

MAHARAJA GANGA SINGH UNIVERSITY BIKANER

SYLLABUS

**SCHEME OF EXAMINATION
AND
COURSES OF STUDY**

FACULTY OF EDUCATION

B.Sc.B.Ed

2025-2029



**B.SC. BED (4 YEAR) SCHEME OF
EXAMINATION AND COURSE OF STUDY**

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**FACULTY OF EDUCATION SYLLABUS AND SCHEME
OF EXAMINATION ORDINANCES FOR B.Sc.B.Ed. PROGRAMME
Session 2025-2029**

The MGS. University, Bikaner hereby institutes the following ordinances under the scheme governing admission, course of study, examination and other matters relating to the degree of B.Sc.B.Ed programme under the Faculty of Education.

I. Eligibility

1. The course of study shall extend over a period of four years as an integrated course in Science, Education, Work Experience, General Hindi/General English and Environmental Education and Sustainable Development leading to the composite degree of B.Sc. B.Ed.
2. Candidates who have passed Senior Secondary 10 +2 examination or any other examination recognized as equivalent thereto by the MGS University, Bikaner with at least 50% marks in the aggregate are eligible for admission to the course.
3. The reservation and relaxation in marks for SC/ST/OBC/PWD and other category shall be as per the rules of the Central Government/State Government whichever is applicable.
4. The Institute will regulate admission through selection on the basis of marks in the qualifying examination and/or in the entrance examination or any other selection process as per the policy of the state or and the University and in accordance with the state quota as decided.
5. Candidate will be eligible for admission to Physical Science (PCM) Group if she/he has qualified qualifying examination with Physics, Chemistry and Mathematics or Statistics and for admission to Biological Science (CBZ) Group if she/he has qualified qualifying examination with Physics, Chemistry and Biology or Biotechnology.

II. Scheme of Instructions and Examinations
PROGRAMME STRUCTURE, & SCHEME OF EXAMINATION
B.Sc. B.Ed. Part I Examination (New Scheme)

Course/ Paper	Periods Per Week	Periods Per Year		Paper with External / Internal	Exam. Duration (hrs.)	Max. Mark	Min. for Pass
Group A: General Courses (GC)*							
GC 1: Gen Hindi/ Gen English	4	124		External	3	100	36
GC 2: Environmental Education & Sustainable Development	2	62		External	2	50	18
Group B: Core Courses (CC)							
CC 1 : Physics	3	93		CC-1 (I) External Internal	3	40 10	36
	3	93		CC-1 (II) External Internal	3	40 10	
	4	124		Practical	5	50	18
CC 2: Chemistry	3	93		CC-2 (I) External Internal	3	40 10	36
	3	93		CC-2 (II) External Internal	3	40 10	
	4	124		Practical	5	50	18
CC 3: Zoology	3	93		CC-3 (I) External Internal	3	40 10	36
	3	93		CC-3 (II) External Internal	3	40 10	
	4	124		Practical	4	50	18
CC 4: Botany	3	93		CC-4 (I) External Internal	3	40 10	36
	3	93		CC-4 (II) External Internal	3	40 10	
	4	124		Practical	4	50	18
CC 5 : Mathematics	4	124		CC-5 (I) External Internal	3	60 15	54
	4	124		CC-5 (II) External Internal	3	60 15	

CC 6 Childhood and growing up	4	124		External Internal	3	60 15	27
Group C : Developing Teacher Sensibilities							
Section I : Experiences for Teacher Enrichment							
ETE 2 : Yoga Health and Well being	2	62		Internal	-	50	18
Section II : Experiences for Social and Environmental Sensitivity (SES)							
SES 1 : Work Experience i .Case study of special child ii Project report on slum area children's how to educate and motivate them	3	93		Internal	-	50	18
SES 2: Arts and Aesthetics	One Week Workshop			Internal		Grade	

ETE and SES Internals are to be evaluated by a team of two members constituted by the Principal.

Distribution of Marks:

General Courses	:	150*
Core (Science) Courses	:	450
Education	:	225

Total Marks

825

Total periods per week:

PCM	45
CBZ	47

*** Marks will not be added to the aggregate for award of division B.Sc**

Course/ Paper	Periods Per Week	Periods Per Year		Paper with External/Internal	Exam. Duration (hrs.)	Max. Mark	Min. for Pass
Group B: Core Courses (CC)							
CC 1 : Physics	3	90		CC-1 (I) External Internal	3	40 10	54
	3	90		CC-1 (II) External Internal	3	40 10	
	3	90		CC-1 (III) External Internal	3	40 10	
	4	120		Practical	5	50	18
CC 2: Chemistry	3	90		CC-2 (I) External Internal	3	40 10	54
	3	90		CC-2 (II) External Internal	3	40 10	
	3	90		CC-2 (III) External Internal	3	40 10	
	4	120		Practical	5	50	18
CC 3: Zoology	3	90		CC-3 (I) External Internal	3	40 10	54
	3	90		CC-3 (II) External Internal	3	40 10	
	3	90		CC-3 (III) External Internal	3	40 10	
	4	120		Practical	4	50	18
CC 4: Botany	3	90		CC-4 (I) External Internal	3	40 10	

	3	90		CC-4 (II)			
	4	120		CC-5 (II) External Internal	3	50 13	
	4	120		CC-5 (III) External Internal	3	50 14	
CC 6:contemporary india and education	4	120		External Internal	3	60 15	27
Group C : Developing Teacher Sensibilities							
Section II : Experiences for Social and Environmental Sensitivity (SES)							
SES 1 : Work Experience Value Education	3	90		Internal	-	50	18
SES3: Addressing special needs in Inclusive School	2	60		External Internal	2 -	40 10	18
SES4: Working with the Community	10 Days			Internal		Grade	

SES Internals are to be evaluated by a team of two members constituted by the Principal.

