FACULTY OF EDUCATION
SYLLABUS
Integrated Programme of
B.Sc.- B.Ed. Degree (Four Year)
Annual Scheme

Academic Session 2018-19
Examination B.Sc B.Ed Part - II (2019)

Rajasthan University
Jaipur
NOTICE

1. Change in syllabus/ordinance/rules/regulations/syllabi and books may from time to time, be made by amendment or remaking 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 Rajasthan University head quarter Jaipur only and not any other place.
B.Sc B.Ed PART - II

CONTENTS

SCHEME OF EXAMINATION

SYLLABUS

1. GENERAL HINDI (COMPULSORY PAPER)*
2. KNOWLEDGE AND CURRICULUM (COMPULSORY PAPER)
3. LEARNING AND TEACHING (COMPULSORY PAPER)
4. PEACE EDUCATION (GROUP - A)
5. OPTIONAL PAPER PCM AND PCB GROUP (GROUP - B)
   I. CHEMISTRY
   II. BOTANY
   III. ZOOLOGY
   IV. PHYSICS
       MATHEMATICS
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.
- 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 faster 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 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 pupils and to maintain a cumulative development.

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 organizations.

**Integrated Programme of B.Sc.-B.Ed. Degree Shall 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**

Examination after each session in theory papers

Scheme of Examination against each subject separately.

**Compulsory Papers:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>I(^{st}) Year</td>
<td>Gen. English</td>
</tr>
<tr>
<td>II(^{nd}) Year</td>
<td>Gen. Hindi</td>
</tr>
<tr>
<td>III(^{rd}) Year</td>
<td>Computer Application (ICT)</td>
</tr>
<tr>
<td>IV(^{th}) Year</td>
<td>Environmental Education</td>
</tr>
</tbody>
</table>

*Each student must secure 40% pass marks in each of the paper to pass the examination. Any student who fails to secure 40% pass marks in a paper shall be re-examined in division.

Raj 18

Registrar (Acad.)

University of Rajasthan
Group - A: - Subject Specialisation:

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year</td>
<td>Instructional System &amp; Educational</td>
</tr>
<tr>
<td>2nd Year</td>
<td>Peace Education</td>
</tr>
<tr>
<td>3rd Year</td>
<td>Guidance and Counselling in School</td>
</tr>
<tr>
<td>4th Year</td>
<td>Physical Education &amp; Yoga</td>
</tr>
</tbody>
</table>

Group-B: Content of Science Subject: - A Student has to opt PCB & PCM Group select any three optional subject (papers) from group B which two must be the school teaching subjects.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Botany</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Zoology</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Physics</td>
<td>I, II &amp; III</td>
</tr>
<tr>
<td>Mathematics</td>
<td>I, II &amp; III</td>
</tr>
</tbody>
</table>

Group C: Pedagogy of School Subject 08 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).

- Pedagogy of Chemistry
- Pedagogy of Biology
- Pedagogy of Physics
- Pedagogy of Mathematics
- Pedagogy of General Science
In all the subjects the student has to study a minimum of 12 papers in Ist year, 12 Paper in IIInd Year, 12Paper in IIIrd Year and 7 Paper in IVth Year (Total 43Papers).

Each theory paper will carry 100 marks and content base paper 05, 06, 07 (G-D) will carry 150 marks. (With practical part). Distribution of marks in mathematics is according to their marking scheme in page no.7.

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

Details of course and scheme of study, titles of the papers, duration etc. for B.Sc.B.Ed Course are provided in Tables given below:

### Four Years Integrated Course

#### Scheme of B.Sc.-B.Ed. Ist Year

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B.Sc.-B.Ed. 01</td>
<td>Gen. English(Compulsory)*</td>
<td>100:00</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>B.Sc.-B.Ed. 02</td>
<td>Childhood and Growing Up</td>
<td>80:20:00</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>B.Sc.-B.Ed. 03</td>
<td>Contemporary Ind. and Education</td>
<td>80:20:00</td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>B.Sc.-B.Ed. 04</td>
<td>Instructional System &amp; Educational Evaluation</td>
<td>80:20:00</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>B.Sc.-B.Ed. 05, 06</td>
<td>Content (PCB &amp; PCM Group) (Select any Three)</td>
<td>50:150</td>
<td></td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td>1. Chemistry(I,II,III)</td>
<td>33+33+34</td>
<td></td>
</tr>
<tr>
<td>VII</td>
<td>B.Sc.-B.Ed. 07</td>
<td>2. Botany(I,II,III)</td>
<td>33+33+34</td>
<td></td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td>3. Zoology(I,II,III)</td>
<td>33+33+34</td>
<td></td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td>4. Physics (I,II,III)</td>
<td>33+33+34</td>
<td></td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td>5. Mathematics(I,II,III)</td>
<td>40+40+40</td>
<td></td>
</tr>
</tbody>
</table>

*Eligibility criterion on passing marks but marks shall not be divided in division.

Dy. Registrar (Acad.)
University of Rajasthan
Jaipur
### Four Years Integrated Course Scheme of B.Sc.-B.Ed. IIInd Year

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.Sc.-B.Ed.</td>
<td>Gen. Hindi (Compulsory)</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>B.Sc.-B.Ed.</td>
<td>Knowledge and Classroom</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>III</td>
<td>B.Sc.-B.Ed.</td>
<td>Learning and Teaching</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>B.Sc.-B.Ed.</td>
<td>Peace Education</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>B.Sc.-B.Ed.</td>
<td>Content (PCB &amp; PCM Group)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI &amp; VII</td>
<td></td>
<td>(Select any Three)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Chemistry (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Botany (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Zoology (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Physics (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Mathematics (I,II,III)</td>
<td>40+40+40</td>
<td>30</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| VIII        | DBH1        | OPEN AIR VOLUNTEER CAMP     |             |             |             |             |             |
|             |             | 1. Community Service        | 25          | 100         |             |             |             |
|             |             | 2. Survey (Based on social and educational events) | 25 |
|             |             | 3. Co-Curricular Activities | 25          |             |             |             |             |
|             |             | 4. Health and Social awareness programme (DISASTER MANAGEMENT AND CLEANINESS) | 25 |

**Eligibility Criterion on passing marks but marks shall not included in division**

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Dy. Registrar (Acad.)
University of Rajasthan
Jaipur

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# Four Years Integrated Course

## Scheme of B.Sc.-B.Ed. IIIrd Year

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Sc.-B.Ed.</td>
<td>Information &amp; Communication Technology</td>
<td>60</td>
<td>-</td>
<td>40</td>
<td>(30+10)</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>01</td>
<td>(Compulsory)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>B.Sc.-B.Ed.</td>
<td>Language Across the Curriculum</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>B.Sc.-B.Ed.</td>
<td>Guidance and Counseling in School</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>04</td>
<td>(G-A)</td>
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<td></td>
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</tr>
<tr>
<td>V</td>
<td>B.Sc.-B.Ed.</td>
<td>Content (PCB &amp; PCM Group)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI &amp; VII</td>
<td>05, 06</td>
<td>(Select any Three)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&amp;</td>
<td>1. Chemistry (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&amp;</td>
<td>2. Botany (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Zoology (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Physics (I,II,III)</td>
<td>33+33+34</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Mathematics (II,III)</td>
<td>40+40+40</td>
<td>30</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>V (a,b)</td>
<td></td>
<td>Pedagogy of a School Subject (part-1),</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Chemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Biology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. General Science</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **Practicum**

