ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 6

Subject : PHYSICS

CLASS : XII

Date : 9.5.20

Chapter : Electrostatics

Topic : E.P. energy, E.P.E. for 3 charge system, work done in rotating Dipole, vel. of q subject to potential.

Multiple Choice Question : **1 x 15 = 15**

1. Give the dimension of electric potential

   (a) $[ML^2T^{-3}A^{-1}]$ (b) $[MLTA]$ (c) $[MLT^{-3}A^{-1}]$ (d) $[M^{-1}L^{-1}TA]$

   Ans. : (a) $[ML^2T^{-3}A^{-1}]$

2. A particle of mass $1g$ and having charge 10^{-8}C is passed through a potential difference of 600V. What will be its kinetic energy?

   (a) $-6x10^6$ erg. (b) $-6x10^6$ J (c) $6x10^6$ erg (d) $6x10^6$ J

   Ans : (d) $6x10^6$ J

3. The charges $+q$, $-4q$and $+2q$ are placed at the angular points of an equilateral triangleof side 0.15 m. If q = 1μC. What is the mutual potential energy of the system?

   (a) 0.4 J (b) 0.5 J (c) –0.6 J (d) 0.8 J

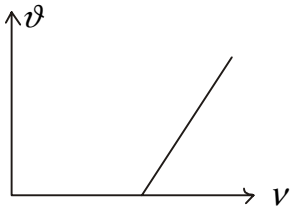
   Ans. : (c) –0.6 J

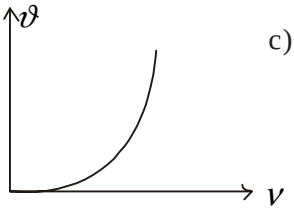
4. A electric dipole moment of P is placed in the position of stable equilibrium in electric field of intensity, E. It is rotated through an angle θ from the initial position. The potential energy of the electric dipole in the final position is :

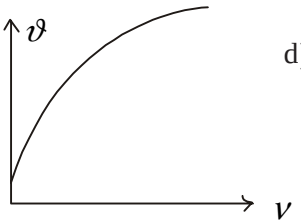
   (a) $PE\sin\theta$ (b) $-PE\sin\theta$ (c) $PE(1-\cos\theta)$ (d) $PE\cos\theta$

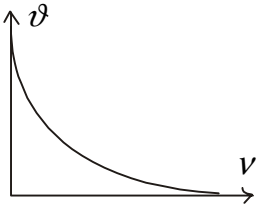
   Ans. : (c) $PE(1-\cos\theta)$

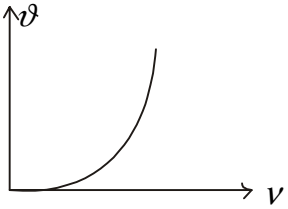
5. The velocity v acquired by an electron starting from rest and moving through a potential difference V is shown by which of the following graphs?

   a) 

   b) 

   c) 

   d) 

   Ans. : (b) 

6. If an electron is brought towards another electron, the electric potential energy of the system :
(a) increases (b) decreases
(c) become zero (d) remain the same.

Ans. (d) remain the same.

7. When is the potential energy of an electric dipole maximum, when placed in a uniform electric field?
(a) When it is aligned antiparallal to the electric field.
(b) When it is aligned parallal to the electric field.
(c) When it is aligned perpendicular to the electric field.
(d) When it is aligned 60^o to the electric field.

Ans. (a) When it is aligned antiparallal to the electric field.

8. An α-particle and a proton are accelarated at same potential difference from rest. Find the ratio of their final volocities :

(a) $\sqrt{2}:1$ (b) 1 : 1 (c) $1:\sqrt{2}$ (d) 1 : 2

Ans. : (c) $1:\sqrt{2}$

9. An electric dipole of moment $\vec{P}$ is lying along a uniform electric field $\vec{E}$. The work done in rotating the dipole by 60^0 is :

(a) $\sqrt{2}$ PE (b) PE/2 (c) 2PE (d) PE

Ans. : (b) PE/2

10. An electric dipole has the magnitude of its charge as q and its dipole moment is P. It is placed in a uniform electric field E. If its dipole moment is along the direction of the field,the force on it and its potential energy are respectively :

(a) $2qE$ and minimum (b) qE and PE (c) Zero and minimum (d) qE and maximum

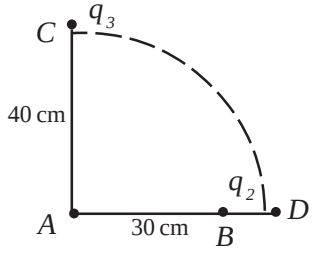
Ans. : (c) Zero and minimum

11. Three $+Q$ point charges are placed at the angular points of a triangle of side x. If these charges are sent to infinity what will be their total kinetic energy?

(a) $3Qx$. (b) $3\frac{Q^2}{x}$ (c) $\frac{Q^2}{x}$ (d) Q^2x

Ans. : (b) $3\frac{Q^2}{x}$

12. Two charges q_1 and q_2 are placed 30 cm apart as show in figure. A third charge q_3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $\frac{q_3K}{4\pi\epsilon_o}$, where K is :



(a) $8q_1$ (b) $6q_1$ (c) $8q_2$ (d) $6q_2$

Ans. : (c) $8q_2$

13. Identical chargges ($-q$) are placed at each corner of a cube of side b. Then the electrostatic potantial energy of chage ($+q$) placed at the centre of the cube will be :

(a) $\frac{-4\sqrt{2}q^2}{\pi\epsilon_0}$ (b) $\frac{8\sqrt{2}q^2}{\pi\epsilon_0 b}$ (c) $\frac{-4q^2}{\sqrt{3}\pi\epsilon_0 b}$ (d) $\frac{8\sqrt{2}q^2}{4\pi\epsilon_0 b}$

Ans. : (c) $\frac{-4q^2}{\sqrt{3}\pi\epsilon_0 b}$

14. 1000 identical water drops each of radius r and each having charge q are conbined into a single drop. If v be potential of each small drop and V be the potential of the large drop, then the ratio $\frac{V}{v}$ is

(a) $\frac{1}{1000}$ (b) $\frac{1}{100}$ (c) 1000 (d) 100

Ans. : (d) 100

15. An Electron of mass m and charge e is accelarated from rest through a Potential difference V in vacuum. Its final speed will be :

(a) $\sqrt{\frac{2eV}{m}}$ (b) $\sqrt{\frac{eV}{m}}$ (c) $\frac{eV}{m}$ (d) $\frac{2eV}{m}$

Ans. : (a) $\sqrt{\frac{V}{v}}$

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