.

Max. Marks: 25

PURPOSE & AIM

This course has been designed to strengthen the intellectual foundation of all the new entrants in the college. One of the most common factor found in the students seeking admission in college after high school is the lack of an overall view of human history, knowledge of global issues, peaks of human intellect, social/political benchmarks and inventors & discoverers who have impacted human life. The Foundation Programme intends to bridge the gap between high school and college education and develop an intellectual readiness and base for acquiring higher education.

INSTRUCTIONAL OBJECTIVES

- to enable the students to realise their position in the whole saga of time and space
- to inculcate in them an appreciation of life, cultures and people across the globe
- to promote, in the students, an awareness of human intellectual history
- to make them responsible and humane world citizens so that they can carry forward the rich legacy of humanity

CURRICULUM

Course Code: V1

Course Credits: 1

Total Contact Hours: 20

MODULE	TITLE	HOURS
1	Introduction & Initial Assessment	1
2	The Human Story: A Panoramic View from Primitive to the Present Times	2.5
3	<i>The Vedas, The Gita & Eastern Philosophy</i>	1.5
4	<i>The Holy Bible & Genesis</i>	1.5

5	Woman: A Journey through the Ages	1.5
6	Changing Paradigms in Society, Religion & Literature	1.5
7	Indian Freedom Struggle & Makers of Modern India	1.5
8	Racism & Martin Luther King Jr.	1.5
9	Modern India at a Glance: Geographical, Political, Economic & Cultural Perspective	1.5
10	Modern World at a Glance: Political & Economic Perspective	1.5
11	Technology & Human Life	1.5
12	The KMV Experience	1.5
13	Final Assessment, Feedback & Closure	1.5

EXAMINATION

- Final multiple choice quiz. **Marks: 20; Time: 1 hour**
- Comparative assessment questions (medium length) in the beginning and close of the programme. **Marks: 5; Time: 0.5 hour** each at the beginning and end.
- Total marks: 25 converted to grade for final result

SYLLABUS

Module1: Being a Human: Introduction & Initial Assessment

- Introduction to the programme
- Initial Assessment of the students through written answers to a couple of questions

Module 2: The Human Story

- Comprehensive overview of human intellectual growth right from the birth of human history
- The wisdom of the Ancients

- Dark Middle Ages
- Revolutionary Renaissance
- Progressive Modern Times
- Most momentous turning points, inventions and discoveries

Module 3: *The Vedas, The Gita & The Indian Philosophy*

- Origin, teachings and significance of *The Vedas*
- Upnishads and Puranas
- Karma Theory of *The Bhagwad Gita*
- Main tenets of Buddhism & Jainism
- Teachings of Guru Granth Sahib

Module 4: *The Holy Bible & Genesis*

- Book of Genesis: Creation and Fall
- Noah's Ark
- Moses & The Ten Commandments
- Christ and His teachings
- Christianity and the world

Module 5: Changing Paradigms in Society, Religion & Literature

- Renaissance: The Age of Rebirth
- Transformation in human thought
- Importance of humanism
- Geocentrism to heliocentrism
- Copernicus, Galileo, Columbus, Darwin and Saint Joan
- Empathy and Compassion

Module 6: Woman: A Journey through the Ages

- Status of women in pre-vedic times

- Women in ancient Greek and Roman civilizations
- Women in vedic and ancient India
- Status of women in the Muslim world
- Women in the modern world
- Crimes against women
- Women labour workforce participation
- Women in politics
- Status of women- our dream

Module 7: Makers of Modern India

- Early engagement of foreigners with India
- Education: The first step to modernization
- Railways: The lifeline of India
- Raja Ram Mohan Roy, Gandhi, Nehru, Vivekanand, Sardar Patel etc.
- Indira Gandhi, Mother Teresa, Homai Vyarawala etc.
- The Way Ahead

Module 8: Racism: Story of the West

- European beginnings of racism
- Racism in the USA - Jim Crow Laws
- Martin Luther King Jr. and the battle against racism
- Apartheid and Nelson Mandela
- Changing face of racism in the modern world

Module 9: Modern India at a Glance: Geographical, Political, Economic & Cultural Perspective

- Geographical and physical features of India
- States, Union Territories and their governance
- India and its neighbours

- India in the global economy
- Cultural diversity of India

Module 10: Modern World at A Glance: Political & Economic Perspective

- Changing world order
- World War I & II
- UNO and The Commonwealth
- Nuclear Powers; Terrorism
- Economic Scenario: IMF, World Bank
- International Regional Economic Integration

Module 11: Technology and Human Life

- Impact of technology on modern life
- Technological gadgets and their role in our lives
- Technology and environment
- Consumerism and materialism
- Psychological and emotional consequences of technology
- Harmonising technology with ethics and humaneness

Module 12: The KMV Experience

- Historical Legacy of KMV
- Pioneering role in women emancipation and empowerment
- KMV Contribution in the Indian Freedom Struggle
- Moral, cultural and intellectual heritage of KMV
- Landmark achievements
- Innovative initiatives; international endeavours
- Vision, mission and focus
- Conduct guidelines for students

Module 13: Final Assessment, Feedback & Closure

- Final multiple choice quiz
- Assessment through the same questions asked in the beginning
- Feedback about the programme from the students
- Closure of the programme

Prescribed Reading

- *The Human Story* published by Dawn Publications

B.Sc. Bio-Technology Semester-II

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2421

Punjabi (Compulsory)

(Theory)

COURSE OUTCOMES

CO1: ਆਤਮ ਅਨਾਤਮ ਪੁਸਤਕ ਦੇ ਕਹਾਣੀ ਭਾਗ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਕਹਾਣੀ ਨੂੰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਕਹਾਣੀ ਜਗਤ ਨਾਲ ਜੋੜਣਾ ਹੈ।

CO2: ਗਾਂਢ ਪ੍ਰਵਾਹ (ਰੇਖਾ ਚਿਤ੍ਰ ਤੇ ਹਲਕੇ ਲੇਖ) ਪੁਸਤਕ ਨੂੰ ਸਿਲੇਬਸ ਵਿਚ ਸ਼ਾਮਲ ਕਰ ਕੇ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੜ੍ਹਣ ਦੀ ਰੁਚੀ ਨੂੰ ਪੈਦਾ ਕਰਨਾ ਹੈ ਅਤੇ ਮੁੱਲਵਾਨ ਇਤਿਹਾਸ ਤੋਂ ਜਾਣੂ ਕਰਵਾਉਣਾ ਹੈ।

CO3: ਸੰਖੇਪ ਰਚਨਾ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਸਮੇਂ ਅਤੇ ਮਿਹਨਤ ਦੀ ਬੱਚਤ ਕਰਨ ਬਾਰੇ ਦੱਸਣਾ ਹੈ।

CO4: ਪੈਰੂ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ ਦੇਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨ੍ਹਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।

CO5: ਸ਼ਬਦ ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ ਪੜ੍ਹਣ ਨਾਲ ਵਿਦਿਆਰਥੀ ਇਸਦੇ ਮੁੱਢਲੇ ਸੰਕਲਪਾਂ ਨੂੰ ਆਧਾਰ ਬਣਾ ਕੇ ਇਹਨਾਂ ਸੰਕਲਪਾਂ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ।

CO6: ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ-ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ।

CO7: ਮੁਹਾਵਰਿਆਂ ਦੀ ਵਰਤੋਂ ਨਾਲ ਗੱਲਬਾਤ ਵਿਚ ਪਰਪੱਕਤਾ ਆਉਂਦੀ ਹੈ। ਇਹ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਗੱਲਬਾਤ ਵਿਚ ਨਿਖਾਰ ਲਿਆਉਣ ਦਾ ਕੰਮ ਕਰਨਗੇ।

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2421

Punjabi (Compulsory)

(Theory)

Time: 3 Hrs.

Max. Marks: 50

Theory:40

CA:10

ਪਾਠ ਕ੍ਰਮ ਅਤੇ ਪਾਠ ਪੁਸਤਕਾਂ

ਯੂਨਿਟ-I

ਆਤਮ ਅਨਾਤਮ (ਕਹਾਣੀ ਭਾਗ), (ਸੰਪ. ਸੁਹਿੰਦਰ ਬੀਰ ਅਤੇ ਵਰਿਆਮ ਸਿੰਘ ਸੰਧੂ) ਗੁਰੂ ਨਾਨਕ ਦੇਵ
ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਉਜਾੜ, ਦਲਦਲ ਕਹਾਣੀਆਂ ਸਿਲੇਬਸ ਦਾ ਹਿੱਸਾ ਨਹੀਂ ਹੈ)

(ਵਿਸ਼ਾ-ਵਸਤੂ, ਸਾਰ)

08 ਅੰਕ

ਯੂਨਿਟ-II

ਗੱਦ ਪ੍ਰਵਾਹ (ਰੇਖਾ ਚਿਤ੍ਰ ਤੇ ਹਲਕੇ ਲੇਖ), ਸੰਪਾ. ਬਿਕਰਮ ਸਿੰਘ ਘੁੰਮਣ, ਜਸਪਾਲ ਸਿੰਘ ਰੰਧਾਵਾ, ਗੁਰੂ ਨਾਨਕ ਦੇਵ
ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ।

(ਹਲਕੇ ਲੇਖ 1 ਤੋਂ 5)(ਆਉ ਗੱਲਾਂ ਕਰੀਏ ਲੇਖ ਸਿਲੇਬਸ ਦਾ ਹਿੱਸਾ ਨਹੀਂ ਹੈ)

(ਸਾਰ, ਵਿਸ਼ਾ ਵਸਤੂ) 08 ਅੰਕ

ਯੂਨਿਟ-III

(ੳ) ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਨਾਂਵ, ਪੜਨਾਂਵ, ਕਿਰਿਆ, ਵਿਸ਼ੇਸ਼ਣ

(ਅ) ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ, ਯੋਜਕ, ਵਿਸਮਿਕ

08 ਅੰਕ

ਯੂਨਿਟ-IV

(ੳ) ਸੰਖੇਪ ਰਚਨਾ (ਅ) ਮੁਹਾਵਰੇ

08 ਅੰਕ

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਸੈਕਸ਼ਨ ਹੋਣਗੇ। ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ।
ਹਰ ਸੈਕਸ਼ਨ ਵਿਚ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 08 ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2031

Basic Punjabi

In lieu of Punjabi (Compulsory)

(Theory)

Course outcomes

CO1:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਨੂੰ ਸਿਖਾਉਣ ਦੀ ਪ੍ਰਕਿਰਿਆ ਵਿਚ ਪਾ ਕੇ ਇਕ ਹੋਰ ਭਾਸ਼ਾ ਸਿੱਖਣ ਦੇ ਮੌਕੇ ਪ੍ਰਦਾਨ ਕਰਨਾ ਹੈ।

CO2:ਇਸ ਵਿਚ ਵਿਦਿਆਰਥੀ ਨੂੰ ਬਾਰੀਕਬੀਨੀ ਨਾਲ ਭਾਸ਼ਾ ਦਾ ਅਧਿਐਨ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO3:ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ ਤੋਂ ਜਾਣੂ ਕਰਵਾਇਆ ਜਾਵੇਗਾ।

CO4:ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ ਨੂੰ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਅੰਦਰ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਦੀ ਅਮੀਰੀ ਦਾ ਅਤੇ ਬਾਰੀਕੀਆਂ ਨੂੰ ਸਮਝਣ ਲਈ ਵੱਖਰੇ - ਵੱਖਰੇ ਸਿਧਾਂਤਾਂ ਦਾ ਵਿਕਾਸ ਕਰਨਾ ਹੈ।

CO5:ਮੁੱਢਲੀ ਪੰਜਾਬੀ ਪੜ੍ਹਾਉਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦਾ ਸ਼ਬਦ ਘੇਰਾ ਵਿਸ਼ਾਲ ਕਰਨਾ ਹੈ।

CO6:ਵਿਦਿਆਰਥੀ ਵਾਕ ਦੀ ਪਰਿਭਾਸ਼ਾ ਅਤੇ ਇਸਦੀ ਬਣਤਰ ਤੋਂ ਜਾਣੂ ਹੋਣਗੇ ਅਤੇ ਭਾਸ਼ਾ ਤੇ ਪਕੜ ਮਜ਼ਬੂਤ ਹੋਵੇਗੀ।

CO7:ਪੈਰਾ ਰਚਨਾ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਬੁੱਧੀ ਨੂੰ ਤੀਖਣ ਕਰਦਿਆਂ ਉਨ੍ਹਾਂ ਦੀ ਲਿਖਣ ਪ੍ਰਤਿਭਾ ਨੂੰ ਉਜਾਗਰ ਕਰਨਾ ਹੈ।

CO8: ਸੰਖੇਪ ਰਚਨਾ ਕਰਨ ਨਾਲ ਵਿਦਿਆਰਥੀ ਆਪਣੀ ਗੱਲ ਨੂੰ ਸੰਖੇਪ ਵਿਚ ਕਹਿਣ ਦੀ ਜਾਚ ਸਿੱਖਣਗੇ ਅਤੇ ਇਹ ਦਿਮਾਗੀ ਕਸਰਤ ਵਿਚ ਸਹਾਈ ਹੋਵੇਗੀ।

CO9:ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ ਚਿੱਠੀ ਪੱਤਰ ਲਿਖਣ ਦਾ ਮਨੋਰਥ ਵਿਦਿਆਰਥੀਆਂ ਨੂੰ ਇਸ ਕਲਾ ਵਿਚ ਨਿਪੁੰਨ ਕਰਨਾ ਹੈ।

CO10: ਮੁਹਾਵਰਿਆਂ ਦੀ ਵਰਤੋਂ ਨਾਲ ਗੱਲਬਾਤ ਵਿਚ ਪਰਪੱਕਤਾ ਆਉਂਦੀ ਹੈ। ਇਹ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਗੱਲਬਾਤ ਵਿਚ ਨਿਖਾਰ ਲਿਆਉਣ ਦਾ ਕੰਮ ਕਰਨਗੇ।

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2031

Basic Punjabi

In lieu of Punjabi (Compulsory)

(Theory)

Time: 3 Hrs.

Max. Marks: 50

Theory:40

CA:10

ਪਾਠ ਕ੍ਰਮ

ਯੂਨਿਟ-I

ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ (ਨਾਂਵ, ਪੜਨਾਂਵ, ਕਿਰਿਆ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸਬੰਧਕ, ਯੋਜਕ ਅਤੇ ਵਿਸਮਿਕ)

08 ਅੰਕ

ਯੂਨਿਟ-II

ਪੰਜਾਬੀ ਵਾਕ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ ਪਛਾਣ

(ੳ) ਸਾਧਾਰਨ ਵਾਕ, ਸੰਯੁਕਤ ਵਾਕ ਅਤੇ ਮਿਸ਼ਰਤ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

(ਅ) ਬਿਆਨੀਆ ਵਾਕ, ਪ੍ਰਸ਼ਨਵਾਚਕ ਵਾਕ ਅਤੇ ਹੁਕਮੀ ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

08 ਅੰਕ

ਯੂਨਿਟ-III

ਪੈਰ੍ਹਾ ਰਚਨਾ

ਸੰਖੇਪ ਰਚਨਾ

08 ਅੰਕ

ਯੂਨਿਟ-IV

ਚਿੱਠੀ ਪੱਤਰ (ਘਰੇਲੂ ਅਤੇ ਦਫ਼ਤਰੀ)

ਮੁਹਾਵਰੇ

08 ਅੰਕ

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਸੈਕਸ਼ਨ ਹੋਣਗੇ। ਸੈਕਸ਼ਨ A-D ਤੱਕ ਦੇ ਪ੍ਰਸ਼ਨ ਯੂਨਿਟ I-IV ਵਿਚੋਂ ਪੁੱਛੇ ਜਾਣਗੇ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।

2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਸੈਕਸ਼ਨ ਵਿਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 08 ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTL-2431
Punjab History and Culture (C. 320 to 1000 B.C.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

COURSE OUTCOMES

After completing Semester II and course on Ancient History of Punjab, students of History will be able to identify and have a complete grasp on the sources & writings of Ancient History of Punjab

CO 1: Analyse the emergence of Mauryan, Gupta empires during the classical age in India

CO 2: To understand the various factors leading to rise and fall of empires and emergence of new dynasties and their Culture, society, administration , polity and religion specifically of Kushans and Vardhanas in the Punjab

CO 3: Students will be adept in constructing original historical argument based on primary source material research

CO 4: To have an insight on the existing Literature of this period and understand the past developments in the light of present scenario.