- **Special Training Programme**
  - Micro Teaching
  - Practice Lesson
  - Observation Lesson

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*By Registrar (Acad.)
Jain University of Rajasthan*

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

### Four Years Integrated Course

**Scheme of B.Sc.-B.Ed. IVth Year**

<table>
<thead>
<tr>
<th>Theory Paper</th>
<th>Course Code</th>
<th>Title of the Paper</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>B.Sc.-B.Ed.</td>
<td>Environmental Education (Compulsory)*</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>B.Ed.</td>
<td>Creating and improving school</td>
<td>80  20</td>
</tr>
<tr>
<td>III</td>
<td>B.Sc.-B.Ed.</td>
<td>Understanding Discipline and Subject</td>
<td>80  20</td>
</tr>
<tr>
<td>IV</td>
<td>B.Sc.-B.Ed.</td>
<td>Physical Education &amp; Yoga</td>
<td>80  20</td>
</tr>
<tr>
<td>V</td>
<td>B.Sc.-B.Ed.</td>
<td>Gender, School and Society</td>
<td>80  20</td>
</tr>
<tr>
<td>VI</td>
<td>B.Sc.-B.Ed.</td>
<td>Assessment for Learning</td>
<td>80  20</td>
</tr>
<tr>
<td>Year</td>
<td>Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Year</td>
<td>Gen. English</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II Year</td>
<td>Gen. Hindi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III Year</td>
<td>Computer Application (ICT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV Year</td>
<td>Environmental Education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Compulsory Papers**

<table>
<thead>
<tr>
<th>Year</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Childhood and Growth Up</td>
</tr>
<tr>
<td></td>
<td>Contemporary India and</td>
</tr>
<tr>
<td>Year</td>
<td>Paper</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------</td>
</tr>
<tr>
<td>1\textsuperscript{st} Year</td>
<td>Instructional System &amp; Educational</td>
</tr>
<tr>
<td>2\textsuperscript{nd} Year</td>
<td>Peace Education</td>
</tr>
<tr>
<td>3\textsuperscript{rd} Year</td>
<td>Guidance and Counselling in School</td>
</tr>
<tr>
<td>4\textsuperscript{th} Year</td>
<td>Physical Education &amp; Yoga</td>
</tr>
</tbody>
</table>

**Group A: Subject Specialisation:**

1. Knowledge and curriculum
2. Learning and Teaching
3. Language Across the Curriculum
4. Creating and inclusive school
5. Understanding Disciplines and Subject
6. Gender, School and Society
7. Assessment for Learning

**Group B: (PCB and PCM Group) (Select any three)**

1. Chemistry (I, II, III)
2. Physics (I, II, III)
3. Biology (I, II, III)
4. Mathematics (I, II, III)
5. Physics (I, II, III)

**Group C: Pedagogy of School Subject 08 A/B:** Pedagogy of a School Subject III\textsuperscript{rd} Year and IV\textsuperscript{th} Year (candidate shall be required to offer any two papers from the following, for part-III & part-IV).

- Pedagogy of Chemistry
- Pedagogy of Biology
- Pedagogy of Physics
- Pedagogy of Mathematics
- Pedagogy of General Science
In all the subjects the student has to study a minimum of 12 papers in 1st year, 12 Paper in IIInd Year. 12Paper in IIIrd Year and 7 Paper in IVth Year (Total 43Papers).

Each theory paper will carry 100 marks and content base paper 05, 06, 07 (G) will carry 150 marks. (With practical part). Distribution of marks in mathematics is according to the marking scheme in page no.7.

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 :-

<table>
<thead>
<tr>
<th>Years</th>
<th>Papers</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Year</td>
<td>12Paper +Practical</td>
<td>600 +150= 750</td>
</tr>
<tr>
<td>II Year</td>
<td>12Paper +Practical +Practicum</td>
<td>600 +150+100= 850</td>
</tr>
<tr>
<td>III Year</td>
<td>12Paper +Practical +Practicum +Final Lesson</td>
<td>600 +150+ 100 +100 = 950</td>
</tr>
<tr>
<td>IV Year</td>
<td>7 Paper +Practical +Practicum +Final Lesson</td>
<td>600+ 100 +100= 800</td>
</tr>
<tr>
<td>Total</td>
<td>43Papers</td>
<td>2400 +550+200 +200= 3350</td>
</tr>
</tbody>
</table>

O. The objectives of the practical work prescribed for the Integrated Programme of 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. Use the curiosity and interest of the pupils and secure their active participation in 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. Plan the objectives of particular lessons and plan for their achievements.

10. Audit the prescribed subject matter in relation to the needs, interest and abilities of 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. Rate 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. Blackboard work.
8. Practical work connected with school subjects.
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.
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 Shiksha, General Hindi, Education and Environment Education. Prescribed for 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 subjects.

ii. Only such candidate shall be allowed to offer General Science for the B.Sc B.Ed Examination who had studied Chemistry and any one subject of life science i.e. Biology, Botany or Zoology.

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 Year shall be in two parts- part 1 comprising theory papers & part 2 practice of teaching in accordance with the scheme of examination laid down from time to time.

O.363 Candidates who fail in Integrated B.Sc-B.Ed examination in part 1 or/ part 2 the theory of education 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 appear in the examination in the immediately following year in the paper in which he fails only. He/she shall be declared to have passed if he secures minimum passing marks prescribed for the paper in which he appeared and shall be deemed to have secured minimum passing marks only prescribed for the paper (irrespective of the marks actually obtained by him) for the purpose of determining his division in accordance with the scheme of examination. The candidate shall have to repeat the whole examination in subsequent year in case he fails to clear the paper in which he failed.

O.326 Candidates who fail in the Integrated B.Sc-B.Ed. examination part 1 and part 2 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 1 & 20 in part 2) supervised lessons.

O.326 A candidate who completes 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;

Paper I: theory papers at B.Sc. level. In Integrated B.Sc-B.Ed II Paper nos. are 02, 03 & 04, each session are 3 hours carrying 100 marks (80 for theory + 20 for sessional) each. Compulsory paper of 100 marks and optional Paper 05, 06, 07 (GeB). in
each session are three hours carrying 150 marks (100 marks theory 50 marks practical). Distribution of marks in mathematics is according to their marking scheme in page no.7. VIIIth paper practicum carrying 100 marks.

Practice Teaching - Micro Teaching, Internship, Practice Teaching of 20 weeks (10 at B.Ed Year III & 10 at B.Sc.-B.Ed Year IV) Block Teaching, 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 ten lessons in each subject should be supervised.

2. 40 (20+20) lessons as desired in the syllabus should be completed as full period class room lesson. Micro teaching lesson to be used in addition to those 40 lessons for developing certain teaching skills.

3. A minimum of ten lessons in each subject will be supervised evaluated by the subject specialist or a team of specialists of the subjects.

Large, the evaluation of the performance in the practical teaching will be based on the last ten lessons in the subject when the student has acquired some competence and skills 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 practical 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 examiners 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). 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 another training college, affiliated to University of Rajasthan.

(c) An external examiner from outside the University of Rajasthan 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.

Working out the result and awarding the division:

Candidate in order to be declared successful at the Integrated B.Sc-B.Ed. I, II, III & IV 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 percent marks in each theory paper and sessionals (24 marks out of 80 and 6 marks out of 20); (b) 30% marks in each theory paper and sessional (11 marks out of 35 & 4 marks out of 15) (c) 36 percent 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:

(a) 50 percent marks in the external examination.

