St. Mary's Convent School Gulaothi, U.P. (2026 – 27)

Set - B

MCQ PAPER

Class 12

Physics

T.sign_____

Time: 45 min.

Max Marks:20

NAME:- L A K S H Y A

Write name in capital letter

ROLL NO:- 0 9

General instructions

1.All question are compulsory.

2.Write neately and clearly in given space.

3.Do not cut or fill the circle given on upper and bottom of paper.

4.Write the answer of each question in the space provided

Write the option in capital letters only)

Section A : Write down the correct option for the given questions.

ANS 1: b ✓ 0.5/0.5

ANS 2: b ✓ 0.5/0.5

ANS 3: b ✓ 0.5/0.5

ANS 4: a ✓ 0.5/0.5

Page total: **2.0 von 2.0**

Section B Very Short Answer (2 × 1 = 2 marks)

ANS 5:

1.0 ✓

The force between the charge of attraction & repulsion is directly proportional to the ~~magnitude of the charge~~ product of the magnitude of their charges and Inversely proportional to the square of their sepration ~~of~~ between them.

$$F = \frac{Kq_1q_2}{r^2}$$

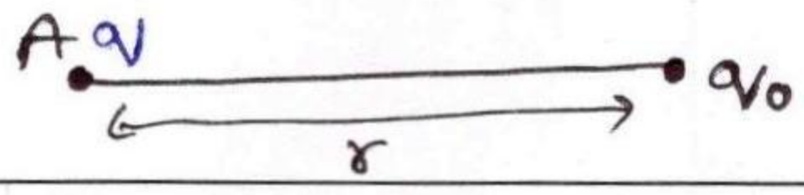
ANS 6:

1.0 ✓

Electric potential at a point is defined as the work done ~~by the~~ in bringing the unit positive charge from the infinite to that point ~~is known as electric potential.~~ against Electrostatic force is known as Electric potential.

$$\Delta V = \frac{W}{d}$$

ANS 7:



~~tod~~ let a point charge q_0 from the point A to q_0 distance r, ~~at a~~ for we wish to find the Electric field at a point A.

~~F=~~ F on q_0 due to q

$$F = \frac{Kq\,q_0}{r^2} \quad \text{--- (1)}$$

Electric field on q_0 is

$$E = \frac{F}{q_0} .$$

put (1) here

$$E = \frac{Kq\,\cancel{q_0}}{r^2} \times \frac{1}{\cancel{q_0}}$$

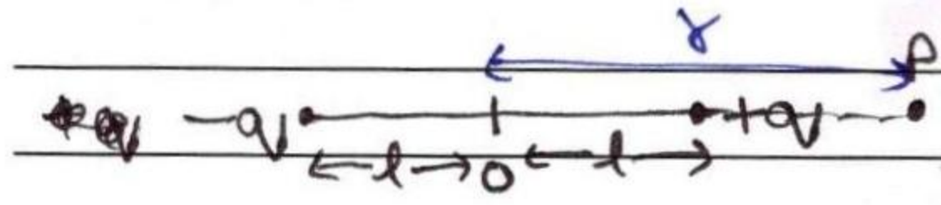
$$\boxed{E = \frac{Kq}{r^2}}$$

Marks	2.0
Teacher's feedback	Correct derivation and result. For completeness, you could state the vector form with direction (along r-hat) and note k = 1/(4πε0).

Page total: **2.0 von 2.0**

ANS 8:

for axial



let a dipol of length 2l. The distance b/tw between the centre of the dipole to the point P is r.