CO 5: To enable students to have thorough insight into the various forms/styles of Architecture and synthesis of Indo - Muslim Art and Architecture in Punjab

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTL-2431
Punjab History and Culture (C. 320 to 1000 B.C.)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Time: 3 Hrs.

Max. Marks: 50
Theory:40
CA:10

Instructions for the Paper Setter:

- 5. Question paper shall consist of four Units**
- 6. Examiner shall set 8 questions in all by selecting Two Questions of equal marks from each Unit.**
- 7. Candidates shall attempt 5 questions in 600 words, by at least selecting One Question from each Unit and the 5th question may be attempted from any of the four Units.**
- 8. Each question will carry 8 marks**

Unit-I

1. Alexander's Invasion's
2. Administration of Chandragupta Maurya and Ashoka.

Unit-II

3. The Kushans: Gandhar School of Art .
4. Gupta Empire: Golden period

Unit-III

5. The Punjab under the Harshvardhana
6. Socio-cultural History of Punjab from 7th to 1000 A.D.

Unit-IV

7. Development of Languages and Education with Special reference to Taxila
8. Development to Art and Architecture.

Suggested Readings

1. L. M Joshi (ed), *History and Culture of the Punjab*, Art-I, Punjabi University, Patiala, 1989 (3rd edition)
2. L.M. Joshi and Fauja Singh (ed.), *History of Punjab* , Vol.I, Punjabi University, Patiala, 1977.
3. Budha Parkash, *Glimpses of Ancient Punjab*, Patiala, 1983.

4. B.N. Sharma: *Life in Northern India*, Delhi. 1966.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2102
Communication Skills in English
(Theory)

COURSE OUTCOMES

At the end of this course, the students will develop the following skills:

CO 1: Enhancement of listening skills with the help of listening exercises based on conversation, news and TV reports

CO 2: Improvement of speaking skills enabling them to converse in a specific situation

CO 3: Acquisition of knowledge of phonetics which will help them in learning about correct pronunciation as well as effective speaking

CO 4: The capability to present themselves well in a job interview

CO 5: The ability of Note-Taking to be able to distinguish the main points from the supporting details and the irrelevant information from the relevant one

CO 6: Speaking skills of the students enabling them to take active part in group discussion and present their own ideas

CO 7: The capability of narrating events and incidents in a logical sequence

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2102

Communication Skills in English

(Theory)

Time: 3 Hrs.

Max. Marks: 50

Theory:25

Practical: 15

CA:10

Instructions for the paper setters and distribution of marks:

The question paper will consist of four sections and distribution of marks will be as under:

Section-A: Two questions of theoretical nature will be set from Unit I of the syllabus and the candidates will have to attempt one carrying 5 marks.

Section-B: Two questions will be set from Unit II of the syllabus. Candidates will have to attempt one carrying 5 marks.

Section-C: Two questions will be set from Unit III of the syllabus. Candidates will have to attempt one carrying 5 marks.

Section-D: Two questions will be set from Unit IV of the syllabus. Candidates will have to attempt one carrying 5 marks.

Important Note:

The candidate will have to attempt five questions in all selecting one from each section of the question paper and the fifth question from any of the four sections.

(5 x 5 = 25)

Course Contents:

Unit I

Listening Skills: Barriers to listening; effective listening skills; feedback skills.

Activities: Listening exercises – Listening to conversation, News and TV reports

Unit II

Attending telephone calls; note taking and note making

Activities: Taking notes on a speech/lecture

Unit III

Speaking and Conversational Skills: Components of a meaningful and easy conversation, understanding the cue and making appropriate responses, forms of polite speech, asking and providing information on general topics

- Activities:**
- 1) Making conversation and taking turns
 - 2) Oral description or explanation of a common object, situation or concept

Unit IV

The study of sounds of English, stress
Situation based

Conversation in English, Essentials of
Spoken English

Activities: Giving Interviews

Recommended Books:

1. *Oxford Guide to Effective Writing and Speaking* by John Seely.
2. *Business Communication* by Sethi, A and Adhikari, B., McGraw Hill Education 2009.
3. *Communication Skills* by Raman, M. & S. Sharma, OUP, New Delhi, India (2011).
4. *A Course in Phonetics and Spoken English* by J. Sethi and P.V. Dhamija, Phi Learning.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2102

**Communication Skills in English
(Practical)**

Time: 3 Hrs.

Max. Marks: 15

PRACTICAL / ORAL TESTING

Course Contents:

1. Oral Presentation with/without audio visual aids
2. Group Discussion
3. Listening to any recorded or live material and asking oral questions for listening comprehension

Questions:

1. Oral Presentation will be of 5 to 7 minutes duration. (Topic can be given in advance or it can be of student's own choice). Use of audio-visual aids is desirable.
2. Group discussion comprising 8 to 10 students on a familiar topic. Time for each group will be 15 to 20 minutes.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2333

Biostatistics

(Theory)

Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Discuss and explain what Biostatistics is and how it is used in the field of Biology.

CO 2: Calculate summary statistics (mean, median, mode, range, standard deviation and variance) from the data.

CO 3: Apply basic statistical concepts commonly used in health and medical sciences.

CO 4: Familiar with the concepts of probability, conditional probability and Bayes theorem.

CO 5: Familiar with the concepts of correlation and regression.

CO 6: Know what drawing a random sample from a population means and why it is important.

CO 7: State the null hypothesis and alternative hypothesis (both one way and two ways) appropriate to a given scenario.

CO 8: Determine if it is appropriate to use the Chi-Square test for testing the significance of fit between data and predicted data.

CO 9: Perform basic test (Chi-Square test) to evaluate results

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTL-2333

Biostatistics

(Theory)

Time: 3 Hrs.

Max. Marks: 40

Theory: 32

CA: 8

Instructions for the Paper Setter:

There will be five sections, namely A, B, C, D, E

Section –A: The examiner shall set 10 short answer type questions covering entire syllabus and the candidates will have to attempt 8 questions of 1 mark each. Answer to each question shall be approximately of 50 words. The total weightage of this section shall be 8 marks.

Section-B, C, D, and E: Eight questions of equal marks are to be set, two in each of the four sections (B-E). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt four questions, selecting at least one question from each section. Each question shall carry 6 marks. The total weightage of these sections shall be 24 marks

Unit-I

Elementary Statistics: Collection of data. Frequency distribution and its graphical representation. The mean, median, mode, standard deviation, variance, covariance of data.

Unit-II

Probability: Basic concepts, sample space and events, use of counting method in probability, addition law, Multiplication Law, Conditional Probability and Independent Events, Bayes theorem with application (without proof).

Unit-III

Introduction to Correlation & Regression: Scatter diagram, linear correlation, linear regression lines

Unit-IV

Hypothesis Testing: Sample Statistics and parameters, Level of significance, Concept of Null and Alternate Hypothesis, Normal test for single mean (Z-test), Chi-square test (Goodness of fit and association of attributes).

Text Books:

1. Mathematics Textbook for class XI, NCERT.
2. Mathematics, Textbook for class XII, NCERT.

Reference Books:

1. S.C Gupta, V.K Kapoor, Fundamentals of mathematical statistics.
2. Mendenhall W. and Sincich T. (1995). Statistics for engineering and sciences (IVth edition). PrenticeHall. And sciences (IVth edition). Prentice Hall.
3. B.A./ B.Sc Part-I (12+3 System of Education) 225 Gupta S.P. (2000). Statistical methods. Sultan Chand and Company, New Delhi.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2484

Zoology-I

(Theory)

COURSE OUTCOMES

After passing this course the student will be able to:

- **CO1.** Understand the general classification of Animal Kingdom.
- **CO2.** Familiarize with the various classes of animal Kingdom.
- **CO3.** Understand the digestive system, respiratory system, excretory and circulatory system of man..
- **CO4.** Come to know the various effects viz. bohr effect, haldane effect etc.
- **CO5.** Understand the skeletal system, neural integration and endocrine system of man.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2484

Zoology-I

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setters: Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). 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. Each question carries 6 marks.

Section–A

Introduction to Animal Kingdom and its diversification:

Overview and General classification of Kingdom Animalia, General Characteristics of each group upto class level with an example.

Section–B

Digestive System: The alimentary canal and associated glands of Man. Digestion of dietary constituents, regulation of digestive processes and absorption. Extra and intracellular digestion, enzymatic digestion and symbiotic digestion.

Respiratory System: Respiratory system of man, Transport of O₂ and CO₂, Oxygen dissociation curve of haemoglobin, Bohr effect, chloride shift, Haldane effect and control of breathing.

Section–C

Circulatory System: General plan of circulation in Man, structure of human heart. Origin and regulation of heart beat, Electrocardiogram, Cardiac output and Blood pressure, Composition and functions of blood and lymph, Blood clotting, blood groups including Rh-factor.

Excretory system: Structure of Kidney and nephron. Urine formation and osmoregulation.

Section–D

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

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

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

Suggested Readings:

1. Sobti, R.C. & Nigam, S.K. (2002). Structural & function biology of chordates, Vishal Publishers, Jalandhar.
2. Sobti, R.C. & Sharma, V.L. (2005). Basics of Biotechnology: Introduction of Life Sciences. Vishal Publishers, Jalandhar.
3. Sobti, R.C. (2005). Introduction to Biotechnology, Part-2, Concepts Tools and Application, Vishal Publishers.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2484(P)

Zoology-I

(Practical)

COURSE OUTCOMES

After passing this course the student will be able to:

CO1. Understand the estimation of blood haemoglobin

CO2. Familiarize with the various systems of human such as digestive, arterial, venous and urinogenital systems.

CO3. The students will be able to record blood pressure and blood groups.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2484 (P)

Zoology-I

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

Experiments:

1. Study the following system of Human with the help of charts / models / videos: Digestive, Arterial, Venous and Urinogenital systems.
2. Analysis of food stuff for the presence of starch, protein and fats.
3. Determination of blood groups of human blood samples.
4. Recording of blood pressure of man.
5. Estimation of hemoglobin content.
6. Make a temporary preparation of the following: Blood smear of mammals.
7. Visit to clinical laboratory / hospital for demonstration of ECG, ECHO, X-ray, ultrasound, CT-scan and MRI.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2065
Genetics
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian and Neo-mendelian genetics

CO2: Study the phenomenon of dominance, laws of segregation, independent assortment of genes.

CO3: Understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance.

CO4: Understand the principles and mechanisms of linkage and crossing over.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2065

Genetics

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit - I

Mendel's Laws of Inheritance: Principle of segregation and Independent assortment, Monohybrid, dihybrid and trihybrid crosses, Back cross and test cross, concept of probability

Interaction of Genes: Incomplete inheritance and co-dominance, pleiotropism, modification of F₂ ratios: epistasis, complementary genes, supplementary genes, inhibitory genes, duplicate genes, lethality and collaborators genes. Multiple allelism.

Unit – II

Linkage: Coupling and repulsion hypothesis, chromosomal theory of linkage, complete and incomplete linkage, linkage groups and significance of linkage.

Crossing Over: Introduction, mechanism of meiotic crossing over, types of crossing over, factors affecting it and its significance.

Unit – III

Mutation: Spontaneous versus induced mutations, types of mutations, mutations rate and frequency, Mutagens: Physical and Chemical, the molecular basis of mutations. Significance & Practical applications of Mutation

Basic Microbial Genetics: Conjugation, transduction, transformation

Unit – IV

Organization of Chromosomes: The structure of prokaryotic and eukaryotic chromosome, centromere and telomere structure, euchromatin and heterochromatin, Special chromosomes: Polytene chromosomes and Lampbrush chromosomes, satellite DNA, the supercoiling of DNA.

Human Genetics: Population genetics, Hardy Weinberg law, Pedigree analysis, Karyotyping, genetic disorders.

Books Recommended:

1. Gupta, P.K. (2018). Genetics, 5th Revised Edition, Rastogi Publications.
2. Hartl, D.L., Cochrane, B. (2017). Genetics: Analysis of Genes & Genomes 9th Edition. Jones & Bartlett Publishers.
3. Brooker, R.J. (2017). Genetics: Analysis and Principles, McGraw-Hill Education.
4. Pierce, B. (2016). Genetics: A conceptual approach, 6th Edition, WH Freeman.
5. Snustad and Simmons (2015). Principles of Genetics, 7th Edition, John Wiley & Sons.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2065 (P)

**Genetics
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian laws.

CO2: Solve Paternity disputes.

CO3: Demonstrate segregation in preserved material.

CO4: Study polytene chromosomes and dermatoglyphics.

CO5: Study mitosis from onion root tips.

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2065 (P)

**Genetics
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

Experiments:

1. Demonstration of Law of segregation and Independent assortment (use of coloured beads, capsules etc.).
2. Numerical problems on Mendelism and on modified F₂ ratios.
3. Numerical problems on Paternity disputes (Blood groups)
4. Segregation demonstration in preserved material
5. Study of polytene chromosomes from permanent slides.
6. Dermatographics: Palm print taking and fingertip patterns.
7. Preparation and study of mitosis slides from onion root tips by squash method.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2086
Biochemistry – II
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Metabolism and characteristics and regulation of metabolic pathways

CO2: Structure and metabolic role of ATP and energy rich metabolites

CO3: Understand characteristics of Enzymes and their enzymatic action

CO4: Understand the Enzyme kinetics

Bachelor of Science (Bio-Technology) Semester-II

Session: 2020-21

Course Code: BBTM-2086

Biochemistry – II

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

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. Each question carries 6 marks.

Unit-I

Introduction to metabolism, catabolism, anabolism, Laws of Thermodynamics and living system, Free energy change and direction of metabolism, Characteristics of Metabolic pathways, Compartmentation and Inter-organ metabolism, Regulation & evolution of metabolic pathways

Unit-II

ATP: Structure, Free energy change, energy coupling with ATP (Creatinine phosphokinase, NDP kinase, Adenylate kinase), metabolic roles of ATP; Experimental methods for studying metabolism, Energy rich metabolites, biological oxidation – Reduction reactions

Unit-III

Introduction to Enzymes: Nomenclature, Classification and Characteristics of enzymes, Cofactors, Co-enzyme and Prosthetic group, Mechanism of Enzyme Action: Nature of active site, enzyme substrate complex, Factors responsible for catalytic efficiency of enzymes., Covalent catalysis, Acid base catalysis, Strain and distortion theory, Induced fit hypothesis.

Unit-IV

Enzyme Kinetics: A brief overview of enzyme energetics, Michaelis Menten equation. Derivation of Michaelis Menten equation and determination of K_m and V_{max} values

Enzyme inhibition: Reversible and Irreversible inhibition, Regulation of enzyme activity, Isozymes and their importance

Books Recommended:

1. Voet, D., Voet, J.G. and Prait, C.W. (2013). Principles of Biochemistry, 4th Edition, Wiley.
2. Stryer, L. (2015). Biochemistry, 8th Edition, W.H. Freeman and Company, New York
3. Berg, J.M., Tymoczko, J. L. And Stryer, L. (2011). Biochemistry, 7th Edition, Freeman.
4. Nelson, D.L. and Cox, M.M. (2013). Principles of Biochemistry, 7th Edition, Freeman
5. Mathew, C.K., Van, K.E. and Anthern, K.G. (2012). Biochemistry 4th Edition, Addison Wesley.
6. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2017). Principles of Biochemistry, 7th Edition, CBS Publishers and Distributors, New Delhi.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2086(P)
Biochemistry – II
(Practical)

Upon completion of this course, the student will be able to understand:

CO1: Estimate salivary amylase and acid phosphatase activity.

CO2: Effect of temperature and pH on enzyme activity.

CO3: Determine K_m for acid phosphatase.

CO4: Understand Competitive and Non-Competitive inhibition.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2086(P)
Biochemistry – II
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

Experiments:

1. Estimation of Alpha-amylase activity from saliva.
2. Assay of acid phosphatase activity.
3. Effect of temperature on enzyme activity.
4. Effect of pH on enzyme activity
5. Determination of K_m for acid phosphatase.
6. Competitive and non-competitive inhibition.

Books Recommended:

1. Plummer D.T. (2017) An Introduction to Practical Biochemistry, 3rd Edition Tata McGraw Hill Education.
2. Sawhney, S.K. and Randhir singh (2001). Introductory Practical Biochemistry, Narosa Publishing House.
3. Wilson, K. and Walker, J. (2010). Principles and Techniques of Biochemistry, 3rd Edition, McGraw Hill Education.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2347
General Microbiology-II
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Know the concept of microbial growth in batch and continuous system.

CO2: Learn the process of Natural resistance and Non-specific defense mechanism against microorganisms.

CO3: Understand the mechanism of action, diagnosis and treatment for Viral diseases, Bacterial diseases & Fungal diseases

CO4: Understand the concepts of Industrial Microbiology

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2347
General Microbiology-II
(Theory)

Time: 3 Hrs.

