MASS PHYSICS

REVISION PACK FOR CBSE BOARD EXAM 2023

Pack Overview

Scoring great marks in cbse exam is not very difficult if you are doing it in systematic way this pack will help you to revise all your syllabus in most efficient way

This pack contains

1. Basic and important theory topics
2. Previous years chapter wise questions from CBSE exams
3. M.C.Qs from each chapter
4. Assertion and reasoning type questions
5. Questions based on case study

Sample papers

This pack is based on latest **sample paper issued by** CBSE to boost your performance in CBSE exam

PART 1

SECTION -A : ELECTROSTATICS

SECTION- B: MAGNETISM (MOVING CHARGES & MATTER)

SECTION- C: CURRENT [A.C/D.C] AND INDUCTANCE [E.M.I]

MAY KALI MATA BLESS YOU ALL

Seats are open for focus JEE/NEET Exam batch 2023

STUDY PLAN

MASS PHYSICS HAS DESIGNED A STUDY PLAN FOR 10 DAYS

TO COVER ENTIRE SYLLABUS

FULL CLASS XII PHYSICS SYLLABUS IS DIVIDE IN 5

SECTIONS {UNITS} EACH SECTION MUST BE COVERD FROM

REVISION BOOKLET IN 2 DAYS:

PART-1

SECTION A : ELECTROSTATICS [NCERT CH-1 & CH-2]

SECTION B : MAGNETISM [NCERT CH-4 & CH-5]

SECTION C: CURRENT & INDUCTANCE [NCERT CH-3,7 CH-6]

PART-2

SECTION D : OPTICS [NCERT CH-9,10 & CH-11]

SECTION E: MODERN PHYSICS [NCERT CH-8,12,13 & CH-14]

TEST SERIES WTF BOARD EXAM 7 TESTS

SECTION A TEST

SECTION B TEST

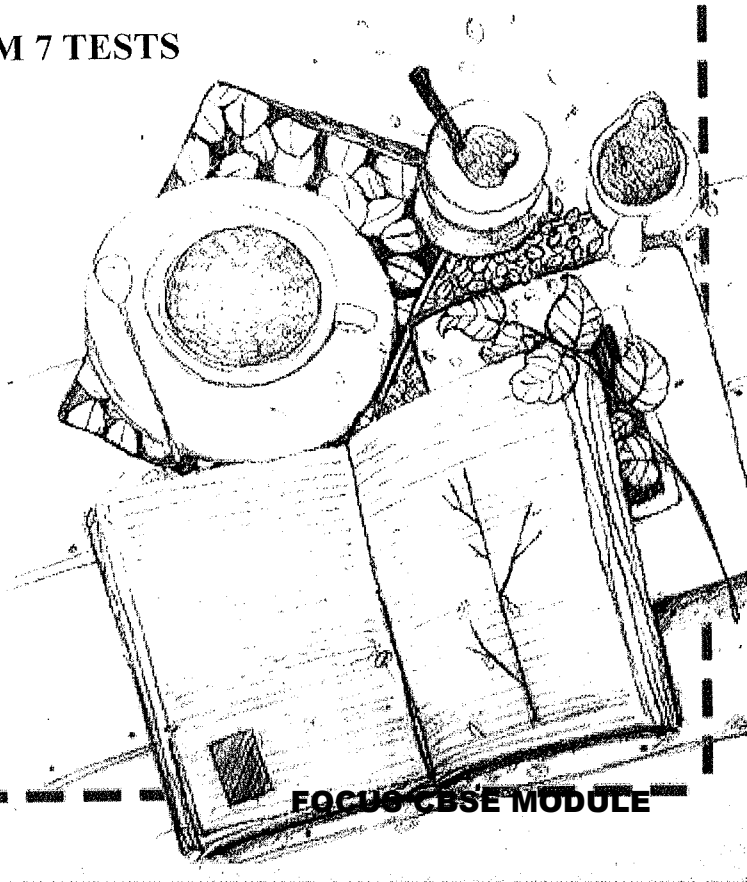
SECTION C TEST

SECTION D TEST

SECTION E TEST

MOCK TEST 1 FULL SYLLABUS

MOCK TEST 2 FULL SYLLABUS



Design of Question Paper

PHYSICS (Theory)

Maximum Marks: 70			Time: 3 hours
S. No.	Typology of Questions	Total Marks	Approximate Percentage
1.	Remembering: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. Understanding: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	27	38%
2.	Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	22	32%
3.	Analysing: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations Evaluating: Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. Creating: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	21	30%
	Total	70	100%

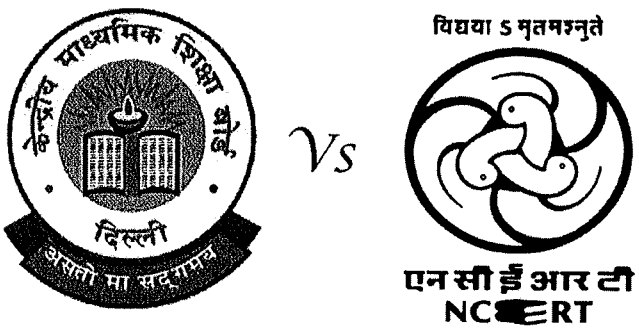
Practical: 30 marks

Physics Deleted Syllabus Class 12

Physics is an important subject for students in Classes 11 and 12. This will have a significant impact on the final score in the **CBSE Board Exams of 2023.** As Physics is a concept-based subject, students who do not understand their concepts cannot perform well. Physics is one of the most challenging subjects in the Science stream examination. There will be a 30% reduction in the CBSE class 12 syllabus this year. This article includes the chapter name and deleted topics of Physics class 12. To learn more about this, check out the article.

Deleted Syllabus of Class 12 Physics

Here are the deleted topics of Physics class 12:



CBSE DATE SHEET:- 2023 BOARD EXAM:-

ENGLISH. ⟶ 24th Feb.

CHEMISTRY → 28th Feb

PHYSICS ⟶ 6th March

MATHS → 11th March

PHYSICAL EDU. → 13th March

BIOLOGY. → 16th March

COMPUTER SCIENCE → 23rd March.

Chapter Number	Chapter Name	DELETED PORTIONS
1	Electric Charges and Fields	Uniformly charged thin spherical shell
3	Current Electricity	Carbon resistors, colour code for carbon resistors. Series and parallel combinations of resistors
4	Moving Charges and Magnetism	Cyclotron
5	Magnetism and Matter	Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis Torque on a magnetic dipole (bar magnet) in a uniform magnetic field Para-, dia- and ferro – magnetic substances, with examples Electromagnets and factors affecting their strengths Permanent magnets
7	Alternating Current	Power factor Wattless current
8	Electromagnetic Waves	Basic idea of displacement current

9-10 **Ray Optics and Optical Instruments**		Reflection of light Spherical mirrors (recapitulation) Mirror formula Scattering of light – blue colour of sky and reddish appearance of the sun at sunrise and sunset Resolving power of microscope and astronomical telescope Polarisation Plane polarised light Brewster's law Uses of plane polarised light and Polaroids
11	**Dual Nature of Radiation and Matter**	Davisson-Germer experiment
13	**Nuclei**	Radioactivity, alpha, beta and gamma particles/rays and their properties Radioactive decay law, half-life and mean life Binding energy per nucleon and its variation with mass number
14	**Semiconductor Electronics**	Zener diode and their characteristics Zener diode as a voltage regulator

NO QUESTION WILL COME FROM THESE TOPICS IN CUET EXAM

MARKING SCHEME FOR FINAL EXAM

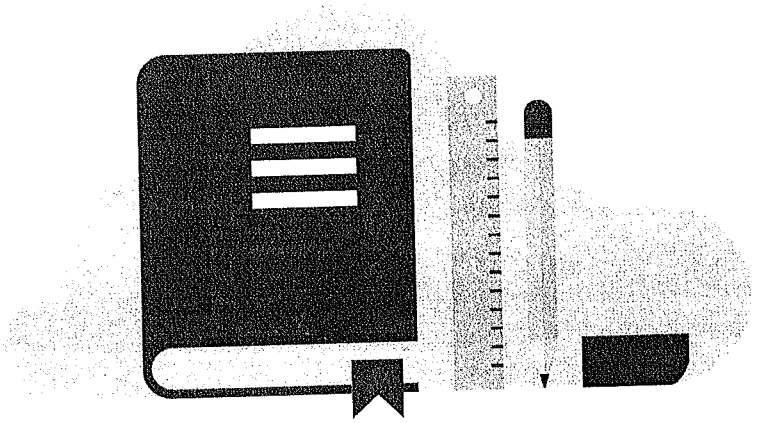
Class: XII
SESSION : 2022-2023
CBSE SAMPLE QUESTION PAPER (THEORY)
SUBJECT: PHYSICS

Maximum Marks: 70 Marks **Time Allowed**: 3 hours.

General Instructions:

(1) There are 35 questions in all. All questions are compulsory
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
(3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study based questions of 4 marks each.
(4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.
5. Use of calculators is not allowed.

Note → Try to attempt 5 Mark Section & 3 Mark Section in first one hr. of your exam.
→ 1 Mark section is for last 45 minute of your exam.
→ Carry Complete Geometry box with pencil.



Chapter 1-2 Revision Notes

ELECTROSTATICS

ELECTRIC CHARGES & FIELD.

ELECTROSTATIC POTENTIAL & CAPACITANCE.

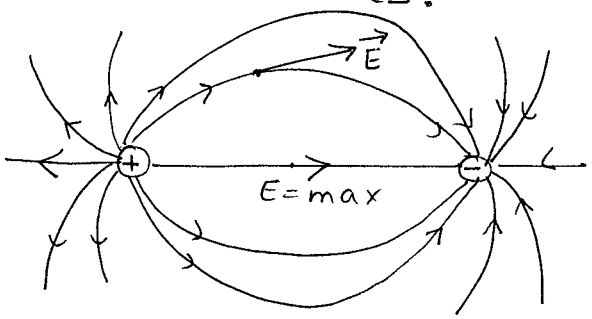
Topics:- Force (F), Field (E), FLUX (Φ), POTENTIAL (V) & CAPACITANCE (C)

IMPORTANT TOPICS:

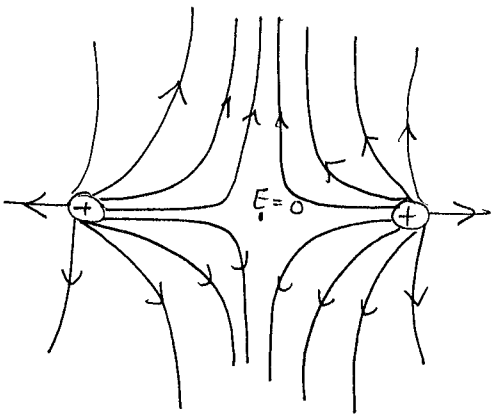
Lets start with quick Revision. of Theory & formula's.

TOPIC's 1. charge:- $q = \pm ne$

2. FIELD LINES:-



$q_1 q_2 < 0$ (attraction)



$q_1 q_2 > 0$ (Repulsion)

TOPIC 2. Quantities with Force constant $K = \frac{1}{4\pi\epsilon_0} = 9\times10^9\ Nm^2C^{-2}$.

$$F = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r^2}$$ → Force between two charges (Coulomb's law)

$$E = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}$$ → Electric field Intensity at a point

$$V = \frac{1}{4\pi\epsilon_0}\frac{q}{r}$$ → Electric Potential at a point

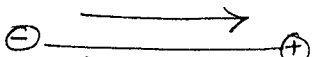
$$U = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r}$$ → Electrostatic Potential energy between two charges

$$\phi = \oint \vec{E}\cdot d\vec{s} = \frac{q}{\epsilon_0}$$ → Electric flux. (Gauss law)

Note $\epsilon_0 = 8.85\times10^{-12}\ N^{-1}m^{-2}C^2$. [for free space]

Topic (3) ELECTRIC DIPOLE (Dipole Moment $\vec{p}$)

Strength between two equal & opposite charges.



$$P = q(2a)$$

* * * Five formulas associated with Electric dipole:-

a) Electric field at axial line of dipole (short)

$$E = \frac{2P}{4\pi\epsilon_0 r^3}$$

b) Electric field at equatorial line of dipole (short)

$$E = \frac{P}{4\pi\epsilon_0 r^3}$$

c) Torque experienced by electric dipole inside Uniform $\vec{E}$ field:-

$$\tau = PE\sin\theta$$

d) P.E stored or work done to move dipole from unstable state to stable state:-

$$U = -PE(\cos\theta_2 - \cos\theta_1)$$

* * e) Potential at a point due to ~~set~~ electric dipole (Important for board exam.) *

$$V = \frac{P\cos\theta}{4\pi\epsilon_0(r^2 - a^2\cos^2\theta)}$$

V at axial line $= \frac{P}{4\pi\epsilon_0(r^2 - a^2)}$ $(\theta = 0^\circ)$

V at equatorial line $= 0$ $(\theta = 90^\circ)$

TOPIC ④ CAPACITANCE [C] → S.I unit farad (F) $C = \frac{q}{V}$

10 Important formulas:-

1) Parallel plate capacitor: (air filled) $C = \frac{\epsilon_0 A}{d}$

2) Parallel plate capacitor (medium filled) $C = K\frac{\epsilon_0 A}{d}$

3) Parallel plate capacitor (Conducting slab) $C = \frac{\epsilon_0 A}{d-t}$

4) Parallel Plate Capacitor (dielectric slab) $C = \frac{\epsilon_0 A}{d - t + \frac{t}{K}}$

5) Isolated Sphere. Capacitor. $C = 4\pi\epsilon_0 r$

6) Spherical Capacitor. (Concentric spheres) $C = 4\pi\epsilon_0 \frac{r_1 r_2}{(r_2 - r_1)}$

7) Cylindrical Capacitor. $C = 2\pi\epsilon_0 \frac{l}{\log_e\left(\frac{r_2}{r_1}\right)}$

8) Energy stored in Capacitor:- $E = \frac{1}{2}CV^2$

9) Capacitors in Series. $C = C_1 + C_2 + C_3$

10) Capacitors in parallel $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$

Topic ⑤ Properties of equipotential Surfaces:-

a) They are always perpendicular to the direction of field.

b) Work done to move a charge from one point to another on these surfaces is zero.

c) The space in between them shows the strength of electric field.

