Education College **QUESTION BANK** **1st Stage**

Physics Dept. **Electricity and magnetism** **1st Semester**

Q1 Chose the correct answer

1- The formula for electrostatic potential is ________

a. Electrostatic potential = Work done*charge
b. Electrostatic potential = Work done/charge
c. Electrostatic potential = Work done+charge
d. Electrostatic potential = Work done-charge

2- Which of the following statement is true?
a. Electrostatic force is non-conservative.

b. Potential at a point is the work done per unit charge in bringing a charge from any point to infinity.
c. Electrostatic force is a conservative force.
d. Potential is the product of charge and work.

3- 1 Volt is equivalent to ……

a. 1 Coulomb
b. 1 Newton / 1 Coulomb
c. 1 Joule / 1 Coulomb
d- 1 Newton / 1 meter

4- If the distance between two negative point charges is increased by a factor of three, the
resultant potential energy is what factor times the initial potential energy?
A. 3.0 D. 1/9 B. 9.0 E. 1 C. 1/3

5- Moving a point charge of $3.2 *10^{-19}$ C between two points in a conducting wire requires $8.0 *10^{-19}$ J. What is the voltage between these two points?

A. 2.5 V B. 0.4 V
C. 25.6 V D. It cannot be determined.

6- A point charge 2nC is located at the origin. What is the potential at (1,0,0)?
a) 12
b) 14
c) 16
d) 18

7- Six equal point charges Q = 10nC are located at 2,3,4,5,6,7m. Find the potential at the origin.
a) 140.35
b) 141.35
c) 142.35
d) 143.35

8- Two point charges, $\mathbf{q_1 = 4\ nC}$ and $\mathbf{q_2 = -3\ nC}$, placed **10 cm** apart. Compute the potentials at points ***A,*** if points ***A*** is midway between them.

a)1260 V b)180 V c)1800 V d)126 V

9- 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

10- The electric potential V at any point O (x, y, z all in metres) in space is given by $V = 4x^2$ volt. The electric field at the point (1 m, 0, 2 m) in volt/metre is A
(a) 8 along negative x-axis
(b) 8 along positive x-axis
(c) 16 along negative x-axis
(d) 16 along positive z-axis

11- Suppose the potential, relative to some reference point, is given by $\mathbf{V = xy^2z^3}$. Calculate the *y*-component of the electric field at (***1, -3, 2***).

a- $72\ \hat{j}$ N/C b- $-72\ \hat{j}$ N/C c- $48\ \hat{j}$ N/C d- $-48\ \hat{j}$ N/C

12-Two conducting spheres **A** and **B** each of radius are **10 cm**, are placed with their centers **1 m** apart. If sphere **A** is given the charge of **30*10^{-9} C** and sphere **B** charge of **- 60*10^{-9} C.** The potential of sphere **B** is:

a) – 4130 V b) 2160 V c) - 5130 V d) 3160 V

13- In a region of constant potential
(a) the electric field is uniform.
(b) the electric field is zero.
(c) there can be no charge inside the region.
(d) both (b) and (c) are correct.

14- If a conductor has a potential V ≠ 0 and there are no charges anywhere else outside, then
(a) there must be charges on the surface or inside itself.
(b) there cannot be any charge in the body of the conductor.
(c) there must be charges only on the surface.
(d) both (a) and (b) are correct.

15- The electric potential inside a conducting sphere ______

a. is zero
b. increases from centre to the surface
c. decreases from centre to the surface
d. remains constant from centre to the surface

16- If a unit positive charge is taken from one point to another over an equipotential surface, then
(a) work is done on the charge.
(b) work is done by the charge.
(c) work done is constant.
(d) no work is done.

17. Which of the following options is correct? In a region of constant potential.

(a) the electric field is uniform.
(b) the electric field is zero.

(c) there can be a charge inside the region.
(d) the electric field shall necessarily change if a charge is placed outside the region.

Q2- A rod of length L located along the x axis has a uniform linear charge density λ. Find the electric potential at a point P located on the y axis a distance d from the origin.
Q3- Calculate the potential V on the axis at a distance x from a uniformly charged disk of radius R.
Q4- Calculate the electric potential V at a distance x along the axis of a thin, uniformly charged ring of radius R carrying a total charge Q.
Q5- At a certain distance from a point charge, the magnitude of the electric field is $500\ V/m$ and the electric potential is $-3.00\ kV$.
(a) What is the distance to the charge?
(b) What is the magnitude of the charge?

