EQUIPOTENTIAL, ELECTRIC POTENTIAL AND POTENTIAL ENERGY

1. Electric lines of force always leave an equipotential surface

1) At any angle to the surface

2) Parallel to the surface

3) Perpendicular to the surface

4) none

2. A unit charge is taken from one point to another over an equipotential surface, then

1) Work is done on the charge

2) Work is done by the charge

3) Work on the charge is constant

4) No work is done

3. Inside a hollow spherical conductor, the potential

1) is constant

2) varies directly as the distance from the centre

3) varies inversely as the distance from the centre

4) varies inversely as the square of the distance from the centre.

4. Choose the correct statement

1) An electron at a higher potential has lower potential energy

2) An electron at a lower potential has lower potential energy

3) An electron moves from higher to lower potential

4) None of the above

5. Choose the correct statement

1) A zero potential point is always a zero electric intensity point

2) A zero electric intensity point is always a zero potential point

3) At a point of zero electric intensity electric potential may not be zero

4) all the above

6. When the separation between two charges is increased, the electric potential energy of the charges

1) increases

2) decreases

3) Remains the same

4) May increase or decrease

7. Choose the wrong statement

1) An equipotential surface is normal to electric field lines

2) potential increases in the direction of electric field

3) We may have zero potential but non zero electric field at a point in space

4) Potential is a scalar quantity

8. Out of the following two statements

A) As we move in the direction of the field potential goes on decreasing

B) If a charged body is moved within the field work must be done by field.

1) A is correct and B is wrong

2) A is wrong and B is correct

3) Both A and B are correct

4) Both A and B are wrong

9. Potential at the point of a pointed conductor is

1) Maximum

2) Same as at any other point

3) Zero

4) Minimum

10. Out of the following two statements

A) three charge system can not have zero mutual potential energy

B) The mutual potential energy of a system of charges is only due to positive charges

1) A is wrong and B is correct

2) A is correct and B is wrong

3) Both A and B are correct

4) Both A and B are wrong

11. If two conducting spheres are separately charged and then brought into contact

1) The total energy of the spheres is conserved

2) The total charge on the spheres is conserved

3) Both the total energy and charge are conserved

4) The final potential is always the mean of the original potential of the two spheres

12. Electric potential at some point in space is zero. Then at that point

1) electric intensity is necessarily zero

2) electric intensity is necessarily non zero

3) electric intensity may or may not be zero

4) electric intensity is necessarily infinite

13. At each corner of an equilateral triangle identical charges are placed. Then

1) at the centre of the triangle the resultant electric intensity is zero

2) at the centre of the triangle the net electric potential is zero

3) the electrostatic potential energy of the system is zero

4) the resultant electric intensity at any corner is zero

14. On the perpendicular bisector of an electric dipole, the electric intensity E and potential V are

1) E = 0, V = 0

2) E ≠ 0, V ≠ 0

3) E ≠ 0, V = 0

4) E = 0, V ≠ 0

15. When an electron approaches a proton, their electrostatic potential energy

1) decreases

2) increases

3) Remains unchanged

4) All the above

16. The mutual electric potential energy of two negatively charged particles are U_1 and U_2 when their distances of separation are d_1 and d_2 respectively. If $d_2 > d_1$, then

1) $U_1 > U_2$ **2) $U_1 < U_2$** **3) $U_1 = U_2$** **4) cannot be decided**

17. If an earthed plate is brought near positively charged plate, the potential and capacity of charged plate

1) increases, decreases

2) decreases, increases

3) decreases, decreases

4) increases, increases

18. At a point in space the electric field points towards north. In the region surrounding this point the rate of change of potential will be zero along

1) North **2) South** **3) North south** **4) East west**

19. Two charged spheres of radii 10cm and 15cm are connected by a thin wire. No current will flow if they have

1) the same charge on each

2) the same potential

3) the same field on their surface

4) the same energy

20. An electron and a proton move through a potential difference of 200V. Then

1) electron gains more energy

2) proton gains more energy

3) both gain same energy

4) none gain energy

21. An electron of mass m and charge e is accelerated from rest through a potential difference V in vacuum. Its final speed will be

1) $\sqrt{\frac{2eV}{m}}$ **2)** $\sqrt{\frac{eV}{m}}$ **3)** $\frac{eV}{2m}$ **4)** $\frac{eV}{m}$

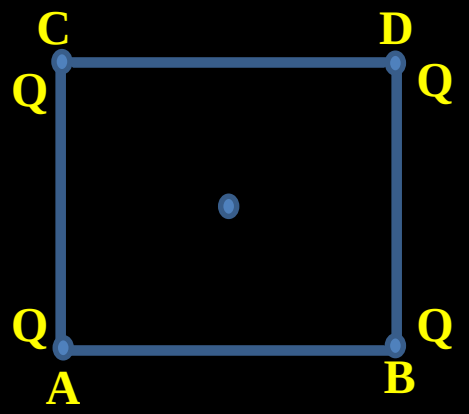
22. Four identical charges each of charge Q are placed at the corners of a square. Then at the centre of the square the resultant electric intensity E and the net electric potential V are