TOPIC (6) GAUSS LAW:-

$$\phi_E = \oint \vec{E} \cdot \vec{ds} = EA\cos\theta = \frac{q}{\epsilon_0}$$

APPLICATIONS OF GAUSS LAW:-

1. Electric field due to line charge $\left(\lambda = \frac{q}{l}\right)$

$$E = \frac{\lambda}{2\pi\epsilon_0 r}$$

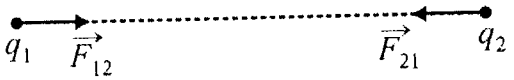
2. Electric field due to charge sheet $\left(\sigma = \frac{q}{A}\right)$

$$E = \frac{\sigma}{2\epsilon_0}$$

3. Electric field due to charged shell $\left(\sigma = \frac{q}{A}\right)$

$$E = \frac{\sigma r^2}{\epsilon_0 R^2}$$

SECTION A 1-MARK QUESTIONS

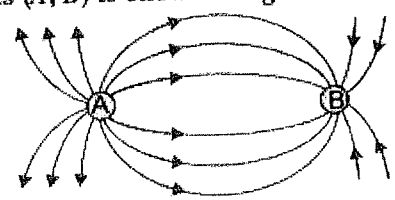
Q. NO.		MARKS
1	**According to Coulomb's law, which is the correct relation for the following figure?**  (i) $q_1 q_2 > 0$ (ii) $q_1 q_2 < 0$ (iii) $q_1 q_2 = 0$ (iv) $1 > q_1/q_2 > 0$	1
2	**The electric potential on the axis of an electric dipole at a distance 'r from it's centre is V. Then the potential at a point at the same distance on its equatorial line will be** (i) 2V (ii) -V (iii) V/2 (iv) Zero	1

CBSE SAMPLE PAPER for (2023)

For:- (2023)

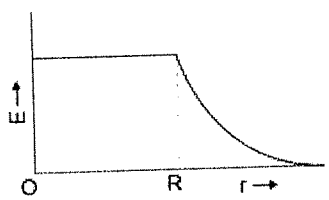
Ans:-

3. The unit of permittivity of free space (ε_0) is
   (a) $CN^{-1}m^{-1}$ (b) Nm^2C^{-2} (c) $C^2N^{-1}m^{-2}$ (d) $C^2N^{-2}m^{-2}$
4. Which of the following is not a property of field lines?
   (a) Field lines are continuous curves without any breaks
   (b) Two field lines cannot cross each other
   (c) Field lines start at positive charges and end at negative charges
   (d) They form closed loops
5. Gauss's law is valid for
   (a) Any closed surface (b) Only regular closed surfaces
   (c) Any open surface (d) Only irregular open surfaces.
6. The spatial distribution of the electric field due to two charges (A, B) is shown in figure. Which one of the following statements is correct?

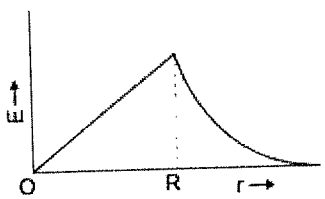


   (a) A is + ve and B is – ve and $|A| > |B|$
   (b) A is – ve and B is + ve, $|A| = |B|$
   (c) Both are + ve but $A > B$
   (d) Both are – ve but $A > B$
7. The electric field due to a uniformly charged sphere of radius R as a function of the distance from its centre is represented graphically by

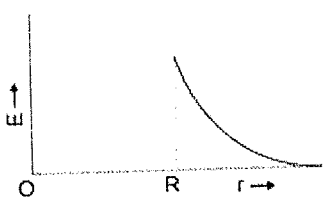
(a)



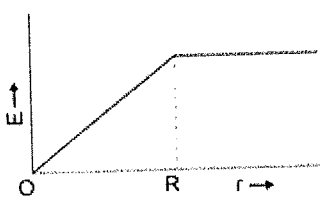
(b)



(c)



(d)



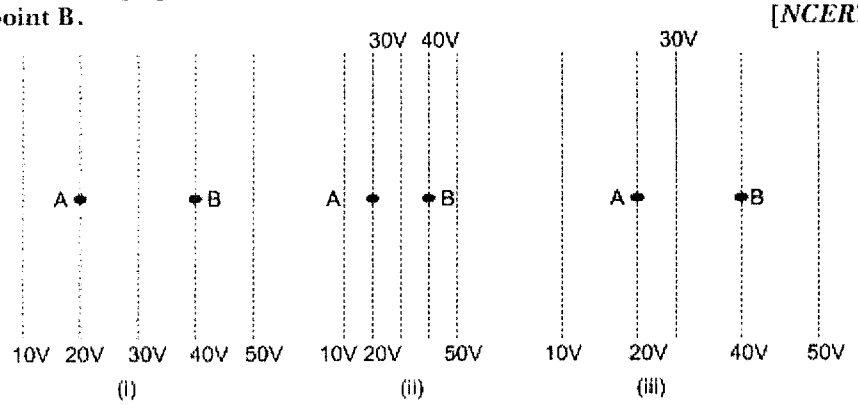
Space for answers:-

(Note while marking the option circle it and make it dark).

like (a)
(b)
●
(d)

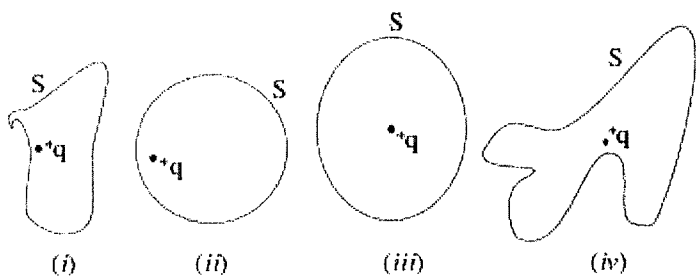
8. A positively charged particle is released from rest in an uniform electric field. The electric potential energy of the charge [*NCERT Exemplar*]
   (*a*) remains a constant because the electric field is uniform.
   (*b*) increases because the charge moves along the electric field.
   (*c*) decreases because the charge moves along the electric field.
   (*d*) decreases because the charge moves opposite to the electric field.

9. Figure shows some equipotential lines distributed in space. A charged object is moved from point A to point B. [*NCERT Exemplar*]



   (*a*) The work done in Fig. (*i*) is the greatest.
   (*b*) The work done in Fig. (*ii*) is least.
   (*c*) The work done is the same in Fig. (*i*), Fig. (*ii*) and Fig. (*iii*).
   (*d*) The work done in Fig. (*iii*) is greater than Fig. (*ii*) but equal to that in Fig. (*i*).

10. The Electric flux through the surface [*NCERT Exemplar*]



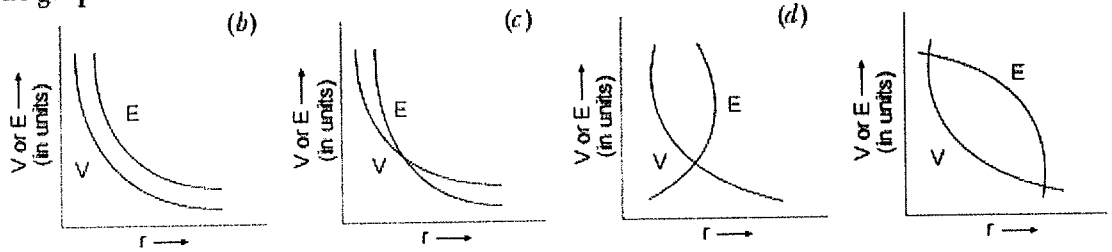
   (*a*) in Fig. (*iv*) is the largest.
   (*b*) in Fig. (*iii*) is the least.
   (*c*) in Fig. (*ii*) is same as Fig. (*iii*) but is smaller than Fig. (*iv*)
   (*d*) is the same for all the figures.

11. A hemisphere is uniformly charged positively. The electric field at a point on a diameter away from the centre is directed [*NCERT Exemplar*]
   (*a*) perpendicular to the diameter (*b*) parallel to the diameter
   (*c*) at an angle tilted towards the diameter (*d*) at an angle tilted away from the diameter

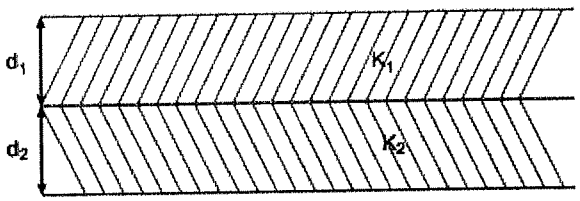
12. A point charge $+q$, is placed at a distance d from an isolated conducting plane. The field at a point P on the other side of the plane is
   (*a*) directed perpendicular to the plane and away from the plane.
   (*b*) directed perpendicular to the plane but towards the plane.
   (*c*) directed radially away from the point charge.
   (*d*) directed radially towards the point charge.

13. The variation potential V with r and electric field E with r for a point charge is correctly shown in the graphs.

(a) (b) (c) (d)



14. A parallel plate capacitor is made of two dielectric blocks in series. One of the blocks has thickness d_1 and dielectric constant k_1 and the other has thickness d_2 and dielectric constant k_2 as shown in figure. This arrangement can be thought as a dielectric slab of thickness d $(= d_1 + d_2)$ and effective dielectric constant k. The k is [*NCERT Exemplar*]



(a) $\frac{k_1 d_1 + k_2 d_2}{d_1 + d_2}$ (b) $\frac{k_1 d_1 + k_2 d_2}{k_1 + k_2}$ (c) $\frac{k_1 k_2 (d_1 + d_2)}{k_1 d_1 + k_2 d_2}$ (d) $\frac{2k_1 k_2}{k_1 + k_2}$

15. Equipotential surfaces [*NCERT Exemplar*]

(a) are closer in regions of large electric fields compared to regions of lower electric fields.

(b) will be more crowded near sharp edges of a conductor.

(c) will be more crowded near regions of large charge densities.

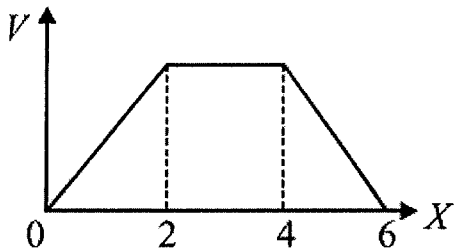
(d) will always be equally spaced.

(OR)

Solutions:-

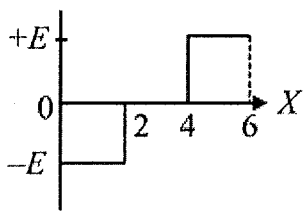
CBSE SAMPLE PAPER QUESTION FOR- 2023 exam:-

15. **The electric potential V as a function of distance X is shown in the figure.**

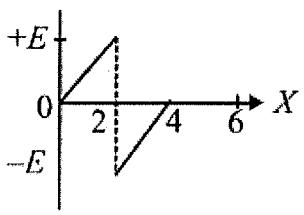


The graph of the magnitude of electric field intensity E as a function of X is

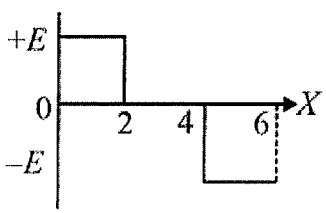
(i)



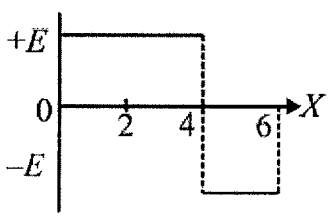
(ii)



(iii)



(iv)



ASSERTION- REASONING TYPE QUESTIONS

Two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true and R is NOT the correct explanation of A

c) A is true but R is false

d) A is false and R is also false

16. Assertion(A): The capacitance of a conductor does not depend on the charge given to it.
Reason (R): The capacitance of a conductor depends only on geometry and size of conductor.

option _____

17. Assertion(A): If a proton and an electron a replaced in the same uniform electric field, they experience different acceleration.
Reason (R): Electric force on a test charge is independent of its mass.

option _____

OR

● Assertion(A): A point charges is placed at the centre of a sphere of radius R. The radius of sphere is increased to $2R$, the electric flux through the surface will remain unchanged.
Reason (R): According to Gauss's theorem the electric flux $\phi = \frac{1}{\varepsilon_0} \times$ charge enclosed by surface, is independent of the radius of spherical surface.

option _____

18. Assertion(A): When charged capacitors are connected in parallel, the algebraic sum of charges remains constant but there is a loss of energy.
Reason (R): During sharing a charges, the energy conservation law does not hold.

option _____

OR

● Assertion(A): The capacitance of a parallel plate capacitor increases with increase of distance between the plates.
Reason (R): Capacitance of a parallel plate capacitor *i.e.*, $C \propto d$

option. _____

SECTION B 2-MARK QUESTIONS

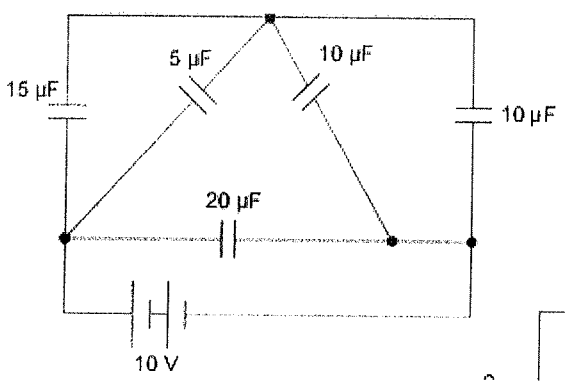
CBSE SAMPLE PAPER QUESTION. (2023).

19. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude 17.7×10^{-22} C/m^2. What is electric field intensity E:

(a) in the outer region of the first plate, and

(b) between the plates?

20. The figure shows a network of five capacitors connected to a 10 V battery. Calculate the charge acquired by the 5 μF capacitor. *[CBSE 2019 (55/3/3)]*



Ans.

21. Draw 3 equipotential surfaces corresponding to a field that uniformly increases in magnitude but remains constant along Z-direction. How are these surfaces different from that of a constant electric field along Z-direction? [*CBSE (AI) 2009*]

Ans.

22. Define electric dipole moment. Is it a scalar or a vector quantity? What are its SI unit? [*CBSE (AI) 2011, 2013, (F) 2009, 2012, 2013*]

Ans.

OR

Depict the orientation of the dipole in (a) stable, (b) unstable equilibrium in a uniform electric field. [*CBSE Delhi 2017*]

Ans:-

23. 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. *[CBSE 2019 (55/1/1)]*

Ans.

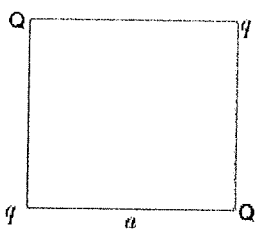
24. Three point charges q, $-4q$ and $2q$ are placed at the vertices of an equilateral triangle ABC of side 'l' as shown in the figure. Obtain the expression for the magnitude of the resultant electric force acting on the charge q. *[CBSE 2018]*

Ans.

OR

HOTS.

◉ Four point charges Q, q, Q and q are placed at the corners of a square of side 'a' as shown in the figure. Find the resultant electric force on a charge Q. *[CBSE 2018]*



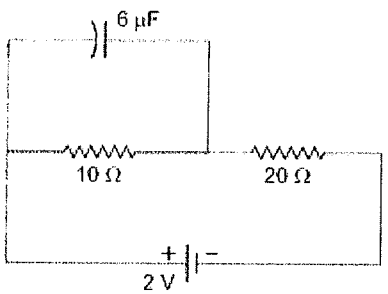
Ans:-

25. Consider two conducting spheres of radii R_1 and R_2 with $R_1 > R_2$. If the two are at the same potential, the larger sphere has more charge than the smaller sphere. State whether the charge density of the smaller sphere is more or less than that of the larger one.
[*HOTS*][*NCERT Exemplar*]

Ans.

