



The Royal College

SUMMER HOLIDAY
HOMEWORK

SESSION

2025-26

STD-XI Science

Dear Parents and Students,

At the outset, we extend our heartfelt appreciation for the unwavering support, steadfast commitment, positivity and enthusiasm you have brought to the start of this new academic year.

Summer is not just a break, it's a reminder to reconnect with your passions, try a new skill, and spend meaningful moments with your family. Relax, recharge, but manage your time wisely. Stay energized, stay hydrated, and make each day purposeful. Don't let procrastination steal your spark! **"A stitch in time saves nine" take the time now to plan and organize your summer learning. Small efforts early can save you a lot of time later!**

At **The Royal College**, we believe that learning is a journey without a pause. This year's Holiday Homework has been thoughtfully designed to blend academics with creativity, ensuring you remain engaged while enjoying the freedom of summer.

Dear students, this is that time of the year to dive into new realms of thought, ignite your imagination, and create memorable moments. Let your curiosity be your compass as you embark on the adventure of reading captivating books, exploring the world through current affairs, and giving life to your ideas through writing. Push the boundaries of your creativity and ask questions that lead to uncharted discoveries. Watch how growth quietly blooms, when you experiment, explore and evolve.

As the **FIFA Club World Cup 2025** draws near, let the spirit of sportsmanship inspire you. Step outdoors, stay fit, and cultivate healthy habits instead of drifting into endless screen time or unhealthy routines. Let the musician in you strum a melody, the artist in you brings a colourful canvas to life, and the reader in you devour wonderful books, the possibilities are endless!

Your teachers have crated meaningful and engaging assignments not mere tasks, but opportunities to think critically, imagine freely, and showcase your talents. Subject-specific worksheets and project guidelines are available under the respective Subject Cards. Infuse your projects with originality and enthusiasm.

May your summer break be refreshing and unforgettable. We eagerly await your return, filled with new experiences, fresh skills, and smiles as radiant as the summer sun!

HAPPY HOLIDAYS!

Read the chapters from **NCERT book** and competition notes and understand the concept and solve the given questions based on it in a separate register. Practice the same chapters from **Arihant Competitive book set**.

PHYSICS

CHAPTER 1 ELECTRIC CHARGES AND FIELDS

Q1) (i) Derive the expression for electric field at a point on the equatorial line of an electric dipole.

(ii) Depict the orientation of the dipole in (a) stable, (b) unstable equilibrium in a uniform electric field.

Delhi 2017

Q2) (i) Obtain the expression for the torque τ experienced by an electric dipole of dipole moment \mathbf{p} in a uniform electric field \mathbf{E} .

(ii) What will happen, if the field were non-uniform?

Delhi 2017

Q3) A thin circular ring of radius r is charged uniformly so that its linear charge density becomes λ . Derive an expression for the electric field at a point P at a distance x from its centre along the axis of the ring. Hence, prove that at large distances ($x \gg r$), the ring behaves as a point charge.

Delhi 2016

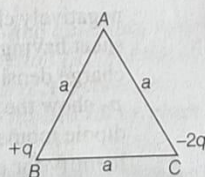
Q4) An electric dipole of dipole moment \mathbf{p} is placed in a uniform electric field \mathbf{E} . Obtain the expression for the torque τ experienced by the dipole. Identify two pairs of perpendicular vectors in the expression.

Delhi 2015C

Q5) Two point charges $+q$ and $-2q$ are placed at the vertices B and C of an equilateral $\triangle ABC$ of side a as given in the figure. Obtain the expression for

(i) the magnitude and

(ii) the direction of the resultant electric field at the vertex A due to these two charges.



All India 2014C

Q6) (i) Define an ideal electric dipole. Give an example.

(ii) Derive an expression for the torque experienced by an electric dipole in a uniform electric field. What is net force acting on this dipole.

(iii) An electric dipole of length 2 cm is placed with its axis making an angle of 60° with respect to uniform electric field of 10^5 N/C . If it experiences a torque of $8\sqrt{3} \text{ Nm}$, calculate the magnitude of charge on the dipole, and its potential energy.

CBSE SQP 2020-21

Q7) (i) Derive an expression for the electric field at any point on the equatorial line of an electric dipole.

(ii) Two identical point charges q each are kept 2 m apart in air. A third point charge Q of unknown magnitude and sign is placed on the line joining the charges such that the system remains in equilibrium. Find the position and nature of Q .

Delhi 2019

Q8) (i) Derive an expression for the electric field E due to a dipole of length $2l$ at a point distant r from the centre of the dipole on the axial line.

(ii) Draw a graph of E versus r for $r \gg l$.

(iii) If this dipole is kept in a uniform external electric field E_0 , diagrammatically represent the position of the dipole in stable and unstable equilibrium and write the expressions for the torque acting on the dipole in both the cases.

All India 2017

Q9) (i) Define torque acting on a dipole of dipole moment \mathbf{p} placed in a uniform electric field \mathbf{E} . Express it in the vector form and point out the direction along which it acts.

(ii) What happens if the field is non-uniform?

(iii) What would happen if the external field \mathbf{E} is increasing (a) parallel to \mathbf{p} and (b) anti-parallel to \mathbf{p} ?

Foreign 2016

- Q 10) A hollow conducting sphere of inner radius r_1 and outer radius r_2 has a charge Q on its surface. A point charge $-q$ is also placed at the centre of the sphere.
- What is the surface charge density on the (a) inner and (b) outer surface of the sphere?
 - Use Gauss's law of electrostatics to obtain the expression for the electric field at a point lying outside the sphere.

All India 2020

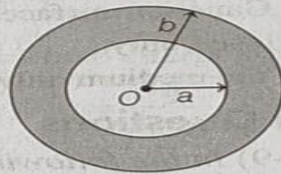
- Q 11) (i) An infinitely long thin straight wire has a uniform linear charge density λ . Obtain the expression for the electric field E at a point lying at a distance x from the wire by using Gauss' law.
- Show graphically the variation of this electric field E as a function of distance x from the wire.

All India 2020

- Q 12) A point charge $+Q$ is placed at the centre O of an uncharged hollow spherical conductor of inner radius a and outer radius b . Find the following

- The magnitude and sign of the charge induced on the inner and outer surface of the conducting shell.
- The magnitude of electric field vector at a distance (a) $r = \frac{a}{2}$ and (b) $r = 2b$, from the centre of the shell.

CBSE SQP 2018-19



- Q 13) Two large charged plane sheets of charge densities σ and $-2\sigma \text{ C m}^{-2}$ are arranged vertically with a separation of d between them. Deduce expressions for the electric field at points (i) to the left of the first sheet (ii) to the right of the second sheet and (iii) between the two sheets.

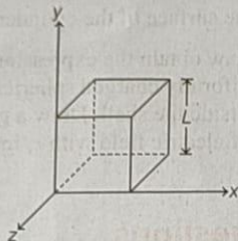
All India 2019

- Q 14) A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge Q .

- A charge q is placed at the centre of the shell. Find out the surface charge density on the inner and outer surfaces of the shell.
- Is the electric field inside a cavity (with no charge) zero independent of the fact whether the shell is spherical or not? Explain.

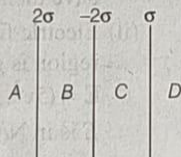
All India 2019

- Q15) (i) Define electric flux and write its SI Unit.
 (ii) Use Gauss' law to obtain the expression for the electric field due to a uniformly charged infinite plane sheet.
 (iii) A cube of side L is kept in space as shown in the figure. An electric field $\mathbf{E} = (Ax + B) \hat{i} \frac{\text{N}}{\text{C}}$ exists in the region. Find the net charge enclosed by the cube.



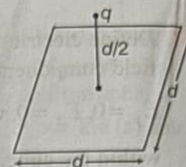
CBSE 2023

- Q16) (i) State Gauss' law in electrostatics. Show that with help of suitable figure that outward flux due to a point charge Q , in vacuum within gaussian surface, is independent of its size and shape.
 (ii) In the figure there are three infinite long thin sheets having surface charge density $+2\sigma$, -2σ and $+\sigma$ respectively. Give the magnitude and direction of electric field at a point to the left of sheet of charge density $+2\sigma$ and to the right of sheet of charge density $+\sigma$.



CBSE SQP 2020-21

the figure. Use Gauss' law to obtain the expression for the electric flux through the square.



- (ii) If the point charge is now moved to a distance d from the centre of the square and the side of the square is doubled, explain how the electric flux will be affected.

CBSE 2018

Q19)

- (i) Use Gauss' law to derive the expression for the electric field (\mathbf{E}) due to a straight uniformly charged infinite line of charge density $\lambda \text{ C/m}$.
 (ii) Draw a graph to show the variation of E with perpendicular distance r from the line of charge.
 (iii) Find the work done in bringing a charge q from perpendicular distance r_1 to r_2 ($r_2 > r_1$).

CBSE 2018

Q20)

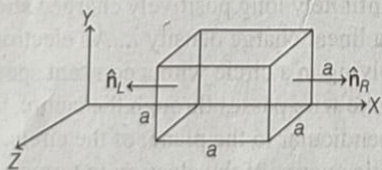
- (i) Use Gauss' theorem to find the electric field due to a uniformly charged infinitely large plane thin sheet with surface charge density σ .
 (ii) An infinitely large thin plane sheet has a uniform surface charge density $+\sigma$. Obtain the expression for the amount of work done in bringing a point charge q from infinity to a point of distant r in front of the charged plane sheet.

All India 2017

sts of

- Q17) (i) Using Gauss' law derive expression for intensity of electric field at any point near the infinitely long straight uniformly charged wire.
 (ii) The electric field components in the following figure are $E_x = \alpha x$, $E_y = 0$, $E_z = 0$; in which $\alpha = 400 \text{ N/C m}$. Calculate (a) the electric flux through the cube, and (b) the charge within the cube assume that $a = 0.1 \text{ m}$.

CBSE SQP 2019-2020



- Q18) (i) Define electric flux. Is it a scalar or a vector quantity?

A point charge q is at a distance of $d/2$ directly above the centre of a square of side d as shown in

CHAPTER 2 ELECTRIC POTENTIAL AND CAPACITANCE

- Q11 (i) Two point charges $+Q_1$ and $-Q_2$ are placed at r distance apart. Obtain the expression for the amount of work done to place a third charge Q_3 at the mid-point of the line joining the two charges.

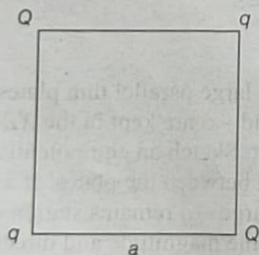
- (ii) At what distance from charge $+Q_1$ on the line joining the two charges (in terms of Q_1, Q_2 and r) will this work done be zero? **Delhi 2020**

- Q2 (i) Draw the equipotential surfaces corresponding to a uniform electric field in the z -direction.
(ii) Derive an expression for the electric potential at any point along the axial line of an electric dipole. **Delhi 2019**

- Q3 A particle, having a charge $+5\mu\text{C}$, is initially at rest at the point $x = 30\text{ cm}$ on the X -axis. The particle begins to move due to the presence of a charge Q that is kept fixed at the origin. Find the kinetic energy of the particle at the instant it has moved 15 cm from its initial position, if

- (i) $Q = +15\mu\text{C}$ and (ii) $Q = -15\mu\text{C}$ **CBSE SQP 2018-19**

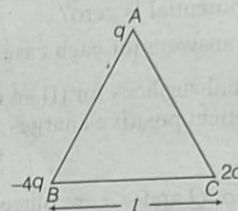
- Q4 Four point charges Q, q, Q and q are placed at the corners of a square of side a as shown in figure.



Find the

- (i) resultant electric force on a charge Q and
(ii) potential energy of this system. **CBSE 2018**

- Q5 (i) Three point charges $q, -4q$ and $2q$ are placed at the vertices of an equilateral triangle ABC of side l as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q .



- (ii) Find out the amount of the work done to separate the charges at infinite distance. **CBSE 2018**

- Q6 (i) Derive the expression for the electric potential due to an electric dipole at a point on its axial line.
(ii) Depict the equipotential surfaces due to an electric dipole. **Delhi 2017**

- Q7 Define an equipotential surface. Draw equipotential surfaces

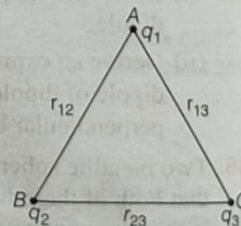
- (i) in case of a single point charge
(ii) in a constant electric field in z -direction. Why the equipotential surfaces about a single charge are not equidistant?
(iii) Can electric field exist tangential to an equipotential surface? Give reason. **All India 2016**

- Q8 Establish the relation between electric field and electric potential at a point.

