



MAHARAJA SURAJMAL BRIJ UNIVERSITY

BHARATPUR (RAJ)

SYLLABUS

Faculty of Education

B.Ed Integrated Programme (Four Years)

1st Year B.Sc.-B.Ed.


अकादमिक प्रभारी
महाराजा सूरजमल बृज विश्वविद्यालय
भरतपुर (राज.)

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.

M.S. BRIJ UNIVERSITY




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

01. 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.

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 (ICT)
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 Counseing in School
IV Year	Physical Education & Yoga

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

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

[Handwritten signatures]
5.

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 1st year, 12 in 2nd year, 12 in 3rd year and 7 in 4th 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. 1st 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. 2nd 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. 3rd 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

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 rd & 4 th 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 10 20		100

4. Criticism Lesson		
Final Lesson	100	100
		800

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

Compulsary 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

- ❖ 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.

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 3rd year & 20 lessons of other teaching subject in 4th 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-I 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 1st comprising theory papers & Part- 2nd 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.

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) An external examiner may be appointed 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 and sessionals (24 marks out of 80); (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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B. A. / B. Sc. / B. Com. Part I

2. General English

Duration: 3 hrs.

Max. Marks: 100

Objectives of the Syllabus:

1. Strengthening the vocabulary of the students.
2. Reinforcing selected components of grammar and usage.
3. Enabling the students' comprehension skills of poetry, prose and short stories.
4. Develop compositional skills.

The pattern of the question paper will be as following:

SECTION 1

Vocabulary:

20 Marks

Note: The students will be required to answer any four out of five options

- | | | |
|------|-----------------------|----------|
| i. | Synonyms | 05 Marks |
| ii. | Antonyms | 05 Marks |
| iii. | Homonyms | 05 Marks |
| iv. | One Word Substitution | 05 Marks |
| v. | Phrasal Verbs | 05 Marks |

Section 2

Grammar and Usage

20 Marks

Note: The students will be required to answer any four out of five options

- | | | |
|------|---|----------|
| i. | Sequence of Tense | 05 Marks |
| ii. | Prepositions | 05 Marks |
| iii. | Modal Auxiliaries | 05 Marks |
| iv. | Articles | 05 Marks |
| v. | Transformation of Sentences (Narration, Voice, Interchange of Degrees of Comparison) | 05 Marks |

1. लक्षणा

2. लुप्तवाक्यानि

3. ~~लुप्तवाक्यानि~~

4. लुप्तवाक्यानि

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Section 3

Comprehension

30 Marks

Note: A. There will be an extract from the prescribed texts for comprehension. 10 Marks

B. There will be seven questions (based on the prescribed texts) to be answered in three to five lines. The students will be required to answer any five. 20 Marks

- | | | |
|------|---------------------|--|
| i. | William Wordsworth: | Three Years She Grew in Sun and Shower |
| ii. | Rupert Brooke: | The Soldier |
| iii. | R K Narayan: | Dasi the Bridegroom |
| iv. | Leo Tolstoy: | How Much Land Does a Man Need ? |
| v. | O Henry: | The Gift of the Magi |
| vi. | A G Gardiner: | All About a Dog |
| vii. | John Bright: | Peace |

Section 4

Composition

30 Marks

Note: The Students will be required to answer any three out of four options.

- | | | |
|------|---------------------------------------|----------|
| i. | C V and Job Application | 10 Marks |
| ii. | Letter Writing (Formal and Informal) | 10 Marks |
| iii. | Paragraph Writing | 10 Marks |
| iv. | Notice and Advertisement Writing | 10 Marks |

prescribed Book : A Pattern to General English by Arvind Singh & Shailen Sharm

1. कला शर्मा

2. अजय शर्मा

3. /

4. 2.5 - Sharm

Arvind Singh

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B.Sc-B.Ed - 02

Childhood and Growing up

Marks -100

Objectives:

After completing the course the students will be able:-

1. To develop an understanding of the basic concepts, methods and principles of psychology.
2. To develop an understanding of the nature and process of development.
3. To understand the different periods of life with Psycho-Social Perspective.
4. To develop an understanding of the nature and process of learning in the context of various learning theories and factors.
5. To understand the critical role of learning Environment.
6. To acquaint them with various Psychological attribute of an individual.
7. To reflect on the changing roles of children in contemporary society.

Unit I: Role of psychology to understand the child

- Psychology: Meaning, nature & branches of psychology.
- Methods of psychology: case study and experimental, Edu. Psychology
- Meaning, nature, scope, educational implication of psychology in new Era.
- Child psychology: meaning, concept

Unit II: Multi dimensional development

- Growth and development- concept, stages principles, dimensions, Factors in influencing development- genetic, biological, environmental and physical
- Theories of development :
 - a) Piaget's vgotsky cognitive development
 - b) Freud's psycho- sexual development
 - c) Erikson's psycho social development
 - d) Linguistic development
 - e) Kohlberys' gilligan's moral development
 - f) Bandura's social developments
 - g) Gessel's maturation theory


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Unit 3: Child Growing up

- Childhood: Meaning, concept and characteristics, effects of family, schools, neighbourhood and community on development of a child
- Adolescence: meaning, concept, characteristics, effects of family, school, peer group, social climate and social media.
- Personality: concept and nature, theories of personality, assessment of personality
- Individual differences: concept, areas (With Special Educational needs-Concept) and educational implication.
- Stress: meaning, types and coping strategies with special reference to personality of adolescent.

Unit 4: Learning to Learn

- Concept and beliefs about learning:-Defining misconception, Brain's role in learning
- Memory and forget, Behaviouristic learning theories (Thorndike, Skinner, Pavlov), Gestalt, Cognitive and Field theory, Information processing theory, Social Constructive approach, Types of learning by Gagne.
- Motivation:-Concept and Maslow's Hierarchy need theory, Creating and maintaining a productive Classroom Environment:-Dealing with misbehaviour, Multi-Culturalism, Changing roles and responsibilities in contemporary Indian society with regarding educational psychology.

Unit 5: Psychological Attributes of an individual

- Intelligence - Meaning, Types of intelligence - Social, Emotional and Spiritual Intelligence, theory of intelligence, Gardner's Multi intelligence theory, Measurement of intelligence, Creativity - Meaning, Components, ways of enhancing creativity, relation with intelligence and other factors, Measurement of creativity, Higher Level thinking skills - critical thinking, reasoning, problem solving, Decision making.
- Socialization and Mental health: Process of Socialization - Group dynamics - Theory of Kurt Lewin's, Leadership and its styles (Kimble young), social prejudice, Mental Health - Common problems related to child - Attention deficit hyperactivity disorder (ADHD), depression, Learning disabilities, dealing with a problematic child.

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Test and Assignment:-

- Class Test 10 Marks
- Project (Any one of the following) 10 Marks

Comparative study of developing pattern's of children with reference to different in SES.

Collecting and analyzing statistics on the girl child with reference to gender ratio.

Administration of an experiment on learning, span of attention, memory Administration and interpretation of an individual group test of intelligence.

References:

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2. Aggarwal, J.C., (1981). Essential of Educational Psychology, Delhi, Doaba Book
3. Arora, Dr. Saroj, Bhargava, Rajshri (2014). Bal Manovigyan, Rakhi Prakashan, Agra
4. Bigge, M.L. (1982). Learning Theories for Teachers, New York: Harper and Row
5. B.P. (2000). Personality theories, Bosten: Allyn and Bacon House.
6. Chauhan, S.S. (2001). Adanaced educational psychology. New Delhi: Vikas Publishing House.
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8. Helen Bee Denise Boyd, First Indian Reprint 2004. The Developing Child, Published by Pearson Education Pre. Ltd, Indian Branch Delhi, India
9. Jack Snoman, Robert Biehler Ninth Edition. Psychology Applied to Teaching. Houghton Mifflin Company, Bosten New York (<http://www.coursewise.com>)
10. Ormrod Ellis Jenne, Third Edition, Educational Psychology Developing Learners Multimedia Edition (<http://www.prenhall.com/ormrod>)
11. Sarswat Kuldeep (2015). Bal Vikas evam Bachpan. Published by Rakhi Prakashan, Agra
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B.Sc-B.Ed - 03

Contemporary India and Education

MARKS-100

Objectives:-

After completing the course the students will be able to

1. To promote reflective thinking among students about issues of education related to contemporary India.
2. To develop an understanding of the trends, issues and challenges faced by contemporary education in India.
3. To appreciate the developments in Indian education in the post independence era.
4. To understand the Commissions and committees on education constituted from time to time.
5. To understand issues and challenges of education and concern for the underprivileged section of the society.
6. To develop awareness about various innovation practices in education.
7. To develop and understanding of self teaching technical devices.
8. To understand the constitutional values and provisions for education.

