



SECTION A

1. Select and write the correct answer for the following multiple choice type of questions: 3

i. Electric intensity at a point near a charged sphere of charge q is given by

(A) $E = \frac{1}{4\pi\epsilon_0 k} \frac{q}{r^2}$

(B) $E = \frac{1}{2\pi\epsilon_0 k} \frac{q}{r}$

(C) $E = \frac{\sigma}{\epsilon_0 k}$

(D) $E = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$

ii. Susceptibility of a paramagnetic substance

(A) increases with increase in temperature.

(B) decreases with increase in temperature.

(C) remains same at any temperature.

(D) first increases then decreases with increase in temperature.

iii. The electric field intensity at a point 2 m from an isolated point charge is 500 N/C. The electric potential at the point is

0 V

2.5 V

250 V

1000 V

2. Answer the following questions: 3

i. What does the hysteresis loop represents?

ii. The magnetic susceptibility of annealed iron at saturation is 4224. Find the permeability of annealed iron at saturation.

($\mu_0 = 4\pi \times 10^{-7}$ SI unit).

iii. If $r = 1$ then, it is a white body. Is it true?

SECTION B

Attempt any TWO questions of the following: 4

3. Two vessels A and B are filled with same gas where volume, temperature and pressure in vessel A is twice the volume, temperature and pressure in vessel B. Calculate the ratio of number of molecules of gas in vessel A to that in vessel B.

4. Derive the quantity for Bohr Magneton and also state its value.

5. State the properties of paramagnetic materials.
6. A. Define emissive power.
B. What is an ideal gas?

SECTION C

Attempt any TWO questions of the following:

6

7. Explain spectral distribution of blackbody radiation.
8. Obtain an expression for energy of a charged capacitor and express it in different forms. _
9. Find the temperature of a blackbody if its spectrum has a peak at
 - i. $\lambda_{\max} = 700 \text{ nm}$ (visible),
 - ii. $\lambda_{\max} = 3 \text{ cm}$ (microwave region) and
 - iii. $\lambda_{\max} = 3 \text{ m}$ (short radio waves)(Take Wien's constant $b = 2.897 \times 10^{-3} \text{ m K}$).

SECTION D

Attempt any ONE question of the following:

4

10. Derive an expression for electric potential due to an electric dipole.
- 11.A. One hundred twenty five small liquid drops, each carrying a charge of $0.5 \mu\text{C}$ and each of diameter 0.1 m form a bigger drop. Calculate the potential at the surface of the bigger drop.
B. What is gyromagnetic ratio? Write the necessary expression.