Draw the equipotential surface for an electric field pointing in $+z$ -direction with its magnitude increasing at constant rate along $-z$ -direction. **CBSE SQP 2020-21**

- Q9 (i) Define electrostatic potential at a point. Write its SI unit.

Three charges q_1, q_2 and q_3 are kept respectively at points A, B and C as shown in figure. Write the expression for electrostatic potential energy of the system.

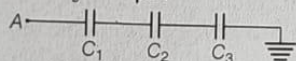


- (ii) energy stored in $3\mu\text{F}$ capacitor
 (iii) total energy drawn from the battery **Foreign 2016**

Q10 Find the ratio of the potential differences that must be applied across the parallel and series combination of two capacitors C_1 and C_2 with their capacitances in the ratio 1 : 2 so that the energy stored in these two cases becomes the same. **All India 2016**

Q11 If two similar large plates each of area A having surface charge densities $+\sigma$ and $-\sigma$ are separated by a distance d in air, then find the expression for
 (i) field at points between the two plates and on outer side of the plates. Specify the direction of the field in each case.
 (ii) the potential difference between the plates.
 (iii) the capacitance of the capacitor so formed. **All India 2016**

Q12 Calculate the potential difference and the energy stored in the capacitor C_2 in the circuit shown in the figure. Given potential at A is 90 V, $C_1 = 20\mu\text{F}$, $C_2 = 30\mu\text{F}$ and $C_3 = 15\mu\text{F}$.



Delhi 2015

Q13 Explain using suitable diagrams, the difference in the behaviour of a

- (i) conductor and
 (ii) dielectric in the presence of external electric field. Define the terms polarisation of a dielectric and write its relation with susceptibility. **All India 2015**

Q14 Two capacitors of unknown capacitances C_1 and C_2 are connected first in series and then in parallel across a battery of 100 V. If the energy stored in the two combinations is 0.045 J and 0.25 J respectively, then determine the value of C_1 and C_2 . Also, calculate the charge on each capacitor in parallel combination. **All India 2015**

Q15 (i) Obtain the expression for the energy stored per unit volume in a charged parallel plate capacitor.
 (ii) The electric field inside a parallel plate capacitor is E . Find the amount of work done in moving a charge q over a closed rectangular loop. **Delhi 2014**

Q16 (i) Derive the expression for the capacitance of a parallel plate capacitor having plate area A and plate separation d .
 (ii) Two charged spherical conductors of radii R_1 and R_2 when connected by a conducting plate respectively. Find the ratio of their surface charge densities in terms of their radii. **Delhi 2014**

Q17 In a parallel plate capacitor with air between the plates each plate has an area of $6 \times 10^{-3} \text{ m}^2$ and the separation between the plate is 3 mm.

- (i) Calculate the capacitance of the capacitor.
 (ii) If this capacitor is connected to 100 V supply, what would be the charge on each plate?
 (iii) How would charge on the plates be affected if a 3 mm thick mica sheet of $K = 6$ is inserted between the plates while the same voltage supply remains connected? **Foreign 2014**

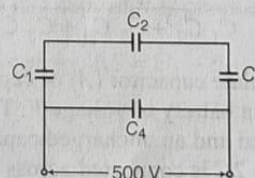
Q18 A capacitor of unknown capacitance is connected across a battery of V volt. The charge stored in it is $360\mu\text{C}$. When potential across the capacitor is reduced by 120 V, the charge stored in it becomes $120\mu\text{C}$.

Calculate

- (i) the potential V and the unknown capacitance C .
 (ii) the charge stored in the capacitor if the voltage applied had increased by 120 V. **Delhi 2013**

Q19 A capacitor of 200 pF is charged by a 300 V battery. The battery is then disconnected and the charged capacitor is connected to another uncharged capacitor of 100 pF. Calculate the difference between the final energy stored in the combined system and the initial energy stored in the single capacitor. **Foreign 2012**

Q20 A network of four capacitors each of $12\mu\text{F}$ capacitance if connected to a 500 V supply as shown in the figure.



Determine

- (i) the equivalent capacitance of the network and
 (ii) the charge on each capacitor. **All India 2010**

Q1} A potential difference V is applied across a conductor of length l and cross-sectional area A . Briefly explain how the current density J in the conductor will be affected if.

CBSE 2023

- (i) The potential difference V is doubled.
- (ii) The conductor were gradually stretched to reduce its cross-sectional area to $\frac{A}{2}$ and then the same potential difference V is applied across it.

Q2} Define current density and relaxation time. Derive an expression for resistivity of a conductor in terms of number density of charge carriers in the conductor and relaxation time.

CBSE 2023

- Q3}** (i) Define the term conductivity of a metallic wire. Write its SI unit.
- (ii) Using the concept of free electrons in a conductor derive the expression for the conductivity of a wire in terms of number density and relaxation time. Hence, obtain the relation between current density and the applied electric field E . CBSE 2018

Q4} The following table gives the length of three copper wires, their diameters and the applied potential difference across their ends. Arrange the wires in increasing order according to the following

CBSE SQP 2017-18

- (i) The magnitude of the electric field within them
- (ii) The drift speed of electrons through them, and

- (iii) The current density within them.

Length	Diameter	Potential Difference
L	$3d$	V
$2L$	d	V
$3L$	$2d$	$2V$

- Q5}** (i) Define the term of drift velocity.
- (ii) On the basis of electron drift derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. On what factors does resistivity of a conductor depend?
- (iii) Why alloys like Constantan and Manganin are used for making standard resistors? Delhi 2016

- Q6}** (i) Derive an expression for drift velocity of electrons in a conductor. Hence, deduce Ohm's law.
- (ii) A wire whose cross-sectional area is increasing linearly from its one end to the other is connected across a battery of potential difference V volt. Which of the following quantities remain constant in the wire?
 - (a) Drift speed
 - (b) Current density
 - (c) Electric current
 - (d) Electric field

Justify your answer.

Delhi 2017

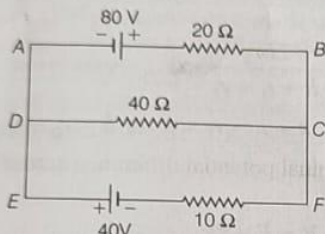
Q7) A storage battery is of emf 8V and internal resistance 0.5 ohm is being charged by DC supply of 120 V using a resistor of 15.5 ohm.

- Draw the circuit diagram.
- Calculate the potential difference across the battery.
- What is the purpose of having series resistance in this circuit?

CBSE SQP 2020-21

Q8) Using Kirchhoff's rules calculate the current through the 40 Ω and 20 Ω resistors in the following circuit.

Delhi 2019

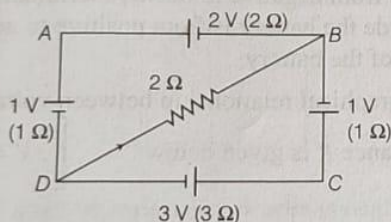


Q9) Two cells of emfs ϵ_1 and ϵ_2 and internal resistances r_1 and r_2 respectively are connected in parallel. Obtain expressions for the equivalent

- resistance and
- emf of the combination

CBSE 2018C

Q10) Using Kirchhoff's rules calculate the potential difference between B and D in the circuit diagram as shown in the figure.



CBSE 2018C

Q11) A cell of emf E and internal resistance r is connected across a variable load resistor R . Draw the plots of the terminal voltage V versus (i) resistance R and (ii) current I .

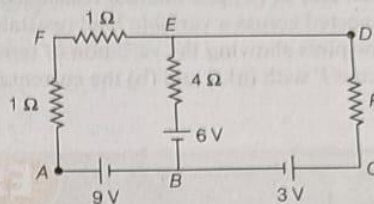
It is found that when $R = 4 \Omega$ the current is 1 A and when R is increased to 9 Ω the current reduces to 0.5 A. Find the values of the emf E and internal resistance r .

All India 2015

Using Kirchhoff's rules, determine the value of unknown resistance R in the circuit, so that no current

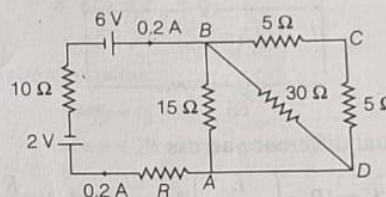
flows through 4 Ω resistance. Also, find the potential difference between points A and D.

Delhi 2012



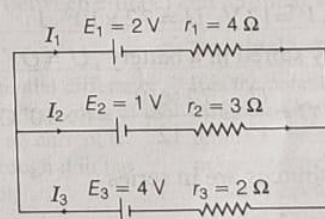
Q12) Calculate the value of the resistance R in the circuit shown in the figure, so that the current in the circuit is 0.2 A. What would be the potential difference between points A and B?

All India 2012



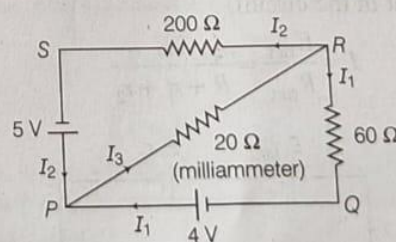
Q13) State Kirchhoff's rules. Use these rules to write the expressions for the currents I_1 , I_2 and I_3 in the circuit diagram shown in figure below.

All India 2010

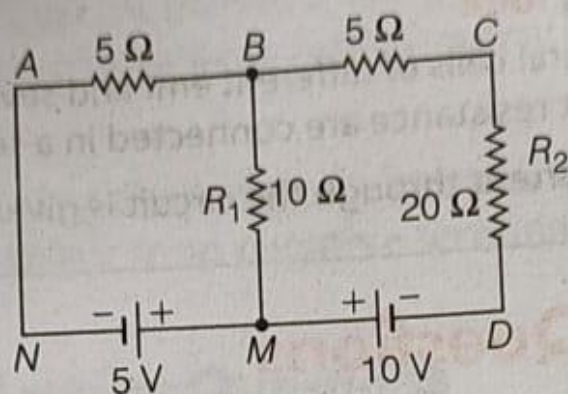


Q14) State Kirchhoff's rules. Apply these rules to the loops PRSP and PRQP to write the expressions for the currents I_1 , I_2 and I_3 in given circuit.

All India 2010



Q15) Find the currents flowing through the branches AB and BC in the network shown.



CBSE 2024

Q16) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel, with their terminals of the same polarity connected together. Obtain an expression for the equivalent emf of the combination.

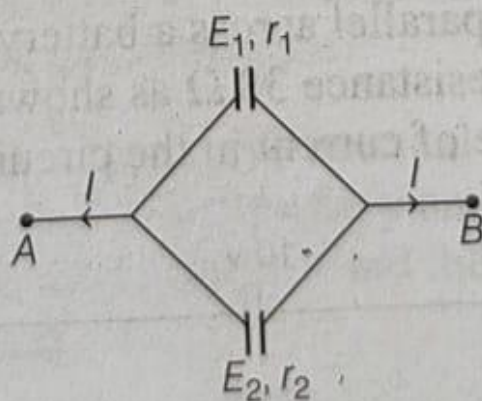
CBSE 2023

Q17) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 respectively are connected in parallel as shown in the figure.

Deduce the expression for the

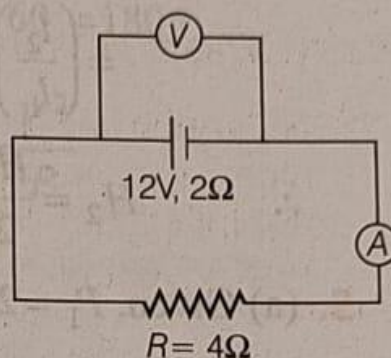
- equivalent emf of the combination,
- equivalent internal resistance of the combination and
- potential difference between the points A and B .

CBSE SQP 2022-23



Q 18) (i) The potential difference applied across a given resistor is altered, so that the heat produced per second increases by a factor of 9. By what factor does the applied potential difference change?

(ii) In the figure shown, an ammeter A and a resistor of $4\ \Omega$ are connected to the terminals of the source. The emf of the source is 12 V having an internal resistance of $2\ \Omega$. Calculate the voltmeter and ammeter readings.