(b) 50 percent marks in 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 teaching as follows:

<table>
<thead>
<tr>
<th>Division</th>
<th>Theory</th>
<th>Practice of Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Pass</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>36%</td>
<td>40%</td>
</tr>
</tbody>
</table>

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.
नोट:
1. अंक प्राप्त करने के लिए प्रत्येक अंक की जानकारी दी जाएगी।
2. प्रश्न पत्र में प्राप्त अंकों का सम्मान नहीं होगा।
3. सही जवाब देने के लिए प्रश्न पत्र में दी गई हिन्दी एवं अंग्रेजी में दो भाग होंगे।
4. प्रश्नों के लिए स्वतंत्रता का लाभ नहीं होगा।

क) दो स्वतंत्र पाठ में बदलने के लिए दिए गए पेंट हैं।
ख) दो व्याख्या पाठ हेतु दिए गए पेंट हैं
ग) आलेखनात्मक प्रश्न पत्र (किक्टच देना है)
घ) आलेखनात्मक प्रश्न पत्र (विलिप देना है)

पाठ प्रश्न:

1. दो स्वतंत्र पाठ बदलने के लिए दिए गए पेंट हैं।
2. दो स्वतंत्र पाठ बदलने के लिए दिए गए पेंट हैं।
3. आलेखनात्मक प्रश्न पत्र (किक्टच देना है)
4. आलेखनात्मक प्रश्न पत्र (विलिप देना है)

पाठ प्रश्न:

(कबीर ग्रंथाकली से प्रक्रि- स्त्रयासुंदर दास)

1. कबीर — सारी सं. — दुधुध को अंग — 7.12, 26, 30
2. सुरदास सूक्तामर सार — सं. क. 30, 18, 17, 10
3. पंकजलिंग-पंकजलिंग — सं. क. 30, 18, 17, 10
4. नेहरू — सं. क. 30, 18, 17, 10
5. तुलसीदास — सं. क. 30, 18, 17, 10
6. महिलावली — सं. क. 30, 18, 17, 10
7. समीक्षक — सं. क. 30, 18, 17, 10
8. सुप्रसाद — सं. क. 30, 18, 17, 10
9. सुरविद्या जीविका — सं. क. 30, 18, 17, 10
MODULE - 02

PART II

KNOWLEDGE AND CURRICULUM

MARKS : 100

Objective:

After completing the course the students will be able:

- To provide awareness and understanding towards knowledge and curriculum.
- To create excellence in the educational system for facing the knowledge of challenges of the twenty first century.
- To realize the importance of curriculum modification.
- To examine the different sources of knowledge and their kinds.
- To familiarize students with the process of construction of knowledge.
- To transform pupil-teacher's into a vibrant knowledge-based society.

Unit I - Concept And Facts Of Knowledge

- Meaning and Nature of knowledge
- Differences between: Knowledge and skill, Teaching and Training, Knowledge and information, Reason and belief.
- Differences of knowledge and relationship such as - Local and universal, concrete and Abstract, Theoretical and Practical, School and out of school.

Unit II - Child's Construction Of Knowledge

- Sources of knowledge: Empirical knowledge Vs Revealed knowledge.
- Different kinds of knowledge:
  a) Disciplinary knowledge: Concepts and Alternative concepts
  b) Course content knowledge: Criteria of Selection and concerns
  c) Indigenous knowledge Vs Global knowledge
  d) Scientific knowledge Vs Religious knowledge

Unit III - Concept Of Curriculum

- Meaning, Nature and objectives of curriculum, Need for curriculum in schools
- Differences between curriculum and syllabus
  Face to face teaching curriculum

Various types of curriculum - subject centered, Experience centered, Activity centered.
Unit IV: Curriculum Planning and Transaction

- Construction of Curriculum
- Models of Curriculum Development: Frederic Bastiaan Bobbit, Ralph Tyler, Hilda

Task:


Unit V: School: The Site of Commitment and Engagement

- Role of School Policies, Procedures, and Organization in creating a context for transactional activities.
- Role of Infrastructure Support, the Physical and Technical Classroom seating Arrangement, Library, Teachers' Room, Cafeteria, etc.
- School Culture and Organisational culture: the context for Teachers's Work.
- Teacher's role and Support is “Developing Curriculum, Transactiong Curriculum and Research on Curriculum”: realities and expectations.

Test: MCQs

1. Choose the correct answer: 10 Marks

2. Prepare a 1000-word report:
   - Section A: Research on educational practices, group, and individual works.
   - Section B: Classroom management: policies, documents from key practices, and their effectiveness in education.
   - Review of works from different subject.
   - Preparation and presentation of 1000-word report.

References:


5. (2000). Educational Management and Administration. New Delhi, Sterling Publisher P.Ltd.
9. www.Knowledgesite.com/India.gov.in
10. www.ncert.nic.in
B.Sc. B.Ed - 03

PART II

Learning and Teaching

MARKS -100

Objectives

After completing the course the student will be able:

1. To get acquainted with the concept, principles and nature of teaching and learning.
2. To understand the different learning styles based on the difference of learners.
3. To study the relationship between teaching and learning and the factors which influence learning.
4. To make use of modern information and communication technology to improve teaching-learning process.
5. To understand learning as a process of communication and be aware of various resources available for making it effective.
6. To study and analyze the socio cultural factors influencing cognition and learning.
7. To study and understand learning in constructivist perspective.
8. To be acquainted with professional ethics of teaching profession.
9. To study the new trends and innovations involved in teaching learning process with professional ethics.

Unit I - Learning and Teaching Process

- Relationship between teaching and learning, Resource and their development for promoting teaching – learning process.

Unit II - Source of Effective Teaching Learning

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

Concept of micro teaching, various teaching skills.

**Unit III - Educational Technology**

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

**Unit IV - New Trends in teaching learning due to technological innovation**

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

**Unit V - Teaching as profession:**

- Ethics of teaching, professional growth of a teacher
- Characteristics and strength of a teacher to face the challenges in present Era.
- Emphasis of reorientation and training programmes for pre-service and In-service teachers.

**Test and Assignment:**

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

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

REFERENCES:

B.Sc. B.Ed.-S:
PART-II
PEACE EDUCATION

OBJECTIVES:

The course will enable the student teachers –

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

UNIT-1: Concept of Peace

- Positive peace and Positive peace

- Peace - Peace as absence of war and abolition of war, as the minimization and elimination of violence, as removal of structural violence, Peace with Justice, Peace and Nonviolent liberation technique (Satyagraha) and Disarmament.

- Positive peace: Positive Interpersonal relations, Peaceful resolution of Conflict, Peace and Development, Alternative defense, living with nature and preserving Life and Eco system and Holistic Inner and Outer Peace.

Unit -2: Introduction of Peace Education

- Meaning, Concept, need, aims and objectives of Peace Education.
- A universal value
• Role of Social Agencies: Family, Religion, Mass Media, Community, School, NGO's, Government Agencies in promoting peace education.

• Current Status of Peace Education at Global Scenario.

Unit 3. Basis of Peace Education

• Skills required for Peace Education (WHO)

• Types of Peace Education: Conflict management, Conservation of Environment

• Challenges to Peace: Stress, Conflict, Crimes, Terrorism, Violence and Modernization.

• Strategies and Methods of teaching Peace Education: Meditation, Yoga, Dramatization, Debate and etc.