OR

Find the charge on the capacitor as shown in the circuit.
[*CBSE (F) 2014*]



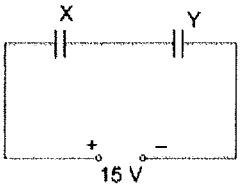
Ans.

SECTION C 3-MARK QUESTIONS

26. A parallel plate capacitor is charged by a battery, which is then disconnected. A dielectric slab is then inserted in the space between the plates. Explain what changes, if any, occur in the values of
(*i*) capacitance
(*ii*) potential difference between the plates
(*iii*) electric field between the plates, and
(*iv*) the energy stored in the capacitor. [*CBSE Delhi 2010, (AI) 2009, 2012*]

Ans.

27. Two parallel plate capacitors X and Y have the same area of plates and same separation between them. X has air between the plates while Y contains a dielectric medium $\varepsilon_r = 4$.



(*i*) Calculate the capacitance of each capacitor if equivalent capacitance of the combination is 4 μF.

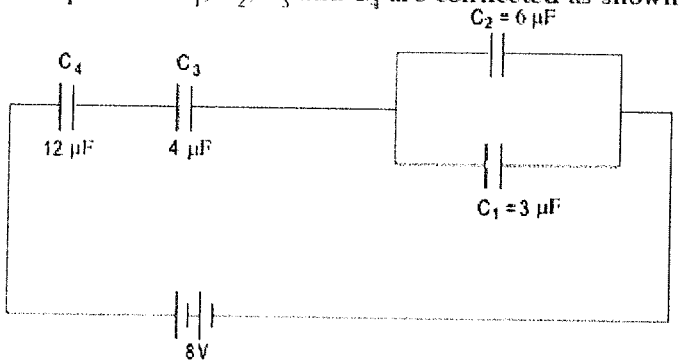
(*ii*) Calculate the potential difference between the plates of X and Y.

(*iii*) Estimate the ratio of electrostatic energy stored in X and Y.

[*CBSE Delhi 2016*]

Ans.

28. In a network, four capacitors C_1, C_2, C_3 and C_4 are connected as shown in the figure.



(*a*) Calculate the net capacitance in the circuit.

(*b*) If the charge on the capacitor C_1 is 6 μC, (*i*) calculate the charge on the capacitors C_3 and C_4, and (*ii*) net energy stored in the capacitors C_3 and C_4 connected in series.

[*CBSE 2019 (55/2/3)*]

Ans.

CBSE (AI) 2014.

29. If N drops of same size each having the same charge, coalesce to form a bigger drop. How will the following vary with respect to single small drop? [*CBSE Sample Paper* 2017]

(*i*) Total charge on bigger drop

(*ii*) Potential on the bigger drop

(*iii*) Capacitance

Ans.

OR

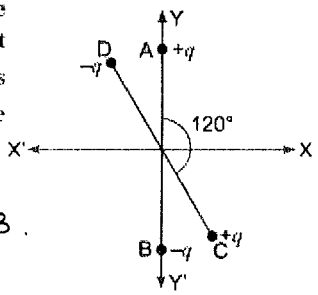
A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge 'Q'. A charge 'q' is placed at the centre of the shell.

(*a*) What is the surface charge density on the (*i*) inner surface, (*ii*) outer surface of the shell?

(*b*) Write the expression for the electric field at a point $x > r_2$ from the centre of the shell.

Ans:- [*CBSE (AI) 2010*]

30. Two small identical electrical dipoles AB and CD, each of dipole moment 'p' are kept at an angle of 120° as shown in the figure. What is the resultant dipole moment of this combination? If this system is subjected to electric field ($\vec{E}$) directed along $+X$ direction, what will be the magnitude and direction of the torque acting on this?



[*CBSE Delhi 2011, 2020 (55/2/1)*]

Ans. Resultant dipole moment

2016, (H.P) 2013.

$$\vec{p}_r = \sqrt{p_1^2 + p_2^2 + 2p_1 p_2 \cos 120°}$$

OR

30.* Two charges q and $-3q$ are placed fixed on x-axis separated by distance 'd'. Where should a third charge $2q$ be placed such that it will not experience any force? [*NCERT Exemplar*]

Ans.

SECTION D 5-MARK QUESTIONS

31. (a)Draw equipotential surfaces for (i)an electric dipole and (ii) two identical positive charges placed near each other.
(b) In a parallel plate capacitor with air between the plates, each plate has an area of $6 \times 10^{-3} m^2$ and the separation between the plates is 3 mm.
(i) Calculate the capacitance of the capacitor.
(ii) If the capacitor is connected to 100V supply, what would be the the charge on each plate?
(iii) How would charge on the plate be affected if a 3 mm thick mica sheet of k=6 is inserted between the plates while the voltage supply remains connected ?.

CBSE sample paper (2023)

Solution :-

31. **OR**
(a)Three charges –q, Q and –q are placed at equal distances on a straight line. If the potential energy of the system of these charges is zero, then what is the ratio Q:q?
(b)(i) Obtain the expression for the electric field intensity due to a uniformly charged spherical shell of radius R at a point distant r from the centre of the shell outside it.
(ii) Draw a graph showing the variation of electric field intensity E with r, for r > R and r < R.

CBSE sample paper (2023)

Ans:-

32. (*a*) Find expressions for the force and torque on an electric dipole kept in a uniform electric field.

OR [*CBSE (AI) 2014; 2019 (55/5/1); 2020 (55/3/1)*]

An electric dipole is held in a uniform electric field. (*i*) Using suitable diagram show that it does not undergo any translatory motion, and (*ii*) derive an expression for torque acting on it and specify its direction.

(*b*) Derive an expression for the work done in rotating a dipole from the angle θ_0 to θ_1 in a uniform electric field E. [*CBSE East 2016*]

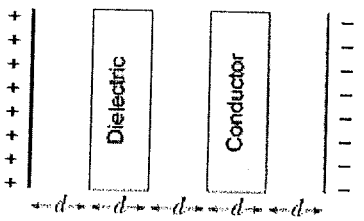
Ans:-

33. (*i*) Compare the individual dipole moment and the specimen dipole moment for H_2O molecule and O_2 molecule when placed in

(*a*) Absence of external electric field

(*b*) Presence of external eclectic field. Justify your answer. CBSE (Delhi) 2015.

(*ii*) Given two parallel conducting plates of area A and charge densities $+\sigma$ and $-\sigma$. A dielectric slab of constant K and a conducting slab of thickness d each are inserted in between them as shown.



(*a*) Find the potential difference between the plates.

(*b*) Plot E versus x graph, taking $x = 0$ at positive plate and $x = 5d$ at negative plate.

[*CBSE Sample Paper 2016*]

Ans:- (i)

SECTION E 4-MARK QUESTIONS

How Do You Solve Case Study questions?

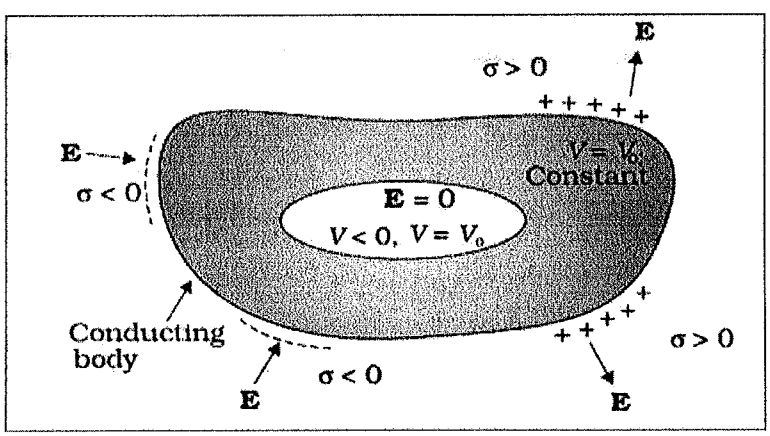
There are several steps to writing an answer to a case study assignment:

1. STEP 1: READ THE CASE STUDY AND QUESTIONS CAREFULLY. • ...
2. STEP 2: IDENTIFY THE ISSUES IN THE CASE STUDY. ...
3. STEP 3: LINK THEORY TO PRACTICE. ...
4. STEP 4: PLAN YOUR ANSWER. ...
5. STEP 5: START WRITING YOUR CASE STUDY ANSWER. ...
6. STEP 6: EDIT AND PROOFREAD. ...
7. STEP 7: SUBMIT.

Q. 34 & 35.

CASE STUDY BASED QUESTIONS

Q.1 The electric field inside the cavity is zero, whatever be the size and shape of the cavity and whatever be the charge on the conductor and the external fields in which it might be placed. The electric field inside a charged spherical shell is zero. But the vanishing of electric field in the (charge-free) cavity of a conductor



is, as mentioned above, a very general result. A related result is that even if the conductor is charged or charges are induced on a neutral conductor by an external field, all charges reside only on the outer surface of a conductor with cavity.

The proofs of the results noted in Fig. are omitted here, but we note their important implication. Whatever be the charge and field configuration outside, any cavity in a conductor remains shielded from outside electric influence: the field inside the cavity is always zero. This is known as electrostatic shielding. The effect can be made use of in protecting sensitive instruments from outside electrical influence.

READ THE ABOVE PARAGRAPH AND ANSWER THE QUESTION

(1) A metallic shell having inner radius R_1 and outer radii R_2 has a point charge Q kept inside cavity. Electric field in the region $R_1 < r < R_2$ where r is the distance from the centre is given by
(a) depends on the value of r
(b) Zero
(c) Constant and nonzero everywhere
(d) None of the above

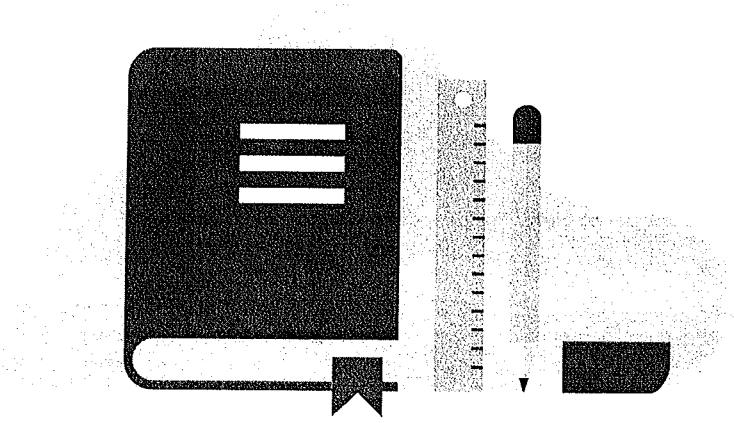
(2) The electric field inside the cavity is depend on
(a) Size of the cavity
(b) Shape of the cavity
(c) Charge on the conductor
(d) None of the above

(3) Electrostatic shielding is based
(a) electric field inside the cavity of a conductor is less than zero
(b) electric field inside the cavity of a conductor is zero
(c) electric field inside the cavity of a conductor is greater than zero
(d) electric field inside the cavity of a plastic is zero

(4) During the lightning thunderstorm, it is advised to stay
(a) inside the car
(b) under trees
(c) in the open ground
(d) on the car

(5) Which of the following material can be used to make a Faraday cage (based on electrostatic shielding)
(a) Plastic
(b) Glass
(c) Copper
(d) Wood

Answer: 1. b 2. d 3. b 4. a 5. c



Chapter 3 Revision Notes

CURRENT ELECTRICITY

IMPORTANT TOPICS:

Lets start with Revision of theory & formulas.

1. E.M.F of a cell:- highest value of potential difference when cell is in open circuit.

Potential difference of two points across a cell.

a) $V = E - Ir$

b) $V = E + Ir$

c) $V = E$

d) $V = IR$.

2. OHM'S LAW $\boxed{\frac{V}{I} = R = \text{Constant}}$

2nd form of ohm's law:- $\boxed{E = \rho J \text{ or } \sigma = \frac{J}{E}}$

J = Current density $= \frac{I}{A}$

3. Drift Velocity & Mobility

$v_d = -\frac{eEc}{m}$ $\qquad \mu = \frac{|v_d|}{E}$.

4 Relation between Current & drift Velocity

$\boxed{I = Ane v_d.}$

5. Effect of temperature on Resistance (Conductors)

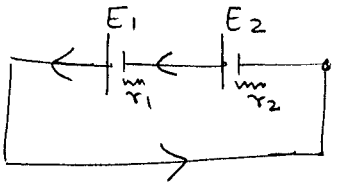
$T \propto R$

$R_T = R_0(1 + \alpha \Delta T)$

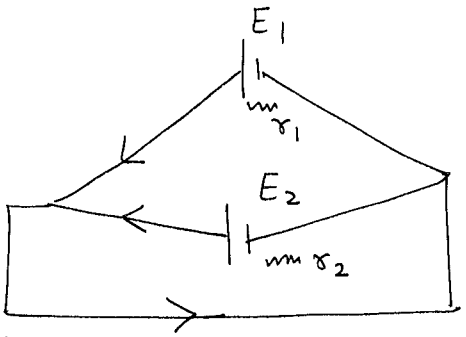
Note Resistance $\boxed{R = \frac{V}{I} = \frac{m l}{ne^2 c A} = \rho \frac{l}{A}.}$ ρ = Resistivity

IMPORTANT TOPICS:

6. Cells in Series & Parallel.



$$E = E_1 + E_2$$



$$\frac{E}{r_{eq.}} = \frac{E_1}{r_1} + \frac{E_2}{r_2}$$

7. Kirchhoff's laws:-

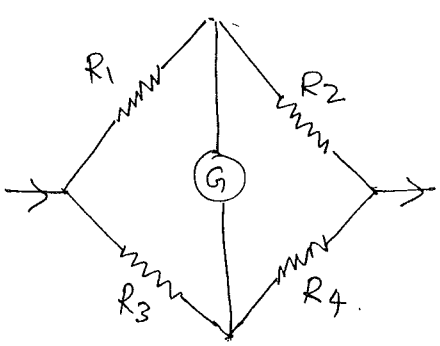
Ist law:- $\sum I_{junction} = 0$

IInd law:- $\sum V_{loop} = \sum E \pm \sum IR = 0$

8. WHEAT STONE BRIDGE :-

If Galvanometer (G) shows no deflection $I_g = 0$ then the bridge is balanced.

