

**CLASS-XII
PHYSICS**

Time 3 hrs

**Theory :70 marks
Practical : 20 marks
CCE : 10 marks
Total : 100 marks**

STRUCTURE OF QUESTION PAPER (THEORY)

1. There will be one theory paper comprising of 18 questions.
2. Question No 1 will be carrying 20 objective type questions of one marks each. In objective type questions there will be 10 multiple choice questions [2 questions of internal choice one theory type and one numerical type in choice from unit 6 (optics) and from unit 7 (Dual Nature of matter)], 3 true/false statements, 2 fill in the blanks and 5 one word answers or definitions.
3. Question number 2 to 8 will be carrying two marks each. There will be three questions of internal choice from unit-I, unit-II and unit-IV. Each one will have one theory type question and one numerical type in choice.
4. Question number 9 to 15 will be carrying three marks each. There will be two questions of internal choice from unit-III (Magnetic effects of current and magnetism) and from unit-VI (Optics). Each one will have one theory question and one numerical type in choice.
5. Question number 16 to 18 will be carrying 5 marks each and there will be internal choice in each of all these questions. From unit VI (optics) internal choice questions will have one question from ray optics and choice question from wave optics.
6. Distribution of marks over different dimensions of the paper will be as follows.

LEARNING OUTCOMES	MARKS	PERCENTAGE OF MARKS
KNOWLEDGE	26	36%
UNDERSTANDING	30	44%
APPLICATION	14	20%
TOTAL	70	100%

7. Use of un-programmable calculator is allowed. The log tables can be used.
8. Total weightage of numerical will be 20% i.e. 14 marks. There will be two numericals of 1 marks, 3 numericals of 2 marks and 2 numericals of 3 marks.

UNIT WISE DISTRIBUTION OF MARKS

Unit No.	Title	Marks
UNIT-I	Electrostatics	09
UNIT-II	Current Electricity	07
UNIT-III	Magnetic effects of current and magnetism	10
UNIT-IV	Electromagnetic Induction & current	07
UNIT-V	Electromagnetic waves	04
UNIT-VI	Optics	14
UNIT-VII	Dual nature of matter	05
UNIT-VIII	Atoms and Nuclei	07
UNIT-IX	Electronics devices	07
Total Marks		70

SCHEMATIC DISTRIBUTION OF MARKS

UNIT	Title	1 Mark Question each	2 Marks Question each	3 Marks Question each	5 Marks Question each	Total Marks
1	Electrostatic	2	1 or N	-	1	09
2	Current Electricity	2	1 or N	1	-	07
3	Magnetic effects of current & magnetism	2	-	1 or N	1	10
4	Electromagnetic Induction & Alternating current	2	1 or N	1	-	07
5	Electromagnetic waves	2	1	-	-	04
6	Optics	4 or N	1	1 or N	1	14
7	Dual Nature of matter	2 or N	-	1	-	05
8	Atoms & Nuclei	2	1	1	-	07
9	Electronic devices	2	1	1	-	07
Total Questions		1(20 sub parts)	7	7	3	18
Total Marks		20	14	21	15	70

INSTRUCTIONS FOR PAPER SETTER

Note : There will be one theory paper comprising of 18 questions.

1. Question No 1 will be carrying 20 objective type questions of one marks each. There will be 2 questions of internal choice one theory type and one numerical type from unit 6 (Optics) and unit 7(Dual Nature of matter), 10 multiple choice questions, 3 true/false statements, 2 fill in the blanks and 5 one word answers or definitions.
2. Question number 2 to 8 total 7 questions will be carrying two marks each. There will be three questions of internal

- choice, from unit-I, unit-II and unit-IV. Each one will have one theory type question and one numerical in choice
3. Question number 9 to 15 total 7 questions will be carrying three marks each. There will be two questions of internal choice from unit-III (Magnetic effects of current & magnetism) and unit-VI (Optics). Each one will have one theory type question and one numerical type in choice.
 4. Question number 16 to 18 will be carrying 5 marks each and there will be internal choice each of all these questions. From Unit-VI (optics) choice question will have one question from ray optics and one from wave optics.
 5. Questions paper should cover all the syllabus.
 6. No question or topic should be repeated in the question paper.
 7. Questions in the paper can be asked only from mentioned PSEB syllabus. Questions from any topic which is not mentioned in the syllabus will be considered as out of syllabus question.
 8. All 3 sets must be of equal standard and difficulty level questions.
 9. At the end of each question, paper setter must write detailed distribution of marks of each sub-question.
 10. Vague, many possible answer questions, confusing answer question etc type of question should not be asked in the paper. One mark questions, answer should be of one word or one line only.
 11. Language used should be clearly understood & specific.
 12. Time and length limit of paper should be kept in mind while setting the paper.
 13. Questions paper should be made according to knowledge, understanding and applications part marks distribution.

THEORY

Unit-1: Electrostatics

Electric Charges; charging by induction, basic properties of electric charge (addition of charges, quantisation of charges and their Conservation)

Coulomb's law-force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electrical field, electric field due to a point charge, electric field due to system of charge, physical significance of electric field, electric-field lines; electric dipole, electric field due to a dipole;(on its axis,on equatorial plane)physical significance of dipoles; torque on a dipole in uniform electric field.Electric field due to continuous charge distribution.

Electric flux, statement of Gauss's theorem proof of Gauss's theorem for a charge enclosed in sphere, and its applications to find electric field due to infinitely long straight wire, uniformly charged infinite thin plane sheet and uniformly charged thin spherical shell (Field inside and outside).

Electric potential, potential difference, electric potential due to a point charge, potential due to an electric dipole with special cases for axis and equatorial plane and system of charges; equipotential surfaces, its properties, relation between field and potential electrical potential energy of a system of two point charges potential energy in external field and of electric dipole in an electrostatic field.

Conductors and insulators, electrostatics of conductors, free charges and bound charges inside a conductor. Electrostatic shielding its uses, Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

Unit-II: Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity, drift of electron mobility and their relation with electric current: Ohm's law, electrical resistance. V-I characteristics (linear and non linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance and resistivity.Internal resistance of a cell, potential difference and emf of cell, combination of cells in series and in parallel.

Kirchhoff's laws and simple applications of Wheatstone bridge, meter bridge.Potentiometer-principle and its applications to measure potential difference and for comparing emf of two cells, measurement of internal resistance of a cell.

Unit-III: Magnetic Effects of Current and Magnetism

Concept of magnetic field. Oersted's experiment;

Biot-savart law and its application to find magnetic field on the axis of a current carrying circular loop, Ampere's circuital law (no proof) and its applications to infinitely long straight wire, straight and toroidal solenoids.

Force on a moving charge in uniform magnetic and electric fields. Cyclotron.

Force on a current-carrying conductor in a uniform magnetic field Force between two parallel current-carrying conductors, definition of ampere. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometers- its current sensitivity and conversion to ammeter and voltmeter.

Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (Bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; magnetism and Gauss's law; Earth's magnetic field and magnetic elements, magnetisation and magnetic intensity, magnetic properties of materials, Para-, dia-and ferro-magnetic substances with examples, Electromagnets and factors affecting their strengths. Permanent magnets.

Unit-IV: Electromagnetic Induction and Alternating Currents

Electromagnetic induction, Faraday's and henry experiments, magnetic flux, Faraday laws, induced emf and current, Lenz's Law and conservation of energy, motional emf, Eddy currents: Self and mutual inductance.

Alternating current, peak and rms value of alternating current/voltage; reactance and impedances; phasors, ac applied across resistance, ac applied across inductor, ac applied across capacitor, ac applied across LCR, LC oscillations, ac applied across inductor, ac applied across capacitor, ac applied across LC oscillations, (qualitative treatment only), LCR series circuit resonance; power in AC circuit, wattless current.

AC generator and transformer.

Unit-V: Electromagnetic Waves

Need for displacement current, Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (Radio waves, Radio-microwaves, infra-red, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit-VI: Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibers, refraction at spherical surfaces, refraction by lens, lenses, thin lens formula/equation, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact, combination of lens and mirror. Refraction and dispersion of light through a prism. Some natural phenomenon due to sunlight, Scattering of light-blue colour of the sky and reddish appearance of the sun at sunrise and sunset.