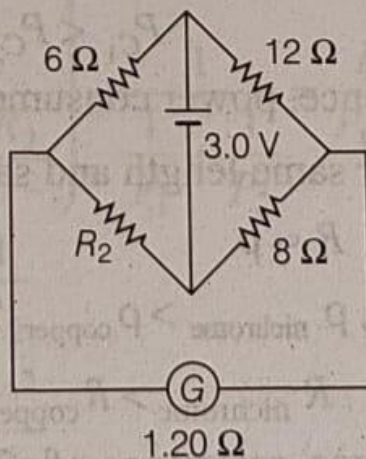
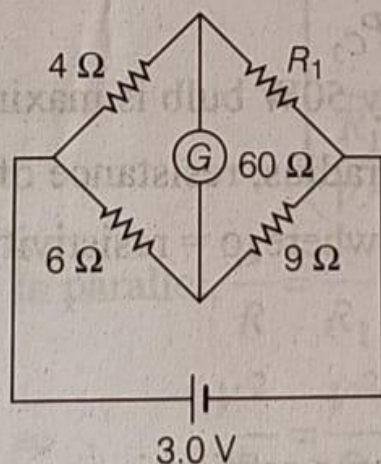


All India 2017

Q 19) Define the current sensitivity of a galvanometer. Write its SI unit. Figure shows two circuits each having a galvanometer and a battery of 3 V .

When the galvanometer in each arrangement do not show any deflection, obtain the ratio R_1/R_2 .

All India 2013



Q 20) Two heating elements of resistances R_1 and R_2 when operated at a constant supply of voltage V , consume powers P_1 and P_2 , respectively. Deduce the expressions for the power of their combination when they are in turn, connected in

- series and
- parallel across their same voltage supply.

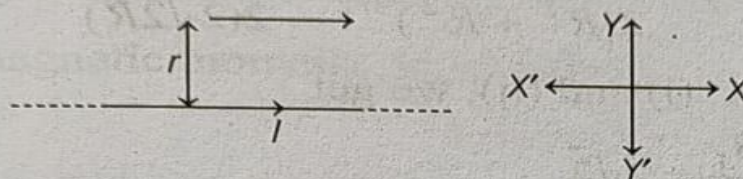
All India 2011

CHAPTER 4 MOVING CHARGES AND MAGNETISM

- Q1) Using Biot-Savart's law, derive an expression for magnetic field at any point on axial line of a current carrying circular loop. Hence, find magnitude of magnetic field intensity at the centre of circular coil.

CBSE SQP 2019-20

- Q2) A particle of mass m and charge q is in motion at speed v parallel to a long straight conductor carrying current I as shown below.



Find magnitude and direction of electric field required so that the particle goes undeflected. CBSE SQP 2018-19

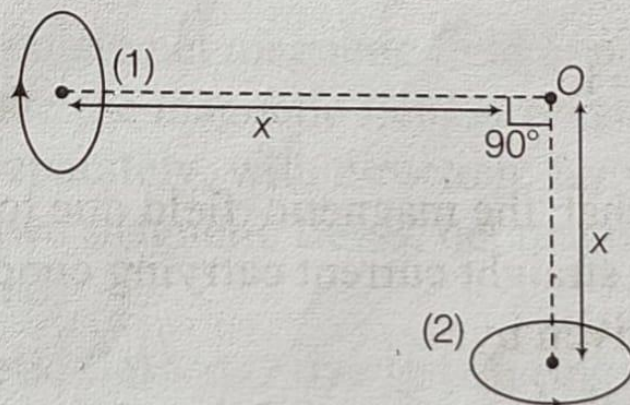
- Q3) (i) State Biot-Savart's law and express it in the vector form.
(ii) Using Biot-Savart's law, obtain the expression for the magnetic field due to a circular coil of radius r , carrying a current I at a point on its axis distant x from the centre of the coil.

CBSE 2018C

- Q4) (i) State Biot-Savart's law and express this law in the vector form.
(ii) Two identical circular coils P and Q each of radius R , carrying currents 1 A and $\sqrt{3}\text{ A}$ respectively, are placed concentrically and perpendicular to each other lying in the XY and YZ -planes. Find the magnitude and direction of the net magnetic field at the centre of the coils.

All India 2017

- Q 5}** Two very small identical circular loops (1) and (2) carrying equal current I are placed vertically (with respect to the plane of the paper) with their geometrical axes perpendicular to each other as shown in the figure. Find the magnitude and direction of the net magnetic field produced at the point O . **Delhi 2014**



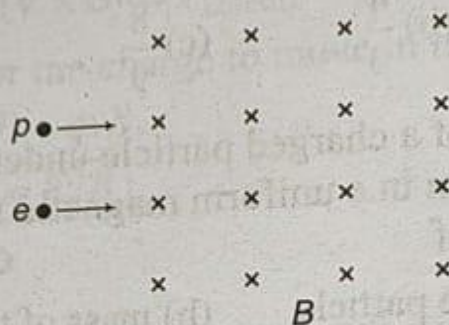
- Q 6}** State Biot-Savart's law expressing it in the vector form. Use it to obtain the expression for the magnetic field at an axial point distance d from the centre of a circular coil of radius a carrying current I . Also, find the ratio of the magnitudes of the magnetic field of this coil at the centre and at an axial point for which $d = a\sqrt{3}$. **Delhi 2013C**

force on the charged p

Q7) An electron and a proton moving with the same speed enter the same magnetic field region at right angles to the direction of the field.

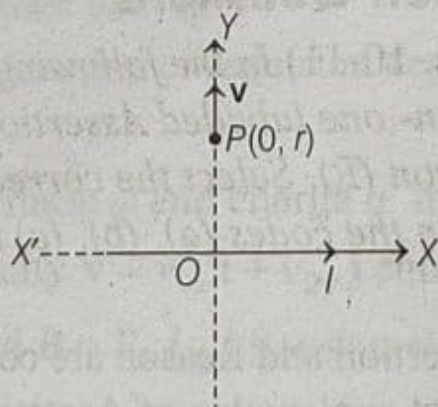
Show the trajectory followed by the two particles in the magnetic field. Find the ratio of the radii of the circular paths which the particles may describe.

Foreign 2010



Q8) An infinite straight conductor is kept along $X'X$ -axis and carries a current I . A charge q at point $P(0, r)$ starts moving with velocity $\mathbf{v} = v_0 \hat{\mathbf{j}}$ as shown in figure. Find the direction and magnitude of force initially experienced by the charge.

CBSE 2024



Q9) Derive an expression for the velocity v_c of a positive ions passing undeflected through a region where crossed and uniform electric field E and magnetic field B are simultaneously present.

Draw and justify the trajectory of identical positive ions whose velocity has a magnitude less than v_c .

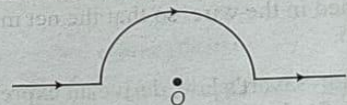
CBSE SQP 2018-19

- Q10) (i) State Ampere's circuital law.
 (ii) Use it to derive an expression for magnetic field inside along the axis of an air cored solenoid.
 (iii) Sketch the magnetic field lines for a finite solenoid. How are these field lines different from the electric field lines from an electric dipole?

Foreign 2010

- Q11) (i) Using Biot-Savart's law, deduce an expression for the magnetic field on the axis of a circular current carrying loop.

- (ii) Draw the magnetic field lines due to a current carrying loop.
 (iii) A straight wire carrying a current of 12 A is bent into a semi-circular arc of radius 2.0 cm as shown in the figure. What is the magnetic field B at O due to
 (a) straight segments and
 (b) the semi-circular arc?



Foreign 2010

- Q12) (i) Define SI unit of current in terms of the force between two parallel current carrying conductors.
 (ii) Two long straight parallel conductors carrying steady currents I_a and I_b along the same directions are separated by a distance d . How does one explain the force of attraction between them? If a third conductor carrying a current I_c in the opposite direction is placed just in the middle of these conductors, find the resultant force acting on the third conductor.

CBSE 2018C

- Q13) Two long straight parallel conductors carry steady currents I_1 and I_2 are separated by a distance d . If the currents are flowing in the same direction, show how the magnetic field set-up in one produces an attractive force on the other. Obtain the expression for this force. Hence, define one ampere.

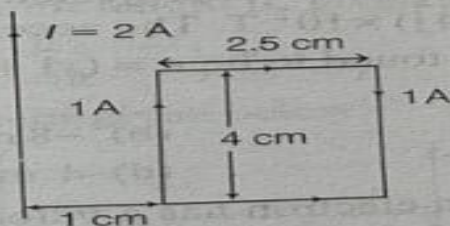
Delhi 2016

- Q14) A wire AB is carrying a steady current of 12 A and is lying on the table. Another wire CD carrying 5 A is held directly above AB at a height of 1 mm. Find the mass per unit length of the wire CD , so that it remains suspended at its position when left free. Give the direction of the current flowing in CD with respect to that in AB . [Take, the value of $g = 10 \text{ ms}^{-2}$]

All India 2013

- Q15) A rectangular loop of wire of size $25 \text{ cm} \times 4 \text{ cm}$ carries steady current of 1 A. A straight wire carrying 2 A current is kept near the loop as shown. If the loop and the wire are co-planar, find the (i) torque acting on the loop and (ii) the magnitude and direction of the force on the loop due to the current carrying wire.

Delhi 2012



- Q16) Depict the magnetic field lines due to two straight, long, parallel conductors carrying currents I_1 and I_2 in the same direction. Hence, deduce an expression for the force per unit length acting on one of the conductors due to the other. Is this force attractive or repulsive?

Delhi 2011C

- Q17) State the underlying principle of working of a moving coil galvanometer. Write two reasons why a galvanometer cannot be used as such to measure the current in a given circuit. Name any two factors on which the current sensitivity of a galvanometer depends.

Delhi 201

Q 18) A rectangular loop of size $l \times b$ carrying a steady current I is placed in a uniform magnetic field \mathbf{B} . Prove that the torque τ acting on the loop is given by $\tau = \mathbf{M} \times \mathbf{B}$, where \mathbf{M} is the magnetic moment of the loop.

All India 2012

Q 19) (i) Show that a planer loop carrying a current I , having N closely wound turns and area of cross-section A , possesses a magnetic moment $\mathbf{M} = NI\mathbf{A}$.

(ii) When this loop is placed in a magnetic field \mathbf{B} , find out the expression for the torque acting on it.

(iii) A galvanometer coil of 50Ω resistance shows full scale deflection for a current of 5 mA . How will you convert this galvanometer into a voltmeter of range 0 to 15 V ?

Foreign 2011

Q 20) (i) With the help of a diagram, explain the principle and working of a moving coil galvanometer.

(ii) What is the importance of radial magnetic field and how is it produced?

(iii) Why is it that while using a moving coil galvanometer as a voltmeter, a high resistance in series is required whereas in an ammeter a shunt is used?

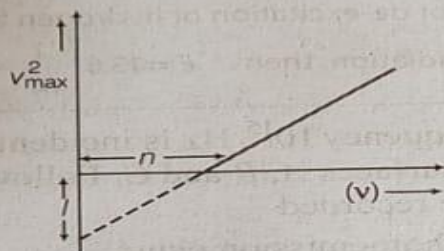
All India 2010

CHAPTER 11 DUAL NATURE OF MATTER AND RADIATIONS

Q1) Explain how does (i) photoelectric current and (ii) kinetic energy of the photoelectrons emitted in a photocell vary, if the frequency of incident radiation is doubled but keeping the intensity same? Show the graphical variation in the above two cases.

CBSE SQP 2017-18

Q2) State Einstein's photoelectric explaining the symbols used.



Light of frequency ν incident is on a photosensitive surface. A graph of the square of the maximum speed of the electrons (v_{\max}^2) versus ν is obtained as shown in the figure. Using Einstein's photoelectric equation, obtain expressions for (i) Planck's constant and (ii) work function of the given photosensitive material in terms of parameters l , n and mass of the electron m .

All India 2018C

Q3) (i) How does one explain the emission of electrons from a photosensitive surface with the help of Einstein's photoelectric equation?

(ii) The work function of the following metals is given as Na = 2.75 eV, K = 2.3 eV, Mo = 4.17 eV and Ni = 5.15 eV. Which of these metals will not cause photoelectric emission for radiation of wavelength 3300 Å from a laser source placed 1 m away from these metals? What happens if the laser source is brought nearer and placed 50 cm away?