Max. Marks: 60
Theory:30
Practical:18
CA:12

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. Each question carries 6 marks.

UNIT-I

Factors affecting Microbial Growth: Temperature, pH, provision of gases. Introduction to concept of microbial growth in batch and continuous system. Bacterial generation, doubling time and specific growth rate. Monoauxic, diauxic and synchronised growth curve. Sporulation and regeneration of bacteria.

UNIT-II

Viruses-Introduction, Plant and animal viruses-structure and composition, Classification based on differences in their transcription process. Cultivation of plant and animal viruses. Life cycle Tobacco Mosaic Virus, Herpes simplex and Bacteriophages (Lysogenic and Lytic cycle)

UNIT-III

Pathogenic microorganisms- Factors contributing towards microbial pathogenicity (Adhesion, Invasiveness and toxigenicity), Natural resistance and Non-specific defense mechanism against microorganisms. Introduction, mechanism of action, diagnosis and treatment for viral diseases- Influenza, AIDS and

Hepatitis. Bacterial diseases-Diphtheria, Tuberculosis, Typhoid, Streptococcus, Klebsiella infection.
Fungal diseases-Aspergillosis and Candidiasis.

UNIT-IV

Introduction to roles of microbes in environment, Bio-mining, Bioconversion, Bioremediation, and
Municipal solid waste transformations.

Books Recommended:

1. Davis, B.D., Dulbecco. R., Eisen, H.N. and Ginsberg, H.S. (1990). Microbiology: 4th Edition, Harper & Row, Publishers, Singapore.
2. Tortora, G.J., Funke, B.R. and Case, C.L. (1994). Microbiology: An Introduction: 5th Edition, The Benjamin / Cummings Publishing Company, Inc.
3. Stanier, R.Y. (1995). General microbiology, MacMillan Press, London.
4. Pelczar, M.T. (1995). Microbiology, Tata McGraw Hill Publication, New Delhi.
5. Schlegel, H. G., (1995). General Microbiology 7th Edition, Cambridge Univ. Press.
6. Jain, S.K. (1999). Prescott and Dunn's Industrial Microbiology 4th Edition, CBS Publishers & Distributors.
7. Chander, M. and Puri, P (2008). A Concise Course in Microbiology, Krishna Brothers Publishers, Old Railway Road, Jalandhar.
8. Postgate. J. (2000). Microbes & Man, 4th Edition, Cambridge Univ. Press.
9. Tortora. G.J., Funke. B.R. (2001). Microbiology: An Introduction, Benjamin Cummings.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2347(P)
General Microbiology-II
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Enumerate the microorganisms. Total vs viable counts.

CO2: Know the importance of Personal hygiene.

CO3: Identify fungus by lactophenol staining

CO4: Study the Growth curve of micro-organisms.

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: BBTM-2347(P)
General Microbiology-II
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

1. Enumeration of microorganism. Total vs viable counts.
2. Personal Hygiene-Microbes from hands, tooth-scum and other body parts.
3. Moxoauxic and diauxic growth curve of micro-organisms.
4. Identification of fungus by and lactophenol staining.
5. Identification of formation of germ tube by *Candida albicans*.
6. Visualization of Streptococcus
7. Waste water management test

Books Recommended:

1. Cappuccino, J.G. and Sherman, N. (1999). Microbiology: A Laboratory Manual 4th Edition, Harlow, Addition-Wesley.
2. Sambrook, J. and Russel, D.W. (2001). Molecular Cloning: A laboratory manual 3rd Edition, Cold Spring Harbor Laboratory Press, New York.
3. Dubey, R.C. and Maheshwari (2012) Practical Microbiology 5th Edition, S. Chand and company Ltd, New Delhi

Bachelor of Science (Bio-Technology) Semester-II
Session: 2020-21
Course Code: AECD-1161
Drug Abuse: Problem, Management and Prevention (Compulsory)

Time: 3 Hrs.

Max. Marks: 50

Theory:40

CA:10

Instructions for the Paper Setter

Eight questions of equal marks (8 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

Meaning of Drug Abuse: Meaning, Nature and Extent of Drug Abuse in India and Punjab.

UNIT-II

Consequences of Drug Abuse
for:

Individual : Education, Employment,
Income. Family : Violence.

Society : Crime

Nation : Law and Order problem.

UNIT-III

Management of Drug Abuse

Medical management : medication for treatment and to withdrawal effects.

UNIT-IV

Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
Social Management: Family, Group therapy and Environmental Intervention.

References:

1. Ahuja, Ram (2003), *Social Problems in India*, Rawat Publication, Jaipur.
2. Extent, Pattern and Trend of Drug Use in India, Ministry of Social Justice and Empowerment, Government of India, 2004.
3. Inciardi, J.A. 1981. *The Drug Crime Connection*. Beverly Hills: Sage Publications.
4. Kapoor. T. (1985) *Drug epidemic among Indian Youth*, New Delhi: Mittal Pub.
5. Modi, Ishwar and Modi, Shalini (1997) *Drugs: Addiction and Prevention*, Jaipur: Rawat Publication.
6. National Household Survey of Alcohol and Drug abuse. (2003) New Delhi, Clinical Epidemiological Unit, All India Institute of Medical Sciences, 2004.
7. Sain, Bhim 1991, *Drug Addiction Alcoholism, Smoking obscenity* New Delhi: Mittal Publications.
8. Sandhu, Ranvinder Singh, 2009, *Drug Addiction in Punjab: A Sociological Study*. Amritsar: Guru Nanak Dev University.
9. Singh, Chandra Paul 2000. *Alcohol and Dependence among Industrial Workers*: Delhi: Shipra.
10. Sussman, S and Ames, S.L. (2008). *Drug Abuse: Concepts, Prevention and Cessation*, Cambridge University Press.

B.Sc. Bio-Technology Semester-III

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3081

**Physical Chemistry-A
(Theory)**

Course outcomes:

Students will be able to:

CO1: understand the various thermodynamic properties and laws of Thermodynamics.

CO2: acquire knowledge about the various thermodynamic terms like enthalpy of formation, enthalpy of ionisation, entropy, internal energy.

CO3: calculate entropy change for reversible and irreversible processes under isothermal and non-isothermal conditions and also absolute entropies of substances.

CO4: understand the relation between free energy change and equilibrium constants K_p , K_c and K_f .

CO5: understand the various types of solutions and their colligative properties like Osmotic pressure, Elevation in boiling point, Depression in freezing point.

CO6: understand the importance of Van't Hoff factor and its application to calculate degree of association and degree of dissociation.

CO7: describe the Phases and Phase rule and its thermodynamic derivation.

CO8: draw and explain the phase diagrams of water system, KI water system and lead-silver system

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3081

**Physical Chemistry-A
(Theory)**

Time: 3 Hrs.

Max. Marks: 40

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit-I

Chemical Thermodynamics:

State of a system, state variables, thermodynamic equilibrium, thermodynamic properties, Intensive and Extensive properties, various types of processes. First Law of Thermodynamics, internal energy and enthalpy, change in internal energy and change in enthalpy for expansion of real and ideal gases under isothermal and adiabatic conditions for reversible and irreversible processes. Relation between C_p and C_v . Internal energy change and enthalpy change in a chemical process. Hess's law of heat summation. Enthalpy of formation, enthalpy of ionisation and calculation of bond dissociation energies from thermochemical data.

Unit-II

Second law of thermodynamics, entropy and Gibb's free energy, Carnot's cycle, Calculation of entropy change for reversible and irreversible processes under isothermal and non-isothermal conditions. Gibbs Hemholtz equation. Third law of thermodynamics, Nernst heat theorem, calculation of absolute entropies of substances. Meaning of chemical equilibrium, homogeneous and heterogeneous equilibria. Thermodynamic derivation of law of chemical equilibrium, Van't Hoff relation, Relation between free energy change and equilibrium constants K_p , K_c and K_f . Temperature and pressure dependence of equilibrium constant.

UNIT-III

Solutions:

Definition, types of solutions, vapour pressure of solution and Raoult's law. Factors influencing the solubility of gas in liquids, Henry's law. Ideal solutions, DuhemMargules equation. Distillation of ideal solutions, Lever rule, vapour pressure of ideal solutions and non ideal solutions. Distillation of non ideal solutions. Azeotropes, colligative properties, lowering of vapour pressure, depression in freezing point, elevation in boiling point, osmotic pressure. Their common features and applications. Thermodynamic derivation of elevation in boiling point, depression in freezing point and osmotic pressure. Van't Hoff factor and its application to calculate degree of association and degree of dissociation.

Unit-IV

Phase Equilibria:

Definition of phase, component and degree of freedom, Phase rule and its thermodynamic derivation. Derivation of Clausius-Clapeyron equation and its importance in phase equilibria, phase diagrams of water system, KI water system and lead-silver system.

Books recommended:

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. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.
6. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
7. University General Chemistry, C.N.R. Rao, Macmillan.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3081(P)

**Physical Chemistry-A
(Practical)**

Course outcomes:

Students will be able to:

CO1: determine surface tension of a given liquid by Stalagmometer.

CO2: determine coefficient of viscosity of pure liquids.

CO3: understand the effect of Hydrogen Bonding on viscosity of various liquids.

CO4: work efficiently with the instruments like pH meter, colorimeter.

CO5: understand with the volumetric terms like normality, molarity, molality, indicator, standard solution, strength.

CO5: understand the technique of volumetric analysis.

CO6: apply the concept of acid-base titrations in daily life.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3081(P)

**Physical Chemistry-A
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

1. Surface tension: Determination of surface tension of a given liquid by Stalagmometer. using number of drops and weight of drops methods
2. Determination of coefficient of viscosity of a pure liquid (Acetone, Ethanol, Propanol, Butanol, Glycol) (Effect of hydrogen bonding on viscosity)
3. Photometry: Verification of Lambert beer's law for solution of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ (in water) and $\text{K}_2\text{Cr}_2\text{O}_7$ (in water)
4. a) pH of buffer solution
b) Acid base titration HCl vs. NaOH.
c) Determination of ionization constant of a weak acid (CH_3COOH)
5. Study of distribution law of Benzoic acid between benzene and water.
6. Study of distribution law by iodine distribution between water and CCl_4 . Given standard solution $\text{Na}_2\text{S}_2\text{O}_3$.
7. Determine composition of HCl and CH_3COOH in the given solution pH metrically.

Books recommended:

1. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
2. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
3. Advanced Experimental Chemistry, Vol. I, Physical, J.N. Guru and R. Kapoor, S. Chand & Co.
4. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh & Sons.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3482

**Zoology-C
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Understand the physiology of their own body and urge them to take precautionary measures to safeguard their health.

CO2. Understand the structure and function of each system in the human body.

CO3. Describe common physiological disorders, syndromes and diseases.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3482

**Zoology-C
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit-I

Introduction to parasitology (pertaining to various terminologies in use). Brief account of Life history, mode of infection and pathogenicity of the following pathogens with reference to man, prophylaxis and treatment, Entamoeba, Trypanosoma, Leishmania, Giardia, Trichomonas and Plasmodium.

Unit-II

Histopathological changes in organs in relation to diseases such as livers, cirrhosis, nephrosis, tumors, cancer, AIDS.

Unit-III

Arthropod vectors of human diseases: Malaria, Yellow fever, Dengue haemorrhagic fever, Filariasis, Plague and Epidemic typhus. Distribution and control of the above mentioned vectors.

Unit-IV

General account of diseases such as AIDS, Hepatitis, typhoid and cholera, their occurrence and eradication programmes. General account of drug therapy and drug resistance.

Books Recommended:

1. Shah, V.C., Bhatavdekar, J., Chinoy, N.J. and Murthy, S.K. (1988). Essential techniques in Cell Biology. Anand Book Depot, Ahmadabad.

2. Celis, J.E. (1998) Cell Biology: A Laboratory handbook. Vol. 1-3. Academic Press, UK.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3482 (P)

**Zoology-C
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1. Identify the structure of different parasitic protozoans.

CO2. Able to perform the pathological examinations of urine and blood.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3482 (P)

**Zoology-C
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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.

1. Preparation of blood smear showing different stages of plasmodium
2. Study of permanent slides and specimens of parasitic protozoans, helminth and arthropods: Entamoeba, Giardia, Plasmodium, Trypanosoma, Leishmania, Trichomonas,
3. Anopheles, Culex (mouth parts), lice, rat flea, *Aedes Aegypti*, Tapeworm, Ascaris, Wuchereria, Trichinella, Ancylostoma, Oxyuris.
4. Pathological examination of blood and urine.
5. Blood Tests:
 - (a) Erythrocyte sedimentation rate
 - (b) Bleeding time
 - (c) Clotting time
 - (d) Prothrombin time

Books Recommended:

1. Sobti, R.C. (1992) Medical Zoology, Shoban Lal Nagin Chand & Co.
2. Chatterjee K.D. (2009) Parasitology (Protozoology and Helminthology) 13th Edition, CBS publishers.
3. Longo D.L., Kasper D.L., Jameson, J.L, Fauci, A.S, Hauser, S.L., Loscalzo, J.L. (2011) Harrison's Principles of Internal Medicine, McGrawHill Professional.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3083
Biochemistry-C
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the Basic principles of metabolism

CO2: Understand Carbohydrate metabolism.

CO3: Understand the Amphibolic nature of Kreb's cycle

CO4: Know ATP synthesis

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3083

**Biochemistry-C
(Theory)**

Time: 3 Hrs.

Max. Marks: 40

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit-I

Metabolism: - Basic principles of metabolism, metabolic pathways, catabolism, anabolism, basic principles of bioenergetics, biological oxidation reduction reaction, energy rich metabolites.

Unit-II

Carbohydrate metabolism: - Biosynthesis and degradation of carbohydrates, Glycolysis, gluconeogenesis, feeder's pathways for glycolysis, regulation of carbohydrates metabolism.

Unit-III

Kreb's cycle: - Amphibolic nature of kreb's cycle, regulation and enzymes of kreb's cycle, glyoxylate pathway.

Unit-IV

Electron transport chain: - Mitochondrial electron chain, oxidative phosphorylation, chemiosmotic hypothesis, ATP synthase and regulation of ATP synthesis.

Books Recommended:

1. Nelson, D.L. and Cox, M.M. (2017), Lehninger Principles of Biochemistry, 7th Edition, WH Freeman, New York.
2. Jain, J. L., Jain, S. and Jain. N. (2016). Fundamentals of Biochemistry, S. Chand & Company Ltd., New Delhi.
3. Rawn, J.D. (1989), Biochemistry, Niel Patterson Publications, North Carolina.

4. Berg, J.M., Tymoczko, J.L., Gatto, G.L., Stryer, L. (2019), Biochemistry, 9th Edition, W.H. Freeman & Co., San Francisco.
5. Voet, D., Voet, J.G. (2018). Fundamentals of Biochemistry, John Wiley and Sons, New York.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3083 (P)
Biochemistry-C
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the importance of absorbance maxima.

CO2: Determine reducing sugar and vitamin C.

CO3: Understand Quantitative estimation of triglycerides and cholesterol.

B.Sc. Biotechnology (Semester-III)
Session: 2020-21
Course Code: BBTM-3083 (P)
Biochemistry-C
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

1. The absorbance curve of two dyes.
2. Determination of reducing sugar using 3,5-dinitrosalicylic acid.
3. Determination of Vitamin C Concentration by Titration.
4. Quantitative estimation of triglycerides and cholesterol
5. CMC of detergent and phospholipids.

Books Recommended:

1. Plummer D.T. (2017). An Introduction of Practical Biochemistry, 3rd Ed. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
2. Sawhney, S.K. and Singh, R. (2014). Introductory Practical Biochemistry. Narosa Publishing House, New Delhi.
3. Bansal, D.D., Khardori, R. & Gupta, M.M. (1985). Practical Biochemistry. Standard Publication, Chandigarh.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3484

**Cell Biology
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

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: Understand Cell Division and Cell Cycle

CO4: Perform a variety of molecular and cellular biology techniques.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3484

**Cell Biology
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit - I

Cell as a basic unit of living systems. The cell theory Broad Classification of Cell Types: PPLO's, bacteria, eukaryotic microbes, plant and animal cells. A detailed classification of cell types within an organism. Cell, tissue, organ and organism as different levels of organizations of otherwise genetically similar cells.

Unit - II

Structure and function of cell organelles, ultrastructure of cell membrane, cytosol, Golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes, cytoskeletal structures (actin, microtubules etc.), Mitochondria, chloroplasts, lysosomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus, chromatin).