Distribution of Marks:

Core (Science) Courses : 600
Education : 175

Total periods per week

PCM 47
CBZ 48

Total Marks 775

B.Sc. B.Ed. Part III Examination (New Scheme)

Course/ Paper	Periods Per Week	Periods Per Year		Paper with External/ Internal	Exam. Duratio n (hrs.)	Max . Mar k	Min . for Pas s
Group B: Core Courses (CC)							
CC 1 : Physics	3	84		CC-1 (I) External Internal	3	40 10	36
	3	84		CC-1 (II) External Internal	3	40 10	
	4	112		Practical	5	50	18
CC 2: Chemistry	3	84		CC-2 (I) External Internal	3	40 10	36
	3	84		CC-2 (II) External Internal	3	40 10	
	4	112		Practical	5	50	18
CC 3: Zoology	3	84		CC-3 (I) External Internal	3	40 10	36
	3	84		CC-3 (II) External Internal	3	40 10	
	4	112		Practical	4	50	18
CC 4: Botany				External Internal	3	40 10	36

	3	84		CC-4 (II) External Internal	3	40 10	
	4	112		Practical	4	50	18
CC 5 : Mathematics	4	112		CC-5 (I) External Internal	3	60 15	54
	4	112		CC-5 (II) External Internal	3	60 15	
CC 6 Gender school and society	4	112		External Internal	3	60 15	27
Group C : Developing Teacher Sensibilities							
Section I : Experiences for Teacher Enrichment							
ETE 3 : Strengthening Professional Development	2	56		Internal		50	18
Group D: Pedagogical Courses							
PC 1: Pedagogy of Science (For PCM Group.) Pedagogy of Physical Science (For CBZ Group)	4	112		External Internal	3	60 15	27
PC 2: Pedagogy of Mathematics (For PCM Group) Pedagogy of Biological Sc. (For CBZ Gr.)	4	112		External Internal	3	60 15	27
PC 3: Learning to function as a Teacher	Four Weeks			Internal		50	18

ETE Internals are to be evaluated by a team of two members constituted by the Principal.

Distribution of Marks:

Total periods per week:

Core (Science) Courses	:	450	PCM	42
Education	:	325	CBZ	44
Total Marks		775		

B.Sc. B.Ed. Part IV Examination

Course/ Paper	Periods Per Week	Periods Per Year		Paper with External/ Internal	Exam. Duratio n (hrs.)	Max . Mar k	Min . for Pas s
Group B: Core Courses (CC)							
CC 1 : Physics	5	80		CC-1 (I) External Internal	3	80 20	36
	6	96		Practical	5	50	18
CC 2: Chemistry	5	80		CC-2 (I) External Internal	3	80 20	36
	6	96		Practical	5	50	18
CC 3: Zoology	5	80		CC-3 (I) External Internal	3	80 20	36
	6	96		Practical	5	50	18

CC 4: Botany	5	80		CC- 4 (I) External Internal	3	80 20	36
	6	96		Practical	5	50	18
CC 5 : Mathematics	5	80		CC-5 (I) External Internal	3	60 15	54
	5	80		CC-5 (II) External Internal	3	60 15	
CC 6: Assessment for Learning	5	80		External Internal	3	60 15	27
CC 7: Knowledge and curriculum	5	80		External Internal	3	60 15	27
Group D: Pedagogical Courses							
PC 1: Learning to function as a Teacher	Sixteen Weeks			Internal External Internal	80 120* 100**	300	150

* External examiners will be appointed by the University for award of external marks.

**For details of marks refer to syllabus.

Distribution of Marks:

Core (Science) Courses	:	450
Education	:	450
Total Marks		900

Total periods per week:

PCM	42
CBZ	43

Year wise marks of the four year B.Sc. B.Ed. course

Class	Marks
I Year	825
II Year	775
III Year	775
IV year	900
Total	3275

Instructional time for all the four years of B.Sc. B.Ed is 32 weeks per Year. Instructional time of Part I of B.Sc.B.Ed includes one week workshop on Arts and Aesthetics. So regular classroom instruction would be executed for 31 weeks. Instructional time of Part II of B.Sc.B.Ed includes two weeks for Working with Community. So regular classroom instruction would be executed for 30 weeks. Instructional time of Part III of B.Sc.B.Ed includes four weeks for Learning to Function as a Teacher (Pre-Internship). So, regular classroom instruction would be executed for 28 weeks. In B.Sc.B.Ed Part IV, Learning to Function as a Teacher (School Internship) of 16 weeks is included, so regular class room instruction would be for 16 weeks.

Note: For Pedagogy Courses in Science/Mathematics, combinations will be as follows:

(i) For PCM Group

(a) 1 Pedagogy Course : Pedagogy of Science

(Science comprises of Physics, Chemistry and an additional input of Biology)

(b) 2 Pedagogy Course: Pedagogy of Mathematics

(ii) For CBZ Group

(a) 1 Pedagogy Course: Pedagogy of Physical Science

(Physical Science comprises of Physics and Chemistry)

(b) 2 Pedagogy Course: Pedagogy of Biological Science

(Biological Science comprises Botany and Zoology)

III Examination

There shall be a University examination at the end of each year as per details of the scheme of examination.