Course Content

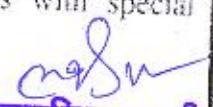
Unit I Education as an Evolving Concept

- Education: Meaning, concept and nature, Ancient to present education as an organized and institutionalized form, formal and state sponsored activities.
- Aims of Education: Historicity of aims of Education, changing aims of education in the context of globalization, sources of aims of Education: Educational aims as derived from the constitution of India influence of aims of education on the curriculum and transactional strategies. Idea of educational thinkers such as Gandhi, Tagore, Aurobindo, Dewey Krishnamurthy, Friere and Illich.

Unit - II: Issues and Challenges

- Diversity, Inequality, Marginalization:- Meaning, Concept, Levels with special reference to Individual, Region, Language, Caste, Gender.




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- Role of education in multicultural and multilingual society for Equalization and Improvement of Marginalization groups.
- Hindrances of Education in India: Quality, Facilities, Access, Cost, Political unwillingness, Youth dissatisfaction, Moral Crisis.

Unit – III: Constitution and Education

- Study of the Preamble, fundamental rights and duties of citizens, Directive Principles for state and constitutional values of Indian Constitution.
- Constitutional provisions for education and role of education in fulfillment of the constitutional promise of Freedom, Equality Justice, Fraternity.
- Education and politics, Constitutional vision related to aims of education, Peace Education, Role of Education, School and Teachers as agents for Imparting Culture, Education and Development. Education and Industrialization.

Unit – IV: Programme and Policies

- Overview the development of education system in India from 1948 to 2010 University Education Commission-1946-48, Secondary Education Commission-1952-53, Indian Education Commission-- 1964-66, National Education Policy-- 1986
- Rammurthy Committee (1990), Yashpal Committee Report (1993) Revised National Education Policy (1992) NCF--2005, NKC--2006, NCFTE-- 2009, RTE--2010.
- SSA, MLL, RMSA, CCE, Navodaya Vidyalaya, Kasturba Gandhi Balika Vidyalaya, Model School.

Unit – V: Innovative Practices

- Concept, Need of innovation in view of technological and social change, Obstacles in innovation, Role of Education in bringing innovations.
- Education through interactive mode of teaching: Computer, Internet, Tally and Video-Conferencing, Eduset, Smart Class Room, Role of E- learning, E- content, E- magazines and E-journals, E- library.
- Yoga Education, Life Skill Education, Education and Competence in life regarding Social inclusion.

Test and Assignments :-

1. Class Test

10 marks


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2. Any one of the following: -

10 marks

- Debate or Organize a one day discussion on the topic related to the subject and submit a report.
- Critical appraisal on the report or recommendations of any commission and committee.
- Organize collage, Poster Making activity in your respective institution.
- Collection of at least three handouts of related topics of the subject.

REFERENCES :-

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2. Agrawal, J.C: Land Marks in the History of Modern Indian Education, New Delhi 2. Brubecher, John.S: A History of the Problems of Education
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4. Dev, A.,Dev, T.A.,Das,S. (1996) Human Rights a Source Book, New Delhi, NCERT, Pp. 233.
5. Dubey, S.C. (1994) Indian Society, New Delhi, NBT, Pp.
6. Education and National Development: Report of the Kothari Commission on Education, New Delhi, 1966.
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9. Ghosh, S.C. (1995) The History of Education in Modern India (1757- 1986), New Delhi : Orient Longman Ltd.
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13. Keay.F.E: Indian Education in Ancient and later Times
14. M.N. Srinivas: Social Change in Modern India
15. Mookerji, R. K. (1947) Ancient Indian Education (Brahmanical and Buddhist). London: Mac Milan and Co. Ltd.

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20. National curriculum Framework for teacher education (2004).
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27. ओड, एल. के. : शिक्षा के नूतन आयाम, राजस्थान हिन्दी ग्रंथ अकादमी, जयपुर।
28. गुप्ता, एच. पी एवं अलका गुप्ता : भारत में शिक्षा प्रणाली का विकास, शारदा पुस्तक प्रकाशन, इलाहाबाद।
29. शब्त, प्यारे लाल : भारतीय शिक्षा का इतिहास, आगरा।
30. जोशी, सुषमा : भारत में शिक्षा प्रणाली का विकास एवं समस्याएँ, शारदा पुस्तक भवन, इलाहाबाद।
31. लाल रमन विहारी : भारतीय शिक्षा और उसकी समस्याएँ, रस्तापी पब्लिकेशन्स, मेरठ।
32. साधिन संदर्भ सामग्री पुरितिका : महिला एवं बाल विकास विभाग, राज. सरकार जयपुर।

B.Sc.- B.Ed. 04

Instructional System and Educational Evaluation

MARKS-100

Objectives:

This course will enable the student teacher to:

- Explain the need, importance and characteristics of educational evaluation.

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- Describe the approaches to educational evaluation
- Discuss the role of educational evaluation in Teaching - Learning Process.
- Explain the nature of tools and techniques of educational evaluation.
- Describe the need and importance of psychological testing.
- Explain the nature of learners' evaluation and need for continuous comprehensive educational evaluation in schools.

Unit I: Instructional System

- Educational Objectives and instructional objectives
- Relationship between educational objectives and instructional objectives
- Classification of educational objectives (Cognitive, affective and psychomotor)
- Functioning of educational objectives
- Usefulness of the taxonomical classification.

Unit II: Need, importance and characteristics

- Teaching Learning process and role of evaluation
- Need and importance of Evaluation
- Definition of Evaluation
- Evaluation, Assessment and Measurement.
- Characteristics of good evaluation.

Unit III: Approaches to Evaluation

- Formative evaluation and summative evaluation
- Difference between summative and formative evaluation
- External evaluation and internal evaluation, advantages and disadvantages.
- Norm referenced evaluation
- Criterion referenced evaluation.

Unit IV: Role of Evaluation in Teaching-Learning Process.

- The relationship between instructional objectives, entering behavior, learning experiences and Performance assessment.
- Diagnosis to overcome deficiency in learning.
- Importance of results of evaluation to students, teachers, institutions with

special reference to help in determining the effectiveness of a course, programme and functioning of a school.

Unit V: Nature of tools and techniques of evaluation

- Nature of test and Purposes of testing with reference to:
 - Instructional purpose b) Guidance purpose c) Administrative purpose
- Administration of Test and Interpreting test result.
- Meaning of Norms, types of Norms, age, Grade, Percentile and standard score. 4. Norms and interpretation of test scores.
- Concept of grade system. Absolute grading, comparative grading and its advantages and disadvantages.

Test and Assignments :-

1. Class Test 10 marks
2. Any one of the following: - 10 marks

- Develop a portfolio for assessment of 2 school students
- Prepare an advanced tool for evaluation.
- Develop a tool for self-assessment.
- Develop an achievement test and its blue print.

References:

1. Anastasi, Anne, (1976), Psychological Testing, 4th ed., New York; Macmillan Publishing Co. Inc.
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4. Ebel, Robert, I., (1996) : Measuring Educational Achievement. Prentice-Hall of India, New Delhi. 27
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9. Noll, V.C (1957). Introduction to Educational Measurement, Houghton Mifflin Company, Boston.
10. Nunnally, Jume, (1964). Educational Measurement & Evaluation, New York;

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

Ionic Solids: Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born Haber cycle; solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

Metallic bond: free electron, valence bond and band theories.

Weak Interactions: Hydrogen bonding, vander Waals forces.

Unit-II

Covalent Bond: Valence bond theory and its limitations, directional and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3 , H_2O , BF_3 , CF_4 , ICl_2 , H_2O .

Molecular Orbital Theory: homonuclear and heteronuclear (CO and NO) diatomic molecules. Multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit-III

s-Block Elements: Comparative study, diagonal relationships, salient features of hydrides, oxides, and complexation tendencies including their function in biosystems, an introduction to alkyl and aryls.

Periodicity of p-block elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energy, electron affinity, electronegativity, diagonal relationship, catenation.

UNIT-IV

Some Important Compounds of p-block Elements: Hydrides of boron, diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principles), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.



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Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of Xenon, s, actue and bonding in Xenon compounds.

Unit- V

Nuclear Chemistry: Fundamental particles of nucleus (nucleons); Concept of nuclides and its representation; Isotopes, Isobars and Isotones (with specific examples); Forces operating between nucleons (n-n, p-p, & n-p); Qualitative idea of stability of nucleus (n/p ratio).