Optical instruments:

Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Waves optics :

wave front and Huygens' Principle, reflection and refraction of plane wave at a plane surface using Huygens' Principle, wave fronts. Proof of laws of reflection and refraction using Huygens' Principle. Interference Young's double hole experiment and expression for fringe width, coherent sources and incoherent addition of waves and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, polarization by scattering and reflection, plane polarised light -Brewster's law, uses of plane polarised light and Polaroids.

Unit-VII: Dual nature of Matter and Radiation

Electron emission, Photoelectric effect, Hertz and Lenard's observations; experimental study of photoelectric effect, and wave theory of light, Einstein's photoelectric equation, particle nature of light, the photon, Matter waves-wave nature of particles, de Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained).

Unit-VIII: Atoms & Nuclei

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, expression for radius, velocity and energy of electron in orbit, energy levels, line spectrum of hydrogen atom, atomic spectra, de-Broglie's explanation of Bohr's second postulate of quantization.

Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity- alpha, beta and gamma particles/rays and their properties; radioactive decay law, alpha, beta and gamma decay. Mass-energy relation, mass-defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear force, nuclear reactor, Nuclear energy.

Unit-XI: Electronic Devices

Classification of metal insulator and semiconductor, Energy bands in solids (qualitative idea only) conductor, insulators and Semiconductors; intrinsic and extrinsic semiconductors, p-n junction, semiconductor Diode-I-V characteristics in forward and reverse bias, diode as a rectifier, I-V characteristics of LED, photodiode, solar cell and Zener diode, Zener diode as a voltage regulator.

STRUCTURE OF PAPER (PRACTICAL)

Time: 3 hrs.

Total: 20 Marks

Two experiment	10
Record of Activities	2
Viva on Activities	3
Record of Experiments	2
Viva of Experiments	3
Total	<hr/> 20

PRACTICALS SYLLABUS

Experiments

SECTION-A

1. To determine resistance per unit length of a given wire by plotting a graph of potential difference versus current.
2. To find resistance of a given wire using meter bridge and hence determine the specific resistance of its material.
3. To verify the laws of combination (series/parallel) of resistance using a meter bridge.
4. To compare the emf of two given primary cells using potentiometer.
5. To determine the internal resistance of given primary cell using potentiometer.
6. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
7. To convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same.
8. To find the frequency of the A.C. mains using a sonometer and electromagnet.

SECTION-B

1. To find the value of v for different values of u in case of a concave mirror and find their focal length.
2. To find the focal length of a convex lens by plotting graphs between u and v or between $1/u$ and $1/v$.
3. To find the local length of a convex mirror, using a convex lens.
4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
6. To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
7. To draw the characteristic curve of a zener diode and to determine its reverse breakdown voltage.

8. To study the characteristics of a common-emitter npn or pnp transistor and to find out the values of current and voltage gains.
9. To determine the reflective index of a glass slab using a traveling microscope.
10. To find refractive index of a liquid by using (i) Concave mirror. (ii) Convex lens and plane mirror.

ACTIVITIES

SECTION-A

1. To assemble the components of a given electrical circuit.
2. To draw the diagram of a given open circuit comprising at least a battery, resistor rheostat, key ammeter and volt meter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.
3. To assemble a household circuit comprising three, bulbs, three (on/off) switches, a – fuse and a power source.
4. To study the variation in potential drop with length of a wire for a steady current.
5. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
6. To measure the resistance and impedance of an inductor with or without iron core.
7. To demonstrate
 - (i) The use of an improvised fuse that melts with the flow of a certain current through it and
 - (ii) Different kinds of fuses used in everyday life.
8. To demonstrate that a current measuring device has finite non- zero resistance. (measurement of resistance of an ammeter).
9. To demonstrate that a voltage measuring device has non- infinite resistance (measurement of resistance of a voltmeter).
10. To show that earth's magnetic field has both vertical & horizontal components, by using dip needle.
11. To show the magnetic field lines with the help of iron filings of bar magnet solenoid.
12. To show the production of induced emf. in a coil due to movement of (i) a magnet towards and away from it (ii) similar coil carrying current towards & away from it.
13. To show that there are two kinds of charges and that like charges repel and unlike charges attract each other.
14. To demonstrate that a large emf is induced when direct current is switched off in an inductive circuit.
15. Make a solenoid for study of its magnetic field.

SECTION-B

1. To identify a diode, an LED, a transistor and IC, a resistor and a capacitor from mixed collection of such items.
2. Use of multimeter to (i) identify base of transistor, (ii) distinguish between npn and pnp type transistors, (iii) see the unidirectional flow of current in case of a diode and an LED. iv) Check whether a given electronic component (e.g. diode, transistor or IC) is in working order.
3. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
4. To study the nature and size of the image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
5. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.
6. To observe polarization of light using two Polaroids.
7. To observe diffraction of light due to a thin slit.
8. To study effect of intensity of light (by varying distance of the source) on an D.R.

Class XII
Physics
Model Test Paper

Time-3 hrs.

Total Marks:70

1. There will be one theory paper comprising of 18 questions.
2. Question No 1 will be carrying 20 objective type questions of one marks each. In objective type questions there will be 10 multiple choice questions [2 questions of internal choice one theory type and one numerical type in choice from unit 6 (optics) and from unit 7 (Dual Nature of matter)], 3 true/false statements, 2 fill in the blanks and 5 one word answers or definitions.
3. Question number 2 to 8 will be carrying two marks each. There will be three questions of internal choice from unit-I, unit-II and unit-IV. Each one will have one theory type question and one numerical type in choice.
4. Question number 9 to 15 will be carrying three marks each. There will be two questions of internal choice from unit-III (Magnetic effects of current and magnetism) and from unit-VI (Optics). Each one will have one theory question and one numerical type in choice.
5. Question number 16 to 18 will be carrying 5 marks each and there will be internal choice in each of all these questions. From unit VI (optics) internal choice questions will have one question from ray optics and choice question from wave optics.

Q1. Multiple choice questions

- (i) An electric dipole is kept in a uniform electric field. It experiences
 1. both a net force and a torque
 2. only a net force but no torque
 3. only a torque but no net force
 4. neither a net force nor a torque
 - (ii). Cyclotron is used to accelerate
 - (a) Electrons (b) neutrons (c) Positive ions (d) Negative ion
 - (iii) The power factor of pure resistive circuit is
 - (a) 0 (b) 1 (c) infinity (d) 90
 - (iv) The velocity of light in vacuum can be changed by changing
 - (1) amplitude (2) frequency
 - (3) wavelength (4) medium
 - (v) Which nature of the wavefront is associated with a parallel beam of light ?
 - (1) plane (2) spherical
 - (3) cylindrical (4) all of these
- Or**
- The focal length of the convex lens is 20 cm . its power will be
 - (a) 0.5 D (b) -5D (c) + 5 D (d) -0.5 D
- (vi) Photoelectric emission from a given surface of metal can take place when the value of a 'physical quantity' is less than the energy of incident photon. The physical quantity is:

- (a) Threshold frequency (b) Work function of surface
(c) Threshold wave length (d) Stopping potential

Or

The mass of photon at rest is

- (a) 1 amu (b) 1.6×10^{-27} kg (c) 0 (d) 9.1×10^{-31} kg

- (vii) Charge number increases by one during
(a) Alpha decay (b) beta negative decay
(c) beta positive decay (d) gamma decay
- (viii) A semiconductor with pentavalent impurity is
(a) P- type (b) N – type (c) Intrinsic (d) L- type
- (ix) Which mirror is used as driver mirror?
(A) Plane mirror (B) convex mirror (c) Concave mirror (D)None
- (x) A wire of resistance R is stretched to double its length . Its resistivity
(a) remains same (b) becomes half (b) becomes double (b) three times

True / false statements

- (xi) Ammeter is used to find value of resistance ? (True / False)
- (xii) Electromagnetic waves are effected with electric field but not affected with magnetic field (True / false)
- (xiii) Convex lens is used to converge ray of light .(True / false)

Fill in blanks

- (xiv) The Electromagnetic radiations used in electric oven is _____.
- (xv) The reaction which takes place in sun is nuclear

One word questions/ definitions

- (xvi) Define unit if capacitance ?
- (xvii) What is shunt?
- (xviii) What is the S.I unit of self inductance?
- (xix) Write Einstein's photoelectric equation?
- (xx) What happen to width of depletion layer when p-n junction diode is reversed biased?