UNIT 4. Effective Teaching of Peace

• Peace Education for Life and Life long education, Peace Education and Removing the Bias towards Violence

• Model of integrated Learning – Cooperative Learning, Group Discussion, Project Work, Role Play, Story Telling, Rational Analytic Method – Case Analysis and Situation analysis,


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

• Integration of Peace Education through curricular and co-curricular activities

• Programmes for Promoting Peace Education – UNESCO

• Addressing challenges to peace in Multicultural Society.

• Role of Great personalities in promoting Peace: Gautam Buddha, M.K. Gandhi, Nelson Mandela, Mother Teresa

Tasks and Assignments
1. Class Test 10 marks

2. Any one 10 Marks

- Prepare a Role Play of Great Personalities who worked/ contributed towards Peace.
- Organize an activity in schools to promote Peace.
- Write a report on Gandhi and Peace.
- Write about the contribution of any two Noble prize winners for Peace.
- Prepare an album of Indian Philosophers and write their thoughts on peace.

REFERENCES:

Scheme:

Max Marks: 150
Duration (hrs.): Max. Marks Min. Pass Marks
3 33
3 33
3 34
4 50

Note: Three questions are to be set; to give (62) questions from each unit. Candidates have to answer at least one question from each unit.

**Paper-I: Inorganic Chemistry**
(2 hrs or 3 periods/week)

**Unit-I**
Chemistry of Elements of First Transition Series:
Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation-states, coordination number and geometries.

Chemistry of Elements of Second and Third Transition Series:
General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

**Unit-II**
Coordination Compounds:
Coordination theory and its experimental verification, effective atomic number concept, structure and nature of coordination compounds, isomerism in coordination compounds, valence bond theory and transition metal compounds.

**Unit-III**
Chemistry of Lanthanide and Actinide Elements:
Electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.
General features, chemistry of separation of Nd, Pu and Am from U, electronic configuration, oxidation states, magnetic properties, complexation behavior, comparison of lanthanides and actinides, super heavy elements.

**Unit IV**
Oxidation and Reduction:
Unit-V

Acids and Bases:

Non-aqueous Solvents:
Physical properties of a solvent, types of solvents and their general characteristics. Reactions in non-aqueous solvents with reference to liquid ethers and liquid SO2.

Electromagnetic Spectrum: An Introduction

Absorption Spectroscopy
Ultraviolet (UV) spectroscopy - Absorption laws (Beer-Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of solvents on transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones.

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

Alcohols - classification and nomenclature
Monohydric alcohols - Methods of formation by reduction of aldehydes, ketones, carboxylic acids, etc. Hydrogen bonding. Acidic nature. Reactions of alcohol with mechanism.
Dihydric alcohols - methods of formation, chemical reactions of vicinal glycols, oxidative cleavage (with HNO3 and H2O2) and puroplagalic rearrangement.
Monohydric alcohols - methods of formation, chemical reactions of glycerol.

Phenols

Ethers and Epoxides
Methods of formation, physical properties. Chemical reactions - cleavage and autooxidation of epoxides.
Aldehydes and Ketones
Structure of the carbonyl group. Syntheses of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes. Syntheses of ketones from nitriles and from carboxylic acids. Physical properties.
Gas phase reactions. AIPV (Meerwein-Ponndorf-Verley), Clemmensen, Wolff-Kishner, LiAlH₄ and related reductions. Halogenation of epoxidizable ketones. Use of acetals and 1,3-dithiane as protecting agents.

Unit IV
Carboxylic Acids
Methods of formation and chemical reactions of halo acids. Hydroxy acids - malic, tartaric and citric acids.
Dicarboxylic acids: methods of formation and effect of heat and dehydrating agents (succinic, glutaric and adipic acids).

Carboxylic Acid Derivatives
Structure, nomenclature and synthesis of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.
Preparation of carboxylic acid derivatives, chemical reactions, mechanisms of esterification and hydrolysis (acidic and basic).

Oxazoles and Nitrogen Compounds

Reactions of amines, electrophilic aromatic substitution in amines, reactions of amines with nitrous acid. Diazotation and mechanism. Synthetic transformations of aryl diazonium salts, azocompound and its applications.
Paper III: Physical Chemistry 
(2 Hrs. or 3 periods/week)

UNIT-I

Thermodynamics - I
Definition of Thermodynamic Terms: System, surroundings, etc. Types of systems, intensive and extensive properties. State and function parameters and their differentials. Thermodynamic properties concept of heat and work.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, heat capacities, heat capacities at constant volume and pressure and their relationship. Joule's law. Integration coefficient and inversion temperature. Calculation of w, q, delta U & delta H for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process


UNIT-II

Thermodynamics - II

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

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

Chemical Equilibrium:


Phase equilibria of two component systems: solid-liquid equilibria. Simple eutectic Bi-Cd, Pb-Ag systems. Solidification of lead.

Solid solutions. Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (NaCl-H2O). System Freezing mixtures acetone-dry ice.

Electrochemistry - I
Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations for weak and strong electrolytes, Ostwald's dilution law, its uses and limitations, Debye-Hückel-London's equation for strong electrolytes (elementary treatment only), Transport number, definition and determination by Hiott's method and moving boundary method.

Applications of conductivity measurements:
- Determination of degree of dissociation, determination of $K_a$ of acids, determination of solubility products of sparingly soluble salts, conductimetric titrations.

Electrochemistry - II
Types of reversible electrodes, Gas-metal, ion, metal-metal ion, metal-insoluble salt anion and redox electrodes, electrode reactions, Nernst equation, derivation of cell EMF, and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells - reversible and irreversible cells, conventional representation of electrochemical cells.


Concentration cell with and without transport, liquid junction potential, application of concentration cells. Valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of $pH$ and $pK_a$, determination of $pH$ using hydrogen quinhydrone and glass electrodes, pH-metric methods.

Suggested Books:
- Principles of Physical Chemistry by R. Shanker and M. S. Pathania.
- Text Book of Physical Chemistry by A. S. Negi and S. C. Anand.

Chemistry Practical I

Laboratory Course II
(4 hrs or 6 periods / week)

Inorganic Chemistry
(i) Preparation of Standard Solutions
   - Dilution - 0.1 M to 0.001 M solutions

(ii) Volumetric Analysis
   - Determination of acetic acid in commercial vinegar using NaOH
   - Determination of alkali content in antacid tablet using HCl
   - Estimation of calcium content in chalk. Calcium oxalate by permanganate.

Dy. Registrar (Acad.)
University of Rajasthan
JAIPUR
(d) Estimation of hardness of water by EDTA
(e) Estimation of ferrous and ferric by dichromate method
(f) Estimation of copper using thiosulphate

(iii) Gravimetric Analysis
(a) Cu as CuSCN
(b) Ni as Ni(dimethylglyoxime)

Organic Chemistry

(a) Laboratory Techniques

Thin Layer Chromatography

Determination of Rf values and identification of organic compounds.
Separation of green leaf pigments (spinach leaves may be used).
Separation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone.
Hexan-2-one and hexan-2-one using toluene and light petroleum (40-60) solvent.

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

6. Paper Chromatography: Ascending and Circular

Determination of Rf values and identification of organic compounds.

(a) Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid.
    leucine and glutamic acid. Spray reagent - ninhydrin.

(b) Separation of a mixture of DL -alanine, glycine and L-Leucine using n-butanol:
    acetic acid: water (4:1.3). Spray reagent-ninhydrin.

