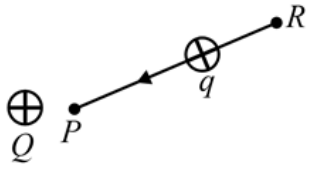
Parishram (2025)

Physics

DPP: 4

Electrostatic Potential and Capacitance

Q1 Consider the following figure as shown below.



Work done by external force in bringing a positive charge from point *R* to *P* is (Here potential at P and R are V_P and V_R respectively)

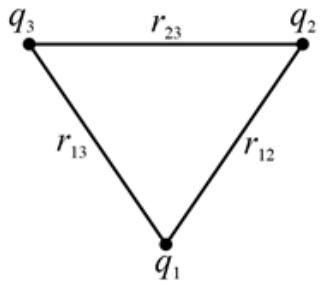
(A) $q(V_R - V_P)$

(B) $-q(V_R - V_P)$

(C) $\left(\frac{V_R - V_P}{2q}\right)$

(D) $\left(\frac{V_R - V_P}{q}\right)$

Q2 The total potential energy of a system of three charges q_1, q_2 and q_3 located as shown in figure is



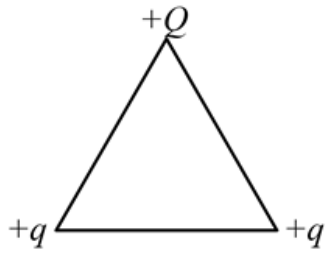
(A) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q_1q_2}{r_{12}} + \frac{q_1q_3}{r_{13}} + \frac{q_2q_3}{r_{23}}\right)$

(B) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q_1q_2}{r_{12}} - \frac{q_1q_3}{r_{13}} + \frac{q_2q_3}{r_{23}}\right)$

(C) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q_1q_2}{r_{12}} + \frac{q_1q_3}{r_{13}} - \frac{q_2q_3}{r_{23}}\right)$

(D) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q_1q_2}{r_{12}} - \frac{q_1q_3}{r_{13}} - \frac{q_2q_3}{r_{23}}\right)$

Q3 Three charges are placed at the vertex of an equilateral triangle of side *l* as shown in figure. For what value of *Q*, the electrostatic potential energy of the system is zero?



(A) –q (B) q/2

(C) –2q (D) –q/2

Q4 For a uniform electric field *E*, along the X-axis, the equipotential surfaces are

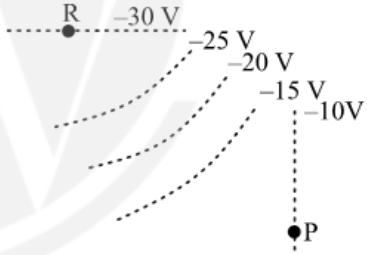
(A) Planes perpendicular to the X-axis

(B) Planes parallel to the YZ-plane

(C) Both (A) and (B)

(D) Neither (A) nor (B)

Q5 Figure shows equipotential surfaces.



What is the direction of electric field E at P and R?

(A) At P, E is to the left. At R, E is upward

(B) At P, E is to the right. At R, E is downward

(C) At P, E is to downward. At R, E is to the left

(D) At P, E is to upward. At R, E is to the right

Q6 Equipotential surface between two equal and opposite charges passing through the middle point is

(A) a plane

(B) curved surface

(C) Both (A) and (B)

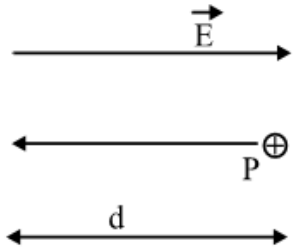
(D) None of these

Q7 Work done in moving a test charge over an equipotential surface?

(A) No (B) Yes

(C) Constant (D) Zero

Q8 In the figure, proton moves a distance *d* in a uniform electric field E as shown in the figure. Does the electric field do a positive or negative work on the proton? Does the electric potential energy of the proton increase or decrease?



(A) Negative, increase

(B) Positive, decrease

(C) Negative, decrease

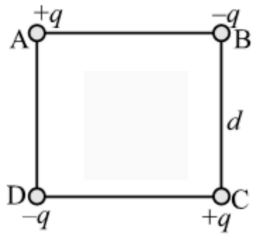
(D) Positive, increase

Q9 Work done in moving a charge from one point to other inside a uniformly charged conducting sphere is

(A) always zero (B) non-zero

(C) may be zero (D) None of these

Q10 Four charges are arranged at the corners of a square ABCD of side *d*, as shown in the figure. The work required to put together this arrangement is



(A) $\frac{-q^2}{4\pi\varepsilon_0 d}\left(4-\sqrt{2}\right)$

(B) $\frac{-q^3}{4\pi\varepsilon_0 d}\left(4-\sqrt{2}\right)$

(C) $\frac{-q^4}{4\pi\varepsilon_0 d}\left(4-\sqrt{2}\right)$

(D) $\frac{q^2}{4\pi\varepsilon_0 d}\left(4-\sqrt{2}\right)$

Q11 Two charges of equal magnitude *q* are placed in air at a distance 2*a* apart and third charge –2*q* is placed at mid-point. The potential energy of the system is (ε_0 = permittivity of free space)

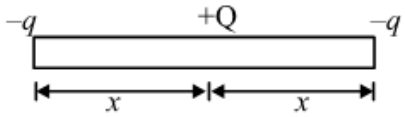
(A) $-\frac{q^2}{8\pi\varepsilon_0 a}$

(B) $-\frac{3q^2}{8\pi\varepsilon_0 a}$

(C) $-\frac{5q^2}{8\pi\varepsilon_0 a}$

(D) $-\frac{7q^2}{8\pi\varepsilon_0 a}$

Q12 Three charges –*q*, +Q and –*q* are placed in a straight line as shown.



If the total potential energy of the system is zero, then the ratio *q*/Q is

(A) 2 (B) 5.5

(C) 4 (D) 1.5

Answer Key

Q1	(B)	Q7	(D)
Q2	(A)	Q8	(A)
Q3	(D)	Q9	(A)
Q4	(C)	Q10	(A)
Q5	(A)	Q11	(D)
Q6	(A)	Q12	(C)