1. A candidate will be permitted to appear in the annual examination only if he/she has pursued a regular course of study and attended at least 80% of the classes for all the course work and practicum and 90% for school internship.
2. A candidate shall be admitted to the next higher class only if s/he passes his/her Part I/ Part

- II / Part III Examination as per rules mentioned herein after.
3. In order to qualify for B.Sc. B.Ed. degree a candidate should obtain a minimum of 36% marks in theory and practicals separately, wherever applicable in each subject in each year of the course and 40% marks in Pre Internship in III Year and also in Internship in Teaching in the Fourth Year.
 4. In Part I, there will be two core subjects; Core subject **GC1** is General Hindi/ General English, Core Subject **GC2** is Environmental Education and Sustainable Development. In order to pass, a candidate must secure atleast **36%** marks in each core subject. However, the marks obtained in these papers will not be taken into account for awarding the division. In case a candidate fails in the core subject, s/he has to clear the same as per provision made in clause 12(ii).
 5. The minimum pass marks in the supplementary examination shall be the same as prescribed for the main examination.
The candidate who has passed any year of B.Sc. B.Ed. programme after taking supplementary examination will be awarded minimum pass marks in the concerned subject irrespective of marks actually obtained in the supplementary examination.
 - (i) A candidate who fails in one or two subjects (excluding General Hindi/General English / Environmental Education and Sustainable Development in the Part I) in any year of the programme will be eligible to take the supplementary examination in the subject(s) in which s/he fails. In case the candidate is not able to pass even in the supplementary examination s/he can appear only as an ex-student in all subjects again at the main examination of the subsequent year. s/he will not be required to appear in practical(s) if s/he has already cleared the same. A candidate shall be deemed to be an ex-student if s/he completed a regular course of study at the Institute and fulfilled the required attendance as specified in clause No. 2 and appeared in University examination but failed or did not take the examination.
 - (ii) A candidate who fails in the practical/theory/field work of a subject at the main examination shall be required to appear only in the corresponding practical/ theory of the supplementary examination.
 - (iii) A candidate who does not appear in the supplementary examination will have to appear in the subsequent main examination in all subjects including practical, only as an ex student.
A candidate who appears for the supplementary examination may take provisional admission to the next higher class at his/her own risk. Such a candidate will, however, be allowed to appear in the University examination of the next higher class subject to his/her passing the supplementary examination, fulfilling the attendance requirement as a regular candidate and completion of courses of study as per scheme of examination. If a candidate getting supplementary does not take provisional admission to the next higher class by the notified last date of admission and passes the supplementary examination at a later stage, s/he will not be admitted to the next higher class. However, such a candidate may take admission to the next higher class in the next academic session.
 - (iv) A candidate who fails in more than two subjects (except General Hindi/General English/ Environmental Education and Sustainable Development) in any year of the course shall be declared failed and will not be promoted to the next class. Such a candidate will be permitted to appear at the main examination of the subsequent year in all the subjects only as an ex-student.
 - (v) However, in the case of General Hindi/General English, and Environmental Education and Sustainable Development, if a candidate fails in Part I he/she would get two more chances for clearing this paper either along with the supplementary examination in Part I or with the main examination in Part II. Non-appearance or absence from the examination of this paper will be counted as a chance.
 - (vi) candidate who fails in more than two subjects but passes in practical he/she will be required to appear again in all the subjects (theory) except practical only as an ex- student.
 6. A candidate will be given a maximum of three chances at the main examination and the corresponding supplementary examination in any year of the course. If he/she does not pass the examination even thereafter, s/he will not be eligible for readmission to any year of the programme.
 7. Pedagogical course – Learning to function as a teacher will be conducted in two phases. Phase I (Pre internship) of 50 marks and phase II (Internship in Teaching) of

300 marks will be conducted in B.Sc., B.Ed. Programme in Part III and IV respectively. If a candidate fails in the Learning to function as a teacher (Pre-Intern - ship/Internship in Teaching) or is unable to complete Pre-Internship/Internship in teaching but passes in all other subjects he/she will be required to repeat the complete Pre-Internship/ Internship in Teaching' in the next academic session along with regular candidates.

8. Division will be awarded to the successful candidates only after the Part IV examination and on the basis of cumulative total of marks obtained in all the four years of the course in all the subjects including Internship in Teaching but excluding the core subjects i.e., General Hindi/General English, and Environmental Education and Sustainable Development.

Scheme of examination Paper divided into three sections

Section-A

Answer All ten questions .Answer limit 50 words. Each Questions carries two marks
(10x2=20 marks)

Section –B

Answer All Five Questions. Answer limit 200 words. Each question has internal choice. Each question carries 6 Marks
(6x5=30 Marks)

Section-C

Answer any three questions out of five. Answer Limit 500 words. Each questions Ten Marks. (3x10=30 Marks)

IV. Evaluation Rules & Regulations Question papers:

- i) Each question paper of 80 marks will be divided into five units
- ii) Each question paper of 60 marks will be divided into five units.
- iii) Each question paper of 50 marks will be divided into five units.
- iv) Each question paper of 40 marks will be divided into five units.
- v) Essay type questions are to aim at testing ability of critical thinking and application of principles etc. taught in theory
- vi) The overall question paper will be set keeping the following difficulty levels. Easy: 30% Average:40% Difficult:30%.
- vii) For SES and EPC mode of internal assessment is given with the paper concerned.

V Award of Division

1. Successful candidates will be awarded division on the basis of the aggregate marks of all the Core Courses, Pedagogy Courses and Courses on Developing Teacher Sensibilities as per the following:

- | | | |
|------|-----------------|---------------------------------|
| i. | First Division | 60% or more |
| ii. | Second Division | 48% or more (but less than 60%) |
| iii. | Third Division | 36% or more (but less than 48%) |

- 2 Candidates can apply for Re-evaluation in any of the theory courses as per rules stipulated by the University for B.Sc. B.Ed. degree. Changes in Statutes/ Ordinances/ Rules/ Regulations/ Syllabi and books may from time to time be made by amendment or remaking and a candidate shall, except in so far as the University determines otherwise, comply with any change that applies to years she/he has not completed at the time of change.

