



**MAHARAJA SURAJMAL BRIJ UNIVERSITY**  
**BHARATPUR (RAJASTHAN)**

**FACULTY OF EDUCATION**  
**B.Sc.-B.Ed. INTEGRATED PROGRAMME**  
**( FOUR YEAR )**  
**B.Sc.- B.Ed. 2<sup>nd</sup> YEAR**  
**SESSION ( 2024-25 )**

**Dr. Farbat Singh**  
**Asstt. Registrar**  
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**NOTICE** –

1. Change in syllabus/ordinance/rules/regulations/syllabi and books may from time to time, be made by amendment or remarking and a candidate shall, accept in so far as the university determines otherwise comply with any change that applies to years he/she has not completed at time of change.
2. All court cases shall be subject to the jurisdiction of Maharaja Surajmal Brij University headquarter Bharatpur only and not any other place.

  
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Ordinance and Regulations related to the Integrated B.Sc.-B.Ed.  
Degree

11. The Objective and the Learning outcomes of the Integrated B.Sc.-B.Ed. Degree are-

Objectives:

- To promote capabilities for inculcating national values and goals as mentioned in the constitution of India.
- To act as agents of modernization and social change.
- To promote social cohesion, international understanding and protection of human rights and right of the child.
- To acquire competencies and skills needed for teacher.
- To use competencies and skills needed for becoming an effective teacher.
- To become competent and committed teacher.
- To be sensitive about emerging issues such as environment, population general equality, legal literacy etc.
- To inculcate logical, rational thinking and scientific temper among the students.
- To develop critical awareness about the social issues & realities among the students.
- To use managerial organizational and information & technological skills.

Learning outcomes:

1. Competence to teach effectively two school subjects at the Elementary & secondary levels.
2. Ability to translate objectives of secondary education in terms of specific Programmes and activities in relation to the curriculum.
3. Ability to understand children's needs, motives, growth pattern and the process of learning to stimulate learning and creative thinking to foster growth and development
4. Ability to use-
5. Individualized instruction
6. Dynamic methods in large classes.
7. Ability to examine pupil's progress and effectiveness of their own teaching through the use of proper evaluation techniques.



  
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8. Equipment for diagnosing pupil progress and effectiveness of their own teachings through the use of proper evaluation techniques.
9. Readiness to spot talented and gifted children and capacity to meet their needs.
10. Ability to organize various school programmes, activities for pupil.
11. Developing guidance point of view in educational, personal and vocational matters.
12. Ability to access the all round development of pupil and to maintain a cumulative record.
13. Developing certain practical skill such as:
  - a. Black board work.
  - b. Preparing improvised apparatus.
  - c. Preparing teaching aids and ICT.
14. Interest and competence in the development of the teaching profession and education Readiness to participate in activities of professional organization.

*Integrated Programme of B.Sc.-B.Ed. Degree Shell Consist of*

- i. First year B.Sc.-B.Ed.
- ii. Second year B.Sc.-B.Ed.
- iii. Third year B.Sc.-B.Ed.
- iv. Final year B.Sc.-B.Ed.

*Duration of the course – Four years*



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1. Compulsory Papers :

Year	Paper
Ist Year	Gen. English
II Year	Gen. Hindi
III Year	Computer Application (ICIT)
IV Year	Environmental Education

\*ELIGIBILITY CRITERIAN ON PASSING MARKS BUT MARKS SHALL NOT BE INCLUDED IN DIVISION.

Group - A :- Subject Speciliasation :

Year	Paper
Ist Year	Instructional System & Educational
II Year	Peace Education
III Year	Guidance and Counseling in School
IV Year	Physical Education & Yoga

Group-B : Content of Science Subject:- A Student has to opt any three paper form group B.

Chemistry	I, II & III
Botany	I, II & III
Zoology	I, II & III
Physics	I, II & III
Mathematics	I, II & III



  
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Group C: Pedagogy of school subject A/B : Pedagogy of a school subject third year and fourth year (candidate shall be required to offer any two papers from the following for part III & Part IV).

Chemistry
Botany
Zoology
Physics
Mathematics

- ❖ In all the subjects the student has to study a minimum of 12 papers in 1<sup>st</sup> year, 12 in 2<sup>nd</sup> year, 12 in 3<sup>rd</sup> year and 7 in 4<sup>th</sup> year. (Total 43 Papers)
- ❖ Each theory paper will carry hundred marks and content base paper 5(a,b), 6(a,b), 7(a,b) will carry 150 marks. (With practical part)

### Scheme of Instruction for B.Sc.-B.Ed. course

Details of courses and scheme of study titles of the papers, duration etc. for B.Sc.-B.Ed. courses are provided in tables given below:-

### Four year Integrated course Scheme of B.Sc.-B.Ed. 1<sup>st</sup> year

Theory Paper	Course code	Title of the paper	Evaluation			
			External	Internal	Practical	Total
I	B.Sc.-B.Ed. 01	Gen. English(compulsory)*	100	-	-	100
II	B.Sc.-B.Ed. 02	Childhood and growing up	80	20	-	100
III	B.Sc.-B.Ed. 03	Contemporary India and education	80	20	-	100

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IV	B.Sc.-B.Ed. 04 (G-A)	Instructional System & educational evaluation	80	20	-	100
V VI & VII	B.Sc.-B.Ed. 05, 06 & 07 (G-B)	Content (PCB & PCM group) (select any three) 1. Chemistry (I,II,III) 2. Botany (I,II,III) 3. Zoology (I,II,III) 4. Physics (I,II,III) 5. Mathematics (I,II,III)	33+33+34 33+33+34 33+33+34 33+33+34 40+40+40	- - - - -	50 50 50 50 30	150 150 150 150 150
						750

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**Four year Integrated course**  
**Scheme of B.Sc.-B.Ed. 2<sup>nd</sup> year**

Theory Paper	Course code	Title of the paper	Evaluation			
			External	Internal	Practical	Total
I	B.Sc.-B.Ed. 01	Gen. Hindi (compulsory)*	100	-	-	100
II	B.Sc.-B.Ed. 02	Knowledge and curriculum	80	20	-	100
III	B.Sc.-B.Ed. 03	Learning and Teaching	80	20	-	100
IV	B.Sc.-B.Ed. 04	Peace Education	80	20	-	100

  
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V VI & VII	B.Sc.-B.Ed. 05, 06 & 07 (G-B)	Content (PCB & PCM group) (select any three) 1. Chemistry (I,II,III) 2. Botany (I,II,III) 3. Zoology (I,II,III) 4. Physics (I,II,III) 5. Mathematics (I,II,III)	33+33+34 33+33+34 33+33+34 33+33+34 40+40+40	- - - - -	50 50 50 50 30	150 150 150 150 150
VIII	B.Sc.-B.Ed.	OPEN AIR /SUPW CAMP 1. community service 2. Survey (Based on social and educational events) 3. Co-Curricular activities 4. Health and Social Awareness programme (DISASTER MANAGEMENT AND CLEANINESS)		25 25 25 25		100
						850

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**Four year Integrated course  
Scheme of B.Sc.-B.Ed. 3<sup>rd</sup> year**

Theory Paper	Course code	Title of the paper	Evaluation			
			External	Internal	Practical	Total
I	B.Sc.-B.Ed. 01	Information & communication (ICT) (Compulsory)	100	-	-	100
II	B.Sc.-B.Ed. 02	Language across the Curriculum	80	20	-	100
III	B.Sc.-B.Ed. 04 (G-A)	Guidance and Counseling in school	80	20	-	100

  
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V	B.Sc.-	Content				
VI	B.Ed.	(PCB & PCM group)				
&	05,	(select any three)				
VII	06	1. Chemistry (I,II,III)	33+33+34	-	50	150
	&	2. Botany (I,II,III)	33+33+34	-	50	150
	07	3. Zoology (I,II,III)	33+33+34	-	50	150
	(G-B)	4. Physics (I,II,III)	33+33+34	-	50	150
		5. Mathematics (I,II,III)	40+40+40	-	30	150
VIII	08 (a,b)	Pedagogy of a school subject (Part-1) 3 <sup>rd</sup> & 4 <sup>th</sup> year (Candidate shall be required to offer any two papers from the followings for Part -1 and other for Part-2)	80	20	-	100
		1. Mathematics				
		2. Physics				
		3. Chemistry				
		4. Biology				
		5. General Science				
Practicum		Special Training Programme				100
		▪ Micro Teaching			10	
		▪ Practice Lesson			50	
		▪ Observation			05	
		▪ Technology Base Lesson			05	
		▪ Criticism Lesson			20	
		▪ Attendance/Seminar/Workshop			10	
		Final Lesson	100			100
						950


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## Four Years Integrated Course Scheme of B.Sc.-B.Ed. IVth Year

Theory Paper	Course Code	Title of the Paper	Evaluation			Total
			External	Internal	Practical	
I	B.Sc.-B.Ed. 01	Environmental Education (Compulsory)*	80	20		100
II	B.Sc.-B.Ed. 02	Creating and inclusive school	80	20		100
III	B.Sc B.Ed. 03	Understanding Disciplines and Subject	80	20		100
IV	B.Sc.-B.Ed. 04(G-A)	Physical Education & Yoga	80	20		100
V	B.Sc.-B.Ed. 05	Gender, School and Society	80	20		100
VI	B.Sc.-B.Ed. 06	Assessment for Learning	80	20		100
VII	B.Sc.-B.Ed. 08(a,b)	Pedagogy of a School Subject (part-2) 1st & 2nd Year (candidate shall be required to offer any two papers from the following for part-1 & other for part-2): 1. Mathematics 2. Physics 3. Chemistry 4. Biology 5. General Science	80	20		100
Practicum		1. Practice teaching 2. Block Teaching (Participation in School Activities Social Participation in Group) 3. Report of any feature of school / case study/action research		50	20	100

  
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	4. Criticism Lesson		
	Final Lesson	100	100
			800

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Four Years Integrated Course  
Scheme of B.Sc.-B.Ed.

Compulsory Papers

Year	Paper
Ist Year	Gen. English
II Year	Gen. Hindi
III Year	Computer Application (ICT)
IV Year	Environmental Education

Group - A	Group - B (PCB & PCM Group) (Select any Three)
1. Instructional System & Educational 2. Peace Education 3. Guidance and Counseling in School 4. Physical Education & Yoga	1. Chemistry (I, II, III) 2. Botany (I, II, III) 3. Zoology (I, II, III) 4. Mathematics (I, II, III) 5. Physics (I, II, III)

Group C: Pedagogy of School Subject A/B: Pedagogy of a School Subject IIIrd Year and IVth Year (candidate shall be required to offer any two papers from the following for part-III & part-IV).

Chemistry
Botany
Zoology
Physics
Mathematics

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- ❖ In all the subjects the student has to study a minimum of 12 papers in 1st year, 12 Paper in IIrd Year, 12 Paper in IIIrd Year and 7 Paper in IVth Year ( Total 43 Papers).
- ❖ Each theory paper will carry 100 marks and content base paper 5(a,b), 6(a,b), 7 (a,b) will carry 150 marks.(with practical part).

### Scheme of Instruction for B.Sc. - B.Ed Courses

Details of courses and scheme of study, titles of the papers, duration etc. for B.Sc. - B.Ed Courses are provided in Tables given below.

Years	Papers	Marks
I Year	12 Paper + Practical	600 + 150 = 750
II Year	12 Paper + Practical	600 + 250 = 850
III Year	12 Paper + Practical + Practicum + Final Lesson	600 + 150 + 100 + 100 = 950
IV Year	7 Paper + Practical + Practicum + Final Lesson	600 + 150 + 100 + 100 = 950
Total	43 Papers	2400 + 700 + 200 + 200 = 3500

O. 321 The objectives of the practical work prescribed for the Integrated Programme of B.Sc.-B.Ed. Degree (Four Year) are follows:

#### PART II

#### Practical Work

#### Objectives:

To develop the ability and self-confidence of pupil teachers:

1. To be conscious of sense of values and need for their inculcation in children through all available means including one's own personal life.
2. Possess a high sense of professional responsibility.
3. Develop resourcefulness, so as to make the best use of the situation available.
4. Appreciate and respect each child's individuality and treat him as independent and integrated personality.
5. Arouse the curiosity and interest of the pupils and secure their active participation in the educative process.



6. Develop in the pupil's capacity for thinking and working independently and guide the pupils to that end.
7. Organize and manage the class for teaching learning.
8. Appreciate the dynamic nature of the class situation and teaching techniques.
9. Define objectives of particular lessons and plan for their achievements.
10. Organize the prescribed subject-matter in relation to the needs, interest and abilities of the pupils.
11. Use the appropriate teaching methods and techniques.
12. Prepare and use appropriate teaching aids, use of the black board and other apparatus and material properly.
13. Convey ideas in clear and concise language and in a logical manner for effective learning.
14. Undertake action research.
15. Give proper opportunity to gifted pupils and take proper care of the back-ward pupils
16. Co-relate knowledge of the subject being taught with other subjects and with real life situations as and when possible.
17. Prepare and use assignments.
18. Evaluate pupil's progress.
19. Plan and organize co-curricular activities and participate in them.
20. Co-operates with school teachers and administrators and learns to maintain school records and registers.