Unit – III

Cell Division and Cell Cycle: mitosis, meiosis, stages of cell cycle, binary fission, amitosis and its regulation. Cell-cell interaction, Cell locomotion (amoeboid, flagellar and ciliar).

Unit-IV

Biological Membranes: Supramolecular architecture of membranes; Solute transport across membranes; Model membranes and Liposome

Books Recommended:

1. De-Robertis, F.D.P. and De-Robertis Jr. E.M.F. (2017) Cell and Molecular Biology, Saunders, Philadelphia.
2. Lodish, Berk, Kaiser, Krieger, Scott, Bretscher, Ploegh and Matsudaira(2007) Molecular Cell Biology 6th Edition, W.H.Freeman& Co Ltd.

4. Geoffrey, M. Cooper & Robert E. Hausman(2013) The Cell: A molecular approach 6th Edition, Sinauer Associates.
5. Alberts, Johnson, Lewis, Raff, Roberts and Walter (2008) Molecular Biology of the Cell, 5th Edition, Garland Science.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3484 (P)

**Cell Biology
(Practical)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1.Perform a variety of molecular and cellular biology techniques.

CO2.Describe cellular membrane structure and function, fine structure and function of cell organelles.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3484 (P)

**Cell Biology
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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.

Study of Cells: (a) Prokaryotic cells: *Lactobacillus*, *E. coli*. Blue green algae.

(b) Eukaryotic cells: Testicular material (for studies of spermatogenesis)

-Study of electron micrographs of various cell organelles-plasma membrane, Mitochondria, Golgi complex, Lysosomes, Endoplasmic Reticulum (smooth and granular), Cilia, Centrioles, inclusions like glycogen, lipids, etc.

-Preparation of Permanent Slides: Principles and procedures- Section cutting of tissues and staining of tissues with Haematoxylin/eosin method.

-Microtomy: Introduction of the instrument- its use, care, section cutting and stretching.

-Study of permanent slides of various tissues (gut region, liver, lung, spleen, kidney, pancreas, testis, ovary, tongue, skin etc.).

Books Recommended:

1. Shah, V.C., Bhatavdekar, J., Chinoy, N.J. and Murthy, S.K. (1988) Essential techniques in Cell Biology. Anand Book Depot, Ahmedabad.

2. Celis, J.E. (1998) Cell Biology: A Laboratory handbook. Vol. 1-3. Academic Press, UK.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3065
Immunology-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the Concept of Immunology

CO2: Know about different immune cells providing immunity

CO3: Inculcate knowledge of immune response towards microorganisms.

CO4: Study Major Histocompatibility system.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2019-20

Course Code: BBTM-3065

**Immunology-A
(Theory)**

Time: 3 Hrs.

Max. Marks: 40

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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

Types of immunity-innate and adaptive. Features of immune response-memory. Specificity and recognition of self and non-self. Terminology used in the study of immune system. Active and Passive immunization

Unit-II

Lymphoid cells, heterogeneity of lymphoid cells; T-cells, B-cells, Null cells; Monocytes, Polymorphs, primary and secondary lymphoid organs-thymus, Bursa of fabricius, spleen, lymph nodes, lymphatic system, Mucosa Associated Lymphoid Tissue (MALT), Lymphocyte traffic.

Unit-III

Introduction of Antigen and Antibody, Epitope (B cell & T Cell epitope), Introduction to Immunogen, Molecular basis of immunogenicity and antigenicity, Factors influencing immunogenicity. Immunoglobulins: classes and structure, affinity and avidity. Antigen-Antibody Interaction. Complement fixing antibodies and complement cascade: Classical, Alternative and Lectin Pathway.

Unit-IV

MHC class I and class II molecules, structure and function of class I and class II MHC molecules. Organization of Major Histocompatibility complex (MHC) and inheritance, regulation of MHC expression and disease susceptibility. T & B Cells and their response, Structure of T-cell antigen receptors: TCR-CD3 complex.

Books Recommended:

1. Punt, J., Stranford, S., Johns, P. And Owen, J.A (2018). Kuby Immunology, 8th Edition. W.H. Freeman and Company, New York.
2. Delves, P. J., Martin, S. J., Burton, D. R. and Roitt, I.M. (2017). Roitt's Esssential Immunology, Wiley Blackwell Publishers.
3. Paul, W.E. (2012). Fundamental Immunology, 7th Edition, LWW Publishers.
4. Kanfmann, S.H.E., Sher A. and Ahmed, R. (2002). Immunology of Infectious Diseases, ASM Press, Washington, D.C.
5. Roitt, I.M. Brostoff, J. and Male, D.K. (2001). Immunology, 6th Edition, Mosby publishers.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3065(P)
Immunology-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Collect blood sample by different methods.

CO2: Calculate Differential leucocyte count, Total leucocytes and RBC count.

CO3: Perform Blood group testing.

CO4: Perform dye exclusion method

CO5. Isolate mononuclear cells from peripheral blood

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3065 (P)

**Immunology-A
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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.

1. Blood Group testing.
2. Differential leucocytes count.
3. Total Leucocytes count.
4. Total RBC count
5. Separation of serum & Plasma from blood.
6. Isolation of mononuclear cells from peripheral blood and to check their viability by dye exclusion method.
7. Collection of blood sample by different method.
8. To perform Double immune diffusion.

Books Recommended:

1. Celis, J.E., Hunter, T. and Carter, N (2005). Cell Biology: A laboratory handbook. 3rd Edition, Vol-III, Academic Press, U.K.
2. Stevans, C.D. (2003). Clinical Immunology and Serology: A Laboratory Perspective 2nd Edition, F.A Davis Company, Philadelphia.
3. Hay, F.C. and Westwood O.M.R. (2002). Practical Immunology, 4th Edition, Wiley Blackwell.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3066

**Genetics
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian and Neo-mendelian genetics

CO2: Study the phenomenon of dominance, laws of segregation, independent assortment of genes.

CO3: Understand the different types of genetic interaction, incomplete dominance, codominance, inter allelic genetic interactions, multiple alleles and quantitative inheritance.

CO4: Understand the principles and mechanisms of linkage and crossing over.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3066

Genetics

(Theory)

Time: 3 Hrs.

Max. Marks: 40

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit - I

Mendel's Laws of Inheritance: Principle of segregation and Independent assortment, Monohybrid, dihybrid and trihybrid crosses, Back cross and test cross.

Interaction of Genes: Incomplete inheritance and co-dominance, pleiotropism, modification of F₂ ratios: epistasis, complementary genes, supplementary genes, inhibitory genes, duplicate genes, lethality and collaborators genes. Multiple allelism.

Unit – II

Linkage: Coupling and repulsion hypothesis, chromosomal theory of linkage, complete and incomplete linkage, linkage groups and significance of linkage.

Crossing Over: Introduction, mechanism of meiotic crossing over, types of crossing over, factors affecting it and its significance.

Unit – III

Mutation: Spontaneous versus induced mutations, types of mutations, mutations rate and frequency, Mutagens: Physical and Chemical, the molecular basis of mutations. Significance & Practical applications of Mutation

Basic Microbial Genetics: Conjugation, transduction, transformation

Unit – IV

Organization of Chromosomes: The structure of prokaryotic and eukaryotic chromosome, centromere and telomere structure, euchromatin and heterochromatin, Special chromosomes: Polytene chromosomes and Lampbrush chromosomes, satellite DNA, the supercoiling of DNA.

Human Genetics: Population genetics, Hardy Weinberg law, Pedigree analysis, Karyotyping, genetic disorders.

Books Recommended:

1. Gupta PK (2018). Genetics, 5th Revised edition, Rastogi Publications.
2. Hartl. D.L., Cochrane B., (2017). Genetics: Analysis of Genes & Genomes 9th Edition. Jones & Bartlett Publishers.
3. Brooker, R.J. (2017). Genetics: Analysis and Principles, McGraw-Hill Education.
4. Pierce, B. (2016). Genetics: A conceptual approach, 6th Edition, WH Freeman.
5. Snustad and Simmons (2015). Principles of Genetics: 7th Edition, John Wiley & sons.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3066 (P)
Genetics
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand Mendelian laws.

CO2: Solve Paternity disputes.

CO3: Demonstrate segregation in preserved material.

CO4: Study polytene chromosomes and dermatoglyphics.

CO5: Study mitosis from onion root tips.

Bachelor of Science (Bio-Technology) Semester-III

Session: 2020-21

Course Code: BBTM-3066 (P)

Genetics

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

1. Demonstration of Law of segregation and Independent assortment (use of coloured beads, capsules etc.).
2. Numerical problems on Mendelism and on modified F₂ ratios.
3. Numerical problems on Paternity disputes (Blood groups)
4. Segregation demonstration in preserved material
5. Study of polytene chromosomes from permanent slides.
6. Dermatographics: Palm print taking and fingertip patterns.
7. Preparation and study of mitosis slides from onion root tips by squash method.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3067
Agro and Industrial Applications of Microbes-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Inculcate the basic concept of agriculture and food processing in industry

CO2: Gain knowledge of industrially important microbes & their improvement programmes

CO3: Understand the Microbial association.

CO4: Formulate the media.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3067
Agro and Industrial Applications of Microbes-A
(Theory)

Time: 3 Hrs.

Max. Marks: 40

Theory: 30

Practical: 18

CA: 12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit-I

Introduction: Basic concept of agriculture and food processing as industry. Differences between microbial industrial processes and chemical industrial processes.

Unit-II

Industrially important microbes, screening (primary and secondary), selection and identification. Maintenance and preservation of industrially important microbial cultures.

Unit-III

Improvement of Industrial Microbes: Improvement programme of industrial microbes, mutational programme of penicillin producing microorganisms, selection pressure in maintaining the hyper producing microbes, revertant back of higher yielding microbes into lower production, media formulation and process optimisation of industrial and agro industrial microbes.

Unit-IV

Microbial association and their interaction with plants, Asymbiotic and symbiotic nitrogen fixation (*Rhizobium*, *Azospirillum*, *Azobacter*, *Anabena*), nitrogen cycle and role of agro bacteria in agriculture or plants.

Books Recommended:

1. Wittmann, C. and Liao, J. (2017). Industrial Biotechnology: Products and Processes (Advanced Biotechnology), Vol. 4 Wiley-VCH.

2. Singh B.D. (2016). Biotechnology:Expanding horizons, Kalyani Publishers / Lyall Bk Depot
3. Chakraborty, P.K. (2013). Agro and Industrial Biotechnology, Black Prints
4. Tyagi, N. (2012). Industrial Microbiology and Biotechnology,Agrotech Press.
- Casida, L.E.J.R. (2007). Industrial Microbiology, New Age International Publishers

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3067 (P)
Agro and Industrial Applications of Microbes – A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

- CO1:** Isolate microbial cells by different methods.
- CO2:** Do Biochemical characterization of microbes.
- CO3:** Understand the concept of Fermentation.
- CO4:** Prepare starter culture
- CO5:** Determine nitrate reduction by bacteria.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: BBTM-3067 (P)
Agro and Industrial Applications of Microbes – A
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

1. Isolation of microbial cells by serial dilution-spread plate method, pour plate method.
2. Measurement of bacterial size.
3. Metabolic Characterization by IMVIC test
4. Alcoholic and Mixed–Acid Fermentation.
5. Starter culture preparation, evaluation and application.
6. Determination of nitrate reduction by bacteria.

Books Recommended:

1. Kumar, M. (2018). Practical Manual for Undergraduates Microbiology, 3rd Edition, Jain Brothers
2. Taormina, P.J. (2016). Microbiological Research and Development for the Food Industry, 1st edition, CRC Press.
3. Dubey, R.C., Maheshwari, D.K. (2010). Practical Microbiology, S Chand & Company.

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: AECE-3221
Environmental Studies (Compulsory Paper)
(Theory)

COURSE OUTCOMES

After passing this course the student will be able to:

CO1: Demonstrate and Understand the ecological relationships between organisms and their environment.

CO2: Present an overview of diversity of life forms in an ecosystem.

CO3: Explain and identify the role of the organism in energy transfers.

CO4: Understand the Environmental Pollution and their management.

CO5: Understanding and awareness for wildlife conservation.

CO7: Knowledge of conservation of threatened animal species

Bachelor of Science (Bio-Technology) Semester-III
Session: 2020-21
Course Code: AECE-3221
Environmental Studies (Compulsory Paper)
(Theory)

Time: 3 Hours.

Max. Marks: 100
Theory: 60
Field Report: 20
CA: 20

Instructions for the Paper Setter:

The question paper should carry 60 marks.

The structure of the question paper being:

Part-A, Short answer pattern – 20 marks

Attempt any five questions out of seven. Each question carries 4 marks. Answer to each question should not exceed 2 pages

Part-B, Essay type with inbuilt choice – 40 marks

Attempt any five questions out of eight. Each question carries 8 marks. Answer to each question should not exceed 5 pages.

Unit 1

The multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness

Unit 2

Natural Resources: Renewable and non-renewable resources:

Natural resources and associated problems.

- (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit 3

Ecosystems

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit 4

Biodiversity and its conservation

- Introduction – Definition: genetic, species and ecosystem diversity
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Unit 5

Environmental Pollution

Definition

- Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Unit 6

Social Issues and the Environment

- From unsustainable to sustainable development
 - Urban problems and related to energy
 - Water conservation, rain water harvesting, watershed management
 - Resettlement and rehabilitation of people; its problems and concerns. Case studies.
 - Environmental ethics: Issues and possible solutions
 - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
 - Wasteland reclamation
 - Consumerism and waste products
 - Environmental Protection Act, 1986
 - Air (Prevention and Control of Pollution) Act, 1981
 - Water (Prevention and control of Pollution) Act, 1974
 - Wildlife Protection Act
 - Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

Unit 7

Human Population and the Environment

- Population growth, variation among nations
- Population explosion – Family Welfare Programmes
- Environment and human health
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Unit 8

Field Work

- Visit to a local area to document environmental assets
river/forest/grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes, etc

References:

1. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.
2. Down to Earth, Centre for Science and Environment, New Delhi.
3. Heywood, V.H. &Waston, R.T. 1995. Global Biodiversity Assessment, Cambridge House, Delhi.
4. Joseph, K. &Nagendran, R. 2004. Essentials of Environmental Studies, Pearson Education (Singapore) Pte. Ltd., Delhi.
5. Kaushik, A. & Kaushik, C.P. 2004. Perspective in Environmental Studies, New Age International (P) Ltd, New Delhi.
6. Rajagopalan, R. 2011. Environmental Studies from Crisis to Cure. Oxford University Press, New Delhi.
7. Sharma, J. P., Sharma. N.K. & Yadav, N.S. 2005. Comprehensive Environmental Studies, Laxmi Publications, New Delhi.
8. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publications, Meerut.
9. State of India's Environment 2018 by Centre for Sciences and Environment, New Delhi
10. Subramanian, V. 2002. A Text Book in Environmental Sciences, Narosa Publishing House, New Delhi

B.Sc. Bio-Technology Semester-IV

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4081

Physical Chemistry-B

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Course outcome:

Students will be able to

CO1. determine rate of reaction, order and molecularity of reaction, half life, activation energy of reaction

CO2. understand Complex reactions, consecutive reactions, parallel reactions, chain reactions and opposing reactions.

CO3. know the variation of equivalent conductance with dilution of weak and strong electrolytes

CO4. determine of degree of ionisation of weak electrolyte, solubility, solubility product of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt

CO5. calculate hydrolysis constant

CO6. to select indicators in different acid base titration

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4081

Physical Chemistry-B

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

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. Each question carries 6 marks.

Unit-I

Electrochemical Cells:

Electrode potential, Electromotive force (EMF). Reversible and irreversible cells, measurement of EMF of a cell. Nernst equation. Reference electrodes and other electrodes, standard electrode potential. Activity and activity coefficient determination from EMF results. Concentration cells with transference and without transference, liquid junction potential, pH, glass electrode, quinone-hydroquinone electrode, Potentiometric titrations.

Unit-II

Chemical Kinetics:

Rate of reaction, rate constant, factors influencing rate of reaction, order, molecularity. Rate equations for 1st order, 2nd order & 3rd order reactions. Methods for determining order of reaction. Half Life, Complex reactions, consecutive reactions, parallel reactions, chain reactions and opposing reactions. Activation energy and calculation from Arrhenius equation. Theories of reaction rates collision theory and transition state theory of bimolecular processes. Catalysis, acid base catalysis, enzyme catalysis including their mechanisms, Michaelis Menten equation for enzyme catalysis. Heterogeneous catalysis and its mechanism. Surface reactions with special reference to Unimolecular surface reaction.