Radiochemistry: Natural and artificial radioactivity; Radioactive disintegration series; Radioactive displacement law; Radioactivity decay rates; Half life and average life; Nuclear binding energy, mass defect and calculation of defect and binding energy; Nuclear reactions, Spallation, Nuclear fission and fusion.

CH-102 Paper II : Organic Chemistry (2 hrs or 3 periods / week)

Unit-I

Mechanism of Organic Reactions: Homolytic and heterolytic bond cleavage. Types of reagents, electrophiles and nucleophiles. Reactive intermediates - carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Types of organic reactions. Energy considerations. Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Unit-II

Stereochemistry of Organic Compounds: Concept of isomerism, Types of isomerism. Difference between configuration and conformation. Flying wedge and Fischer projection formulae.

Optical Isomerism: Elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity. Properties of enantiomers, chiral and achiral molecules with two stereogenic centres. Diastereomers, threo and erythro isomers, meso compounds. Resolution of enantiomers. Inversion, retention and racemization (with examples).

Relative and absolute configuration, sequence rules, D/L and R/S systems of nomenclature.

Geometric Isomerism: Determination of configuration of geometric isomers - cis / trans and E / Z systems of nomenclature. Geometric isomerism in oximes and alicyclic compounds.

Conformational Isomerism: Newman projection and Sawhorse formulae, Conformational analysis of ethane, n-butane, cyclohexane.

Alkanes and Cycloalkanes: IUPAC nomenclature of branched and unbranched alkyl group, classification of carbon atoms in alkanes. Methods of formation (with special reference of Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation - orientation, reactivity and selectivity. Cycloalkanes - nomenclature, methods of formation, chemical reactions. Baeyer's strain theory and its limitations. Theory of strainless rings.

Alkenes, Cycloalkenes, Dienes and Alkynes: Methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. Regioselectivity in alcohol dehydration - the Saytzeff rule, Hoffmann elimination. Physical properties and relative stabilities.

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of alkenes, Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions. Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 . Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes.

Classification and Nomenclature of isolated, conjugated and cumulated dienes. Structure of allenes and butadiene. Methods of formation, properties, Chemical reactions - 1,2- and 1,4-additions, Diels-Alder reaction and polymerization.

Structure and bonding in alkynes. Methods of formation. Chemical reactions - acidity of alkynes; mechanism of electrophilic and nucleophilic addition reactions; hydroboration-oxidation; metal-anion reduction, oxidation and polymerization.

Unit-IV

Arenes and Aromaticity: Nomenclature of benzene derivatives. The aryl group, aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO diagram.

Aromaticity: the Huckel rule, aromatic ions - three to eight membered.

Aromatic electrophilic substitution: General pattern of the mechanism, role of sigma and pi-complexes. Mechanism of nitration, halogenation, sulphonation, mercuration, Friedel-Crafts reactions and chloromethylation. Energy profile diagrams. Activating and deactivating substituents. Directive influence - orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction.

Unit-V

Alkyl and Aryl Halides: Methods of formation of alkyl halides, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides $\text{S}_{\text{N}}2$ and $\text{S}_{\text{N}}1$ reactions with energy profile diagrams.

Polyhalogen compounds: Chloroform, carbon tetrachloride.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.


Relative reactivities of alkyl, allyl, vinyl and aryl halides.

CH-103 Paper III: Physical Chemistry (2 hrs. or 3 Periods/week)

UNIT-I

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs and calculations of slopes; differentiation of functions like e^x , x^n , $\sin x$ and $\log x$; maxima and minima, partial differentiation and reciprocity relations, integration of some useful/relevant functions; permutations and combinations, factorials, probability.

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


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UNIT- II

Gaseous States: Postulates of kinetic theory of gases, deviation from ideal behavior van der Waals equation of state.

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

Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect.)

UNIT- III

Solid State: Definition of space lattice, unit cell.

Laws of crystallography- (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals.

Basic concept of X-ray diffraction by crystals. Derivation of Bragg's equation Determination of Crystal structure of NaCl and CsCl (Laue's method and powder method), band theory of solids. Defects in solids

UNIT IV

Colloidal State: Definition of colloids, classification of colloids.

Solids in liquids (sols) properties- kinetic, optical and electrical, stability of colloids. Protective action, Hardy-Schulze law, gold number.

Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier

UNIT V

Chemical Kinetics: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction, concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions - zero order, first order, second order; pseudo order, half-life and mean-life. Determination of the order of reactions - differential method, method of integration, method of half-life period and isolation method.

Radioactive decay as a first order phenomenon.

Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometry. Theories of chemical kinetics. Effect of temperature on rate of reaction. Arrhenius equation, concept of activation energy.

Simple collision theory based on hard sphere model transition state theory (equilibrium hypothesis). Expression for the rate constant bases on equilibrium constant and thermodynamic aspects.

Practical: CH -104: Laboratory Course -I

(4 hrs or 6 periods / week)

INORGANIC CHEMISTRY

Separation and identification of six radicals (3 cations and 3 anions) in the given inorganic mixture including special combinations.



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ORGANIC CHEMISTRY

Laboratory Techniques

- (a) Determination of melting point (naphthalene, benzoic acid, urea, etc.); boiling point (methanol, ethanol, cyclohexane, etc.); mixed melting point (urea-cinnamic acid, etc.).
(b) Crystallization of phthalic acid and benzoic acid from hot water, acetanilide from boiling water, naphthalene from ethanol etc.; Sublimation of naphthalene, camphor, etc.

Qualitative Analysis

Element Detection (N, S and halogens). Functional group determination (unsaturation, phenolic, alcoholic, carboxylic, carbonyl, ester, carbohydrate, amine, amide, nitro) in simple organic solids and liquids.

PHYSICAL CHEMISTRY

(One of the following experiments should be given in the examination)

(i) Chemical Kinetics:

- (a) To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature.
(b) To study the effect of acid strength on the hydrolysis of an ester.
(c) To compare the strengths of HCl and H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.
(d) To study kinetically the reaction rate of decomposition of iodide by H_2O_2 .

(ii) Viscosity, Surface Tension:

- (a) To determine the viscosity/surface tension of a pure liquid (alcohol etc.) at room temperature. (using the Ostwald viscometer/stalagmometer).
(b) To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).
(c) To determine the percentage composition of a given mixture (non-interacting systems) by viscosity method.
(d) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solutions.

(Instructions to the Examiners)

CHY 104: Chemistry Practical (Pass course)

Max. Marks: 50

Duration of Exam: 5 hrs.

Inorganic Chemistry

Ex. 1 Separation and identification of 3 cations and 3 anions in the mixture

15

Organic Chemistry

Ex. 2 Laboratory Techniques

3

Ex. 3 Qualitative Analysis

Detection of element and detection of functional group

10

Physical Chemistry

Ex. 4 Perform one of the experiments mentioned in the syllabus.

12

Ex. 5 Viva-voce

5

Ex. 6 Record

5

Total

50


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4. Botany
B.Sc. Part- I

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
Practicals:	4 Hrs. duration	50 MARKS

Duration of examination of each theory paper-

3 hours

Duration of examination of practicals

4 hours

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only
2. Q.No. 1 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 I

Paper- I

ALGAE, LICHEN AND BRYOPHYTA

Unit- I

General characters, Classification (Smith). Diverse Habitat. Range of thallus structure, Photosynthetic pigments and Food reserves. Reproduction (Vegetative, Asexual, Sexual). Types of life-cycles: Economic Importance.

Unit- 2

Type Studies

Cyanophyceae - *Oscillatoria*, *Nostoc*

Chlorophyceae- *Volvox*, *Oedogonium*, *Chara*.

Xanthophyceae - *Vaucheria*

Phaeophyceae - *Ectocarpus*.

Rhodophyceae- *Polysiphonia*.

Unit-3

General characters, Origin, and evolution of Bryophyta. Classification (Eichler); Habitat, Range of thallus structure, Reproduction (Vegetative and Sexual); Alternation of generations; Economic importance.

Unit-4

Type Studies

Hepaticopsida - *Riccia*, *Marchantia*.


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Anthocerotopsida - *Anthoceros*.

Bryopsida - *Funaria*.

Lichens- General characters, Habitat, Structure, Reproduction, Economic and Ecological importance of Lichens.