Practical skill to teach the two school subjects offered under Theory papers VIII A/B and the following:

1. Observation of lesson delivered by experienced teachers and staff of the college.
2. Planning units and lessons.
3. Discussion of lesson plans, unit plans and lessons given (including criticism lesson)
4. Organization and participation in co-curricular activities.
5. Setting follows up assignment.
6. Evaluation in terms of educational objectives use of teachers made tests & administration of standardized tests.
7. Black-board work.

  
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8. Practical work connected with school subjects.
9. Preparation and use of audio visual aids related to methods of teaching.
10. Experimental and laboratory work in Chemistry, Botany, Zoology, Physics and Mathematics subjects of experimental and practical nature.
11. Study of the organization of work and activities in the school.
12. Observation and assistance in the health education programme.
13. Observation and assistance in the guidance Programme.
14. Maintenance of cumulative records.
15. Techniques of teaching in large classes.

O.322 A candidate has to deliver at least 40 lessons (20 lessons of one teaching subject in 3<sup>rd</sup> year & 20 lessons of other teaching subject in 4<sup>th</sup> year) in a recognized school under the supervision of the staff of the college shall be eligible for admission to the examination for the degree of B.Sc.-B.Ed.

#### Notes-

- i. Teaching subject means a subject offered by the candidate at his/her running B.Sc.-B.Ed. course either as a compulsory subject or as an optional subject provided that the candidate studied it for at least two years. Thus the qualifying subjects like General English, General Hindi, General Education and Environmental Education prescribed for running B.Sc.-B.Ed. course of the University or a subject dropped by candidates at the Part-1 stage of the degree course shall not be treated as teaching subject.
- ii. Only such candidate shall be allowed to offer General Science for the B.Sc.-B.Ed. examination as have taken their running B.Sc.-B.Ed. course with any two subjects out of Chemistry, Zoology, Botany, Physics, Mathematics.



  
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O.323 No candidate shall be allowed to appear in the integrated B.Sc.-B.Ed. examination I, II, III & IV year unless he/she has attended (80% for all course work & practicum and 90% for school internship)

O.324 The examination for integrated B.Sc.-B.Ed. for four years shall be in two parts: - Part 1<sup>st</sup> comprising theory papers & Part- 2<sup>nd</sup> practice of teaching in accordance with the scheme of examination laid down from time to time.

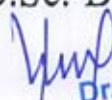
O.325 Candidate who fails in integrated B.Sc.-B.Ed. examination in theory may present themselves for re-examination there in at a subsequent examination without attending a further course at an affiliated training college.

Provided that a candidate who fails in any one of the theory papers and secures at least 48% marks in the aggregate of the remaining theory papers may be allowed to reappear in examination in the immediately following year in the paper in which passing marks prescribed for the paper in which he/she appeared and shall be deemed to have secured minimum passing marks only prescribed for the paper (irrespective of the marks actually obtained by him/her) for the purpose of determining his/her division in accordance with the scheme of examination. The candidate shall have to repeat the whole examination in subsequent year in case he/she fails to clear the paper in which he/she failed.

O.326 Candidate who fail in the integrated B.Sc.-B.Ed. Examination Part-III and Part-IV only in the practice of teaching may appear in the practical examination in the subsequent year provided that they keep regular terms for four calendar months per year and give at least 40 lessons (20 in Part- III & 20 in Part- IV) supervised lessons.

O.326 A: A candidate who complete a regular course of study in accordance with the provision laid down in the ordinance, at an affiliated teacher's training college for four academic year but for good reasons fails to appear at the integrated B.Sc.-B.Ed. Examination may be admitted to a subsequent examination as an Ex-student as defined in O.325 or O.326 above.

O.326 B: No candidate shall be permitted to appear as an Ex-student at more than one subsequent examination. The Integrated B.Sc.-B.Ed. programme shall be of duration.

  
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Registrar



of four academic years, which can be completed in a maximum of five years from the date of admission to the integrated B.Sc.-B.Ed. degree.

Regulation 42 :-

### Scheme Of Integrated B.Sc.-B.Ed. Four Year Examination

The integrated B.Sc.-B.Ed. (Four Years) will consist of the following components;

**Part-I-** Main theory papers at B.Sc.-B.Ed. I to IV paper nos. are 01, 02, 03 & 04 in each session are of three hours carrying 100 marks in 02, 03 & 04 (80 for theory + 20 for sessional) each. Paper 05 A/B, 06 A/B, 07 A/B in each session are three hours carrying 150 marks (100 marks theory + 50 practical). In Mathematics (120 marks theory + 30 marks practical) and (08\* A/B only in III & IV year) in each session are of three hours carrying 100 marks (80 marks theory + 20 marks sessional) each.

**Part-II-** Practice teaching – Micro Teaching, Internship, Practice Teaching of 20 weeks (10 at B.Sc.-B.Ed. Part-III & 10 at B.Sc.-B.Ed. Part-IV) Block Teaching and Criticism and Final Lesson in III & IV Year per teaching subject .

### **Organization Evaluation Of Practice Teaching:**

1. Every candidate will teach at least 40 lessons (20 in III Year & 20 in IV Year) during practice teaching session. At least 10 lessons in each subject should be supervised.
2. 40 (20+20) lessons as desired in the syllabus should be completed as full period classroom lesson. Micro teaching lesson to be used in addition to those 40 lessons for developing certain teaching skills.
3. A minimum of 10 lessons in each subject will be supervised evaluated by the subject specialist or a team of specialists of the subject.



  
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4. By and large, the evaluation of the performance in the practical teaching will be based on the last 10 lessons in the subject when the student has acquired some competence and skill of teaching.

5. The internal assessment in practice of teaching will be finalized by the principal with the help of members of the teaching staff and the same will be communicated to the university before the commencement of the practical each year.

6. At integrated B.Sc.-B.Ed. III year each candidate should be prepared to teach one lessons at the final practice examination. At the integrated B.Sc.-B.Ed. IV year exam candidate should be prepared to teach two lessons (one in each subject). The external examiner may select at least 10% of the candidates to deliver two lessons in integrated B.Sc.-B.Ed. IV year.

7. There will be a board of examiners for the external examination for each college which will examine each candidate in at least one lesson and a minimum of 15% in two lessons (one in each of the two subjects).

8. The board of examination will consist of:

(a) The Principal of the college concerned.

(b) A Principal or a senior and experienced member of the teaching staff of training college, affiliated to Maharaja Surajmal Brij University.

(c) <sup>may be appointed</sup> external examiner from outside the Maharaja Surajmal Brij University or a senior member of the teaching staff of an affiliated training college.

(d) The board as far as possible will represent social science, language and science.

9. Approximately 50 lessons will be examined by the board each day.

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### Working Out the Result and Awarding the Division:

1. A candidate in order to be declared successful at the integrated B.Sc.-B.Ed. I, II, III & IV Year Examination shall be required to pass separately in Part-I (Theory) and Part-II (Practice of teaching).
2. For a passing in Part-I (theory) a candidate shall be required to obtain at least (a) 30% marks in each - Theory Paper, Sessionals and Practical; (b) 36% marks in the aggregate of all the theory papers.
3. For passing in Part-II (school internship Practice of teaching) a candidate shall be required to obtain separately at least-
  - 40% marks in the external examination.
  - 40% marks in the internal assessment.
4. The successful candidates at integrated B.Sc.-B.Ed. four year examination obtaining total marks will be classified in three divisions and shall be assigned separately in theory and school internship practice of teaching as follows:

Division	Theory	Practice of Teaching
I	60%	60%
II	48%	48%
Pass	36%	40%

The practical work record shall be properly maintained by the college and may be made available for work satisfaction of external examiner in school internship (practice teaching), those are expected to submit a report regarding this separately.



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Acad.I

नंबर 36 से कम अंक आने पर छात्रों को उत्तीर्ण नहीं किया जायेगा। इस प्रश्न-पत्र में प्राप्त अंकों को श्रेणी निर्धारण हेतु नहीं जोड़ा जायेगा।  
अंक विभाजन - प्रश्न पत्र में दो भाग होंगे - 1. साहित्य खण्ड एवं 2. व्याकरण खण्ड। साहित्य खण्ड में दो भाग होंगे - गद्य भाग एवं पद्य भाग। प्रत्येक भाग के लिए 25 अंक निर्धारित हैं।

क	दो व्याख्या पद्य से (प्रत्येक में विकल्प देना है)	60 अंक
ख	दो व्याख्या गद्य से (प्रत्येक में विकल्प देना है)	5 x 2 = 10 अंक
ग	आलोचनात्मक प्रश्न पद्य से (विकल्प देना है)	5 x 2 = 10 अंक
घ	आलोचनात्मक प्रश्न गद्य से (विकल्प देना है)	7½ x 2 = 15 अंक
		7½ x 2 = 15 अंक

## व्याकरण / व्यावहारिक हिन्दी खण्ड

i.	निबंध लेखन - शब्द सीमा 300 शब्द	25 अंक
ii.	कार्यालयी लेख - शासकीय-अर्द्धशासकीय पत्र, परिपत्र, अधिसूचना, कार्यालय ज्ञापन, विज्ञप्ति, कार्यालय आदेश।	8 अंक
iii.	संक्षेपण (विकल्प देना है)	4x2 = 8 अंक
iv.	पल्लवन (विकल्प देना है)	5 अंक
v.	शब्द निर्माण की प्रविधि - उपसर्ग, प्रत्यय, संधि, समास	4 अंक
vi.	वाक्य शुद्धि / शब्द शुद्धि	5 अंक
vii.	मुहावरे	5 अंक
viii.	पारिभाषिक शब्दावली	5 अंक
ix.	व्याकरणिक कोटियाँ - संज्ञा, सर्वनाम, विशेषण, क्रिया, क्रिया विशेषण	5 अंक

## साहित्य खण्ड : गद्य-पद्य की निर्धारित रचनाएँ

गद्य भाग - निम्नांकित पाठ निर्धारित हैं -

1.	कहानी	: बड़े घर की बेटी (प्रेमचंद)
2.	संस्मरण	: प्रणाम (महादेवी वर्मा)
3.	रेखाचित्र	: बाईस वर्ष बाद (यनारसीदास चतुर्वेदी)
4.	विज्ञान	: शनि सबसे सुन्दर ग्रह (गुणाकर मुळे)
5.	निबंध	: गेहूँ और गुलाब (शमशेर बेनीपुरी)
6.	निबंध	: सूखे चेहरों का भूगोल (मणिमधुकर)
7.	निबंध	: मजदूरी और प्रेम (सरदार पूर्ण सिंह)
8.	निबंध	: राजस्थान की सांस्कृतिक धरोहर (अमरचंद नाहटा)
9.	निबंध	: राष्ट्र का स्वरूप (वासुदेव शरण अग्रवाल)
10.	ध्वंग्य	: टिटुरता हुआ गणतंत्र (हरिशंकर परसाई)

## पद्य भाग -

1.	कबीर- 1.	मन रे ! जागत रहिये भाई
	2.	हमारे राम रहीम करीमा केसौ, अलह राम सति सोई।
	3.	काजी कौन कतेब बखानै।
	4.	मन रे! हरि भजि, हरि भजि हरि भजि भाई।
	5.	है मन भजन कौ प्रवान

संदर्भ : कबीर ग्रंथावली-श्यामसुंदरदास

2.	सूरदास 1.	किलकत कान्ह घटुरुवनि आयत
	2.	मुरली तऊ गोपालहिं भायत
	3.	देखौ माई सुन्दरता कौ सागर



4. जसोदा वार बार यौं माछीं
5. चित दै सुनौं स्याम प्रवीन

3. तुलसीदास

1. कबहुँक अंघ अवसर पाई
  2. अवलौं नसानी अघ न नरौहीं
  3. गोहि मूठ मन बहुत वियोगी
  4. ऐसौ को उदार जग मांही
  5. गन पछितैहैं अवसर बीते
- सदभ विनय पत्रिका, गीता प्रेस गोरखपुर

4. रहीम

गद

1. छवि भावन मोहनलाल की
  2. कमल दल नैननि की उनमानि
- दोहा

1. प्रीतम छवि नैननि बसी
2. बसि कुसंग चाहत कुसल
3. रहिमन अंसुआ नैन बरि
4. रहिमन औछे नरन सौं वैर भलौ ना प्रीति
5. रहिमन निज मन की बिथा
6. काज परे कछु और है
7. खैर खून खौंसी, खुसी बैर प्रीति मदपान
8. दादुर मोर किसान मन लाग्यो रहे घन माँहि
9. पावस देखि रहीम मन कोइल साधै मौन
10. रहिमन बिगरी आदि को बनै न खरचे दाम