Q6- A small spherical object carries a charge of $8.00\ nC$. At what distance from the center of the object is the potential equal to $100\ V$? $50.0\ V$? $25.0\ V$? Is the spacing of the equipotential proportional to the change in potential?

Q7- The electric potential inside a charged spherical conductor of radius R is given by $V = \frac{k_e Q}{R}$, and the potential outside is given by $V = \frac{k_e Q}{r}$. Using $E_r = -\frac{dV}{dr}$ derive the electric field (a) inside and (b) outside this charge distribution.

Q8- How many electrons should be removed from an initially uncharged spherical conductor of radius 0.300 m to produce a potential of 7.50 kV at the surface?

Q9- A charge of 3 C experiences a force of 1000 N when it is placed in a uniform electric field. Calculate the potential difference between two points separated by a distance of 1 cm along the field.

Q10- Define the following:

1- Electric dipole 2- Null point 3- Electrostatics

Q11-An insulating sphere of radius ***a*** has a uniform volume charge density **ρ** and a total positive charge ***Q***. Starting with Gauss's law calculate the electric field at point inside the sphere.

Q12 -Using **Gauss's law for** calculating the **electric field** due to an isolated **point charge *q*.**

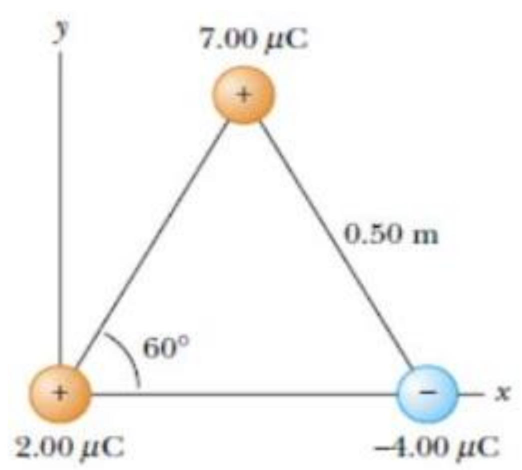
Q13- A point charge (q_1 = 10 nC) is located at the origin, and (q_2 = 15 nC) at (x=4 m). Find the electric field at the point P (x= 0) and (y =3m).

Q14- A long straight metal rod has a radius of 600 cm and a charge per unit length of 30 pC/m. Find the electric field (a) 3oo cm, (b) 1200 cm, (c) 500cm, and (d) 10m, from the axis of the rod, where distances are measured perpendicular to the rod.

Q15- A ring of radius (*a)* carries a uniformly distributed positive total charge *(Q)*. Calculate the electric field due to the ring at 1- A point *P* lying a distance *x* from its center along the central axis perpendicular to the plane of the ring 2- A point *P* at the center of the ring.

Q16- calculate the magnitude and the direction of the electric field at a point P. whichis due to 30 cm to the right of a point charge $Q = 3x\,10^{-6}$ C

Q17- Three point charges are located at the corners of an equilateral triangle as shown in this Figure. Calculate the resultant electric force on the 7.00μC charge.



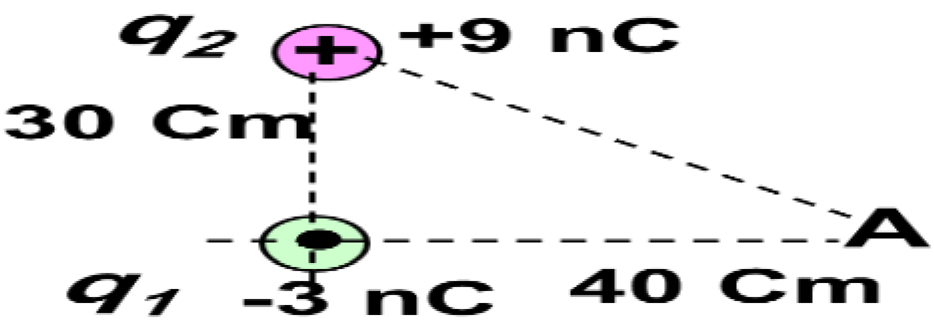
Q18- What is the electric flux through a sphere that has a radius of **1m** and carries a charge of **1 μC** at its center? The magnitude of the electric field at the center of the ring is

Q19- What are the types of charge density and define them?

Q20- Draw the pattern of electric field lines when

i) two positive charges
ii) negative and positive charge
iii) +q charge

Q21- Find electric field at the point A.