Two marks questions

- Q2.** Write any two uses of U.V rays ?
- Q3.** Derive the relation between drift velocity and current?

Or

Three resistors of 2 ohm each are arranged in a triangle. What is the resistance in ohms between two corners?

- Q4.** What is iron loss in a transformer and how can it be reduced ?

Or

How much current is drawn by primary coil of a transformer, which converts 220 V A.C. to 44V A.C. to operate a device of impedance 440 Ohm.

- Q5.** What are the conditions for total internal reflection ?
- Q6.** Why two electric lines of force never intersect each other

Or

Electric potential at 0.5 m from a point charge is 50 V. What is the magnitude and sign of charge?

Q7. Derive an expression for the radius of n^{th} Bohr's orbit in Hydrogen atom.

Q8. Distinguish between Extrinsic and intrinsic semiconductors ?

Three marks questions

Q9. Using sign conventions and assumptions derive lens maker formula for double convex lens.

Or

A double convex lens made of glass of refractive index 1.60 has both radii of curvature 30 cm each. Find the focal length of the lens. If an object is placed at a distance of 15 cm from this lens, find the position of the image formed. ?

Q10. Derive relation for de Broglie wavelength ?

Q11. Prove relation for total energy of Bohr's orbit ?

Q12. Derive an expression for power in L-C-R series circuit connected to ac supply ?

Q13. Give a method to convert galvanometer in to ammeter.?

Or

A Galvanometer of 50 ohm resistance shows full scale deflection for a current of 2mA. Calculate shunt resistance needed to convert it to an ammeter of range 0-5 A.

Q14. Explain full wave rectifier with diagram?

Q15. Explain principle of a potentiometer and describe how will you use it to compare emf of two cells.

Five marks questions

Q16. Draw the course of ray in an astronomical telescope and find a relation for its magnifying power when the final image is formed at a distance of distinct vision.

Or

Define interference of light and deduce the expression for fringe width in Young's double slit experiment.

Q17. Explain with the help of a labelled diagram the underlying principle, construction and working of a cyclotron.

Or

Using Ampere's circuital law, derive an expression for magnetic field intensity produced at a point due to the current flowing through an infinite long straight conductor or solid conductor (i) outside (ii) on the surface and inside.

Q18. Define Capacitance. Derive expression for capacitance of a parallel plate capacitor having conducting slab between its plates.

Or

Define electric field at a point. Two-point charges, q and $-q$ is placed at a distance ' $2a$ ' apart. Calculate the electric field at a point P situated at a distance along the perpendicular bisector of the line joining the charges.

CLASS-XII
39. CHEMISTRY

Time: 3 Hrs

Theory: 70 Marks
Practical: 20 Marks
C.C.E.: 10 Marks
Total: 100 Marks

STRUCTURE OF QUESTION PAPER (THEORY)

1. There will be one theory paper comprising of 18 questions. All questions are compulsory.
2. Question no. 1 will have 20 sub parts and each part will carry 1 mark. All questions are compulsory. This question will be of multiple choice, numerical, one word answers, true false and comprehensive.
3. Question no. 2 to 8 will be of two marks each. There will be internal choice in two questions. All questions are compulsory.
4. Question no.9 to 15 will be of three marks each. There will be internal choice in two questions. All questions are compulsory
5. Question no.16 to 18 will be of five marks each. There will be internal choice in them.
6. Distribution of marks over different dimensions of the paper will be as follows.

LEARNING OUTCOMES	PERCENTAGE OF MARKS
KNOWLEDGE	36%
UNDERSTANDING	44%
APPLICATION	20%
Total	100%

7. Use of un-programmable calculator is allowed. The log tables can be used.
- 8.Total weightage of numerical will around 20%

UNITWISE DISTRIBUTION OF MARKS

SR.NO	UNIT	TOTAL MARK
1	Solutions	07
2	Electro-chemistry	06
3	Chemical-kinetics	05
4	Surface chemistry	05
5	General principles & process of isolation of elements	02
6	p-block elements	08
7	d & f-block elements	07
8	Coordination number	02
9	Haloalkanes & Haloarenes	06
10	Alcohol, Phenols & Ether	05
11	Aldehyde, Ketons & Carboxylic acids	05
12	Organic compounds containing Nitrogen compounds	03
13	Biomolecules	03
14	Polymers	04
15	Chemistry in everyday life	02
	TOTAL QUESTIONS & TOTAL MARKS	T.Q=18 T.M=70

Total Question in paper =18

SCHEMATIC DISTRIBUTION OF MARKS

Sr. No	UNIT	1 MARK	2 MARK	3 MARK	5 MARK	TOTAL MARK
1	Solutions	1 N(M.C.Q.)	-	1N+1(T)	-	07
2	Electro-chemistry	-	-	1N+1(T)	-	06
3	Chemical-kinetics	1N (M.C.Q.)	2N (1 (internal choice question))	-	-	05
4	Surface chemistry	5 (comprehension)	-	-	-	05
5	General principles & process of isolation of elements	-	1	-	-	02
6	p-block elements	1(O.W)	1	-	1(internal choice question)	08
7	d & f-block elements	-	1	-	1(internal choice question)	07
8	Coordination number	-	1 (internal choice question)	-	-	02
9	Haloalkanes & Haloarenes	1 (T/F)	-	-	1(internal choice question)	06
10	Alcohol, Phenols & Ether	2 (M.C.Q., T/F)	-	1 (internal choice question)	-	05
11	Aldehyde, Ketons & Carboxylic acids	2 (O.W, T/F)	-	1 (internal choice question)	-	05
12	Organic compounds containing Nitrogen compounds	3 (T/F, O.W., M.C.Q)	-	-	-	03
13	Biomolecules	1 (T/F)	1	-	-	03
14	Polymers	1 (O.W)	-	1	-	04
15	Chemistry in everyday life	2 (O.W, M.C.Q)	-	-	-	02
	TOTAL QUESTIONS & TOTAL MARKS	20 sub parts T.M=20	T.Q=7 TM=14	T.Q=7 T.M=21	T.Q=3 T.M=15	T.Q=18 T.M=70

Note: In above SCHEMATIC DISTRIBUTION OF MARKS

T=Theory, N=Numerical, M.C.Q. = Multiple choice questions, O.W= One word, T/F= True and False

Total Question in paper =18 questions

INSTRUCTIONS FOR PAPER SETTER

Note:

1. There will be one theory paper comprising of 18 questions. All questions are compulsory.
2. Question no. 1 will have 20 sub parts and each part will carry 1 mark. All questions are compulsory. This question will be of multiple choice, numerical, one word answers, true false and comprehensive.
3. Question no. 2 to 8 will be of two marks each. There will be internal choice in two questions. All questions are compulsory.
4. Question no.9 to 15 will be of three marks each. There will be internal choice in two questions. All questions are compulsory
5. Question no.16 to 18 will be of five marks each. There will be internal choice in them.
6. Questions paper should cover all the syllabus.
7. No question or topic should be repeated in the question paper.
8. Questions in the paper can be asked only from mentioned PSEB syllabus. Questions from any topic which is not mentioned in the syllabus will be considered as out of syllabus question.
9. All sets must be of equal standard and difficulty level questions.
10. At the end of each question, paper setter must write detailed distribution of marks of each sub-question.
11. Vague, many possible answer questions, confusing answer question etc type of question will not be asked in the paper.
12. Language used should be clearly understood & specific.
13. Time and length limit of paper should be kept in mind while setting the paper.

SYALLBUS (THEORY)

Unit I: Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties - relative lowering of vapour pressure, Raoult's Law, elevation of B.P., depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass. Vant Hoff factor.