सदभ : रहीम ग्रन्थावली, विद्यानिवास मिश्र

5. पदमाकर कविरा

1. कुलन में केलिन में कछारन में कुजन में
2. और भाँति कुजन में गुंजरित और भीरे
3. पात बिनु कीन्हे ऐसी भाँति गुन बेलिन के
4. चितै चितै चारों ओर चौकि चौकि परे त्योंहीं सवैया
5. या अनुराग की लखीं जहँ.....
6. फाग के भीर अमीरन में गहि गोविन्द लैं यई भीतर गोरी।

6. मैथिलीशरण गुप्त

साकेत - अष्टमसर्ग से  
कैकेयी का अनुताप  
तदनन्तर बैठी समा उटज के आगे .....  
सौ बार धन्य वह एक लाल की माई।

7. प्रसाद : कामायनी, श्रद्धासर्ग - कहा आगन्तुक ने सस्नेह विजयिनी मानवता हो जाय।

8. पंत : 1. प्रथम रश्मि छन्द 1-13

2. भारत माता

9. निराला: 1. भारती जय विजय करे

2. बादल राग -1

3. दलित जन पर करो करुणा

4. फिर नभ घन घहराये।

10. रागधारी सिंह दिनकर - रश्मि-तृतीय सर्ग - आरंभिक अंश

सच्चे शूरमा

सच है विपत्ति जय आती है ..... क्या कर सकती चिनगारी है।



  
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## B.Sc.-B.Ed. 2<sup>nd</sup> Year

### Knowledge and curriculum

Marks -100

#### Objectives

1. To create excellence in the educational system for facing the knowledge of challenges of the twenty first century.
2. To encourage the application of knowledge skills in the Indian educational institutions.
3. To enhance the quality of pre-service and in-service teacher training.
4. To realize the importance of curriculum modification.
5. To provide awareness and understanding of social environment.
6. To transform teacher-pupils in to a vibrant knowledge – based society.

#### Unit-1: Concept of knowledge & child's construction of knowledge

- Meaning and nature of knowledge.
- Sources of attainment of knowledge in school with special references of society, culture and modernity.
- Distinctions between knowledge and skill, knowledge and information, reason and belief.
- Sources of knowledge: Empirical knowledge Vs Revealed knowledge.
- Different kinds of knowledge:
  - (a) Disciplinary knowledge: Concept and Alternative concepts.
  - (b) Course content knowledge: Criteria of selection and concerns.
  - (c) Indigenous knowledge Vs Global knowledge.
  - (d) Scientific knowledge Vs Religious knowledge.
- Concepts of Belief, Information, Knowledge and Understanding.

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## Unit II Facts of Knowledge-

Different facts of knowledge and relationship such as-

Local and Universal

Concrete and Abstract

Theoretical and Practical

School and Out of School

(With an emphasis on understanding special attributes of school knowledge)

## Unit III : Concept of curriculum

- Meaning, Nature and Objectives of Curriculum, Need for curriculum in schools.
- Philosophical, Psychological, Sociological and Scientific basis of Education with reference of Gandhi, Tagore, Dewey and Plato.
- Difference between curriculum and syllabus.
- Factors Influencing curriculum.
- Various types of curriculum- Subject centered, Experience centered, Activity centered, Child centered, and Craft centered.

## Unit IV Curriculum Planning and Transaction

- Construction of Curriculum
- Models of Curriculum Development given by Franklin Bobbit, Ralph Tyler, Hilda Taba and Philip Jackson
- Curriculum Transaction: Role of a teacher in knowledge Construction through Dialogue, Challenge and Feedback as a Critical Pedagogue.

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## Unit-V School: The Site of Curriculum Engagement

- Role of School Philosophy, Administration (and organization) in creating a context for transacting the curriculum effectively.
- Role of Infrastructural support in Teaching and Learning: Classroom seating Arrangement, Library, Laboratory, Playground, Canteen etc.
- School Culture and Organizational ethos as the context for Teachers' Work.
- Teacher's role and Support is "Developing Curriculum, Transacting Curriculum and Researching Curriculum": Realities and expectations.

### Test and Assignment:-

1. Class Test

10 Marks

2. Project (Any one of the following) 10 Marks

- Seminars discussions, movie appraisals, group work, field works,
  - Projects and the close reading of articles, policies, documents from key practitioners in the area of Curriculum Studies in Education.
- How does school knowledge get reflected in the form of curriculum, syllabus and textbooks?
  - Review of a text book of any school subject.
  - Prepare a children's literature handbook.

### References-

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2. Balsara, M (1999). Principles of Curriculum Reconstruction. New Delhi, Kanishka Publication.
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5. Mohanty, J. (2003). Modern Trends in Education Technology. (Reprint Addition 2013)
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7. Ramesh Shukla (2005). Dictionary of Education (2005). New Delhi, A.P.H. Publishing Corporation.
8. Soti and Sharma, A. (2014). Eminent Educational Thinkers of India. Agra, R.S.A. International Publisher. Agra.
9. [www.knowledgecommission.gov.in](http://www.knowledgecommission.gov.in)
10. [www.ncert.nic.in](http://www.ncert.nic.in)
11. [www.takingglobal.org/exprest/article.html?cid-178](http://www.takingglobal.org/exprest/article.html?cid-178)

## Learning and Teaching

MARKS -100

### Objectives:

After completing the course the students will be able:-

1. To get acquainted with the concept, principles and nature of teaching and learning.
2. To understand the different learning styles based on the difference of learners.
3. To study the relationship between teaching and learning and the factors which influence learning
4. To make use of modern information and communication technology to improve teaching-learning process.

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5. To understand learning as a process of communication and be aware of various resources available for making it effective.
6. To study and analyze the socio cultural factors influencing cognition and learning.
7. To study and understand learning in constructivist perspective.
8. To get acquainted with professional ethics of teaching profession.
9. To study the new trends and innovations involved in teaching learning process with professional ethics.

#### Unit I – Learning and Teaching Process

- Teaching: Meaning, Nature, Principle, Levels, Phases and maxims of teaching. Difference of training and instruction from teaching.
- Learning : Meaning, Nature, Factors affecting learning and types of learning
- Relationship between teaching and learning, Resource and their development for promoting teaching – learning process.
- Tradition and changes in view of the learning process a shift from teaching and learning.

#### Unit II – Source of Effective Teaching Learning

- Effective teaching: Meaning, component and parameters of effective teaching, classroom instruction strategies, Teacher behavior and classroom climate. (Flander's interaction analysis system)
- Instructional objectives in terms of bloom's taxonomy.
- Programming Learning: Concept, principles and types of programme learning.
- Concept of micro teaching, various teaching skills.

#### Unit III – Educational Technology

- Educational Technology: Meaning, Importance and Approaches.
- Model of teaching: Meaning, Assumptions and Fundamental elements of a model of a teaching suchman's inquiry training model.
- Communication: Concept, Elements and Communication skills, Teaching Learning process as the communication.

#### Unit IV – New Trends in teaching learning due to technological innovation

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- Analysis and organisation learning in diverse class room: Issues and concerns.
- Team Teaching, Panel discussion, Conference, Symposium, Workshop, Cooperative learning, Group discussion, Brain storming- issues and concerns with respect to organise teaching and learning process in a classroom such as study habits, self learning, learning skills, interest, ability, giftedness with respect to socio economic background.

#### Unit V Teaching as profession:

- Ethics of teaching, professional growth of a teacher
- Teacher as a professional practitioner, identification of the performance, competency and commitment area for teacher.
- Need of Professional enrichment of teachers
- Professional ethics and its development

#### Test and Assignment:-

1. Class Test 10 MARKS
2. Any One 10 MARKS

- Preparation and practical implication of at least two technical learning resources ( transparencies, Power Point Slides, Animated Videos)
- Identify the learning need of the learner in diverse class room with regard to their abilities, learning styles, socio cultural difference, learning difficulties and their implication for class room teaching.
- Identify the professional skills for teachers and report any two programmes for professional development of teaching organized by the school/ training college/ any other agencies.
- Conduct and Interview of any two students with multilingual background and face the problems in teaching learning process.

#### REFERENCES:

1. Aggarwal J.C.( 2004), " Educational Psychology", Vikas Publishing House Pvt. Ltd., New Delhi
2. Berk Laura (2007), " Child Development"; Prentice Hall of India, New Delhi.



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5. Coleman Margaret (1996), " Emotional and Behavioral Disorders"; Allyn and Bacon, Bostan.
6. Erickson Marian (1967), "The Metally Retarded Child in the classroom"; The macmillan company
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8. Goleman Daniel (2007), " Social Intelligence"; Arrow Books, London.
9. Henson Kenneth (1999), "Educational Psychology For Effective Teaching"; Wadsworth Publishing Co. Belmont, california
10. Khandwala Pradip(1988), "Fourth Eye" ; A. H. Wheeler, Allahabad.
11. Mangal S.K. (1993), "Advanced Educational Psychology" Prentice Hall of India Pvt. Ltd., New Delhi
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13. Osborn Alex (1971), "Your Creative Power"; Saint Paul Society, Allahabad, India.
14. Pringle M.K. and Varma V.P.(Ed) (1974), "Advances in Educational Psychology" University & London Press, London
15. Shaffer David(1999), "Social and Personality Development" Wadsworth Thomson Learning, U.S.A.
16. Sharma Tara Chand (2005), "Reading Problems of Learners "; Sarup and Sons, New Delhi.
- 17: Sousa David (2001), " How The Brain Learns"; Cowin Press, Inc. A Sage Publication Company, California.



  
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# PEACE EDUCATION

## OBJECTIVES:-

MARKS-100

The course will enable the student teachers to –

- to understand the concept of peace education.
- to acquire the knowledge about peaceful mind makes peaceful world.
- To understand the theory and practice of peace education
- To understand the philosophical thoughts for peace.
- To promote awareness about the existence of Conflicting relationships between people, within and between nations and between nature and humanity.
- To create frameworks for achieving Peaceful and Nonviolent societies.

## UNIT I Concept of Peace

- Negative peace and Positive peace,
- Negative Peace - Peace as absence of war and abolition of war, as the minimization and elimination of violence, as removal of structural violence, Peace with Justice, Peace and Nonviolent liberation technique (Satyagraha) and Disarmament.
- Positive peace: Peace as Love, Mutual Aid, Positive Interpersonal relations, Peaceful resolution of Conflict, Peace and Development, Alternative defense, living with nature and preserving Life and Eco system and Holistic Inner and Outer Peace.

## Unit -2: Introduction of Peace Education

- Meaning, Concept and need of Peace Education.
- As a universal value
- Aims and Objectives of Peace Education
- Role of Social Agencies: Family, Religion, Mass Media, Community, School, NGO's, Government Agencies in promoting peace education.
- Current Status of Peace Education at Global Scenario.

## Unit 3- Bases of Peace Education

- Becoming peace teacher-acquisition of knowledge, values and attitudes.
- Life Skills required for Peace Education (WHO)
- Areas of Peace Education: Conflict management, Conservation of Environment



- Challenges to Peace- Stress, Conflict, Crimes, Terrorism, Violence and Modernization.
- Strategies and Methods of teaching Peace Education- Meditation, Yoga , Dramatization , Debate and etc.

#### UNIT 4. Effective Teaching of Peace

- Peace Education for Life and Life long education, Peace Education and Removing the Bias towards Violence – Correcting Distortions.
- Model of integrated Learning – Transactional Modalities - Cooperative Learning, Group Discussion, Project Work, Role Play, Story Telling, Rational Analytic Method – Case Analysis and Situation analysis,
- Peace Research, International classroom, International Parliament, Peace Awards, Creating Models for Peace technology - development of new tools, techniques, mechanisms and institutions for building up peace and Engaging students in Peace Process.

#### Unit 5- Transacting Peace Education & Role of Social Agencies:

- Integration of Peace Education through curricular and co-curricular activities
- Role of mass media in Peace Education
- Programmes for Promoting Peace Education –UNESCO
- Addressing challenges to peace in Multicultural Society.
- Role of Religion in propogation of Peace. Nelson Mandela Mother- Theresa, Vivekananda, Gandhian Philosophy in promoting Peace Education. Role of Great personalities in promoting Peace.

#### Tasks and Assignments

1. Class Test 10 marks
2. Any one 10 Marks

- Prepare a Role Play of Great Personalities who worked/ contributed towards Peace.
- Organize an activity in schools to promote Peace.
- Write a report on Gandhi and Peace.