Delhi 2017

Q4) (i) State two important features of Einstein's photoelectric equation.

(ii) Radiation of frequency 10^{15} Hz is incident on two photosensitive surfaces P and Q . There is no photoemission from surface P . Photoemission occurs from surface Q but photoelectrons have zero kinetic energy. Explain these observations and find the value of work function for surface Q .

Delhi 201

Q5) Sketch the graphs showing variation of stopping potential with frequency of incident radiations for two photosensitive materials A and B having threshold frequencies $\nu_A > \nu_B$.

- In which case, is the stopping potential more and why?
- Does the slope of the graph depend on the nature of the material used? Explain.

All India 2016

Q6) Define the term "cut-off frequency" in photoelectric emission. The threshold frequency of a metal is f . When the light of frequency $2f$ is incident on the metal plate, the maximum velocity of photoelectron is v_1 . When the frequency of the incident radiation is increased to $5f$, the maximum velocity of photoelectrons is v_2 . Find the ratio $v_1 : v_2$.

Foreign 2016

Q7) Write three characteristic features in photoelectric effect which cannot be explained on the basis of wave theory of light, but can be explained only using Einstein's equation.

Delhi 2016

Q8) (i) Write the important properties of photons which are used to establish Einstein's photoelectric equation.

(ii) Use this equation to explain the concept of

(a) threshold frequency and

(b) stopping potential.

Delhi 2015

Q9) (i) Describe briefly three experimentally observed features in the phenomenon of photoelectric effect.

(ii) Discuss briefly how wave theory of light cannot explain these features.

Delhi 2015

Q10) Write Einstein's photoelectric equation and mention which important features in photoelectric effect can be explained with the help of this equation.

The maximum kinetic energy of the photoelectrons gets doubled when the wavelength of light incident on the surface changes from λ_1 to λ_2 . Derive the expressions for the threshold wavelength λ_0 and work function for the metal surface.

Delhi 2015, All India 2014

Q11) A beam of monochromatic radiation is incident on a photosensitive surface. Answer the following questions giving reasons.

- (i) Do the emitted photoelectrons have the same kinetic energy?
- (ii) Does the kinetic energy of the emitted electrons depend on the intensity of incident radiation?
- (iii) On what factors does the number of emitted photoelectrons depend?

Foreign 2015

Q12) Write Einstein's photoelectric equation and point out any two characteristic properties of photons on which this equation is based. Briefly explain three observed features which can be explained by this equation.

All India 2013

Q13) (i) Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons.

(ii) Write the basic features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based.

Delhi 2013

Q14) Draw a graph between the frequency of incident radiation (ν) and the maximum kinetic energy of the electrons emitted from the surface of a photosensitive material. State clearly how this graph can be used to determine

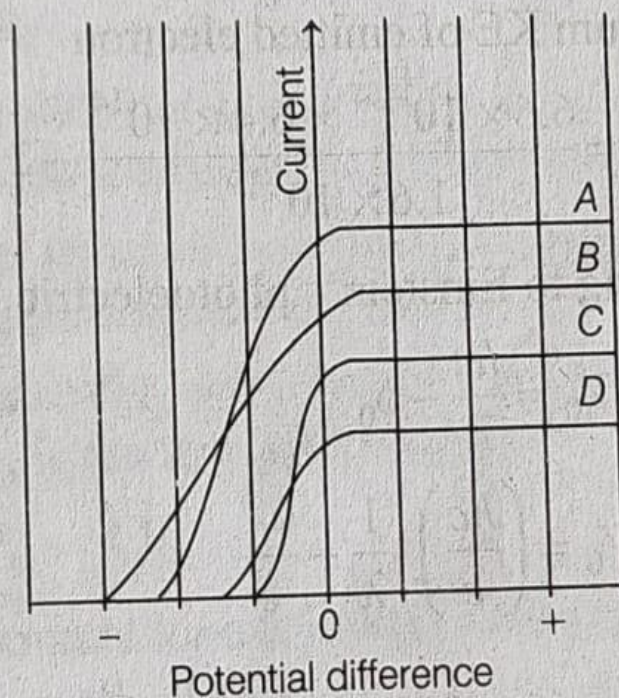
- (i) Planck's constant and
- (ii) work function of the material.

Foreign 2012

Q15) Write Einstein's photoelectric equation. State clearly how this equation is obtained using the photon picture of electromagnetic radiation. Write the three salient features observed in photoelectric effect which can be explained using this equation.

Delhi 2012

- Q.16 (i) Figure shows the variation of photoelectric current measured in a photocell circuit as a function of the potential difference between the plates of the photocell when light beams A , B , C and D of different wavelengths are incident on the photocell. Examine the given figure and answer the following questions.



- (a) Which light beam has the highest frequency and why?
- (b) Which light beam has the longest wavelength and why?
- (c) Which light beam ejects photoelectrons with maximum momentum and why?

Or

- (ii) What is the effect on threshold frequency and stopping potential on increasing the frequency of incident beam of light? Justify your answer.

Q17) (i) Explain de-Broglie argument to propose his hypothesis. Show that de-Broglie wavelength of photon equals electromagnetic radiation.

(ii) If deuterons and alpha particle are accelerated through same potential, find the ratio of the associated de-Broglie wavelengths of two.

CBSE SQP 2020-21

Q18) An electron is accelerated from rest through a potential difference of 100V. Find

(i) the wavelength associated with

(ii) the momentum of and

(iii) the velocity required by the electron. **Delhi 2011**

Q19) (i) Determine the de-Broglie wavelength of a proton whose kinetic energy is equal to the rest mass energy of an electron. Mass of a proton 1836 times that of electron.

(ii) In which region of electromagnetic spectrum does this wavelength lie? **All India 2011C**

Q20) (i) A particle is moving three times as fast as an electron. The ratio of the de-Broglie wavelength of the particle to that of the electron is 1.813×10^{-4} . Calculate the particle's mass and identify the particle.

(ii) An electron and a proton have the same kinetic energy. Which of the two will have larger de-Broglie wavelength? Give reason.

All India 2011C

CHEMISTRY

CHAPTER 1 SOLUTION

18

depression in freezing point is observed to be 1°C . Calculate the degree of dissociation of $\text{F}-\text{CH}_2\text{COOH}$. (Given : K_f for water = $1.86 \text{ K kg mol}^{-1}$) **CBSE 2023**

Q1. If benzoic acid ($M = 122 \text{ g mol}^{-1}$) is associated into a dimer when dissolved in benzene and the osmotic pressure of a solution of 6.1 g of benzoic acid in 100 mL benzene is 6.5 atm at 27°C , then what is the percentage association of benzoic acid? **CBSE 2023**
(Given : $R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$)

Q2. 0.3 mL of acetic acid ($M = 60 \text{ g mol}^{-1}$) dissolved in 30 g of benzene shows a depression in freezing point equal to 0.45°C . Calculate the percentage association of acid if it forms a dimer in the solution. **CBSE 2023**
(Given : K_f for benzene = $5.12 \text{ K kg mol}^{-1}$)

Q3. The freezing point of benzene decreases by 2.12 K when 2.5 g of benzoic acid $\text{C}_6\text{H}_5\text{COOH}$ is dissolved in 25 g of benzene. If benzoic acid forms a dimer in benzene, calculate the van't Hoff factor and the percentage association of benzoic acid.
(Given : K_f for benzene = $5.12 \text{ K kg mol}^{-1}$) **CBSE SQP 2021**

Q4. Calculate the freezing point of a solution containing 0.5 g KCl (Molar mass = 74.5 g/mol) dissolved in 100 g water, assuming KCl to be 92% ionised.
(Given : K_f of water = 1.86 K kg/mol) **CBSE SQP 2020**

Q5. A 0.01 m aqueous solution of AlCl_3 freezes at -0.068°C . Calculate the percentage of dissociation.
(Given : K_f for water = $1.86 \text{ K kg mol}^{-1}$) **Delhi 2020**

Q6. The freezing point of a solution containing 5g of benzoic acid ($M = 122 \text{ g mol}^{-1}$) in 35g of benzene is depressed by 2.94 K . What is the percentage of association?
(Given : K_f for benzene = $4.9 \text{ K kg mol}^{-1}$) **All India 2020**

Q7. Give reasons for the following. **CBSE SQP 2019**

- When 2g of benzoic acid is dissolved in 25 g of benzene, the experimentally determined molar mass is always greater than the true value.
- Mixture of ethanol and acetone shows positive deviation from Raoult's law.
- The preservation of fruits by adding concentrated sugar solution protects them against bacterial action.

Q8. At 300 K, 30 g of glucose present in a litre of its solution has an osmotic pressure of 4.98 bar. If the osmotic pressure of a glucose solution is 1.52 bar at the same temperature, what would be its concentration? **All India 2019**

Q9. A 4% solution (w/w) of sucrose ($M = 342 \text{ g mol}^{-1}$) in water has a freezing point of 271.15 K. Calculate the freezing point of 5% glucose ($M = 180 \text{ g mol}^{-1}$) in water. (Given : Freezing point of pure water = 273.15 K) **Delhi 2019**

Q10. Calculate the freezing point of an aqueous solution containing 10.5 g of magnesium bromide in 200 g of water, assuming complete dissociation of magnesium bromide. (Molar mass of magnesium bromide = 184 g mol^{-1} , K_f for water = $1.86 \text{ K kg mol}^{-1}$) **CBSE 2018 C**

Q11. A 10% solution (by mass) of sucrose in water has freezing point of 269.15 K. Calculate the freezing point of 10% glucose in water, if freezing point of pure water is 273.15 K .
(Given : Molar mass of sucrose = 342 g mol^{-1} and molar mass of glucose = 180 g mol^{-1}) **Delhi 2017**

KEY IDEA

First, calculate the value of molality (m) of sucrose, using

$$m = \frac{w_{\text{solute}} \times 1000}{M_{\text{solute}} \times W_{\text{solvent}}}$$

then, calculate the cryoscopic constant (K_f) by using depression in freezing point, $\Delta T_f = K_f m$. Finally calculate the ΔT_f of glucose solution followed by freezing point of glucose solution $T_f = 273.15 - \Delta T_f$.

Q12. Calculate the boiling point of solution when 4 g of MgSO_4 ($M = 120 \text{ g mol}^{-1}$) dissolved in 100 g of water assuming MgSO_4 undergoes complete ionisation. (K_b for water = $0.52 \text{ K kg mol}^{-1}$) **All India 2016**

Q13. Calculate the mass of NaCl (molar mass = 58.5 g mol^{-1}) to be dissolved in 37.2 g of water to lower the freezing point by 2°C , assuming that NaCl undergoes complete dissociation. (K_f for water = $1.86 \text{ K kg mol}^{-1}$) **Foreign 2015**

Or What mass of NaCl must be dissolved in 65.0 g of water to lower the freezing point of water by 7.50°C ? The freezing point depression constant (K_f) for water is 1.86°C/m .