Electric field due to (-q)

$$E_1 = \frac{kq}{(r+l)^2}$$

Electric field due to (+q)

$$E_2 = \frac{kq}{(r-l)^2}$$

Electric field due to dipol

$$E_{net} = E_1 \mp E_2$$

$$= kq\left[\frac{1}{(r+l)^2} \mp \frac{1}{(r-l)^2}\right]$$

$$= kq\left[\frac{r^2+l^2-2rl \mp r^2 \mp l^2 \mp 2rl}{(r+l)^2(r-l)^2}\right]$$

$$= kq\left[\frac{-4rl}{r^2(r^2+l^2+2rl)}\right]$$

$$= kq\left[\frac{-4rl}{(r^2+l^2-2rl)}\right]$$

$$= kq\left[\frac{-4rl}{(r^2+l^2+2rl)}\right]$$

$\because l \ll\ll r$

$$= kq\left[\frac{-4rl}{(r^2+2rl)(r^2-2rl)}\right]$$

$$= kq\left[\frac{-4rl}{r^4-2r^3l+2r^3l-4r^2l^2}\right]$$

$$= kq\left[\frac{-4rl}{r^4}\right]$$

$$= \frac{kq-4l}{r3}$$

$$\boxed{E^2 = \frac{-k2P}{r3}}$$

Marks	1.0
Teacher's feedback	You derived the electric field instead of the dipole moment. For charges ±q separated by 2a, the dipole moment is p = 2aq, directed from −q to +q. Mentioning p = 2ql at the end is insufficient.

ANS 9:

Electric flux through the sphere

$E = \frac{Kq}{r^2}$ $\quad \phi_E = \frac{q}{\varepsilon_0}$

$E = \frac{9\times10^9 \times 2\times10^{-6}}{0.5 \times 0.5} \times 10^2$ $\quad \phi_E = \frac{2\times10^{-6}}{8.85\times10^{-12}}$ ✓

$E = \frac{18\times10^{93} \times 10^2 \times 10^2}{8\times8}$ $\quad \phi_E = \frac{2\times10^6}{8.85}$

$E = 72\times10^3\ C$

$\phi_E \approx 0.02\times10^7$ Farada ✓

Marks	2.0
Teacher's feedback	Correctly applied Gauss's law; flux ≈ 2.3×10^5 N·m^2/C. However, the initial electric field calculation is unnecessary and incorrect, and units are misused/missing. State the flux with correct units and avoid extraneous wrong steps.

Page total: **2.0 von 2.0**

ANS 10:

Capacitance has its charge and ~~to~~ potential difference.

$C = \frac{Q}{V}$

$V = \frac{Q}{C}$

Small word done on Q charge

$dW = V \cdot dQ$

on Integrating both side

$\int dW = \int \frac{Q}{C} \cdot dQ$

$W = \frac{1}{C} \frac{Q^2}{2}$

$$W = \frac{1}{2} \frac{Q^2}{C}$$

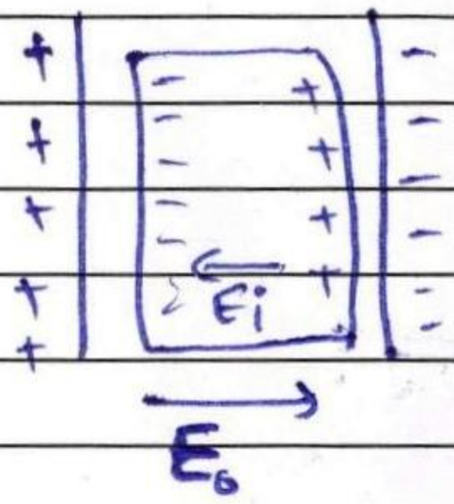
~~Enrg~~ Work stored in the form of Energy

$$U = \frac{1}{2} \frac{Q^2}{C}$$

Marks	2.0
Teacher's feedback	Correct derivation and final expression. For completeness, include integration limits (q: 0 → Q) and note equivalent forms: U = 1/2 C V^2 = 1/2 Q V.

Page total: **2.0 von 2.0**

ANS 11:



Q= without dielectric

$$C = \frac{A\varepsilon_0}{d}$$

K=1 for air

with ~~dielectric~~ fully dielectric

$$C' = \frac{KA\varepsilon_0}{d}$$

i.e

$$\boxed{C' = KC}$$

~~In~~ it ~~increase~~ increases K time by ~~inserting~~ inserting dielectric medium.