$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$



9. Potentiometer (definition & formula only)

Device used to measure potential difference in terms of length.

$$V \propto l$$

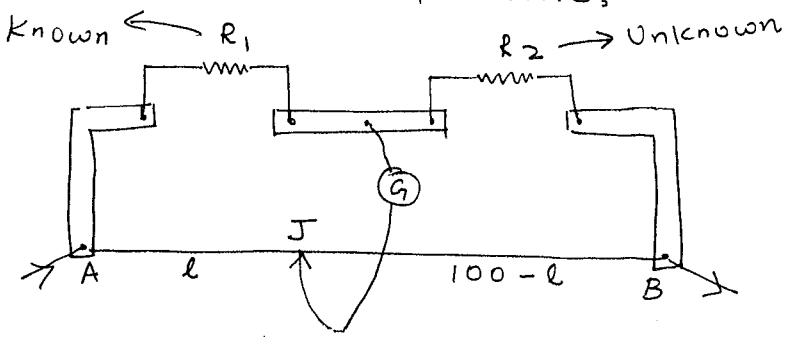
$$V = kl$$

10. METER BRIDGE. (SLIDE WIRE BRIDGE)

Device used to find Unknown Resistance of a wire:-

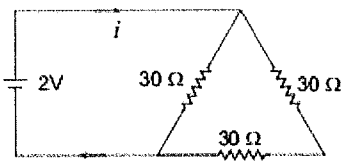
$$\frac{R_1}{R_2} = \frac{l}{100-l}$$

$$R_2 = \left(\frac{100-l}{l}\right) R_1$$



SECTION A 1-MARK QUESTIONS

1. Two resistors of resistance R_1 and R_2 having $R_1 > R_2$ are connected in parallel. For equivalent resistance R, the correct statement is:
   (a) $R > R_1 + R_2$ (b) $R_1 < R_1 < R_2$
   (c) $R_2 < R_1 < (R_1 + R_2)$ (d) $R < R_2 < R_1$
2. The current in the adjoining circuit will be
   (a) $\frac{1}{45}$ A (b) $\frac{1}{15}$ A
   (c) $\frac{1}{10}$ A (d) $\frac{1}{5}$ A



3	**The temperature (T) dependence of resistivity of materials A and material B is represented by fig (i) and fig (ii) respectively. Identify material A and material B.**

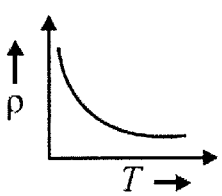


fig. (i)

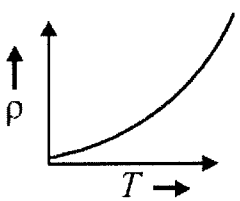


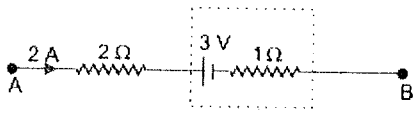
fig. (ii)

CBSE SAMPLE Paper For – 2023 6th March exam.

(i) material A is copper and material B is germanium
(ii) material A is germanium and material B is copper
(iii) material A is nichrome and material B is germanium
(iv) material A is copper and material B is nichrome

Solution:–

4. Figure represents a part of a closed circuit. The potential difference between points A and B $(V_A - V_B)$ is



(a) +9 V (b) − 9 V (c) +3 V (d) + 6 V

5. A student connects 10 dry cells each of emf E and internal resistance r in series, but by mistake the one cell gets wrongly connected. Then net emf and net internal resistance of the combination will be

(a) $8E, 8r$ (b) $8E, 10r$ (c) $10E, 10r$ (d) $8E, \frac{r}{10}$

6. A metal rod of length 10 cm and a rectangular cross-section of 1cm × $\frac{1}{2}$cm is connected to a battery across opposite faces. The resistance will be [*NCERT Exemplar*]

(a) maximum when the battery is connected across 1 cm × $\frac{1}{2}$ cm faces.

(b) maximum when the battery is connected across 10 cm × 1 cm faces.

(c) maximum when the battery is connected across 10 cm × $\frac{1}{2}$ cm faces.

(d) same irrespective of the three faces.

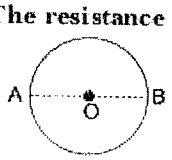
7. Which of the following characteristics of electrons determines the current in a conductor? [*NCERT Exemplar*]

(a) Drift velocity alone
(b) Thermal velocity alone
(c) Both drift velocity and thermal velocity
(d) Neither drift nor thermal velocity.

8. Temperature dependence of resistivity ρ(T) of semiconductors insulators and metals is significantly based on the following factors. [*NCERT Exemplar*]

(a) Number of charge carriers can change with temperature T.
(b) Time interval between two successive collision can depend on T.
(c) Length of material can be a function of T.
(d) Mass of carriers is a function of T.

9. A wire of resistance 12Ω/m is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points A and B as shown in figure is

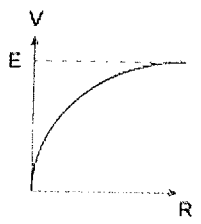


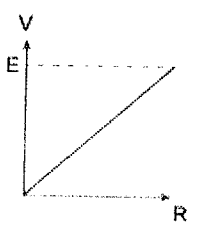
(a) 3 Ω (b) 6 πΩ (c) 6 Ω (d) 0.6 πΩ

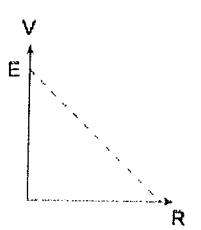
10. Kirchhoff's junction rule is a reflection of [*NCERT Exemplar*]

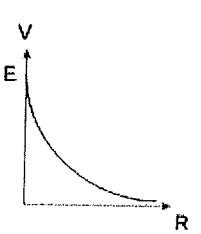
(a) conservation of current density vector.
(b) conservation of charge.
(c) the fact that the momentum with which a charged particle approaches a junction is unchanged (as a vector) as the charged particle leaves the junction.
(d) the fact that there is no accumulation of charged at a junction.

11. A cell of emf E and internal resistance r is connected across an external resistor R. The graph showing the variation of P.D. across R versus R is

(a) 

(b) 

(c) 

(d) 

12. In a Wheatstone bridge, all the four arms have equal resistance R. If resistance of the galvanometer arm is also R, then equivalent resistance of the combination is

(a) R (b) $2R$ (c) $\frac{R}{2}$ (d) $\frac{R}{4}$

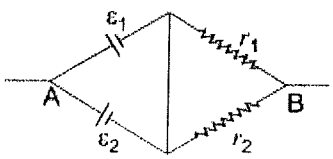
13. Two batteries of emf ε_1 and ε_2 ($\varepsilon_2 > \varepsilon_1$) and internal resistances r_1 and r_2 respectively are connected in parallel as shown in Figure. [*NCERT Exemplar*]

(a) The equivalent emf ε_{eq} of the two cells is between ε_1 and ε_2, *i.e.*, $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$

(b) The equivalent emf ε_{eq} is smaller than ε_1.

(c) The ε_{eq} is given by $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2$ always.

(d) ε_{eq} is independent of internal resistances r_1 and r_2.



14. The drift velocity of the free electrons in a conducting wire carrying a current i is v. If in a wire of the same metal, but of double the radius, the current be $2I$, then the drift velocity of the electrons will be

(a) $v/4$ (b) $v/2$ (c) v (d) $4v$

15. A resistance R is to be measured using a meter bridge. Student chooses the standard resistance S to be 100 Ω. He finds the null point at l_1 = 2.9 cm. He is told to attempt to improve the accuracy. Which of the following is a useful way? [*NCERT Exemplar*]

(a) He should measure l_1 more accurately.

(b) He should change S to 1000 Ω and repeat the experiment.

(c) He should change S to 3 Ω and repeat the experiment.

(d) He should give up hope of a more accurate measurement with a meter bridge.

Answers:- (Note this Module is self practice Module so try to work hard on these questions).

ASSERTION- REASONING TYPE QUESTIONS

Two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true and R is NOT the correct explanation of A

c) A is true but R is false

d) A is false and R is also false

16. Assertion(A): The current density is a vector quantity.
Reason (R): Current density has magnitude current per unit area and is directed along the direction of current.

option _____

17. Assertion(A): The drift velocity of electrons in a metallic conductor decreases with rise of temperature of conductor.
Reason (R): On increasing temperature, the collision of electrons with lattice ions increases; this hinders the drift of electrons.

option. _____

18. Assertion(A): The connecting wires are made of copper.
Reason (R): Copper has very high electrical conductivity.

option _____

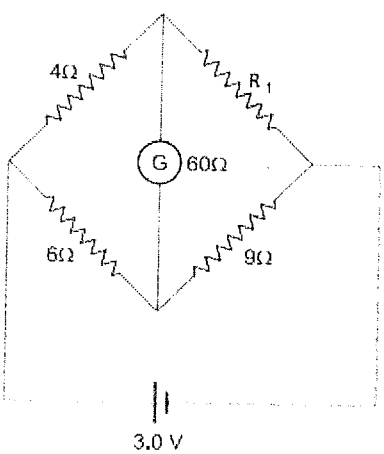
SECTION B 2-MARK QUESTIONS

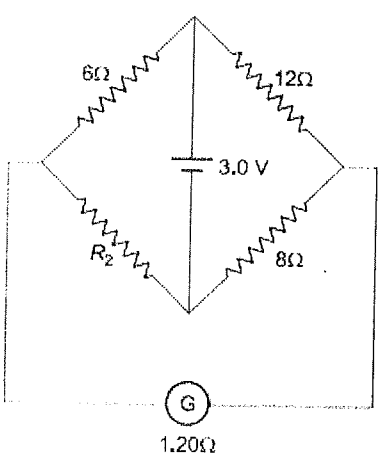
19. A set of 'n' identical resistors, each of resistance 'R' when connected in series have an effective resistance 'X'. When they are connected in parallel, their effective resistance becomes 'Y'. Find out the product of X and Y. *[CBSE 2019 (55/5/1)]*

Ans.

20. Figure shows two circuits each having a galvanometer and a battery of 3 V. When the galvanometers in each arrangement do not show any deflection, obtain the ratio $\frac{R_1}{R_2}$.

[CBSE (AI) 2013]





Ans.

21. Answer the following:

(*a*) Why are the connections between the resistors in a meter bridge made of thick copper strips?

(*b*) Why is it generally preferred to obtain the balance point in the middle of the meter bridge wire?

(*c*) Which material is used for the meter bridge wire and why? *[CBSE (AI) 2014] [HOTS]*

Ans.

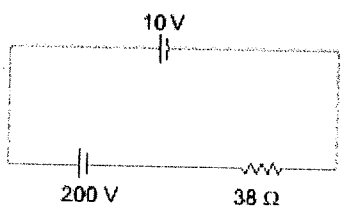
22. First a set of n equal resistors of R each are connected in series to a battery of emf E and internal resistance R. A current I is observed to flow. Then the n resistors are connected in parallel to the same battery. It is observed that the current is increased 10 times. What is n?

Ans. *[NCERT Exemplar] [HOTS]*

23. Two electric bulbs have the following specifications.
(*i*) 100 W at 220 V (*ii*) 1000 W at 220 V.
Which bulb has higher resistance? What is the ratio of their resistances?

Ans.

24. A 10 V cell of negligible internal resistance is connected in parallel across a battery of emf 200 V and internal resistance 38 Ω as shown in the figure. Find the value of current in the circuit.



Ans.

25. **Define the terms (*i*) drift velocity, (*ii*) relaxation time.** ***[CBSE Delhi 2011, (AI) 2013]***

Ans:- Try to complete your Focus NCERT/CBSE Modules to cover this type of questions.....

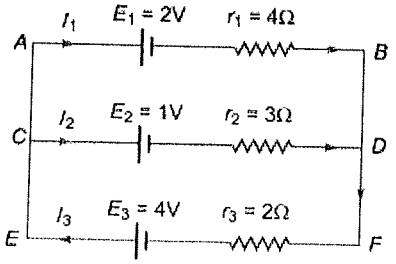
SECTION C 3-MARK QUESTIONS

26. Show, on a plot, variation of resistivity of (*i*) a conductor, and (*ii*) a typical semiconductor as a function of temperature.

Using the expression for the resistivity in terms of number density and relaxation time between the collisions, explain how resistivity in the case of a conductor increases while it decreases in a semiconductor, with the rise of temperature. *[CBSE 2019 (55/2/1)]*

Solution:-

27. 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. [*CBSE (AI) 2010*]



Ans. **Kirchhoff's Rules:**

(*i*) The algebraic sum of currents meeting at any junction is zero, *i.e.*,

$$\Sigma I = 0$$

(*ii*) The algebraic sum of potential differences across circuit elements of a closed circuit is zero, *i.e.*, $\Sigma V = 0$

From Kirchhoff's first law

$$I_3 = I_1 + I_2 \qquad \ldots(i)$$

Applying Kirchhoff's second law to mesh *ABDCA*

$$-2 - 4I_1 + 3I_2 + 1 = 0$$

$$\Rightarrow \quad 4I_1 - 3I_2 = -1 \qquad \ldots(ii)$$

Applying Kirchhoff's second law to mesh *ABFEA*

$$-2 - 4I_1 - 2I_3 + 4 = 0$$

$$\Rightarrow \quad 4I_1 + 2I_3 = 2 \text{ or } 2I_1 + I_3 = 1$$

Using (*i*) we get

$$\Rightarrow \quad 2I_1 + (I_1 + I_2) = 1$$

$$\text{or} \quad 3I_1 + I_2 = 1 \qquad \ldots(iii)$$

Solving (*ii*) and (*iii*), we get

$$I_1 = \frac{2}{13}\text{A}, I_2 = 1 - 3I_1 = \frac{7}{13}\text{A}$$

$$\text{so,} \quad I_3 = I_1 + I_2 = \frac{\mathbf{9}}{\mathbf{13}}\mathbf{A}$$

28. (*a*) Give reason:

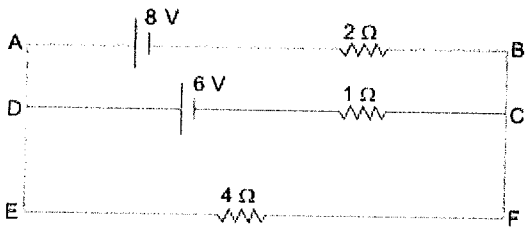
(*i*) Why the connections between the resistors in a metre bridge are made of thick copper strips,

H.B Board. 2014.

(*ii*) Why is it generally preferred to obtain the balance length near the mid-point of the bridge wire.

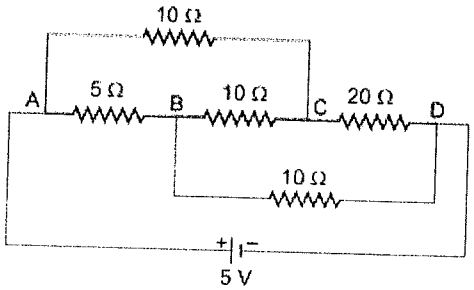
(*b*) Calculate the potential difference across the 4Ω resistor in the given electrical circuit, using Kirchhoff's rules.

[*CBSE 2019 (55/2/1)*]



Ans.

29. Calculate the value of the current drawn from a 5 V battery in the circuit as shown.



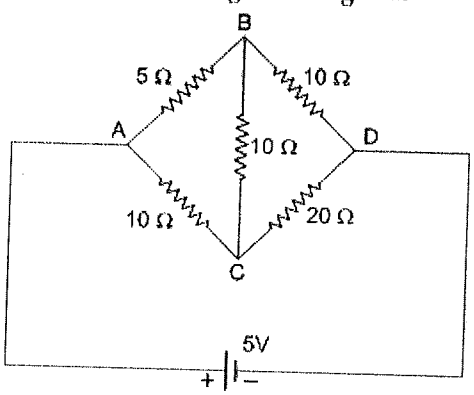
Ans. [*CBSE (F) 2013*]

The equivalent wheatstone bridge for the given combination is shown in figure alongside.

