



Because of Today, Tomorrow Will Be Better

# RK Academy

One Step Ahead To Your Success...

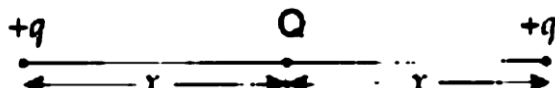


CLASS: - XII  
SUB: - PHYSICS

WEEKLY TEST  
CH 1,2

FM: - 40  
TIME: - 1 HR 30 MIN

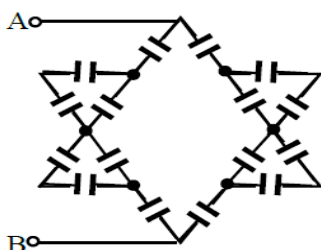
1. A charge  $Q$  is placed at the centre of the line joining two-point charges  $+q$  and  $+q$  as shown in the figure. The ratio of charges  $Q$  and  $q$  is



- (a) 4      (b)  $\frac{1}{4}$       (c) -4      (d)  $-\frac{1}{4}$
2. Each of the two-point charges are doubled and their distance is halved. Force of interaction becomes  $p$  times, where  $p$  is :
- a) 1      b) 4      c)  $\frac{1}{16}$       d) 16
3. A cylinder of radius  $R$  and length  $L$  is placed in a uniform electric field  $E$  parallel to the cylinder axis. The total flux for the surface of the cylinder is given by
- (a)  $2\pi R^2 E$       (b)  $\pi R^2$
- (c)  $\frac{\pi R^2 - \pi R}{E}$       (d) Zero
4. The figure here shows electric field lines. The electric field strength at  $P_1$  is  $E_1$  and that at  $P_2$  is  $E_2$ . If distance between  $P_1, P_2$  is  $r$ , then which of the following statement is true?



- (a)  $E_1 > E_2$     (b)  $E_1 < E_2$     (c)  $E_2 = rE_1$     (d)  $E_2 = E_1/r^2$
5. A proton moves in the direction of the electric field. Let  $\Delta U$  represent the change in its potential energy and  $\Delta W$  represent the work done by the electric field. Then
- (A) both  $\Delta U$  and  $\Delta W$  are positive      (B) both  $\Delta U$  and  $\Delta W$  are negative
- (C)  $\Delta U$  is negative but  $\Delta W$  is positive      (D)  $\Delta U$  is positive but  $\Delta W$  is negative
6. The number of electrons passing through a 40 W bulb which is connected to a 24 V car battery in one hour is
- (A)  $4.75 \times 10^{13}$     (B)  $1.75 \times 10^{23}$     (C)  $2.75 \times 10^{23}$     (D)  $3.75 \times 10^{23}$
7. Two-point charges  $4q$  and  $16q$  are placed at a distance  $r$  apart. Suppose a third charge  $-q$  is placed in between, on the line joining  $4q$  and  $16q$ , so that the electric potential energy of the system of charges is minimum. The position of the third charge is
- (A)  $r/3$  from  $4q$     (B)  $r/3$  from  $16q$     (C)  $2r/3$  from  $4q$     (D)  $2r/3$  from  $16q$
8. When a metal plate is introduced between the plates of a parallel plate capacitor its capacitance increases to 4.5 times the initial value. If  $d$  is the separation between the two plates of the capacitor, the thickness of the metal plate introduced is
- (A)  $d/3$     (B)  $5d/9$     (C)  $7d/9$     (D)  $d$
9. In the figure shown, each capacitor is of capacitance  $4 \mu F$ . The equivalent capacitance between A and B is



- (A)  $1\ \mu\text{F}$       (B)  $2.4\ \mu\text{F}$       (C)  $2\ \mu\text{F}$       (D)  $4\ \mu\text{F}$

**10. Assertion:** *Coulomb force and gravitational force follow the same inverse-square law.*

**Reason:** *Both laws are same in all aspects.*

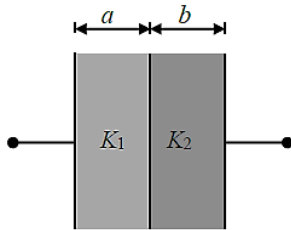
- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (c) If the Assertion is correct but Reason is incorrect
- (d) If both the Assertion and Reason are incorrect

**11. A hollow metal sphere of radius 5 cm is charged so that the potential on its surface is 10 V. The potential at the centre of the sphere is**

- (a) 0 V      (b) 10 V      (c) Same as at point 5 cm away from the surface
- (d) Same as at point 25 cm away from the surface

## **2 MARKS**

**12.** A parallel plate capacitor has two layers of dielectrics as shown in the figure. Find the ratio of potential differences across the dielectric layers when connected to a battery.



