SHIKSHA CLASSES

BOARD QUESTION PAPER

Subject : Physics Topic: 3. Kinetic Theory of Gases & Radiation Total Marks : 20
Class : XII Time : 1 Hr.

Section A

Q. 1 : Select and write the most appropriate answer from given alternatives in each sub-question **5**

i) If R is the molar gas constant and $\gamma = \frac{C_P}{C_V}$ then C_V is equal to

a) γR b) $\frac{R}{\gamma}$ c) $\frac{R}{\gamma - 1}$ d) $\frac{\gamma R}{\gamma - 1}$

ii) Emissive power of a body depends upon

a) temperature of the body only
b) nature of surface of the body only
c) temperature and nature of surface of the body
d) area of surface of the body

iii) A good absorber of heat is a good radiator of heat is

a) Stefan's law b) Kirchhoff's law
c) Planck's law d) Wien's law

iv) K.E. per kg of nitrogen molecules at 127^0C is

a) 1.782×10^3 J/kg b) 1.782×10^4 J/kg
c) 1.782×10^5 J/kg d) 1.782×10^6 J/kg

v) The law of equipartition of energy is only applicable to the system whose constituents are:

a) in orderly motion b) at rest
c) in random motion d) moving with constant speed

Q. 2 : Very short answer type question. **2**

i) State wien's displacement law.
ii) State the fundamental assumptions of the kinetic theory of gases.

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Section B

Attempt any THREE. **6**

Q. 3: State and prove Boyle's law on the basis of kinetic theory of gases.

Q. 4: Explain the construction & working of a perfectly black body.

Q. 5: Determine the pressure of 4 gm of hydrogen occupying 16 litre of volume at 10^0C.

($R = 8.315$ J/mol K, mol. wt. of $H_2 = 2$)

Q. 6: At what temperature will the rms velocity of gas be three times its value at N.T.P?

Section C

Attempt any one of following. **3**

Q. 7: Assuming the expression for the pressure, on the basis of kinetic theory of gases, derive an expression for the average

i) K.E. per molecule

ii) K.E. per mole and

iii) K.E. per unit mass.

Q. 8: The rate of fall of temperature due to radiation of a metal sphere of thermal capacity 6.5 cal/^{0}C is 0.5^0C/min when its temperature is 5^0C. The diameter of the sphere is 3cm. Calculate the emissive power of the surface of sphere. $(J = 4.2 J / cal)$

Section D

Attempt any one. **4**

Q. 9: **i)** State Newton's law of cooling. Show that the rate of fall of temperature of a body is directly proportional to the excess temperature of a body over the surroundings.

ii) Radiant energy incident on a body at the rate of 1500 J/min. If the coefficient of emission of the body is 0.9 and coefficient of reflection is 0.06. Find the radiant energy absorbed, reflected and transmitted by the body in 5 min.

Q. 10: i)Derive an expression for the pressure exerted by a gas on the basis of kinetic theory.

ii)Calculate the change in internal energy of 3 moles of helium gas when its temperature is increased by 2K.

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