03 Marks Questions

- Q14. Concentrated nitric acid used in laboratory work is 70% nitric acid by mass in aqueous solution. What should be the molarity of such a sample of the acid if the density of the solution is 1.504 g mL? [Ans. 12.32 M]
- Q15. Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0 g of polymer of molar mass 185,000 in 450 mL of water at 37°C. [Ans. 31 Pa]
- Q16. (i) Why an unripe mango placed in a concentrated salt solution to prepare pickle shrivels?
(ii) What happens to freezing point of benzene when naphthalene is added?
(iii) It is advised to add ethylene glycol to water in car radiator while driving in hill station. Why?
- Q17. (i) The order of boiling points of four equimolar aqueous solutions is $C < B < A < D$. What is the order of their freezing points?
(ii) 0.5% aqueous solution of KCl was found to be freeze at -0.24°C . Calculate the van't Hoff factor. [Ans. $i = 1.92$]
- Q18. (i) State the condition for reverse osmosis.
(ii) What is the molarity of K^+ in aqueous solution that contains of K_2SO_4 ?
(Molar mass = 174 g mol^{-1}) [Ans. $2 \times 10^{-4} \text{ M}$]
- Q19. A 5% solution (by mass) of canesugar in water has freezing point of 271 K and freezing point of pure water is 273.15 K. What is the freezing point of a 5% solution (by mass) of glucose in water? [Ans. 269 K]
- Q20. KBr is 80% dissociated in aqueous solution of 0.5 m concentration. Calculate the temperature at which solution freezes. [Given, K_f for water = $1.86 \text{ K Kg mol}^{-1}$] [Ans. 271.326K]

05 Marks Questions

- Q21. (i) When kept in water, raising swells in size. Name and explain the phenomenon involved with the help of diagram. Give three applications of the phenomenon.
(ii) What is the elevation in boiling point of a solution of 13.44 g of CuCl_2 in 1 kg of water (using the given information, i.e. molecular weight of $\text{CuCl}_2 = 134.4$ and $K_b = 0.52 \text{ Km}^{-1}$)? [Ans. $\Delta T_b = 0.16 \text{ K}$]
- Q22. (i) Why doctors advise gargles by saline water in case of sore throat?
(ii) How does sprinkling of salt help in clearing the snow covered roads in hilly areas? Explain the phenomenon involved in the process.
(iii) The freezing point depression constant for water is $1.86 \text{ K kg mol}^{-1}$. If 5.00 g Na_2SO_4 is dissolved in 45.0 g H_2O , the freezing point is changed by -3.82°C . Calculate the van't Hoff factor for Na_2SO_4 . [Ans. $i = 2.63$]
- Q23. (i) List any four factors on which the colligative properties of a solution depend.
(ii) Arrange the depression in freezing point of water observed for the same concentration of acetic acid trichloroacetic acid and trifluoroacetic acid. Explain this order as well.
(iii) What is the freezing point of a solution containing 8.1 g HBr in 100 g water assuming the acid to be 90% ionised?
[K_f for water = $1.86 \text{ K kg mol}^{-1}$] [Ans. $T_f = 3.53^\circ\text{C}$]

Q24 (i) Why is boiling point of 1 M NaCl solution more than that of 1 M glucose solution?

(ii) A non-volatile solute 'X' (molar mass = 50 g mol⁻¹) when dissolved in 78 g of benzene reduced its vapour pressure to 90%. Calculate the mass of X dissolved in the solution.

(iii) Calculate the boiling point elevation for a solution prepared by adding 10 g of MgCl₂ to 200 g of water assuming MgCl₂ is completely dissociated.

(K_b for water = 0.512 K kg mol⁻¹, Molar mass MgCl₂ = 95 g mol⁻¹)

CBSE 2023

Q25 (i) Why is the value of van't Hoff factor for ethanoic acid in benzene close to 0.5?

(ii) Determine the osmotic pressure of a solution prepared by dissolving 232×10^{-3} g K₂SO₄ in 2 L of solution at 25 °C, assuming that K₂SO₄ is completely dissociated.

($R = 0.082$ L atm K⁻¹ mol⁻¹, Molar mass K₂SO₄ = 174 g mol⁻¹)

CHAPTER 2 ELECTROCHEMISTRY

- Q1** (ii) With the help of a graph explain why it is not possible to determine Λ_m for a weak electrolyte by extrapolating the molar conductivity (Λ_m) for a weak electrolyte by extrapolating the molar conductivity (Λ_m) versus $C^{1/2}$ curve as for strong electrolyte. **CBSE 2023**

- Q2** (i) The molar conductivities of NH_4^+ and Cl^- ion are $73.8 \text{ S cm}^2 \text{ mol}^{-1}$ and $76.2 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. The conductivity of 0.1 M NH_4Cl is $1.29 \times 10^{-2} \text{ S cm}^{-1}$. Calculate its molar conductivity and degree of dissociation. **CBSE 2023**

- (ii) Calculate the half-cell potential at 298 K for the reaction $\text{Zn}^{2+} + 2e^- \longrightarrow \text{Zn}$

if $[\text{Zn}^{2+}] = 0.1 \text{ M}$ and $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$.

- Q3** (i) Calculate the emf of the following cell at 25°C .
 $\text{Zn(s)} | \text{Zn}^{2+} (0.1 \text{ M}) || \text{H}^+ (0.01 \text{ M}) | \text{H}_2 (\text{g}) (1 \text{ bar}), \text{Pt (s)}$
 [Given : $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$, $E^\circ_{\text{H}^+/\text{H}_2} = 0.00 \text{ V}$,
 $\log 10 = 1$]

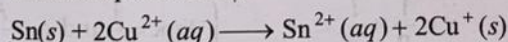
- (ii) State Kohlrausch law of independent migration of ions. Why does the conductivity of a solution decrease with dilution? **CBSE 2023**

- Q4** (i) Molar conductivity of substance "A" is $59 \times 10^3 \text{ S/m}$ and "B" is $1 \times 10^{-16} \text{ S/m}$. Which of the two is most likely to be copper metal and why?

- (ii) What is the quantity of electricity in Coulombs required to produce 4.8 g of Mg from molten MgCl_2 ? How much Ca will be produced if the same amount of electricity was passed through molten CaCl_2 ?

(Atomic mass of $\text{Mg} = 24 \text{ u}$, atomic mass of $\text{Ca} = 40 \text{ u}$).

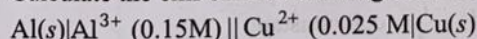
- (iii) What is the standard free energy change for the following reaction at room temperature? Is the reaction spontaneous?



CBSE SQP 2023

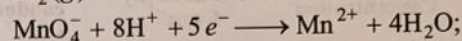
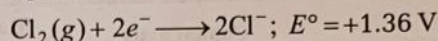
- Q5** (i) State Kohlrausch law. **CBSE SQP 2021**

- (ii) Calculate the emf of the following cell at 298 K :

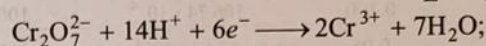


(Given: $E^\circ_{(\text{Al}^{3+}/\text{Al})} = -1.66 \text{ V}$, $E^\circ_{(\text{Cu}^{2+}/\text{Cu})} = 0.34 \text{ V}$ $\log 0.15 = -0.8239$, $\log 0.025 = -1.6020$)

- Q6** (i) On the basis of E° values identify which amongst the following is the strongest oxidising agent? **CBSE SQP 2021**



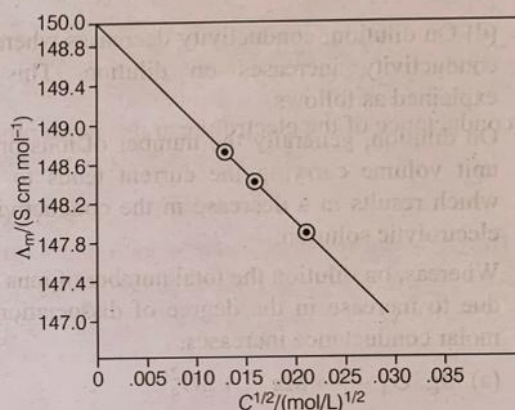
$$E^\circ = 1.51 \text{ V}$$



$$E^\circ = +1.33 \text{ V}$$

- (ii) The following figure 2, represents variation of (Λ_m) vs \sqrt{C} for an electrolyte.

Here, Λ_m is the molar conductivity and C is the concentration of the electrolyte.



- (a) Define molar conductivity.
 (b) Identify the nature of electrolyte on the basis of the above plot. Justify your answer.
 (c) Determine the value of Λ_m for the electrolyte.
 (d) Show how to calculate the value of A for the electrolyte using the above graph.

- Q7** (i) Calculate the degree of dissociation of 0.0024 M acetic acid if conductivity of this solution is $8.0 \times 10^{-5} \text{ S cm}^{-1}$. **CBSE SQP 2020**

Given: $\lambda^\circ_{\text{H}^+} = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$;

$\lambda^\circ_{\text{CH}_3\text{COO}^-} = 40.9 \text{ S cm}^2 \text{ mol}^{-1}$

- (ii) Solutions of two electrolytes 'A' and 'B' are diluted. The limiting molar conductivity of 'B' increases to a smaller extent, while that of 'A' increases to a much larger extent comparatively. Which of the two is a strong electrolyte? Justify your answer.

- Q8** (i) Apply Kohlrausch law of independent migration of ions, write the expression to determine the limiting molar conductivity of calcium chloride.

(ii) Define fuel cell.

Delhi 2017

KEY IDEA

To find out the mass of Ag deposited at cathode, we first need to find the quantity of electricity passed (Q) using Faraday's law. The value of Q helps in determining the mass of 108 g of Ag.

Q9 What type of battery is lead storage battery? Write the anode and cathode reactions, and the overall cell reaction occurring in the operation of a lead storage battery. **Delhi 2012, 2011, Foreign 2012**

Q10. An aqueous solution of copper sulphate, CuSO_4 was electrolysed between platinum electrodes using a current of 0.1287 A for 50 min.

[Given: Atomic mass of Cu = 63.5 g mol^{-1}]

(i) Write the cathodic reaction.

(ii) Calculate

(a) Electric charge passed during electrolysis.

(b) Mass of copper deposited at the cathode.

[Given, $1 \text{ F} = 96500 \text{ C mol}^{-1}$] **All India 2011C**

KEY IDEA

(i) Cathode is the site of reduction.

(ii) Use $Q = It$ to find the amount of charge passed and $m = ZIt$

$$= \frac{\text{Equivalent weight} \times It}{96500}$$

to find the mass of copper deposited.

5 Marks Questions

Q11 (i) Why does the cell voltage of a mercury cell remain constant during its lifetime? **CBSE SQP 2023**

(ii) Write the reaction occurring at anode and cathode and the products of electrolysis of aq. KCl.

(iii) What is the pH of HCl solution when the hydrogen gas electrode shows a potential of -0.59 V at standard temperature and pressure?

Q12. A lead storage battery is the most important type of secondary cell having a lead anode and a grid of lead packed with PbO_2 as cathode. A 38% solution of sulphuric acid is used as electrolyte. (Density = 1.294 g mL^{-1}). The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H_2SO_4 falls to 1.139 g mL^{-1} . (20% H_2SO_4 by mass).

(i) Write the reaction taking place at the cathode when the battery is in use.

(ii) How much electricity in terms of Faraday is required to carry out the reduction of one mole of PbO_2 ?

(iii) What is the molarity of sulphuric acid before discharge?

(iv) Lead storage battery is considered as a secondary cell. Why?

(v) Write the products of electrolysis when dilute sulphuric acid is electrolysed using platinum electrodes.

CBSE SQP 2020

Q13 (i) The e.m.f. of the following cell at 298 K is 0.1745 V .
 $\text{Fe(s)} | \text{Fe}^{2+} (0.1 \text{ M}) || \text{H}^+ (x \text{ M}) | \text{H}_2 (\text{g}) (1 \text{ bar}) | \text{Pt(s)}$
Given, $E^\circ_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$

Calculate the H^+ ions concentration of the solution at the electrode where hydrogen is being produced.

(ii) Aqueous solution of copper sulphate and silver nitrate are electrolysed by 1 A current for 10 minutes in separate electrolytic cells. Will the mass of copper and silver deposited on the cathode be same or different?

Explain your answer.

CBSE SQP 2020

Q14. (i) A cell is prepared by dipping a zinc rod in 1M zinc sulphate solution and a silver electrode in 1M silver nitrate solution. The standard electrode potential given:

$$E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}, E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$$

What is the effect of increase in concentration of Zn^{2+} on the E_{cell} ?

(ii) Write the products of electrolysis of aqueous solution of NaCl with platinum electrodes.

(iii) Calculate e.m.f. of the following cell at 298 K.

$$\text{Ni(s)} | \text{Ni}^{2+} (0.01 \text{ M}) || \text{Cu}^{2+} (0.1 \text{ M}) | \text{Cu(s)}$$

[Given, $E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}$, $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$]

Write the overall cell reaction.

CBSE SQP 2019

Q15. (i) Write the cell reaction and calculate the emf of the following cell at 298 K.

$$\text{Sn(s)} | \text{Sn}^{2+} (0.004 \text{ M}) || \text{H}^+ (0.020 \text{ M}) | \text{H}_2 (\text{g}) (1 \text{ bar}) | \text{Pt(s)}$$

(Give: $E^\circ_{\text{Sn}^{2+}/\text{Sn}} = -0.14 \text{ V}$)

(ii) Give reasons.

(a) On the basis of E° values, O_2 gas should be liberated at anode, but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl.

(b) Conductivity of CH_3COOH decreases on dilution.