Unit-III

Ionic Equilibria and Conductance: Conductivity, equivalent and molar conductance. Variation of equivalent conductance with dilution of weak and strong electrolytes. Arrhenius and Debye Huckel theory. Kohlraush law of independent migration of ions. Transference number and their experimental determination using Hittorf and moving boundary methods. Ionic velocity, ionic mobility. Applications of conductance measurements. Determination of degree of ionisation of weak electrolyte, solubility, solubility product of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt, conductometric titrations.

Unit-IV

Ionic strength. Debye Huckel theory of activity coefficients. Mathematical treatment of multistage equilibria of acids and bases. Salt hydrolysis, calculation of hydrolysis constant, Buffer solutions, Buffer index, Buffer capacity universal buffer preparation. Acid base indicators. Theory of acid base indicators. pH change and selection of indicators in different acid base titrations.

Books recommended:

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. 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; 1st edition, Pubs: John Wiley & Sons Inc., 1992.
7. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd, 2002.
8. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4081(P)

**Physical Chemistry-B
(Practical)**

Course outcome:

Students will be able to

CO1. know the principle and mechanism of Conductometric titrations and polarimetric experiments

CO2. determine the heat of neutralization and Heat of solution Calorimetrically

CO3. know the principle and working of Abbe's Refractometer

CO4. determine the composition of unknown mixture of two liquids by refractive index measurements.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4081(P)

Physical Chemistry-B

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

1. Refractometry: Determine refractive index of a given liquid as a criterion for its purity. (Benzene i.e. commercial) benzene + A.R. acetone).
2. Polarimetry: Determine the %age composition of an optically active solution.
3. Calorimetry:
 - a) Determination of Heat of neutralization
 - (i) Strong acid-strong base
 - (ii) Weak acid-strong base.
 - b) Determination of Heat of solution of KCl, NH_4Cl , KNO_3
4. Conductometry:
 - a) Determination of cell constant.
 - b) Determination of specific and equivalent conductance of electrolyte (NaCl and HCl).
 - c) Precipitation titration of Na_2SO_4 vs. BaCl_2 .
 - d) Neutralization titrations NaOH vs. HCl and NaOH vs. CH_3COOH .
5. Determination of adsorption isotherm of oxalic acid on charcoal.

Books recommended:

1. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
2. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
3. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
4. Advanced Experimental Chemistry, Vol. I, Physical, J.N. Guru and R. Kapoor, S. Chand & Co.
5. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh & Sons.
6. Experiments Physical Chemistry, J.C. Ghosh, Bharati Bhavan.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4074

Botany-C

(Theory)

Course outcome: -

After passing this course the student will develop:

CO1. Understand the plants and plant cells in relation to water.

CO2. Understand the chemical contents of the plant products.

CO3. Know the concept and characteristics of antiseptic, disinfectant and their mode of action.

CO4. Know the prevention and control measures of plant diseases and its effect on economy of crops.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4074

**Botany-C
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

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. Each question carries 6 marks.

Unit-I

Water relations, osmosis, transpiration, water potentials, its components, physiological & molecular adaptations in plants with respect to cold – heat - drought and salt stress.

Unit-II

Heat shock proteins, dehydrins, late embryogenesis abundant proteins, role of different osmolytes in stress tolerance.

Unit-III

Plant Pathology & epidemiology: Definition, classification, mode of transmission & control measures of plant diseases. Disease resistance host pathogen interaction. Phytoalexins, PRproteins.

Unit-IV

A detailed account of the following plant diseases with respect to casual agents, symptoms, epidemiology, disease cycle & their control measures. Black stem rust of wheat, Loose smut of wheat, Late and early blight of potato, False smut of rice, Bacterial blight of rice, Red rot of sugarcane, TMV of potato, Yellow vein mosaic of bhindi, Bunchy top of banana, Downy mildew of bajra.

Suggested Readings:

1. Salisbury, F.B. and C.W. Ross (1992), Plant Physiology, Wadsworth Publication Company
2. Taiz, L. and Zeiger, E. (2002), Plant Physiology. 3rd Edn., Sinauer Associates
3. Srivastava, H.N. (2005) Plant Physiology, Pardeep Publications .
4. Pandey, B.P. (2014) Plant Pathology, S Chand .
5. M.J. Carlile, S.C. Watkinson & G.W. Gooday (2001), The Fungi 2ndEd. Academic Press.
6. G.N. Agrios (2008), Plant Pathology 5thEd., Academic Press.
7. R.S. Mehrotra and Ashok Aggarwal (2003) Plant Pathology Tata McGraw Hill New Delhi.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4074(P)

Botany-C

(Practical)

Time: 3 Hrs.

Max. Marks: 18

Course outcome: -

After passing this course the student will develop:

CO1. practical on plants and plant cells in relation to water

CO2. Know the symptoms and control measures of plant diseases and its effect on economy of crops.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4074(P)

Botany-C

(Practical)

Time: 3 Hrs.

Max. Marks: 18

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 MahaVidyalaya, Jalandhar.**Experiments:**

1. Estimation of relative water content of leaf.
2. Measurement of osmotic potential of different tissues by Chardakov method.
3. Study of Plant pathogens
 - (a) Symptoms of the diseases
 - (b) Morbid anatomy of the plants infected with following diseases.

Black stem rust of wheat, Loose smut of wheat, Late and early blight of potato, False smut of rice, Bacterial blight of rice, Red rot of sugarcane, TMV of potato, Yellow vein mosaic of bhindi, Bunchy top of banana, Downy mildew of bajra.

Books:

1. Salisbury, F.B. and C.W. Ross (1992), Plant Physiology, Wadsworth Publication Company
2. Taiz, L. and Zeiger, E. (2002), Plant Physiology. 3rd Edn., Sinauer Associates
3. Srivastava, H.N. (2005) Plant Physiology, Pardeep Publications .
4. Pandey, B.P. (2014) Plant Pathology, S Chand .
5. M.J. Carlile, S.C. Watkinson & G.W. Gooday (2001), The Fungi 2ndEd. Academic Press.
6. G.N. Agrios (2008), Plant Pathology 5thEd., Academic Press.
7. R.S. Mehrotra and Ashok Aggarwal (2003) Plant Pathology Tata McGraw Hill New Delhi.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4083
Biochemistry-D
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand lipid catabolism and its regulation.

CO2: Study lipid Anabolism.

CO3: Study amino acid metabolism and its regulation.

CO4: Understand nucleic acid metabolism,

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4083

Biochemistry-D

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

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. Each question carries 6 marks.

Unit – I

Lipid Catabolism: Oxidation of fatty acids, degradation of triacylglycerol, phosphoglycerides, sphingolipids, regulation of lipid metabolism.

Unit-II

Lipid Anabolism: Synthesis of fatty acids, triacylglycerol, phosphoglycerides, sphingolipids, cholesterol.

Unit-III

Amino Acid Metabolism: Transamination reactions of amino acids, urea cycle, overview of biosynthesis and degradation of essential amino acids, regulation of amino acid biosynthesis.

Unit-IV

Nucleic Acid Metabolism: Biosynthesis of purines and pyrimidines nucleotides, regulation of nucleotide biosynthesis. Degradation of purines and pyrimidines, nucleotides, salvage pathway.

Books Recommended:

1. Jain, J. L., Jain, S. and Jain. N. (2016). Fundamentals of Biochemistry, S. Chand & Company Ltd., New Delhi.

2. Rawn, J.D. (1989). Biochemistry, Niel Patterson Publications, North Carolina.
3. Berg, J.M., Tymoczko, J.L., Gatto, G.L., Stryer, L. (2015). Biochemistry, 4th Edition., W.H. Freeman & Co., San Francisco.
4. Voet, D., Voet, J.G. (2012). Fundamentals of Biochemistry, John Wiley and Sons, New York.
5. Nelson, D.L. and Cox, M.M. (2017). Lehninger's Principles of Biochemistry, 7th Edition., WH Freeman, New York.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4083(P)
Biochemistry-D
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Estimate amino acids.

CO2: Purify proteins.

CO3: Estimate Blood cholesterol.

CO4: Determine fat content in milk

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4083(P)

Biochemistry-D

(Practical)

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

1. Quantitative estimation of amino acids using the Ninhydrin reaction.
2. Purification of protein using salt precipitation.
3. Isolation of Casein from milk and Isoelectric pH of casein.
4. Determination of fat content in milk.
5. Estimation of blood cholesterol.

Books Recommended:

1. Plummer D.T. (2017). An Introduction of Practical Biochemistry, 3rd Edition. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
2. Bansal, D.D., Khardori, R. and Gupta, M.M. (1985). Practical Biochemistry, Standard Publication, Chandigarh.
3. Sawhney, S.K. and Singh, R. (2005). Introductory Practical Biochemistry, Narosa Publishing House, New Delhi.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4064
Skill Development in Biotechnology-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Detect mechanism of food borne infections.

CO2: Test food adulterants Biochemically/microbially.

CO3: Learn nutritional aspects of the carbohydrates, lipids & proteins.

CO4: Study advanced techniques used in food borne pathogens and toxins.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4064
Skill Development in Biotechnology-A
(Theory)

Time: 3 Hrs.

Max. Marks: 60
Theory:30
Practical:18
CA:12

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. Each question carries 6 marks.

Food Biotechnology

Unit-I

Commercial potential of food fermentation industry; Novel food ingredients: Low calorie sweetner, Plant tissue culture and naturally produced flavor modifiers, natural food coloring agents; Nutraceuticals: Probiotics, Food spoilage: Detection and mechanism of food borne infections (*Clostridium*, *Salmonella*, *Staphylococcus*, *Aspergillus* sp.)

Unit-II

Introduction to HACCP plan, Preservation: thermal processing, cold preservation, chemical preservatives, food dehydration, food irradiation, biological control; Quality assurance: Biochemical/ microbial testing of food adulterants: milk, butter, oil, jams, jellies, Government regulatory practices and policies (FSSAI, FDA etc.), Food packaging: need and ways (glass, metal, plastics, moulded pulp and aluminium foil).

Dietics and Nutrition Management

Unit III

Energy value of biomolecules: carbohydrates, fats and proteins, basal metabolic rate definition and its measurement, factors affecting BMR, energy requirements of human beings, Energy

requirements in different age groups and special conditions (pregnant ladies and lactating mothers), different dietary types, requirements, utilization and functions.

Unit-IV

Methods of protein determination, amino acid imbalance, protein requirements, utilization and functions, nutritional aspects of vitamins and minerals, food processing and loss of nutrients during processing and cooking, naturally occurring antinutrients, balanced diet, recommended dietary allowances for different categories of human beings, disorders related to nutrition-protein energy malnutrition, starvation and obesity.

Books Recommended:

1. Frazier, W.C. and Westhoff, D.C. (2013). Food microbiology (Tata McGraw-Hill publishing Co. Ltd).
2. Admas, M.R. and Moss, M.O. (2015). Food microbiology, 4th Edition, Royal Society of Chemistry).
3. SriLakshmi B. (2018). Food science, 7th Edition, New Age International Publishers, India.
4. Jay J.M., Loessner M.J. and Golden D.A. (2006). Modern Food Microbiology, 7th Edition, Springer India.
5. Sivasankar B. (2004). Food processing and preservation, 1st Edition, Prentice-Hall of India Pvt. Ltd, New Delhi.
6. Michael P. Doyle, Larry R. Beuchat (2007). Food Microbiology: Fundamentals and Frontiers, 3rd Edition, ASM Press.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4064(P)
Skill Development in Biotechnology-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Detect adulterants in food products.

CO2: Determine Gluten content in wheat flour.

CO3: Determine fat content in different food products.

CO4: Determine the BMR.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4064(P)
Skill Development in Biotechnology-A
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

Experiments:

1. Detection of Adulteration in food (oil, butter).
2. Determination of crude fiber content in wheat and chickpea.
3. Determination of Gluten content in wheat flour.
4. Isolation of protein concentrates.
5. Determination of fat content in different food products.
6. Determine the BMR.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4065

Immunology-B

(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn T-cell subsets and its surface markers

CO2: Study different Immunodiagnostics techniques.

CO3: Understand the concept of immunization

CO4: Have sound Knowledge of Vaccines and its different types

CO5: Understand the Immunity to viruses, Bacteria as well as its immuno-pathological consequences.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4065

Immunology-B

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit-I

T-cell subsets and surface markers, T-dependent and T-independent antigens, Adjuvants, Monoclonal antibodies: its production and uses.

Unit-II

Various types of immunodiffusion and immunoelectrophoretic procedures. Immunoblot, ELISA, RIA, Agglutination of pathogenic bacteria, Haemagglutination and haemagglutination inhibition.

Unit-III

Immune invasion: mechanism used by parasites, regulation of immune invasion, Immunity to viruses, intracellular and extracellular bacteria, immunopathological consequences of parasitic infections.

Unit-IV

Whole organism vaccine, Types of vaccines: purified macromolecules as vaccine, recombinant antigen vaccine, recombinant vector vaccine, synthetic peptide vaccine, multivalent subunit vaccine, DNA Vaccine, RNA Vaccine.

Books Recommended:

1. Abbas, A.K. Litchman, A.H. and Pillai, S. (2017). Cellular and Molecular Immunology, 9th Edition, Elsevier.
2. Benjamni, E., Coico, R. and Sunshine, G. (2015). Immunology: A short course, 7th Edition, New York, Wiley- Wiley-Blackwell.
3. Delves, P. J., Martin, S. J., Burton, D. R. and Roitt, I.M. (2017). Roitt's Essential Immunology, Wiley Blackwell Publishers.
4. Roitt, I., Brostoff, J. and Male, D. (2001). Immunology, 6th Edition, Mosby.
5. Kanfmann S.H.E., Sher, A., Ahmed, R. (2002). Immunology of infectious Diseases, ASM Press, Washington D.C.
6. Butler, M. (2004). Animal Cell culture and Technology, 2nd Edition, Garland Science.
7. Punt, J., Stranford, S., Johns, P. And Owen, J.A (2018). Kuby Immunology, 8th Edition, W.H. Freeman and Company, New York.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4065(P)
Immunology-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Prepare Vaccine chart of child.

CO2: Study Haemagglutination & Haemagglutination inhibition assay.

CO3: Perform Direct and indirect ELISA.

CO4: Perform Double immunodiffusion test.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4065(P)
Immunology-B
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments

1. Preparation of vaccine chart of child, highlighting optional vaccines
2. Haemagglutination assay
3. Haemagglutination inhibition assay
4. Double immunodiffusion test using specific antibody and antigen Line of identity, partial identity and non identity
5. Single immunodiffusion test using specific antibody and antigen
7. Direct and indirect ELISA
8. To perform Immunoelectrophoresis.

Books Recommended:

1. Stevans, C.D. (2003). Clinical Immunology and Serology: A Laboratory Perspective 2nd Edition, F.A Davis Company, Philadelphia.
2. Celis, J.E., Hunter, T. and Carter, N. (2005). Cell Biology: A laboratory handbook. 3rd Edition, Vol-III, Academic Press, U.K.
3. Hay, F.C. and Westwood O.M.R. (2002). Practical Immunology, 4th Edition, Wiley Blackwell.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4066

**Molecular Biology
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Study Molecular aspects of genetics.

CO2: Know the basic mechanism and essential component required for prokaryotic & eukaryotic DNA replication.

CO3: Understand the DNA recombination molecular mechanisms.

CO4: Learn the concept of operon and its structure and regulation.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4066

Molecular Biology

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit-I

DNA as genetic material, Structure of DNA, Types of DNA, Modes of Replication of DNA in prokaryotes and eukaryotes, DNA polymerases, the replication complex: Pre-priming proteins, Fidelity of replication. Mechanism of replication.

Unit - II

DNA recombination in prokaryotes and eukaryotes: molecular mechanisms, Holiday Junction model, DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair, Insertion elements and transposons: Bacterial and eukaryotic transposons.

Unit-III

Transcription and RNA processing

RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains, Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA

splicing and processing: processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

UNIT IV

Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system): lac, his, trp operons, Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation, Regulation, Posttranslational modifications of proteins

Books Recommended:

1. Adams, R. L. P., Knowler, J. T., and Leader, D. P. (1992). The Biochemistry of Nucleic acids, 11th Edition, Chapman and Hall, The New York/London/Tokyo/Melbourne/Madras.
2. Bolsover, S. R., Hyams, J. S., S. Shephard, E. A. and White H. A. (1997). From Genes to Cells., John Wiley and Sons.
3. Krebs, J E, Goldstein, ES, Kilpatrick, ST (2017). Lewin's Gene XII, Jones and Bartlett publishers, Inc.
4. Maulik, S. and Patel, S. D. (1997). Molecular Biotechnology Therapeutic Application and Strategies, John Wiley & Sons.
5. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8th Edition, Wiley Blackwell.
6. Strachan, T. and Read, A. (2010). Human Molecular Genetics, Garland Science
7. Pierce, B. (2016). Genetics: A conceptual approach, 6th Edition, WH Freeman.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4066(P)
Molecular Biology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Isolate genomic DNA and RNA from plants

CO2: Perform agarose gel electrophoresis.

