11.45 QUESTIONS FROM PAST PAPERS:

(A) Thermal Expansion:

Year 2008:

Q.1(c) Define Linear Expansion. How does the concept of linear expansion help the fabrication of bimetallic strips? Explain the working of a bimetallic strip in a thermostat.

Year 2005:

Q.1(b) What do you understand by Thermal Expansion? What is the relation between the coefficient of linear expansion and the coefficient of volumetric expansion? Derive the relation for the length of a rod at a given temperature t°C when l_o is its length at 0°C.

Year 2004:

Q.2(b) Derive the relation $\beta = 3\alpha$, where α = Coefficient of Linear Expression, β = Coefficient of Volumetric Expansion.

Year 2003 (P.E):

Q.2(b) Define the Coefficient of Linear Expansion and the Coefficient of Cubical Expansion and derive the relation between them.

Year 2003 (P.M):

Q.1(b) What is Thermal Expansion? Derive an expression for the coefficient of Linear Expansion.

Year 2002 (P.E):

Q.2(c) Describe the working of a bimetallic trip as thermostat. (Draw necessary diagrams)

Year 2002 (P.M):

Q.1(b) Show that β = 3, where 'β' and 'α' have their usual meanings.

Year 2001:

Q.2(c) Prove that the Coefficient of Cubical Expansion is three times of the Coefficient of Linear Expansion.

(B) Gas Laws:

Year 1993, 2006:

Q.1(b) State the gas laws. How are they combined to give the equation of an ideal gas?

Year 2001:

Q.1(c) Deduce the Genral Gas Equation PV = nRT.

(C) Specific Heat:

Year 2010:

Q.5(c) Using the First-Law of Thermodynamics in two isotherms of an ideal gas at different temperature, show that $C_p - C_v = R$.

Year 2008:

Q.1(b) Employing the 1st Law of Thermodynamics in two isotherms at different temperatures obtained in PV diagram show that $C_p - C_v = R$. Why is the specific heat at constant pressure greater than the specific heat at constant volume?

Year 2007:

Q.2(b) Define heat capacity, specific heat and molar specific heat. Write down their mathematical relations and units. Establish the equation of relation between the molar specific heat and common specific heat.

Year 2006:

Q.2(c) Using the 1st Law of Thermodynamics, show that the sum of molar specific heat of a gas at constant volume and the molar gas constant is equal to the molar specific heat of the gas at constant pressure.

Year 2005:

Q.2(b) Define Heat Capacity, Specific Heat and Molar Specific Heat. Write down the mathematical equations and their units. Establish the relation between molar specific heat and common specific heat.

Year 2004:

Q.1(b) Express a relation for Molar Specific Heat. Why are there two different Molar Specific Heats of a gas? Explain.

Year 2004:

Q.1(b) Derive the expression Cp - Cv = R, the symbols have their usual meanings.

Year 2003 (P.E):

Q.1(c) Using the First Law of Thermodynamics, prove the relation Cp – Cv = R, the symbols have their usual meanings.

Year 2003 (P.M):

Q.1(c) Show that the difference between Molar specific Heat of a gas at constant pressure and Molar Specific Heat of a gas at constant volume is equal to the Universal Gas Constant.

Year 2001:

Q.1(b) Show that Cp – Cv = R.

(D) Kinetic Molecular Theory:

Year 2012:

Q.3(a) Derive the relation for the pressure on an ideal gas in terms of its density and mean square velocity.

Year 2011:

Q.1 Derive a relation for the pressure of an ideal gas in term of its density and mean source velocity.

Year 2010:

Q.3(a) On the basis of Kinetic Theory of gasses, derive an expression for the pressure of a gas. Also show that the absolute temperature of an ideal gas is directly proportional to the average translational kinetic energy of the molecules.

Year 2009:

Q.1(b) Show that the average translation K.E per molecule is directly proportional to the absolute temperature.

Year 2009:

Q.1(c) Derive a relation for the pressure of an ideal gas in terms of its density and mean square velocity.

Year 2008:

Q.2(c) Using the relation $P = \frac{1}{3}\rho\overline{V}^2$ deduce the expression of the Boyle's Law and the Charles Law.

Year 2007:

Q.1(b) State the basic assumptions of the Kinetic Molecular Theory of gases.

Year 2007:

Q.1(c) Show that the pressure of an ideal Gas is $P = \frac{1}{3}\rho\overline{V}^2$, where ρ represents the density of the gas. Verify Boyle's Law on the basis of the Kinetic Molecular Theory.

Year 2006:

Q.1(c) State the 1st and the 2nd Laws of Thermodynamics. Describe briefly Isobaric process or Adiabatic process with graphical representation.

Year 2003 (P.E):

Q.1(b) State the basic assumptions of the Kinetic Molecular Theory of gases.

Year 2003 (P.M):

Q.2(c) Show that the pressure of an ideal gas is $P = \frac{1}{3}\rho\overline{V}^2$, where ρ is the density of the gas.

Year 2002 (P.E):

Q.1(b) Verify Boyle's and Charles' Law on the basis of the Kinetic Theory of gases.

Year 2002 (P.M):

Q.1(c) Using the equation of pressure, $P = \frac{1}{3}\rho\overline{V}^2$, prove that the absolute temperature of an ideal gas is proportional to the average translational kinetic energy of the molecule

(E) Laws of Thermodynamics:

Year 2010:

Q.1(i) Write down two statements of second law of thermodynamics and prove their equivalence.

Year 2008:

Q.2(b) State and explain the First Law of Thermodynamics. On the basis of the 1st Law explain Isothermal or Isobaric process.

Year 2006:

Q.1(c) State the 1st and the 2nd Laws of Thermodynamics. Describe briefly Isobaric process or Adiabatic process with graphical representation.

Year 2005:

Q.1(c) Briefly describe any two processes of thermodynamics. Draw the graph and give the mathematical equation for each.

Year 2004:

Q.2(c) State the First Law of Thermodynamics and apply this law to (i) Isobaric process and (ii) Isochoric process.

Year 2003 (P.M):

Q.2(b) Give Kelvin's and Clausius statements for the Second Law of Thermodynamics and prove that they are equivalent.

Year 2002 (P.M):

Q.2(b) What is Thermodynamic? Give two statements of the Second Law of Thermodynamics.

Year 2002 (P.M):

Q.2(c) One the basis of the First Law of Thermodynamics explain the following:
(i) Isothermal process (ii) Isobaric process

(F) Carnot Engine and Efficiency:

Year 2011:

Q.3(a) What is carnot engine? Describe its construction, working and derive an expression for its efficiency.

Year 2009:

Q.2(c) What is Carnot Engine? Describe its working cycle. Prove that the efficiency of Carnot engine is less than 100 percent above absolute zero temperature of the sink.

Year 2007:

Q.2(c) Describe the complete operation of a Carnot engine and obtain an expression for its Efficiency.

Year 2005:

Q.2(c) What is a heat engine? Describe the working of a Carnot engine and derive the equation for its efficiency.

Year 2002 (P.E):

Q.1(c) Describe construction and working of Carnot engine.

Year 2001:

Q.2(b) Derive an expression for the Efficiency of a Carnot's engine. Draw a labelled graphical representation of the Carnot's cycle.

(G) Entropy:

Year 2009:

Q.2(b) What do you mean by Entropy? Describe the second law of thermodynamics in terms of Entropy.

Year 2002 (P.E):

Q.2(c) Describe the working of a bimetallic strip as thermostat. (Draw necessary diagrams)