CHAPTER TEST

STD: XII PHYSICS – ELECTRIC POTENTIAL AND CAPACITANCE

TIME: 1HR 15 MIN MARKS: 35

Answer all the questions. Section A carries 1 mark, Section B carries 2 marks, Section C carries 3 marks, Section D carries 5 marks, Section E carries 4 marks.

SECTION – A

1. The capacitance of a parallel plate capacitor increases from 5 μF to 60 μF when a dielectric is filled between the plates. The dielectric constant of the dielectric is
   a) 65 b) 55 c) 12 d) Cannot be determined.
2. If voltage applied on a capacitor is increased from V to 2 V, choose the correct conclusion.
   a) Q remains the same, C doubled b) C remains same, Q doubled c) Both Q and C doubled d) Both Q and C remains same
3. Two points A and B are maintained at a potential of 7 V and −4 V respectively. The work done in moving 50 electrons from A to B is
   a) $8.8\times10-17\ J$ b) $2.4\times10-17\ J$ c) $0.8\times10-17\ J$ d) $17.6\times10-19\ J$
4. Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately
   a) Planes b) Spheres c) Paraboloids d) Ellipsoids
5. Assertion (A): Electric potential and Electric potential energy are two different quantities.
   Reason (R): For a test charge Q and a point charge Q, the electric potential energy becomes equal to the potential.
   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true and R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.
6. Assertion (A): Capacity of a conductor is independent on the amount of charge on it.
   Reason (R): Capacitance depends on the dielectric constant of surrounding medium, shape and size of conductor.
   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true and R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true

SECTION – B

7. Is electrostatic potential necessarily zero at a point where the electric field strength is zero? Give an example to illustrate your answer.
8. Define an equipotential surface. draw equipotential surfaces (i) in case of a single point charge. (ii) In a constant electric field in z direction.
9. A charge 24 μC is given to a hollow metallic sphere of radius 0.2 m. Find the potential (i) at the centre of sphere (ii) at a distance of 0.1 cm from the centre of sphere.
10. Why it is safer to sit inside a bus or car rather than standing under a tree during lightning?

SECTION – C

11. What do you understand by potential gradient? Establish a relation between electric field and potential gradient.
12. Calculate the voltage required to balance an oil drop carrying 10 electrons, when located between the plate of a capacitor, which are 5 mm apart. Given mass of drop = 3×10−16 kg, charge on electron 1.6×10−19 C.
13. Derive an expression for equivalent capacitance of three capacitors of capacitances $C1$,$C2$ and $C3$ when connected in (i) series (ii) parallel.
14. Two capacitances 0.5 μF and 0.75 μF are connected in parallel to a potential of 110 V. Calculate: (i) Charge from the source (ii) Charge on each capacitor (iii) Energy stored in the combination.

SECTION – D

15. (i) What is capacitance of a conductor?
    (ii) Deduce an expression for capacitance of a parallel plate capacitor when the distance between the plate is filled with (a) air (b) dielectric medium of constant K.

SECTION – E

16. Case Study Based Question:
    Two equal and opposite charge separated by a very small distance constitute a dipole. Electric potential due to dipole is inversely proportional to square of the distance, as the distance increases the potential decreases. When dipole is placed in an electric field it experiences a torque which is considered as external work done.
    i) Write the formula for dipole moment.
    ii) What is the significance of negative sign when energy due to dipole placed in uniform electric field is obtained?
    iii) Two charges −5 μC and +5 μC separated at a distance of 2 mm is placed in a uniform electric field 2×104 NC−1. Calculate the:
    a) dipole moment and b) energy at most stable and unstable position.