The resistance of arm ACD, $R_{S_1} = 10 + 20 = 30\Omega$

Also, the resistance of arm ABD, $R_{S_2} = 5 + 10 = 15\Omega$

Since the condition $\frac{P}{Q} = \frac{R}{S}$ is satisfied, it is a balanced bridge.



No current flows along arm BC.

$\therefore$ Equivalent resistance $R_{eq} = \frac{R_{S_1} \times R_{S_2}}{R_{S_1} + R_{S_2}}$

$$= \frac{30 \times 15}{30 + 15} = \frac{30 \times 15}{45} = 10\ \Omega$$

Current drawn from the source,

$$I = \frac{V}{R_{eq}} = \frac{5}{10} = \frac{1}{2}\text{A} = 0.5\ \text{A}$$

30. 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.

Ans.

Examples; HOTS.
CBSE (DELHI) 2009.

SECTION D 5-MARK QUESTIONS

31. Draw a circuit diagram of a Metre Bridge and write the mathematical relation used to determine the value of an unknown resistance. Why cannot such an arrangement be used for measuring very low resistance? *[CBSE East 2016, CBSE 2019 (55/4/1)]*

Ans.

32. Establish a relation between electric current and drift velocity. *[CBSE (AI) 2013]*

OR

Prove that the current density of a metallic conductor is directly proportional to the drift speed of electrons.

Ans:-

33. (a) Explain the term drift velocity of electrons in a conductor .Hence obtain the expression for the current through a conductor in terms of drift velocity.

CBSE. (2023)

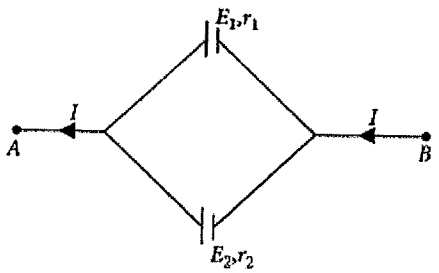
(b) Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 respectively are connected in parallel as shown in the figure.

Deduce the expression for the

(i) equivalent emf of the combination

(ii) equivalent internal resistance of the combination

(iii) potential difference between the points *A* and *B*.



OR

(a) State the two Kirchhoff's rules used in the analysis of electric circuits and explain them.

(b) Derive the equation of the balanced state in a Wheatstone bridge using Kirchhoff's laws.

Ans.

SECTION E 4-MARK QUESTIONS

How Do You Solve Case Study questions?

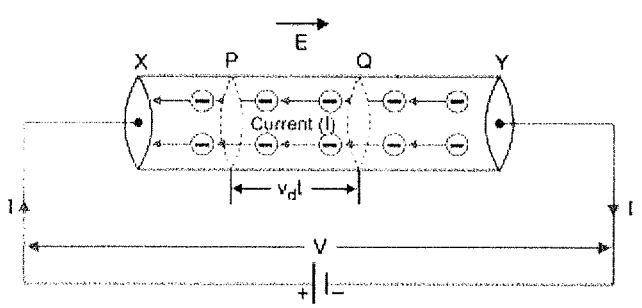
There are several steps to writing an answer to a case study assignment:

1. STEP 1: READ THE CASE STUDY AND QUESTIONS CAREFULLY. • ...
2. STEP 2: IDENTIFY THE ISSUES IN THE CASE STUDY. ...
3. STEP 3: LINK THEORY TO PRACTICE. ...
4. STEP 4: PLAN YOUR ANSWER. ...
5. STEP 5: START WRITING YOUR CASE STUDY ANSWER. ...
6. STEP 6: EDIT AND PROOFREAD. ...
7. STEP 7: SUBMIT.

Question:-
(34-35) ELECTRON DRIFT:

An electric charge (electron, ions) will experience a force if an electric field is applied. If we consider solid conductors, then of course the atoms are tightly bound to each other so that the current is carried by the negative charged electrons. Consider the first case when no electric field is present, the electrons will be moving due to thermal motion during which they collide with the fixed ions. An electron colliding with an ion emerges with same speed as before the collision. However, the direction of its velocity after the collision is completely random. At a given time, there is no preferential direction for the velocities of the electrons. Thus, on an average, the number of electrons travelling in any direction will be equal to the number of electrons travelling in the opposite direction. So, there will be no net electric current. If an electric field is applied, the electrons will be accelerated due to this field towards positive charge. The electrons, as long as they are moving, will constitute an electric current.

The free electrons in a conductor have random velocity and move in random directions. When current is applied across the conductor, the randomly moving electrons are subjected to electrical forces along the direction of electric field. Due to this electric field, free electrons still have their random moving nature, but they will move through the conductor with a certain force. The net velocity in a conductor due to the moving of electrons is referred to as the drift of electrons.



READ THE ABOVE PARAGRAPH AND ANSWER THE QUESTION

(*i*) When a potential difference V is supplied across a conductor at temperature T, the drift velocity of electrons is proportional to

(*a*) V (*b*) $\sqrt{V}$ (*c*) $\sqrt{T}$ (*d*) T

(*ii*) A steady current flows in a metallic conductor of non-uniform cross-section. Which of the following quantities is constant along the conductor?

(*a*) Current density (*b*) Drift speed

(*c*) Current (*d*) None of these

(*iii*) Relation between drift velocity (v_d) of electron and thermal velocity (v_T) of an electron at room temperature is

(*a*) $v_d = v_T = 0$ (*b*) $v_d > v_T$ (*c*) $v_d < v_T$ (*d*) $v_d = v_T$

(*iv*) Which of the following characteristics of electrons determines the current in a conductor?

(*a*) Thermal velocity alone

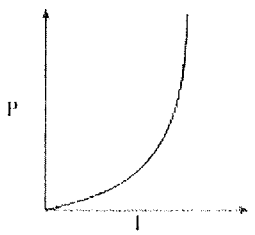
(*b*) Drift velocity alone

(*c*) Both drift velocity and thermal velocity

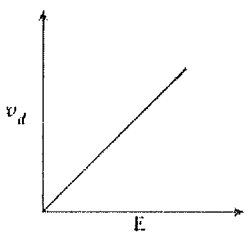
(*d*) Neither drift nor thermal velocity

(*v*) If E denotes electric field in a uniform conductor, I corresponding current through it, v_d drift velocity of electrons and P denotes thermal power produced in the conductor, then which of the following graphs is/are correct?

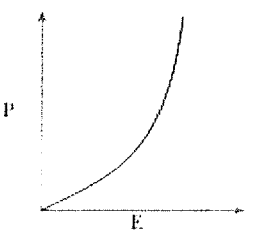
(*a*)



(*b*)



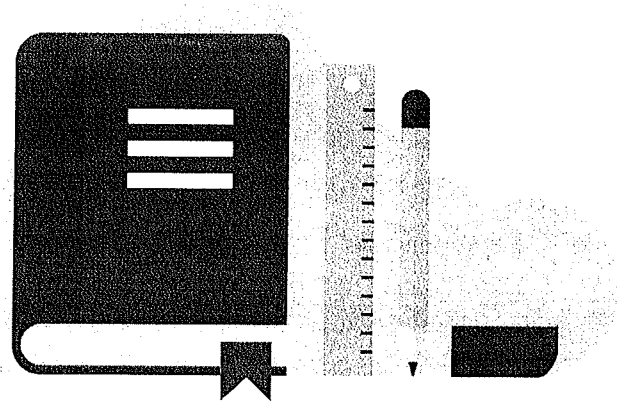
(*c*)



(*d*) All of the above

ANSWER KEY

(*i*) (*a*) (*ii*) (*c*) (*iii*) (*c*) (*iv*) (*b*) (*v*) (*d*)



Chapter 4-5 Revision Notes

MOVING CHARGES AND MAGNETISM

&

MAGNETISM AND MATTER

IMPORTANT TOPICS:

Lets start with Revision of theory & formulas:-

TOPIC (1) TABLE FOR MAGNETIC FIELD.

S.I unit Tesla [$1T = 10^4$ Gauss]

Small field due to small Current Carrying element	$dB = \frac{\mu_0}{4\pi} \frac{I\,dl\sin\theta}{r^2}$
Field at the centre of Circle Carrying Current	$B = \frac{\mu_0 n I}{2r}$
Field at the axial line due to Current Carrying Coil.	$B = \frac{\mu_0 n I r^2}{2(r^2+x^2)^{3/2}}$
Field due to finite Straight Current	$B = \frac{\mu_0}{4\pi} \frac{I}{r} (\sin\phi_2 + \sin\phi_1)$
Field due to infinite Straight Current	$B = \frac{\mu_0}{4\pi} \frac{2I}{r}$
Field at the centre due to Current carrying Circular $\overset{\frown}{arc}$.	$B = \frac{\mu_0}{4\pi} \frac{I}{r} \theta$
Field due to Semi-Circle.	$B = \frac{\mu_0 I}{4r}$

TOPIC (2) Table For Forces inside Magnetic field.

direction by FLHR.

Force on moving charge inside field.	$F = qvB\sin\theta$
force on Current Carrying wire	$F = BIl\sin\theta$
force between two parallel Current	$F = \left(\frac{\mu_0}{4\pi} \frac{2I_1 I_2}{r}\right) l$
torque on Current Carrying loop	$\tau = nIAB\sin\alpha$ $\tau = MB\sin\alpha$

IMPORTANT TOPICS:

TOPIC ③ Galvanometer: device used to detect sensitive currents.

$$\theta = \frac{nAB}{K} I$$

or $\boxed{\theta \propto I}$

Case 1. Low Resistance Galvanometer (Ammeter) $S = \frac{I_g G}{I - I_g}$

Case 2. High Resistance Galvanometer (Voltmeter) $R = \frac{V}{I_g} - G.$

TOPIC ④ Ampere's Circuital law & enclosed Current (Inside Amperian loop)

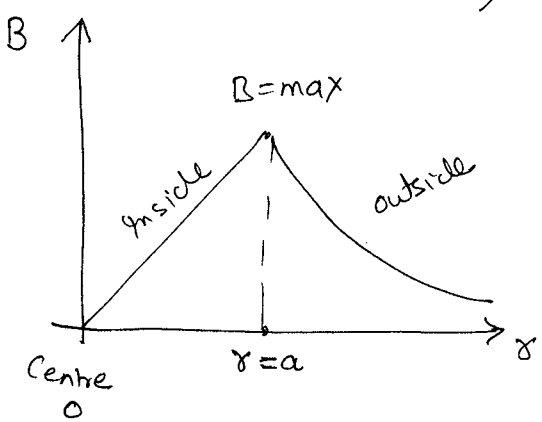
$$\boxed{\oint \vec{B} \cdot d\vec{l} = \mu_0 I}$$

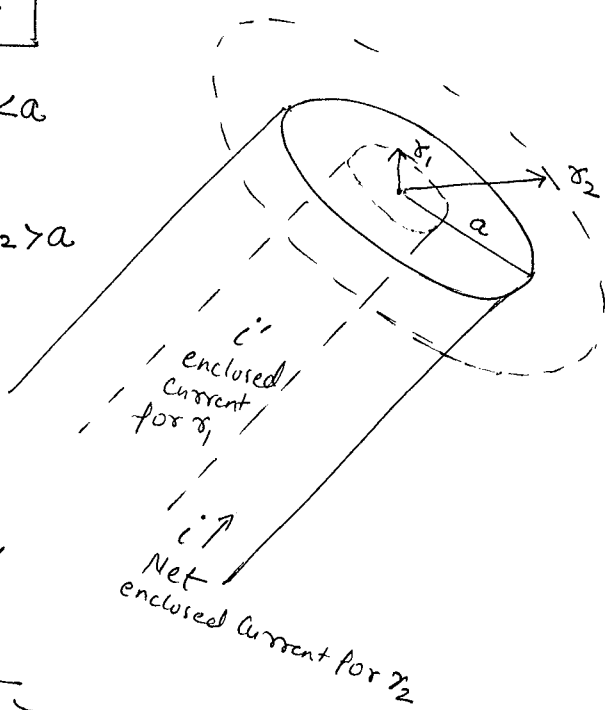
Inside the conductor $r_1 < a$

$B \propto r$

outside the conductor $r_2 > a$

$B \propto \frac{1}{r}$





Note:- $\frac{\mu_0}{4\pi} = 10^{-7}\ Tm A^{-1}$ also $\mu_0 = 4\pi \times 10^{-7}\ Tm A^{-1}$

(absolute permeability of free space)

Topic (5) Magnetic terms. & Classification of Magnetic Materials (Dia, para, ferro Magnetic Substances)

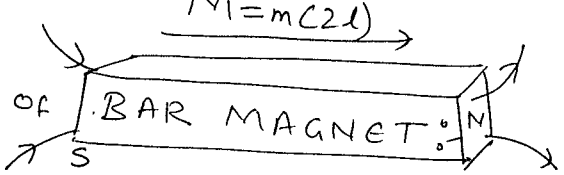
a) Magnetic Intensity $H = \frac{B}{\mu_0}$
b) Intensity of Magnetisation. $I = \frac{M}{V}$
c) Magnetic Susceptibility $\chi_m = \frac{I}{H}$
d) Magnetic Induction. $B = \frac{F}{qv\sin\theta}$
e) Magnetic Permability $\mu = \frac{B}{H}$
f) Relative Permeability $\mu_r = \frac{\mu}{\mu_0}$

DIAMAGNETIC SUBSTANCES :- [$M_{individual} = 0$, $M_{Net} = 0$]
→ they are repelled by field
→ $\vec{B}$ lines dosnt pass through them.
→ χ_m = -ve.

PARAMAGNETIC SUBSTANCES: [$M_{individual} \neq 0$, $M_{Net} = 0$]
→ they are attracted by field (weak to strong)
→ $\vec{B}$ lines passes through them.
→ χ_m = +ve

[Note: FERROMAGNETIC are updated Version of Para-magnetic]

TOPIC (6) Properties of



also $M = nIA$

a) Bar magnet is equivallent to Solenoid.
2) B at axial & equatorial line can be obtained just like electric field.
3) Mono-pole dosn't exist.
4). On cutting a Magnet Dipole moment decreases.