CO3: Quantify DNA.

CO4: SDS-PAGE electrophoresis of different protein samples.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4066(P)

**Molecular Biology
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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 MahaVidyalaya, Jalandhar.

Experiments

1. Isolation of genomic DNA from plants by CTAB method.
2. To perform agarose gel electrophoresis.
3. Quantification and determination of purity of DNA.
4. To perform RNA Isolation from plants.
5. Quantification and determination of purity of RNA.
6. SDS-Page electrophoresis of different protein samples.

Books Recommended:

1. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8th Edition, Wiley Blackwell
2. Sambrook J. and Green M. R. (2013). Molecular Cloning: A Laboratory Manual, 4th Edition, CSHL.
3. Brown T.A (2017). Genomes, 3rd Edition, Garland Science.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4067
Agro and Industrial Applications of Microbes – B
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

- CO1:** Understand Industrial and Agro-industrial Microbes.
- CO2:** Get Acquainted with Microbial Processes in Agrobiotechnology.
- CO3:** Know industrially important Primary and secondary metabolites.
- CO4:** Study Microbial Processes used in Industrial Biotechnology.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4067
Agro and Industrial Applications of Microbes – B
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit-I

Industrial and Agro-industrial Microbes:

Microbes involved in antibiotics (Penicillin, streptomycin, Tetracyclin), pharmaceutical drugs, solvent production, surfactants, Production of herbicides and biopesticides, Microbial pesticides and mycoherbicides: Introduction, advantages and disadvantages.

Unit-II

Biotransformation, Production of organic acids (Glutamic acid, Citric acid, Lactic acid), vitamins, aminoacids, alcoholic Beverages (wine, beers).

Unit-III

Microbial Processes in Agrobiotechnology:

Introduction, BT gene in BT cotton, SCP: Spirulina production (Yeast, Bacteria). Probiotics, Prebiotics and synbiotics. Soil treatment with microbes, Composting, Vermiculture, Aquaculture Biofertilizers, Mycorrhizal fungi. Mycotoxins.

Unit-IV

Microbial Process in Industrial Biotechnology:

Industrial production of metabolites: Primary and secondary metabolites production, Fermented foods-cheese, bread, pickles, Saurkraut, Sausage citric acid, Enzyme production- Amylases, cellulases, proteases in leather industries, Biochips.

Books Recommended:

1. Singh B.D. (2016). Biotechnology: Expanding horizons, Kalyani Publishers / Lyall Bk Depot.
2. Chakraborty, P.K. (2013). Agro and Industrial Biotechnology, Black Prints.
3. Wittmann, C. and Liao, J. (2017). Industrial Biotechnology: Products and Processes (Advanced Biotechnology), Vol. 4 Wiley-VCH.
4. Casida, L.E.J.R. (2007). Industrial Microbiology, New Age International Publishers.
5. Tyagi, N. (2012). Industrial Microbiology and Biotechnology, Agrotech Press.
6. Okafor, N. (2007). Modern Industrial Microbiology and Biotechnology, CRC Press.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4067(P)
Agro and Industrial Applications of Microbes – B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Screen cellulase producing microorganism from wood degrading soil.

CO2: Understand Additive and Synergistic effect of two antibiotics on the microorganism.

CO3: Isolate and identify microbes from spoiled food sample.

CO4: Study Antimicrobial activity of essential oils.

CO5: Determine milk quality.

CO6: Isolate prebiotics from curd

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4067(P)
Agro and Industrial Applications of Microbes – B
(Practical)

Time: 3 Hrs.

Practical Marks: 18

Note: The question paper will be set by the examiner based on the syllabus.

1. Screening of cellulase producing microorganism from wood degrading soil.
2. Additive and Synergistic effect of two antibiotics on the above microorganism.
3. Minimum inhibitory concentration of antibiotics for the above microorganism.
4. Plating the milk samples for microbial contamination.
5. MBRT Test for determination of milk quality.
6. Isolation and identification of microbes from spoiled food sample.
7. Determination of Antimicrobial activity of essential oils.
8. Isolate prebiotics from yoghurt and see its characteristics.

Books Recommended:

1. Dubey, R.C and Maheshwari, D.K. (2010). Practical Microbiology, S Chand & Company.
2. Kumar, M. (2018). Practical Manual for Undergraduates Microbiology, 3rd Edition, Jain Brothers.
3. Taormina, P.J. (2016). Microbiological Research and Development for the Food Industry, 1st Edition, CRC Press.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4068
Enzymology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the concept of Enzymes.

CO2: Understand enzyme kinetics.

CO3: Study the effect of pH and temperature on rate of enzyme catalyzed reactions.

CO4: Study importance of Isozymes.

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4068

**Enzymology
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section.

Unit I

Introduction to Enzymes: Nomenclature, Classification and Characteristics of enzymes, Enzyme specificity, Cofactors, Co-enzyme and Prosthetic group.

Unit II

Mechanism of Enzyme Action: Nature of active site, identification of functional groups at active site, enzyme substrate complex, Factors responsible for catalytic efficiency of enzymes. Covalent catalysis, Acid base catalysis, Strain and distortion theory, Induced fit hypothesis.

Unit-III

Enzyme Kinetics:

A brief concept of bioenergetics and kinetics, Kinetics of single and bi-substrate enzyme catalyzed reactions, Michaelis Menten equation. Derivation of Michaelis Menten equation and determination of K_m and V_{max} values, Lineweaver-Burk plot, Hanes Plot.

Unit-IV

Enzyme inhibition: reversible and irreversible inhibition, Kinetics of competitive, uncompetitive and non-competitive inhibition. Effect of pH and temperature on rate of enzyme catalyzed reactions. Reversible covalent modification and zymogen activation, Isozymes and their importance.

Books Recommended:

1. Devsena, T. (2010). Enzymology, Oxford University Press.
2. Palmer, T and Bonner, P. (2008). Enzymes (Biochemistry, Biotechnology, Clinical Biochemistry, 2nd Edition, Woodhead Publishing.
3. Price N and Stevens L, (2000). Fundamentals of Enzymology, 3rd Revised Edition, Oxford university press, New Delhi.

Bachelor of Science (Bio-Technology) Semester-IV
Session: 2020-21
Course Code: BBTM-4068(P)
Enzymology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the concept of Enzymes.

CO2: Understand enzyme kinetics.

CO3: Study the effect of pH and temperature on rate of enzyme catalyzed reactions.

CO4: Understand the importance of Isozymes

Bachelor of Science (Bio-Technology) Semester-IV

Session: 2020-21

Course Code: BBTM-4068(P)

**Enzymology
(Practical)**

Time: 3 Hrs.

Practical Marks: 18

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.

1. Estimation of α -amylase activity from saliva.
2. Assay of acid phosphatase activity.
3. Effect of temperature on enzyme activity.
4. Effect of pH on enzyme activity
5. Determination of V_{max} and K_m for acid phosphatase.

Books Recommended:

1. Plummer D.T. (2017). An Introduction of Practical Biochemistry, 3rd Edition, Tata McGraw Hill Publishers Co. Ltd., New Delhi.
2. Bansal, D.D., Khardori, R. & Gupta, M.M. (1985). Practical Biochemistry, Standard Publication, Chandigarh.
3. Sawhney, S.K. and Singh, R. (2005). Introductory Practical Biochemistry, Narosa Publishing House, New Delhi.

B.Sc. Bio-Technology Semester-V

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTL-5061
Patent Laws in Biotechnology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Know the Procedure for obtaining patent.

CO2: Understand the Legal aspects of patenting.

CO3: Understand Patents related to Bacteria, Virus, Fungi and medicinal plants.

CO4: Get knowledge about TRIPs articles relevant to Biotechnology Sector.

CO5: Know about the ethical issues in Biotechnology.

Bachelor of Science (Bio-Technology) Semester-V

Session: 2020-21

Course Code: BBTL-5061

**Patent Laws in Biotechnology
(Theory)**

Time: 3 Hrs.

Max. Marks: 40

Theory: 32

CA: 08

Instructions for the Paper Setter

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

Introduction to Patent law. First Indian Patent Law and Amendments, History of Indian Patent System, Patentable and Non Patentable Inventions in India, Requirements and objectives of Patent, Patentable subject matter. Procedure for obtaining patent and patenting agencies in India.

Unit-II

Writing a patent, Formats of application and background information, Provisional and Complete Specifications, Types of patent applications, Life of a Patent, Rights of Patentee, Post Grant Opposition, Infringement of Patent, Patent Cooperation Treaty, Patent Offices in India, Sources of Patent Information, Patent literature search.

Unit - III

Patenting in Biotechnology, economic and depository considerations, TRIPs articles relevant to Biotechnology Sector, Patenting Genes, Gene fragments, SNPs, Proteins and Stem cells, Patents related to Bacteria, Virus, Fungi and medicinal plants.

Unit IV

Ethical issues in Biotechnology, Types of risk associated with release of genetically modified microorganisms, Ecological impact, Biosafety, environmental and agricultural concerns, Ethics of Human cloning, reproduction and stem cell research, Legal aspects of patenting

Books Recommended:

1. Singh, I. and Kaur, B (2010) Patent law and Entrepreneurship, 3rd Edition, Kalyani Publishers
2. Singh, B.D. (2016). Biotechnology expanding horizons, Kalyani Publishers, New Delhi.
3. Singh, I. and Kaur, B (2014) Patent law in Bio-Technology, Kalyani Publishers.
4. Ahuja, V.K (2007) Law Relating to Intellectual Property Rights, 1st Edition.
5. Krishna, S.V. (2007). Bioethics and Biosafety in Biotechnology. New Delhi: New age.

e-Resources:

1. www.ipindia.nic.in
2. <https://www.wipo.int/pct/en>
3. <https://www.uspto.gov/learning-and-resources/inventors-entrepreneurs-resources>
4. <https://www.vgtu.lt/library/e-resources/databases/patent/287170>

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTL-5062
rDNA Technology-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about different DNA Modifying enzymes.

CO2: Understand the different features of plasmids and development of plasmids as vector.

CO3: Know about the different methods of Transformation.

CO4: Study the labelling of DNA and RNA.

Bachelor of Science (Bio-Technology) Semester-V

Session: 2020-21

Course Code: BBTM-5062

**rDNA Technology-A
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Introduction to genetic engineering. Why gene cloning and DNA analysis is important. What is clone, how to clone a gene: Overview of the procedure.

Tools in Recombinant DNA Technology: Restriction and modifying enzymes, Type I, Type II and Type III enzymes and their characteristic features; restriction sequences, isoschizomers, rare cutting enzymes, enzyme cutting similar sequence in different manner

DNA Modifying enzymes: Characteristics and applications of Nucleases – DNase and RNase, DNA-Pol I, Klenow fragment, T4DNA polymerase, T7 DNA polymerase, T4 Polynucleotide kinase, Phosphatase, Reverse transcriptase, Taq polymerase and Ligase. Terminal deoxynucleotidyl transferase, reverse transcriptase. RNase-H, DNase-I, Nuclease S-I

Unit-II

Cloning vectors: Basic features of plasmids, antibiotic resistance genes, multiple cloning site, pBR 322, pUC 8, Bacteriophage λ based vectors: insertional and replacement vectors, phagemid, cosmid, fosmid

Isolation and purification of DNA from bacteria, plants, animals and soil.

Unit-III

Gene identification: Nucleic acid hybridization (Southern & Northern blotting), Merits and demerits of nitrocellulose and nylon membranes (N & N+). Methods of Transformation: CaCl_2 , electroporation, transfection, micro projectile.

Unit-IV

Labelling of DNA and RNA- Radioactive labeling (Nick Translation, Random Priming, End Labelling), Non-Radioactive labelling (Direct & Indirect non isotopic labeling), Detection systems of labeled probes

Books Recommended:

1. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8th Edition, Wiley Blackwell.
2. Sambrook, J and Green MR (2012) Molecular Cloning: A Laboratory Manual, 4th Edition, CSHL.
3. Brown TA. (2017) Genomes, 4th Edition, Garland Science.
4. Glick, B. R., & Pasternak, J. J (2003). Molecular biotechnology- principles and applications of recombinant DNA. Washington: ASM Press.
5. Clark, D. P. & Pazdernik, N. J. (2009). Biotechnology- applying the genetic revolution. USA: Elsevier Academic Press.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5062(P)
rDNA Technology-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Grow *E.coli* bacterial culture.

CO2: Isolate genomic DNA from bacteria.

CO3: Quantify DNA using Spectrophotometer and determine their purity.

CO4: Perform Agarose Gel Electrophoresis.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5062(P)
rDNA Technology-A
(Practical)

Time: 3 Hrs.

Max. Marks: 18

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.

1. Growing of *E.coli* bacterial culture.
2. Isolation of genomic DNA from bacteria.
3. Spectrophotometric quantification of DNA and determination of purity.
4. Agarose Gel Electrophoresis.
5. Restriction enzyme digestion of the isolated DNA with 6, 5 and 4 cutters.
6. Agarose Gel Electrophoresis of the digested fragments.

Books Recommended:

1. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8th Edition, Wiley Blackwell.
2. Sambrook, J and Green MR (2012) Molecular Cloning: A Laboratory Manual, 4th Edition, CSHL.
3. Brown TA. (2017) Genomes, 4th Edition, Garland Science

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5063
Concepts of Plant Tissue Culture
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Study the macronutrients and micronutrients and their deficiency symptoms in plants.

CO2: Know about the different physiological functions & biosynthesis of major plant growth regulators.

CO3: Understand the concept of Totipotency.

CO4: Understand the different methods of gene transfer in plants.

Bachelor of Science (Bio-Technology) Semester-V

Session: 2020-21

Course Code: BBTM-5063

Concepts of Plant Tissue Culture

(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Introduction to Plant Tissue Culture and its Historical Background, Plant nutrition: macronutrients and micronutrients and their deficiency symptoms. Plant tissue culture media: types, components and their role.

Unit-II

Physiological functions and biosynthesis of major plant growth regulators such as auxins, cytokinins, gibberellins and abscisic acid.

Unit-III

Totipotency, factors affecting cellular totipotency, Cell differentiation, Dedifferentiation and redifferentiation of cells. Tissue competency, plant-explant-plant concept. Factors influencing plant tissue culture: Genotypic, physiological, biochemical and other extrinsic factors.

Unit IV

Transgenic Plant Biotechnology: Methods of gene transfer - Direct (Electroporation, Microprojectile, Microinjection, PEG mediated, DEAE Dextran mediated methods) and indirect (agrobacterium mediated gene transfer)

Books Recommended:

1. Taiz, L and Zeiger, E. (2002). Plant Physiology, 3rd Edition, Sinauer Associates.
2. Razdan, MK. (2019) Introduction to Plant tissue culture, Science Publishers
3. Bhojwani, SS and Razdan, MK. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.
4. Smith, RH. (2000) Plant tissue culture: techniques and experiments, Gulf professional publishing

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5063(P)
Concepts of Plant Tissue Culture
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Get acquainted with functions and operations of various instruments used in plant tissue culture laboratory.

CO2: Prepare cotton plugs.

CO3: Prepare stock solutions of Murashige & Skoog (1962) medium.

CO4: Clean glassware, plasticware and contaminated cultures.

CO5: Prepare, sterilize and inoculate the explants.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5063(P)
Concepts of Plant Tissue Culture
(Practical)

Time: 3 Hrs.

Max. Marks: 18

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.

- 1.To study functions and operations of various instruments required for plant tissue culture (pH meter, autoclave, laminar air-flow, incubators, oven, distillation unit etc).
- 2.Laboratory design set up for a PTC Laboratory.
- 3.Cleaning of glassware, plasticware and contaminated cultures.
- 4.Different types of enclosure used in plant tissue culture. Preparation of cotton plugs.
- 5.Preparation of stock solutions of Murashige & Skoog (1962) medium.
- 6.Preparation of Murashige & Skoog's medium from stock solutions.
- 7.Different sterilization process (Instruments, glassware and thermolabile and thermostable components)
- 8.Selection, preparation, sterilization and inoculation of explants.

Books Recommended:

- 1.Taiz, L and Zeiger, E. (2002). Plant Physiology, 3rd Edition, Sinauer Associates.
- 2.Razdan, MK. (2019) Introduction to Plant tissue culture, Science Publishers
- 3.Bhojwani, SS and Razdan, MK. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.
- 4.Smith, RH. (2000) Plant tissue culture: techniques and experiments, Gulf professional publishing

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5064
Animal Tissue Culture
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the different aseptic techniques used in Animal Tissue Culture (ATC).