Notes:

- i. A course/ paper means any General Courses (GC), Core Courses (CC), Pedagogy Courses (PC) and Courses on Developing Teacher Sensibilities (i.e. ETE and SES) inclusive of Practical/Practicum, as the case may be.
- ii. Marks of that part of the course/ paper in which the candidate passes will be carried over.

B.Sc. B.Ed. Part -I
Group A : General Courses (GC)
FIRST YEAR

GC -1 सामान्य हिंदी

उत्तीर्णांक : 36

अवधि : 3 घंटे

पूर्णांक : 100

अंक योजना –
(अ भाग)

गद्य एवं पद्य संकलन की विविध विधाएँ क्रमशः

1. एक प्रश्न व्याख्याओं से संबंधित क्रमशः (दो व्याख्याएँ)
2. दो परिचयात्मक प्रश्न पाठ्य पुस्तकों से

(25+25 = 50 अंक)

(10+10 = 20 अंक)

(15+15 = 30 अंक)

(ब भाग)

व्याकरण खंड

- | | |
|--|--------|
| 1. शब्द शुद्धि – | 5 अंक |
| 2. वाक्य शुद्धि – | 5 अंक |
| 3. पारिभाषिक शब्दावली (अंग्रेजी शब्दों के हिंदी समानार्थक शब्द) – | 5 अंक |
| 4. संक्षेपण – | 5 अंक |
| 5. पल्लवन – | 5 अंक |
| 6. वाक्यांश के लिए एक सार्थक शब्द – | 5 अंक |
| 7. प्रारूप (प्रार्थना पत्र, निविदा, परिपत्र, अधिसूचना, ज्ञापन, विज्ञापन) – | 5 अंक |
| 8. शब्द युग्म – अर्थ भेद – | 5 अंक |
| 9. निबंध – | 10 अंक |

पाठ्य पुस्तकें

1. गद्य प्रभा, संपादक डा. नवल किशोर, प्रकाशन : पंचशील प्रकाशन, फिल्म कालोनी चौड़ा रास्ता जयपुर मूल्य रुपये 15/-
2. कविता के आधुनिक सोपान, संपादक डा. जीवन सिंह, डा. भागीरथ भार्गव, प्रकाशक: किरण पब्लिकेशन, पुरानी मंडी अजमेर, मूल्य रुपये – 5.50/-

GC-1 GENERAL ENGLISH

Contact Hours: 4 periods per Week

Maximum Marks: 100

Duration: 3 Hours

Minimum for Pass: 36

Objectives: This is essentially a language-based course. It aims at making students read English prose with a view to enhancing their comprehension of the language and encouraging them to develop reading habits. It also aims at developing basic skills in grammar, enriching their vocabulary and enabling them to write simple and correct English. **Scheme of Examination**

Comprehension and Vocabulary

- | | | |
|---|--|--|
| a. | Questions based on content from the prescribed text | 10 Marks |
| b. | Questions based on a passage from the prescribed text to test the candidate's comprehension and vocabulary | 20 Marks |
| c. | Questions based on an unseen passage to test the candidate's comprehension and vocabulary | 10 Marks |
| (There will be a text of essays and short stories between 100 and 200 pages in length. The following chapters are prescribed for study: | | |
| 1. | M. K. Gandhi | : Training: Literary and Spiritual |
| 2. | Kamla Devi Chattopadhyay | : Indian Women and the Salt Satyagraha |
| 3. | Uma Rao | : A Special Child |
| 4. | Neelam Sanjan Gour | : Personal Friend |
| 5. | Vandana Shiva | : Women in the Food Chain |
| 6. | Boman Desai | : Between the Mosque and the Temple |

Recommended Books:

- | | | |
|----|------------------------------|--|
| 1. | A.J. Thomson & A.V. Martinet | : A Practical English Grammar (OP) |
| 2. | S. Pit Corder | : Intermediate English Practice Book (O.L.) |
| 3. | Bhaskaran and Horsburgh | : Strengthen your English (OUP 1973) |
| 4. | F.T. Wood | : A Remedial English Grammar for Foreign Students (Macmillan 1965) |

5. T.L.H.Smith- Pearse : The English Errors of Indian students. OUP
Book Prescribed
Dr. Jasbir Jain (Edt.): **The Many Worlds of Literature**, Macmillan India Ltd.

**GC-2Environmental Education and Sustainable
Development Instructional Time: 2 periods / week
Max. Marks: 50**

Exam. Duration: 2 Hours

External: 50

Objectives of the Course:

The Course ‘Environmental Education and Sustainable Development’ aims to orient student-teachers to analyze and understand environment concerns through the process of inquiry, critical analysis, intellectual discourse and essential projects.

Course Outline:

Unit I: Importance and Scope of Environment

Importance need and scope of Environmental Conservation and Regeneration, Structure and functions of different ecosystems, India as a mega biodiversity nation, Role of individual in conservation of natural resources: water, energy and food, Equitable uses of resources for sustainable livelihoods, Environmental legislation: awareness and issues involved in enforcement.

Unit II: Natural Resources and Environment management

Community participation in natural resource management- water, forests etc, Deforestation in the context of tribal life, Sustainable land use management, Traditional knowledge and biodiversity conservation. Consumerism and waste generation and its management, Environmental degradation and its impact on the health of people, water resource management, Biomedical waste management.

Unit III: Sustainable Environment in Global World

Environmental conservation in the globalised world, Alternative sources of energy, Impact of natural disaster/man-made disaster on environment, Biological control for sustainable agriculture, Heat production and green house gas emission, Impact of industry/mining/transport on environment, Sustainable use of forest produces.

