DAV PUBLIC SCHOOL,SASARAM

Class -: 12TH

Subject-: Physics

Topic-: Electrostates

Worksheet -01

PRACTICE QUESTIONS

Very Short Answer/Objective Type Questions [1 Mark]

1. Gauss's law will be invalid if
   - (a) there is magnetic monopoles.
   - (b) the inverse square law is not exactly true.
   - (c) the velocity of light is not a universal constant.
   - (d) none of these.

2. An electric dipole of moment p is placed in the position of stable equilibrium in uniform electric field of intensity E. It is rotated through an angle θ from the initial position. The potential energy of electric dipole in the final position is
   - (a) $pE \cos \theta$
   - (b) $pE \sin \theta$
   - (c) $pE(1 - \cos \theta)$
   - (d) $-pE \cos \theta$

3. An electric dipole is kept in a non-uniform electric field. It experiences
   - (a) a force and a torque.
   - (b) a force but not a torque.
   - (c) a torque but not a force.
   - (d) neither a force nor a torque.

   Ans. (a) As the dipole will feel two forces which are although opposite but not equal. A net force will be there and its these forces act at different points of the body. A torque is also there.

4. ABC is an equilateral triangle. Three charges $+q$ are placed at each corner. The electric intensity at O will be
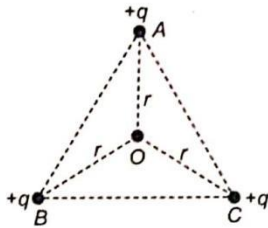
(a) $1. \dfrac{q}{4\pi\varepsilon_0} \cdot r^2$ (b) $1. \dfrac{q}{4\pi\varepsilon_0 r}$

(c) Zero (d) $1. \dfrac{3q}{4\pi\varepsilon_0 r^2}$

5. There are two charges $+1$ μC and $+5$ μC. The ratio of the forces acting on them will be

(a) $1 : 5$ (b) $1 : 1$

(c) $5 : 1$ (d) $1 : 25$

6. Four charges are arranged at the corners of a square $ABCD$, as shown. The force on the charge kept at the centre O is
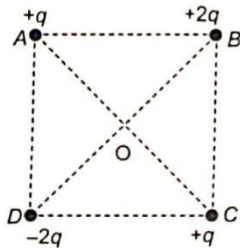
(a) zero

(b) along the diagonal AC

(c) along the diagonal BD

(d) perpendicular to side AB

7. Which of the following statement is correct?

[NCERT Exemplar]

If $\int E \cdot ds = 0$ over a surface, then

(a) the electric field inside the surface and on it is zero.

(b) the electric field inside the surface is necessarily uniform.

(c) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.

(d) all charges must not necessarily be outside the surface.

8. A hemisphere is uniformly charged positively. The electric field at a point on a diameter away from the centre is directed [NCERT Exemplar]

(a) perpendicular to the diameter

(b) parallel to the diameter

(c) at an angle tilted towards the diameter

(d) at an angle tilted away from the diameter.

9. Figure shows electric field lines in which an electric dipole p is placed as shown. Which of the following statements is correct? [NCERT Exemplar]
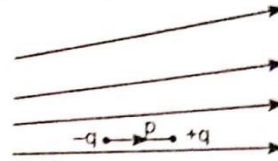

(a) The dipole will not experience any force.

(b) The dipole will experience a force towards right.

(c) The dipole will experience a force towards left.

(d) The dipole will experience a force upwards.

10. A positive charge Q is uniformly distributed along a circular ring of radius R. A small test charge q is placed at the centre of the ring. [NCERT Exemplar]
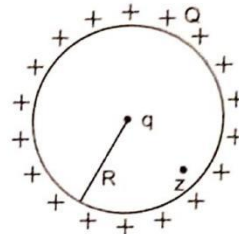
Which of the following statement is not correct?

(a) If $q > 0$ and is displaced away from the centre in the plane of the ring, it will be pushed back towards the centre.

(b) If $q < 0$ and is displaced away from the centre in the plane of the ring, it will never return to the centre and will continue moving till it hits the ring.

(c) If $q < 0$, it will perform SHM for small displacement along the axis.

(d) q at the centre of the ring is in an unstable equilibrium within the plane of the ring for $q > 0$.

11. In the process of charging of a metal sphere by induction, why is a charged rod not removed before earthing the sphere?