SECTION A 1-MARK QUESTIONS

1. If a conducting wire carries a direct current through it, the magnetic field associated with the current will be _____ .
   (*a*) both inside and outside the conductor (*b*) neither inside nor outside the conductor
   (*c*) only outside the conductor (*d*) only inside the conductor
2. A compass needle is placed above a straight conducting wire. If current passes through the conducting wire from South to North. Then the deflection of the compass _____ .
   (*a*) is towards West (*b*) is towards East
   (*c*) keeps oscillating in East-West direction (*d*) no deflection
3. When a charged particle moving with velocity $\vec{v}$ is subjected to a magnetic field of induction $\vec{B}$, the force on it is non-zero.
   This implies that
   (*a*) angle between is either zero or 180°
   (*b*) angle between is necessarily 90°
   (*c*) angle between can have any value other than 90°
   (*d*) angle between can have any value other than zero and 180°

4	**Two concentric and coplanar circular loops P and Q have their radii in the ratio 2:3. Loop Q carries a current 9 A in the anticlockwise direction. For the magnetic field to be zero at the common centre, loop P must carry** (i) 3A in clockwise direction (ii) 9A in clockwise direction (iii) 6 A in anti-clockwise direction (iv) 6 A in the clockwise direction.	1
5	**A long straight wire of circular cross section of radius a carries a steady current I. The current is uniformly distributed across its cross section. The ratio of the magnitudes of magnetic field at a point distant a/2 above the surface of wire to that at a point distant a/2 below its surface is** (i) 4 :1 (ii) 1:1 (iii) 4: 3 (iv) 3 :4	1
6	**If the magnetizing field on a ferromagnetic material is increased, its permeability** (i) decreases (ii) increases (iii) remains unchanged (iv) first decreases and then increases	1

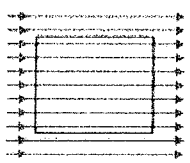
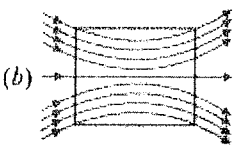
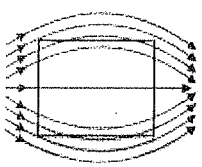
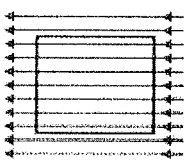
From CBSE Sample Paper-2023.

Ans:-

7. Magnetism in substances is caused by
(*a*) orbital motion of electrons only
(*b*) spin motion of electrons only
(*c*) due to spin and orbital motions of electrons both
(*d*) hidden magnets

8. A bar magnet of magnetic moment $\vec{m}$ is placed in a uniform magnetic field of induction $\vec{B}$. The torque exerted on it is
(*a*) $\vec{m} \cdot \vec{B}$ (*b*) $-\vec{m} \cdot \vec{B}$ (*c*) $\vec{m} \times \vec{B}$ (*d*) $-\vec{m} \times \vec{B}$

9. A uniform magnetic field exists in space in the plane of paper and is initially directed from left to right. When a bar of soft iron is placed in the field parallel to it, the lines of force passing through it will be represented by

(*a*)  (*b*)  (*c*)  (*d*) 

10. A permanent magnet attracts
(*a*) all substances (*b*) only ferromagnetic substances
(*c*) some substances and repels others (*d*) ferromagnetic substances and repels all others

11. Susceptibility is positive for
(*a*) paramagnetic substances (*b*) ferromagnetic substances
(*c*) non-magnetic substances (*d*) diamagnetic substances

12. If the horizontal and vertical components of earth's magnetic field are equal at a certain place, the angle of dip is
(*a*) 90° (*b*) 60° (*c*) 45° (*d*) 0°

13. **Electro-magnets are made of soft iron because soft iron has**
   (*a*) small susceptibility and small retentivity
   (*b*) large susceptibility and small retentivity
   (*c*) large permeability and large retentivity
   (*d*) small permeability and large retentivity.

14. **A current carrying loop is placed in a uniform magnetic field. The torque acting on it does not depend upon the**
   (*a*) shape of the loop (*b*) area of the loop (*c*) value of current (*d*) magnetic field

15. **A circular coil of 50 turns and radius 7 cm is placed in a uniform magnetic field of 4 T normal to the plane of the coil. If the current in the coil is 6 A then total torque acting on the coil is**
   (*a*) 14.78 N (*b*) 0 N (*c*) 7.39 N (*d*) 3.69 N

Answers:-

For answer key & other solution of Focus Revision notes:-
Visit Massphysics.com. & download our app. from play store.

ASSERTION- REASONING TYPE QUESTIONS

Two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true and R is NOT the correct explanation of A

c) A is true but R is false

d) A is false and R is also false

16. Assertion(A): Diamagnetic materials can exhibit magnetism.
Reason (R): Diamagnetic materials have permanent magnetic dipole moment.

option _____

17. Assertion(A): When a magnetic dipole is placed in a non uniform magnetic field, only a torque acts on the dipole.
Reason (R): Force would not act on dipole if magnetic field were non uniform.

option. _____

18. Assertion(A): Magnetic lines of force form continuous closed loops whereas electric lines of force do not.
Reason (R): Magnetic poles always occur in pairs as north pole and south pole.

option _____

SECTION B 2-MARK QUESTIONS

19. **Write two properties of a material suitable for making (*a*) a permanent magnet, and (*b*) an electromagnet.** *[CBSE (AI) 2017]*

Ans. (*a*) Two properties of material used for making permanent magnets are

(*i*) High coercivity (*ii*) High retentivity

(*iii*) High permeability

(*b*) Two properties of material used for making electromagnets are

(*i*) High permeability (*ii*) Low coercivity

(*iii*) Low retentivity

20. **At a place, the horizontal component of earth's magnetic field is B and angle of dip is 60°. What is the value of horizontal component of the earth's magnetic field at equator?** *[CBSE Delhi 2017]*

Ans:–

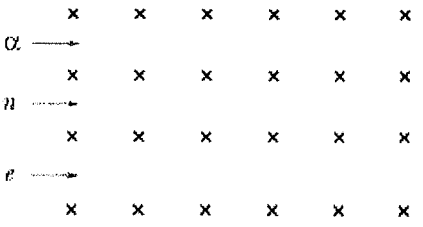
21. Write the expression, in a vector form, for the Lorentz magnetic force $\vec{F}$ due to a charge moving with velocity $\vec{v}$ in a magnetic field $\vec{B}$. What is the direction of the magnetic force? *[CBSE Delhi 2014]*

Ans. Force, $\vec{F} = q(\vec{v} \times \vec{B})$

Obviously, the force on charged particle is perpendicular to both velocity $\vec{v}$ and magnetic field $\vec{B}$.

22. (*i*) Write the expression for the magnetic force acting on a charged particle moving with velocity v in the presence of magnetic field B.

(*ii*) A neutron, an electron and an alpha particle moving with equal velocities, enter a uniform magnetic field going into the plane of the paper as shown. Trace their paths in the field and justify your answer. [*CBSE Delhi 2016*]



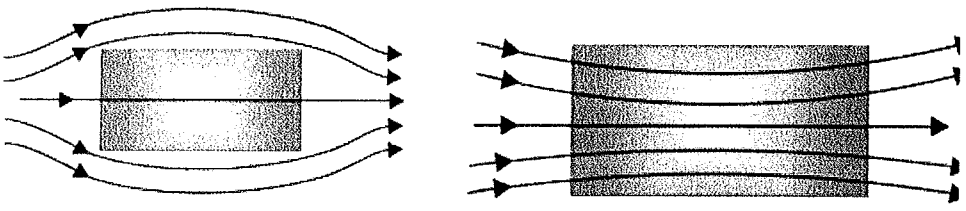
Ans: (*i*) $\vec{F} = q(\vec{v} \times \vec{B})$

(*ii*)

23. A proton and a deuteron having equal momenta enter in a region of uniform magnetic field at right angle to the direction of the field. Find the ratio of the radii of curvature of the path of the particle. [*CBSE Delhi 2013*]

Ans:-

24. A uniform magnetic field gets modified as shown in figure when two specimens A and B are placed in it.



(a) (b)

(i)Identify the specimen A and B.
(ii) How is the magnetic susceptibility of specimen A different from that of specimen B?

CBSE - 2022 (S.Q.P)

Ans.

25. In what way is the behaviour of a diamagnetic material different from that of a paramagnetic, when kept in an external magnetic field? [*CBSE Central 2016*]

Ans:-

SECTION C 3-MARK QUESTIONS

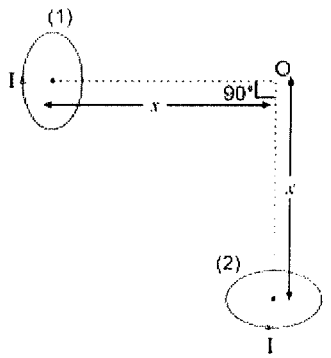
26	Two long straight parallel conductors carrying currents I_1 and I_2 are separated by a distance d. If the currents are flowing in the same direction, show how the magnetic field produced by one exerts an attractive force on the other. Obtain the expression for this force and hence define 1 ampere.	3

2022 (SQP) CBSE.

Ans:—

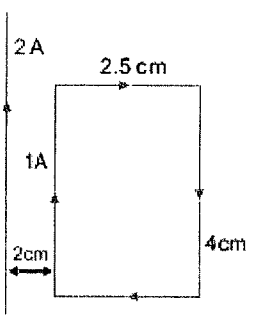
27. Two small identical circular loops, marked (1) and (2), carrying equal currents, are placed with the geometrical axes perpendicular to each other as shown in the figure. Find the magnitude and direction of the net magnetic field produced at the point *O*.

[*CBSE (F) 2013, 2014*]



Ans:-

28. A rectangular loop of wire of size 2.5 cm × 4 cm carries a 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 coplanar, 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. [*CBSE Delhi 2012*]



Ans. (*i*) Torque on the loop 'τ' = $MB \sin\theta = \vec{M} \times \vec{B}$

$\tau = 0$ [$\because$ $\vec{M}$ and $\vec{B}$ are parallel]

(*ii*) Magnitude of force

$$|\vec{F}| = \frac{\mu_0 I_1 I_2 l}{2\pi}\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$$

$$= 2\times10^{-7}\times2\times1\times4\times10^{-2}\left[\frac{1}{2\times10^{-2}} - \frac{1}{4.5\times10^{-2}}\right]$$

$$= 16\times10^{-7}\times\left[\frac{4.5-2}{2\times4.5}\right] = \frac{8\times5\times10^{-7}}{9} = 4.44\times10^{-7}\text{N}$$

Direction of force is towards conductor (attractive).

29. (*a*) Briefly explain how a galvanometer is converted into an ammeter.

(*b*) A galvanometer coil has a resistance of 15 Ω and it shows full scale deflection for a current of 4 mA. Convert it into an ammeter of range 0 to 6 A. [*CBSE 2019 (55/4/1)*]

Ans:—

30. (*a*) State Gauss's law for magnetism. Explain its significance. [*CBSE 2019 (55/1/1)*]

(*b*) Write the four important properties of the magnetic field lines due to a bar magnet.

Ans. (*a*) Gauss's law for magnetism states that "The total flux of the magnetic field, through any closed surface, is always zero."

Alternatively

$$= \oint_s \vec{B}.\vec{d}s = 0$$

This law implies that magnetic monopoles do not exist. Also magnetic field lines form closed loops.

(*b*) Four properties of magnetic field lines

(*i*) Magnetic field lines always form continuous closed loops.

(*ii*) The tangent to the magnetic field line at a given point represents the direction of the net magnetic field at that point.

(*iii*) The larger the number of field lines crossing per unit area, the stronger is the magnitude of the magnetic field.

(*iv*) Magnetic field lines do not intersect.

SECTION D 5-MARK QUESTIONS

31. **Derive an expression for torque acting on a rectangular current carrying loop kept in a uniform magnetic field B. Indicate the direction of torque acting on the loop.**

[CBSE Delhi 2013; (F) 2009, 2019 (55/1/1)]

Ans:-

32. State and explain Biot-Savart law. Use it to derive an expression for the magnetic field produced at a point near a long current carrying wire. *[CBSE 2019 (55/3/1)]*

Ans:-

* 33. **Derive an expression for the force per unit length between two long straight parallel current carrying conductors. Hence define SI unit of current (ampere).**

[CBSE (AI) 2009, 2010, 2012, Patna 2015]

DELHI (2014). (SQP-2022)

Ans:-

SECTION E 4-MARK QUESTIONS

How Do You Solve Case Study questions?

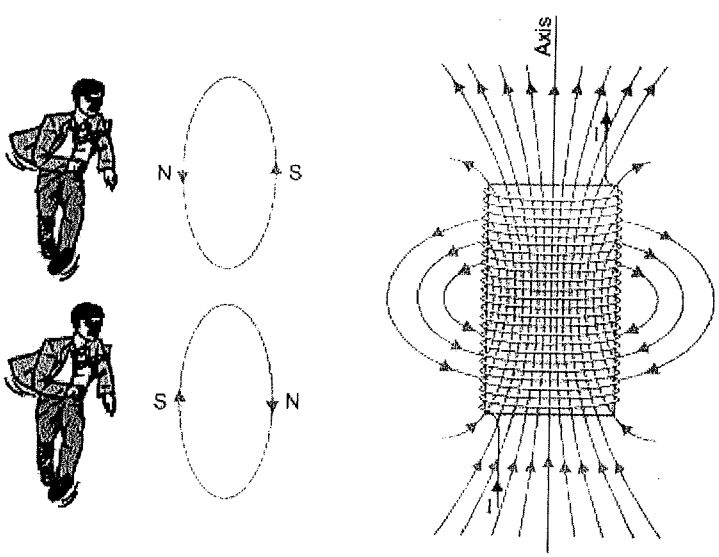
There are several steps to writing an answer to a case study assignment:

1. STEP 1: READ THE CASE STUDY AND QUESTIONS CAREFULLY. • ...
2. STEP 2: IDENTIFY THE ISSUES IN THE CASE STUDY. ...
3. STEP 3: LINK THEORY TO PRACTICE. ...
4. STEP 4: PLAN YOUR ANSWER. ...
5. STEP 5: START WRITING YOUR CASE STUDY ANSWER. ...
6. STEP 6: EDIT AND PROOFREAD. ...
7. STEP 7: SUBMIT.

Question:-
(34-35) MAGNETIC MOMENT:

The magnetic moment is the magnetic strength and orientation of a magnet or other object that produces a magnetic field. They include; loops of electric current, moving elementary particles such as electrons, various molecules and many astronomical objects such as many planets, some moons, star etc. More precisely the term magnetic moment normally refers to a system's magnetic dipole moment, the component of the magnetic dipole; a magnetic north and south pole separated by a very small distance. The magnetic dipole components is sufficient for small enough magnets or for large enough distances.

A current carrying loop suspended to move freely, always stays along a fixed direction, the plane of loop staying perpendicular to north-south direction just like a bar magnet. Moreover the two current loops when brought close together attract or repel each other depending on the direction of current just as two bar magnets when brought close together repel when their north poles face each other and attract when north pole of one magnet faces the south pole of the other magnet.



Magnetic field lines of a solenoid

READ THE ABOVE PARAGRAPH AND ANSWER THE QUESTION

(*i*) The SI unit for magnetic moment is?