(c) Separation of monosaccharides a mixture of D-galactose and D-Fructose Using

(ii) Qualitative Analysis

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

Physical Chemistry

Transition Temperature

Determination of the transition temperature of the given substance by thermometric
calorimetric method (e.g. MnCl₂·4H₂O · SrBr₂·2H₂O)

(a) To determine the solubility of a solid acid at different temperatures and to determine
ΔH of the dissolution process.
(b) To determine the enthalpy of neutralization of a weak acid - weak base versus strong
    base - strong acid and determine the enthalpy of ionization of the weak acid - weak
    base.
(c) To determine the enthalpy of solution of solid calcium chloride and calculate the
    lattice energy of calcium chloride from its enthalpy data using Born-Haber cycle.

(iii) Phase Equilibrium

a) To study the effect of a solute (e.g. NaCl, sucrose, acid) on the critical solution
    temperature of two partially miscible liquids (e.g. phenol-water system) and to
determine the concentration of the solute in the given phenol-water system.
b) To construct the phase diagram of two components (e.g. diphenylamine-
benzophenone) system by cooling curve method.

(iv) Distribution law
a) To study the distribution of iodine between water and CCL,
b) To study the distribution of benzoic acid between benzene and water.

(Instructions to the students)

Chemistry Practical

Duration of Exam: 5 hrs.
Minimum Pass Marks: 18

Inorganic Chemistry
Ex. 1 Volumetric Analysis
or
Gravimetric Analysis as mentioned in the syllabus

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

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

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

Ex. 4 O.E.A.N.E.
Ex. 5 Record

Books and References
1. General Chemistry, J. J. Leckie and D. Wilkinson, and P. E. Caughey, Wiley
2. Organic Chemistry, J. J. Leckie, ELBS
5. Inorganic Chemistry, W. W. Porterfield, Addison Wesley
6. Inorganic Chemistry, A. G. Sharpe, ELBS
10. Qualitative and Quantitative Organic Chemistry, Sudhanshu John Wiley

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B. Listed (Laboratory Courses)

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JAEE
BOTANY

Schema

Max Marks: 100
Max Marks 33
Max Marks 33
Max Marks 34
Max Marks 50
3 hours
4 hours

Duration: Examination of each theory paper:
Duration: Examination of practicals:

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. Paper 1 will have 18 very short answer type Questions (not more than 20 words) of half marks each, covering the entire syllabus.

3. Each paper is divided into four units. There will be one question from each unit. These 5 questions will have internal choice.
PAPER-1
Molecular Biology and Biotechnology

Unit-1

Genetic Material: Biological inheritance and physical basis of heredity material. Structure of DNA, RNA and mRNA. Watson and Crick model of DNA. Nucleosome model.

DNA replication: Meselson-Stahl experiment of semiconservative replication of DNA. RNA
Primary processing of messenger RNA. DNA-Protein interactions.
Preliminary description of DNA damage and repair.

Unit-2

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

Translation: genetic code, codon, initiation, elongation and termination.

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

Unit-3


Unit-4


Practical Exercises

\[ \frac{\sqrt{r^{2} - 3}}{a} \times \frac{1}{p} \]
2. Med. preparation
3. Aseptic culture technique
4. Explant culture-shoot tip, nodal segment
5. DNA isolation from plant parts
6. Gel electrophoresis technique


Paper-II

PLANT PHYSIOLOGY AND BIOCHEMISTRY
(2 hrs/week)

Unit-1

Unit-2
Photosynthesis: Pigments, Photosynthetic apparatus, light reaction, photosystem I & II, Z scheme, photophosphorylation, C3 (Calvin cycle), C4 cycle, and factors affecting the photosynthesis.
Respiration: Aerobic and anaerobic respiration, RQ (Respiratory Quotient), Kreb's cycle, electron transport system, oxidative phosphorylation, and factors affecting the process. Fermentation.

Unit-3
Carbohydrates: Introduction, importance, nomenclature, classification, molecular structure & function of mono-, di-, and oligosaccharides, their properties, glycosidic linkages, and glycoprotein.
Proteins: Amino acids, structure, electrochemical properties, peptide bonds, chemical bonds and structure, structure and classification of proteins, physical and chemical properties.
Lipids: Introduction of fatty acids (saturated and unsaturated), Alpha and Beta oxidation.
Brief introduction and application of secondary metabolites.

Phases of growth and development: Seed dormancy and germination, plant movement, Biological clock, their regulatory factors.
Photoperiodism & vernalisation: physiological and mechanism of action, concept of florigen and phototropism.
Plant hormones: auxins, gibberellins, cytokinins, ethylene, and MIA, discovery & physiological effects.

Suggested Readings
Practical Exercises:

1. To determine the osmotic potential of vacuolar sap by plasmolysis method.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. To study the effect of temperature on permeability of plasma membrane.
4. To separate chloroplast pigments by solvent method.
5. To separate chloroplast pigments using paper chromatography.
6. To separate amino acids in a mixture by paper chromatography.
7. To prepare the standard curve of protein.
8. To demonstrate the tests for proteins in the unknown samples.
9. To demonstrate the enzyme activity—Catalase, peroxidase, and amylase.
10. To demonstrate tests for different types of carbohydrates and lipids.
11. Assay of growth hormone (auxin, cytokinin, gibberellic).
16. Demonstrate anaerobic and aerobic respiration.
17. Demonstrate measurement of growth using respirometer.
Paper III

Pteridophytes, Gymnosperms & Palaeobotany
(2 hrs./week)

Unit-1

Unit-2
Morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Marsilea.

Unit-3
Uses of Gymnosperms, distribution and classification (K.R. Sporne).

Unit-4
Morphology, anatomy, reproduction and life cycle of Cycas, Pinus and Ephedra. Economic importance of Gymnosperms.


Suggested Laboratory Exercises:

1. Study of external morphology, anatomy of vegetative and reproductive parts of Psilotum, Selaginella, Equisetum and Marsilea.
2. Study of external morphology, anatomy of vegetative and reproductive parts of Cycas, Ephedra.
3. Study of fossils and slabs of fossils.

Suggested Readings


[Signature]

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**BOTANY PRACTICAL EXAMINATION SKELETON PAPER**

**TIME: 4 Hours**

<table>
<thead>
<tr>
<th>Task</th>
<th>Practical</th>
<th>Regular</th>
<th>Ex NC</th>
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</thead>
<tbody>
<tr>
<td>1(a) Demonstrate on the Tissue culture or Biotechnology</td>
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<tr>
<td>1(b) Exercise based on molecular biology</td>
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<tr>
<td>2 Perform the given physiological experiment and write the</td>
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<td>7</td>
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<tr>
<td>principle, procedure, results based on observations and</td>
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<tr>
<td>precautions involved.</td>
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<tr>
<td>3 Perform the bio-chemical test of the given sample and discuss the</td>
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<td>3</td>
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<tr>
<td>observation giving reasons</td>
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<tr>
<td>4 Make a suitable preparation of material “A” (Pteridophyte)</td>
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<td>5</td>
<td>5</td>
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<tr>
<td>(vegetative/reproductive part). Draw a labelled sketch. Identify</td>
<td></td>
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<tr>
<td>giving reasons</td>
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<tr>
<td>Make a suitable preparation of material “B” (Gymnosperm)</td>
<td></td>
<td>5</td>
<td>5</td>
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<tr>
<td>(vegetative/reproductive part). Draw a labelled sketch. Identify</td>
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<tr>
<td>giving reasons</td>
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<tr>
<td>6 Statement upon spots (1-5)</td>
<td></td>
<td>10</td>
<td>15</td>
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<tr>
<td>7 Critical record</td>
<td></td>
<td>5</td>
<td>5</td>
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<td>TOTAL</td>
<td></td>
<td>50</td>
<td>50</td>
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</tbody>
</table>
Zoology

Scheme:
Max Marks: 100

<table>
<thead>
<tr>
<th>Paper I</th>
<th>: 3 Hrs duration</th>
<th>33 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper II</td>
<td>: 3 Hrs duration</td>
<td>33 Marks</td>
</tr>
<tr>
<td>Paper III</td>
<td>: 3 Hrs duration</td>
<td>34 Marks</td>
</tr>
<tr>
<td>Practical</td>
<td>: 4 Hrs duration</td>
<td>50 Marks</td>
</tr>
</tbody>
</table>

NOTE:
There will be two parts of every theory question paper with a total duration of 3 hours. First part of question paper will comprise of question No. 1 containing 9 (Paper I & II) or 10 (Paper III) very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit /section out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit /section. Each question will carry 6 marks.