12. Why is repulsion the surest test for checking whether a body has a charge or not?

13. Determine the ratio of magnitudes of two charges q_1 and q_2.
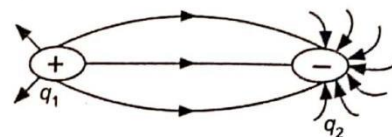

14. The like charges always repel and the unlike charges always attract each other. Is it possible that two like charges attract each other?

15. Two point charges $+q$ and $-q$ are placed d distance apart. Draw the line on which the resultant field is parallel to the line joining the two charges.

16. A charge q is placed at the centre of a cube of side l. What is the electric flux passing through two opposite faces of the cube? [AI 2012]

17. The given figure shows a non-conducting semi-circular rod. What is the direction of the net electric field at point P due to the charge on the rod?
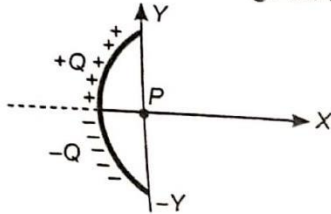
18. Trace the path of an electron and a proton, if both enter a uniform electric field, with the same velocity, perpendicular to the field.
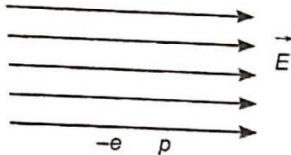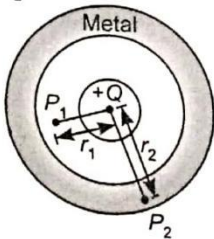

19. When is electric flux said to be (i) positive (ii) negative?

Short Answer Type Questions [2 Marks]

20. A small metal sphere carrying the charge $+Q$ is located at the centre of a spherical cavity in a large uncharged metal sphere as shown in the figure.

Use the Gauss's theorem to find the electric flux at points P_1 and P_2.

21. A spherical rubber balloon carries a charge that is uniformly distributed over its surface. As the balloon is blown up and increases in size, how does the total electric flux coming out of the surface change? Give reason.

22. A point charge Q is at the centre of a conducting shell and another charge q is outside the shell. Now, answer the following:
    (a) Does the charge Q experience a force?
    (b) Does the charge q experience a force? Explain.

23. An electric dipole is free to move in a uniform electric field. Explain its motion when it is placed (i) parallel to the field, and (ii) perpendicular to the field.

24. S_1 and S_2 are two hollow concentric spheres enclosing charge Q and $2Q$ respectively as shown in figure.
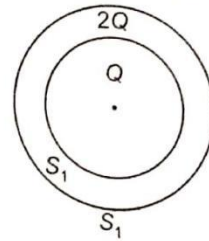
    (i) What is the ratio of the electric flux through S_1 and S_2?
    (ii) How will the electric flux through the sphere S_1 change, if a medium of dielectric constant 5 is introduced in the space inside S_1 in place of air?

25. Show diagrammatically the orientation of the dipole in the field for which the torque is (i) maximum, (ii) half the maximum value, and (iii) zero.

26. Explain how neutral bodies produce charges when rubbed with each other.

Long Answer Type [I] Questions [3 Marks]

27. Use the Gauss's law to derive an expression for the electric field between two uniformly charged large parallel sheets with surface charge densities σ and $-\sigma$ respectively. [Dehradun 2019]

28. Two identical point charges Q are kept at a distance r from each other. A third point charge is placed on the line joining the above two charges such that all the three charges are in equilibrium. What is the magnitude, sign and position of the third charge? [Delhi 2019]

29. An infinitely long cylinder of radius R carries a uniform volume charge density ρ Cm^{-3}. Obtain an expression for electric field at a point (a) inside and (b) outside the cylinder. [HOTS]

30. An uncharged comb after combing hair, when brought near the paper bits attracts them. Answer the following:
    (a) Does the mass of comb/paper bit get changed?
    (b) Is paper bit still uncharged?
    (c) What is the difference between the charging of a comb and the charging of the paper bits?

31. A thin metallic spherical shell of radius R carries a charge Q on its surface. A point charge $\frac{Q}{2}$ is placed at its centre C and an other charge $+2Q$ is placed outside the shell at a distance x from the centre as shown in figure. Find (i) the force on the charge at the centre of shell and at the point A, (ii) the electric flux through the shell.