

Answer on Question 59305, Physics, Electromagnetism

Question:

Which of the following statements is NOT correct about polarization of an atom, ion or molecule?

- a) An atom, ion or non-polar molecule has zero dipole moment in a zero field.
- b) The permanent dipole moment of polar molecules are randomly oriented in zero field.
- c) In the presence of a field the orientation of polar molecules in which the dipole moment is parallel to the field have a lower energy and so are statistically more favourable.
- d) In an ionic lattice the positive ions are displaced in the direction opposite to the field.

Solution:

As we know, each atom, ion or non-polar molecule has zero dipole moment in the zero field, but acquires a dipole moment when a field is applied (such moments are called induced dipoles). Thus, the statement a) is correct.

When polar molecules are present, their permanent dipole moments are completely randomly oriented in the zero field, so that the vector sum is zero, at any rate on a time average. Thus, the statement b) is also correct.

In the presence of a field, orientations in which the dipole moment is parallel to the field have a lower energy and so are statistically more favourable, giving a resultant dipole moment in the direction of the field. Thus, the statement c) is also correct.

In an ionic lattice, the positive ions are displaced in the direction of an applied field while the negative ions are displaced in the opposite direction, giving a resultant dipole moment to the whole body. Therefore, the statement d) is NOT correct.

Answer:

- d) In an ionic lattice the positive ions are displaced in the direction opposite to the field.