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Questions:

Assertion and reason

1. Assertion (A) : An applied electric field will polarize the polar dielectric material.
Reason (R) : In polar dielectrics, each molecule has a permanent dipole moment but these are randomly oriented in the absence of an externally applied electric field.
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

2. Assertion : For a point charge, concentric spheres centered at a location of the charge are equipotential surfaces.
Reason : An equipotential surface is a surface over which potential has zero value.
Codes:
(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
(c) If the Assertion is correct but Reason is incorrect.
(d) If both the Assertion and Reason are incorrect.

5 Marks

3. A capacitor of unknown capacitance is connected across a battery of V volts. The charge stored in it is 360μC. When potential across the capacitor is reduced by 120V, the charge stored in it becomes 120 μC.
(i) Calculate the potential V and the unknown capacitance C.
(ii) what will be the charge stored in the capacitor, if the voltage applied had increased by 120 V?

3 Marks

4. An electric dipole of length 4 cm, when placed with its axis making an angle of 60° with a uniform electric field, experiences a torque of $4\sqrt{3}$ N-m. Calculate the potential energy of the dipole, if it has a charge $\pm 8nC$

5. Net capacitance of three identical capacitors in series is $1\mu F$. What will be their net capacitance, if connected in parallel?
Find the ratio of energy stored in these two configurations if they are both connected to the same source.

6. Three capacitors of 10, 15 and 30μF are connected in series and on this combination, a potential difference of 60V is applied. Calculate the charge, potential difference and energy stored on each capacitor.

7. Two point charges +10 μC and - 10 μC are separated by a distance of 40 cm in air. Calculate the electrostatic potential energy of the system, assuming the zero of the potential energy to be at infinity.

2 Marks

8. No work is done in moving a test charge over an equipotential surface, why?

9. Define the term potential energy for charge q at a distance r in an external field.

10. A parallel plate capacitor with air between the plates has a capacitance of 8pF. 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 new value of capacitance.

11. If the potential difference across a capacitor is doubled, what happens to :
(a) the charge on the capacitor and
(b) the energy stored in the capacitor

Multiple Choice Question

12. Work done in carrying an electron from A to B lying on an equipotential surface of one volt potential is
(a) 1 eV (b) 10 eV (c) 1 volt (d) Zero

13. A parallel plate air capacitor has a capacitance 18μF. If the distance between the plates is tripled and a dielectric medium is introduced, the capacitance becomes 72 μF. The dielectric constant of the medium is
(a) 4 (b) 9 (c) 12 (d) 2

14. Two charges 3 x 10^{-8} C and - 2 x 10^{-8} C located 15 cm apart. At what point on the line joining the two charges is the electric potential zero?
(a) 9 cm (b) 45 cm (c) 18 cm (d) Both (a) and (b)