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- Write about the contribution of any two Noble prize winners for Peace.
- Prepare an album of Indian Philosophers and write their thoughts on peace.

REFERENCES :-

1. Adams.D (Ed) (1997) UNESCO and a culture of Peace: Promoting a Global Movement. Paris UNESCO.
2. Aber,J.L. Brown, J.L.A.Henrich, C.C.(1999) Teaching Conflict Resolution: An effective.
3. Dr.Haseen Taj (2005) National Concerns and Education, Neelkamal Publications.pvt.Ltd
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6. Prakashan, Agra-2 7. Wttp://www.un.org/cyberschoolbus/peace/content.htm.

  
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B.Sc. Part II, Session 2018-19

2. Chemistry

Scheme:

Max Marks: 150

	Duration (hrs.)	Max. Marks
Paper I	3	33
Paper-II	3	33
Paper-III	3	34
Practical	5	50

Note: Ten (10) questions are to be set taking two (02) questions from each unit. Candidates have to answer any 5 questions selecting at least one question from each unit.

CH-101 Paper I: Inorganic Chemistry

(2 hrs or 3 Periods/week)

Unit-I

**Chemistry of Element of first Transition Series:**

Characteristic properties of d-block elements. Properties of the elements of the first transition series. Their binary compounds and complexes illustrating relative stability of their oxidation states. Coordination number and geometry.

**Chemistry of Elements of second and Third Transition Series:**

General characteristics. Comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

Unit-II

**Coordination Compounds:**

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates. Nomenclature of coordination compounds. Isomerism in coordination compounds. Valence bond theory of transition metal complexes.

  
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### Unit-III

#### Chemistry of Lanthanide and Actinide Elements:

Electronic structure. Oxidation states. Ionic radii and lanthanide contraction. Complex formation occurrence and isolation of lanthanide compounds.

General features. Chemistry of separation of Np, Pu and Am from Electronic configuration oxidation states magnetic properties. Complexation behavior, comparison of lanthanides and actinides. super heavy elements.

### Unit IV

#### Oxidation and Reduction:

Uses of Redon Potential data. Analysis of redox cycle. Redox stability in water frost. Latimer and Pourbaix diagrams Application of redox data in the extraction of elements.

### Unit -V

#### Acids and Bases:

Theories : Arrhenius. Bronsted- Lowry, Lux-Flood, Solvent system concept and Lewis' concept of acids and bases.

#### Non-aqueous Solvents:

Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid  $\text{NH}_3$  and liquid  $\text{SO}_2$ .

## CH-202 Paper-II: Organic Chemistry

(2 hrs. or 3 periods/week)

### Unit-I

#### Electromagnetic Spectrum : An introduction

#### Absorption Spectroscopy

Ultraviolet (UV) spectroscopy- Absorption laws (Beer- Lambert law , molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions. Effect of solvents on transitions, effect of conjugation shifts. UV spectra of conjugated and enones.

Infrared (IR) spectroscopy – Molecular vibrations, Hook's law .selection rules, intensity and position of IR bands. Measurement of IR spectrum , fingerprint region, characteristics absorption of various functional groups and interpretation of simple organic compounds.

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## Unit-II

Alcohols – Classification and nomenclature .

Monohydric alcohols- Methods of formation by reduction of aldehydes, ketones carboxylic acids and esters. Hydrogen bonding . Acidic nature, Reactions of alcohol with mechanism. Dihydric alcohols – methods of formations. Chemical reactions of vicinal glycols, oxidative ,Trihydric alcohols method of formation. Chemical reactions of glycerol.

Phenols- Nomenclature structure and bonding Preparation of Phenols Physical properties and acidic character, comparative acidic strength of alcohols and phenols. Reactions of phenols electrophilic aromatic substitution. Acylation and carboxylation Mechanism of Fries rearrangement. Claisen rearrangement. Gatterman synthesis. Hauben reaction, Lederer-Manasse reaction and reamer- Tiemann reaction.

Ethers and Epoxides – Method of formation. Physical properties. Chemical reactions-cleavage and autooxidation Ziesel's method.

Synthesis of epoxides , Acid and base catalyzed ring opening of epoxides, orientation of epoxides ring opening reaction of Grignard and organolithium reagents with epoxides

## Unit- III

Aldehydes and Ketones: Structure of the carbonyl group. Syntheses of aldehydes from acid chlorides synthesis of aldehydes and ketones using 1,3-dithianes. Syntheses of ketones from nitriles and from carboxylic acids. Physical properties.

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol. Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives Witting reaction , Mannich reaction. Oxidation of aldehydes , Baeyer – Villiger oxidation of ketones , Cannizzaro reactions MPV (Meerwein– Ponder –Verlay ), Clemmensen, wolf-Kishner,  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  Reductions Halogenation of enolizable Ketones. Use of acetals and 1,3-dithiane as protecting group.

## Unit –IV

Carboxylic Acids

Structure and bonding, physical properties. acidity of carboxylic acids, effects of substituents on acid strength, preparation of carboxylic acids. Reactions of carboxylic acids, Hell-Volhard – Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation.

Methods of formations and chemical reactions of halo acids. Hydroxy acids- malic tartaric and citric acids.

  
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**Dicarboxylic acids:** Methods of formations and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

### Carboxylic Acid Derivatives

Structure nomenclature and synthesis of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties. Interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives. Chemical reaction, mechanisms of esterification and hydrolysis (acidic and basic)

### Unit V

### Organic compounds of Nitrogen

Preparation of nitroalkanes and nitroarenes. Chemical reaction of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Amines structure nomenclature and preparation of alkyl. And aryl amines (reduction of nitro compounds nitriles) reductive amination of aldehydic and ketonic compounds. Physical properties stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amines salts as phase-transfer catalysis. Gabriel phthalimide reaction and Hoffmann bromamide reaction with mechanism.

Reactions of amines electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid diazotization and mechanism synthetic transformations of aryl diazonium salts. a/o coupling and its applications.

### CH-203 Paper III : Physical Chemistry

(2 hrs. or 3 periods/week)

### Thermodynamics-I

**Definition of Thermodynamic Terms :** System surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process, concept of heat and work.

**First Law of Thermodynamics:** Statement definition of internal energy and enthalpy, heat capacity. Heat capacities at constant volume and pressure and pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversion temperature. Calculation of  $w, q, du$  &  $dh$  for the expansion of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchoff's equation.

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## Unit -II

### Thermodynamics -II

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

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

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

### Chemical Equilibrium:

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action Le Chatelier's principal. Reaction Isotherm and reaction isochore. Clapeyron equation and Clausius-Clapeyron equation, applications.

## Unit -III

**Phase Equilibrium:** Statement and meaning of the terms: phase component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system -water,  $\text{CO}_2$ , and Sulphur systems.

**Phase equilibria of two component system -** solid- liquid equilibria simple eutectic Bi-Cd, Pb-Ag, systems. Desilverization of lead.

**Solid solutions-** Compound formation with Congruent melting point (Mg-Zn) and incongruent melting point. ( $\text{NaCl-H}_2\text{O}$ ) systems. Freezing mixture acetone- dry ice.

**Liquid- Liquid mixtures:** Ideal liquid mixture. Raoult's and Henry's Law, Non ideal system- azeotropes  $\text{HCl-H}_2\text{O}$  and ethanol -water systems. Partially miscible liquids : phenol -water lower distribution law thermodynamic derivation. Application.

## Unit IV

### Electrochemistry-I

Electrical transport- conduction in metals and in electrolyte solutions, Specific conductance and equivalent conductance, measurement of equivalent conductance. Variation of equivalent and specific conductance with dilution.



Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes ( elementary treatment only ). Transport number, definition and determination by Hittorf's method and moving boundary method.

Applications of conductivity measurements :

Determination of degree of dissociation, determination of  $K_a$  of acids, determination of solubility product of sparingly soluble salt. Conductometric titrations.

### Unit- V

#### Electrochemistry- II

Types of reversible electrodes : Gas- metal- ion, metal – insoluble salt anion and redox electrode, potential, standard hydrogen electrode, reference electrodes of cell E.M.F. and single electrode potential , standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells – reversible and irreversible cells conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computations of cells EMF. Calculation of thermodynamic quantities of cell reactions ( $\Delta G, \Delta H$  and  $K$  ), Polarization, over potential and hydrogen over voltage .

Concentration cell with and without transport, liquid junction potential application of concentration cells. Valency of ions solubility product and activity coefficient, potentiometric titrations. Definitions of pH and  $pK_a$ . determination of pH using hydrogen quinhydrone and glass electrodes by potentiometric methods.

#### Suggested Books:

1. Principles of Physical Chemistry : B.R. Puri, Sharma and M.S. Pathania
2. A Text Book of Physical Chemistry : A.S. Negi and S.C. Anand,
3. A Text Book of Physical Chemistry : Kundu and Jain
4. The elements of Physical Chemistry : P.W. Atkins Oxford.
5. University General Chemistry : C.N.R. Rao, Mac Millen

### CH-204 Chemistry Practical ( Pass Course), Laboratory Course-II

(4 hrs. or 6 periods/week)

#### Inorganic Chemistry

##### (i) Preparation of Standard Solutions

Dilution – 0.1 M to 0.001 M solutions :

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**(ii) Volumetric Analysis**

- (a) Determination of acetic acid in commercial vinegar using NaOH
- (b) Determination of alkali content in antacid tablet using HCl
- (c) Estimation of calcium content in chalk as calcium oxalate by permanganometer
- (d) Estimation of hardness of water by EDTA
- (e) Estimation of ferrous and ferric by dichromate method
- (f) Estimation of copper using thiosulphate

**(iii) Gravimetric Analysis**

- (a) Cu as CuSCN
- (b) Ni as Ni (dimethylglyoxime)

**Organic Chemistry**

**(i) Laboratory Techniques**

**A. Thin Layer Chromatography**

Determination of  $R_f$  values and identification of organic compounds.

- a) Separation of green leaf pigments (spinach leaves may be used).
- b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone hexan-2-one and hexan-3-one using toluene and light petroleum (40-60) solvent system.
- c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)

**B. Paper Chromatography : Ascending and Circular**

Determination of  $R_f$  values and identification of organic compounds.

- (a) Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid. Leucine and glutamic acid. Spray reagent - ninhydrin.
- (b) Separation of a mixture of DL- alanine, glycine and L-Leucine using n- butanol acetic acid : water (4:1:5), Spray reagent - ninhydrin.
- (c) Separation of monosaccharides a mixture of D- galactose and D- Fructose using n-butanol : acetone ; water (4:5:1) Spray reagent aniline hydrogen phthalate.

**(ii) Qualitative Analysis**

Identification of two organic compounds (one solid and one liquid) through the functional group analysis determination of melting point, boiling point and preparation of suitable derivatives

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## Physical Chemistry

### (i) Transition Temperature

(a) Determination of the transition temperature of the given substance by thermometric dilatometric method (e.g.  $\text{MnCl}_2 \cdot 4\text{H}_2\text{O} / \text{SrBr}_2 \cdot 2\text{H}_2\text{O}$ ).

### (ii) Thermo chemistry

a) To determine the solubility of benzoic acid at different temperatures and to determine  $\Delta H$  of the dissolution process.

b) To determine the enthalpy of neutralization of weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid weak base .

c) To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born-haber cycle.

### (iii) Phase Equilibrium

a) To study the effect of a solute (e.g. NaCl succinic acid ) on the critical solution temperature of two partially miscible liquid (e.g. phenol- water system) and to determine the concentration of that solute in the given phenol water system.

b) To construct the phase diagram of two components (e.g. diphenylamine benzophenone ) systems by cooling curve method.

### (iv) Distribution law

a) To study the distribution of iodine between water and  $\text{CCl}_4$ .

b) To study the distribution of benzoic acid between benzene and water

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(Instructions to the Examiner )

B.Sc. Part II

CH-204 Chemistry Practical (Pass Course )

Max.Marks: 50

Duration of Exam : 5 hrs.

Inorganic Chemistry

  
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Ex.1 Volumetric Analysis

Or

Gravimetric Analysis as mentioned in the syllabus

16

Organic Chemistry

Ex.2 Identification of two organic compounds (one solid and one liquid) through the functional group analysis, determination of melting point, boiling point and preparation of suitable derivatives.

Or

Perform one experiment out of the experiments on thin layer and paper chromatography given in syllabus.