1) E≠ 0, V = 0

2) E = 0, V ≠ 0

3) E = 0, V = 0

4) E ≠ 0, V ≠ 0



23. Electric potential on the surface of a hollow conducting sphere is V. The electric potential is $\frac{V}{2}$ at a distance

1) R/2 inside the sphere

2) $R^2/2$ from the surface of the sphere and outside it

3) 2R from the centre of the sphere

4) 2R from the surface of the sphere and outside it

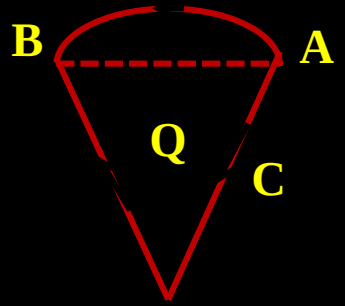
24. A charge Q is at the centre of a semicircle of diameter AB. If work done in moving a charge q along the semicircle is W_1 and work done in moving the same charge q along the path ACB is W_2, then

1) $W_1 > W_2$

2) $W_1 < W_2$

3) $W_1 = W_2 = 0$

4) $W_1 = W_2 \neq 0$



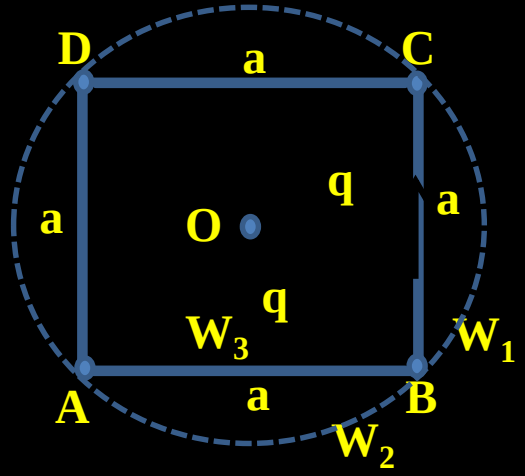
25. A charge Q is placed at one corner A of a square ABCD. Its centre is 0. A test charge q is moved along three paths namely BC, BCD and BOD doing the works W_1, W_2 and W_3 respectively. Then

1) $W_1 = W_2 = W_3 =$ zero

2) $W_1 > W_2 > W_3$

3) $W_1 \neq 0$ and $W_2 = W_3 = 0$

4) $W_1 < W_2 < W_3$



26. In hydrogen atom electron of charge –e and mass m revolves round the nucleus in a circular orbit of radius r. The electrostatic potential energy of the electron is $\frac{1}{4\pi\epsilon_0}$ times

1) $\frac{-e}{r}$ 2) $\frac{-e^2}{r}$ 3) $\frac{e^2}{r}$ 4) $\frac{-me^2}{r}$

27. In the electric field of a point charge Q a certain charge is carried from point A to B, C, D and E. Then the workdone is (Q is at the centre of the circle)

1) least along the path AB

2) least along the path AD

3) zero along any one of the paths AB, AC, AD and AE

4) least along AE

28. Two conducting spheres of radii r_1 and r_2 are at the same potential. Their charges are in the ratio of

1) $\frac{r_2}{r_1}$ 2) $\left(\frac{r_2}{r_1}\right)^2$ 3) $\frac{r_1}{r_2}$ 4) $\left(\frac{r_1}{r_2}\right)^2$

29. A condenser is charged to a potential V by connecting it to a battery. If the charge on the condenser is Q

1) the energy stored in the condenser is 1/2 QV

2) work done by the battery during charging is 1/2 QV

3) work done by the battery during charging is QV

4) both (1) and (3) are true

30. Identify the correct order in which the gain in kinetic energies increases in the following cases

i) Alpha particle accelerated through a P.D of 2V

ii) Proton accelerated through a P.D of 2V

iii) Deutron accelerated through a P.D of 3V

iv) Electron accelerated through a P.D of 5V

1) ii, iii, i and iv

2) iii, iv, i and ii

3) iv, ii, i and iii

4) i, iii, ii and iv

31. When a charged particle of charge 'q' and mass 'm' is accelerated through a P.D of V. Then the velocity (v) acquires by it is

a) $v \propto q$ b) $v \propto m^{-\frac{1}{2}}$ c) $v \propto V$ d) $v \propto q^{\frac{1}{2}}$

1) b is correct

2) Both b and c are correct

3) Both b and d are correct

4) a and c are correct

32. When 'n' identical drops each of potential V coalesce to form a bigger drop of potential 'V_1'. Then

a) $v_1 \propto n$ **b) $v_1 \propto n^{2/3}$** **c) $V_1 \propto V^{2/3}$** **d) $V_1 \propto V$**

1) a and c are correct

2) a and d are correct

3) b and c are correct

4) b and d are correct

33. Two concentric spheres of radii R and r have similar charges with equal surface densities (σ). Then electric potential (V) at their common centre is

