ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 8

Subject : PHYSICS

Date : 14.5.20

CLASS : XII

Chapter : Electrostatics

Topic : capacitor, capcitance of a solid spherical conductor, energy of a capacitor, sharing of charges by connecting two charged spheres and find loss of energy in the above case.

Multiple Choice Question : **1 x 15 = 15**

1. When a air capacitor is charged to a potential difference of $10V$, it acquires $40\,\mu C$ charge. When an oil is used as dielectric, the capacitor acquires $100\,\mu C$ charge. The dielectric constant of the oil is

   (a) 4 (b) 2.5 (c) 0.4 (d) 1.0

   Ans : (b) 2.5

2. Two insulated metal sphere have radii 9 cm A and 18 cm B are in air. They are given charges $10^{-8}C$ and $3 \times 10^{-8}C$ respectively. Now the sphees are connected by a wire. What will be the loss of energy due to sharing of charges?

   (a) $3.33 \times 10^{-3}J$ (b) $6.66 \times 10^{-4}J$ (c) $8.33 \times 10^{-7}J$ (d) $8.33 \times 10^{2}J$

   Ans. : (c) $8.33 \times 10^{-7}J$

3. Electric capacitance of earth is

   (a) $1F$ (b) $1\,\mu F$ (c) $711\,\mu F$ (d) $9 \times 10^{8}\,\mu F$

   Ans. : (c) $711\,\mu F$

4. n small drops of the same size are charged to V volt each. They coalesce to form a big drop. The potential of the big drop will be —

   (a) $n^{\frac{1}{3}}V$ (b) $n^{\frac{2}{3}}V$ (c) $n^{\frac{3}{2}}V$ (d) n^3V

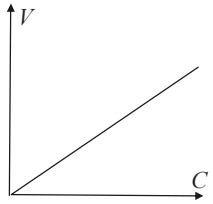
   Ans. : (b) $n^{\frac{2}{3}}V$

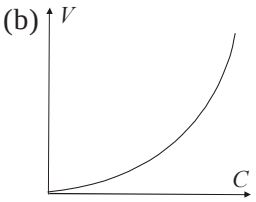
5. If the radius of a conducting sphere is 1m, its capacitance in farad will be

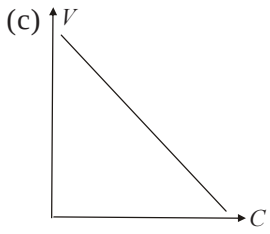
   (a) 10^{-3} (b) 10^{-6} (c) 9×10^{-9} (d) 1.1×10^{-10}

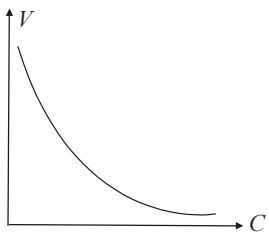
   Ans. : (d) 1.1×10^{-10}

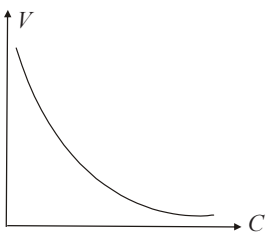
6. A few capacitors are equally charged. Which of the figures show the nature of variation of the potential difference V between their plates with their capacitances C?

   (a) 

   (b) 

   (c) 

   (d) 

   Ans. : (d) 

7. When a capacitor is connected to a *dc* battery,

(a) no current flows through the circuit

(b) current flows through the circuit for sometime, but eventually stops.

(c) current grows up and reaches a maximum value when the capacitor is fully charged

(d) current reverses its direction alternately due to charging and discharging of the capacitor.

Ans. : (b) Current flows through the circuit for sometime, but eventually stops.

8. A capacitance C is charged to a potential difference V from a cell and then disconnedted from it. A charge $+Q$ is now given to its positive plate. The potential difference across the capacitor is now

(a) V (b) $V+\frac{Q}{C}$ (c) $V+\frac{Q}{2C}$ (d) None Ans. : (c) $V+\frac{Q}{2C}$

9. In a charge capacitor, energy is –

(a) equally shared between the positive and the negative plates (b) stored in one plate when the other is grounded (c) stored in the electric field between the two plates

(d) discharged if one of the plates is grounded.

Ans. : (c) stored in the electric field between the two plates

10. If the potential difference between the plates of a capacitor is increased by 20%, the energy stored in the capacitor increases by exactly

(a) 20% (b) 22% (c) 40% (d) 44% Ans. : (d) 44%

11. The maximum electric field that dielectric medium of a capacitor can withstand without break down (of its insulating property) is called its

(a) polarisation (b) capacitance (c) dielectric strength (d) None of these

Ans. : (c) dielectric strength

12. If dielectric constant and dielectric strength be denoted by K and X respectively, then a material suitable for use as a dielectric in a capacitor must have —

(a) high K and high X (b) high K and low X (c) low K and high X (d) low K and low X

Ans. : (a) high K and high X

13. Two capacitors C_1 and C_2 are charged to $120V$ and $200V$ respectively. It is found that by connecting them together the potential on each one can be made zero. Then,

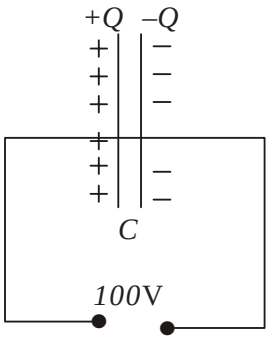
(a) $5C_1 = 3C_2$ (b) $3C_1 = 5C_2$ (c) $3C_1 + 5C_2 = 0$ (d) $9C_1 = 4C_2$

Ans. : (b) $3C_1 = 5C_2$

14. A 900 pF capacitor is charged by $100V$ battery in the figure. How much electrostatic energy is stored by its capacitor?

(a) $45 \times 10^{-6}\ J$
(b) $4.5 \times 10^{6}\ J$
(c) $4.5 \times 10^{-6}\ J$
(d) $0.45 \times 10^{5}\ J$

Ans. : (c) $4.5 \times 10^{-6}\ J$



15. A parallel plate capacitor has a uniform electric field (Vm^{-1}) in the space between the plates. If the distance between the plates is $d(m)$ and area of each plate is $A(m^2)$ the energy (joule stored in the capacitor, is

(a) $\frac{1}{2}\varepsilon_0 E^2$ (b) $\varepsilon_0 EAd$ (c) $\frac{1}{2}\varepsilon_0 E^2 Ad$ (d) $E^2 Ad/\varepsilon_0$ Ans. : (c) $\frac{1}{2}\varepsilon_0 E^2 Ad$