(*a*) $\frac{A}{T}$ (*b*) $\frac{Am}{T}$ (*c*) $\frac{J}{T}$ (*d*) $\frac{Ns}{T}$

(*ii*) The bar magnet is replaced by a solenoid of cross sectional area 2×10^{-4} m^2 and 1000 turns, but same magnetic moment (0.4 Am^2) then current through the solenoid is

(*a*) 1 A (*b*) 2 A (*c*) 3 A (*d*) 4 A

(*iii*) The magnetic moment of a current (I) carrying circular coil of radius (r) varies as

(*a*) $\frac{1}{r^2}$ (*b*) $\frac{1}{r}$ (*c*) r (*d*) r^2

(*iv*) The ratio of magnetic length to the geometrical length of a bar magnet is

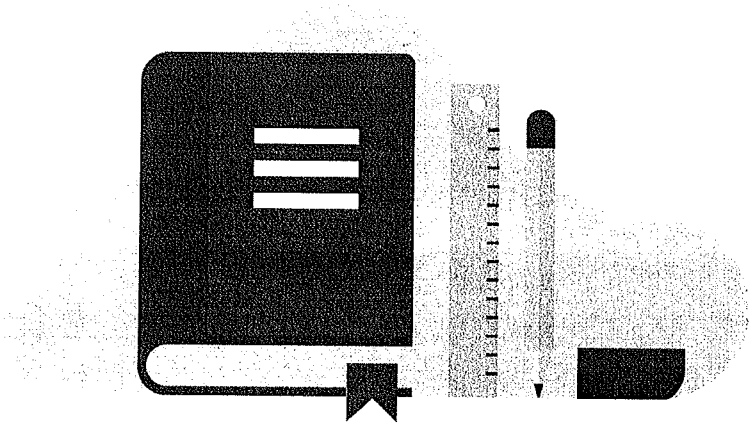
(*a*) $\frac{5}{6}$ (*b*) $\frac{6}{5}$ (*c*) $\frac{7}{6}$ (*d*) $\frac{6}{7}$

(*v*) A current carrying conductor of length 44 cm turns into circular loop. It carries 1 A current around circular path. The dipole moment generated in the loop is $\left[\text{take } \pi = \frac{22}{7}\right]$

(*a*) 150 Acm^2 (*b*) 152 Acm^2 (*c*) 154 Acm^2 (*d*) 156 Acm^2

Answer key

(*i*) (*c*) (*ii*) (*b*) (*iii*) (*d*) (*iv*) (*a*) (*v*) (*c*)



Chapter 6-7 Revision Notes

ELECTROMAGNETIC INDUCTION

{E.M.I}

&

ALTERNATING CURRENT

{A.C}

IMPORTANT TOPICS:

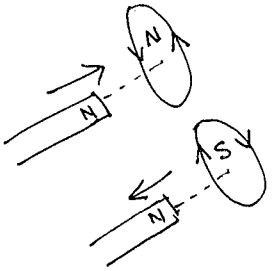
Lets start with Revision of theory & formulas.

TOPIC 1. Induced emf (Current)

a)	$e = -N\frac{d\phi}{dt}$	Faraday's law of E.M.I
b)	$e = -\frac{N[BA\cos\theta_2 - BA\cos\theta_1]}{t}$	
c)	$e = Blv$	motional emf (linear)
d)	$e = \frac{B\omega l^2}{2}$	motional emf (angular)
e)	$e = -L\frac{dI}{dt}$	self Inductance (L)
f)	$e = -M_{21}\frac{dI}{dt}$	Mutual Inductance (M)

Note Induced Current $i = \frac{e}{R}$. Eddy Current & multiple Induced Current in Bulk piece of metal are

TOPIC (2). LENZ'S LAW:- (Law to find direction of Induced Current which opposes the change that produces it)



HINT:- Think opposite to the situation & get polarity for direction of Current that's Lenz's Law.

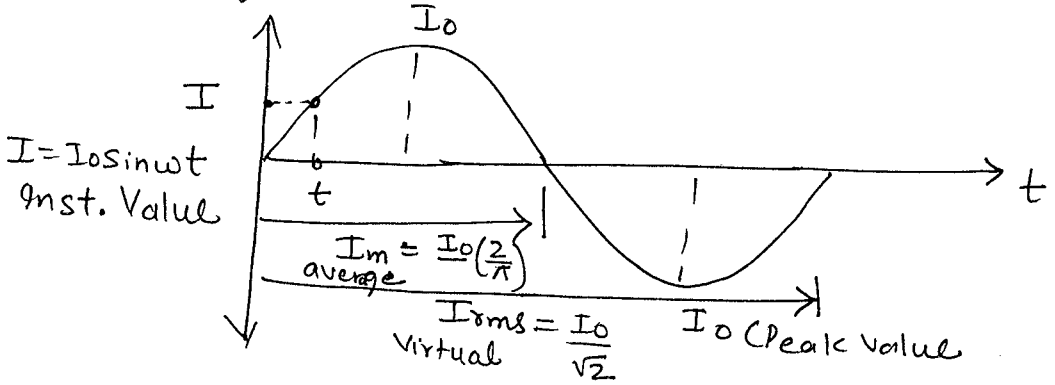
Topic (3) Self Inductance of solenoid $L = \frac{\mu_r \mu_0 N^2 A}{l}$

Mutual Inductance of 2-Coaxial Solenoid $M = \frac{\mu_r \mu_0 N_1 N_2 A}{l}$

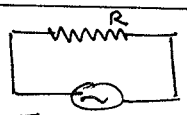
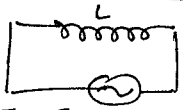
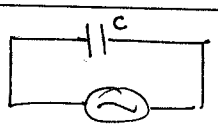
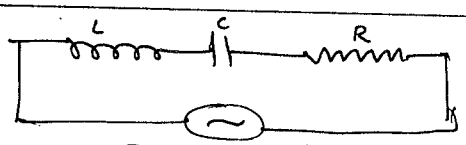
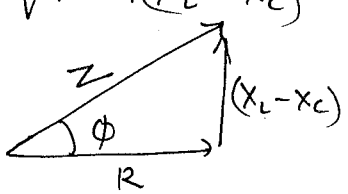
IMPORTANT TOPICS:

ALTERNATING CURRENT :-

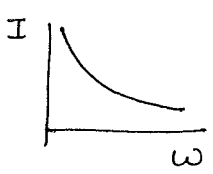
Topic ① Types of A.C.

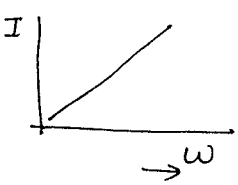


Topic ② CIRCUITS OF A.C.

R - CIRCUIT	L - CIRCUIT	C - CIRCUIT	L-C-R - CIRCUIT
			
$E = E_0 \sin\omega t$	$E = E_0 \sin\omega t$	$E = E_0 \sin\omega t$	$E = E_0 \sin\omega t$
$I = I_0 \sin\omega t$	$I = I_0 \sin(\omega t - \pi/2)$	$I = I_0 \sin(\omega t + \pi/2)$	$I = I_0 \sin(\omega t - \phi)$
E & I are in phase	I lags by $\pi/2$	I leads by $\pi/2$	I lags by ϕ.
opposing factor R	opposing factor $X_L = \omega L$	opposing factor $X_C = \frac{1}{\omega C}$	opposing factor (Impedence) $Z = \sqrt{R^2 + (X_L - X_C)^2}$
			
$P = E_{rms} I_{rms}$	$P = 0$	$P = 0$	$P = E_{rms} I_{rms} \cos\phi$
			$\cos\phi = \frac{R}{Z}$ (Power factor)
			Resonance Condition ($I = max$)
			$X_L = X_C$
			$\omega_0 = \frac{1}{\sqrt{LC}}$

graph of Current w.r.t frequency (ω)





TOPIC ③:- TRANSFORMER [device to change the magnitude of A.C Voltage)

$$\frac{E_s}{E_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s} = K$$

→ $K > 1$ step up $E_s > E_p \Rightarrow N_s > N_p$

→ $K < 1$ step down $E_s > E_p \Rightarrow N_s < N_p$

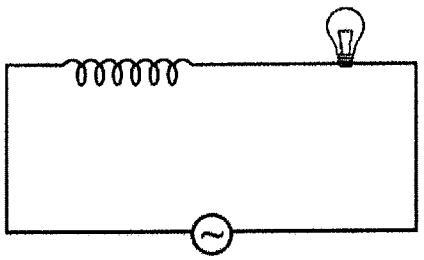
TOPIC ④ A.C Generator · (device to convert mech. motion to electrical energy)

$$e = e_0 \sin \omega t$$

$e_0 = NBA\omega_0$ = max emf Induced in generator :-

SECTION A 1-MARK QUESTIONS

1. **An iron cored coil is connected in series with an electric bulb with an AC source as shown in figure. When iron piece is taken out of the coil, the brightness of the bulb will**



(i) decrease

(ii) increase

(iii) remain unaffected

(iv) fluctuate

SQP - 2022 CBSE.

2. In an *ac* circuit, voltage V and current i are given by

$V = 100 \sin 100\, t$ volt

$i = 100 \sin (100t + \pi/3)$ mA

The power dissipated in the circuit is

(*a*) 10^4W (*b*) 10 W (*c*) 2.5 W (*d*) 5 W.

3. A rectangular, a square, a circular and an elliptical loop, all in the (x-y) plane, are moving out of a uniform magnetic field with a constant velocity $\vec{v} = v\hat{i}$. The magnetic field is directed along the negative z-axis direction. The induced emf, during the passage of these loops, out of the field region, will not remain constant for

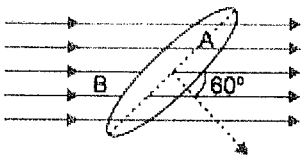
(i) any of the four loops
(ii) the circular and elliptical loops
(iii) the rectangular, circular and elliptical loops
(iv) only the elliptical loops

SQP For - 2023 (Board)
6th March.

4. Lenz's law is essential for
(*a*) conservation of energy
(*b*) conservation of mass
(*c*) conservation of momentum
(*d*) conservation of charge

5. The self inductance L of a solenoid of length l and area of crosssection A, with a fixed number of turns N increases as [*NCERT Exemplar*]
(*a*) l and A increase.
(*b*) l decreases and A increases.
(*c*) l increases and A decreases.
(*d*) both l and A decrease.

6. An area $A = 0.5\ m^2$ shown in the figure is situated in a uniform magnetic field $B = 4.0\ Wb/m^2$ and its normal makes an angle of 60° with the field. The magnetic flux passing through the area A would be equal to



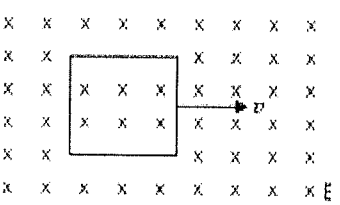
(a) 2.0 weber (b) 1.0 weber (c) $\sqrt{3}$ weber (d) 0.5 weber

7. In a pure capacitive circuit, the current
(a) lags behind the applied emf by angle $\pi/2$ (b) leads the applied emf by an angle π
(c) leads the applied emf by angle $\pi/2$ (d) and applied emf are in same phase

8. If an LCR circuit contains $L = 8$ henry; $C = 0.5\ \mu F$, $R = 100\ \Omega$ in series. Then the resonant angular frequency will be:
(a) 600 rad/s (b) 500 rad/s (c) 600 Hz (d) 500 Hz

9. If an LCR circuit contains $L = 8$ henry; $C = 0.5\ \mu F$, $R = 100\ \Omega$ in series. Then the resonant angular frequency will be:
(a) 600 rad/s (b) 500 rad/s (c) 600 Hz (d) 500 Hz

10. A conducting square loop of side L and resistance R moves in its plane with a uniform velocity v perpendicular to one of its sides. A magnetic induction B constant in time and space, pointing perpendicular and into the plane of the loop exists everywhere as in given figure. The current induced in the loop is

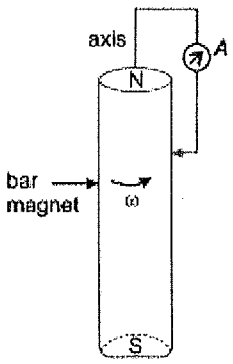


(a) Blv/R clockwise (b) Blv/R anticlockwise
(c) $2\ Blv/R$ anticlockwise (d) zero.

11. Inductance plays the role of
(a) inertia (b) friction (c) source of emf (d) force

12. A magnet is dropped with its north pole towards a closed circular coil placed on a table then
(*a*) looking from above, the induced current in the coil will be anti-clockwise.
(*b*) the magnet will fall with uniform acceleration.
(*c*) as the magnet falls, its acceleration will be reduced.
(*d*) no current will be induced in the coil.

13. A cylindrical bar magnet is rotated about its axis (Figure given alongside). A wire is connected from the axis and is made to touch the cylindrical surface through a contact. Then [*NCERT Exemplar*]



(*a*) a direct current flows in the ammeter A.
(*b*) no current flows through the ammeter A.
(*c*) an alternating sinusoidal current flows through the ammeter A with a time period $T = 2\pi/\omega$.
(*d*) a time varying non-sinusoidal current flows through the ammeter A.

14. A copper ring is held horizontally and a magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is
(*a*) equal to that due to gravity
(*b*) less than that due to gravity
(*c*) more than that due to gravity
(*d*) depends on the diameter of the ring and the length of the magnet

15. The mutual inductance of two coils depends upon
(*a*) medium between coils
(*b*) separation between coils
(*c*) both on (*a*) and (*b*)
(*d*) none of (*a*) and (*b*)

ASSERTION- REASONING TYPE QUESTIONS

Two statements are given-one labelled Assertion (A) and the other labelled Reason(R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true and R is the correct explanation of A

b) Both A and R are true and R is NOT the correct explanation of A

c) A is true but R is false

d) A is false and R is also false

16. Assertion(A): Only a change of magnetic flux will maintain an induced current in the coil.
Reason (R): The presence of a large magnetic flux will maintain an induced current in the coil.

option _____

17. Assertion(A): Capacitor serves as a block for DC and offers an easy path to AC.
Reason (R): Capacitive reactance is inversely proportional to frequency.

option. _____

18. Assertion(A): An inductance and a resistance are connected in series with an AC circuit. In this circuit the current and the potential difference across the resistance lags behind potential difference across the inductance by an angle $\pi/2$.
Reason (R): In *LR* circuit voltage leads the current by phase angle which depends on the value of inductance and resistance both.

option. _____

SECTION B 2-MARK QUESTIONS

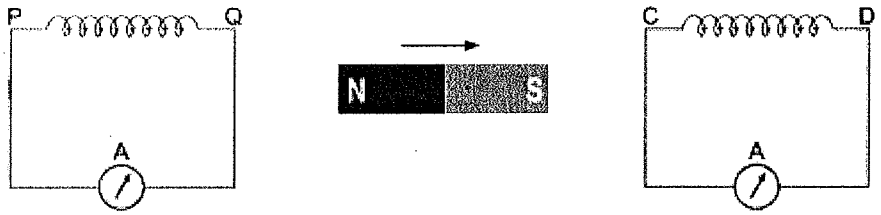
19. Give one example of use of eddy currents. [*CBSE (F) 2016*]

(*i*) Electromagnetic damping in certain galvanometers.

(*ii*) Magnetic braking in trains.