12

Physical Chemistry

Ex.3 Perform one of the physical chemistry experiments as mentioned in the syllabus

12

Ex. 4 Viva – voce

5

Ex.5 Record

5

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50

*Books Suggested (Theory Course)*

1. Basic Inorganic Chemistry F.A. Cotton: G. Wilkinson and P.L. Caus Wiley.
2. Concise Inorganic Chemistry J.D. Lee. ELBS
3. Concepts Inorganic Chemistry B. Doughts. D. Me Danial and J. Alexander
4. Inorganic Chemistry. D.F. Shriver P.W. Atkins and C.H. Langford .Oxford .
5. Inorganic chemistry. W.W. Porterfield Addison Wesley
6. Inorganic Chemistry. A.G. Sharpe EI BS
7. Inorganic Chemistry. G.I. Miessler and D.A. Tarr. Prentice Hall
8. Organic Chemistry. Morrison and Boyd. Prentice Hall
9. Organic Chemistry. L.G. Wade jr Prentice Hall
10. Fundamental of Organic Chemistry. Solomons. John Wiley.
11. Organic chemistry Vol. I,II,III S.M. Mukher ji, S.P. Singh, and R.P. Kapoor, Wiley Eastern Ltd (New Age International)
12. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.
13. Introduction to Organic Chemistry, Stretciewicz. Heathcock and Kosover, Macmillan
14. Physical Chemistry. G.M. Barrow. International Student Edition, McGraw Hill
15. Basic Programming with Application, V.K. Jain Tata McGraw Hill

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16. Computer and common Sense. R. Hunt and Shelly, Prentice hall
17. University General Chemistry, C.N.R. Rao Macmillan
18. Physical Chemistry. R.A. Alberty, Wiley Eastern Ltd.
19. The Elements of Physical Chemistry, P.W. Atkins, Oxford
20. Physical Chemistry Through Problems, S.K. Dogra and S. Dogra Wiley Eastern Ltd.

*Books Suggested (Laboratory Course)*

1. Vogel's Qualitative inorganic Analysis, Revised, Svehla, Orient Longman
2. Vogel's Textbook of quantitative inorganic Analysis (revised) J. Bassett. R.C. Deneoy, G.H. Jeffery and J. Mendham .ELBS.
3. Standard Methods of Chemical Analysis. W.W. Scott. The Technical Press
4. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
5. Handbook of preparative Inorganic Chemistry. Vol. I& II Braver, Academic Press.
6. Inorganic Synthesis. McGraw Hill
7. Experimental Organic Vol. I&II P.R. Singh, D.S. Gupta and K.S. Bajpai, Rata McGraw Hill
8. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
9. Vogel's Textbook of Practical Organic Chemistry, R.S. Furniss. Hannaford, V.Rogers.
10. Experiments in General Chemistry, C.N.R. Rao and U.C. Agrawal. East -West Press
11. Experiments in Physical chemistry, R.C. Das and B. Behra. Tata McGraw Hill
12. Advanced Practical Physical Chemistry, J.13. Yadav, Goel Publishing House
13. Advanced Experimental Chemistry; Vol. 1- Physical. J.N. Gurtii and R. Kapoor. S.Chand & Co.
14. Selected Experiments in Physical Chemistry, N.G. Mukharjee. J.N. Ghjose & sons.
15. Experiments in Physical Chemistry, J.C. Ghosh, Bharti Bhavan.

  
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## 4. BOTANY

### B.Sc. Part- II

Scheme

Paper I

Paper II

Paper III

3 Hrs duration

3 Hrs duration

3 Hrs duration

4 Hrs. duration

Max Marks: 100

Max.Marks 33

Max Marks 33

Max. Marks 34

Max. Marks 50

3 hours

4 hours

Duration of examination of each theory paper-

Duration of examination of practicals -

Note:

1. There will be 5 question in each paper all questions are compulsory. Candidate has to answer all questions in the main answer book only.
2. Q.No. will have 20 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q.No. 2 to 5 will have internal choice.

  
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**B.SC. PART-II**  
**Paper I : Molecular Biology and Biotechnology**

**UNIT- 1**

**Genetic Material:** Biological, chemical and physical nature of hereditary material, structure of DNA and RNAs ( mRNA, tRNA and rRNA). Watson and crick model of DNA, Nucleosome model.

**DNA replication:** Meselson- stahl experiment of semiconservative replication of DNA; RNA Primers, okazaki-fragments, polymerases; DNA- Protein interactions. Preliminary account of DNA damage and repair.

**UNIT- 2**

**Central dogma of life, Transcription in eukaryotes:** role of promoter, gene, pre mRNA synthesis, pre mRNA processing: capping, splicing and polyadenylation.

**Translation:** genetic code (Codon), initiation, elongation and termination.

**Regulation of gene expression in prokaryotes and eukaryotes:** Negative and positive control, attenuation and antitermination, Reverse transcriptase and its application.

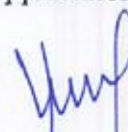
**UNIT- 3**

**Biotechnology:** Functional definition. Basic aspects of plant tissue culture, basal medium, media preparation and aseptic culture technique. Concept of cellular totipotency; Callusing; Differentiation and Morphogenesis; Micropropagation; Tissue culture and its applications. Basic concept of Protoplast culture, Anther culture, Embryo culture nad their applications.

**UNIT- 4**

**Recombinant DNA Technology:** Tools and Techniques used in rDNA technology. Restriction enzymes. Vectors for gene transfer, Bacteriophage, plasmids, cosmids and Artificial chromosome, cDNA technology, gene amplification, Polymerase chain reaction, Application of PCR technique, DNA fingerprinting and its uses, Application of Biotechnology and transgenic plants.



  
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**B.Sc. Part II**  
**Paper- II (Pass Course Syllabus)**  
**Plant Physiology and Biochemistry**

(2 Hrs/week)

Max. Marks 33; Duration of examination of theory paper: 3hours

**Unit-1**

**Water:** Structure, physio-chemical properties, importance to plant life, concept of water potential. Absorption and transport of water; Ascent of sap. Transpiration, stomatal factors affecting transpiration. Guttation.

**Mineral Nutrition :** Essential micro and macro nutrients; their uptake, hydroponics and nutrient requirement deficiency and toxicity symptoms.

**Transport of organic substances:** Mechanisms of phloem transport, factors regulating the translocations of nutrients.

**Unit-2**

**Photosynthesis:** Pigments, Photosynthetic apparatus, Light reaction, photo system I & II, Z scheme, photophosphorylation, C<sub>3</sub> ( Calvin cycle), C<sub>4</sub> Cycle, and factors affecting the photosynthesis.

**Respiration :-** Aerobic and anaerobic respiration; RQ (Respiratory Quotient), K<sub>2</sub>CO<sub>3</sub> cycle, electron transport system, oxidative phosphorylation and factors affecting the process, Fermentation.

**Unit-3**

**Carbohydrates:** Introduction, importance, nomenclature, classification, molecular structure & function of mono, di and polysaccharides, their properties, glycosidic linkages and glycoprotein.

**Proteins:** Amino acids-structure, electrochemical properties, peptide bonds, chemical bonds and nomenclature, structure and classification of proteins, physical and chemical properties.

**Enzymes:** Structure, nomenclature & classification of enzyme. Characteristics of enzymes. mechanism of action, multi-enzyme system, regulation of enzyme activity.

**Lipids:** Importance of fatty acids (Saturated and unsaturated), Alpha and Beta Oxidation. Brief introduction and application of secondary metabolites.

**Unit-4**

**Phases of growth and development:** Seed dormancy and germination, plant movement, Biological clock-their regulatory factors.

**Photoperiodism & vernalisation:** Physiology and mechanism of action, concept of florigen and phytochrome.

**Plant Hormones:** Auxins, Gibberellins, Cytokinins, Ethylene and ABA: discovery & Physiological effects.

  
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**Exercises:**

1. To determine the osmotic potential of vacuolar sap by plasmolytic method.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature of permeability of plasma membrane.
4. To Separate chloroplast pigments by solvent method.
5. To Separate chloroplast pigments using paper chromatography.
6. To separate amino acids in a mixture by paper chromatography.
7. To prepare the standard curve of protein.
8. To demonstrate the tests for proteins in the unknown samples.
9. To demonstrate the enzyme activity Catalase, peroxidase and amylase.
10. To demonstrate the tests for different types of carbohydrates and lipids
11. Bioassay of growth hormone auxin, cytokinin, gibberellins.
12. Demonstration of phenomenon of osmosis by use of potato osmometer.
13. To demonstrate root pressure.
14. To demonstrate rate of transpiration by use of photometers.
15. Photosynthesis by inverted funnel method. Moll's experiment.
16. To demonstration anaerobic and aerobic respiration.
17. R.Q. by Ganong's respirometer.
18. Measurement of growth using auxanometer.

  
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5

**B.Sc. Part II**  
**Paper- III : Pteridophytes, Gymnosperms And Palaeobotany**

Exam Duration : 3 Hrs.

Maximum Marks : 34

**Unit-I**

General characters of pteridophytes, classification by (G.M.Smith). Distribution and alternation of generation. Stellar system in pteridophytes. Eusporangiate and Leptosporangiate development of Sporangia, Apogamy and Apospory. Economic importance of pteridophytes.

**Unit-II**

Morphology, anatomy and reproduction of Psilotum, Lycopodium, Selaginella, Equisetum and Marsilea. Characteristics of Gymnosperms, distribution and classification (K.R.Sporne)

**Unit-III**

Morphology, anatomy, reproduction and life cycle of Cycas, Pinus and Ephedra, Economic importance of Gymnosperms.

**Unit-IV**

Process of fossilization, types of fossils, techniques of study of fossils. Geological time scale. Primitive land plant: Rhynia, Fossil pteridophytes: reconstructed plants-Lepidodendron and Calamites. Fossil Gymnosperm- Williamsonia.

  
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### 3. Zoology

Scheme:  
Max. Marks: 100

Paper I	: 3 Hrs duration	33 Marks
Paper II	: 3 Hrs duration	33 Marks
Paper III	: 3 Hrs duration	34 Marks
Practical	: 4 Hrs duration	50 Marks

**NOTE:**

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit/section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

#### PAPER - I: Z-201

#### STRUCTURE AND FUNCTION OF INVERTEBRATE TYPES

**NOTE**

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit/section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

#### Section-A

#### Structure and Function-I

Structural and functional organization of vital systems of non-choradates as exemplified by Amoeba, Paramecium, Euglena, Obelia, Sycon, Fasciola, Taenia, Nereis, Hirudinaria, Palaemon, Lamellidens, Pila and Aseterias.

1. Locomotion: Pseudopodial (*Amoeba*), ciliary (*Paramecium*), flagellar (*Euglena*), parapodial (*Nereis*), pedal-muscular foot (*Pila*) and tube-feet (*Asterias*).
2. Skeleton: Endoskeleton (spicules of *Sycon*); exoskeleton, chitinous (*Palaemon*), calcareous (Corals, *Pila*, *Lamellidens* and *Asterias*), siliceous (*Radiolaria*).
3. Nervous System: Sensory and nerve cells (*Obelia*); brain ring and longitudinal nerves (*Fasciola* and *Taenia*); brain and ventral nerve cord (*Nereis* and *Palaemon*); nervous system of *Pila* and *Lamellidens*.
4. Sense-organs: Statocyst and osphradium (*Lamellidens* and *Pila*), compound eye (*Palaemon*) and simple eye (*Nereis*, *Pila*); tactile and olfactory organs (*Palaemon*); nuchal organs (*Nereis*).

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## Section - B

### Structure and Function - II

1. Food feeding, digestive structures and digestion: Autotrophic (Euglena) : heterotrophic through food vacuole ( Paramecium) and in hydroid and medusoid zooids ( Obelia) : Parasitic ( Fasciola, Taenia, Hirudinaria): Predatory ( Nereis, Palaemon, Asterias) : filter-feeding (Lamellidens)
2. Respiration: Aquatic general body surface ( Euglena), Nereis, Hirudinaria): dermal bronchial ( Asterias) parapodia (Nereis), gills ( Palaemon, Lemellidens, Pila): aerial: pulmonary sac (pila), trachea (insect); anaerobic ( fasciola, Taenia).
3. Excretion: General body surface ( protozoa, Sycon, Obelia): Protonephridial system and flame cells (Fasciola, Taenia); nephridia ( Nereis, Hirudinaria); malpighian tubules (insect); organ of Bojanus ( Lamellidens, Pila).
4. Circulation: Cyclosis (Euglena, Paramecium); diffusion ( Sycon, Obedia, Fasciola, Taenia); open circulatory system ( Hirudinaria, Palaemon, Lamellidens, Pila, Asterias); closed circulatory system ( Nereis).
5. Reproduction: Asexual (paramecium, Euglena, Sycon); alternation of generation (obelia); sexual ( Fasciola, Taenia, Nereis, Lamellidens, Pila, Hirudinaria, Asterias).

## Section- C

### Invertebrate Adaptations

1. Salient features of Hemichordata.
2. Evolution of canal system of sponges.
3. Parasitic adaptations in Helminthes.
4. Social organization in termites and honey bees.
5. Direct and indirect development in insects.
6. Water vascular system of starfish.
7. Crustacean larvae.
8. Parasitism in Crustacea.