CBSE 2019

Q16. E°_{cell} for the given redox reaction is 2.71 V
 $\text{Mg(s)} + \text{Cu}^{2+} (0.001 \text{ M}) \longrightarrow \text{Mg}^{2+} (0.01 \text{ M}) + \text{Cu(s)}$
 Calculate E_{cell} for the reaction, write the direction of flow of current when an external opposite potential applied is

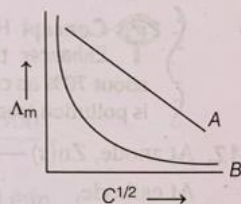
- (i) less than 2.71 V (ii) greater than 2.71 V

Q17. (i) A steady current of 2 amperes was passed through two electrolytic cells X and Y connected in series containing electrolytes FeSO_4 and ZnSO_4 until 2.8 g of Fe deposited at the cathode of cell X.

How long did the current flow? Calculate the mass of Zn deposited at the cathode of cell Y.

(Molar mass : Fe = 56 g mol^{-1}
 Zn = 653 g mol^{-1} , $1F = 96500 \text{ C mol}^{-1}$)

(ii) In the plot of molar conductivity (Λ_m) vs square root of concentration ($C^{1/2}$), following curves are obtained for two electrolytes A and B.



Answer the following.

- (a) Predict the nature of electrolytes A and B.
 (b) What happens on extrapolation of Λ_m to concentration approaching zero for electrolytes A and B?

Delhi 2019

Q18. (i) For the reaction
 $2\text{AgCl(s)} + \text{H}_2(\text{g}) (1 \text{ atm}) \longrightarrow 2\text{Ag(s)} + 2\text{H}^+ (0.1 \text{ M}) + 2\text{Cl}^- (0.1 \text{ M})$

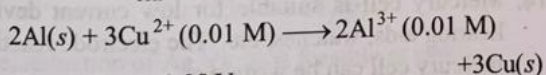
$\Delta G^\circ = -43600 \text{ J}$ at 25°C .

Calculate the emf of the cell. [$\log 10^{-n} = -n$]

(ii) Define fuel cell and write its two advantages.

CBSE 2018

Q19. (i) Calculate E°_{cell} for the following reaction at 298 K:



Given, $E_{\text{cell}} = 1.98 \text{ V}$

(ii) Using the E° values of A and B, predict which is better for coating the surface of iron

$[E^\circ_{(\text{Fe}^{2+}/\text{Fe})} = -0.44 \text{ V}]$ to prevent corrosion and why?

Given : $E^\circ_{(\text{A}^{2+}/\text{A})} = -2.37 \text{ V}$,

$E^\circ_{(\text{B}^{2+}/\text{B})} = -0.14 \text{ V}$

All India 2016

Q20. (i) Define the following terms.

- (a) Molar conductivity (Λ_m)
 (b) Secondary batteries
 (c) Fuel cell

(ii) State the following laws.

- (a) Faraday's first law of electrolysis.
 (b) Kohlrausch's law of independent migration of ions.

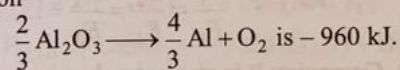
Delhi 2015C

Q21. (i) Predict the products of electrolysis in each of the following.

- (a) An aqueous solution of AgNO_3 with platinum electrodes.
 (b) An aqueous solution of H_2SO_4 with platinum electrodes.

(ii) Estimate the minimum potential difference needed to reduce Al_2O_3 at 500°C .

The Gibbs energy change for the decomposition reaction



($F = 96500 \text{ C mol}^{-1}$) Delhi 2014C

Q22. (i) Define the following terms.

- (a) Limiting molar conductivity (b) Fuel cell

(ii) Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100Ω . If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520Ω , calculate the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution.

The conductivity of 0.1 mol L^{-1} KCl solution is $1.29 \times 10^{-2} \Omega^{-1} \text{ cm}^{-1}$.

Delhi 2014



KEY IDEA

To solve such type of question,

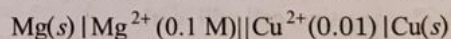
(i) First calculate the cell constant using relation, Λ / A (cell constant) = $R \times \kappa$ then, find conductivity (κ).

(ii) Then, find molar conductivity of solution by the formula,

$$\Lambda_m = \frac{\kappa \times 1000}{\text{Molarity}}$$

Q23. (i) State Faraday's first law of electrolysis. How much charge in terms of Faraday's is required for the reduction of 1 mole of Cu^{2+} to Cu.

(ii) Calculate emf of the following cell at 298 K.



Given, $E^\circ_{\text{cell}} = +2.71 \text{ V}$, $1F = 96500 \text{ C mol}^{-1}$

All India 2014

Q 24 The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is $3.905 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity and degree of dissociation (α). Given, $\lambda_{(\text{H}^+)}^\circ = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$ and $\lambda_{(\text{CH}_3\text{COO}^-)}^\circ = 40.9 \text{ S cm}^2 \text{ mol}^{-1}$. **All India 2016**

Q 25 Conductivity of $2.5 \times 10^{-4} \text{ M}$ methanoic acid is $525 \times 10^{-5} \text{ S cm}^{-1}$. Calculate its molar conductivity and degree of dissociation.

Given: $\lambda_{(\text{H}^+)}^\circ = 349.5 \text{ S cm}^2 \text{ mol}^{-1}$
and $\lambda_{(\text{HCOO}^-)}^\circ = 50.5 \text{ S cm}^2 \text{ mol}^{-1}$.

All India 2015

CHAPTER 3 HALOALKANE AND HALOARENE

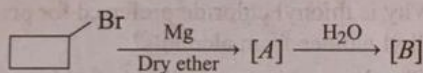
(iii) Benzyl chloride gives S_N1 reaction.

Q1. Account for the following. CBSE 2024

- (i) Haloalkanes react with $AgCN$ to form isocyanide as main product.
- (ii) Allyl chloride shows high reactivity towards S_N1 reaction.
- (iii) Haloarenes are extremely less reactive towards nucleophilic substitution reactions.

Q2. Answer any three of the following. CBSE 2023

- (i) Which isomer of C_5H_{10} gives a single monochloro compound C_5H_9Cl in bright sunlight?
- (ii) Arrange the following compounds in increasing order of reactivity towards S_N2 reaction.
2-bromopentane, 1-bromopentane, 2-bromo-2-methylbutane
- (iii) Why *p*-dichlorobenzene has higher melting point than those of *ortho*- and *meta*-isomers?
- (iv) Identify A and B in the following.



Q3. Account for the following. CBSE 2023

- (i) Benzyl chloride is highly reactive towards S_N1 reaction.
- (ii) (\pm) butan-2-ol is optically inactive, though it contains a chiral carbon atom.
- (iii) Chloroform is stored in closed dark coloured bottles.

Q4. (i) Identify the major product formed when 2-cyclohexylchloroethane undergoes a dehydrohalogenation reaction. Name the reagent which is used to carry out the reaction.

- (ii) Why are haloalkanes more reactive towards nucleophilic substitution reaction than haloarenes and vinylic halides?

CBSE SQP 2023

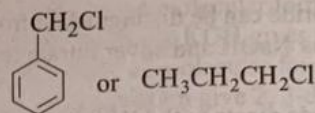
Or

- (i) Name the possible alkenes which will yield 1-chloro-1-methylcyclohexane on their reaction with HCl . Write the reactions involved.

- (ii) Allyl chloride is hydrolysed more readily than *n*-propyl chloride. Why?

CBSE SQP 2023

Q5. Which one of the following compound will undergo faster hydrolysis reaction by S_N1 mechanism? Justify your answer. CBSE SQP 2019



Or

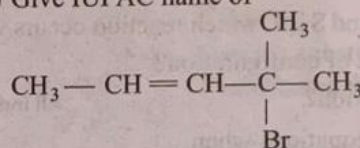
A compound is formed by the substitution of two chlorine atoms for two hydrogen atoms in propane. Write the structures of the isomers possible. Give the IUPAC name of the isomer which can exhibit enantiomerism.

Q6. (i) Write equation for preparation of 1-iodobutane from 1-chlorobutane.

- (ii) Out of 2-bromopentane, 2-bromo-2-methylbutane and 1-bromopentane, which compound is most reactive towards elimination reaction and why?

All India 2019

(iii) Give IUPAC name of



All India 2019

Q7. Give reasons for the following.

- (i) The presence of $-\text{NO}_2$ group at *ortho* or *para*-position increases the reactivity of haloarenes towards nucleophilic substitution reactions.
- (ii) *p*-dichlorobenzene has higher melting point than that of *ortho* or *meta*-isomer.
- (iii) Thionyl chloride method is preferred for preparing alkyl chloride from alcohols.

All India 2019

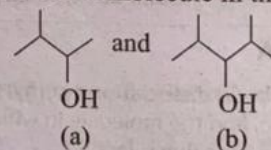
Q8. (i) Out of $(\text{CH}_3)_3\text{C}-\text{Br}$ and $(\text{CH}_3)_3\text{C}-\text{I}$, which one is more reactive towards S_N1 and why?

- (ii) Write the product formed when *p*-nitrochlorobenzene is heated with aqueous NaOH at 443 K followed by acidification.

(iii) Why *dextro* and *laevo*-rotatory isomers of butan-2-ol are difficult to separate by fractional distillation?

Delhi 2019

Q9. (i) Identify the chiral molecule in the following pair:



- (ii) Write the structure of the product when chlorobenzene is treated with methyl chloride in the presence of sodium metal and dry ether.

(iii) Write the structure of the alkene formed by dehydrohalogenation of 1-bromo-1-methylcyclohexane with alcoholic KOH .

CBSE 2018

Q10 Write the product(s) formed when

- 2-bromopropane undergoes dehydrohalogenation reaction.
- chlorobenzene undergoes nitration reaction.
- methylbromide is treated with KCN. **CBSE 2018 C**

Q11 Give the IUPAC name of the product formed when

- 2-methyl-1-bromopropane is treated with sodium in the presence of dry ether.
- 1-methylcyclohexene is treated with HI.
- Chloroethane is treated with silver nitrite. **CBSE SQP 2018**

Q12 Following compounds are given to you:

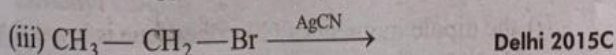
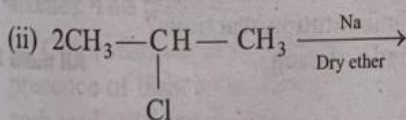
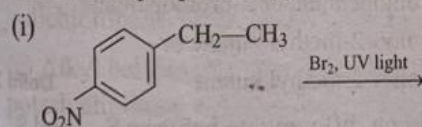
2-bromopentane, 2-bromo-2-methylbutane, 1-bromopentane

- Write the compound which is most reactive towards S_N2 reaction.
- Write the compound which is optically active.
- Write the compound which is most reactive towards β -elimination reaction. **Delhi 2017; All India 2017**

Q13 How do you convert the following?

- Chlorobenzene to biphenyl
- Propene to 1-iodopropane
- 2-bromobutane to but-2-ene **Delhi 2015**

Q14 Write the major product(s) in the following.



Q15 Give reasons.

- C—Cl bond length in chlorobenzene is shorter than C—Cl bond length in CH_3-Cl .
- The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
- S_N1 reactions are accompanied by racemisation in optically active alkyl halides. **Foreign 2015**

Q16 How can the following conversions be carried out?

- Aniline to bromobenzene
- Chlorobenzene to 2-chloroacetophenone
- Chloroethane to butane **All India 2015C**

Q17 What happens when

- chlorobenzene is treated with $\text{Cl}_2/\text{FeCl}_3$?
- ethyl chloride is treated with AgNO_2 ?
- 2-bromopentane is treated with alcoholic KOH?

Write the chemical equations in support of your answer. **All India 2015**

Q18 Give reasons.

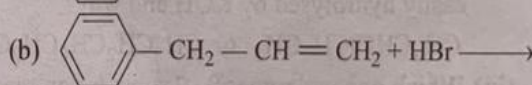
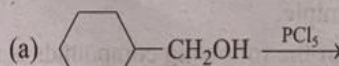
- n*-butyl bromide has higher boiling point than *t*-butyl bromide.
- Racemic mixture is optically inactive.
- The presence of nitro group ($-\text{NO}_2$) at *o/p*-positions increases the reactivity of haloarenes towards nucleophilic substitution reactions. **Delhi 2015**

Q19 (i) Why are alkyl halides insoluble in water?

(ii) Why is butan-1-ol optically inactive but butan-2-ol is optically active?

(iii) Although chlorine is an electron withdrawing group, yet it is *ortho*, *para*-directing in electrophilic aromatic substitution reactions. Why? **Foreign 2015**

Q20 (i) Draw the structures of major monohalo products in each of the following reactions.