Modes of Learning Engagement:

- Case studies and success stories (involve local material).
- Problem solving and enquiry methods
- Small assignments which may include observation of important relevant days, preparation of bulletin board material, games, crossword puzzles, worksheet etc.
- Setting up of Eco-clubs.
- Conducting a seminar and developing a seminar document
- Project work and writing of project report
- Discussion of activities pertaining to two different classes and subjects.
- Activities on infusion of appropriate concerns

Practicum:

1. The students on completion of each topic of Unit-I-III will submit a small assignment in the form of an activity. This may include observation of importance of relevant season, preparation of bulletin board material, wall games, crossword puzzles, worksheet etc.
2. The class can also form an environment club. The activity has to be on some local specific issue pertaining to the native place of the students.
3. From the wide range of topics suggested in Units the student will be assigned one topic. The student will develop a seminar document, which will be submitted after the seminar.

Suggested Readings:

1. NCERT (1981) Environmental Education at School Level. New Delhi. NCERT.

2. Odum, E.P (1971). Fundamental Ecolog. London. W.B. Saunders Company.
st
3. Palmer, Joy A. (1998). Environmental education in the 21 Century.
London. Routledge.
4. Sharma R. C and Tan, Marle C (Eds.) (1990). Resource Book in Evironmental
education for secondary school lectures. Bangkok.UNSECO.
5. Sharma, R.C. (1981). 'Environmental Education. New Delhi. Metropolitan
Publishers.
6. UNESCO (1990). Sourcebook in Environmental Education for Secondary
School Teachers. Bangkok. CEE (1995). Joy of learning. Handbook of
Environmental Education Activities. Vol.I-3 to 5.—Ahmedabad. Centre for
Environment Education,
7. CEE (1996) Joy of learning. Handbook of environmental educationactivities.
Vol.II-6 to 8.-- Ahmedabad: Centre for Environment Education
8. Pandya (1999). Mamata Guide to green material: experiences and learnings in
developing effective environmental education material. Ahmedbad. Centre for
Environment Education,
9. Sharma, R. C. (1981). Environmental Education. Delhi. Metropolitan.
10. Reddy, K. Purushotham. (2007). Environmental education. New Delhi.
Neelkamal Publications Pvt. Ltd.
11. NCERT (2009). Project book in Environmental Education for class VII, VII, IX and X.
New Delhi. NCERT.
12. NCERT (2011). Teachers' Handbook on Environmental Education for the higher
secondary stage. New Delhi. NCERT.
13. NCERT (2013). Project book in Environmental Education for the higher secondary
stage. New Delhi. NCERT.

**Group B :CORE COURSES (CC) CC –
1 PHYSICS**

Scheme	Exam Duration	Max. Marks	Min.Pass Marks
Paper I	3hrs.	40	36
Internal		10	
Paper II	3hrs.	40	
Internal		10	
Practical	5hrs.	50	18

Note : There will be two experiments. The distribution of marks will be as follows: Two experiments (one from each section)

Each of 15 marks	30 marks
Viva voce	10 marks
Record	10 marks
Total	50 marks

**CC – 1 (I) - PAPER I- RELAVITY, MECHANICS, OSCILLATIONS AND
WAVES**

Duration- 3 hours

Max.Marks :40

Note :- The paper is divided in five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit. MKSA system of units is to be used. The question paper shall have at least 30 percent weightage of problems and numerical.

UNIT – I

Relativity: Reference systems, inertial and non-inertial frames, Galilean transformation, Galilean invariance and conservation laws, propagation of light, Michelson – Morley experiment. Postulates of the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with a zero rest mass.

Unit-II

Mechanics: Motion under central force, Kepler's laws, Gravitational law and field,

Potential due to a spherical body, Gauss and Poisson equations for gravitational potential, gravitational self-energy.

Rigid body motion, Rotational motion, Moment of inertia and their products, principal moments and axes, Euler's equations.

System of particles, centre of mass, equation of motion, single stage and multistage rocket, energy and momentum conservation, concepts of elastic and inelastic collisions.

Unit-III

Oscillations: Potential well and periodic oscillations, cases of harmonic oscillations, different equations and its solutions, Kinetic and potential energy, Simple Harmonic oscillations in – Spring and mass system, Simple and compound pendulum, Torsional pendulum, Bifilar oscillations, Helmholtz resonator, LC circuits, Vibration of a magnet, Oscillation of two masses connected by a spring, Superposition of two simple harmonic motions of same frequency along the same line, Interference, Superposition of two mutually perpendicular simple harmonic vibrations of same frequency, Lissajou's figures, Cases of different frequency.

Unit –IV

Coupled Oscillations: Two coupled oscillators, normal modes, N-coupled oscillators, damped harmonic oscillators, Power dissipation, Quality factor, Driven harmonic oscillator, Transient and steady state, Power absorption, Resonance in system with many degrees of freedom.

Waves in Media: Speed of transverse waves on a uniform string, speed of Longitudinal waves in a fluid, energy density and energy transmission in waves, waves over liquid surfaces, gravity waves and ripples, Group velocity and Phase velocity, Superposition of waves, linear homogeneous equations and the superposition principle, nonlinear superposition and consequences.

Acoustics: Noise and Music, The human ear and its responses, limits of human audibility, intensity and loudness, bel and decibel, the musical scale, temperament and musical instruments, Production and detection of ultrasonic and infrasonic waves and applications,

Transducers and their characteristics, Recording and reproduction of sounds, various systems, Measurements of frequency, waveform, intensity and velocity, The acoustics of halls, reverberation period, Sabine's formula.

