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:-
Write name in capital letter

| P | A | L | A | K | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

ROLL NO:-

| 1 | 2 | | | |
|---|---|---|---|---|

## 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)

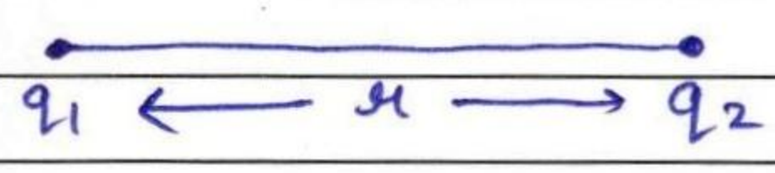
## ANS 5:

1.0 ✓

Let the two point charges $+q_1$ and $+q_2$, separated by small distance 'r' then :-

$F \propto q_1 q_2$

$F \propto \frac{1}{r^2}$




On combining :- $F \propto \frac{q_1 q_2}{r^2}$

$F = K \frac{q_1 q_2}{r^2}$

$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$

## ANS 6:

1.0 ✓

Electrical Potential at a point is difined as the amount of work done in bringing a unit positive charge from infinity to a point P against the electrostatic force.

Page total: **2.0** **von** **2.0**

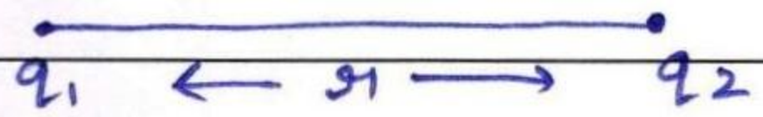
ANS 7:

Electric Force due to a point charge :-

$$F = \frac{K q_1 q_2}{r^2}$$

Electric field due to a point charge :-

$$F = \frac{\vec{F}}{q}$$



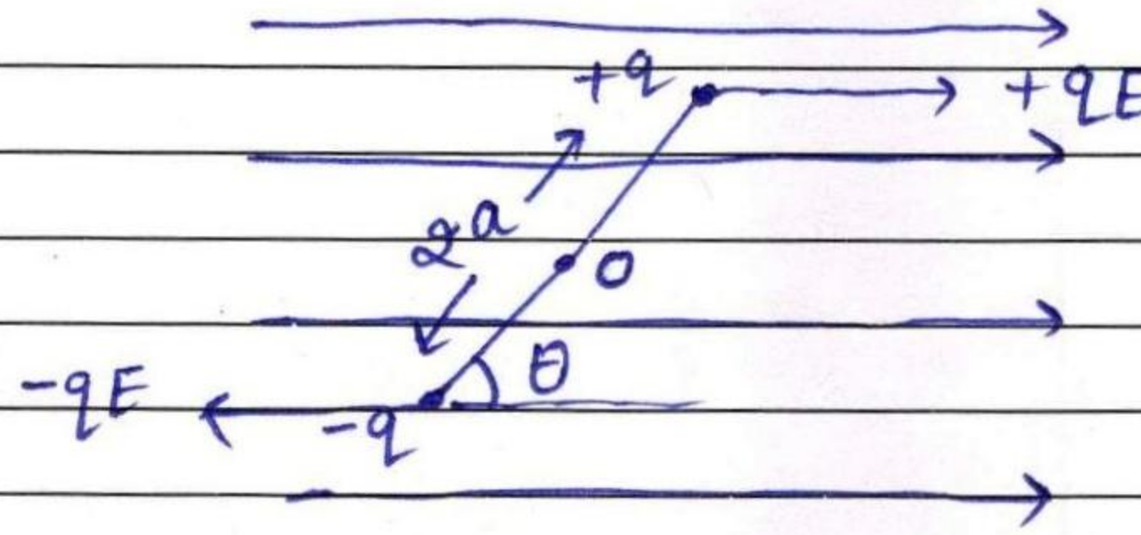

$$E = \frac{\frac{K q q_2}{r^2}}{q}$$

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

| Marks | 2.0 |
|---|---|
| Teacher's feedback | Correct magnitude derived. For completeness, specify the source charge (Q) and include the direction with unit vector: E = k Q/r^2 r-hat. |

Page total: 2.0 von 2.0

# ANS 8:




Let two charges $-q$ and $+q$ are placed in a uniformly electric field, then the electric dipole moment is :-

$$\tau = F \times \perp d$$

$$\tau = F d \sin\theta$$

$$\tau = qE \cdot 2a \sin\theta$$

$$\tau = pE \sin\theta \quad \because [p = 2qa]$$

$$\tau = \vec{P} \cdot \vec{E}$$

| | |
|---|---|
| Marks | 2.0 |
| Teacher's feedback | Correctly identified p = 2aq. Note: torque on a dipole is τ = p × E (magnitude pE sinθ), not a dot product. |

Page total: **2.0 von 2.0**

ANS 9:

$q = 2\,\mu C = 2 \times 10^{-6}\,C$

$r = 0.5\ m$

$\phi_E = \frac{q}{\varepsilon_0}$ $\because [\varepsilon_0 = 8.85 \times 10^{-12}]$