(ii) Which halogen compound in each of the following pairs will react faster towards S_N2 reaction?

(a) CH_3Br or CH_3I

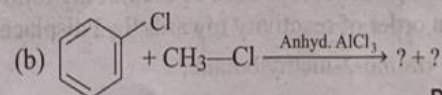
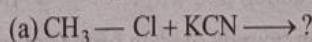
(b) $(\text{CH}_3)_3\text{C}-\text{Cl}$ or CH_3-Cl **Delhi 2014**

Q21 (i) Which compound in each of the following pairs will react faster towards S_N2 reaction with $-\text{OH}$ group?

(a) CH_3Br or CH_3I

(b) $(\text{CH}_3)_3\text{CCl}$ or CH_3Cl

(ii) Write the product(s) of the following reactions.



Q22 Give reasons for the following.

(i) Ethyl iodide undergoes S_N2 reaction faster than ethyl bromide.

(ii) (\pm) 2-butanol is optically inactive.

(iii) C—X bond length in haloarene is smaller than C—X bond length in CH_3-X . **All India 2013**

Q23. Explain the following.

- (i) The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
- (ii) Alkyl halides, though polar, are immiscible with water.
- (iii) Grignard reagents should be prepared under anhydrous conditions.

Delhi 2013C



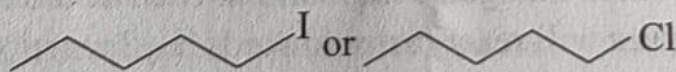
KEY IDEA

- (i) Find the hybridisation of C-atoms in chlorobenzene and cyclohexyl chloride and consider their electronegativity to find the bond polarity and thus, dipole moment.
- (ii) Strong intermolecular H-bonding among water molecules.
- (iii) Consider reactive nature of Grignard reagent with water.

Although, chlorine is an electron withdrawing group, yet it is *ortho*, *para*-directing in electrophilic aromatic substitution reactions. Explain, why is it so? Delhi 2012

Q24. Answer the following questions.

- (i) What is meant by chirality of a compound? Give an example.
- (ii) Which one of the following compounds is more easily hydrolysed by KOH and why?
 $\text{CH}_3\text{CHClCH}_2\text{CH}_3$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$
- (iii) Which one undergoes $\text{S}_{\text{N}}2$ substitution reaction faster and why?



All India 2012

Q25. Answer the following.

- (i) Haloalkanes easily dissolve in organic solvents. Why?
- (ii) What is the racemic mixture? Give an example.
- (iii) Out of the two bromo derivatives, $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$ and $(\text{C}_6\text{H}_5)_2\text{CHBr}$, which one is more reactive towards $\text{S}_{\text{N}}1$ substitution reaction and why?

Delhi 2011

Rearrange the compounds of each of the following sets in order of reactivity towards $\text{S}_{\text{N}}2$ displacement.

- (i) 2-bromo-2-methylbutane,

CHAPTER 4 BIOMOLECULES

Or What are the products of hydrolysis of lactose?

All India 2013; Delhi 2010C

Q1. Write the product obtained when D-glucose reacts with $\text{H}_2\text{N}-\text{OH}$.

All India 2015

Q2. Define the following term.
Anomers

All India 2014, Foreign 2014

Q3. What are the products of hydrolysis of sucrose?

All India 2013, 2010; Delhi 2014

Q4. What is a glycosidic linkage? Delhi 2013; All India 2011C

Q5. Name two components of starch. Delhi 2013C

Q6. Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain. All India 2012

Q7. What is meant by invert sugars?

Foreign 2012, 2010; Delhi 2010

Q8. Give an example each of reducing and non-reducing sugars.

Delhi 2010C

Q9. What are monosaccharides? All India 2010

Q10. What is meant by reducing sugars? All India 2010

2 Marks Questions

Q11. Classify the following sugars into monosaccharides and disaccharides.

Galactose, Glucose, Lactose and Maltose

Q12. Give the reaction of glucose with hydrogen cyanide. Presence of which group is confirmed by this reaction? CBSE 2023

Q13. (i) How are carbohydrates stored in animal's body? Mention any one organ where they are present.

(ii) What is the basic structural difference between starch and cellulose?

CBSE 2023

Q14. Account for the following. CBSE SQP 2023

(i) There are 5—OH groups in glucose.

(ii) Glucose is a reducing sugar.

Q15. What happens when D-glucose is treated with the following reagents?

(i) Bromine water

(ii) HNO_3

CBSE 2023

Q16. Explain what is meant by

(i) pyranose structure of glucose?

(ii) glycosidic linkage?

Delhi 2012, All India 2011C

Q17. Write such reactions and facts about glucose which cannot be explained by its open chain structure.

Delhi 2012; Foreign 2011, 2010; All India 2011C, 2011, 2010 C

Q18. What is essentially the difference between the α -form of glucose and β -form of glucose? Explain. Delhi 2011

Q19. Write chemical reactions to show that open structure of D-glucose contains the following.

(i) Straight chain

(ii) Five alcohol groups

(iii) Aldehyde as carbonyl group

All India 2020

3 Marks Questions

Q20. When sucrose is hydrolysed the optical rotation values are measured using a polarimeter and are given in the following table.

Time (hours)	Specific rotation
0	+ 66.5°
∞	- 39.9°

(i) Account for the two specific rotation values.

(ii) What is the specific name given to sucrose based on the above observation?

(iii) One of the products formed during the hydrolysis of sucrose is a glucose, that reacts with hydroxylamine to give compound A. Identify compound A.

Q21. Write the structure of product when D-glucose reacts with the following. (Any three) CBSE 2023

(i) HI

(ii) Conc. HNO_3

(iii) Br_2 water

(iv) HCN

Q22. What happens when D-glucose is treated with the following reagents?

(i) Br_2 water

(ii) HCN

(iii) $(\text{CH}_3\text{CO})_2\text{O}$

All India 2019

Q23. Give three reactions of glucose which cannot be explained by its chain structure. CBSE SQP 2019

Or

Enumerate the reaction of D-glucose which cannot be explained by the open chain structure.

Delhi 2014C, 2011C

Q24. What is essentially the difference between α -glucose and β -glucose? What is meant by pyranose structure of glucose? All India 2012

Q25. What is glycogen? How is it different from starch? How is starch structurally different from cellulose? Foreign 2012

How can reducing and non-reducing sugars be distinguished? Mention the structural features characterising reducing sugars.

Delhi 2011C

BIOLOGY

CHAPTER 1: SEXUAL REPRODUCTION IN FLOWERING PLANTS

Very Short Answer Type Questions

- Q 1. What is meant by emasculation?
- Q 2. Why is apple called a false fruit? Which part of the flower forms the fruit.
- Q 3. Name the structures formed at the end of microsporogenesis and megasporogenesis?


Short Answer Type Questions

- Q 4. Mention two strategies evolved to prevent self-pollination in flowers.
- Q 5. Why do you think zygote is dormant for sometime in a fertilised ovule?

Long Answer Type Questions

- Q 6. (i) With the help of labelled diagram only, show the different stages of embryo development in a dicot plant.
- (ii) Endosperm development precedes embryo development. Justify.
- Q 7. With a neat diagram, explain the 7-celled, 8-nucleate nature of female gametophyte.


Q8 If the stamens are well exposed usually which mode of pollination the plant is expected to follow?

[OEB]  K


Q9 List the different types of pollination depending upon the source of pollen grain.

K [Delhi Set-1, 2016]


Q10 Explain double fertilisation in an angiosperm.

 U [Outside Delhi Set-2, 2020]

Q11 Explain three different modes of pollination that can occur in a chasmogamous flower.

 U [Delhi Set-1, 2020]


Q12 A non-biology person is quite shocked to know that apple is a false fruit, mango is a true fruit and banana is a seedless fruit. As a biology student how would you satisfy this person?

 U Ap [Delhi Set-1, 2015]


Q13 "For a common man both mango and strawberry are fruits, but not for a biology students". Justify.

E [Outside Delhi Set-2, 2019]

Q14 Do you think apomixis can be compared with asexual reproduction? Support your answer, giving one reason. How is apomixis beneficial to farmers? Explain.

 A [Delhi Comptt, Set-1,2,3, 2018]


Q15 Differentiate between parthenocarpy and parthenogenesis. Give one example of each.

 U [Delhi Set-1, 2018]



Q16 Parthenocarpy and apomixis have been observed in some plants. Give an example of each. State a similarity and a difference observed between the two processes.

U [Delhi Set-3, 2017]



- Q17 (a) Explain the process of double fertilisation in angiosperms.
- (b) Why does the development of endosperm precedes that of embryo?
- (c) List the parts of a typical dicot embryo.

 [Delhi Set-3, 2019]

- Q18 (a) A capsicum flower has 240 ovules in its ovary. But, it produces a fruit with only 180 viable seeds. Explain giving a reason that could be responsible for such a result.
- (b) Describe the development of an endosperm in a viable seed. Why does endosperm development precede embryo development?
- (c) Give an example of an angiosperm seed that has a perisperm. Name the part the perisperm develops from.


  [Delhi Set-1, 2017]

- Q19 (a) Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy.
- (b) Explain the events upto double fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm.

  (Outside Delhi, 2018)

- Q20 (a) Explain the post-pollination events leading to seed production in angiosperms.
- (b) List the different types of pollination depending upon the source of pollen grain.



 [Delhi Set-1, 2016]

Very Short Answer Type Questions

- Q 1 How the entry of only one sperm and not many is ensured during fertilisation?
- Q 2 Name the thin clear coat around the mammalian egg.
- Q 3 The basal parts of the endometrium remain intact during menstruation. Give reason.

Short Answer Type Questions

- Q 4 Mention the two functions of the placenta.
- Q 5 Write the functions of the following:
- (i) Corpus luteum
 - (ii) Endometrium

Long Answer Type Questions


- Q 6 Where is morula formed in humans? Explain the process of its development from zygote.
- Q 7 (i) Mention the site where fertilisation of the ovum occurs in a human female. Explain the process of fertilisation and mention how polyspermy is prevented.
- (ii) Explain the formation of placenta after the implantation in a human female.

Q8. Read the two statements below and answer the questions that follow:

Statement I: Female P has been a surrogate mother once.

Statement II: Female Q is a national-level swimmer.

- (a) Is it correct to say that the hymen is DEFINITELY broken in both females P and Q?
- (b) Give a reason to support your answers to (a).


Ap  U [CFPQ]

Q9. The graph given below shows the number of primordial follicles per ovary in women at different ages. Study the graph and answer the questions that follow.

- (a) What is the average age of the women at the onset of menopause?
- (b) At what age are maximum primordial follicles present in the ovary according to the given graph?

A U [Outside Delhi Set-1, 2023]

Q10 Mention the relationships between pituitary and ovarian hormones during a menstrual cycle.


 Ap [Outside Delhi 2017, Set-2]

Q11 Mention the relationship between concentration of luteinizing hormone and maintenance of endometrium in the human uterus.

A [Delhi Set-1, 2017]

Q12 Polyspermy is an extremely rare condition in which an ovum is fertilised by more than one sperm.

- (a) How many chromosomes will a zygote contain if 2 sperms fertilised an ovum?
- (b) How is polyspermy prevented in humans?

 A U [Delhi Set-1, 2023]

Q13 List the changes occur when the primary oocyte undergoes in the tertiary follicular stage in human.

A [OEB]

- Q14 (a) Highlight one aspect by which meiosis during oogenesis differs from regular meiosis.
- (b) Name two hormones that are common to spermatogenesis and oogenesis.
- (c) State the function of hormone identified in (b) in both human male and Female. **U**

[CFPQ] **AI**

Q15 Explain the events in a normal woman during her menstrual cycle on the following days:

Pituitary hormone levels from 8 to 12 days

3+2

Q16 Name the gonadotropins in human. Explain their role in human male and female, respectively.

AI **U** [Delhi Set-2, 2020]

Q17 (a) Explain the following phases in the menstrual cycle of a human female:

- Menstrual phase
- Follicular phase
- Luteal phase

Q18 Where and how in the testes process of spermatogenesis occur in humans?

Q19 Draw diagram of human sperm and label four parts. **AI** **U** [Delhi Set-1, 2020]

Q20 (a) Differentiate between spermatogenesis and oogenesis on the basis of

- Time of initiation of the process.
 - Site of completion of the process.
 - Nature of meiotic division undergone by gamete mother cells.
- (b) Name the hormones and state their role involved in controlling spermatogenesis in humans.

