Unique Paper Code	:	42174404_OC
Name of the Paper	:	C-IV Chemistry of s- and p- block elements, states of matter and Chemical kinetics.
Name of the Course	:	B Sc (Prog.) L.Sc/P.Sc/Analytical Chemistry/Industrial ` Chemistry
Semester	:	IV
Duration	:	3Hours
Maximum Marks	:	75

Instructions for candidates

(a) All questions carry equal marks.
(b) Use separate answers sheets (with the section heading) for section A and section B.
(c) Attempt any two questions from section A and two from section B.
(d) Use of scientific Calculator is permitted.
(e) Use graph wherever required.

SECTION A
(Inorganic Chemistry)
Attempt any two questions.

1. (a) Draw an Ellingham's diagram for metal oxides. Explain why most of the lines slope upwards from left to right?

(b) What happens when (attempt ***any five***):

(i) N_2H_4 is heated in air.
(ii) $CuSO_4$ reacts with excess of aqueous NH_3.
(iii) PCl_3 reacts with water.
(iv) PCl_5 reacts with SO_2.
(v) HN_3 reacts with NaOH.
(vi) H_2SO_4 reacts with benzene.

(c) What do you understand by diagonal relationship? Give at least three examples to show how Li resembles Mg more than its congeners.

(d) Write a short note on allotropes of Carbon.

(5, 5, 5 3.75)

2. (a) Explain the structure and bonding in diborane. Why is it called an electron deficient compound?

(b) Explain ***any two*** of the following:

(i) Ionization energy of Ga is less than that of Al.
(ii) H_2O is a liquid while H_2S is a gas.
(iii) PCl_5 exists while NCl_5 does not exist.

(c) What do you understand by hydrometallurgy? Explain the extraction of Ag/Au by cyanide process.

(d) Write the name and structure of peroxoacids of sulphur. Also determine the oxidation state of Sulphur in them.

(5, 5, 5, 3.75)

3. (a) Define electronegativity. Explain Mulliken's scale of electronegativity. What are the advantages of using this scale?

(b) How is phosphoric acid prepared from phosphorus in the furnace process? Why is concentrated phosphoric acid syrupy in nature?

(c) What do you understand by inert pair effect? Explain with suitable examples.

(d) Write a short note on ***any one*** of the following:

(i) Electrolytic Refining

(ii) van Arkel-de Boer process

(5, 5, 5, 3.75)

SECTION B

(Physical Chemistry)

Attempt any two questions.

4. (a) Sketch the Maxwell distribution curve for the gas molecules in terms of molecular speeds. Label both axes and explain the effect of temperature on the distribution curve.

(b) Derive the formula for the coefficient of viscosity of liquid explaining all terms. At 20 °C, pure water with an absolute viscosity of 1.002×10^{-3} N m^{-2} s requires 98 s to through the capillary of an Ostwald viscometer. At 20 °C, solvent '**X'** requires 68 s. If densities of water and solvent '**X'** be 0.999 and 0.867 g cm^{-3} respectively, calculate. viscosity of solvent '**X'**.

(c) Discuss the activated complex theory (ACT) of biomolecular reactions.

(d) What are Miller Indices. Write the Millar Indices of the planes with intercepts**:**
(i) (2a,3b,c) **(ii)** (a, -3b,-3c).

(5,5,5,3.75)

5. (a) Describe Isotherms of carbon dioxide as studied by Andrews.

(b) Derive an expression for Bragg's equation with diagram and explain the significance of **'n'** in the equation.

(c) Differentiate between order and molecularity giving examples. Explain the Van't Hoff differential method for the determination of the orders of reactions.

(d) In the determination of the surface tension of a liquid **A** by the drop number method, equal volumes of **A** and water gave 63 and 25 drops, respectively. Calculate the surface tension of **A** if ρ (**A**) = 0.896 g cm^{-3} and ρ (water) = 0.998 g cm^{-3} Given: γ (H_2O) = 72.75 × 10^{-3} Nm^{-1}.

(5,5,5,3.75)

6. (a) Describe the reasons for deviation of gases from ideal behavior. Derive Vander Waals equation of state for a real gas.

(b) What do you understand by the term Surface Tension? What are its units? Describe one method using Stalagmometer for the measurement of surface Tension of a liquid giving expression.

(c) State and explain the term: temperature coefficient of a reaction. What is meant by energy of activation? Calculate energy of activation of a reaction whose reaction rate at 27°C gets doubled for 10°C rise in temperature.

(d) A certain solid **X** (Atomic mass 27) crystallises in a f.c.c. structure. If the density of **X** is 2.7g cm^{-3}, what is the length of the edge?

(5,5,5,3.75)