Q22- An electric field with a magnitude of 3.50 kN/C is applied along the x axis. Calculate the electric flux through a rectangular plane 0.350 m wide and 0.700 m long assuming that
(a) the plane is parallel to the yz plane;
(b) the plane is parallel to the xy plane;
(c) the plane contains the y axis, and its normal makes an angle of 40.0° with the x axis.

Q23- Fill up the following blanks

1-The magnitude of the electric force between two point charges is directly proportional to the …………………. and inversely proportional to the ……………………..

2- The electric field is ………inside a charged conductor. Excess charge accumulates on ………..

3- Gauss's law states that the ……………through any closed Gaussian surface is equal to the …….. inside the surface divided by the …………

4- When charging by………… the rod does not touch the electroscope. The electroscope gets……….charge of the rod.

Q19- Choose the correct answer of the following

1-The electric flux through a flat surface of area ***A*** in a uniform electric field ***E*** is a maximum when

a) The surface is parallel to E. b) The surface is perpendicular to

c) The surface is square in shape. d)The surface is at angle 45^o to E.

2- A neutral atom has

a**)** more neutrons than protons.
b) the same number of neutrons and protons.
c) the same number of electron and protons.
d) the same number of neutrons and electrons

3- When comparing the force of attraction between an electron and a proton due to the electric force and gravity, it can be concluded that:
a) The gravitational force is a lot weaker. b) The electric force is a lot weaker. c) The two types of forces are the same. d)None of them.

4- Two point charges, each with a charge of **2 μC** are separated by a distance of **2 m**. The magnitude of the electrical force of repulsion between them is:

a) $9x10^2$ N b) $9 x10^3$ N *c*) $9x10^4$ N d) $9 x10^{-3}$ N

5-A circular ring of radius *b* has a total charge *q* uniformly distributed around it. The magnitude of the electric field at the center of the ring is

a- ke q/b^2 b- ke q^2/b^2
c- ke q^2/b d- 0

6-How many electrons are there in ($4.8 * 10^{-19}$ C) of negative charge.

a- 3 b-30 c- 4 d- 40

7- Which factor is squared in Coulomb's law equation?

a) Force b) Coulomb constant c) distance d) charges

8- when one material is rubbed against the other, then it becomes electrically?

a) neutral b) charged c) positively charged d) negatively charged

9- Which combination would have an attraction?

a) Neutron and electron b) proton and electron
c) neutron and proton d) proton and electron

10-If the charge of one object is doubled, what would happen to the force?

a) the objects would lose their charge b) they would be no change

c) it would be twice as strong d) it would lose half its strength

11 - What is the correct unit for charge?

a) meter b) Coulomb c) Newton d) kilogram

12- An uncharged object has …………………..

a) more protons b) more electrons
c) equal electrons and protons d) no protons and electrons

13- **Electric field strength can be defined as**

a) E= Q/F b) E=F/Q c) E=W/F d) E=P/Q

14- The charge carried by one electron is $e = -1.6 \times 10^{-19}$ C. The number of electrons necessary to produce a charge of - 1.0 C is ……..

A) 6.25×10^{18}.
B) 1.6×10^{19}.
C) 6.25×10^{9}.
D) none of the given answers

15- What are the units of the Coulomb (electric) constant k, which appears in Coulomb's law?

A) $N^2 \cdot m/C^2$
B) N·m/C
C) N/C
D) $N \cdot m^2/C^2$

16-A metal sphere of radius 2.0 cm carries a charge of 3.0 μC. What is the electric field 6.0 cm from the center of the sphere?

A) 4.2×10^6 N/C
B) 9.3×10^6 N/C
C) 7.5×10^6 N/C
D) 5.7×10^6 N/C

17-Materials in which the electrons are bound very loosely to the nuclei and can move about freely within the material are referred to as

A) superconductors.
B) semiconductors.
C) conductors.
D) insulators.

18-Which of the following is not a vector?

A) electric charge
B) electric force
C) electric field
D) none of them

19- What is the electric flux through a sphere that has a radius of **1m** and carries a charge of **1 μC** at its center?

a) 11. 3 $x10^4$ Nm^2/C
b) 1.13 $x10^4$ Nm^2/C
c) 113 $x10^4$ Nm^2/C
d) 0.113 $x10^4$ Nm^2/C

20-Which is the value of the constant in Coulomb's equation?

a) $K = 8.9875 \times 10^{9} \frac{N.m^2}{C^2}$
b) $K = 8.9875 \times 10^{-9} \frac{N.m^2}{C^2}$
c) $K = 6.67 \times 10^{-11} \frac{N.m^2}{C^2}$
d) $K = 9.11 \times 10^{-31} \frac{N.m^2}{C^2}$