AI **Ap** [Delhi Set-3, 2019]

Very Short Answer Type Questions

- Q 1. Why do some women use Saheli pills?
- Q 2. During which duration the emergency contraceptives are proved to be effective?
- Q 3. Give the name of the STD, which can be transmitted through contaminated blood.

Short Answer Type Questions

- Q 4. Amniocentesis for sex-determination is banned in our country. Is this ban necessary? Comment.
- Q 5. What is artificial insemination in ART? Under what conditions is the person medically advised to go for it?

Long Answer Type Questions

- Q 6. Describe the technique by which genetic disorder in a developing foetus can be detected.
- Q 7. What are the traditional methods of contraception, which have been in use since ancient times?

Q 8. Name two hormones that are constituents of contraceptive pills. Why do they have high and effective contraceptive value? Name a commonly prescribed non-steroidal oral pill.



K [Outside Delhi Set-3, 2016]

Q 9. List any two types of IUDs that are available for human females and state their mode of action.



Ap [Outside Delhi Comptt. Set-1, 2, 2017]

- Q10 List any two reasons other than physical and congenital disorders for causing infertility in couples.
- Q11 Explain how IVF as a technique helped childless couples in having children.
- Q12 Compare ZIFT with ICSI.

AI Ap

[Delhi Set-3, 2020]

Q13 Prepare a poster for the school programme depicting the objectives of:

"Reproductive and Child Health Care Programme".



AI

Ap

[Delhi Set-1, 2019]

Q14 It is commonly observed that parents feel embarrassed to discuss freely with their adolescent children about sexuality and reproduction. The result of this parental inhibition is that the children go astray sometimes.

- (a) Explain the reasons that you feel are behind such embarrassment amongst some parents to freely discuss such issues with their growing children.
- (b) By taking one example of a local plant and animal, how would you help these parents to overcome such inhibitions about reproduction and sexuality?

AI

U

[Delhi, 2017]

Q15 A large number of married couples across the world are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

a) Why in your opinion the female partner is often blamed for such situations in India? Mention any two values that you as a biology student can promote to check this social evil.

Q16 State any two reasons responsible for the cause of infertility.

Q17 Suggest a technique that can help the couple to have a child where the problem is with the male partner.

Ap [APQ 2023-24]

Q18 After a brief medical examination a healthy couple came to know that both of them are unable to produce functional gametes and should look for an 'ART' (Assisted Reproductive Technique). Name the 'ART' and the procedure involved that you can suggest to them to help them bear a child.

U [Delhi Set-1, 2015]

Reproductive and Child Healthcare (RCH) programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects. As this is important and essential for building a reproductively healthy society.

(a) "Providing sex education in schools is one of the ways to meet this goal". Give four points in support of your opinion regarding this statement.

(b) List any two 'indicators' that indicate a reproductively healthy society.

AI C [SQP 2023 - 24]

- Q20 (a) Explain one application of each one of the following:
- (A) Amniocentesis
 - (B) Lactational amenorrhea
 - (C) ZIFT

CHAPTER 4 HUMAN HEALTH AND DISEASES

Very Short Answer Type Questions

- Q1. Why sharing of injection needles between two individuals are not recommended?
- Q2. Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible?
- Q3. Mention the useful as well as the harmful drug obtained from the latex of poppy plant.

Short Answer Type Questions

- Q4. What would happen to immune system, if thymus gland is removed from the body of a person?
- Q5. What is colostrum? Why is it important to be given to the new born infants?

Long Answer Type Questions

- Q6. Answer the following questions:
- (i) Name a drug used:
 - (a) As an effective sedative and pain killer.
 - (b) For helping patients to cope with mental illnesses like depression, but often misused.
 - (ii) How does the moderate and high dosage of cocaine affect the human body?
- Q7. Describe the life-cycle of HIV from the time of its entry into the human body till full blown AIDS sets in.

Q8 (a) Differentiate between active and passive immunity.

(b) Comment on the role of vaccination and immunisation in keeping human population healthy.



A I U

[Outside Delhi Set-1, 2019]

Q9 (i) How does a Human Immunodeficiency Virus (HIV) replicate in a host?

(ii) How does an HIV-infected patient lose immunity?

(iii) List any two symptoms of this disease.

A [SQP 2023-24]

Q10 'An HIV patient normally doesn't die of 'AIDS', but death is caused due to many other infections' Do you agree with the statement? Give explanatory reasons in support of your answer



A

[SQP 2022]

Q11 (a) Differentiate between the roles of B-lymphocytes and T-lymphocytes in generating immune responses.

(b) Explain the mechanism of action of T cells to antigens.

A U

[SQP 2023-24]

Q12 (a) Briefly describe the types of cancer associated genes.

(b) Explain Severe combined immunodeficiency (SCID).

[SQP 2023-24]

Q13 (a) If a patient is advised anti-retroviral drug, name the possible infection he/she is likely to be suffering from. Name the causative organism.

(b) How do vaccines prevent subsequent microbial infection by the same pathogen?

(c) How does a cancerous cell differ from a normal cell?

(d) Many microbial pathogens enter the gut of humans along with food. Name the physiological barrier that protects the body from such pathogens.

U + K

[SQP 2023-24]

- 14 (a) Innate immunity is a non-specific type of defense and consists of four types of barriers. Categorise these barriers and give one example for each.
- (b) Differentiate between benign and malignant tumours? Which one is lethal and why?

U [APQ 2023-24]

- 15 (a) Explain the life cycle of Plasmodium starting from its entry into the body of female *Anopheles* till the completion of its life cycle in humans.
- (b) Explain the cause of periodic recurrence of chill and high fever during malarial attack in humans.

U + K [SQP 2023-24]

- Q16 Enumerate four most common warning signs of drug and alcohol abuse amongst the youth



A [SQP 2022-23]

- Q17 State the mode of action of cocaine on human body. Write the scientific name of the source plant it is obtained from.

K [SQP 2022-23]

- Q18 Name two drugs obtained from poppy plant. "These drugs are medically useful but are often abused". Taking the mentioned examples justify by giving reasons.



K

C

[Outside Delhi Set-2, 2016]

- Q19 Why is there a fear amongst the guardians that their adolescent wards may get trapped in drug/alcohol abuse?

U

[Outside Dehli Set-1, 2, 3, 2017]

- Q20 (i) Write the scientific name of the plant from where natural cannabinoids are obtained.
- (ii) Mention the parts of the plant that are used for extracting the drug.
- (iii) How does the drug affect human body?



K

[SQP 2022-23]

CHAPTER 5 MICROBES IN HUMAN WELFARE

Very Short Answer Type Questions


- Q 1. Give the significance of biofertilisers.
- Q 2. What are *Nucleopolyhedroviruses* being used for now-a-days?
- Q 3. Name the pests that ladybird, beetle and dragonflies help to get rid of.


Short Answer Type Questions

- Q 4. List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment.
- Q 5. Why is *Rhizobium* categorised as a 'symbiotic bacterium'? How does it act as a biofertiliser?

Long Answer Type Questions

- Q 6. What are antibiotics? Name the classes of organisms that produce antibiotics.
- Q 7. Explain how are microbes important for humans.

Q 8. Describe the contributions of Alexander Fleming, Ernst Chain and Howard Florey in the field of microbiology.  K [Outside Delhi Set-2, 2020]

Q 9. List the event that reduces biological oxygen demand (BOD) of a primary effluent during sewage a treatment.  U [Delhi Set-2, 2016]

Q.10 Describe the process of waste-water treatment under the following heads:

- (i) Primary treatment.
- (ii) Secondary treatment.



[SQP 2023-24]

- Q11 (a) Farmers are often suggested to use the following organisms in their crop land to improve soil fertility.
(i) *Rhizobium* (ii) *Anabaena*-Explain.
- (b) Organic farmer use *Trichoderma* and baculovirus as biological control agents. Explain.

[SQP 2023-24]

12. Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.
- (a) Recommend two microbes that can enrich the soil with nitrogen.
- (b) Why do leguminous crops not require such enrichment of the soil?



[Delhi Set-1, 2018]

13. What is the pathogenic property of baculovirus, used as a biological agents? Name the genus of these organisms.



[Outside Delhi Comptt. Set-1, 3, 2017]

4. How do mycorrhiza help the plants to grow better?
- OR

- (a) (i) Give an example of a genus of fungi that forms mycorrhizial association with plants.
- (ii) How does the plant derive benefits from this association?



[Delhi Set-1, 2023]

15. Name a genus of baculovirus. Why are they considered good biocontrol agents?



[Outside Delhi Set-1, 2016]

OR

Name the genus to which baculoviruses belong. Describe their role in integrated pest management programmes.



[Delhi Set-1, 2016]

- Q16 (a) Organic farmers prefer biological control of diseases and pests to the use of chemicals for the same purpose. Justify.
- (b) Give an example of a bacterium, a fungus and an insect that are used as biocontrol agents.

K [Outside Delhi/ Delhi, 2018]

- Q17 (a) How does *Bacillus thuringiensis* (Bt) act as a biocontrol agent for protecting *Brassica* and fruit trees? Explain.

(b) List the components of biogas.

(c) What makes methanogens a suitable source for biogas production?

U [SOP 2023-24]

- Q18 Substantiate by giving two reasons as to why a holistic understanding of the flora and fauna of the cropland is required before introducing an appropriate biocontrol method.



K U [SQP 2023-24]

- Q19 List the events that lead to biogas production from wastewater whose BOD has been reduced significantly.

U [Delhi Set-2, 2016]

- Q20 Explain the changes that milk undergoes when suitable starter/inoculum is added to it. How does the end product prove to be beneficial for human health?

U [Outside Delhi, 2020]

(i)
(ii)

A

MATHEMATICS

Practice of all the questions from R.D Sharma book of Mathematics.

1) Inverse Trigonometric functions

Page no.3.6, Ex-3.1, Q2 (i, ii), Q3 (i, ii, iv, v), Q6

Page no. 3.9, Ex-3.2 Q1 (iii, iv), Q2 (ii, iii, v), Q5

Page no-3.14, Ex-3.4, Q1 (iii, iv), Q2(i, ii)

Page no. 3.32, Ex-3.7, Q6 (vii, viii), Q7 (v, vi, viii, ix)

2) Matrices

Page no.4.37, Ex-4.3, Q5 (i, ii), Q6, Q9, Q17 (i, ii)

Page no .4.57, Ex-4.5, Q5, Q7, Q8

3) Determinants

Page no.

5.32, Ex-5.2, Q2(x, xi, xii), Q11, Q16

Page no.6.24, Ex-6.1, Q35 to Q41

4) Continuity

Page no.8.31, Ex-8.2, Q4 (vi, viii), Q5, Q8, Q9

5) Differentiation

Page no.14.34, Ex-10.2, Q25, Q48, Q59, Q61, Q76, Q77

Page no.10.57, Ex-10.3, Q13, Q16, Q20, Q39 to Q45

Page no.10.80, Ex-10.5, Q30, Q33, Q34, Q36, Q41, Q42

Page no.10.93, Ex-10.7, Q8, Q12, Q14, Q19, Q22

6) Higher Order Derivative

Page no.11.14, Ex-11.1, Q10, Q17, Q20, Q23, Q26, Q27

7) Derivative as a rate measure

Page no.12.18, Ex-12.2, Q9, Q15, Q17, Q26, Q28

8) Increasing and decreasing function

Page no.13.27, Ex-13.2, Q1 (vii, ix, xvi, xix), Q15

9) Maxima and Minima

Page no. 14.31, Ex-14.4, Q1 (iii, iv), Q2, Q5

MOST IMPORTANT:

- **DO A GOOD SOCIAL WORK PER WEEK, CLICK PICTURES, PASTE AND WRITE IT IN THE SCRAPBOOK.**
- **PLANT A SAPLING ON “WORLD ENVIRONMENT DAY” (5 JUNE), CLICK A PICTURE WITH IT AND WRITE A PARAGRAPH ON WORLD ENVIRONMENT DAY. PASTE IT IN THE SCRAPBOOK.**
- **90% OF THE HOMEWORK IS OFFLINE. PLEASE DON'T USE MOBILE PHONES.**

**For any query, please connect Mr. Devansh Kohli between
11:00 am to 12:00 noon on 7906097284.**