Suggested Laboratory Exercises

1. Study of class material by making suitable temporary slides and study of permanent slides of, *Oscillatoria*, *Nostoc*, *Volvox*, *Oedogonium*, *Chara*, *Vaucheria*, *Ectocarpus*, *Polysiphonia*.
2. Study of external morphology and preparation of suitable sections of vegetative/reproductive parts of *Riccia*, *Marchantia*, *Anthoceros*, *Funaria*.
3. Study of lichens.

Suggested Readings

- Bold J.I.C. Alexopoulos, C.J. and Delivoryas, T Morphology of Plant and Fungi (4th Ed.) Harper & Foul Co, New work, 1980.
- Ghemawat, M.S. Kapoor, J.N. and Narayan, H.S. A text Book of Algae, Ramesh Book Depot, Jaipur, 1976.
- Gilbart, M.; Smith. Cryptogamic Botany, Vol. I & II (2nd Ed.) Tata McGraw Hill Publishing Co., Ltd., New Delhi, 1985.
- Kumar, H.D. : Introductory Phycology. Affiliated East- West Press, Ltd. New York, 1988.
- Puri, P. : Bryophytes, Atmaram & Sons, Delhi. Lucknow, 1985.
- Sarabhai, R.C. and Saxana, R.C. : A text book of Botany. Vol I & II, Ratan Prakashan Mandir, Meerut, 1980.
- Singh, V., Pande, P.C. and Jain, D.K. : A text book of Botany. Rastogi, & Co., Meerut, 2001.
- Vashista, B.R.: Botany for Degree Students (Algae, Bryophytes) S.Chand & Co., New Delhi, 2002.

Paper II

Microbiology, Mycology and Plant Pathology


Unit-I

Microbiology: Meaning and scope, history and development in the field of microbiology. concept of quorum sensing and biofilms.

Eubacteria: General account, occurrence, morphology (structured and shapes), flagella, capsule, nutritional types, endospore, reproduction (binary fission, transformation, conjugation, transduction), economic and biological importance.

Mycoplasma and Phytoplasma: occurrence, morphology, reproduction and importance.

Virus: General characteristics and importance. Structure of TMV and Pox virus, Structure and multiplication of Bacteriophage.


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Unit-II

Fungi: General characters, occurrence, thallus organization, reproduction, economic importance, classification of fungi (Alexopoulos).

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Albugo and white rust; *Sclerospora* and Downy mildew/Green ear disease of Bajra; *Aspergillus*; *Peziza*.

Unit -III

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Puccinia and Black rust of wheat; *Ustilago* and loose smut of wheat and covered smut of barley; *Agaricus*; *Alternaria* and early blight of potato.

Unit-IV

Causes and symptoms of plant diseases with special reference to green ear disease of Bajra, smut of wheat, citrus canker, little leaf of brinjal and root knot disease. A brief account of principles of plant protection.

Suggested Laboratory Exercises:

1. Study of bacteria using curd or any other suitable material, Gram's staining of bacteria.
2. Study of Mycoplasma, TMV, bacteriophage (Photographs/3-D models).
3. Study of symptoms of plant diseases- Downy mildew of Bajra, Green ear of bajra, Powdery mildew.
4. Study of specimen, permanent slides and by making suitable temporary slides. *Albugo*-white rust; *Sclerospora*- downy mildew, green ear; *Aspergillus*; *Claviceps*- ergot; , *Peziza*, *Ustilago*- Loose smut of wheat, covered smut of barley, *Puccinia*- Black rust of wheat; *Agaricus* and *Alternaria*- early blight of potato.
5. Media preparation; potato dextrose agar, Nutrient agar.
6. Culture techniques of fungi and bacteria.

Suggested Books;

- Alexopoulos, C.J. and Mims, C.W. : Introductory Mycology, John Wiley and Sons, New York, 2000.
- Dube, H.C.: Fungi, Rastogi Publication, Meerut, 1989.
- Sarabhai, R.C. and Saxena, R.C.: A Text book of Botany, Rastogi Publication, Meerut, 1990.
- Sharma, O.P: Fungi, Today and Tomorrow Printers and Publishers, New Delhi, 2000.
- Vashihsta, B.R. Botany for degree students- Fungi, S.Chand & Co. New Delhi, 2001.
- Bilgrami, K.S. and Dube, H.C.: A Text book of modern plant Pathology, Vikas Publications, New Delhi 2000.

- Biswas, S.B. and Biswas: An Introduction to Viruses, Vikas Publications, New Delhi 2000
- Clifton, A.: Introduction of Bacteria, McGraw Hill co. Ltd., New York, 1985.
- Madahar, C.L.: Introduction of Plants Virus, S.Chand and Co., New Delhi, 1978.
- Palzar M.J. Jr. Chan, E.C.S. and Krieg, N.R. : Microbiology, McGraw hill Edu. Pvt. Ltd., London 2001.
- Purohit, S.S : Microbiology, Agro. Bot. Publication, Jodhpur 2002.
- Sharma, P.D. : Microbiology and Pathology, Rastogi Publication, Meerut, 2003.
- Singh, V. and Srivastava V. : Introduction of Bacteria. Vikas Publication. 1998.
- Cappuccino, J. and Sherman, N.: Microbiology: A Laboratory Manual (10 Th Ed.), Benjamin Cummings, 2013
- Anja, K.R. Experiments in Microbiology, Plant Pathology and Biotechnology New age International (P) Ltd., Publishers, New Delhi 2003.
- Mehrotra, R.S. and Aggarwal, Ashok: Plant Pathology, Tata McGraw- Hill Education, 2003.

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B.Sc. Part- I BOTANY:

PAPER III- CELL BIOLOGY, GENETICS AND PLANT BREEDING

Unit- I : Cell organelles and Nuclear material:

Ultrastructure and function of different cell organelles (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosome, peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum). Chromatin structure and chromosome organisation: eukaryotic and prokaryotic, Transposons.

Unit-2: Cell divisions

Cell Cycle, Mitosis: stages, structure and functions of spindle apparatus; anaphasic chromosome movement; Meiosis: its different stages- meiosis I, meiosis II, synaptonemal complex, chiasmata formation and crossing over.

Basis of genetic material: Griffith's transformation experiment and the Hershey and Chase blender experiment to demonstrate DNA as the genetic material.

Concept of Gene: *Neurospora* genetics: one gene one enzyme hypothesis.

Extra nuclear genome: Mitochondrial and chloroplast genome, plasmids.

Chromosomal aberrations: Deletion, Duplication, Translocation, Inversion, Aneuploidy and Polyploidy.

Unit-3: Genetic Inheritance

Mendel's laws of inheritance and their exceptions: allelic (incomplete and co-dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes). Quantitative inheritance: grain colour in wheat, corolla length in *Nicotiana tabacum*.

Cytoplasmic inheritance: Maternal influence, shell coiling in snails, kappa particles in *Paramecium*, multiple allelism : ABO blood groups in men.

Unit-4 : Plant Breeding

Introduction and objectives of plant breeding ; general methods of plant breeding- in self-pollinated, cross-pollinated and vegetatively propagated crop plants.

Introduction and acclimatization. selections, hybridizations, hybrid vigour and inbreeding depression. Role of mutation and polyploidy in plant breeding. Famous Indian and international plant breeders and their contribution. National and International agricultural research institutes.

Plant breeding work done on wheat and rice in India, Green revolution.

Suggested Laboratory Exercises:

- Study of cell structure from Onion, *Hydrilla* and *Spirogyra*
- Study of cyclosis in *Tradescantia* spp.
- Study of plastid for pigment distribution in *Lycopersicon*, *Cassia* and *Capsicum*.
- Study of electron microphotographs of eukaryotic cells for various cell organelles.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- To solve genetic problems based upon Mendel's Laws of inheritance: Monohybrid, Dihybrid, Back cross and Test cross.
- Permanent slides/Photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.
- Emasculation, bagging & Tagging techniques.
- Cross pollination Techniques.

Suggested Readings:

- Choudhary, I.L.K. (1989), Elementary Principles of Plant Breeding, Oxford and IBM Publishing Co, New Delhi.
- Gupta, P.K. (2009) Cytology, Genetics Evolution and Plant Breeding, Rastogi Publications, Meerut.
- Miglani, GS (2000), Advanced Genetics, Narosa Publishing House, New Delhi.
- Russel, P.I.(1998), Genetics The Benejamins/Cummings Publishing Co., Inc. U.S.A.
- Shukla, R.S and chandel, P.S, (2000) Cytogenetics, Evolution and Plant Breeding. S.Chand & Co. Ltd. New Delhi.
- Singh, R.B.(1999), Text Book of Plant Breeding, Kalyani Publishers, Ludhiana.
- Dayansagar, VR. (1986). Cytology and Genetics, Tata McGraw Hill Pub.Co. Ltd. New.
- Roy.SC. and De. KK. (1999) Cell Biology. New Central Book Agency (P) Ltd.Calcutta.
- Verma. PS and Agarwal, Vk (2012) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S.Chand and Co. Ltd. New Delhi.