Unit II: Electrochemistry

Redox reactions; conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and laws of electrolysis (elementary idea) dry cell-electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells; corrosion. Relation between Gibbs Energy change and EMF of cell.

Unit III: Chemical Kinetics

Rate of a reaction (average and instantaneous), factors affecting rates of reaction; concentration, temperature, catalyst; order and molecularity of a reaction: rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation Energy, Arrhenius equation.

Unit IV: Surface Chemistry

Absorption physisorption and chemisorption; factors affecting adsorption of gases on solids; catalysis; homogenous and heterogeneous, activity and selectivity; enzyme catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophilic, lyophobic, multimolecular and macromolecular/colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsion-types of emulsions.

Unit V: General Principles and Processes of Isolation of Elements

Principles and methods of extraction – concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminum, copper, zinc and Iron.

Unit VI: p-Block Element

Group 16 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen; preparation, properties and uses; classification of oxides; Ozone. Sulphur - allotropic forms; compounds of sulphur preparation, properties and uses of sulphur dioxide, sulphuric acid, industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).

Group 17 elements: (General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens; preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only).

Group 18 elements: General introduction, electronic configuration. Occurrence, trends in physical and chemical properties, uses.

Unit-VII: d and f Block Elements

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals-metallic character, ionization, enthalpy, oxidation states, ionic radii, colour, catalytic properties, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanoids - electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and consequences.

Actenoids - Electronic configuration, oxidation states.

Unit-VIII: Coordination Compounds

Coordination compounds - introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding; Werner's theory VBT, CFT, Isomerism (structure and stereo) importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems).

Unit-IX: Haloalkanes and Haloarenes.

Haloalkanes: Nomenclature, nature of C-X bond, physical and chemical properties, mechanism of substitution reactions, optical rotation.

Haloarenes: Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only)

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit -X: Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses, with special reference to - methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit-XI: Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit-XII: Organic compounds containing Nitrogen

Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and Isocyanides - will be mentioned at relevant places in context.

Diazonium Salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit-XIII: Biomolecules

Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); importance

Proteins - Elementary idea of amino acids, peptide bond, polypeptides proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins; enzymes.

Vitamins: Classification and functions.

Harmones: Elementary idea (excluding structure)

Nucleic Acids: DNA & RNA .

Unit-XIV: Polymers

Classification - natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers; natural and synthetic like polythene, nylon, polyesters, bakelite, rubber. Biodegradable and Non- Biodegradable Polymers.

Unit-XV: Chemistry in everyday life :

1. Chemicals in medicines analgesic, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

2. Chemicals in food- preservatives, artificial sweetening agents. Elementary idea of antioxidants.

3. Cleansing agents- soaps and detergents, cleansing action.

STRUCTURE OF QUESTION PAPER (PRACTICAL)

	Marks: 20
Volumetric Analysis	6
Mixture Analysis	5
Content based Experiment	5
Class record & viva	4
Total Marks	20

PRACTICAL SYLLABUS

A. Surface Chemistry

- Preparation of one lyophilic and one lyophobic sol. Lyophilic sol - starch, egg albumin and gum. Lyophobic sol - aluminum hydroxide, ferric hydroxide, arsenious sulphide.
- Study of the role of emulsifying in stabilizing the emulsions of different oils.

B. Chemical Kinetics

- Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.
- Study of reaction rates of any one of the following:-

- i. Reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions.
 - ii. Reaction between potassium iodate, KIO_3 , and sodium sulphite: ($\text{Na}_2 \text{SO}_3$) using starch solution as indicator (clock reaction).
- C. Thermochemistry:** Any one of the following experiments
 - a. Enthalphy of dissolution of copper sulphate or potassium nitrate.
 - b. Enthalphy of neutralization of strong acid (HCl) and strong base (NaOH)
 - c. Determination of enthalpy change during interaction (Hydrogen bond formation) between acetone and chloroform.
- D. Electrochemistry:** Variation of cell potential in $\text{Zn}/\text{Zn}^{+2}||\text{Cu}^{+2}/\text{Cu}$ with change in concentration of electrolytes (CuSO_4 or ZnSO_4 at room temperature.
- E. Chromatography**
 - a. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values.
 - b. Separation of constituents present in an inorganic mixture containing two cations only (constituents having wide difference in R_f , values to be provided).
- F. Determination of concentration/morality of KMnO_4 , solution by titrating it against a standard Solution of:**
 - a. Oxalic acid.
 - b. Ferrous ammonium sulphate.

(Students will be required to prepare standard solutions by weighing themselves).
- G. Preparation of Inorganic Compounds**
 - a. Preparation of double salt of ferrous ammonium sulphate or potash alum.
 - b. Preparation of potassium ferric oxalate.
- H. Preparation of Organic Compounds:** Preparation of any two of the following compounds
 - a. Acetanilide
 - b. Di-benzal acetone
 - c. p-Nitroacetanilide,
 - d. Aniline yellow or 2-Napthol aniline dye.
 - e. Iodoform
- I. Test for the functional groups present in organic compounds:** Unsaturation, alcoholic, pheholic, aldehydic, ketonic, carboxylic and amino (primary) groups.

J. Study of carbohydrates, fats and proteins in pure form and detection of their presence in given food stuffs.

K. Qualitative analysis: Determination of one cation and one anion in a given salt.

Cations- Pb^{2+} , Cu^{2+} , As^{3+} , Al^{3+} , Fe^{3+} , Mn^{2+} , Zn^{2+} , Co^{2+} , Ni^{2+} , Ca^{2+} , Sr^{2+} , Ba^{2+} , Mg^{2+} , NH_4^+

Anions- \

(Note: Insoluble salts excluded)

PROJECT

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects

1. Study of presence of oxalate ions in guava fruit at different stages of ripening.
2. Study of quantity of casein present in different samples of milk.
3. Preparation of soyabean milk and its comparison with the natural milk with respect to curd formation, effect of temperature etc.
4. Study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc.)
5. Study of digestion of starch by salivary amylase and effect of PH and temperature on it.
6. Comparative study of the rate of fermentation of following material wheat flour, gram flour, Potato juice, carrot juice etc.
7. Extraction of essential oils present in saunf (aniseed), Ajwain (carum) illaichi (cardamom).
8. Study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

Note: Any investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

**CLASS XII
CHEMISTRY
MODEL TEST PAPER**

Time:3 hrs.

Total Marks:70

Pass Marks:23

1. There will be one theory paper comprising of 18 questions. All questions are compulsory.
2. Question no. 1 will have 20 sub parts and each part will carry 1 mark. All questions are compulsory. This question will be of multiple choice, numerical, one word answers, true false and comprehensive.
3. Question no. 2 to 8 will be of two marks each. There will be internal choice in two questions. All questions are compulsory.
4. Question no.9 to 15 will be of three marks each. There will be internal choice in two questions. All questions are compulsory
5. Question no.16 to 18 will be of five marks each. There will be internal choice in them.

Section-A

Passage Based Question (Q No. i to v)

Read the given passage and answers following questions

There are mainly two type of adsorption of gases on solids. If accumulation of gases on the surface of solid occurs on account of weak vander waal forces, the adsorption is termed as physical adsorption. When gas molecules or atoms held to solid surface by chemical bonds, adsorption is termed as chemical adsorption. The chemical bonds may be covalent or ionic. Chemical adsorption involves a high energy of activation therefore it is referred as Activated adsorption. A physical adsorption at low temperature may pass into chemical adsorption temperature is increased.

- i. What is adsorption?
- ii. Which adsorption is known as activated adsorption?
- iii. Give conditions of temperature which favour physical adsorption.
- iv. What are type of adsorption?
- v. What type of force exist in physical adsorption?

Q No.(vi) to (x) are one word:

- vi. Name the monomer of PVC.
- vii. Name the medicine use to lower high fever.
- viii. Give IUPAC name of $\text{CH}_3\text{CH}_2\text{NHCH}_3$.
- ix. Name one reagent used to distinguish between aldehyde and ketones.
- x. Give formula of Caro's Acid.

