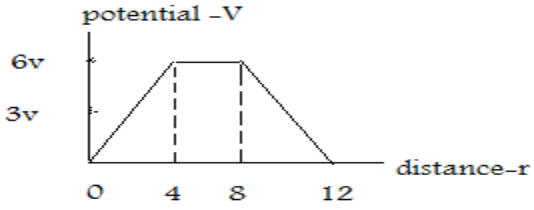
	INDIAN SCHOOL AL WADI AL KABIR	
Class: XII **All Sections**	**Department: SCIENCE 2023 – 24** **SUBJECT: PHYSICS**	**Date of submission:** **04-5-2023**
Worksheet **No: 2** **WITH ANSWERS**	**CHAPTER 1 : ELECTRIC POTENTIAL AND CAPACITANCE**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

SECTION A [1 MARK]

Directions (Q1-Q6) Select the most appropriate option from those given below each question

[1]The graph shows the variation of potential with distance from a fixed point charge, find the electric field 3m from the point charge.



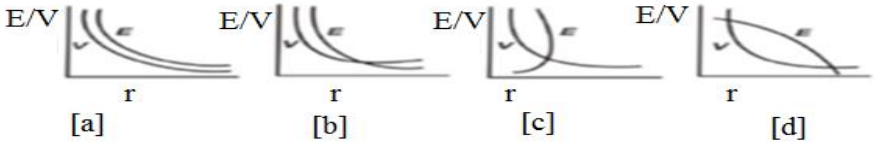
[a] 2v/m [b] 3v/m [c.] -1.5v/m [d] – 3v/m ANS. [c]

[2] When the charge is supplied to a conductor, its potential depends upon

[a] amount of charge [b] geometry and size of the conductor

[.c] both [a]&[b] [d]only on [a] ANS.[c]

[3] The variation of potential V with r & electric field with r for a point charge is correctly shown in the graphs



ANS. [b]

[4] A dipole is placed parallel to electric field.If W is the work done in rotating the dipole from 0^0 to 60^0 ,then work done in rotating it from o^o to 180^0 is

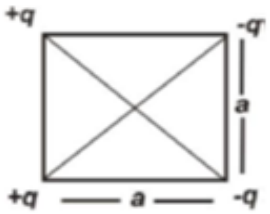
[a] 2W[b] 3W [c] 4W [d] $\frac{W}{2}$ ANS. [c]

[5] A parallel plate capacitor is charged by a battery .Once it is charged ,battery is removed. Now a dielectric material is inserted between the plates of the capacitor, which of the following does not change?

[a] Electric field[b] potential difference [c.] charge on the plates[d] energy stored

ANS. [c]

[6] The potential at the centre of the square is



[a] zero [b] 2kq [c] $\frac{kq}{a^2}$ [d] $\frac{kq}{2a^2}$ ANS. [a]

SECTION B [2 marks]

[7] A 4μF capacitor is charged by a 200 v supply.It is then disconnected from the supply and is connected to another 2 μF capacitor. How much energy of the first capacitor is lost in the form of radiation?
$E1 = ½ C1 V1^2$
$E2 = ½ C_p V^2$
Energy lost = E1 –E2 = 2.67×10^{-2} J
[8]The electric field intensity at a point due to a point charge is 20 N/C and the electric potential is 10 J/C. Find the magnitude of the charge and distance of the point from charge.
$V = \frac{KQ}{r}$, E = V/d
$Q = 0.55 \times 10^{-9}$ C

[9]A capacitor with air between the plates has a capacitance of 8F.The separation between the plates is now reduced by half and the space between them is filled with a medium of dielectric constant 5.Calculate the value of the capacitance of the capacitor in second case.

$C = \frac{\epsilon_o A}{d}$
$C^1 = \epsilon r \frac{\epsilon_o A}{\frac{d}{2}}$
$C^1 = 80F$
[10] A charge +lμc is placed at a distance of 0.lm from another charge of +4μc in air. At what point on the line joining the charges, is the electric field intensity zero?