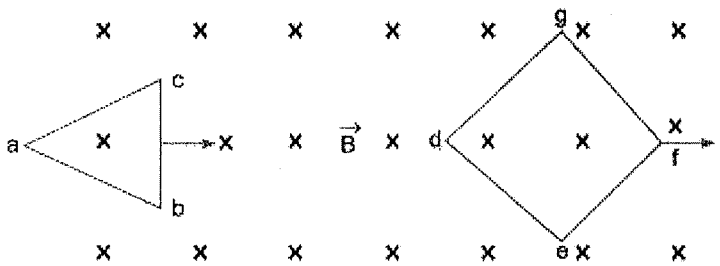
(*iii*) Induction furnace to produce high temperature. (*Any one*)

20. A bar magnet is moved in the direction indicated by the arrow between two coils *PQ* and *CD*. Predict the directions of induced current in each coil. [*CBSE (AI) 2012, 2017*]



Ans:-

21. Two loops of different shapes are moved in the region of a uniform magnetic field pointing downward. The loops are moved in the directions shown by arrows. What is the direction of induced current in each loop? [*CBSE (F) 2010*] [*HOTS*]



Ans.

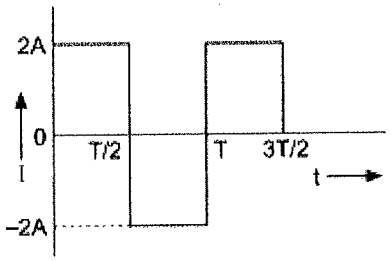
22. A current is induced in coil C_1 due to the motion of current carrying coil C_2.
(*a*) Write any two ways by which a large deflection can be obtained in the galvanometer G.
(*b*) Suggest an alternative device to demonstrate the induced current in place of a galvanometer.
[*CBSE Delhi 2011*]

Ans.

23. In a series *LCR* circuit with an ac source of effective voltage 50 V, frequency $\nu = 50/\pi$ Hz, $R = 300\ \Omega$, $C = 20\ \mu F$ and $L = 1.0$ H. Find the rms current in the circuit. [*CBSE (F) 2014*]

Ans:-

24. What is the rms value of alternating current shown in figure? [*HOTS*]



Ans:–

25. Why is the use of *ac* voltage preferred over *dc* voltage? Give two reasons. [*CBSE (AI) 2014*]

(*i*) The generation of *ac* is more economical than *dc*.

(*ii*) Alternating voltage can be stepped up or stepped down as per requirement during transmission from power generating station to the consumer.

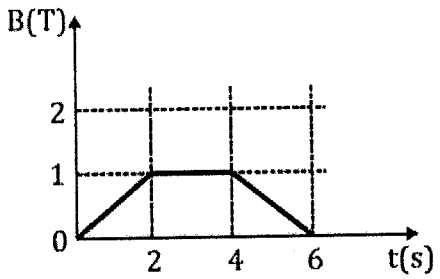
(*iii*) Alternating current in a circuit can be controlled by using wattless devices like the choke coil.

(*iv*) Alternating voltages can be transmitted from one place to another, with much lower energy loss in the transmission line.

Ans:–

SECTION C 3-MARK QUESTIONS

26. The magnetic field through a circular loop of wire, 12cm in radius and 8.5Ω resistance, changes with time as shown in the figure. The magnetic field is perpendicular to the plane of the loop. Calculate the current induced in the loop and plot a graph showing induced current as a function of time.



CBSE SQP For-2023

Ans:-

27. An a.c. source generating a voltage $\varepsilon = \varepsilon_0 \sin \omega t$ is connected to a capacitor of capacitance C. Find the expression for the current I flowing through it. Plot a graph of ε and I versus ωt to show that the current is ahead of the voltage by $\pi/2$.

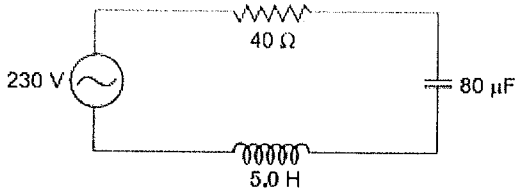
OR

An ac voltage $V = V_0 \sin \omega t$ is applied across a pure inductor of inductance L. Find an expression for the current i, flowing in the circuit and show mathematically that the current flowing through it lags behind the applied voltage by a phase angle of $\frac{\pi}{2}$. Also draw graphs of V and i versus ωt for the circuit.

CBSE SQP For 2023 Exam.

Ans:-

28. The figure shows a series LCR circuit connected to a variable frequency 230 V source.



(*a*) Determine the source frequency which drives the circuit in resonance.

(*b*) Calculate the impedance of the circuit and amplitude of current at resonance.

(*c*) Show that potential drop across LC combination is zero at resonating frequency.

[*CBSE 2019 (55/2/1)*]

Ans:-

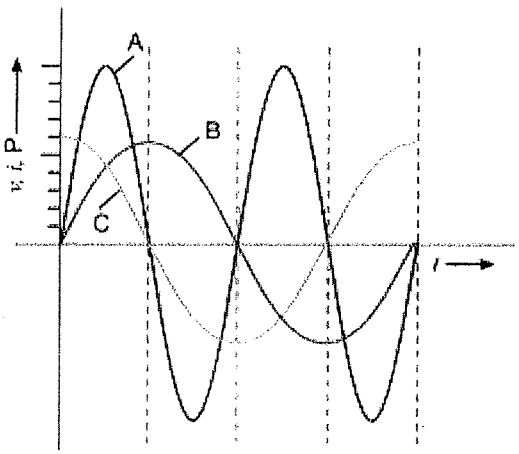
29. A device 'X' is connected to an *ac* source. The variation of voltage, current and power in one complete cycle is shown in the figure.

(*a*) Which curve shows power consumption over a full cycle?

(*b*) What is the average power consumption over a cycle?

(*c*) Identify the device 'X'. [*NCERT Exemplar*]

CBSE (2012, 2016) Delhi.



Ans:-

30. Define self-inductance of a coil. Show that magnetic energy required to build up the current I in a coil of self inductance L is given by $\frac{1}{2}LI^2$. [*CBSE Delhi 2012*]

OR

Define the term self-inductance of a solenoid. Obtain the expression for the magnetic energy stored in an inductor of self-inductance L to build up a current I through it. [*CBSE (AI) 2014*]

Ans:-

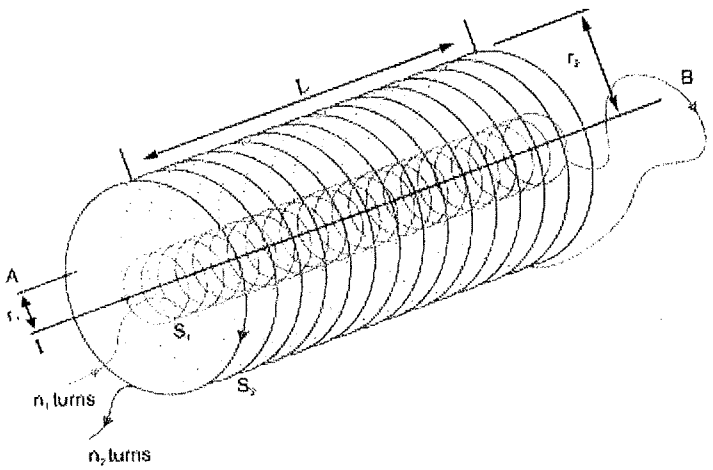
SECTION D 5-MARK QUESTIONS

31. Obtain the expression for the mutual inductance of two long co-axial solenoids S_1 and S_2 wound one over the other, each of length L and radii r_1 and r_2 and n_1 and n_2 be number of turns per unit length, when a current I is set up in the outer solenoid S_2. [*CBSE Delhi 2017*]

OR

(*a*) Define mutual inductance and write its SI units. [*CBSE 2019*, (55/1/1)]

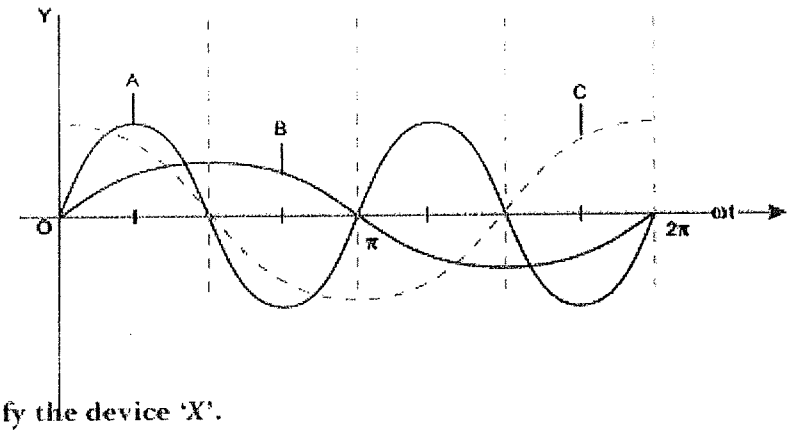
(*b*) Derive an expression for the mutual inductance of two long co-axial solenoids of same length wound one over the other.



32. (*i*) Draw a labelled diagram of a step-up transformer. Obtain the ratio of secondary to primary voltage in terms of number of turns and currents in the two coils.

(*ii*) A power transmission line feeds input power at 2200 V to a step-down transformer with its primary windings having 3000 turns. Find the number of turns in the secondary to get the power output at 220 V. [*CBSE Delhi 2017*]

33. A device 'X' is connected to an ac source $V = V_0 \sin \omega t$. The variation of voltage, current and power in one cycle is show in the following graph:



(a) Identify the device 'X'.

(b) Which of the curves, *A*, *B* and *C* represent the voltage, current and the power consumed in the circuit? Justify your answer.

(c) How does its impedance vary with frequency of the *ac* source? Show graphically.

(d) Obtain an expression for the current in the circuit and its phase relation with *ac* voltage.

For -(2023) 6th March.

Ans:-

You can also Include A.C Generator theory. Diagram for 5 Mark Section:-

Practice sheet For. A.C generator :-

SECTION E 4-MARK QUESTIONS

How Do You Solve Case Study questions?

There are several steps to writing an answer to a case study assignment:

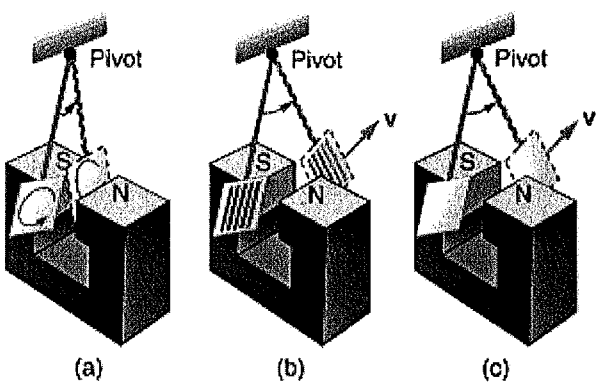
1. STEP 1: READ THE CASE STUDY AND QUESTIONS CAREFULLY. • ...
2. STEP 2: IDENTIFY THE ISSUES IN THE CASE STUDY. ...
3. STEP 3: LINK THEORY TO PRACTICE. ...
4. STEP 4: PLAN YOUR ANSWER. ...
5. STEP 5: START WRITING YOUR CASE STUDY ANSWER. ...
6. STEP 6: EDIT AND PROOFREAD. ...
7. STEP 7: SUBMIT.

(34). MAGNETIC DAMPING:

When a conductor oscillates inside a magnetic field, eddy currents are produced in it. The flow of electrons in the conductor immediately creates an opposing magnetic field which results in damping of the magnet and produces heat inside the conductor similar to heat build-up inside of a power cord during use.

By Lenz's law the circulating currents create their own magnetic field that opposes the field of the magnet. Thus, the moving conductor experiences a drag force that opposes its motion. A damping force is generated when these eddy current and magnetic field interact with each other. It is a damping technique where electromagnetically induced current slow down the motion of an object without any actual contact. As the distance between magnet and conductor decreases the damping force increases. The electromagnetic damping force is proportional to the induced

eddy current, strength of the magnetic field and the speed of the object which implies that faster the object moves, greater will be the damping and slower the motion of object, lower will be damping which will result in the smooth stopping of the object.



(a) (b) (c)

READ THE ABOVE PARAGRAPH AND ANSWER ANY FOUR QUESTIONS

(*i*) Foucault's current are also known as

(*a*) direct current (*b*) induced current

(*c*) eddy current (*d*) both eddy current and induced current

(*ii*) Eddy current have negative effect because they produce

(*a*) heating only (*b*) damping only

(*c*) heating and damping (*d*) harmful radiation

(*iii*) The electromagnetic damping force is proportional to

(*a*) the induced eddy current (*b*) the strength of magnetic field

(*c*) the speed of object (*d*) all of the above

(*iv*) In electromagnetic induction, line integral of induced field E around a closed path is _____ and induced electric field is _____.

(*a*) zero, non conservative (*b*) non zero, conservative

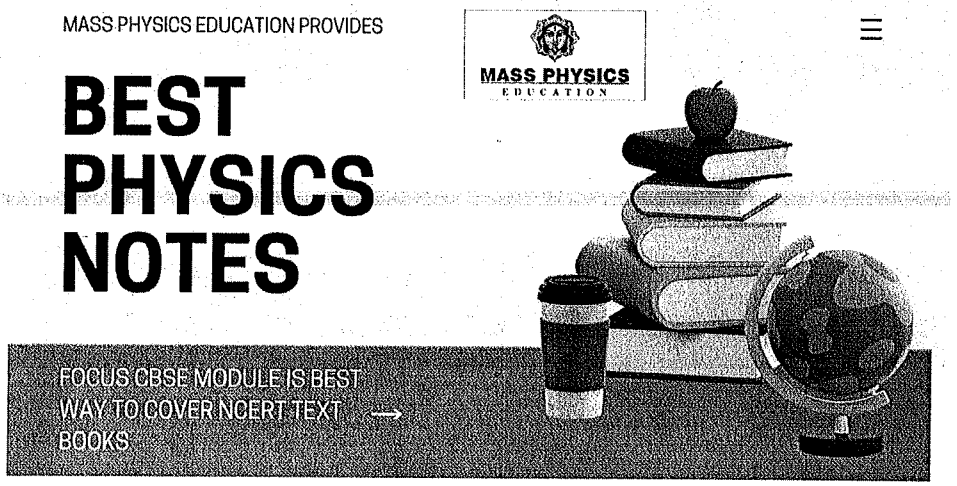
(*c*) zero, conservative (*d*) non zero, non conservative

(*v*) A circular coil of area 200 cm^2 and 25 turns rotates about its vertical diameter with a angular speed of 20 m/s in a uniform horizontal magnetic field of magnitude 0.05 T. The maximum voltage induced in the coil is

(*a*) 0.5 V (*b*) 1.5 V (*c*) 2.5 V (*d*) 2.0 V

Answer key

(*i*) (*c*) (*ii*) (*c*) (*iii*) (*d*) (*iv*) (*d*) (*v*) (*a*)



PART 2 CONTAINS

SECTION D

OPTICS AND DUAL NATURE

SECTION E

MODERN PHYSICS-- ATOM ,NUCLEI AND SEMICONDUCTOR