Multiple choice question (Q No 11-15)

- xi. Which of following solution has highest boiling points .
(a) 0.01 m glucose (b) 0.01m K₂SO₄
(b)(C) 0.01 MKNO₃ (d)0.01M Urea
- xii. For areaction $X+Y \rightarrow \text{Product}$, the rate law is given by
If Rate= $K(X)^{3/2} (Y)^{1/2}$ than what is order of Reaction.
(a) 2 (b) $\frac{1}{2}$ (c) $\frac{3}{2}$ (d) 1
- xiii. $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[443K]{\text{Conc.H}_2\text{SO}_4}$ 'A' will be
(a) CH₂=CH₂ (b) CH₃ CH₂-O-CH₂-CH₃
(c) C₂H₅OCH₃ (d) CH₃ CH₂CH₂CH₃
- xiv. Which is most basic in aq solution
(a) CH₃ NH₂ (b) (CH₃)₂NH
(c) (CH₃)₃N (d) C₆H₅ NH₂
- xv. Drugs used to kill micro-organisms are called
(a) Disnfection (b) Antiseptic (c) Antibiotics (d) Antacid

Q No xvi to xx are true/ false type.

- xvi. Aniline does not undergo friedal craft's alkylation
- xvii. Haloalkanes are soluble in water.
- xviii. Formaldehyde is more reactive acetone.
- xix. Phenols are more acidic than alcohols.
- xx. Vitamin K is also called as ascorbic acid.

Section-B

(Short Answer Questions 2 marks Q 2 to 8)

2. Why transition metals show variable oxidation states?
3. Explain (a) lonisation isomerism (b) Linkage isomerism

Or

Give IUPAC names (i) K₃ [Fe (CN)₆] (ii) [Co (en)₂ Cl(NO₂)]⁺

4. Explain froth flotation process.

5. Why H_2S is more Acidic than H_2O ?
6. Give difference between DNA and RNA.
7. In a reaction when the concentration of reactants is tripled, the rate of reaction becomes 27 times. What is order of reaction?
8. A 1st order Reaction is 20% complete in 10 minutes. Calculate the time required for 75% completion.

Or

Prove that $t_{75\%}=2t_{50\%}$ for 1st order reaction

Section-C

Long Answer Question, 3 marks Q 9 to 15

9. Give monomers and equation of preparation for followings
- i) Nylon 6,6 ii) Terylene ii) Bakelite **(1+1+1)**
10. Phenols are more acidic than alcohols why.

OR

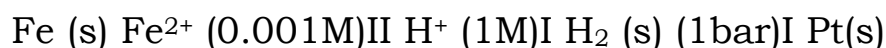
Explain

- (i) Reimer Tiemann reaction
 - (ii) coupling reaction
 - (iii) kolbe's reaction. **(1+1+1)**
11. Aldehydes are more reactive than ketones towards nucleophilic addition reaction.

OR

Carboxylic acid have both carbonyl group and hydroxyl group but don't show the properties of carbonyl why.

12. Calculate emf of following cell at 298K



$$E^{\circ}\text{Fe}^{2+}/\text{Fe} = -0.44\text{V}$$

13. Explain electrochemical Theory of rusting.

**CLASS-XII
MATHEMATICS**

Time: 3 Hrs

**Theory: 80 Marks
Practical: 10 Marks
CCE: 10 Marks
Total: 100 Marks**

1. All the questions are compulsory.
2. The question paper consists of 36 questions divided into 4 sections A,B,C,and D.
3. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.
4. There is no overall choice. However, an internal choice has been provided in one question of 2 marks, two questions of 4 marks each and three questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted.

SR. NO.	UNIT	CHAPTERS	Q. Carrying 1-Mark	Q. Carrying 2-Mark	Q. Carrying 4-Mark	Q. Carrying 6-Mark	Total Marks
1	Relations & Functions	Relations & Functions	1	1	-	-	3
2		Inverse Trigonometric Functions	1	-	1	-	5
3,4	Algebra	Matrices and Determinants	2	1	-	1	10
5	Calculus	Continuity and Differentiability	3	-	1	-	7
6		Applications of Derivatives	1	1	-	1	9
7		Integrals	3	1	1	-	9
8		Applications of the Integrals	-	-	1	-	4
9		Differential Equations	2	-	1	-	6
10	Vectors and three Dimensional Geometry	Vectors	2	2	-	-	6
11		Three Dimensional Geometry	2	-	-	1	8
12	Linear Programming	Linear Programming	1	-	1	-	5
13	Probability	Probability	2	-	-	1	8
		TOTAL QUESTIONS	20	6	6	4	
		TOTAL MARKS	20	12	24	24	80

SYLLABUS

UNIT I: RELATIONS & FUNCTIONS

- 1 Relations and Functions:**
Types of relations: Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function.

2 Inverse Trigonometric Functions:

Definition, Range, Domain, Principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

UNIT II: ALGEBRA

3 Matrices:

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation of matrices. Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

4 Determinants:

Determinant of a square matrix (up to 3×3 matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equation by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

UNIT III: CALCULUS

5 Continuity and Differentiability:

Continuity and Differentiability, derivative of composite functions, chain rule, derivative of inverse trigonometric functions, derivative of implicit function. Concepts of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretation.

6 Applications of Derivatives

Applications of derivatives: rate of change of bodies, increasing/decreasing functions, tangents and normal, use of derivatives in approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real life situations).

7 Integrals:

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{dx}{ax^2 + bx + c}$$
$$\int \frac{(px + q)}{ax^2 + bx + c} dx, \int \frac{(px + q)}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx$$
$$\int \sqrt{ax^2 + bx + c} dx \text{ and } \int (px + q)\sqrt{ax^2 + bx + c} dx$$

Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

8 Applications of the Integrals:

Applications in finding the area under simple curves, especially lines, circles/parabolas/ellipses (in standard form only), area between any of the two above said curves (the region should be clearly identifiable).

9 Differential Equations:

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$$\frac{dy}{dx} + py = q$$

where p and q are functions of x or constant.

$$\frac{dx}{dy} + px = q$$

where p and q are functions of y or constant

UNIT IV: VECTORS AND THREE DIMENSIONAL GEOMETRY

10 Vectors:

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and

application of scalar (dot) product of vectors, vector (cross) product of vectors, scalar triple product of vectors.

11 Three-dimensional Geometry:

Direction cosines and direction ratios of a line joining two points. Cartesian equations and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

UNIT V: LINEAR PROGRAMMING

12 Linear Programming:

Introduction, related terminology such as constraints, objectives function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P problems, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints)

UNIT VI: PROBABILITY

13 Probability:

Conditional probability, multiplication theorem on probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of random variable.

Assessment of Activity Work:

Time : 2hrs

10 Marks

Throughout the year any 10 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class (XI or XII) which is available on the link : <http://www.ncert.nic.in/exemplar/labmanuals.html> A record of the same may be kept by the student. An year end test on the activity may be conducted at the School Level. The weightage are as under:

- The activities performed by the student through out the year and record keeping : **5 marks**
- Assessment of the activity performed during the year end test: **3 marks**
- Viva-voce : **2 marks**

Activities

1. To verify that the relation R in the set L of all lines in a plane, defined by $R = \{(l, m) : l \perp m\}$ is symmetric but neither reflexive nor transitive.
2. To verify that the relation R in the set L of all lines in a plane, defined by $R = \{(l, m) : l \parallel m\}$ is an equivalence relation.