[x = 10/3 cm from +1μc]

SECTION C [1 MARK]

Directions: Choose any one of the following four responses.
(a) Both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) Assertion is correct, Reason is incorrect
(d) Both Assertion and Reason are incorrect .

11. **Assertion (A) :** Positive charge always moves from a higher potential point to a lower potential point.
Reason (R) : Electric potential is a vector quantity.

12. **Assertion (A) :** The whole charge of a conductor cannot be transferred to another isolated conductor.
Reason (R) : The total transfer of charge from one to another is not possible.

13. **Assertion (A) :** Electric potential of the earth is zero.
Reason (R) : The electric field due to the earth is zero.

14. **Assertion (A) :** Capacity of a parallel plate capacitor increases when distance between the plates is decreased.
Reason (R) : Capacitance of capacitor is inversely proportional to distance between them.

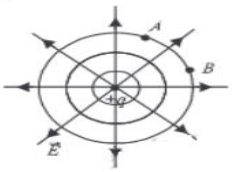
15. **Assertion (A) :** When air between the plates of a parallel plate condenser is replaced by an insulating medium of dielectric constant its capacity increases.
Reason (R) : Electric field intensity between the plates with dielectric in between it is reduced.

11[c]12[d] 13[c] 14[a] 15[a]

CASE-STUDY BASED QUESTIONS [SECTION D – 1 MARK EACH]

Equipotential Surfaces

For the various charge systems, we represent equipotential surfaces by curves and line of force by full line curves. Between any two adjacent equipotential surfaces, we assume a constant potential difference the equipotential surfaces of a single point charge are concentric spherical shells with their centres at the point charge. As the lines of force point radially outwards, so they are perpendicular to the equipotential surfaces at all points.



(i) Identify the wrong statement.
(a) Equipotential surface due to a single point charge is spherical.
(b) Equipotential surface can be constructed for dipoles too.
(c) The electric field is normal to the equipotential surface through the point.
(d) The work done to move a test charge on the equipotential surface is positive.

(ii) Nature of equipotential surface for a point charge is
(a) Ellipsoid with charge at foci
(b) Sphere with charge at the centre of the sphere
(c) Sphere with charge on the surface of the sphere
(d) Plane with charge on the surface.

(iii) A spherical equipotential surface is not possible
(a) inside a uniformly charged sphere
(b) for a dipole
(c) inside a spherical condenser
(d) for a point charge

(iv) The work done in carrying a charge q once round a circle of radius a with a charge Q at its centre is
(a) $\frac{qQ}{4\pi\varepsilon_0 a}$ (b) $\frac{qQ}{4\pi\varepsilon_0 a^2}$ (c) $\frac{q}{4\pi\varepsilon_0 a}$ (d) zero

(v) The work done to move a unit charge along an equipotential surface from P to Q
(a) must be defined as $-\int_P^Q \vec{E}.d\vec{l}$
(b) is zero
(c) can have a non-zero value
(d) both (a) and (b) are correct.

[i]d [ii]b [iii]b [iv]d [v]d

SECTION E [3 marks]

[1]Two point charges of +3 x 10^{-19} C and +12 x 10^{-19} C are separated by a distance of 2.5m. Find the point on the line joining them where electric field intensity is zero.

[x = 5/3cmfrom 12 x 10^{-19} c]

[2]A neutral hydrogen molecule has two protons and two electrons. If one of the electrons is removed, we get a hydrogen molecule ion (H_2). In the ground state of H_2 the protons are separated by roughly 1.5A° and the electron is roughly 1A° from each proton. Estimate the potential energy of the system.

U = $\frac{Kq1q2}{r12}$ + $\frac{kq2q3}{r23}$ + $\frac{kq3q1}{r31}$ = -19.2eV

[3][a]Define electrostatic potential energy[b] Derive the expression for electrostatic potential energy of a system of 3 charges q1, q2 and q3

[4] Derive the expression for the capacitance of a capacitor in presence of a dielectric

SECTION F [5 marks]

[5]Derive the expression for capacitance of a parallel plate capacitor

[6]What is an electric dipole. Derive an expression for electrostatic potential energy of an electric dipole in an external electric field of strength E

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