The candidate has to answer all questions in the main answer book only.

PAPER - I:
STRUCTURE AND FUNCTION OF INVERTEBRATE TYPES

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 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Q. No. 2 to 10) in this part, i.e., three from each unit /section, out of which candidate will be required to attempt any 4 questions selecting at least one question from each unit /section. Each question will carry 6 marks.

The candidate has to answer all questions in the main answer book only.

Section - A

Habit, Habitat, Morphology, Structure, Organs and Systems (Locomotion, Digestive, Circulatory, Respiratory, Excretory, Nervous & Reproductive), Life Cycle, Affinities and Adaptations

Note: * indicates whenever required.
Section - B

Habit, Habitat, Morphology, Structure, Organs and Systems (Locomotion, Digestive, Circulatory, Respiratory, Excretory, Nervous & Reproductive), Life Cycle, Affinities and Adaptations.

Note: * indicates whenever required.

Mollusca: Pila, Unio, Sepia
Echinodermata: Asterias, Echinus, Cucumaria.
Hemichordata: Balanoglossus and its phylogenetic significance

PAPER - II:

ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

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 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.

2. 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.

3. Candidate has to answer all questions in the main answer book only.

A. Physiology with special reference to mammals

1. Physiology of digestion: Major types of digestive enzymes and their digestive action in the alimentary canal.

2. Physiology of blood circulation: Composition and functions of blood; mechanism of blood clotting; heart beat; cardiac cycle; blood pressure; body temperature regulation.

3. Physiology of respiration: Mechanism of breathing; exchange of gases: transportation of oxygen and carbon dioxide in blood; regulation of respiration.
Physiology of excretion: kinds of nitrogenous excretory end products (ammonotelic, uroiletic and ureotelic); role of liver in the formation of these end products. Functional architecture of mammalian kidney tubules and formation of urine; hormonal regulation of water and electrolyte balance (Homeostasis).

Section - B

Regulatory aspects of Animal Physiology
1. Physiology of nerve impulse and reflex action: Functional architecture of a neuron, origin and propagation of nerve impulse, synaptic transmission, reflex arc.
2. Physiology of muscle contraction: Functional architecture of skeletal muscles; chemical and biophysical events during contraction and relaxation of muscle fibers.
3. Types of endocrine glands, their secretions and functions: Pituitary, adrenal, thyroid, pancreas, testes and ovary.
5. Preliminary idea of neurosecretion, hypothalamic control of pituitary function.

Section - C

Biochemistry
1. Carbohydrates: Structure, function and significance; oxidation of glucose through glycolysis, Kreb's cycle and oxidative phosphorylation; interconversion of glycogen, glucose in liver; role of insulin and glucagon.
3. Lipids: Structure, function and significance; Beta-oxidative pathway of fatty acids; brief account of biosynthesis of triglycerides. Cholesterol and its metabolism.

Paper - III:
Immunology, Microbiology & Biotechnology

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 10 very short answer (Maximum 25 words) type questions, each of 1 mark. This part is compulsory to attempt. Questions should be evenly distributed covering entire syllabus.
   Second part of question paper will be of long answer type questions having three sections. There will be total 9 questions (Question 11 to 19) 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 sub-section. Each question will carry 6 marks.
   Candidate has to answer all questions in the main answer book only.

Immunology
1. Immunology: Definition, types of immunity: innate and acquired; humoral and mediated. Organs of immune system.
2. Antigen and antibody: Antigenicity of molecules, haptens, antibody types.

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Antigen-antibody reactions: Precipitation reaction, agglutination reaction,
complement fixation and lytic reactions and phagocytosis.

Immunity: Regulating cells: Macrophages, lymphocytes (B and T types) T-helper cells, T-killer cells, plasma cells and memory cells.

Mechanism of humoral or antibody mediated immunity and cell mediated immunity.

Section - B

Microbiology


2. The Prokaryota (Bacteria): Structural organization:
   (i) Size, shapes and patterns of arrangement.

3. Genetic material of Bacteria: Chromosome, replication of bacterial DNA.

4. Reproduction in Bacteria: Asexual reproduction, binary fission, budding, endospore formation, exosporia and cyst formation; sexual reproduction, conjugation.

Microbial Nutrition: Culture of Bacteria
   a. Carbon and energy source
   b. Nitrogen and minerals
   c. Organic growth factors
   d. Environmental factors: Temperature and pH

5. Bacteria of Medical Importance:
   (i) Gram-Positive
      a. Cocci: Staphylococci, Streptococci
      b. Bacilli: Diphtheria, Tetanus.
   (ii) Gram-Negative
      a. Cocci: Gonorrhea, Meningitis
      b. Bacilli: Diarrhoea
   (iii) Mycobacteria: Tuberculosis, Leprosy

Section - C

Biotechnology

1. Definition, history, scope and application of biotechnology, major areas of biotechnology (microbial, plant and animal biotechnology).

2. Vectors for gene transfer.

3. Basic concepts of animal cell, tissue, organ and embryo culture.

4. Genetic engineering (outline introduction): Applications of genetic engineering, hazards and regulations.

5. Reproductive technology in prokaryotes and eukaryotes.

6. Recombinant DNA technology: plasmids and their applications, PCR, DNA fingerprinting, DNA footprinting, RFLP, RAPD, APFL, human genome project.

7. Monoclonal antibodies and their applications.

8. Brief account of cloning: its advantages and disadvantages.

9. Biotechnology in medicine (outline idea only): Antibiotics, vaccines, enzymes, vitamins, artificial blood.

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Environmental Biotechnology (outline idea only): Metal and petroleum recovery, pest control, waste water treatment.
Food, drink and dairy biotechnology (outline idea only): Fermented food production: dairy products, wine, beer, vinegar and food preservation.

\[ \text{B.Sc. B.Ed. PART-II} \]

Practical - Zoology

Min. Marks: 18

4 Hrs. / Week

Max. Marks: 50

I. Study of Museum Specimens:

- **Arthropoda**
  - Peripatites
  - Limulus, Spider, Scorpion, Centipede, Millipede, Lepas, Balanus, Squilla, Eupagurus, Crab, Mantis, Honey-bee, (queen, king, worker) Locust, Silkworm Moth, Beetle, White grub.

- Echinodermata
  - Chlamy, Aphyus, Cypreaea, Mytilus, Pearl Oyster, Dentalium, Loligo, Mulinus.