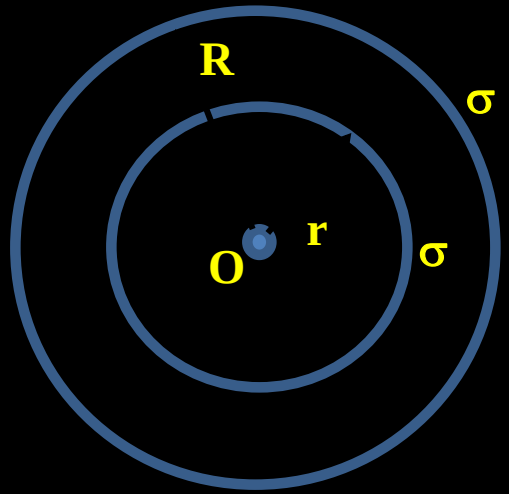
a) $V \propto \frac{\sigma}{\epsilon_0}$ b) $V \propto (R + r)$ c) $V \propto (R-r)$ d) $V_1 \propto \sigma(R-r)$

1) a and b are correct

2) a and c are correct

3) b and d are correct

4) a is correct



34. Match list–I with List–II

LIST - I	LIST - II
a) Electric potential inside a charged conducting sphere	e) Inversely proportional to square of the distance (r^2)
b) Electric potential outside conducting charged sphere	f) Directly proportional to distance (r) from the centre
c) Electric field inside the non conducting charged sphere	g) constant

d) Electric field outside a conducting charged sphere

h) Inversely proportional to distance (r)

1) a – f, b – e, c – g, d – h

2) a – e, b – f, c – h, d – g

3) a – h, b – g, c – e, d – f

4) a – g, b – h, c – f, d – e

35. Match list–I with List–II

LIST - I	LIST - II
a) Two like charges are brought nearer	e) The force between them decreases
b) Two unlike charges are brought nearer	f) Potential energy of the system increases
c) When a third charge not of same nature is placed equidistant from two like charges	g) Mutual forces are affected

d) When a dielectric medium is introduced between two charges

h) Potential energy of the system decreases

1) a – h, b – f, c – g, d – e

2) a – f, b – h, c – g, d – e

3) a – h, b – f, c – e, d – g

4) a – g, b – e, c – f, d – h

36. Match list–I with List–II

LIST - I	LIST - II
a) Electric potential due to a point charge V =	e) $\vec{E} \cdot \vec{r}$
b) Electric field intensity E =	f) Eqd
c) Electric potential V =	g) $\frac{Q}{4\pi \in_0 r}$
d) Electro static potential energy	h) $-\frac{dv}{dx}$

37. Match list–I with List–II

LIST - I	LIST - II
a) Electric energy is stored in the capacitor	e) decreases
b) Capacity of capacitor when dielectric between the plates with disconnecting the battery	f) In the electric field between the plates
c) Potential difference between the plates of capacitor when dielectric medium is inserted between the plates with disconnecting the battery	g) Remains same

d) Charge on the capacitor when dielectric medium is inserted between the plates of the capacitor with disconnecting the battery

h) increases

1) a – h, b – f, c – g, d – e

2) a – f, b – g, c – e, d – h

3) a – f, b – h, c – e, d – g

4) a –g, b – f, c – e, d – h

38. Statement I : When a proton with certain energy moves from low potential to high potential then its KE decreases.
Statement II : The direction of electric field is opposite to the potential gradient

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

39. Statement I : When Proton and α - particle which are initially at rest are accelerated by same electric field for the same time interval, debroglie wavelength for α particle is less than that of proton.
Statement II : In the given electric field to get particular momentum the time of acceleration is inversely proportional to charge

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

40. Statement I : Proton and duetron are projected with same velocity normal to the electric field of same strength require different times of travel to acquire velocity of same magnitude.
Statement II : In the electric field in getting certain velocity from rest, the time of acceleration is inversely proportional to specific charge of the particle.

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

41. Statement I : A circle is drawn with a point positive charge (+q) at its centre. The work done in taking a unit positive charge once around it is zero

Statement II : Displacement of unit positive charge is zero

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

42. Statement I : When two charged spheres are connected by a conducting wire, the charge flows from smaller sphere to larger sphere.
Statement II : Smaller sphere is at high potential when equal charges are imparted to both the spheres

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

43. Statement I : Electric potential at any point on the equatorial line of electric dipole is zero.
Statement II : Electric potential is scalar

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

44. Statement I : In bringing an electron towards a proton electrostatic potential energy of the system increases.
Statement II : Potential due to proton is positive.

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

45. Statement I : The surface of a conductor is an equipotential surface
Statement II : Conductor allows the flow of charge

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.

46. Statement I : When charge is shared between two conductors then there is no loss of charge, but there is loss of electrostatic energy
Statement II : Law of conservation of energy fails.

1) Statement I is true, Statement II true, statement II is the correct explanation for statement I

2) Statement I is true, Statement II true, statement II is not the correct explanation for statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true.