3. To demonstrate a function which is not one-one but is onto.
4. To demonstrate a function which is one-one but not onto.
5. To draw the graph of $\sin^{-1} x$, using the graph of $\sin x$ and demonstrate the concept of mirror reflection (about the line $y = x$).
6. To explore the principal value of the function $\sin^{-1} x$ using a unit circle.
7. To sketch the graphs of a^x and $\log_a x$, $a > 0, a \neq 1$ and to examine that they are mirror images of each other.
8. To establish a relationship between common logarithm (to the base 10) and natural logarithm (to the base e) of the number x .
9. To find analytically the limit of a function $f(x)$ at $x = c$ and also to check the continuity of the function at that point.
10. To verify that for a function f to be continuous at given point x_0 , $\Delta y = f(x_0 + \Delta x) - f(x_0)$ is arbitrarily small provided Δx is sufficiently small.
11. To verify Rolle's Theorem.
12. To verify Lagrange's Mean Value Theorem.
13. To understand the concepts of decreasing and increasing functions.
14. To understand the concepts of local maxima, local minima and point of inflection.
15. To understand the concepts of absolute maximum and minimum values of a function in a given closed interval through its graph.
16. To construct an open box of maximum volume from a given rectangular sheet by cutting equal squares from each corner.
17. To find the time when the area of a rectangle of given dimensions become maximum, if the length is decreasing and the breadth is increasing at given rates.
18. To verify that amongst all the rectangles of the same perimeter, the square has the maximum area.
19. To evaluate the definite integral $\int_a^b \sqrt{1-x^2} dx$ as the limit of a sum and verify it by actual integration.
20. To verify geometrically that $\vec{c} \times (\vec{a} + \vec{b}) = \vec{c} \times \vec{a} + \vec{c} \times \vec{b}$
21. To verify that angle in a semi-circle is a right angle, using vector method.
22. To locate the points to given coordinates in space, measure the distance between two points in space and then to verify the distance using distance formula.
23. To demonstrate the equation of a plane in normal form.
24. To verify that the angle between two planes is the same as the angle between their normals.
25. To find the distance of given point (in space) from a plane (passing through three non-collinear points) by actual measurement and also analytically.
26. To measure the shortest distance between two skew lines and verify it analytically.
27. To explain the computation of conditional probability of a given event A, when event B has already occurred, through an example of throwing a pair of dice.

Projects (Assessment of Project work is to be recorded under CCE)

1. To minimise the cost of the food, meeting the dietary requirements of the staple food of the adolescent students of your school.
2. Estimation of the population of a particular region/country under the assumptions that there is no migration in or out of the existing population in a particular year.
3. Finding the coordinates of different points identified in your classroom using the concepts of three dimensional geometry and also find the distances between the identified points.
4. Formation of differential equation to explain the process of cooling of boiled water to a given room temperature.
5. Project on history of Mathematicians: It may include history of Indian mathematicians such as Aryabhata, Brahmgupta, Varahamihir, Sridhara, Bhaskaracharya, Ramanujan etc., and history of foreign mathematicians such as Cantor, Pythagoras, Thales, Euclid, Appollonius, Descartes, Fermat, Leibnitz, Euler, Fibonac, Gauss, Newton, etc.
6. On linear Programming problems related to day-to-day life like collecting data from families of their expenditures and requirements from the factories to maximum output.
7. Collect data from dieticians, transporters, agents and formulate linear programming problems.
8. Make a chart of the formulae of applications of calculus.
9. Applications of conic sections, vectors, three dimensional geometry, calculus, etc., in Mathematics and Physics.
10. Mathematics and Chemistry: Study structure of organic compounds.
11. Mathematics and Biology: Study of science of heredity etc.
12. Mathematics and Music
13. Mathematics and Environment
14. Mathematics and Arts: Construction of shapes using curves
15. Mathematics and Information and Communication Technology: Writing of Mathematical programmes, flow charts, algorithm, circuit diagrams etc.
16. Collection of statistical data and analysing it for standard deviation and mean deviation.
17. Observe the various patterns and properties in Pascal's triangle and make a project.
18. Prepare a project based on the Fibonacci sequence, their properties and similar pattern found in nature.
19. Form a differential equation for the growth of bacteria in different environments.
20. Study the nature of mathematics and make a project showing where three aspects of nature of mathematics - formalism, logic, intuition is applied in the development of mathematics.

SUBJECT: MATHEMATICS
SAMPLE TEST PAPER 2019-20

Time: 3 hour

Class: 12th

M.M. 80

1. All the questions are compulsory.
2. The question paper consists of 36 questions divided into 4 sections A,B,C,and D.
3. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.
4. There is no overall choice. However, an internal choice has been provided in one question of 2 marks, two questions of 4 marks each and three questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted.

Section- A

Select the correct option(Q 1.1-Q 1.10):

1. The value of $\operatorname{cosec}^{-1}(-2)$ is equal to
(A) $\frac{\pi}{3}$ (B) $-\frac{\pi}{6}$ (C) $-\frac{\pi}{3}$ d) $\frac{\pi}{6}$
2. $\int \frac{\sin x}{\cos^2 x} dx$ equals
(A) $\sec x + c$ (B) $\tan x + c$ (C) $\operatorname{cosec} x + c$ (D) $\sec^2 x + c$
3. If $AB = C$ where A is a matrix of order 2×4 and C is a matrix of order 2×5 , then the order of B' is :
(A) 3×5 (B) 4×5 (C) 3×3 (D) 5×5
4. In a single throw of two dice, the chances of throwing a sum of 5 is:
(A) 0 (B) $\frac{1}{36}$ (C) $\frac{1}{9}$ (D) $\frac{5}{36}$
5. $\int e^x(\cos x - \sin x) dx$ equals
(A) $e^x \sin x + c$ (B) $-e^x \cos x + c$ (C) $e^x \cos x + c$ (D) $-e^x \sin x + c$
6. The number of arbitrary constants in the particular solution of a differential equation of fifth order is:
(A) 0 (B) 2 (C) 3 (D) 5
7. If $f(x) = \begin{cases} \frac{\sin 3x}{5x}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is continuous at $x = 0$, then k is equal to :
(A) 5 (B) $\frac{3}{5}$ (C) $\frac{5}{3}$ (D) 0
8. If θ is the angle between any two vectors \vec{a} and \vec{b} , then $|\vec{a} \cdot \vec{b}| = |\vec{a} \times \vec{b}|$ when θ is equal to
(A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{2}$ (D) π
9. The distance of the plane $\vec{r} \cdot (2\hat{i} + 3\hat{j} - 6\hat{k}) = 7$ from origin is
(A) -1 (B) 0 (C) $\frac{1}{7}$ (D) 1
10. If $y = 3^x$, then $\frac{dy}{dx}$ is :
(A) 3^x (B) $3^x \log 3$ (C) 3 (D) $\frac{3^x}{\log 3}$

Fill in the blanks (Q 11-Q 15):

11. If $|A| = 3$. where A is a 2×2 matrix, $|Adj A| = \dots\dots\dots$
12. If f is a bijection, then it is.....
13. If A and B are mutually exclusive events, then $P(A \cap B) = \dots\dots\dots$
14. The value of $\int_{-\pi}^{\pi} \sin^{2019} x \cos^{2020} x \, dx$ is equal to.....
15. Degree of differential equation $\left(\frac{dy}{dx}\right)^3 + \frac{d^3y}{dx^3}$ is.....

State whether it is true or false (Q. 16-Q. 20):

16. If $\vec{a} = \hat{i} + 4\hat{j} + 4\hat{k}$ and $\vec{b} = 4\hat{i} - \hat{j} + 2\hat{k}$, then $\vec{a} \cdot \vec{b}$ is equal to 8
17. Derivative of $\sin^{-1}(\cos x)$ w.r.t. x is 1
18. If a line makes angles α, β, γ respectively with positive directions of the coordinate axes, then the value of $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma = 3$.
19. Product of slopes of tangent and normal is equal to -1 .
20. Quadrant represented by the region $x \geq 0, y \geq 0$

Section -B

21. If $A = \begin{bmatrix} -2 & 4 \\ -1 & 3 \end{bmatrix}$, then verify $A'A = I$.

Or

If $A = \begin{bmatrix} 1 & -2 \\ 3 & 2 \end{bmatrix}$ and $f(x) = x^2 - 2x + 3$, then find $f(A)$.

22. If the function $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \frac{x}{x+1}$, find $f(f(3))$.
23. Find the equation of the tangent to the curve $y = 2x^2 + 3 \sin x$ at $x = 0$.
24. Find a vector in direction of vector $4\hat{i} - \hat{j} + 3\hat{k}$ which has magnitude 7 units.
25. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$, find the angle between \vec{a} and \vec{b} .
26. Evaluate $\int \sin 5x \sin 3x \, dx$.