- Hemichordata
  - Peniaceros, Echinus, Ophiothrix, Cucumaria, Antendan.

- Balanoglossus.

II. Study of Microscopic Slides:

- **Arthropoda**
  - V.S. of integument (cuticle): Pediculus, Bedbug, Termite and its castes, Cyclops, Daphnia, crustacean larvae (Nauplius, Metanauplius, Zoea, Mysis, Megalopa, Phyllosoma), statocyst of penaeid.

- **Mollusca**

- **Notoptera**

III. Anatomy:

- Prawn/Squilla

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

\[ \text{Key} \text{ (Achd.)} \]

\[ \text{Rajasthan} \]
IV. Study of the Following Through Permanent Slide Preparation:
(i) Study of different cell types - Blood smear (Wrights or Leishman stain).
(ii) Osphradium, gill lamella and radula of pila.
(iii) Statocyst and Hastate plate of Prawn/Squilla

V. Microbiology Immunology and Biotechnology:
1. Preparation and use of culture media for microbes.
2. Study of microbes in food materials like curd, etc (Gram +ve & Gram-ve bacteria, Aspergillus, Mucor, Rhizopus, Penicillium, Alternaria and Fusarium).
3. Educational tour to any Microbiology laboratory/ Dairy/ Food processing factory/ Distillery. Collection of tissue may also be encouraged wherever possible. Candidates are required to submit a detailed report of the visit.
4. Antigen-antibody reactions - precipitation, agglutination.

Animal Physiology:
1. Counting of red and white blood cells in the given blood sample.
2. Estimation of hemoglobin in the given blood sample.
3. Estimation of haematocrit value (PCV) in the given blood sample.
4. Demonstration of enzyme activity (catalase) in liver.
5. Study of salivary digestion of starch and the effect of heat and alcohol on salivary digestion of starch.

VII. Biochemistry:
1. Detection of protein, carbohydrate and lipid in the animal tissue/food samples.
2. Identification of different kinds of mono-, di- and poly-saccharides in the given food samples.
Scheme of Practical Examination Distribution of Marks

Time: 4 Hrs.  Min. Pass Marks.: 18  Max. Marks: 50

<table>
<thead>
<tr>
<th></th>
<th>Regular</th>
<th>Ex. /N.C. Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anatomy (any system)</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2. Permanent Preparation</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Exercise in Microbiology/Immunology/Biotechnology</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Exercise in Animal Physiology</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Exercise in Biochemistry</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. Identification and comments on Slides (1 to 8)</td>
<td>16</td>
<td>16</td>
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<tr>
<td>7. Viva Voce</td>
<td>5</td>
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<tr>
<td>8. Class Record</td>
<td>5</td>
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</tbody>
</table>

Notes:

1. Anatomy: Study of systems of the prescribed types with the help of dissection.
2. With reference to microscopic slides, in case of non-availability, the exercise should be substituted with diagrams/photographs.
3. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
4. Vetting material for permanent preparations would be as per the syllabus or as derived through collection and culture methods.
5. It should be ensured that animals used in the practical exercises are not covered under the wildlife act 1972 and amendments made subsequently.

Koj
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University of Rajasthan
JAIPUR
References

17. Grant: Biology of Developmental System
Murphy K: Janeway's Immunology, Garland Science; 8th edition, 2011.
Raj | \[ \frac{\text{Tox}}{23} = 18 \] 
- (Acad)
Scheme:

Min. Pass Marks: 36

<table>
<thead>
<tr>
<th>Paper</th>
<th>Duration</th>
<th>Max. Marks: 33</th>
<th>Min. Pass marks: 12</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>3 hrs.</td>
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<tr>
<td>II</td>
<td>3 hrs.</td>
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<tr>
<td>III</td>
<td>3 hrs.</td>
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<tr>
<td>Practical</td>
<td>5 hrs.</td>
<td>Max. Marks: 50</td>
<td>Min. Pass marks 18</td>
</tr>
</tbody>
</table>

Max. Marks: 100

Paper-1: Thermodynamics and Statistical Physics

Work Load: 2 hrs. Lecture/week

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying five marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit-1

Thermal and adiabatic interactions: Thermal interaction; Zeroth law of thermodynamics. System in thermal contact with a heat reservoir (Canonical distribution); Energy fluctuations; Entropy and systems in a heat bath; Helmholtz free energy; Adiabatic interaction and enthalpy; General interaction and first law of thermodynamics; Hamiltonian general interaction; Gibb's free energy; Phase transitions; Clausius Clapeyron equation; Vapour pressure curve; Heat engine and efficiency of engine. Carnot's cycle; Thermodynamic scale as an absolute scale; Maxwell relations and their applications.

Unit-2

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

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

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

Unit-3

Statistical Mechanics: Validity of Classical approximation; Phase space, micro and macro thermal dynamic probability, relation between entropy and thermodynamic probability; Law of ideal gas. Barometric equation; Specific heat capacity of diatomic gas. H. J.
Paper- II: Mathematical Physics and Special Theory of Relativity

Work Load: 2 hrs. Lecture / week

Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of nine marks comprising of six parts of short answer type with answer not exceeding half a page. Remaining questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying 3 marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

UNIT-1

Vector calculus, coordinate system, scalar, vector, expression for gradient, divergence, curl — application to Cartesian, cylindrical, and spherical polar coordinate systems. Transformation and Jacobian, transformation of covariant, contravariant and mixed tensors. Multiplication and contraction of tensors; Metric tensor and its use in calculation of tensors. Dirac delta function and its properties.

UNIT-2

Lorentz transformation, Length Contraction, Time Dilation, Mass variation, rotation in space-time like and space like vector, world line, macro-causality. Four vector formulation, energy, momentum four vector, relativistic equation of motion. Invariance of rest mass, orthogonality of four force and four velocity, Lorentz force as an example of four force, transformation of four frequency vector, longitudinal and transverse Doppler's effect. Transformation between laboratory and center of mass system. Four momentum conservation. Kinematics of decay products of unstable particles and reaction thresholds; Pair production, elastic and inelastic collision of two particles. Compton effect.

UNIT-3

(a) Transformation of electric and magnetic fields between two inertial frames. Electric field measured in moving frames. Electric field of a point charge moving with constant velocity.

Paper III: Electronics and Solid State Devices

Work Load: 2 hrs. Lecture /week
Examination Duration: 3 Hrs.

Scheme of Examination: First question will be of ten marks comprising of five parts of short answer type with answer not exceeding half a page. Remaining four questions will be set with one from each of the unit and will be of six marks each. Second to fifth question will have two parts namely (A) and (B) each carrying equal marks. Part (A) of second to fifth question shall be compulsory and Part (B) of these questions will have internal choice.

Unit 1: Circuits, Networks and PN junctions

Networks: Some important definitions, loop and nodal equation based on D.C. Circuits (Kirchhoff's Laws). Four terminal network: Amperes and voltage divisions, parameters of any four terminal network, input, output and mutual impedance for an active four terminal network. Various circuit theorems: Superposition, Thevenin, Norton, reciprocity, compensation, maximum power transfer and Miller theorem. PN junction: Charge densities in N and P materials; Conduction by drift and diffusion of charge carriers. PN diode equation, capacitance effects.