$\phi_E = \frac{2 \times 10^{-6}}{8.85 \times 10^{-12}}$

$\phi_E = \frac{2}{8.85} \times 10^{6}$

| Marks | 1.0 |
|---|---|
| Teacher's feedback | Correct use of Gauss's law; flux is q/ε0 and independent of radius. However, ε0 value is wrong and no final numerical value with units is given. Using ε0=8.85×10^-12 gives Φ≈2.26×10^5 N·m^2/C. |

Page total: **1.0 von 2.0**

ANS 10:

Work done :-

$$dW = \int v\, dq \qquad \therefore \left[ v = \frac{q}{C} \right]$$

$$dW = \int \frac{q}{C}\, dq$$

$$dW = \frac{1}{C} \int q\, dq$$

$$dW = \frac{1}{C} \left[ \frac{q^2}{2} \right]$$

$$dW = \frac{[CV]^2}{2C} = \frac{C^2V^2}{C} = \frac{CV^2}{2}$$

$$dW = \frac{1}{2} CV^2$$

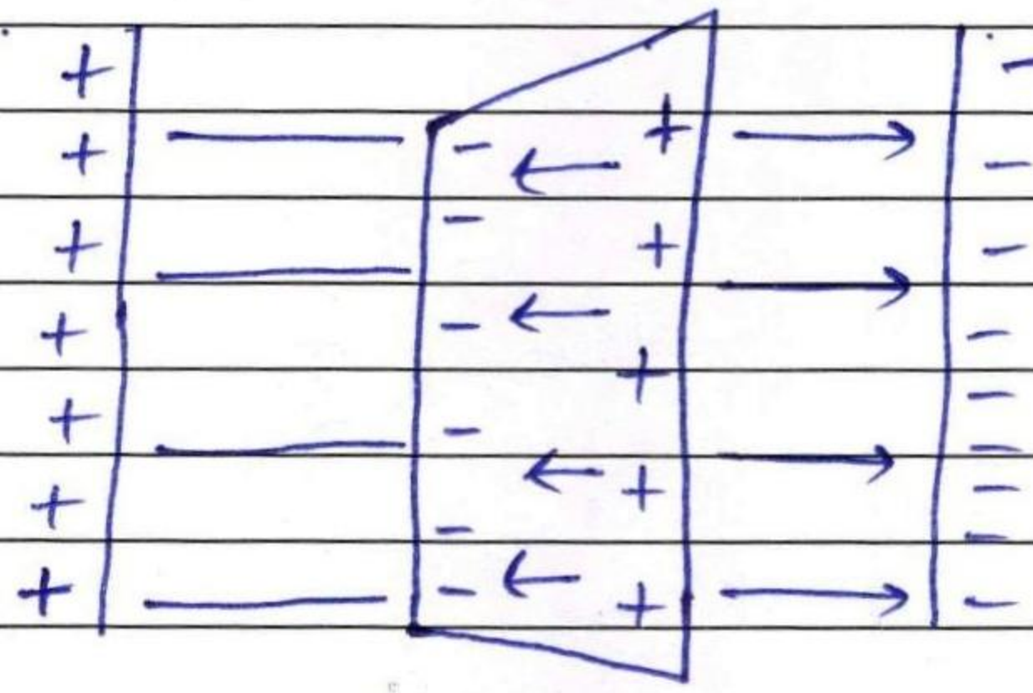
$$U = \frac{1}{2} CV^2$$

Work stored in the form of Energy.

| | |
|---|---|
| Marks | 2.0 |
| Teacher's feedback | Correct derivation and final formula. Note: differential work is dW = v dq; the integral gives total energy W (or U). You incorrectly wrote dw equals the integral and kept using dw after integration. |

Page total: **2.0 von 2.0**

# ANS 11:



when a dielectric medium is placed between the two parallel plate capacitor, then the capacitance of the material increases.

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

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

here, the capacitance increases by K.

2.0 von 2.0

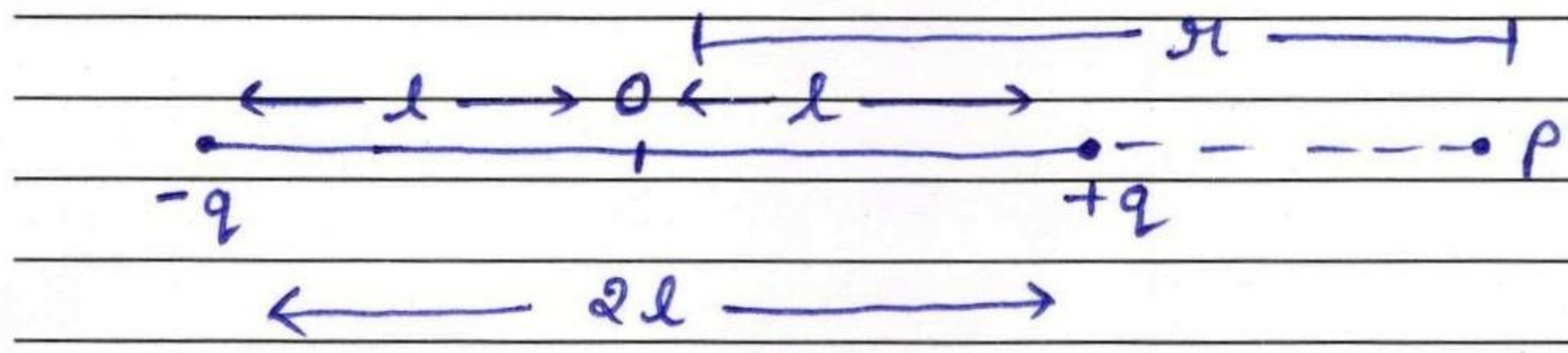
A capacitor is used to store the electric charge.