Section -C

27. Differentiate $(\sin x)^x + (x)^{\sin x}$ w.r.t. x .

Or

If $y = e^{\tan^{-1} x}$, then prove that $(1 + x^2)^2 y_2 + 2x(1 + x^2) y_1 = y$

28. Using integration, find the area bounded by the region given by $\left\{ (x, y) : \frac{x^2}{16} + \frac{y^2}{9} \leq 1 \leq \frac{x}{4} + \frac{y}{3} \right\}$.

29. Evaluate $\int_1^4 (3x^2 - 2x) \, dx$ as limit of sum.

Or

Evaluate $\int \frac{1}{(x-1)(x-2)(x-3)} \, dx$

30. Prove that $\sin^{-1} \left(\frac{12}{13} \right) + \cos^{-1} \left(\frac{4}{5} \right) + \tan^{-1} \left(\frac{63}{16} \right) = \pi$

31. Solve the differential equation $\left[\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}} \right] \frac{dx}{dy} = 1, (x \neq 0)$.

32. Graphically maximize $Z = 5x + 2y$ subject to the constraints:

$$x - 2y \leq 2, 3x + 2y \leq 12, -3x + 2y \leq 3, x \geq 0, y \geq 0$$

Section -D

33. Using matrix method, solve the following system of equations

$$x + 2y - 3z = 1, 2x - 3z = 2, x + 2y = 3$$

34. Show that semi-vertical angle of right circular cone of given surface area and maximum volume is $\sin^{-1}\left(\frac{1}{3}\right)$.

Or

Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius r is $\frac{4r}{3}$.

35. Find the equation of plane passing through the intersection of planes $2x + y - z = 3$ and $5x - 3y + 4z + 9 = 0$ and parallel to the line $\frac{x-1}{2} = \frac{y-3}{4} = \frac{z-5}{5}$

Or

Find the shortest distance and the vector equation of the line of shortest distance between the lines given by $\vec{r} = 3\hat{i} + 8\hat{j} + 3\hat{k} + \lambda(3\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = -3\hat{i} - 7\hat{j} + 6\hat{k} + \mu(-3\hat{i} + 2\hat{j} + 4\hat{k})$.

36. An insurance company insured 3000 scooters, 4000 cars and 5000 trucks. The probabilities of an accident involving a scooter, a car and a truck are 0.02, 0.03, 0.04 respectively. One of the insured vehicles meets with an accident. Find the probability that it is a car.

Or

Find mean and variance of number of aces, when two cards are drawn (with replacement) at random from a well-shuffled pack of 52 cards.

BIOLOGY

The present syllabus provides the students with new concepts along with an extended exposure to contemporary areas of the subject. The syllabus also aims at emphasizing on the underlying principles that are common to both animals and plants as well as highlighting the relationship of Biology with other areas of knowledge. The format of the syllabus allows a simple, clear, sequential flow of concepts. It relates the study of biology to real life through the use of technology. It links the discoveries and innovations in biology to everyday life such as environment, industry, health and agriculture. The updated syllabus also focuses on reducing the curriculum load while ensuring that ample opportunities and scope for learning and appreciating basic concepts of the subject continue to be available within its framework. The prescribed syllabus is expected to:

- promote understanding of basic principles of Biology;
- encourage learning of emerging knowledge and its relevance to individual and society;
- promote rational/scientific attitude towards issues related to population, environment and development;
- enhance awareness about environmental issues, problems and their appropriate solutions;
- create awareness amongst the learners about diversity in the living organisms and developing respect for other living beings;
- appreciate that the most complex biological phenomena are built on essentially simple processes; It is expected that the students would get an exposure to various branches of Biology in the syllabus in a more contextual and friendly manner as they study its various units

Class XII Session 2019-20

Max Marks 70

Time allowed 3 Hours

Unit	Title	No. of periods	Marks
I	Reproduction	30	14
II	Genetics and Evolution	40	18
III	Biology and Human Welfare	30	14
IV	Biotechnology and its Applications	30	10
V	Ecology and Environment	30	14
	Total	160	70

SCHEMATIC DISTRIBUTION OF MARKS

Unit	Chapter	Section A 1 mark questions	Section B 2 marks questions	Section C 3 marks questions	Section D 3marks questions (Diagram based)	Section E 5 marks questions	Total marks
Reproduction	1 . Reproduction in organisms	1 or 1	-	-	-		1
	2. Sexual reproduction in flowering plants	-	--	-	1	1 or 1 (One question should be from chapter 2 and other choice question should be from chapter 3)	8
	3. Human Reproduction	-	1 or 1	-	-		2
	4. Reproductive health	-	-	1	-		3
Genetics and Evolution	5. Heredity and variation	-	1	1	-	-	5
	6. Molecular bases of inheretance	-	1	1	-	1 OR 1 (One question should be from chapter 6 and other choice question should be from chapter 7)	10
	7. Evolution	-	-	1 or 1	-		3
Biology and Human welfare	8.Human health and diseases	1	1	-	1	-	6
	9. Strategies for enhancement in food production	Or 1	-	1	-	-	3
	10. Microbes in human welfare	-	1	1	-	-	5
Biotechnolog y and its applications	Biotechnology- Principles and processes	1	-	1	-	-	4
	Biotechnology and its applications	1	1	1	-	-	6
Ecology and environment	13. Organisms and populations	-	-	1	-	-	3
	14. Ecosystem	-	-	-	1	1	8
	15. Biodiversity and conservation	1	-	-	-	Or 1	1
	16. Environmental issues	-	1	Or 1	-	-	2

No. Of questions		5	7	9	3	3	70
------------------	--	---	---	---	---	---	----

Instructions to the paper setter

1. There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
2. Section A contains question numbers 1 to 5, multiple choice questions of one mark each.
3. Section B contains question numbers 6 to 12, short answer type I questions of two marks each.
4. Section C contains question numbers 13 to 21, short answer type II questions of three marks each.
5. Section D contains question number 22 to 24, diagram/illustration/graph based short answer type questions of three marks each.
6. Section E contains question numbers 25 to 27, long answer type questions of five marks each.
7. There is no overall choice in the question paper. However, internal choices are provided in two questions of one mark, one question of two marks, two questions of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.
8. There should be at least one comparison based question.
9. Language used should be clearly understood and specific.

Syllabus (Theory)

Unit I. Reproduction

Chapter-1: Reproduction in Organisms

Reproduction, a characteristic feature of all organisms for continuation of species; Asexual reproduction Modes of reproduction-Asexual and sexual reproduction; Modes- Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Chapter-2: Sexual Reproduction in Flowering Plants

Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreedings devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

Chapter-3: Human Reproduction

Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

Chapter-4: Reproductive Health

Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control – Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (Elementary idea for general awareness).

Unit II. Genetics and Evolution

Chapter-5: Principles of Inheritance and Variation

Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination - in humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance - Haemophilia, Colour blindness; Mendelian disorder in humans - Thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Chapter-6: Molecular Basis of Inheritance

Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation - Lac Operon; Genome and human genome project; DNA fingerprinting.

Chapter-7: Evolution

Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution - Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; Adaptive Radiation; Human evolution.

Unit III. Biology and Human Welfare

Chapter-8: Human Health and Diseases

Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology - vaccines; Cancer, HIV and AIDs; Adolescence, drug and alcohol abuse.

Chapter-9: Strategies for Enhancement in Food Production

Improvement in food production : Plant breeding, tissue culture, single cell protein, Biofortification, Apiculture and Animal husbandry.

Chapter-10: Microbes in Human Welfare

In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers. Antibiotics; production and judicious use.

Unit IV. Biotechnology and Its Applications

Chapter-11: Biotechnology - Principles and Processes

Genetic engineering (Recombinant DNA technology).

Chapter-12: Biotechnology and its Application

Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; biosafety issues, biopiracy and patents.

Unit V. Ecology and Environment

Chapter-13: Organisms and Populations

Organisms and environment: Habitat and niche, Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributesgrowth, birth rate and death rate, age distribution.

Chapter-14: Ecosystem

Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy; nutrient cycles (carbon and phosphorous); ecological succession; ecological services - carbon fixation, pollination, seed dispersal, oxygen release (in brief).

Chapter-15: Biodiversity and its Conservation

Concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites.