PAPER - II: Z-202

## ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

### NOTE:

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit/section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

## Section-A

### Animal Physiology with special reference to mammals

1. Osmoregulation in mammals.
2. Physiology of digestion: Various types of digestive enzymes and their digestive action in the alimentary canal.
3. Physiology of blood circulation: Composition and functions of blood; mechanism of blood clotting; heart beat; cardiac cycle; blood pressure; body temperature regulation.
4. Physiology of respiration: Mechanism of breathing; exchange of gases: transportation of oxygen and carbon dioxide in blood; regulation of respiration.
5. Physiology of excretion: Kinds of nitrogenous excretory end products (ammonotelic, uricotelic and ureotelic); role of liver in the formation of these end products. Functional



architecture of mammalian kidney tubule and formation of urine; hormonal regulation of water and electrolyte balance (Homeostasis).

### Section - B

#### Regulatory aspects of Animal Physiology

1. Physiology of nerve impulse and reflex action: functional architecture of a neuron, origin and propagation of nerve impulse, synaptic transmission, reflex arc.
2. Physiology of muscle contraction: Functional architecture of skeletal muscles; chemical and biophysical events during contraction and relation of muscle fibers.
3. Types of endocrine glands, their secretions and function Pituitary, adrenal, thyroid, islets of Langerhan's, testis and ovary.
4. Physiology of Reproduction: Hormonal control of male and female reproduction, implantation, parturition and lactation in mammals. Menopause in human.
5. Preliminary idea of neurosecretion, hypothalamic Control of pituitary function.

### Section-C

#### Biochemistry

1. Carbohydrates: Structure, function and significant): oxidation of glucose through glycolysis, Krebs' cycle and oxidative phosphorylation; elementary knowledge of interconversion of glycogen and glucose in liver; role of insulin and glucagon.
2. Proteins : Structure, function and significance, essential and non-essential amino acids, transformation of amino acids: deamination, transamination, decarboxylation. Synthesis of protein and urea, fate of ammonia (Ornithine cycle), fate of carbon skeleton.
3. Enzymes: Types and mechanism of action.
4. Lipids: Structure, function and significance; Beta oxidative pathway of fatty acids; brief account of biosynthesis of triglycerides. Cholesterol and its metabolism.
5. Catabolism and biosynthesis of nucleotides.
6. Mineral metabolism: Iodine, iron, calcium and zinc.

### Paper - III: Z-203

### Immunology, Microbiology & Biotechnology

#### NOTE:

1. There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus. Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit/section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit/section. Each question will carry 6 marks.
2. The candidate has to answer all questions in the main answer book only.

### Section - A

#### Immunology

1. Immunology: Definition, types of immunity: innate and acquired; humoral and cell mediated. Organs of immune system.
2. Antigen and antibody: Antigenicity of molecules, happens, antibody types.
3. Antigen-Antibody reactions; Precipitation reaction, agglutination reaction, neutralizing reaction, complement and lytic reactions and phagocytosis.
4. Immunity Regulating Cells: Macrophages, lymphocytes (B and T-Types) T-helper cells, T-Killer cells, plasma cells and memory cells.

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5. Mechanism of humoral or antibody mediated immunity and cell mediated immunity.
6. MHC: Structure and function of class I, II and III MHC molecules, regulation of MHC expression.

### Section- B

#### Microbiology

1. Brief introduction to the History of Microbiology: Work of Anatomy Van Leeuwenhoek, theory of spontaneous generation, germ theory of fermentation and disease: Works of Louis Pasteur, John Tyndall, Robert Koch and Edward Jenner.
2. The Prokaryota (Bacteria) : Structural organization:
  - (i) Size, shapes and patterns of arrangement
  - (ii) Structural organization: Slime layer (capsule), cell envelopes: cytoplasmic membrane (inner membrane). Cell wall (outer membrane) of Gram-negative and Gram-positive bacteria; Mesosomes; cytoplasmic organization; cell projections: flagella and cilia.
3. Genetic material of Bacteria: chromosome, replication of bacterial DNA.
4. Reproduction in Bacteria: Asexual reproduction, binary fission, budding, endospore formation, exospores and cyst formation; sexual reproduction, conjugation.
5. Microbial Nutrition: Culture of bacteria
  - a. Carbon and energy source
  - b. Nitrogen and minerals
  - c. Organic growth factors
  - d. Environmental factors: temperature and pH
6. Bacteria of Medical Importance:
  - (i) Gram-Positive
    - a. Cocci: *Staphylococci*, *Streptococci*
    - b. Bacilli: *Diphtheria*, *Tetanus*
  - (ii) Gram-Negative
    - a. Cocci: *Gonorrhoea*, *Meningitis*
    - b. Bacilli: *Diarrhoea*
  - (iii) Mycobacteria: *Tuberculosis*, *Leprosy*
7. AIDS and hepatitis. The causative agents, transmission, pathogenicity, laboratory diagnosis, treatment and prevention (elementary idea only).

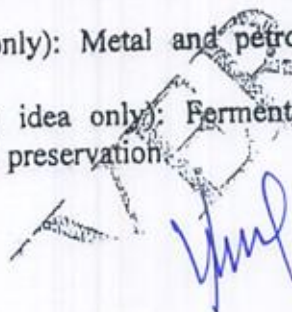
  
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## Section - C

### Biotechnology

1. Definition, history, scope and application of biotechnology, major areas of biotechnology (microbial, plant and animal biotechnology).
2. Vectors for gene transfer.
3. Basic concepts of animal cell, tissue, organ and embryo culture.
4. Protoplast fusion in prokaryotes and eukaryotes.
5. Recombinant DNA technology; hybridomas and their applications, PCR. DNA finger printing, DNA foot printing. RFLP, RAPD & AFLP, Human genome project. Genomics & Proteomics (Brief idea only).
6. Monoclonal antibodies and their applications.
7. Genetic engineering (outline idea only); Applications of genetic engineering, hazards and regulations.
8. Transgenic animals, their uses.
9. Brief account of cloning: its advantages and disadvantages.
10. Biotechnology in medicine (outline idea only), antibiotics, vaccines, enzymes, vitamins, hormones, artificial blood.
11. Environmental Biotechnology (outline idea only): Metal and petroleum recovery, pest control, waste water treatment.
12. Food, drink and dairy biotechnology (outline idea only): Fermented food production; dairy products, wine, beer, vinegar and food preservation.



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Syllabus: B.Sc. Part - II (Pass Course)  
Zoology Practical

4 Hrs./ Week

Max. Marks: 50

I. Study of Museum Specimens:

- Annelida : Nereis, Heteronereis, Aphrodite, Chaetopterus, Arenicola, Glossiphonia, Pontobdella, Polygordins.
- Onychophora : Peripatus
- Arthropoda : *Limulus*, Spider, Scorpion, Centipede, Millipede, Lepas, Balanus, Squilla, Eupagurus, Crab, Mantis, Honey-bee, (queen, king, worker) Locust, Silkworm Moth, Beetle, White grub.
- Mollusca : Chiton, Aplysia, Cypraea, Mytilus, Pearl Oyster, Dentalium, Loligo, Nautilus.
- Echinodermata : Pentaceros, Echinus, Ophiothrix, Cucumaria, Antedon.
- Hemichordata : Balanoglossus

II. Study of Microscopic Slides:

- Annelida : T.S. body of Nereis through various regions.
- Arthropoda : V.S. of integument (cuticle): Pediculus, Bedbug, Termite and its castes, Cyclops, Daphnia, crustacean larvae ( Nauplius, Zoea, Mysis, Megalopa). Statocyst of prawn.
- Mollusca : V.S. Shell. T.S gill of pila: Glochidium larva

III. Study of the Following Through Permanent Slide Preparation:

- (i) Trachea, Mosquito larva, Lice, Termites.
- (ii) Differential staining and identification of various types of blood cells. \ 0

  
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#### IV. Anatomy:

Prawn/Squilla

:Study of External features, appendages, alimentary canal and nervous system; Hastate Plate

Cockroach/Grasshopper

: Study of External features, Appendages, Alimentary canal, Nervous system and Mouthparts.

#### V. Microbiology Immunology and Biotechnology:


1. Preparation and use of culture media for microbes.
2. Study of microbes in food materials like curd, etc (Lactobacillus Aspergillums, Mucor, Penicillium.
3. Educational tour to any Microbiology Laboratory, Dairy, Food processing factory and Distillery for first hand study. Collection of material may also be encouraged wherever possible. Candidates are expected to submit a detailed report of such visit.
4. Antigen-antibody reactions-precipitation, agglutination
5. A brief practical idea of fermentation of food, food preservation.

#### VI. Animal Physiology:

1. Counting of red and white blood cells in the given blood sample.
2. Estimation of hemoglobin in the given blood sample.
3. Estimation of haematocrit value (PCV) in the given blood sample.
4. Demonstration of enzyme activity (catalase) in liver.
5. Study of salivary digestion of starch and the effect of heat and alcohol on salivary digestion of starch.
6. Study of histological structure of major endocrine glands of mammals.
7. Demonstration of blind spot in Human-eye.

#### VII. Biochemistry:

1. Detection of protein, carbohydrate and lipid in the animal tissue/food samples.
2. Identification of different kinds of mono-di-and polysaccharides in the given food samples
3. Circular paper chromatography of dyes/amino acids.

  
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Acad. I

**B.Sc. Part - II**  
**Scheme of Practical Examination Distribution of Marks**

Time: 4 Hrs.

Max. Marks: 50

	Regular	Ex./N.C. Students
1. Anatomy (any system)	3	3
2. Permanent Preparation Exercise in	4	6
3. Microbiology/ Immunology /Biotechnology	5	6
4. Exercise in Animal Physiology	6	7
5. Exercise in Biochemistry	6	7
6. Identification and comments on Spots (1 to 8)	16	16
7. Viva voce	5	5
8. Class Record	5	-
	50	50

**Notes:**

1. With reference to Anatomy, study of prescribed types (charts/models) candidates must be well versed in the study of various systems. CD, ROMs multimedia computer based simulations including computer assisted learning (CAL) and other soft wares may be used.
2. With reference to permanent preparations and microscopic slides, the exercise should be substituted with diagrams, photographs, models, charts, etc.
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. The candidates may be asked to write detailed methodology wherever necessary and separate marks may be allocated for the same.
5. Mounting material for permanent preparations would be as per the syllabus or as available through collection and culture methods.
6. It should be ensured that animals used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently or Necessary permission from chief wildlife warden be sought.

**Recommended Books:**

1. Barnes R. D: Invertebrate Zoology, W. B. Saunders, 1969.
2. Barrington EJW: Invertebrate Structure and Function. 2nd edition John Wiley & Sons, Inc., 1978.
3. Barrington EJW: The Biology of Hemichordata and Protochordata. Oliver & Boyd, London 1965.
4. Barrett KE, Barman SM, Boctano, S and Brooks HL. Ganongs: Review of Medical Physiology. 24th edition Me Graw Hill Education India Pvt. Ltd., 2012.
5. Berril NJ: The Tunicates. The Roy Society, London.
6. Brusca RG and Brusca GJ: Invertebrates. 2nd edition Sinauer/Panama Books, 2003.
7. Cooper GM and Hausman RE: The Cell: A Molecular Approach. 6th edition ASM Press Washington, DC Sinauer/Panama Books, 2013.
8. Conn EE, Stumpf PK, Bruening G, Doi, RH: Outline of Biochemistry. 5th edition. John Wiley & Sons, 1987.
9. De Robertis EDP' and De Robertis Jr EMF: Cell and Molecular Biology. 8th edition Lippincot Williams & Wilkins, 2006.
10. David R, Burggren Wand French K: Eckert Animal Physiology. 5th edition W H