3. ZOOLOGY

Scheme:

Max Mark: 100

Paper - I	3 Hrs duration	33 Marks
Paper - II	3 Hrs duration	33 Marks
Paper - III	3 Hrs duration	34 Marks
Practicals	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 Marks) type questions, each of 1 mark. This part is compulsory to attempt Question should be evenly distributed covering the 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 question in the main answer book only.

PAPER - I: Z-101

DIVERSITY OF ANIMAL AND EVOLUTION


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 Marks) type questions, each of 1 mark. This part is compulsory to attempt Question should be evenly distributed covering the 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 question in the main answer book only.

Section - A

Diversity of Animals

1. Zoogeographical distribution: Principal zoogeographical regions of the world with special reference to their mammalian fauna.
2. Diversity of fauna of India and the world.
3. Adaptation of animal and their modes of life and the environment.
4. Reason of depletion of biodiversity and conservative measures of biodiversity wherever required.
5. Continental drift.


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Section - B

Biosystematic and Taxonomy

1. General Principles of taxonomy, concept of five kingdom scheme, international code of nomenclature, (ICZN) cladistics, molecular taxonomy.
2. Concept of Protozoa and Metazoa, and levels of organisation.
3. Taxonomy and basis of classification of non-chordata and chordate: symmetry, coelom, segmentation and embryogeny.
4. Detailed classification of non-chordata and Chordata (up to sub orders with examples).
5. Phylogeny of major invertebrate phyla (Sponges, Crustacea, Echinodermata & Hemichordata).

Section - C

Evolution

1. History of evolutionary thoughts (Lamarckism and Darwinism).
2. Natural selection, speciation.
3. Variation, isolation and adaptations.
4. Paleontology: Fossils, geological division of the Earth's crust, imperfection of the geological record.
5. Study of extinct forms: Dinosaurs, Archaeopteryx.

PAPER - II: Z-102 CELL BIOLOGY AND GENETICS

NOTE:

1. There will be two parts of this theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 very short Answer (Maximum 25 Marks) type questions, each of 1 mark. This part is compulsory to attempt. Question should be evenly distributed covering the 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

Cell Biology

1. Introduction to cell; Morphology, size, shape, characteristics and structure of prokaryotic and eukaryotic animal cell; basic idea of virus and cell theory.
2. Cell membrane; Characteristics of cell membrane molecules, fluid-mosaic model of Singer and Nicholson, concept of unit membrane.
3. Cell membrane transport; Passive (diffusion and osmosis, facilitated, mediated) and active transport.
4. Cytoplasmic organelles:
 - (i) Structure and biogenesis of mitochondria; electron transport chain and generation of ATP molecules.
 - (ii) Structure and function of endoplasmic reticulum, ribosome (prokaryotic and eukaryotic) and Golgi complex.

- (iii) Structure and function of lysosome, microbodies and centrioles.
- (iv) Structure and function of cilia, flagella, microvilli and cytoskeletal elements.

Section - B

1. **Nuclear Organization:**
 - (i) Structure and function of Nuclear envelope, nuclear matrix and nucleolus.
 - (ii) Chromosomes; Morphology, chromonema, chromomeres, telomeres, primary and secondary constrictions, chromatids, prokaryotic chromosome.
 - (iii) Giant chromosome types; Polytene and Lampbrush.
 - (iv) Chromosomal organisation; Euchromatin, heterochromatin and folded fiber model and nucleosome concept.
2. **Nucleic Acids:**
 - (i) DNA structure, polymorphism (A, B and Z types) and replication (semi conservative mechanism) experiments of Messelson and Stahl; elementary idea about polymerases, topoisomerases, single strand binding proteins, replicating forks (both unidirectional bidirectional), leading and lagging strands, RNA primers and Okazaki fragments, elementary idea about DNA repair.
 - (ii) RNA structure and types (mRNA, rRNA and tRNA and transcription).
3. **Genetic code and translation:** Triplet code, characteristics of triplet code, protein synthesis (translation).
4. **Cell in reproduction**
 - (i) Interphase nucleus and cell cycle: S, G-1, G-2 and M phase.
 - (ii) Mitosis: Different stages, structure and function of spindle apparatus; anaphasic movement.
 - (iii) Meiosis: Different stages, synapses and synaptonemal complex, formation of chiasmata and significance of crossing over.

Section - C

Genetics

1. Mendelism: Brief history of genetics and Mendel's work; Mendelian laws, their significance and current status, chromosomal theory of inheritance.
2. Chromosomal mutations; Classification, translocation, inversion, deletion and duplication; Variations in chromosome numbers: haploidy, polyploidy, aneuploidy, euploidy and polysomy.
3. Linkage and crossing over, elementary idea of chromosome mapping.
4. Genetic interaction: Supplementary genes, complementary genes, duplicate genes, epistasis, inhibitory and polymorphic genes.
5. Multiple genes inheritance, ABO blood groups and Rh factor and their significance.
6. Cytoplasmic inheritance.
7. Sex determination in Drosophila and man, pedigree analysis.
8. Genetic disorders; Down's Turner's and Klinefelter's syndromes, color blindness, Hemophilia, Phenylketonuria.
9. Concept of genes. Recon. muton and cistron.

PAPER - III: Z-103
GAMETE AND DEVELOPMENTAL BIOLOGY

NOTE:

1. There will be two parts of this theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 very short Answer (Maximum 25 Marks) type questions, each of 1 mark. This part is compulsory to attempt. Question should be evenly distributed covering the 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

Developmental Biology: Scope and Early Events

1. Historical review, type and scope of embryology.
2. Gametogenesis:
 - (i) Formation of ova and sperm.
 - (ii) Vitellogenesis.
3. Fertilisation: Activation of ovum, essence of activation; Changes in the organization of the egg cytoplasm.
4. Parthenogenesis.

Section - B

Developmental Biology Pattern and Processes

1. Cleavage: Definition, planes and patterns of cleavage among non chordates and chordates, significance of cleavage, blastulation and morulation.
2. Fate maps, morphogenetic cell movements, significance of gastrulation.
3. Embryonic induction, primary organizer, Differentiation and competence.
4. Development of chick up to 96 hours stage.
5. Embryonic adaptations:
 - (i) Extra embryonic membranes in chick, their development and functions.
 - (ii) Placentation in Mammals: Definition, types, classification on the basis of morphology and histology, functions of placenta.
 - (iii) Paedogenesis and neoteny.

Section - C

Dimensions in Developmental Biology

1. Regeneration.
2. Various type of stem cells and their applications.
3. Cloning of animals.
 - (i) Nuclear transfer technique.
 - (ii) Embryo transfer technique.
4. Teratogenesis (Genetic and induced).
5. Biology of aging.
6. Cell death.



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Zoology Practical

4 Hrs. / Week

Max. Marks:50

I. Microscopic Techniques:

1. Organisation and working of Optical Microscope, Dissecting and Compound microscopes.
2. General methods of microscopic slide preparations; narcotization; fixing and preservation; washing; staining; destaining; dehydration; clearing and mounting; General idea of composition, preparation and use of:
 - (i) Fixatives: Formalin, Bouin's fluid.
 - (ii) Stains: Aceto-carmin, Aceto-orcin, Haematoxylin-Eosin, Giemsa.
 - (iii) Common reagents: Normal saline, Acid water, Acid alcohol and Mayer's albumin.
3. Collection and Culture Methods:
 - (i) Collection of Animals from their natural habitat during field trips such as Amoeba, Paramecium, Euglena, Planaria, Daphnia, Cyclops, etc.
 - (ii) Culture of Paramecium in the laboratory and study of its structure life - process and behavior in live state.
 - (iv) Vermicomposting (Theory and Practice).

II. Study of Microscopic Slides and Museum Specimens:

Protozoa: *Amoeba*, *Euglena*, *Trypanosoma*, *Giardia*, *Entamoeba*, *Elphidium* (Polystomella). Foraminiferous shells, *Monocystis*, *Plasmodium*, *Paramecium*, *Paramecium* showing binary fission and conjugation, *Opalina*, *Nyctotherus*, *Balantidium*, *Vorticella*.

Porifera: *Leucosolenia*, *Euplectella*, *Spongilla*, T.S Sycon, Spicules. Spongin fibers, Gemmules.