Chapter-16: Environmental Issues

Air pollution and its control; water pollution and its control; agrochemicals and their effects; solid waste management; radioactive waste management; greenhouse effect and climate change; ozone layer depletion; deforestation; any one case study as success story addressing environmental issue(s)

CLASS XII (2019-20)
BIOLOGY (054)
Sample Question Paper

Time allowed: 3hrs.

Maximum Marks: 70

General Instructions:

1. There are a total of 27 questions and five sections in the question paper. All questions are compulsory.
2. Section A contains question numbers 1 to 5, multiple choice questions of one mark each.
3. Section B contains question numbers 6 to 12, short answer type I questions of two marks each.
4. Section C contains question numbers 13 to 21, short answer type II questions of three marks each.
5. Section D contains question number 22 to 24, diagrammatic/illustrative short answer type questions of three marks each.
6. Section E contains question numbers 25 to 27, long answer type questions of five marks each.
7. There is no overall choice in the question paper. However, internal choices are provided in two questions of one mark, one question of two marks, two questions of three marks and all three questions of five marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.

Section A

1. Vegetative propagation in onion occurs by
 - a) Offset
 - b) Bulb
 - c) Sucker
 - d) Rhizome

OR

The process through which female gamete undergo development into new organism without fertilization is called

- a) Parthenocarpy
 - b) Parthenogenesis
 - c) Apomixis
 - d) Self incompatibility
2. What are the motives that stimulate the youngsters to take drugs
 - a) Peer pressure
 - b) Desire for excitement
 - c) To escape from frustration
 - d) All of the above

OR

The term totipotency refers to the capacity of a

- a) Cell to generate whole plant
 - b) Bud to generate whole plant
 - c) Seed to germinate
 - d) Cell to enlarge in size
3. The first isolated type II restriction endonuclease enzyme is.

- a) Eco RI
 - b) Hind –II
 - c) Bam-II
 - d) Eco R1I
4. The part of Human insulin which is removed during maturation of pro insulin to insulin is
- a) C – peptide
 - b) A –peptide
 - c) D -peptide
 - d) B -peptide
5. An example of Ex-situ conservation is
- a) Seed bank
 - b) National park
 - c) Sacred Grove
 - d) Wildlife sanctuary

Section B

6. How do Leydig cells help in spermatogenesis

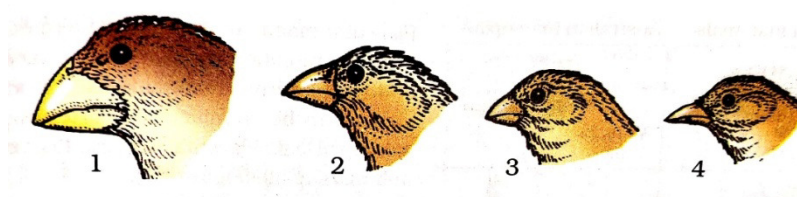
OR

Write down the function of

- a. Corpus luteum
 - b. Endometrium
7. Write any two points of difference in test cross and back cross
8. If a double standard DNA has 20 % of cytosine, what will be the percentage of adenine in this DNA.
9. Write down two points of difference between innate and acquired immunity.
10. Do you think microbes can also be used as source of energy? If yes how?
11. What are Cry proteins? Name the organism that produces it.
12. How does algal bloom destroy the quality of fresh water body?

Section C

13. Briefly discuss any two assisted reproductive techniques that can help infertile couples to have child.
14. A child has blood group O. If the father has blood group A and mother has blood group B work out the genotype of parents and the possible genotypes of other offsprings.
15. How did Hershey and Chase differentiate between DNA and protein in their experiment while proving that DNA is the genetic material ?
16. The following diagram represents a variety of beaks of finches that Darwin found in Galapagos Islands



Briefly discuss the phenomena that Darwin explained on the basis of his above mentioned study.

OR

What are connecting links? Give two examples.

17. Briefly describe various steps involved in plant breeding.
18. Microbes can be used to decrease the use of chemical fertilizers and pesticides. Explain how this can be accomplished?
19. Expand PCR. How it helps in amplification of gene of interest?
20. What are transgenic animals? How are transgenic animals helpful to mankind?
21. Give an account of energy flow in an ecosystem

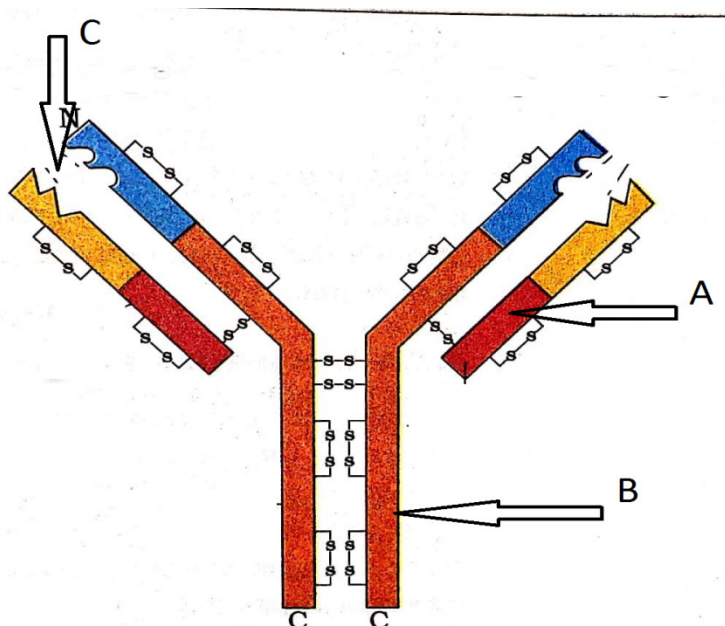
OR

Briefly discuss

- a. Catalytic converter
- b. Biological magnification

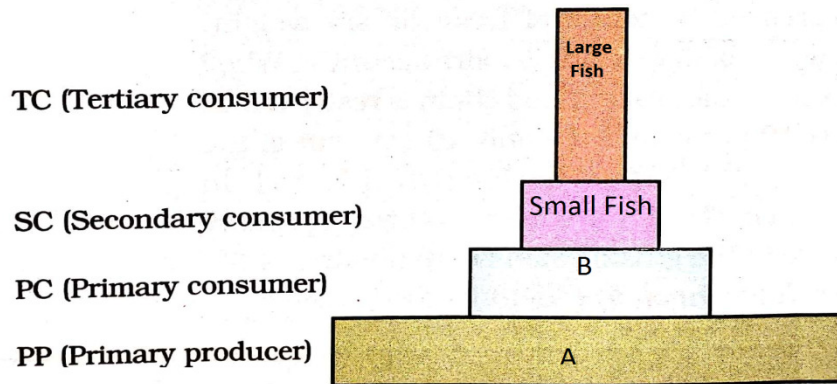
Section D

22. Draw a neat, well labeled diagram showing the various parts of typical angiosperm ovule.
23. The following diagram represents the structure of an antibody molecule. Observe the structure carefully and label the parts A, B and C of this diagram.



24. The following diagram depicts the pyramid of number in aquatic ecosystem. Observe the diagram carefully and answer the following questions

Trophic level



- A. Label the part A in this diagram
- B. Label the part B in this diagram
- C. The pyramid of number in aquatic ecosystem is
- Always straight
 - Always Inverted
 - May be straight or inverted
 - None of the above

Section E

25. Explain the development of male gametophyte in angiosperms. Illustrate the answer with suitable diagrams.

OR

What is spermatogenesis? In which part of testes does it take place? Briefly describe the process of spermatogenesis with help of suitable diagram.

26. In a medium where E.Coli was growing, lactose was added, which induced Lac operon. Then, why does Lac operon shut down sometime after addition of lactose in the medium. Illustrate your answer with suitable diagram.

OR

- A. 'Ontogeny repeats phylogeny' Justify.
- B. Describe Darwin's theory of natural selection.

27. Explain why ecological succession will be faster in a forest devastated by fire than on a bare rock? Also compare succession in case of an abandoned land after floods with that of bare rock.

OR

What kind of threats to the biodiversity may lead to its loss?