**13.** If a dipole is kept in a uniform electric field  $E$ . Diagrammatically represent the position of the dipole in stable and unstable equilibrium. Write the expression for torque in both cases.

**14.** Calculate the distance between two electrons such that the electrical repulsive force between them is equal to the weight of the either.

## **3 MARKS**

**15.** An electric dipole of length 2 cm is placed with its axis making an angle of  $60^\circ$  to a uniform electric field of  $10^5\ \text{N/C}$ . if it experiences a torque of  $8\sqrt{3}\ \text{Nm}$ . Calculate the

- i. Magnitude of the charge
- ii. Potential energy of the dipole

**16.** A dipole is placed with center at origin. Find potential due to the dipole on its axis. Show that potential at all equatorial point is zero.

**17.** Potential of a field is given as  $V = 5x^3 + 4y^3x + yz$ , then find expression for electric field  $E$  at  $(1, 0, 2)$ .

## **5 MARKS**

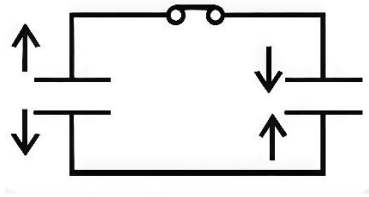
**18. .**

- i. A dipole of  $+q$  and  $-q$  charge separated at  $2l$  is placed on X-axis such that its centre lies at origin. Find expression for electric field at  $(0, y)$  where  $y \gg l$ .
- ii. A hollow sphere of radius 8 cm is given a charge of  $16\ \mu\text{C}$ . what is the electric field intensity at centre and outer surface of the sphere.

**19. .**

- i. Derive an expression for the capacitance of a parallel plate capacitor with air present between the two plates.
- ii. Two identical parallel plate capacitors are connected as shown in the figure. Initially one plate has total charge  $q_0$  and separation between both plates is  $x_0$ . At an instant, plates of one capacitor begin to move towards each other

and plates of the other capacitor away from each other. If velocity of a plate relative to the other in both the capacitors has the same magnitude  $v$ , find current (in A) in the circuit. (Given:  $q_0 = 1\text{mC}$ ,  $x_0 = 1\text{mm}$ ,  $v = 8\text{m/s}$ )



#### **4 MARKS CASE STUDY**

**20.** For electrostatics, the concept of electric field is convenient, but not really necessary. Electric field is an elegant way of characterizing the electrical environment of a system of charges. Electric field at a point in the space around a system of charges tells you the force a unit positive test charge would experience if placed at that point (without disturbing the system). Electric field is a characteristic of the system of charges and is independent of the test charge that you place at a point to determine the field. The term field in physics generally refers to a quantity that is defined at every point in space and may vary from point to point. Electric field is a vector field, since force is a vector quantity.

**(i) Which of the following statement is correct? The electric field at a point is**

- (a) always continuous.
- (b) continuous if there is a charge at that point.
- (c) discontinuous only if there is a negative charge at that point.
- (d) discontinuous if there is a charge at that point.

**(ii) The force per unit charge is known as**

- (a) electric flux
- (b) electric field
- (c) electric potential
- (d) electric current

**(ii) The SI unit of electric field is**

- (a) N/m
- (b) N-m
- (c) N/C
- (d)  $\text{N/C}^2$

**(iv) The magnitude of electric field intensity  $E$  is such that, an electron placed in it would experience an electrical force equal to its weight is given by**

- (a)  $mge$
- (b)  $mg/e$
- (c)  $e/mg$
- (d)  $e^2g/m^2$