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- Freeman & Company, New York, 2001.
11. Eckert R, Randall D. J. Burggen W, French K: Eckert Animal Physiology and Burggren WW & Co. Ltd., 1997.
  12. Fox SI: Human Physiology. 8th edition McGraw Hill Education 2003.
  13. Gardner EL, Simmons MJ and Snustad DP: Principles of Genetics 8th edition John Wiley & Sons, Inc., 2006.
  14. Giese A. C: Cell Physiology. 4th Edition, Saunders, 1973.
  15. Glick BR., Paeternak 11: Molecular Biotechnology, 4th edition ASM Press, 2010.
  16. Goldsby RA, Kindt TJ and Osborne BA: Kuby Immunology. WH Freeman and Co., New York, 2002.
  17. Grant: Biology of Developmental System
  18. Gupta PK. Genetics: Classical to Modern. Rastogi Publications, 2007.
  19. Hall JE: Guyton and Hall Textbook of Medical Physiology. 12th edition Saunders Publications, 2010.
  20. Hill RW, Wyse GA, Anderson M: Animal Physiology. 3rd edition Sinauer Associates Inc. USA, 2012.
  21. Hyman LH: The Invertebrates, Vol. 6, Mc Graw Hill.
  22. Jordan EL and Verma PS: Invertebrate Zoology. S. Chand & Company Ltd., 2012.
  23. Karp G: Cell & Molecular Biology: Concepts and Experiments. 7th edition John Wiley & Sons, Inc., 2013.
  24. Kotpal RL: Modern Text Book of Zoology: Invertebrates. Rastogi Publications, 2012.
  25. Lal SS: Practical Zoology Invertebrate. 11th revised edition Rastogi Publications, 2014.
  26. Lehninger AL: Biochemistry. 2nd edition Kalyani Publishers, 1991.
  27. Lal SS: Practical Zoology Invertebrate. 11th revised edition, Rastogi Publications, 2014.
  28. Lehninger AL: Biochemistry. Kalyani Publisher, 2008.
  29. Lodish H, Berk A, Kaiser CA, Krieger M, Bertscher A, Ploegh H, Amon A, Scott M P. Molecular Cell Biology. 7th edition. Mac Millian High Education (International edition) England, 2013.
  30. Meyers R. A: Molecular Biology and Biotechnology (A comprehensive Desk References John Wiley & Sons, 1995).
  31. Murphy K: Janeway's Immunology. Garland Science: 8th edition, 2011.
  32. Nelson DL and Cox MM: Lehninger Principles of Biochemistry, 5th edition W. H. Freeman, 2008.
  33. Nelson DL and Cox MM: Lehninger Principles of Biochemistry. 6th edition W. H. Freeman, 2013.
  34. Owen J, Punt J, Stranford S: Kuby Immunology. 7th edition WH Freeman & Co. Ltd., 2013.
  35. Old RW and Primrose SB: Principles of Gene Manipulation: An Introduction to Genetic Engineering. University of California, 1980.
  36. Sastry KV: Animal Physiology and Biochemistry, 2nd edition Rastogi Publications, 2014-15.
  37. Vander AJ, Sheerman J, Liciano D: Human Physiology: The Mechanics of Body Function. Mc Graw Hill Co., New York, 1998.
  38. Verma PS and Jordan EL: Invertebrate Zoology. S.Chand & Co. Ltd, New Delhi, 2001.
  39. Verma PS, Tyagi BS, Agarwal VK: Animal Physiology. 6th edition S. Chand & Co., 2004.
  40. Voet D and Voet JG: Biochemistry. 4th edition, John Wiley & Sons, Inc., 2011.
  41. Voet D and Voet JG: Biochemistry. John Wiley & Sons, New York, 1990.
  42. Verma PS: A Manual of Practical Zoology: Invertebrates. S. Chand & Co. Ltd. New Delhi, 1971.
  43. Voet D and Voet JG: Biochemistry. 4th edition, John Wiley & Sons Inc., 2011.
  44. Wake MH: Human's Comparative Vertebrate Anatomy. 3rd edition University of

45. Trigunayat, M.M : A Manual of Practical Entomology. Scientific Publisher, Jodhpur (Raj.)  
46. Trigunayat, M.M and Kritika Trigunayat: Prayogic Manual Part-2 Scientific publishers,  
Jodhpur, Rajasthan.



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# 1. B.Sc. Part II Physics

Scheme:

Max. Marks: 100

Paper I	3 hrs. Duration	Max. Marks: 33
Paper II	3 hrs. Duration	Max. Marks: 33
Paper III	3 hrs. Duration	Max. Marks: 34
Practical	5 hrs. Duration	Max. Marks: 50

## Paper-I: Thermodynamics and Statistical Physics

Work Load: 2 hrs. Lecture /week

Examination Duration: 3 Hrs.

**Scheme of Examination:** Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words. Candidates have to attempt any 9 questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit. Second to fifth questions will have 100% internal choice.

### Unit-1

**Thermal and adiabatic interactions:** Thermal interaction: Zeroth law of thermodynamics; System in thermal contact with a heat reservoir (canonical distribution); Energy fluctuations; Entropy of a system in a heat bath; Helmholtz free energy; Adiabatic interaction and enthalpy; General interaction and First law of thermodynamics; Infinitesimal general interaction; Gibbs free energy, Phase transitions; Clausius Clapeyron equation; Vapour pressure curve; Heat engine and efficiency of engine. Carnot's Cycle; Thermodynamic scale as an absolute scale; Maxwell relation and their applications.

### Unit-2

**Production of low temperatures and applications:** Joule Thomson expansion and JT coefficients for ideal as well as Vander Waal's gas, porous plug experiment, temperature inversion, Regenerative cooling, Cooling by adiabatic expansion and demagnetization; Liquid Helium. He I and He II, superfluidity, Refrigeration through Helium dilution: Quest for absolute zero. Nernst heat theorem

**The distribution of molecular velocities:** Distribution law of molecular velocities, most probable, average and r.m.s. velocities; Energy distribution function: effusion and molecular beam, Experimental verification of the Maxwell velocity distribution, the principle of equipartition of energy.

  
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### Unit - 3

**Transport phenomena:** Mean free path, distribution of free path, coefficients of viscosity, thermal conductivity, diffusion and their interaction.

**Classical Statistics:** Validity of Classical approximation; micro and macro states, Thermodynamic probability, relation between entropy and thermodynamic probability, Monoatomic ideal gas; Barometric equation; Specific heat capacity of diatomic gas; Heat capacity of solids.

### Unit - 4

**Quantum Statistics:** Black body radiation and failure of classical statistics; Postulates of quantum statistics, indistinguishability, wave function and exchange degeneracy, equal a priori probability; Bose-Einstein statistics and its distribution function; Planck distribution function and radiation formula; Fermi-Dirac statistics and its distribution function, contact potential, thermionic emission; Specific heat anomaly of metals; Nuclear spin statistics (para- and ortho-hydrogen).

#### Reference Books:

1. Treatise on heat by Shah & Srivastava
2. Thermodynamics by DP Khandelwal
3. Heat & Thermodynamics – Brijlal Subrahium

### Paper- II: Mathematical Physics and Special Theory of Relativity

Work Load: 2 hrs. Lecture/week

Examination Duration: 3 Hrs.

**Scheme of Examination:** Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words. Candidates have to attempt any 9 questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit. Second to fifth questions will have 100% internal choice.

#### UNIT-1

Orthogonal curvilinear coordinate system, scale factors, expression for gradient, divergence, curl and their application to Cartesian, circular cylindrical and spherical polar coordinate.

Coordinate transformation and Jacobian, transformation of covariant, contravariant and mixed tensor; Addition, multiplication and contraction of tensors; Metric tensor and its use in transformation of tensors.

Dirac delta function and its properties.

#### UNIT-2

  
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Lorentz transformation and rotation in space-time like and space like vector, world line, macro-causality

Four vector formulation, energy momentum four vector, relativistic equation of motion, invariance of rest mass, orthogonality of four force and four velocity. Lorentz force as an example of four force, transformation of four frequency vector, longitudinal and transverse Doppler's effect.

Transformation between laboratory and center of mass system, four momentum conservation, kinematics of decay products of unstable particles and reaction thresholds: Pair production, inelastic collision of two particles, Compton Effect.

### UNIT - 3

(A) Transformation of electric and magnetic fields between two inertial frames.

(B) The second order linear differential equation with variable coefficient and singular points, series solution method and its application to the Hermite's, Legendre's and Laguerre's differential equations; Basic properties like orthogonality, recurrence relation, graphical representation and generating function of Hermite, Legendre, Laguerre and Associated Legendre function (simple applications).

### UNIT-4

Techniques or separation of variables and its application to following boundary value problems (i) Laplace equation in three dimensional Cartesian coordinate system - line charge between two earthed parallel plates, (ii) Helmholtz equation in circular cylindrical coordinates-cylindrical resonant cavity, (iii) Wave equation in spherical polar coordinates the vibrations of a circular membrane, (iv) Diffusion equation in two dimensional Cartesian coordinate system-heat conduction in a thin rectangular plate, (v) Laplace equation in spherical coordinate system-electric potential around a spherical surface.

#### Reference Books:

1. Mathematical Physics - Satyaprakash
2. Mathematics for physics & Engee. - Pipes & Horwill
3. Mathematical Physics - B.S. Rajput

  
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## Paper III: Electronics and Solid State Devices

**Work Load: 2 hrs. Lecture/week**

**Examination Duration: 3 Hrs.**

**Scheme of Examination:** Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words. Candidates have to attempt any ten questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit. Second to fifth questions will have 100% internal choice.

### Unit 1

#### Circuit analysis and PN junctions

**Circuit analysis:** Networks- some important definitions, loop and nodal equation based on D.C. and A.C. circuits (Kirchhoffs Laws). Four terminal network: Ampere volt conventions, open, close and hybrid parameters of any four terminal network, Input, output and mutual impedance for an active four terminal network. Various circuit theorems: Superposition, Thevenin, Norton, reciprocity, Compensation, maximum power transfer and Miller theorems.

**PN junction:** Charge densities in N and P materials Conduction by drift and diffusion of charge carriers, PN diode equation; capacitance effects.

### Unit 2

#### Rectifiers and transistors

**Rectifiers:** Half-wave, full wave and bridge rectifier calculation of ripple factor, efficiency and regulation; Filters: series inductor, shunt capacitor. L-section and T-section filters. Voltage regulation: Voltage regulation and voltage stabilization by Zener diode, voltage multiplier.

**Transistors:** Notations and volt-ampere characteristics for bipolar Junctions transistor, Concept of load line and operating point Hybrid parameters. CB, CE, CC configurations. Junction field effect transistor (JEFT) and metal oxide semiconductor field effect transistor (MOSFET). Circuit symbols, biasing and volt-ampere characteristic, source follower operation of FET as variable voltage resistor.

### Unit 3

#### Transistor biasing and amplifiers

**Transistor biasing:** Need of bias and stability of Q point, stability factors, and various types of bias circuits for thermal bias stability fixed bias, collector to base feedback bias and four resistor bias.

**Amplifiers:** Analysis of transistor amplifiers using hybrid parameters and its gain-frequency response, Cascade amplifiers, basis idea of direct coupled and R.C. coupled amplifiers, Differential amplifiers, Amplifier with feedback: Concept of feedback, positive and negative

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### Oscillators and Logic Circuits

**Oscillators:** criteria for self-excited and self-sustained oscillation, circuit requirement for buildup of oscillation, basic transistor oscillator circuit and its analysis, Colpitt's and Hartely oscillator- R.C Oscillators, crystal oscillators and its advantages

**Logic circuits:** Logic fundamentals: AND, OR, NOT, NOR, NAND, XOR gates, Boolean algebra, De Morgan's theorem, positive and negative logic, logic gates circuit realization using DTL and TTL logic, simplification of Boolean expressions

#### Reference Books:

1. John D. Ryder, Electronic Fundamentals and Applications, Prentice Hall of India Pvt. Ltd. New Delhi.
2. John D. Ryder, Engineering Electronics, McGraw Hill Book Company, New Delhi.
3. Jacob Millman and Christosc Halkias, Integrated Electronics. Analog and Digital Circuits and systems: McGraw Hill Ltd:(1972)
4. Albert Paul Malvino, Digital Computer Electronics, TataMcGraw- Hill-Pub. Co. Ltd., New Delhi (1983).
5. Kumar & Gupta Hand book of Electronics.
6. G.K. Mithal, Hand Book of Electronics.
7. G.K. Mithal Electronics Devices and Applications;
8. R.P. Jain, Digital Electronics.

  
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## PRACTICAL

Teaching: 4 hrs/week

Examination Duration : 5hrs.

Max Pass Marks: 50

Note: Total number of experiment to be performed by the students during the session should be 16 selecting any 8 from each section.

### Section-A

1. Study of dependence of velocity of wave propagation on line parameter using torsional wave apparatus.
2. Study of variation or reflection coefficient of nature of termination using-torsional wave apparatus.
3. Using platinum resistance thermometer: find the melting point of a given substance.
4. Using Newton's rings method: find out the wave length of a monochromatic source and find the refractive index of liquid.
5. Using Michelson's interferometer: find out the Wavelength of given monochromatic source (Sodium Light).
6. To determine dispersive power of prism.
7. To determine wavelength of sodium light using grating.
8. To determine wavelength of sodium light using Biprism.
9. Determine the thermodynamic constant  $\gamma = C_p/C_v$  using Clement's & Desorme's method.
10. To determine thermal conductivity of a bad conductor by Lee's method.
11. Determination of ballistic constant of ballistic galvanometer.
12. Study of variation of total thermal radiation with temperature.

