

Sen BSC

**B.SC. PHYSICS
SECOND SEMESTER
PHYSICS- II
BSP - 721 OLD COURSE [REPEAT]**
[USE OMR FOR OBJECTIVE PART]

**SET
A**

Duration : 3 hrs.

Full Marks : 70

Time : 30 min.

(Objective)

Marks : 20

Choose the correct answer from the following:

1×20=20

- The imaginary loop around an electrical conductor is called
 - Gaussian loop
 - Amperian loop
 - Closed loop
 - None
- According to Amperian circuital law
 - $\oint_{\text{closed}} \mathbf{B} \cdot d\mathbf{l} = \mu_0 I$
 - $\oint_{\text{closed}} \mathbf{B} \cdot d\mathbf{l} = \mu_0 I^2$
 - $\oint_{\text{closed}} \mathbf{B} \cdot d\mathbf{l} = I/\mu_0$
 - $\oint_{\text{closed}} \mathbf{B} \cdot d\mathbf{l} = \mu_0 I$
- The pressure of a gas is numerically equal to _____ of the mean kinetic energy of translation of a unit volume of the molecules.
 - 1/3th
 - 2/3th
 - 1/4th
 - 2/5th
- Theory of Equipartition of energy says that the energy associated with each degree of freedom is
 - 3kT
 - 3/2kT
 - 1/2kT
 - None
- In an isochoric process, _____ remains constant.
 - Temperature
 - Volume
 - Pressure
 - Both A and C
- The flux of the electric field E through any closed surface equals _____ times the total charge enclosed by the surface is _____
 - C_0 , Faradays law
 - $1/C_0$, Faradays law
 - $1/C_0$, Gauss law
 - None
- The electric charges is equal to the amount of charge carried by a
 - Single proton
 - Single electron
 - Single neutron
 - Both proton and electron
- The kinetic energy of a molecule is directly proportional to the _____ of a gas.
 - Absolute temperature
 - Volume
 - Pressure
 - All of the above
- The flux of the electric field through any surface enclosing a point charge Q is
 - Q/C_0
 - QC_0
 - C_0/Q
 - 1/Q

(Descriptive)

Time : 2 hrs. 30 min.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. Discuss Rayleigh- Jean's law of black body radiation. How did Planck remove the shortcomings of this law? 10
2. State Ampere's law. 2+4+4
Using Ampere's law calculate the magnetic field at a point inside a long current carrying solenoid. =10
- Also prove that if the magnetic field induction \vec{B} is not a function of time,
- $$\text{curl } \vec{B} = \mu_0 \vec{J}$$
- Where symbols have usual meaning.
3. a. Write the limitation of first law of thermodynamics and also state the second law of thermodynamics. 4+6=10
- b. A system is taken from A to B along the path ACB when 60 Joules of heat enter into it and system does 25 Joules of work.
- i. How much heat will enter into the system along the path ADB when the work done along the path is 10 Joule?
- ii. When the system returns from state B to A along path BA work done is 15 Joule. Calculate the amount of heat transfer.
4. a. Find an expression for the energy of a gas on kinetic theory of gases. 4+2+4
=10
- b. What do you mean by *mean free path* and *mean free time* of a gas molecule?
- c. Show that mean free path of the molecules of a gas is inversely proportional to the density of the gas.

5. a. Define capacitance and the unit to measure it. 2+5+3
=10
 b. Derive an expression for the capacitance of a parallel plate capacitor.
 c. A potential difference of $3000V$ is applied across the two plates of a parallel plate capacitor separated by a distance of $2cm$ and area $4m^2$. The potential falls to $1000V$ when a sheet of dielectric is introduced. Determine electric field and capacity with air a dielectric.
6. a. Define and explain interference of light with mathematical derivation. 6+4=10
 b. Explain how interference fringes are produced by Fresnel's biprism.
7. a. Describe the experimental arrangement to produce Newton's rings. 5+5=10
 b. How is plane polarized light produced by a Nicol's prism?
8. a. What are spontaneous and stimulated emissions? Explain. 3+3+4
=10
 b. Describe the working of a He-Ne laser with an appropriate figure.