CO2: Know about the different sources, types and eradication of contamination.

CO3: Study the different culture media and reagents used in ATC.

CO4: Study different safety considerations in ATC laboratory.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5064
Animal Tissue Culture
(Theory)

Time: 3 Hrs.

Max. Marks: 60
Theory: 30
Practical: 18
CA: 12

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

Historical background, Advantages & Disadvantages of animal tissue culture, Design and layout of ATC Lab, Equipments used in ATC Lab, Aseptic Techniques in ATC- Sterilization of culture media, glassware & tissue culture laboratory. Growth and viability of cells in culture, cryopreservation and retrieval of cells from frozen storage, transportation of cells. Characteristics of normal and transformed cells.

Unit- II

Contamination- sources, Types, monitoring and eradication of contamination, Cross Contamination. Safety considerations in ATC laboratory, Clean Environment – P1, P2, P3,P4 facility and their applications.

Unit-III

Culture Media and Reagents-Types of cell culture media, physiochemical properties, balanced salt solution, constituents of serum, serum free media (SFM), design of SFM, Advantages and disadvantages of serum supplemented and serum free media, conditioned media

Unit-IV

Primary culture and Established cell line Culture (Finite & continuous cell lines), Isolation of Cells-Enzyme digestion, perfusion and mechanical disaggregation. Culture of attached cells

and cells in suspension, phases of cell growth and determination of cell growth data (calculation of *in vitro* age, multiplication rate, population doubling time, cell counting, phases of cell cycle)

Books Recommended

1. Gareth, EJ. (1996). Human Cell Culture Protocols, Humara Press.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.
3. Julio, E., Celis (1998). Cell Biology-A laboratory hand book, Vol. I-IV, 2nd Edition, Academic Press, New York.
4. Freshney, RT. (2016), Culture of Animal Cells 7th Edition, John Wiley and Sons, New York.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5064(P)
Animal Tissue Culture
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Perform different Sterilization techniques.

CO2: Prepare Hanks Balanced salt solution.

CO3: Prepare Minimal Essential Growth medium.

CO4: Isolate lymphocytes for culturing.

CO5: Isolate macrophages from blood for culturing.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5064(P)
Animal Tissue Culture
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

1. Sterilization techniques: Theory and Practical -Glass ware sterilization -Media sterilization -Laboratory Sterilization
2. Sources of contamination and decontamination measures.
3. Preparation of Hanks Balanced salt solution
4. Preparation of Minimal Essential Growth medium.
5. Isolation of lymphocytes for culturing and perform cell viability test.
6. Isolation of macrophages from blood for culturing

Book Recommended:

1. Freshney, RT. (2016), Culture of Animal Cells. 7th Edition, John Wiley and Sons, New Delhi.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5065
Bioprocess Engineering-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand the fundamental principles of chemical Engineering and biochemical engineering.

CO2: Study the Microbial Growth Kinetics.

CO3: Learn about different types of microbial culture: Batch, Fed batch and continuous culture.

CO4: Study the effect of temperature, pH and inducer on product synthesis.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5065
Bioprocess Engineering-A
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Introduction: Fundamental principles of Chemical Engineering and biochemical engineering. Fourier's Laws of heat transfer, Molecular diffusion, Diffusion theory, role of diffusion in bioprocessing, Oxygen transfer methodology in bioreactors and factors affecting oxygen transfer, Types of microbial culture: Batch, Fed batch and continuous culture.

Unit-II

Microbial Growth Kinetics: Simple kinetics of microbial growth, yield coefficient, doubling time, specific growth rate, substrate inhibition kinetics, product inhibition kinetics, metabolic and biomass productivities.

Unit-III

Introduction to multistage feedback systems: Internal & external feedback systems, effector molecules (Enzyme inhibitors and enzyme activators) and their kinetics, Effect of temperature, pH and inducer on product synthesis.

Unit-IV

Sterilization: Introduction, air and media sterilizations, design of batch sterilization process, Methods of batch sterilization, Del factor, sterilization cycle, continuous sterilization of feeds and liquid wastes, Filter sterilization, sterilization of fermenters.

Books Recommended:

1. Stanbury, PF, Whitaker, A. and Hall, SJ. (2016). Principles of Fermentation Technology 2nd Edition., Pergamon Press, Oxford.

2. Young, MY. (2000). Comprehensive Biotechnology (Vol. 1-4), Pergamon Press, Oxford.
3. Young, MY. (1996). Environmental Biotechnology, Principles & Applications, Kluwer Academic Publications, New Delhi.
5. Bailary, JE. and Ollis, DF. (1986). Biochemical Engineering Fundamentals, McGraw Hills, New York.
5. Pirt SJ. (1985). Principles of microbes and cell cultivations. Blackwell Scientific Publication, London.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5065(P)
Bioprocess Engineering-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: To study the growth curve of microorganism.

CO2: To determine the specific growth rate and generation time of a bacterium during submerged fermentation.

CO3: To study the effect of temperature, pH and aeration on growth of microbes.

CO4: Produce an enzyme in a Bioreactor/shaking flask.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5065(P)
Bioprocess Engineering-A
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

- 1.To study the growth curve of microorganism.
- 2.To determine the specific growth rate and generation time of a bacterium during submerged fermentation.
- 3.Demonstration of sterilization of fermenter and other accessories.
- 4.To study the effect of temperature, pH and aeration on growth of microbes.
- 5.Production and assay of an enzyme in a Bioreactor/shaking flask along with method of validation.

Books Recommended:

- 1.Cappuccino JG., Sherman N. (2007). Microbiology: A laboratory, Pearson Benjamin Cummings.
- 2.Plummer DT. (2004). An introduction to practical biochemistry, Tata McGraw Hill Publishers Co. Ltd., New Delhi.
- 3.Bansal, DD., K Hardori, R., Gupta, MM. (1985). Practical biochemistry, Standard Publication Chandigarh.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5066
Biophysical & Biochemical Techniques-A
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Gain fundamental knowledge about the basic principles of sedimentation.

CO2: Study the different types of centrifugation machines and rotors.

CO3: Understand the principles of different types of chromatography (Paper, column, ion-exchange etc).

CO4: Understand the principles of single and double beam UV/Visible spectroscopy.

CO5: Understand the basic principle and instrumentation of NMR and ESR.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5066
Biophysical & Biochemical Techniques-A
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Centrifugation: Basic principles of sedimentation, theory and applications of preparative and analytical centrifugation, Differential and density gradient centrifugation, Types of centrifugation machines and rotors, Sedimentation co-efficient, Factors affecting sedimentation coefficient, care of rotors.

Unit - II

Chromatography: Partition Coefficient, Theory and Principle of Paper and column chromatography, Two dimensional chromatography, gel exclusion chromatography, Principle and applications of paper, thin layer, ion-exchange and affinity chromatography.

Unit III

Gas Liquid Chromatography, High Performance Liquid chromatography, Fast Protein Liquid chromatography.

Unit IV

Spectroscopy: Basic Principle, Lambert Beer's law, Absorption spectrum, theory & principles of single and double beam UV/Visible spectroscopy, Basic Principle and instrumentation of NMR and ESR

Books Recommended:

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.

4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman.
5. Mousumi, D. (2011). Tools and techniques of biotechnology. Jaipur, India: Pointer Publisher.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5066(P)
Biophysical & Biochemical Techniques-A
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Separate bio-molecules by paper chromatography.

CO2: Separate bio-molecules by thin layer chromatography.

CO3: Separate proteins by ion-exchange column chromatography.

CO4: Separate proteins by affinity column chromatography.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5066(P)
Biophysical & Biochemical Techniques-A
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

- 1.To study sedimentation using Swing Out Rotor and Angle Rotor.
- 2.To study separation of bio-molecules by paper chromatography.
- 3.To study separation of bio-molecules by thin layer chromatography.
- 4.Separation of proteins by ion-exchange column chromatography
- 5.Separation of proteins by affinity column chromatography.

Books Recommended:

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2000). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman & Co.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5087
Physical, Organic & Inorganic Aspects of Spectroscopy-A
(Theory)

Course outcomes:

Students will be able to:

CO1: understand the various regions of electromagnetic spectrum and use of it in spectroscopic studies.

CO2: understand basic features of different spectrometers.

CO3: explain the phenomenon of Fluorescence and Phosphorescence.

CO4: explain the common terms related to UV and IR spectroscopy like Chromophore, auxochromes, force Constant, vibrational Coupling, field Effect.

CO5: use UV and IR spectroscopy data in elucidating the chemical structure of a compound.

CO6: apply the various selection rules of UV and IR Spectroscopy, explain the common terms related to UV and IR spectroscopy like Chromophore, auxochromes, force Constant, vibrational Coupling, field Effect.

CO7: study the UV and IR spectra of different organic compounds.

CO8: calculate λ_{max} of conjugated and α , β -unsaturated carbonyl compounds and also understand the factors affecting λ_{max} .

CO9: understand the various sampling Techniques used in spectroscopy.

CO10: solve the numerical problems based on UV and IR spectroscopy.

CO11: understand the various Sampling Techniques used in spectroscopy.

CO12: understand the various applications of UV and IR spectroscopy.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5087
Physical, Organic & Inorganic Aspects of Spectroscopy-A
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory: 30

Practical: 18

CA: 12

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

Energy and Electromagnetic Spectrum

Introduction, electromagnetic spectrum and Units, regions of the spectrum, basic features of different spectrometers, statement of Born-Oppenheimer approximation, degree of freedom, Frank Condon Principle, Fluorescence and Phosphorescence.

Unit- II

Ultraviolet and Visible Spectroscopy

The energy of electronic excitation, measurement techniques, Beer-Lambert Law, Molar extinction coefficient. Different types of transition noticed in UV spectrum of organic functional groups and their relative energies. Chromophore, auxochromes, Absorption and intensity shifts, Transition probability. Factors affecting λ_{\max} , Effect of steric hindrance to coplanarity, Solvent Effects.

Unit – III

Infrared Spectroscopy

Vibrational Energy Levels, Selection Rules, Force Constant, Fundamental Vibration Frequencies, Factors influencing Vibrational Frequencies (Vibrational Coupling, Hydrogen Bonding, Electronic effect, Bond Angles, Field Effect) of different functional groups. Sampling Techniques.

Unit – IV

Applications of UV and IR Spectroscopy

Applications of UV spectroscopy, Woodward Fieser rules for calculating λ_{max} of conjugated polyenes and α,β -unsaturated carbonyl compounds. Applications of IR spectroscopy, Absorption of Common functional Groups, Interpretation of simple IR spectra, Finger print Regions. Simple numerical problems based on UV and IR spectroscopy.

Books Recommended:

1. Organic Spectroscopy By W. Kemp; Publisher- Palgrave, New York
2. D.H. Williams and I. Fleming. Spectroscopic Methods in Organic Chemistry.
3. Spectrometric Identification of Organic Compounds - R.M. Silverstein & F. X. Webster; Publisher: John Wiley and Sons, Inc.
4. Introductory Problems in Spectroscopy- By R.C. Banks, E.R. Matjeha and G. Mercer; Publisher : The Benjamin / Cummings Publishing Company Inc.
5. Introduction to Spectroscopy – D. L. Pavia, G. M. Lampman, and G. S. Kriz
Publisher: Brooks / Cole, a part of Cengage Learning

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5087(P)
Physical, Organic & Inorganic Aspects of Spectroscopy-A
(Practical)

Course outcomes:

Students will be able to:

CO1: record and compare IR spectra of various organic compounds.

CO2: compare the UV-Vis spectra of various organic compounds.

CO3: do the preparation and IR characterisation of various inorganic compounds.

CO4: verify Beer Lambert Law for different solutions.

Bachelor of Science (Bio-Technology) Semester-V
Session: 2020-21
Course Code: BBTM-5087(P)
Physical, Organic & Inorganic Aspects of Spectroscopy-A
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

1. Record of IR spectra of diethylether, ethyl acetate and butanone and make comparisons.
2. Synthesis and electronic spectral studies of d-d bands of $(\text{Ni}(\text{NH}_3)_6)\text{Cl}_2$ and $(\text{Ni}(\text{en})_3)\text{Cl}_2$ complexes. A comparison of their electronic spectral with that of $(\text{Ni}(\text{H}_2\text{O})_6)\text{Cl}_2$ for the calculation of 10 Dq values.
3. Convert cyclohexanone to cyclohexanol and hydrazine of cyclohexazone. Compare the UV-Vis and IR spectra of products with that of starting material.
4. Preparation of $(\text{Fe}(\text{py})_4(\text{NCS})_2)$ and its IR characterization.
5. Take commercial sample of methyl orange and record its UV-vis and fluorescence spectra under neutral, acidic and basic medium and make comparisons.
6. To verify Beer- Lambert Law for $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of given $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ solution.

Bachelor of Science (Bio-Technology) Semester-V

Session: 2020-21

Course Code: BBTS-5068

**Term Paper
(Seminar)**

Time: 3 Hrs.

Max. Marks: 20

Term paper on recent advances in Life Sciences using Internet and library based resources. To be presented as hard Copy/CD/Floppy. Viva/ seminar should be conducted by a panel of three internal examiners.

B. Sc. Bio-Technology Semester-VI

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6061
Intellectual Property Rights & Entrepreneurship
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand about Intellectual property right (IPR) and different forms of protection under IPR.

CO2: Understand about World Trade Organization and its related intellectual property provisions.

CO3: Know about World Intellectual Property Organisation and International depository authorities

CO4: Understand the concept of Entrepreneurship

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6061
Intellectual Property Rights & Entrepreneurship
(Theory)

Time: 3 Hrs.

Max. Marks: 40

Theory: 32

CA: 8

Instructions for the Paper Setter:

There will be five sections, namely A, B, C, D, E

Section –A: The examiner shall set 10 short answer type questions covering entire syllabus and the candidates will have to attempt 8 questions of 1 mark each. Answer to each question shall be approximately of 50 words. The total weightage of this section shall be 8 marks.

Section-B, C, D, and E: Eight questions of equal marks are to be set, two in each of the four sections (B-E). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt four questions, selecting at least one question from each section. Each question shall carry 6 marks. The total weightage of these sections shall be 24 marks

Unit I

Intellectual Property, Introduction to Intellectual Property Rights (IPR), History of IPR in India, Benefits, Problems and Management of IPR, Different forms of protection under IPR: Trade secret, Patents, Plant Breeder Rights and Copyright, Trademark and Geographical indications.

Unit II

Intellectual property and its legal protection in research, design and development, World Trade Organization and its related intellectual property provisions, General Agreement on Tariffs and Trade (GATT), Principles and objectives of GATT, Principles, objectives, structure and functions of WTO

Unit III

Trade related Investment Measures (TRIMs), Trade related aspects of IPR (TRIPS), TRIPS agreement, objectives and principles, Most Favored Nation (MFN) Principle, Berne convention, Budapest Treaty, International depositary authorities, World Intellectual Property Organisation (WIPO)

Unit IV

Entrepreneurship, Characteristics of entrepreneur, Selection of a product line, design and development processes, Plant layout and design, Demand for a given product, Financing of Enterprise, Capital structure, Project inspection

Books Recommended:

1. Singh, I. and Kaur, B (2010) Patent law and Entrepreneurship, 3rd Edition, Kalyani publishers.
2. Ahuja, V.K (2007) Law Relating to Intellectual Property Rights, 1st Edition.
3. Singh, B.D. (2016) Biotechnology expanding horizons, Kalyani Publishers, New Delhi.

e-Resources:

5. www.ipindia.nic.in
6. <https://www.wipo.int/pct/en>
7. <https://www.uspto.gov/learning-and-resources/inventors-entrepreneurs-resources>

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6062

**rDNA Technology-B
(Theory)**

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand basics of cloning and expression vectors.

CO2: Understand both genomic and cDNA cloning.

CO3: Understand fundamental concepts of PCR and microarray.

CO4: Understand DNA sequencing and site directed mutagenesis.

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6062

**rDNA Technology-B
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

UNIT I

Shuttle vectors, BAC, role of antibiotics and antibiotics resistance genes in a vector, insertional inactivation, Important components of Expression Vectors, pET28a, pGEX , role of promoter and types of promoter, their induction system and types of host requirements, gene fusion/tags.