Textbooks and References

- Robert Resnick, Introduction to special relativity (Wiley India Pvt. Ltd., 2005) Charles Kittel, Berkeley Physics Course vol.-1, Mechanics (Mc Graw-Hill, 1965)
R.P Feynman, R.B. Ligton and M.Sands, The Feynman Lectures on Physics, vol-1(Narosa Publishing House)
N. K. Bajaj, The Physics of Waves and Oscillations (Tata McGraw-Hill Pub. Com. Ltd., 2006)
R.S. Gambir, Mechanics (CBS Publishers and Distrubutions, New Delhi)
S. Garg, C. K. Ghosh, S.Gupta, Oscillations and Waves (PHI Learning Pvt. Ltd., 2009)
R.K Ghosh, The Mathematics of Waves and Vibrations, (Mc Milan, 1975)
Frank S. Crawford Jr., Berkely Physics Course: Vol.3, Waves (McGraw Hill book company, 1968)
I G Main, Vibrations and Waves (Cambridge University Press, 1984)
H J Pain, The Physics of Vibrations and Waves (John Wiley & Sons Ltd., 2005)

CC – 1 (II) - PAPER –II
MATHEMATICAL BACKGROUND, PROPERTIES OF
MATTER AND ELECTROMAGNETIC WAVES

Duration- 3 hours

Max. Marks:40

Note:- The paper is divided in five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit. MKSA system of units is to be used. The question paper shall have at least 30 per cent weightage of problems and numerical.

Unit-I

Scalars and Vectors: dot products, triple vector product, gradient of scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integral, Flux of a vector field, Gauss divergence theorem, Green's theorem and Stokes theorem. Functions of two and three variables, Partial derivatives, geometrical interpretation of total differential of a function of two and three variables, Higher order derivatives and their applications.

Unit –II

Elasticity, Small deformations, Young's modulus, bulk modulus and modulus of rigidity for an isotropic solid, Poisson's ratio, relation among elastic constants, Theory of bending of beams and cantilever, Torsion of a cylinder, Bending moments and Shearing forces.

Unit –III

Kinematics of moving fluids, Equation of continuity, Euler's equation, Bernoulli's principle, viscous fluids, Streamline and turbulent flow, Poiseuille's law, Capillary tube flow, Reynold's number, Stokes' law, Surface tension and surface energy, molecular interpretation of surface tension, Pressure on a curved liquid surface, wetting.

Unit-IV

Electromagnetic induction, Faraday's law (its integral and differential form), Lenz's law, Mutual and Self-inductance, Transformers, Energy in a static magnetic field, Measurement of self-inductance by Rayleigh's method, Maxwell's displacement current, Maxwell's equations, Electromagnetic field and Energy density.

Unit –V

Plane electromagnetic wave in vacuum, Wave equation for E and B of linearly, Circularly and elliptically polarized electromagnetic waves, Poynting vector, Reflection and Refraction at a plane boundary of dielectrics, Polarization by Reflection and total internal Reflection, Faraday effect, Wave in conducting medium, Reflection and Refraction by the ionosphere.

Textbooks and References

Berkeley Physics Course, Vol. II Electricity and Magnetism, Ed, E.M. Proc. (Mc Graw Hill)
Haliday and Resnik, Physics-VI Ed.

D.J Griffith —Introduction to electrodynamics, (Prentice Hall of India A.M
parties, Electromagnetic field.

V. V Sarvate, Electromagnetic field and Waves, (Wiley Eastern Ltd., New Delhi)

S.N Ghosh, Electromagnetic theory and wave propagation, (Narosa Publishing
House.)

Kakani and Hemrajani, Electromagnetism theory and Problems, (CBS Publishers and
Distributors, New Delhi)

Duration : 5 hours Max. Marks: 50 Min. Pass Marks : 18 Any 12 of the following experiments are to be done. Few more experiments may be set at the institutional level.

Section A

1. Study of conservation of momentum in two dimensional oscillations.
2. Study of a compound pendulum.
3. Study of damping of a bar pendulum under various mechanics.
4. Study of oscillations of a mass under different combinations of springs.
5. Study of bending of a cantilever or a beam
6. Study of torsion of a wire (static and dynamic methods.)
7. Study of flow of liquids through capillaries.

8. Determination of surface tension of a liquid by different methods.
9. Study of viscosity of a fluid by different methods.
10. To study the random decay and determine the decay constant by statistical method.
11. To determine Poisson's ratio of rubber tube.

Section B

1. Study of magnetic field due to a current
2. Measurement of low resistance by Carey-Foster bridge.
3. Measurement of inductance using impedance at different frequencies.
4. Measurement of capacitance using impedance at different frequencies.
5. Study of decay of currents in LR and RC circuits.
6. Response curve for LCR circuit and resonance frequency and quality factor.
7. To determine the frequency of A.C mains
8. To study the characteristics of semi conductor junction diode and to determine forward and reverse resistance.
9. Conversion of galvanometer into an ammeter
10. Conversion of galvanometer into voltmeter.
11. To determine the internal resistance of laclanche cell using potentiometer.

Laboratory Tutorials

Elementary Fortran programs, flowcharts and their interpretation. To print out all natural even/odd numbers between given limits. To find maximum, minimum and range of a given set of numbers.

To compile a frequency distribution and evaluate moments such as mean, standard deviation etc.

To find the product of two matrices.

To find a set of prime numbers and Fibonacci series.

Motion of a projectile using computer simulation

Numerical solution of equation of motion.

Motion of particle in a central force field. To

find the roots of a quadratic equations.

CC-2 CHEMISTRY			
Scheme	Exam Duration	Max. Marks	Min. Pass Marks
Paper I	3hrs.	40	36
Internal		10	
Paper II	3hrs.	40	
Internal		10	
Practical	5hrs.	50	18

Note: There will be three experiments. The distribution of marks will be as follows: Three experiments (one from each group)

Experiments (3)	40 marks
Viva Voce	05 marks
Record	05 marks
	50 marks

CC 2 (I) - PAPER I- INORGANIC CHEMISTRY

Duration- 3 hours

Max. Marks: 40

Note : The paper is divided in five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit.