Coelenterata: *Millepora*, *Physalia*, *Velella*, *Aurelia*, *Alcyonium*, *Gorgonia*, *Pennatulata*. Sea anemone, Stone corals, *Obelia* colony and medusa.

Ctenophora: Any Ctenophore.

Platyhelminthes: *Taenia*, *Planaria*, *Fasciola*, (W.M.) T.S. body of *Fasciola* through various regions. Miracidium, Sporocyst, Redia, Cercaria and Metacercaria Larvae of *Fasciola*. Scolex, T.S. mature proglottid of *Taenia*. *Cysticercus* larva.

Asehelminthes: *Ascaris*, *Wuchereria*, *Dracunculus*.

III. Biodiversity: Appliances used in Biodiversity study.

Nature trails, water sieving.

Discovery hunt in college campus/university campus/Forest reserves/sanctuaries/National Park.

Biodiversity survey:

Insect count on vegetation; Bird counts with general information on survey methods.

- Preparation of fact sheet of common wild life found in your campus /area.
- IV. **Fields visits/Excursion to wild life areas.**
(i A candidate is expected to submit a written report of the visit. ii No protected animal be harmed in any way).
- V. **Study of the following Through Permanent Slide Preparation:** Paramecium Euglena, Foraminiferous shells, Sponge spicules. Spongin fibres, Gemmule, Hydra, Obelia colony and Medusa; Parapodium of Neries and Heteronereis, Cyclops, Daphnia.
- VI. **Exercise in Cell Biology:**
1. Squash preparation for the study of mitosis in onion root tip.
2. Squash preparation for the study of meiosis in grasshopper or cockroach testis.
3. Study of giant chromosomes in salivary glands of chironomous or Drosophila larva.
4. Study of cell permeability using mammalian R.B.C.
5. Permanent slides of mitosis and meiosis (all stages).
- VII **Exercise in Genetics:**
A. **Study of Drosophila:**
1. Life cycle and an idea about its culture.
2. Identification of male and female.
3. Identification of wild and mutants (yellow body, ebony, vestigial wing and white eye).
4. Study of permanent prepared slides: Sex comb and salivary gland chromosomes.
- VIII. **Developmental Biology:**
1. **Study of development of frog/toad with the help of Chart/Slides/Models:**
(i) Eggs, cleavage, blastula, gastrula, neurula, tail-bud, hatching, mature tadpole larvae, metamorphic stages, toadlet/ froglet.
(ii) Histological slides: Cleavage, blastula, gastrula, neurula and tail-bud stage.
2. **Study of development of chick with the help of whole mounts/Charts/Slides/Models.**
(i) 18 hrs, 21 hrs, 24 hrs, 33 hrs, 48 hrs, 72 hrs and 96 hrs of incubation.
(ii) Primitive streak stage in living embryo, if possible, after removal of the blastoderm from the egg.
(iii) Study of the embryo at various stages of incubation in vivo by making a window in the egg-shell.
(iv) Study of various foetal membranes in a 10-12 day old chick embryo.

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Scheme of Practical Examination and Distribution of Marks

Time: 4 Hrs.

Max. Marks : 50

	Regular	Ex. /N.C. Student
1. Study of Biodiversity	06	4
2. Permanent Preparation	04	7
3. Cell Biology and Genetics	4+4	6+6
4. Developmental Biology	6	6
5. Identification and Comments on Spots (1 to 8)	16	16
6. Viva Voce	5	5
7. Class Record	5	-
	50	50

Notes:

1. With reference to study of museum specimens and developmental Biology, candidate must be well versed in the study of various systems with the help of chart/models/CD-ROMs, multimedia computer based simulations including computer assisted learning (CAL) and other softwares.
2. With reference to permanent preparations and microscopic slides, in case of non-availability, the exercise should be substituted with diagrams, photographs, models, charts etc.
3. Candidates must keep a records of all work done in the practical class and submit the same for the inspection of 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 preparation would be as per the syllabus or as available through collection and culture methods.
6. It should be ensure that animal used in the practical exercises are not covered under the wild life act 1972 and amendments made subsequently.

Recommended Books;

1. Balinsky-B. I. and Fabain BC Intoduction to Embryology. CENGAGE Learning 2012.
2. Barrington EJW: The Biology of Hemichordata and Protchordata. Oliver & Boyd. London. 1965.
3. Berril N J: Development Biology. Tata McGraw Hill 1971.
4. Colbert EH: Evolution of the Vertebrates 2nd edition John Wiley & Sons, New York 1969.
5. Colbert EH. Morales M. Minkoff EC. Colberts Evolution of the Vertebrates: A History of the Backboneed Animal Through Time 5th edition Wiley Liss 2001.
6. Costanzo LS: Physiology. 4th edition Saunders Inc 2009.
7. Davenport R: An outline of Animal Development Addison-Wesley Longman Inc 1979.

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8. De Robertis EDP and De Robertis Jr EMF. Cell and Molecular Biology. 8th edition Lippincor Williams & Wilkins 2006.
9. Gasque: CD Manual of Laboratory, Experience Cell Biology Mc Graw-Hill Professional publishing 1989.
10. Gilbert SF and Singer SR: Development Biology, Sinauer Associates; 9th addition 2010.
11. Lodish H, berk A, Kaiser CA, Krieger M, Bertscher A, Ploegh H, Amon A, scott M P: Molecular Cell Biology 6th edition W.H. Freeman and Company, New Yark. 2008.
12. Lodish H, Berk A. Keiser CA, Kriser M, Bertscher
13. Lodish H, Berk A. Matsudaira, P, Kaiser CA, Krieger M, scott MP, Zipursky SL, Darnell J: Molecular Cell Biology . 5th addition W.H. freeman and Company. New York 2004.
14. Lodish H, Berk A, Zipursky SL, Matsudaira P. Baltimore D., Darnell J: Molecular Cell Biology 4th addition W.H. freeman and Company. New York 2000.
15. Morgan DD The Cell Cycle: Principal of Control, Sinauer/Panima Books 2007.
16. Petsko GA and Ringe D: Protein structure and function Sinauer/Panima Books 2004.
17. Rao KV Development Biology: A Modern synthesis. Oxford and IBH publishing 1994.
18. Rastogi VB Animal Distribution, Evolution and development Biology. Kedar Nath Ram Nath Educational Publisher.
19. Rastogi VB Evolutionary Biology Kedar Nath Ram Nath Educational Publisher.
20. Singh SP and Tomar BS: Cell Biology 10th edition Rastogi , Publication Meerut New Delhi. 1971
21. Snustad DP and Simmons MJ. Principle of genetics 4th eddition John Wile & Sons Inc. 2005.
22. Verma PS. A manual of Practical Zoology: invertebrates. S. Chand & Co Ltd New Delhi 1971.
23. Verma PS & Agrawal VK: Chordate Embryology: Development Biology. S. Chand & Com Ltd 2012.
24. Verma PS & Agrawal VK: Cell Biology, Genetic Molecular Biology. Evolution and Ecology. 14th addition S. Chand 2004.
25. Winchester AM: An introduction to genetics Barners & Noble. Canada. 2002.
26. Winchester AM: Genetics: A survey of principal of Heredity Oxford & IBH Publishing Co. 1967.
27. Winchester AM: Human Genetics: Ohio Charles E. Merrill Publishing Co. 1971.
28. Trigunayat, M.M & Kritika Trigunayat, A manual of practical Zoology, Part-I Scientific Publishers, Jodhpur.
29. एम.एम. त्रिगुणायत व कृतिका त्रिगुणायत, प्रायोगिक मैनुअल भाग-1 साईटिक पब्लिशर्स जोधपुर (राज.)

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B.Sc. Part I

1. Physics

Scheme

Paper I	Exam. 3 Hours Duration	Max. Marks 33
Paper II	Exam. 3 Hours Duration	Max. Marks 33
Paper III	Exam. 3 Hours Duration	Max. Marks 34
Practical	Exam. 5 Hours Duration	Max. Marks 50

Paper-I (Mechanics)

Work Load: Two hours lecture per 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 nine 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 - I

Physical Law and frame of Reference:

Inertial and non-inertial frames: Transformation of displacement, velocity, acceleration between different frames of reference involving translation, Galilean transformation and invariance of Newton's laws.

Special theory of Relativity: Postulates of Special theory of relativity, Lorentz transformation, transformation of velocity and acceleration, Length contraction and time dilation with experimental verification

Coriolis Force: Transformation of displacement, velocity and acceleration between rotating frame, Pseudo forces, Coriolis force, Motion relative to earth, Foucault's pendulum.