### Section B

1. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath)
2. Study of Power supply using two diodes/bridge rectifier with various filter circuits.
3. Study of half wave rectifier using single diode & application of L and  $\pi$  section filters.
4. To study characteristics of a given transistor PNP/NPN (common emitter, common base and common collector configurations)
5. Determination of band gap using a junction diode.
6. Determination of power factor ( $\cos \theta$ ) of a given coil using CRO.
7. Study of single stage transistor audio amplifier (variation of gain with frequency).
8. To determine  $e/m$  by Thomson's method.
9. Determination of velocity of sound in air by standing wave method using speaker, microphone and CRO.
10. Measurement of inductance of a coil by Alderson's bridge.
11. Measurement of capacitance and dielectric constant of a liquid and gang condenser by de-Sauty bridge.

  
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Blueprint for setting question paper I & II for B.Sc. part II Examination - 2018

First question is compulsory and is of 9 marks. This question contains 12 short answer type questions of one mark each. Candidates have to attempt any 9 questions with answer not more than 50 words. Second to fifth questions are of six marks each with internal choice.

प्रथम प्रश्न अनिवार्य है और यह 9 अंक का है। इस प्रश्न के अन्तर्गत 12 लघुत्तरात्मक प्रश्न हैं, जिनमें से कोई भी 9 प्रश्न हल करने हैं, जिनका उत्तर 50 शब्दों से अधिक न हो। प्रश्न संख्या 2 से 5 तक प्रत्येक प्रश्न 6 अंक का है, जिसमें आन्तरिक विकल्प है।

1 पचास शब्द सीमा में नौ भागों के उत्तर दीजिए।

- |      |      |       |        |
|------|------|-------|--------|
| (i)  | (ii) | (iii) | (iv)   |
| (v)  | (vi) | (vii) | (viii) |
| (ix) | (x)  | (xi)  | (xii)  |

- 2 (a)  
(b)

Unit – I प्रथम इकाई

Or / अथवा

- (a)  
(b)

- 3 (a)  
(b)

Unit – II द्वितीय इकाई

Or / अथवा

- (a)  
(b)

- 4 (a)  
(b)

Unit – III तृतीय इकाई

Or / अथवा

- (a)  
(b)

- 5 (a)  
(b)

Unit – IV चतुर्थ इकाई

Or / अथवा

- (a)

  
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Blueprint for setting question paper III for B.Sc. part II Examination - 2018

First question is compulsory and is of ten marks. This question contains 12 short answer type questions of one mark each. Candidates have to attempt any 10 questions with answer not more than 50 words. Second to fifth questions are of six marks each with internal choice.

प्रथम प्रश्न अनिवार्य है और यह 10 अंक का है। इस प्रश्न के अन्तर्गत 12 लघुत्तरात्मक प्रश्न हैं, जिनमें से कोई भी 10 प्रश्न हल करने हैं, जिनका उत्तर 50 शब्दों से अधिक न हो। प्रश्न संख्या 2 से 5 तक प्रत्येक प्रश्न 6 अंक का है, जिसमें आन्तरिक विकल्प है।

1 पचास शब्द सीमा में दस भागों के उत्तर दीजिए।

- |      |      |       |        |
|------|------|-------|--------|
| (i)  | (ii) | (iii) | (iv)   |
| (v)  | (vi) | (vii) | (viii) |
| (ix) | (x)  | (xi)  | (xii)  |

Unit – I प्रथम इकाई

- 2 (a)  
(b)

Or / अथवा

- (a)  
(b)

Unit – II द्वितीय इकाई

- 3 (a)  
(b)

Or / अथवा

- (a)  
(b)

Unit – III तृतीय इकाई

- 4 (a)  
(b)

Or/ अथवा

- (a)  
(b)

Unit – IV चतुर्थ इकाई

- 5 (a)  
(b)

Or/ अथवा

- (a)  
(b)





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**B. A./B. Sc. Part II Examination-2019**

**5. MATHEMATICS**

Teaching : 3 hours per week per theory paper

2 hours per week per batch for practical

(20 candidates in each batch)

Examination Scheme :

			Max. Pass Marks
	Science		150
		Duration	Max Marks
Paper – I	Real Analysis	3 hrs	40 (Science)
Paper – II	Differential Equations	3 hrs	40 (Science)
Paper – III	Numerical Analysis and Optimization Techniques	3 hrs	40 (Science)
Practicals		2 hrs	30 (Science)

Note :-

01. Syllabus of each of the three papers is divided into FIVE units .
02. Each paper is divided into THREE sections A, B, & C.
03. **Section-A** : TEN short answer type questions will be set taking two questions from each unit. Each question will carry 1 mark for Science and 1.5 mark for Arts. All questions will be compulsory .
04. **Section-B** : TEN questions will be set taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt ONE question from each unit.



  
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05. Section-C : FIVE questions will be set taking one questions from each unit. Each question will carry 5 marks for Science in all three papers and 6 marks for Arts in paper I & II and 6.33marks in paper III. Student has to attempt ANY THREE Questions.
06. Common paper will set for Faculty of Science and Faculty of Social Science . Each candidate is required to appear in the practical examination to be conducted by internal and external examiners. External examiner will be appointed by the University and internal examiner will be appointed by the principal in consultation with the head, department of Mathematics in the college.
08. An internal/external examiner can conduct practical examination of not more than 100 (one hundred) candidates( 20 candidates in each batch).
09. Each candidate has to pass in theory and practical examinations separately.

### Paper – I Real Analysis

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks 40 (Science)

**Note:** This paper is divided into THREE Sections A, B, & C. Section-A consists TEN short answer type questions. Each question is of 1 mark for Science and 1.5 mark for Arts. All questions are compulsory. Section-B consists TEN questions taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt FIVE questions selecting ONE question from each unit. Section-C consists FIVE questions taking one questions from each unit. Each question will carry 5 marks for Science and 6 marks for Arts. Student has to attempt ANY THREE questions .

**Unit – I:** The set of real numbers as a complete ordered field, Incompleteness of  $\mathbb{Q}$ , Archimedean and dense properties of  $\mathbb{R}$ , Absolute value of real numbers, Intervals, Limit point of a set, Bolzano-Weierstrass theorem, open and closed sets, Compact sets, Heine Borel Theorem, Connected sets. Equivalent sets, Finite and infinite sets, Denumerable sets, Countable and uncountable sets.

**Unit – II :** Real sequences, Bounded and unbounded sequences, Monotonic sequence, Limit point and limit of a sequence, Convergence of sequences, Necessary and sufficient condition for convergence, Sub sequence, Cauchy sequence, Cauchy's general principal of convergence. Continuity of a function, Cauchy's and Heine's definition of continuity, Types of discontinuity, Properties of continuous functions on closed intervals, Uniform Continuity.

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**Unit – III: Differentiability-** Darboux theorem, Rolle's theorem, Algebraic and geometric interpretation of Rolle's theorem, Lagrange's and Cauchy's mean value theorems, Taylor's theorem with various forms of remainders. Limits and Continuity for the functions of two variables. Improper Integrals and their convergence, Comparison test,  $\mu$ -test, Abel's test and Dirichlet's test.

**Unit – IV:** Reimann Integration – partition of an interval, Darboux sums, Lower and Upper Reimann Integrals, Definition of Reimann Integration, Integrability of continuous, discontinuous and monotonic functions, Fundamental theorem of integral calculus, Mean value theorems, Reimann Steiltze's integrals. Differentiation and Integration under the sign of Integration.

**Unit – V :** Uniform convergence of sequence and series of functions, Cauchy's criterion for uniform convergence,  $M_n$ - test, Weierstrass M-test, Abel and Dirichlet's tests, Uniform convergence and continuity, Term by term integration, and term by term differentiation. Fourier Series – Periodic functions, Dirichlet's conditions, Fourier series in the interval  $(\alpha, \alpha+2\pi)$  and particular cases in the interval  $(0, 2\pi)$ ,  $(-\pi, \pi)$ , Half range Fourier series.

## Paper – II Differential Equation

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks 40 (Science)

**Note:** This paper is divided into THREE Sections A, B, & C. Section-A consists TEN short answer type questions. Each question is of 1 mark for Science and 1.5 mark for Arts. All questions are compulsory. Section-B consists TEN questions taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt FIVE questions selecting ONE question from each unit. Section-C consists FIVE questions taking one questions from each unit. Each question will carry 5 marks for Science and 6 marks for Arts. Student has to attempt ANY THREE questions .

**Unit – I :** Order and degree of differential equations, Differential equations of first and first degree, Method of separation of variables, Homogeneous differential equation, and equations reducible to homogeneous forms, Linear differential equation and equations reducible to linear forms. Exact differential equation and equations which can be made exact. Differential equations of first order but not of first degree- Differential equations solvable for  $x$ ,  $y$  and  $p$ .

**Unit – II :** Clairaut's form and Singular Solutions with extraneous locii. Linear differential equations with constant coefficients, Complimentary functions and Particular integrals.

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**Unit – III :** Homogeneous linear differential equations, Differential equations reducible to homogeneous linear differential equations. Simultaneous differential equations, Differential equations of the form  $dx/P = dy/Q = dz/R$ : geometric interpretation and method of solution. Exact differential equations of  $n^{\text{th}}$  order, Existence and uniqueness theorem.

**Unit – IV :** Linear differential equations of second order- Solution by finding a part of complimentary function, Solution by transformation into Normal form and by changing the independent variable, Factorisation of operators, Method of variation of parameters, Method of undetermined coefficient.

**Unit – V :** Partial differential equation of first order and first degree, Lagrange's linear equations. Non-Linear partial differential equations of order one: Standard form I, II, III, and IV, Charpit's method. Linear partial differential equations with constant coefficient, Homogeneous and Non-homogeneous linear partial differential equations.

### Paper – III Numerical Analysis and Optimization Techniques

Teaching : 3 Hours per Week

Duration of Examination : 3 Hours

Max. Marks 40 (Science)

**Note:** This paper is divided into THREE Sections A, B, & C. Section-A consists TEN short answer type questions. Each question is of 1 mark for Science and 1.5 mark for Arts. All questions are compulsory. Section-B consists TEN questions taking two questions from each unit. Each question will carry 3 marks for Science and 4 marks for Arts. Student has to attempt FIVE questions selecting ONE question from each unit. Section-C consists FIVE questions taking one questions from each unit. Each question will carry 5 marks for Science and 6.33 marks for Arts. Student has to attempt ANY THREE questions.

**Unit – I :** Calculus of Finite Differences- Introduction, Difference Operators, Differences of Polynomials, Factorial notation, Relation between difference and derivative, Separation of symbols. Newton-Gregory's formulae for Forward and Backward interpolation with equal intervals, Newton's divided difference interpolation formula, Lagrange's interpolation formula.

**Unit – II :** Central differences- Gauss's central difference interpolation formulae, Stirling and Bessel's interpolation formulae. Numerical differentiation. Numerical integration – General quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eight rule, Weddle rule, Newton-Cote's quadrature formula, Gauss's quadrature formula.

  
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**Unit – III :** Numerical solution of algebraic and transcendental equations - Graphical method, Iterative method, Regula-Falsi method, Newton-Raphson method and their convergences. Solution of system of linear equations – Gauss's elimination method, Gauss-Jordan's elimination method, method of triangularisation of matrices, Relaxation method. Numerical solution of ordinary differential equations – Picard's successive approximation method, Euler's method and Euler's modified method.

**Unit – IV :** Linear programming problem - feasible solution, optimal solution, Basic solution, Degenerate and non-degenerate basic solution, Convex sets and their properties, Extreme point of a set, Theory of Simplex method, Optimality criterion, Simplex algorithm.

**Unit – V :** Duality in linear programming problem – Dual of l. p. p., properties of the dual, Fundamental theorem of l. p. p. , use of duality to solve l. p. p. . Transportation problem – Basic feasible solution and methods to find it, North-west corner rule, least-cost method, Vogel's approximation method, Optimality criterion, Travelling Salesman problem.

### Practicals

Teaching : 2 Hours per Week

Examination Scheme:

Duration - 2 Hours

Maximum Marks

Science

30

Distribution of Marks:

Two Exercises one from each group

10 marks each	=	20 marks
Practical record	=	05 marks
Viva-voce	=	05 marks
Total Marks	=	30 marks



  
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**Group - A :** Numerical solution of algebraic and transcendental equations using Bisection method, Secant method, Newton-Raphson method.

Jacobi's method and Gauss-Seidal method to solve system of linear equations.

Numerical solution of differential equations using Runge-Kutta methods .

**Group - B :** Modelling of industrial and engineering problem into linear programming problem , its dual and their solution by simplex method, Modelling of industrial and engineering problems into Assignment problem and their solutions.

**Note :-**1. Each candidate (Regular/Non-collegiate) has to prepare his/her record.

2. Students can use Non-programmable scientific calculators.

3. Student must know about all functions and operations of scientific calculator.

  
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