| | |
|---|---|
| Marks | 2.0 |
| Teacher's feedback | Correct formulas capturing the principle that a dielectric increases capacitance by factor K. No wrong steps. |

Page total:

ANS 12:

1). Electric Potential due to axial point :-




Electric Potential due to $+q = \frac{Kq}{r-l}$

Electric Potential due to $-q = \frac{-Kq}{r+l}$

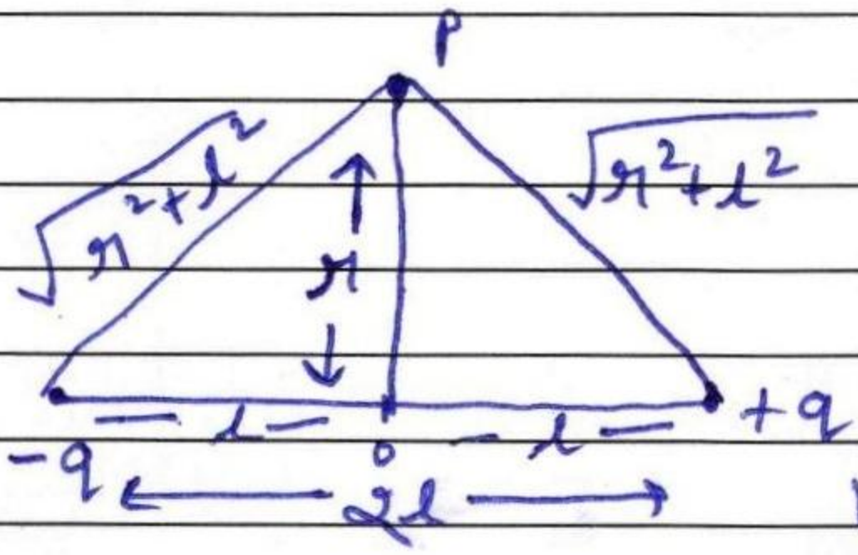
$$E_{net} = \frac{Kq}{r-l} - \frac{Kq}{r+l}$$

$$E_{net} = Kq\left[\frac{1}{r-l} - \frac{1}{r+l}\right] = Kq\left[\frac{r+l-(r-l)}{(r^2-l^2)}\right]$$

$$E_{net} = Kq\left[\frac{r+l-r+l}{(r^2)}\right] \quad \therefore [r^2 >> l^2]$$

$$E_{net} = Kq\frac{2l}{r^2} = \frac{KP}{r^2} \quad [\because P = 2ql]$$

2). Electric Potential due to Equatorial point :-




$$V_{+q} = \frac{Kq}{\sqrt{r^2+l^2}}$$

$$V_{-q} = \frac{-Kq}{\sqrt{r^2+l^2}}$$

$V_{net} = 0$

| Marks | 1.0 |
|---|---|
| Teacher's feedback | General potential is V = K p cosθ / r^2 (far field). Your derivation assumes only axial points (missing cosθ) and then incorrectly states V_net=0 (true only on the equatorial line). Specify geometry and derive general form. |

Page total: **1.0 von 3.0**

ANS 13:

$C = 8pF = 8 \times 10^{-12} F$

$d' = \frac{d}{2}$

$K = 6$

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

$C' = \frac{2 \times 6 \times 8.85 \times 10^{-12} A}{d}$

$8 \times 10^{-12} = \frac{12 \times 8.85 \times 10^{-12} A}{d}$

$C = 8pF = 8 \times 10^{-12} F$

$d' = \frac{d}{2}$ , $K = 6$

$C = \frac{\varepsilon_0 A}{d} = 8pF$, $C' = \frac{K\varepsilon_0 A}{\frac{d}{2}} = 8 \times 10^{-12}$

$C' = \frac{2K\varepsilon_0 A}{d} = \frac{2 \times 6 \times 8.85 \times 10^{-12} A}{d}$

| | |
|---|---|
| Marks | 1.0 |
| Teacher's feedback | You identified d' = d/2 and used dielectric concept, but you incorrectly set C' equal to the original C and wrote an inconsistent equality. Correct result: C' = 2K·C = 12×8 pF = 96 pF. |

15.0/20.0 Usha Rani 04:36, 18.08.202(

Page total: 1.0 von 3.0