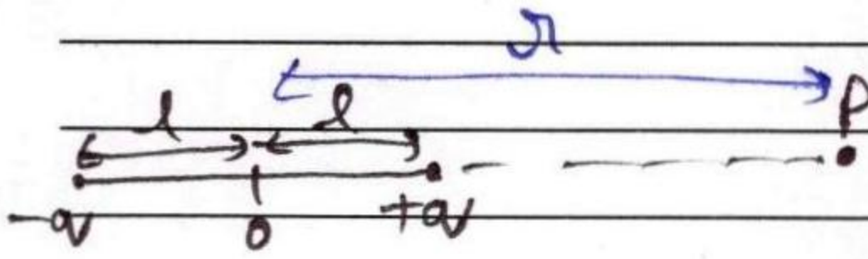
1.0 von 2.0

- dielectric medium is a non conducting medium which do not allow the flow of charge but allow support Electrostatic field!

Marks	1.0
Teacher's feedback	Correct C and C' formulas and C'=KC. But "K=1" is wrong (that's for vacuum/air). Also missing the principle: dielectric polarization reduces the internal field, lowering potential for given charge, thus increasing capacitance.

Page total:

ANS 12:



Let a dipol separated by small distance 2l
A point from the centre of the dipol to P so the distance is r.

Electric potential due to
(V_1) $(-qV) = \frac{-Kq_V}{l+r}$

Electric potential due to
(V_2) $(+qV) = \frac{Kq_V}{(r-l)}$

$E_{net} = 0$

$V_{net} = V_1 + V_2$

$= \frac{-Kq_V}{l+r} + \frac{Kq_V}{(r-l)}$

$= Kq_V\left[\frac{1}{r-l} - \frac{1}{r+l}\right]$

$= Kq_V\left[\frac{r+l-r+l}{(r-l)(r+l)}\right]$

$= Kq_V\left[\frac{2l}{r^2+rl-lr+-l^2}\right]$

$\therefore l \ll\ll\ll r$

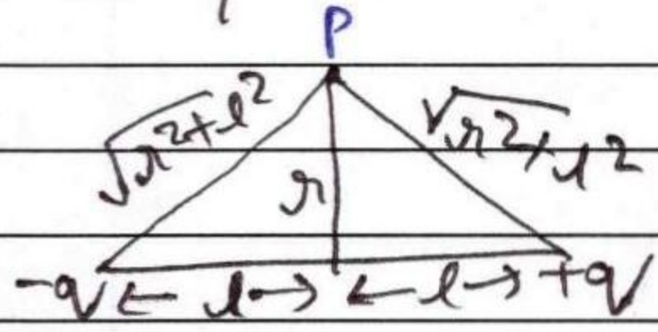
$= Kq_V\left[\frac{2l}{r^2}\right]$

$= \frac{Kq_V 2l}{r^2}$

$= \frac{KP}{r^2}$

$V = \frac{1}{4\pi\varepsilon_0}\frac{P}{r^2}$

for equitorial



Electric potential due to $-qV$

$= \frac{-Kq_V}{\sqrt{r^2+l^2}}$

Electric Potential due to $+qV$

$= \frac{Kq_V}{r^2+l^2}$

$V_{net} = V_1 + V_2$

$= 0$

Marks	2.0
Teacher's feedback	Correct axial-line derivation and approximation. However, the final result is missing the angular dependence; the general potential is V = (1/4πε0)(p cosθ)/r^2. You derived only the axial case (cosθ = 1), so the answer is incomplete.

Page total: **2.0 von 3.0**

ANS 13:

C with air = 8 pf

$$C = \frac{A\varepsilon_0}{d}$$

$$8 = \frac{A\varepsilon_0}{d} \quad \text{---} (1)$$

C with half distance

$$C' = \frac{A\varepsilon_0 K}{\frac{d}{2}}$$

$$C' = \frac{2A\varepsilon_0 K}{d}$$

$$C' = 2 \times 6 \times 8$$

$$C' = 96 \text{ pf}$$

Marks	3.0
Teacher's feedback	Correct reasoning and calculation. Final answer 96 pF is accurate.

17.0/20.0 Usha Rani 04:28, 18.08.202

Page total: 3.0 von 3.0