Unit 2: Rectifiers and transistors


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

Unit 3: Transistor biasing and amplifiers

Transistor biasing: Need of bias and stability of common emitter factors, and various types of biasing methods, thermal bias stability, fixed bias, collector to base feedback bias and four resistor...
Unit 4: Oscillators and Logic Circuits

Oscillators: criteria for self-excited and self-sustained oscillation, circuit requirement for build-up of oscillation, Basic transistor oscillator circuit and its analysis, Colpitt's and Hartley oscillators, R-C Oscillators.

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

Reference Books:

7. A. Mitral, Electronics Devices and Applications.
PRACTICAL

Teaching: 4 hrs/week
Practical One-Paper: 3 hrs. duration
Min Pass Marks: 18
Max. Marks: 50

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

Section-A

1. Study of dependence of velocity of wave propagation on line parameter using torsional wave apparatus.
2. Study of variation of reflection and refraction using torsional wave apparatus.
3. Using platinum resistance thermometer find the melting point of a given substance.
4. Using Newton's ring method find out the wave-length of a monochromatic source and find refractive index of liquid.
5. Using Michelson's interferometer and find out the wave-length of a given monochromatic source (Sodium Light).
6. To determine dispersive power of prism.
7. To determine wave length of sodium light using grating.
8. To determine wave length of sodium light using Biprista.
9. Determine the thermodynamic constant \( \frac{C_2}{C_1} \) using Clément's & Desorme's method.
10. To determine thermal conductivity of a bad conductor by Lee's method.
11. Determination of ballistic constant of a ballistic galvanometer.
12. Study of variation of total thermal radiation with temperature.

Section-B

1. Plot thermo emf versus temperature graph and find the neutral temperature (Use sand bath).
2. Study of power supply using two half wave rectifier with various filter circuits.
3. Study of half wave rectifier using single choke and application of L and π section filters.

4. To study characteristics of a given transistor PNP/NPN (common emitter, common base and common collector configurations).

5. Determination of band gap using a junction diode.

6. Determination of power factor (cos φ) of a given coil using GRO.

7. Study of single stage transistor audio amplifier (variation of gain with frequency).

8. To determine √L by Bessel's method.

9. Determination of velocity of sound in air by standing wave method, using speaker, uniform wall, and GRO.


11. Measurement of capacitance and dielectric constant of a liquid and gang condenser made by Sine bridge.
Teaching: 3 Hours per Week per Theory Paper.  
2 Hours per Week per Batch for Practical  
(20 candidates in each batch)

<table>
<thead>
<tr>
<th>Examination:</th>
<th>Min. Pass Marks</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheme:</td>
<td>Science – 54</td>
<td>150</td>
</tr>
</tbody>
</table>

| Paper – I       | Real Analysis and Metric Space | 3 hrs. | 40 (Science) |
| Paper – II      | Differential Equations | 3 hrs. | 40 (Science) |
| Paper – III     | Numerical Analysis and Vector Calculus | 3 hrs. | 40 (Science) |
| Practical       | Numerical Methods  | 2 hrs. | 30 (Science) |

Note:
1. A common paper will be set for both the Faculties of Social Science and Science. However, the marks obtained by the candidate in the case of Faculty of Social Science will be computed according to the ratio of the maximum marks of the papers in the two Faculties.
2. 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 Local Head/Head, Department of Mathematics in the college.
3. An internal/external examiner can conduct Practical Examination of not more than 100 (Hundred) Candidates. (20 candidates in each batch)
4. Each candidate has to pass in Theory and Practical examinations separately.
Paper - I: Real Analysis and Metric Spaces

Duration: 3 Hours per Week
Max. Marks: 40 (Science)

Note: This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.

Real sequences - Limit and Convergence of a sequence. Monotonic sequences.


Unit 3: Notion of limit, continuity and differentiability for functions of two variables. Riemann integration - Lower and Upper Riemann integrals, Riemann integrability, Mean value theorem of integral calculus, Fundamental theorem of integral calculus.

Unit 4: Functions of bounded variations. Sequence and series of functions - Pointwise and Uniform convergence, Cauchy's criterion, Weierstrass M-test, Abel's test, Dirichlet's test for uniform convergence of series of functions, Uniform convergence and Continuity of series of functions, Term by term differentiation and integration.


Reference Books:
5. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition), 2011.
Paper - II: Differential Equations
Teaching: 3 Hours per Week
Duration of Examination: 3 Hours
Max. Marks: 40 (Science)

The paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all, taking ONE question from each Unit. All questions carry equal marks.

Unit 1: Degree and order of a differential equation. Equations of first order and first degree. Equations in which the variables are separable. Homogeneous equations and equations reducible to homogeneous form. Linear equations and equations reducible to linear form. Exact differential equations and equations which can be made exact.

Unit 2: First order but higher degree differential equations solvable for \(xy\) and \(p\). Clairaut's form and singular solutions with Extraneous Loci. Linear differential equations with constant coefficients. Complimentary function and Particular integral.


Unit 4: Linear differential equations of second order. Linear independence of solutions. Solution by transformation of the equation by changing the dependent variable or the independent variable. Factorization of operators, Method of variation of parameters, Method of undetermined coefficients.


Reference Books:
Paper - III: Numerical Analysis and Vector Calculus  
Duration of Examination: 3 Hours  
Max. Marks: 40 (Science)  

Note: (i) This paper is divided into FIVE Units. TWO questions will be set from each Unit. Candidates are required to attempt FIVE questions in all taking ONE question from each Unit. All questions carry equal marks.  
(ii) Non-Programmable pocket Calculators are allowed.


Unit 3: Relation between the roots and coefficients of general polynomial equation in one variable, transformation of equations, Descarte’s rule of signs, solution of cubic equations by Cardon’s method, biquadratic equations by Ferari’s method.

Numerical solution of Algebraic and Transcendental equations, Bisection method, Secant method, Regula-Falsi method, Iteration method, Newton-Raphson Method (derivation of formulae and rate of convergence only).

Unit 4: Gaussian elimination and Iterative methods (Jacobi and Gauss-Seidal) for solving system of linear algebraic equations. Partial Pivoting method, Ill conditioned systems. Numerical solutions of ordinary differential equations of first order with initial conditions using Picard’s, Euler’s and modified Euler’s method.

Unit 5: Scalar and Vector point functions. Differentiation and integration of vector point functions. Directional derivative. Differential operators. Gradient. Divergence and Curl. Theorems of Gauss, Green, Stokes (without proof) and problems based on these theorems.

Reference Books:
Practical: Numerical Methods
Teaching: 2 Hours per Week per Batch

Examination:

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Marks</td>
<td>30</td>
</tr>
<tr>
<td>Min. Pass Marks</td>
<td>10</td>
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<tr>
<td>Distribution of Marks:</td>
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</tr>
<tr>
<td>Two Practicals one from each group</td>
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</tr>
<tr>
<td>10 Marks each</td>
<td>=</td>
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<tr>
<td>Practical Record</td>
<td>=</td>
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<tr>
<td>Viva-voce</td>
<td>=</td>
</tr>
<tr>
<td>Total Marks</td>
<td>=</td>
</tr>
</tbody>
</table>

Duration: 2 Hours

(i) Bisection method, (ii) Secant method (iii) Regula-Falsi method (iv) Iteration method.
(v) Newton-Raphson Method.


Note:
1. Problems will be solved by using Scientific Calculators (non-Programmable)
2. Candidates must know about all functions and operations of Scientific Calculator.
3. Each Candidate (Regular/Reappearing) has to prepare his/her practical record.
4. Each Candidate has to pass in Practical and Theory examinations separately.