Unit I Atomic Structure and Bonding

- (A) **Atomic Structure:** Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of Ψ and Ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d, orbitals.
- (B) **Structure and Bonding:** Covalent Bond -Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and

shapes of simple inorganic molecules and ions, valence

shall electron pair repulsion (VSEPR) theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- and H_2O , MO 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 II Chemistry of main group elements

- (A) **s-Block Elements:** Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in bio-systems, an introduction to alkyls and aryls.
- (B) **p-Block Elements:** Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxy acids and halides of group 13-16, hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.
- (C) **Chemistry of Noble Gases:** Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Unit III Ionic compounds: Bonding and Structure

- (A) **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.
- (B) **Structure of Ionic solids:** 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. X-ray diffraction by crystals, Derivation of Bragg equation, Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).
- (C) **Weak Interactions-** Hydrogen bonding, van der Waals forces.

Unit IV Acids and Bases

- (A) **Theories of Acids and Bases:** Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concept of acids and bases. Solvent system of acid and bases with special reference to liquid Ammonia, liquid BrF_3
- (B) **Concept of Hard and Soft Acids and Bases (HSAB):** Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.
- (C) **Solvent Systems:** Physical properties of a solvent, types of solvents and their general characteristics reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2 .

Unit-V Chemistry of Transition Elements

- (A) **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 (hydrides, carbides and oxides) and complexes with respect to relative stability of their oxidation states, coordination number and geometry.
- (B) **Chemistry of Elements of Second and Third Transition Series:** General characteristics, comparative treatment of Zr/Hf, Nb/Ta, Mo/W in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

Textbooks and References

1. Lee, J.D. Concise Inorganic Chemistry, ELBS.
2. Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry
3. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications.
4. Shriver and Atkins Inorganic Chemistry, W. H. Freeman and Company
5. James Huheey, Inorganic chemistry: Principles of Structure and Reactivity, Pearson Education India

6. B.N. Figgis, J.E Huheey, P.W. Atkins Inorganic Chemistry, Pearson Education
7. Duward Shriver, Inorganic Chemistry, W. H. Freeman
8. Gary Wulfsberg, Inorganic Chemistry, University Science Books
9. A. R. West, Solid State Chemistry and its Applications, Wiley

CC 2 (II) - Paper II PHYSICAL CHEMISTRY

Duration- 3 hours. Max. Marks:40 Note : The paper is divided in five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit.

Unit- I Mathematical Concepts and Nuclear Chemistry

- (A) **Mathematical Concepts:** Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like K_X, n , e^x, X , $\sin x$, $\log x$; maxima and minima, partial differentiation and reciprocity relations, Integration of some useful/relevant functions; permutations and combinations, Factorials, Probability.
- (B) **Nuclear Chemistry:** Radioactive decay – decay law, disintegration constant, half-life and average life, alpha and beta disintegration reactions, group displacement law, nuclear reactions fission, fusion, artificial radioactivity, applications of radioactivity, nuclear power, carbon dating, biological effects of various types of radiations, nuclear chemistry for peace, Nuclear chemistry in Medicine and diagnostic techniques.

Unit –II Behaviour of gases

- (A) **Gaseous States:** Postulates of kinetic theory of gases, deviation from ideal behaviour, Vander Waals equation of state;
- (B) **Critical Phenomena:** 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.
- (C) **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 Liquid and Colloidal States

- (A) **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 cholestric phases, Thermography and seven segment cells.
- (B) **Colloidal States:** 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 liquids (emulsions): types of emulsions, preparation, Emulsifier, Liquids in solids (gels): classification, preparation and properties, inhibition, general application of colloids, colloidal electrolytes.

Unit IV Solutions, Dilute Solutions and Colligative Properties

- (A) Ideal and no-ideal solutions, methods of expressing concentrations of solutions, activity and coefficient.
- (B) Dilute solutions, colligative properties, Raoult's law relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties.

Unit V Concept of Equilibrium

- (A) **Chemical Equilibrium:** Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chatelier's principle. Reaction isotherm and

reaction isochore – Clapeyron equation and Clausius – Clapeyron equation, applications.

(B) Phase Equilibrium: statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system-water, CO₂ and S systems. Phase equilibria of two component system – solid – liquid equilibria, simple eutectic-Bi-Cd, Pb-Ag systems, desilverisation of lead. Solid solutions – compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl- H₂O), (FeCl₃-H₂O) system. Freezing mixtures, acetone-dry ice. Liquid-liquid mixtures- Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system- azeotropes- HCl-H₂O and ethanol – water systems. Partially miscible liquids – Phenol-water, trimethylamine-water, nicotine-water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation. Nernst distribution law- thermodynamic derivation, applications.

Textbooks and References

1. Engel, Physical Chemistry, Pearson Publications.
2. Mary Anne White, Physical Properties of Materials, Taylor & Francis second edition.
3. D N Bajpai, Advanced Physical Chemistry, S. Chand Publishing
4. S Lewis and D Gladstone, Elements of Physical Chemistry, Macmillan.
5. Peter Atkins Julio de Paula, Atkins' Physical Chemistry Oxford University Press.

PRACTICAL

Duration: 5 Hours

Max. Marks: 50

Min. Pass Marks : 18

(A) Inorganic Chemistry

Semi micro analysis: Detection of the presence of three cations and three anions (including interfering) in a given mixture qualitatively.