UNIT II

Overview of cloning, genomic cloning in Lambda vector, screening of recombinants, calculating number of clones that have to be screened, Linker, Adapters, cDNA cloning, Different strategies for cDNA cloning- self priming and adaptor/linker methods. Cloning vectors for Eukaryotes (YAC, viral vectors, Ti & Ri plasmids)

UNIT III

Basics of PCR, primer designing, Various types of PCR, applications of PCR, PCR based methods of site directed mutagenesis (overlap extension and cassette mutagenesis), random mutagenesis and gene cloning

UNIT IV

DNA Sequencing: Sanger-Coulson method (chain termination method), Maxam- Gilbert method (chemical degradation of DNA), New generation sequencing, Fundamental concepts

& applications of microarray, Phage display and selection of mutant peptides, yeast two hybrid assay.

Books Recommended:

1. Primrose, S.B. and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8th Edition, Wiley Blackwell.
2. Sambrook, J. and Green M.R. (2012) Molecular Cloning: A Laboratory Manual, 4th Edition, CSHL.
3. Brown, T.A. (2017) Genomes, 4th Edition, Garland Science.
4. Glick, B. R., and Pasternak, J. J (2003). Molecular biotechnology- Principles and applications of recombinant DNA, ASM Press, Washington.
5. Clark, D. P. and Pazdernik, N. J. (2009). Biotechnology- applying the genetic revolution, Elsevier Academic Press,

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6062(P)
rDNA Technology-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Isolate plasmid DNA and treat it with restriction enzymes.

CO2: Prepare and transform competent cells.

CO3: Select transformants.

CO4: Perform polymerase chain reaction.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6062(P)
rDNA Technology-B
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

1. Isolation of plasmid DNA
2. Digestion of plasmid with three different restriction enzymes.
3. Preparation of competent cells
4. Transformation of competent cells by CaCl₂ method.
5. Confirmation of the transformants for the presence of plasmid.
6. To perform Polymerase chain reaction
7. Expression vector experiment

Books Recommended:

1. Primrose, SB and Twyman, R. (2010). Principles of Gene Manipulation and genomics, 8th Edition, Wiley Blackwell.
2. Sambrook, J and Green MR (2012) Molecular Cloning: A Laboratory Manual, 4th Edition, CSHL.
3. Brown TA. (2017) Genomes, 4th Edition, Garland Science

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6063
Applications of Plant Tissue Culture
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Understand concept of Micropropagation and its application

CO2: Understand about somatic embryogenesis and its applications

CO3: Know about Haploid and triploid plant production and embryo culture

CO4: Understand the concept of protoplast fusion and somatic cell hybridization and secondary metabolite production

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6063

**Applications of Plant Tissue Culture
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit I

Micropropagation methods (axillary bud, shoot-tip and meristem culture), Stages of micropropagation, Factors affecting micropropagation and technical problems, Applications of micropropagation, Acclimatization of tissue culture raised plants. Modes of regeneration, Somatic embryogenesis and organogenesis, Types of somatic embryogenesis, Applications of somatic embryogenesis.

Unit II

Haploid and triploid plant production through tissue culture; ovary and ovule culture; embryo culture and rescuing hybrid embryos; somaclonal variations, selection of variant cell lines and its applications.

Unit-III

Protoplast isolation and culture, viability of protoplasts, protoplast fusion, selection of somatic hybrids and cybrids, applications of somatic cell hybridization.

Unit-IV

Cell suspension culture, production of secondary metabolites by plant tissue culture, immobilized plant cell culture, use of bioreactors in secondary metabolite production, transgenic approaches in secondary metabolite production.

Books Recommended:

1. Bhajwani, S.S, and Razdan, M.K. (1996). Plant Tissue Culture. Theory and Practice, Elsevier.
2. Razdan, M.K. (2003) Introduction to Plant tissue culture, Science Publishers.
3. Singh, B.D. (2004) Biotechnology expanding horizons, Kalyani Publishers, New Delhi.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6063(P)
Applications of Plant Tissue Culture
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Practically perform steps of micropropagation.

CO2: Understand about significance of growth hormones in culture medium.

CO3: Perform regeneration of shoots/embryos

CO4: Perform suspension culture

CO5: Perform Anther culture, ovary culture and embryo rescue.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6063(P)
Applications of Plant Tissue Culture
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

1. Micropropagation and its different steps.
2. Significance of growth hormones in culture medium.
3. Induction of callus from different explants.
4. To study regeneration of shoots/embryos.
5. Raising of cell suspension cultures.
6. Anther culture, ovary culture and embryo rescue.

Books Recommended:

1. Taiz, L and Zeiger, E. (2002). Plant Physiology, 3rd Edition, Sinauer Associates.
2. Razdan, MK. (2019) Introduction to Plant tissue culture, Science Publishers
3. Bhojwani, SS and Razdan, MK. (2004). Plant Tissue Culture. Theory and Practice, Elsevier.
4. Smith, RH. (2000) Plant tissue culture: techniques and experiments, Gulf professional publishing

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6064
Animal Biotechnology
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about commonly used cell lines and their characteristics

CO2: Understand about Transfection methods and expression vectors

CO3: Know about Stem cells and their applications

CO4: Understand the concept of genetic engineering and its applications

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6064

**Animal Biotechnology
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit- I

Commonly used animal cell line, their origin and characteristics (WI-38, MRC-5, IMR-90, TIG 1, HEK-293, 3T3, BHK21-C13, C7, CHO-K1, A-2790, A9, B16, HeLa, A 549),
Differentiation of cells, Organ Culture

Unit- II

Transfection methods (calcium phosphate precipitation, DEAE-Dextran- mediated transfection, Lipofection, electroporation, Retroviral infection, Microinjection), Promoters, Expression vectors and detection of transgenics, need to express proteins in animal cells.

Unit- III

Applications: Cell fusion and production of monoclonal antibodies; scale up methods for propagation of anchorage dependent and suspension cell culture; Bioreactors for large scale culture of cells; micro carrier cultures; Stem cells- Basics, embryonic & adult stem cells & their applications, Transdifferentiation.

Unit-IV

Genetic Engineering in Animal Cells: Methodology for Transgenic animals (Mice, rabbit, Cattle, goat, sheep, pigs, Fish) production of regulatory proteins, blood products, vaccines and hormones, Transgenic animal as bioreactor, Animal cloning- IVF & embryo transfer, Benefits and Concerns surrounding the use of animal biotechnology

Books Recommended

1. Gareth, EJ. (1996). Human Cell Culture Protocols, Humara Press.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.
3. Julio, E., Celis (1998). Cell Biology-A laboratory hand book, Vol. I-IV, 2nd Edition, Academic Press, New York.
4. Freshney, RT. (2016), Culture of Animal Cells 7th Edition, John Wiley and Sons, New York.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6064(P)
Animal Biotechnology
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about DNA isolation from blood

CO2: Perform RNA isolation from blood

CO3: Know about IgG purification

CO4: Know about cell line maintenance

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6064(P)
Animal Biotechnology
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

1. Seeding of cell line.
2. Maintenance of a cell line and check doubling time.
3. DNA isolation from blood
4. Quantification of isolated DNA.
- 5.. Isolation of RNA from blood.
6. Separation and purification of IgG antibodies from Serum using protein A column.

Book Recommended:

1. Freshney, RT. (2016), Culture of Animal Cells. 7th Edition, John Wiley and Sons, New Delhi.
2. Butler, M. (2004). The Animal Cell Culture and Technology, IRL Oxford Univ. Press.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6065
Bioprocess Engineering-B
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the Design of a Fermenter and its types.

CO2: Study about D.O and pH Probes.

CO3: Study about different techniques of Downstream Processing.

CO4: Learn about Effluent treatment and fermentation Economics.

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6065

**Bioprocess Engineering-B
(Theory)**

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 marks.

Unit-1

Design of a Fermenter: Introduction, fermenter for microbial, animal & plant cell culture, Aseptic operation of fermenter, impeller and spargers, batch, fed batch, C.S.T.B.R, plug flow and air loop bioreactors and its kinetics.

Unit-II

Control and measurement equipments of fermenter (Temperature & pH control system, Flow measurement, foam sensing, pressure control & D.O. probes, Operation and agitation and its kinetics.

Unit-III

Down Stream Processing: Introduction, removal of microbial cells and other solid matters. Foam separation, filtration, industrial filters and its principles, centrifugation and industrial centrifuges, cell disruption, aqueous two phase extraction system, Basics concept of super critical fluid extraction and whole broth processing.

Unit-IV

Effluent treatment- Primary, Secondary and Tertiary treatment, aerobic and anaerobic slug treatment process, fermentation economics.

Books Recommended:

1. Stanbury, PF, Whitaker, A. and Hall, SJ. (2016). Principles of Fermentation Technology 2nd Edition., Pergamon Press, Oxford.
2. Young, MY. (2000). Comprehensive Biotechnology (Vol. 1-4), Pergamon Press, Oxford.
3. Young, MY. (1996). Environmental Biotechnology, Principles & Applications, Kluwer Academic Publications, New Delhi.
5. Bailary, JE. and Ollis, DF. (1986). Biochemical Engineering Fundamentals, McGraw Hills, New York.
5. Pirt SJ. (1985). Principles of microbes and cell cultivations. Blackwell Scientific Publication, London.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6065(P)
Bioprocess Engineering-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Undergo two-week training in fermentation technology in industry/institute and learn practical aspects of fermentation technology

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6065(P)
Bioprocess Engineering-B
(Practical)

Time: 3 Hrs.

Practical Marks: 18

Note:

Students will go for atleast two-week training in industry/institute and the students will be required to submit written report of their training which will be evaluated by the teacher who has taught theory course.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6066
Biophysical & Biochemical Techniques-B
(Theory)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the Mass Spectroscopy and its applications.

CO2: Study about electrophoresis.

CO3: Study about Two dimensional gel electrophoresis and capillary electrophoresis.

CO4: Learn about concepts of radio-isotopy.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6066
Biophysical & Biochemical Techniques-B
(Theory)

Time: 3 Hrs.

Max. Marks: 60
Theory:30
Practical:18
CA:12

Instructions for the Paper Setter

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 atleast one question from each section. The fifth question may be attempted from any section. Each question carries 6 Marks.

UNIT-I

Electrophoresis: Factors affecting electrophoretic mobility, Types of electrophoresis, Basic principle, theory and application of native, SDS-PAGE and Agarose Gel electrophoresis, Use of solubilizers in electrophoresis.

UNIT-II

Introduction to IEF (Iso-electric focusing), Two dimensional gel electrophoresis and capillary electrophoresis, Applications of electrophoresis in biology for isolation of biomolecules based on charge and molecular weight.

UNIT III

Mass spectroscopy: Ionization methods and Analyzers, MALDI TOF and MALDI Q, Applications of mass spectroscopy in biology for qualitative and quantitative determination of bio-molecules, Introduction to fluorescence spectroscopy

UNIT-IV

Radioisotopic Techniques: Basic concepts of radioisotopy, theory and applications of Geiger-Muller tube, solid and liquid scintillation counters, primary and secondary flours. Safety rules for radioisotopic studies.

Books Recommended:

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2009). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman.
5. Mousumi, D. (2011). Tools and techniques of biotechnology. Jaipur, India: Pointer Publisher.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6066(P)
Biophysical & Biochemical Techniques-B
(Practical)

COURSE OUTCOMES:

After passing this course the student will be able to:

CO1: Learn about the qualitative and quantitative analysis of DNA sample

CO2: Prepare standard curve of protein

CO3: Prepare standard curve of DNA

CO4: Separation of bio-molecules by vertical and horizontal gel electrophoresis

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6066(P)
Biophysical & Biochemical Techniques-B
(Practical)

Time: 3 Hrs.

Practical Marks: 18

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.

Experiments:

- 1.. Preparation of standard curve of protein
2. Preparation of standard curve of DNA.
3. Casting of horizontal gel and Separation of bio-molecules by electrophoresis
4. Casting of Native-PAGE gel and Separation of bio-molecules by electrophoresis.
5. Casting of discontinuous PAGE gel and Separation of bio-molecules by electrophoresis.

Books Recommended:

1. Upadhyay, A., Upadhyay, K. and Nath N. (2016) Biophysical chemistry: Principles and Techniques. Himalaya Publishing House, India.
2. Wilson K. and Walker J. (Eds.) (2010). Practical Biochemistry: Principles and Techniques, Cambridge University Press, U.K.
3. Sheehan, D. (2000). Physical Biochemistry: Principles and Applications, John Wiley and Sons Ltd., Chichester, England.
4. Freifelder, D. (1982). Physical Biochemistry. Applications to Biochemistry & Molecular Biology, W.H. Freeman & Co.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6087
Physical, Organic & Inorganic Aspects of Spectroscopy-B
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

Course outcomes:

Students will be able to:

CO1:explain common terms in NMR spectroscopy such as chemical shift, coupling constant, and anisotropic effect, spin spin splitting, shielding constant and their affect on the spectra of the compound.

CO2:study thevarious measurement techniques in NMR spectroscopy.

CO3:understand the various cleavages and rearrangements in Mass spectroscopy.

CO4:factors affecting cleavage patterns in Mass spectroscopy.

CO5: interpret the spectrum of unknown compounds on the basis of NMR and Mass spectroscopy.

CO6:understand the various applications of NMR and Mass spectroscopy.

CO7:use NMR and Mass spectroscopy data in elucidating the chemical structure of a compound.

CO8:solve the numerical problems based on use NMR and Mass spectroscopy.

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6087
Physical, Organic & Inorganic Aspects of Spectroscopy-B
(Theory)

Time: 3 Hrs.

Max. Marks: 60

Theory:30

Practical:18

CA:12

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. Each question carries 6 marks.

UNIT-I

I. Proton Magnetic Resonance spectroscopy (1H NMR)

The Nuclear spin, Larmor frequency, the NMR isotopes, population of nuclear spin level, spin and spin compounds, shielding constant, range of typical chemical Shifts simple application of chemical shifts, Anisotropic effect. Spin spin splitting, Coupling constant.

UNIT-II

II. Applications of NMR spectroscopy

NMR spectra with various examples such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene, o-, m-, p- anisidine, o-, m-, p- nitrophenols, acetophenone.

Simple numerical of structure elucidation of NMR spectroscopic data.

UNIT- III

III. Mass Spectrometry

Basic Principles Elementary theory. Molecular ions, isotope ions, fragment ions of odd and even electron types, Nitrogen rule, Factors affecting cleavage patterns, simple cleavage, cleavages at a hetero atom, multicentre fragmentations, rearrangements, diels – alder fragmentation, Mc Lafferty rearrangement.

UNIT- IV

IV. Applications of Mass Spectroscopy

Cleavage associated with common functional groups , Aldehydes, ketones cyclic and acyclic esters, alcohols, olefins, aromatic compounds amines, Interpretation of the spectrum of unknown simple molecules.

Books Recommended:

1. Organic Spectroscopy By W. Kemp; Publisher- Palgrave, New York
2. D.H. Williams and I. Fleming.Spectroscopic Methods in Organic Chemistry.
3. Spectrometric Identification of Organic Compounds - R.M. Silverstein & F. X. Webster;
Publisher: John Willey and Sons,Inc.
4. Introductory Problems in Spectroscopy- By R.C. Banks, E.R. Matjeha and G. Mercer;
Publisher : The Benzamine / Cummings Publishing Company Inc.
5. Introduction to Spectroscopy – D. L. Pavia, G. M. Lampman, and G. S. Kriz
Publisher: Brooks / Cole, a part of cengage learning

Bachelor of Science (Bio-Technology) Semester-VI
Session: 2020-21
Course Code: BBTL-6087 (P)
Physical, Organic & Inorganic Aspects of Spectroscopy-B
(Practical)

Course outcomes:

Students will be able to:

CO1: interpret the spectrum of unknown compounds on the basis of NMR spectroscopy.

CO2: use NMR data in elucidating the chemical structure of a compound.

CO3: understand the concept of Green Chemistry and will be able to use green approach in preparation of organic compounds.

CO4: understand the concept of chromatography and its applications in separation of various components of the given mixture.

Bachelor of Science (Bio-Technology) Semester-VI

Session: 2020-21

Course Code: BBTL-6087 (P)

**Physical, Organic & Inorganic Aspects of Spectroscopy-B
(Practical)**

Time: 3 Hrs.

Max. Marks: 18

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.

Experiments:

1. Record ^1H NMR spectra of ethylacetate and ethyl acetoacetate (in CDCl_3 or CCl_4) and show the presence of tautomeric structures.
2. Preparation of benzillic acid from benzaldehyde .
3. Separation of components of spinach using column chromatography.
4. Prepare p-nitroacetanilide and make comparison of ^1H NMR spectra data of aniline,acetanilide (starting material) and p-nitroacetanilide (product).
5. Compare the IR and ^1H NMR spectra of aspirin and salicylic acid.