Unit - II

Centre of Mass:

Introduction about Centre of Mass, Centre of Mass Frame; Collision of two particles in one and two dimensions (elastic and inelastic), Slowing down of neutrons in a moderator, Motion of a system with varying mass, Angular momentum concept, conservation and charge particle scattering by a nucleus.

Rigid body

Equation of a motion of a rotating body, Inertial coefficient, Case of J not parallel to w , Kinetic energy of rotation and idea of principal axes, Determination of moment of inertia of symmetric bodies using inertial coefficients, Precessional motion of a spinning top.

Unit - III

Motion under Central Forces:

Introduction about Central Forces, Motion under central forces, Gravitational interaction, Inertial and gravitational mass, General solution under gravitational interaction, Keplers Laws, Discussion of trajectories, Cases of elliptical and circular orbits, Rutherford scattering.

Elastic Properties of Matter

Elastic constants and relations among them, Elastic theorems, Bending of beams and cantilever, Torsion of a cylinder, Experimental determination of Y by bending of beam; η by Maxwell's needle; Y , η and σ by Searle's method & η by static method

Unit - IV

Damped Harmonic Oscillations:

Introduction about oscillations in a potential well, Damped force and motion under damping, Damped Simple Harmonic Oscillator, Power dissipation, Anharmonic oscillator and simple pendulum as an example.

Driven Harmonic Oscillations

Driven harmonic oscillator with damping, Frequency response, Phase relation, Quality factor, Resonance, Series and parallel of LCR circuit, Electromechanical system-Ballistic Galvanometer.

Coupled Oscillations

Equation of motion of two coupled Simple Harmonic Oscillators, Normal modes, motion in mixed modes, Transient behaviour, Dynamics of a number of oscillators with neighbour interactions.

Reference Books:

1. Mechanics: Berkeley Physics Course Vol- I, Charles Kittel
2. Mechanics: H S Hans S P Puri, Tata McGraw-Hill
3. The Physics of Waves & Oscillations. N.K. Bajaj, Tata McGraw-Hill
4. Analytical Mechanics L.N. Hand, J.D. Finch (Cambridge University Press).



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Paper - II (Electromagnetism)

Work Load: Two hours lecture per week

Examination Duration: Three hours

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 nine 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 I

Scalar and Vector Fields

Concept of Field, Scalar and Vector Fields, Gradient of scalar field, Physical significance and formalism of Gradient, Divergence and Curl of a vector field in Cartesian co-ordinates system, Problems based on Gradient, Divergence and curl operators.

Concept of Solid angle, Gauss's divergence and Stokes theorem, Differential and integral form of Gauss's law, Ampere's law and Faraday's law.

Unit II

Fields of stationary and moving charges

Potential energy of system of (i) Discrete N-charges (ii) Continuous charge distribution. Energy required to build a uniformly charged sphere, classical radius of electron, Electric field due to a short electric dipole, Interaction of electric dipole with external uniform and non-uniform electric field, potential due to a uniformly charged spherical shell.

Poisson's and Laplace equations in Cartesian co-ordinates and their applications to solve the one dimensional problems of electrostatics.

Invariance of charge, Electric field measured in moving frames, Electric field of a point charge moving with constant velocity.

Unit III

Electric field in matter

Multipole expansion, definition of moments of charge distribution, Dielectrics, Induced dipole moments, polar & non polar molecules, Free and bound charges, Polarization, Atomic polarizability, electric displacement vector, electric susceptibility, dielectric constant, relation between them.

Electric potential and electric field due to a uniformly polarized sphere (i) outside the sphere (ii) at the surface of the sphere (iii) inside the sphere, Electric field due to a dielectric sphere placed in a uniform electric field (a) outside the sphere (b) inside the sphere, Electric field

charge placed in dielectric medium and Gauss law, Clausius-Mossotti relation in dielectrics, Transient behaviour of series R-C Circuit with a DC Source.

Unit IV

Magnetostatics and magnetic field in matter

Lorentz force, properties of magnetic field, Ampere's law, magnetic field due to a current carrying solid conducting cylinder (i) outside (ii) at the surface and (iii) inside the cylinder, Ampere's law in differential form, Introduction of Magnetic Vector potential, Poisson's equation for vector potential, Deduction of Bio-Savart law using Magnetic Vector potentials, Differential form of Ampere's law, Transient behaviour of series L-R Circuit with a DC Source.

Atomic magnet, Gyromagnetic ratio, Bohr-magneton, Larmor frequency, induced magnetic moment and dia-magnetism, spin magnetic moment, para and ferro magnetism, Intensity of Magnetization, Magnetic permeability and Susceptibility, free and bound current densities, Magnetic field due to a uniformly magnetized material and Non-uniformly magnetized material.

Reference Books:

1. Electricity & Magnetism; AS Mahajan & Abbas A Rangwala, Tata McGraw-Hill
2. Introduction to electrodynamics; David J. Griffith. Prentice-Hall
3. Berkley Physics Course. Vol II
4. Fundamental University Physics Vol II; Fields and Waves. M. Alonso and EJ Finn; Addison-Wesley Publishing Company.

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Work Load: Two hours lecture per week

Examination Duration: Three hours

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 question will have 100% internal choice.

Unit-1

Interference:

Concept of Spatial and Temporal Coherence, coherence length, coherence time, Types of interference, interference by division of wave fronts: Fresnel's Biprism, Measurement of wavelength λ and thickness of a thin transparent sheet, Interference by division of amplitude: Interference in thin films of constant thickness in transmitted and reflected waves. Interference produced by a wedge shaped film, Newton's rings, Determination of wavelength λ and refractive index μ by Newton's Rings: fringes of equal inclination (Haidinger fringes) and equal thickness (Fizeau fringes), Michelson's Interferometer, shape of fringes, Measurement of wavelength, difference between two spectral lines and thickness of a thin transparent sheet.

Unit - 2

Diffraction:

Fresnel's diffraction, Half period zones, Fresnel's diffraction at a circular aperture, straight edge and a rectangular slit, Zone plate, Multiple foci of zone plate, comparison between zone plate and convex lens, Fraunhofer diffraction by single slit and a circular aperture, Fraunhofer diffraction by N parallel slits with two slits as a special case, Missing order, Plane diffraction grating and its use in determining wavelength, Dispersion by a grating, Rayleigh's criterion of resolution, Resolving power of a Telescope and a Grating.

Unit - 3

Polarization:

Polarization: Plane, Circular and Elliptically Polarized light, Polarization by reflection, Double refraction and Huygens explanation of double refraction, Production and detection of Plane, Circular and Elliptically Polarized light; Quarter wave and Half wave plates, optical activity, Specific rotation, Biquartz and half shade Polarimeters and their comparison.

- (i) **Laser:** Spontaneous and Stimulated emission Einstein's A&B coefficients, Energy density of radiation as a result of stimulated emission and absorption, population inversion, Methods of Optical pumping, Energy level schemes, He-Ne, Ruby, CO₂ lasers.




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(T) Holography. Basic concepts of holography, principle, theory, Construction and reconstruction of image. Application of holography.

Unit -4

Wave motion:

1D and 3D wave equation, Transverse waves in a stretched string, Elastic waves in solids, Pressure waves in a gas column, spherical waves, Fourier's Theorem and its application to square and saw-tooth waves, Phase and group velocities, Dispersion of waves, Electromagnetic waves, Energy density of Electromagnetic waves, Electromagnetic waves in an Isotropic and Dispersive medium, Spectrum of Electromagnetic waves

Reference Books:

1. Optics by Brij Lal & Subramaniam, S. Chand.
2. Optics by D. P. Khandelwal.
3. Principles of optics by B. K. Mathur.
4. Introduction to Modern Optics by A. K. Ghatak.
5. An introduction to Modern Optics by G. R. Fowels.
6. Essentials of Lasers by Allen.

Practical

Work Load: Four hours laboratory work per week

Examination Duration: Four hours

Minimum Experiments: Total sixteen taking eight from each section.

Section A

1. To study the variation of power transfer by two different loads by a DC source and to verify maximum power transfer theorem.
2. To study the variation of charge and current in a R-C circuit with a different time constant (using a DC source).
3. To study the behaviour of a R-C circuit with varying resistance and capacitance using at mains as a power Source and also to determine the impedance and phase relations.
4. To study the rise and decay of current in an L-R circuit with a source of constant emf.
5. To study the voltage and current behaviour of an L-R circuit with an AC power source. Also determine power factor, impedance and phase relations.
6. To study the characteristics of a semi- conductor junction diode and determine forward and reverse resistances
7. To study the magnetic field along the axis of a current carrying circular coil, Plot the necessary graph and hence find radius of the circular coil.
8. To determine the specific resistance of a material and determine difference between two small resistance using Carey Fosters Bridge
9. To convert a galvanometer into an ammeter of a given range
10. To convert a galvanometer into a voltmeter of a given range.




