(1) In an experiment to measure the molar mass of a gas, 250 cm^3 of the gas was confined in a glass vessel. The pressure was 152 Torr at 298 K and the mass of the gas was 33.5 mg. What is the molar mass of the gas ? (12%)

(2) An electric battery is charged by supplying 250 kJ of energy to it as electrical work, but in the process it lost 25 kJ of energy as heat to the surroundings. What is the change in internal energy of the battery ? (12%)

(3) Given that the enthalpy of combustion of graphite is −393.5 kJ/mol and that of diamond is −395.4 kJ/mol, calculate the enthalpy of the transition from graphite to diamond. (12%)

(4) When 3.0 mol $O_{2(g)}$ is heated at a constant pressure of 3.25 atm, its temperature increases from 260 K to 285 K. Giving that C_{pm} for $O_{2(g)}$ =29.4 JK^{-1}mol^{-1}. Calculate q, H and U. (13%)

(5) The vapor pressure of a liquid in the temperature range 200K to 260K was found to fit the expression ln (P) = 16.255 − 2501.8 / T (P in Torr and T in K). Calculate the enthalpy of vaporization of the liquid. (13%)

(6) When 2 mole of gas at 330K and 3.5 atm is subjected to isothermal compression, its entropy decreases by 25 JK^{-1}. Calculate (a) the final pressure of the gas (b) G for the compression. (13%)

(7) The change in Gibbs energy for a certain constant-pressure process was found to fit the expression G/J = -85.4+36.5(T/K). Calculate the value of S for the process (12%)

(8) The partial molar volumes of acetone and chloroform in a mixture in which the mole fraction of chloroform is 0.4693 are 74.116 cm^{3}mol^{-1} and 80.235 cm^{3}mol^{-1}, respectively. What is the volume of a solution of mass 2.0 kg ? (13%)

R = 8.314 51 J K^{-1} mol^{-1}
8.314 51 kPa L K^{-1} mol^{-1}
8.205 78 ×10^{-2} L atm K^{-1} mol^{-1}
62.364 L Torr K^{-1} mol^{-1}
1.987 22 cal K^{-1} mol^{-1}