(B) Organic Chemistry:

Laboratory techniques

1. Calibration of Thermometer

Naphthalene (80-82°C), Acetanilide (113.5-114°C), Urea (132.5-133°C), Distilled Water (100°C)

2. Distillation

- a. Simple distillation of ethanol-water mixture using water condenser
- b. Distillation of nitrobenzene and aniline using air condenser

3. Crystallization

- a. Concept of induction of crystallization
- b. Phthalic acid from hot water (using fluted filter paper and stem less funnel)
- c. Acetanilide from boiling water
- d. Naphthalene from ethanol
- e. Benzoic acid from water

4. Decolourisation and crystallization using charcoal

- a. Decolourisation of brown sugar (sucrose) with animal charcoal using gravity filtration.
- b. Crystallization and decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorizing carbon) using ethanol.

5. Sublimation (simple and Vacuum)

Camphor, Naphthalene, phthalic acid and Succinic acid.

6. Determination of melting point/ boiling points

- a. **Determination of melting point:** Naphthalene, Benzoic acid, Urea, Succinic acid, Cinnamic acid, Salicylic acid, Acetanilide, m-Dinitrobenzene p- Dichlorobenzene, Aspirin.

- b. **Determination of boiling points:** Ethanol, Cyclohexane, Toluene, Aniline and Nitrobenzene

(C) Physical Chemistry

1. Chemical Kinetics

- To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
- To study the effect of acid strength on the hydrolysis of an ester.
- To compare the strength of HCl and H₂SO₄ by studying the kinetics of hydrolysis of ethyl acetate.
- To study kinetically the reaction rate of decomposition of iodide by H₂O₂

2. Colloids.

- To prepare arsenious sulphide sol and compare the precipitating power of mono -, bi- and trivalent anions.

3. Viscosity

- To determine the percentage composition of a given mixture (non interacting systems) by viscosity method.
- To determine the percentage composition of a given binary mixture by viscosity method (acetone & ethyl methyl ketone)

4. Surface Tension

- To determine the surface tension of amyl alcohol in water at different concentrations and calculate the excess of these solutions.
- To determine the percentage composition of a given surface tension binary mixture by surface tension method (acetone & ethyl methyl ketone)

CC-3 ZOOLOGY

Scheme	Exam Duration	Max.Marks	Min. Pass Marks.
Paper I	3 hours 40 (External)	10 (Internal)	36
Paper II	3 hours	40 (External) 10 (Internal)	
Practical	4 hours	50 (External)	
			18

Duration : 3 Hrs.

Objectives :

CC – 3 (I) -PAPER I : NON CHORDATA

To enable students to understand

Max Marks : 40
students to the organizational

hierarchies and complexities, the evolutionary trends in external morphology and internal structure; identification and classification with examples, to enable them to understand various modes of adaptations in animals.

Note : The paper is divided in five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit.

Unit I

- General principles of taxonomy and classification. Outline classification of Protozoa up to order.
- General Structural organization of *Amoeba*, *Englena* and *Plasmodium*.
- Habit and habitat, structure, nutrition, osmoregulation and reproduction of *Paramecium*
- Locomotion in Protozoans- pseudopodial, ciliary and flagellar.
- Nutrition in Protozoa
- Reproduction in Protozoa.

Unit – II

- Outline classification of Porifera and Coelenterata up to order.
- Habit, habitat, morphology, internal structure, reproduction of *Sycon*
- Canal system and skeleton in Sponges

- d) Habit, habitat, morphology, internal structure, nutrition and reproduction of *Obelia*
- e) Polymorphism in coelenterates, coral reefs

Unit - III

- a) Outline classification of Platyhelminthes and Nematodes up to order.
- b) Habit and habitat, morphology, internal structure, reproduction and life – cycle of *Fasciola*, and *Ascaris*
- c) Parasitic adaptations in Helminthes

Unit – IV

- a) Outline classification of Annelida and Arthropoda up to order.
- b) Habit and habitat, structure, nutrition, respiration, circulation, excretion, nervous system and reproduction of
 - (i) *Hirudinaria*
 - (ii) *Palaemon*
- c) *Peripatus* : structure and affinities
- d) Mouth parts and feeding habits of Insects.

Unit – V

Outline classification of Mollusca and Echinodermata up to order

- a) Habit and habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of *Pila*
- b) Torsion in Gastropoda
- c) Habit and habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of *Asterias*
- d) Larval forms of Echinoderms.

Textbooks References: -

- 1 Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (Rastogi Publication, Meerut 10 Revised Edition)
- 2 Invertebrate Zoology series (Protozoa of Echinodermata) by R.L. Kotpal – (Rastogi Publication, Meerut)
- 3 Invertebrate Zoology by E.L. Jordan and P.S. Verma – S. Chand & Co., Delhi
- 4 Invertebrate Zoology by J.K. Dhami and P.S. Dhami – S. Chand & Co., Delhi
- 5 A textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad)
- 6 Life of Invertebrate Zoology by Russel and Hunter – (Macmillan)
- 7 Invertebrate Zoology by R.D. Barnes :- (W.B. Saunders, Philadelphia)
- 8 A manual of Zoology Vol. I by Ekambernatha Ayyar (Vishwnathan, Madras)
- 9 The invertebrate series of L.H. Hyman – (McGraw Hill)
- 10 A student's textbook of Zoology by Adma Sedgwick Vol. I, II & III (Central Book Depot, Allahabad)
- 1 A textbook of Zoology Vol. I by Parkar and Haswell – (Macmillan)
- 2 Lower non chordate, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur
- 3 Higher non Chordate, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur
- 4 Animal taxonomy and evolution, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur

CC – 3 (II) -PAPER II : ANIMAL CELL BIOLOGY AND GENETICS

Duration : 3hrs. Max. Marks : 40 Objectives :

To enable students to comprehend the modern concepts and applied aspects of Cell Biology and modern concepts of Genetics and to create awareness regarding inheritance.

Note: The paper is divided into five independent units. Two questions will be set from each unit. The candidates are required to attempt one question from each unit.