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Section B

1. To study the random decay and determine the decay constant using the statistical board,
2. Using compound pendulum study the variation of time period with amplitude in large angle Oscillations.
3. To study the damping using compound pendulum.
4. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.
5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators.
6. To study the viscous fluid damping of a compound pendulum and determining damping coefficient and Q of the oscillator.
7. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.
8. To find J by Calendar and Barne's Method.
9. To determine Youngs modulus by bending of beam.
10. To determine Y , σ and η by Searle's method.
11. To ensure Curie temperature of Monel alloy.
12. To determine modulus of rigidity of a wire using Maxwell's needle.
13. Study of normal modes of a coupled pendulum system. Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.
14. To study variation of surface tension with temperature using Jaegger's method.
15. To study the specific-rotation of sugar solution by polarimeter



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Blueprint for setting question paper I & II for B.Sc. part I Physics Examination - 2016

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 अंकों 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 अंकों का है, जिसमें आन्तरिक विकल्प है।

1. पदाक्षर शब्द सीमा में नौ 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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Blueprint for setting question paper III for B.Sc. part I Physics 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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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 :

	Science	Max. Pass Marks
		150
	Duration	Max Marks
Paper – I	Discrete Mathematics	3 hrs 40 (Science)
Paper – II	Advanced Calculus	3 hrs 40 (Science)
Paper – III	Coordinate Geometry and Vector Calculus	3 hrs 40 (Science)
Practical		2 hrs 30 (Science)

Note :-

1. Syllabus of each of three papers is divided into FIVE units.
2. Each paper is divided into THREE sections A, B & C.
3. **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.
4. **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.
5. **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.
6. Common paper will set for Faculty of Science and Faculty of Social Science.

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7. 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.
8. An internal/external examiner can conduct practical examination of not more than 100 (one hundred) candidates (20 candidates in each batch).
9. Each candidate has to pass in theory and practical examinations separately.

Paper – I Discrete Mathematics

Teaching : 3 hrs per week

Duration of Examination : 3 hrs

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 : Algebraic Structures – Binary operations, Definition and examples of groups, Elementary properties of groups, Order of an element, Cyclic groups, properties of cyclic groups, Permutation: product of two permutations, even and odd permutations, inverse of permutations, cyclic permutations, Permutation groups.

Unit – II: Graph theory – Introduction, definition of graph, degree of vertex, Directed graphs, finite and infinite graphs, hand shaking property, Regular graphs, Bipartite graphs, Operations on graphs, Isomorphism, Sub graphs, Connected and Disconnected graphs, Euler circuit and Euler graphs, Hamiltonian cycles and Hamiltonian graphs, Weighted graphs, Shortest path problem, Dijkstra algorithm.

Unit – III : Planner and non planner graphs, Euler's formula, Detection of planarity, Dual of planner graphs, Graph colouring, Chromatic number, Map colouring, Five colour theorem, Matrix representation of graphs. Trees, properties of trees, rooted tree, binary tree, Spanning tree, Spanning tree in weighted graphs, Kruskal's algorithm and Prim's algorithm to find minimal spanning tree in a weighted graph.




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Unit – IV : Boolean Algebra- Definition, duality, properties of Boolean algebra, Ordered relation in Boolean algebra, Lattices, Homomorphism, Boolean functions and expressions, Conjunctive and Disjunctive normal forms, Fundamental theorem of arithmetic, divisibility in \mathbb{Z} , Congruences, Chinese Remainder Theorem.

Unit – V : Generating functions – Discrete numeric function, ordinary generating function, Convolution of sequences, Summation using convolution, counting techniques, Partition of integers, Exponential generating function, Recurrence Relation - First order relation, second order linear homogeneous relation, Third and higher order linear homogeneous relations, Linear non homogeneous relations of second and higher order, Solution of recurrence relations using generating functions. Logic and propositional calculus- propositions, basic logical operations, truth tables, tautologies and contradictions, quantifiers.

Paper – II Advanced Calculus

Teaching : 3 hrs per week

Duration of Examination : 3 hrs

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 question 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 : Convergence and Divergence of Infinite Series- Introduction, Tests for convergence, Comparison test, D' Alembert ratio test, Cauchy's n^{th} root test, Raabe's test, De Morgan and Bertrand test, Cauchy's condensation test. Successive Differentiation- n^{th} derivative of single variable functions, Leibnitz's theorem, Expansion of functions Using Maiclaurin's theorem.

Unit – II : Polar Coordinates – Angle between radius vector and tangent, length of perpendicular from pole to the tangent, polar sub tangent and subnormal, Pedal equation of Cartesian and polar curves. Derivatives of arcs – Cartesian and polar forms. Curvature – Definition, radius of curvature for Cartesian, polar and parametric curves, curvature at the origin, centre of curvature, circle of curvature, chord of curvature. . Partial differentiation, Euler's theorem on homogeneous functions, Total differentiation.



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Unit – III : Envelopes – Family of curves, Definition of envelope, Envelopes of Cartesian, polar and parametric curves. Asymptotes – Definition, methods to find asymptotes of Cartesian and polar curves, Intersection of curve and its asymptotes. Maxima and Minima of functions of two or three variables – Lagrange's condition for two independent variables, Lagrange's method of undetermined multipliers, Singular points, double point, Tracing of Cartesian and polar curves.

Unit – IV : Gamma and Beta functions – Definition, Transformations of Gamma functions, Relation between Beta and Gamma functions, Euler's functional equation, Double multiple formula. Double Integral- Evaluation of double integrals, Change of order of integration, Triple integrals – Evaluation of triple integrals, Dirichlet's formula for triple integrals.

Unit – V : Rectification- Meaning, lengths of Cartesian and polar plane curves. Quadrature – Areas bounded by plane curves (Cartesian and polar), Use of double integrals to find areas. Volume and Surfaces of solids of revolution, Pappus theorem, Use of triple integrals to find volumes.

Paper – III Coordinate Geometry and Vector Calculus

Teaching : 3 hrs per week

Duration of Examination : 3 hrs

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 : Two Dimensional Coordinate Geometry – Conic sections, Parabola, Ellipse and Hyperbola, Intersection with straight lines, Condition of tangency, Tangent and Normals, Pair of tangents, Chord of contact, Pole and Polar lines, diameter, Parametric coordinates.



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Unit-II : Three Dimensional Coordinate Geometry– Sphere, Plane sections of sphere, Intersection of a sphere with a line, Tangent plane, Plane of contact, Pole and Polar planes, Orthogonality of two spheres, Radical plane, Radical line and Radical centre of sphere. Cone – Definition and equation, Enveloping cone , Representation of cone by a general equation second degree, Tangent plane, Reciprocal cone, Right circular cone.

Unit-III: Cylinder – Definition and Equation of cylinder, Enveloping cylinder, Right circular cylinder. Central Conicoid – Definition and standard equation, Tangent lines and tangent planes , Director sphere, Pole and Polar planes, Enveloping cone and enveloping cylinder, Normals to conicoids, Diameter and diametral planes.

Unit – IV: Generating lines of conicoids- condition for a straight line to be a generator, system of generating lines, properties of generating lines of hyperboloid. Reduction of general equation of second degree- principal planes and principal directions, centre of a conicoid , canonical forms, transfer of origin and rotation of coordinate axes for canonical form.

Unit –V: Vector Calculus – Differentiation and Integration of vector point function, Gradient of scalar point function, Divergence and Curl of vector point functions, Identities on gradient, curl, divergence. Gauss and Stock's theorems(no proofs are required) and their applications.

Practical

Teaching : 2 hours per week

Examination Scheme:

Duration - 2 hours

	Science
Maximum Marks	30
Minimum Pass Marks	11
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 : Graphs of some standard functions- x^n (for different value of n), e^x , $\log_e x$, $\log_a x$ ($a < 1$ and $a > 1$), $\sin x$, $\cos x$, $\tan x$, $\cot x$, $\operatorname{cosec} x$, $\operatorname{sec} x$.

Tracing of Cartesian and polar two dimensional curves.

Group – B : Classification and Tracing of conics representing by general equation of second degree $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$.

Classification of conicoid representing by general equation of second degree $ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy + 2ux + 2vy + 2wz + d = 0$

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

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