Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, May 2021

Course : Chemistry of s & p-block elements, States of matter, Chemical kinetics **Semester : IV**
Program : B.Sc. (H) Physics/Mathematics **Time : 03 hrs**
Course Code: CHEM 1010 GE **Max. Marks: 100**

Section A

Instructions:
1. Each Question will carry 5 Marks
2. Complete the statement /select the correct answer(s)
3. Answer should be fill in blank, true or false.

S. No.	Question	CO
Q 1	(i) Potassium, Rubidium and Cesium can form all types of oxides, when burnt in air. True/False (ii) Potassium ion has**…**charge and ….....polarizing power than barium ion. higher/lower (iii) ……of group-I can form only normal oxide and peroxide. (iv) X, Y and Z of group-II can form only normal oxides. Write down the name of the elements X, Y, and Z. (v) Beryllium does not react with steam. True/False **(1* 5= 5 Marks)**	**CO1**
Q 2	Bauxite- [a], Classiterite- [b], Salt Petre- [c], Karnalite- [d] and Calamine [e] are the ores of which metals. Write their name citing a, b, c, d and e. **(1* 5= 5 Marks)**	**CO2**
Q 3	(i) Diborane can be prepared by the reaction of …with…….. (ii) The shape of PCl_5 is …….. (iii) Peroxomonosulphuric acid is also known as…… (iv) The shape of the SF_4 molecules is …….. (v) Mention any two examples of pseudohalogens. **(1*5= 5 marks)**	**CO1**
Q 4	(i) In $C_{60,}$ the number of pentagons are …and hexagons are …. (ii) The order of acidity in boron trihalides is $BF_3>BBr_3>BCl_3$. (True/False) (iii) Among B_5H_9, B_4H_{10} and $B_{12}H_{12}^{2-}$, which one will show closo structure? (iv) The order of the first ionization potential is Mg < Al<P<S True or False) (v) Atoms in a P4 molecule of white phosphorus are arranged regularly at the center and corners of a tetrahedron (True or False) **(1*5= 5 marks)**	**CO1**

Q 5	(i) The total pressure (in atm) of a gaseous mixture containing 4 gm of oxygen and 3 gm of hydrogen, confined in a total volume of one liter at 20 ^{0}C, will be… (ii) The compressibility factor (z), for an ideal gas is…. (iii) The v_{rms} of certain gas at 27 ^{0}C is b m/sec. Its v_{rms} at 927 ^{0}C will be…. **(3+ 2*1= 5 marks)**	**CO3**
Q 6	(i) Polonium has simple cubic unit cell (n=1). The atomic mass of the same is 209 gm/mol, while its density is 0.0915 gm/cm^3. Find out the edge length of the unit cell of Polonium in cm. (ii) The SI unit of coefficient of viscosity is Kg-m/sec. (True/False) (iii) A liquid rises in a capillary tube is due to …… **(3+ 2*1= 5 marks)**	**CO3**

Section B

Instructions:

1. Each question will carry 10 marks
2. Write short/brief notes of 1-2 page answer.
3. Question 5 has internal choices, and hence you have to attempt only one out of two questions.
4. Draw the neat diagram, to justify your answer.

Q 1	(i) The value of 'k' for a first order reaction is 0.00154 sec^{-1}. Find out the $t_{1/2}$ of the reaction. (ii) The rate constant of a second order reaction (in liter/mole-sec) is 0.00057 & 0.00164 at 25 ^{o}C and 40^{o}C respectively. Find out the activation energy of the reaction in KCal. **(4+6= 10 marks)**	**CO2**
Q 2	Discuss the (i) Differential and (ii) Half-life method for the determination of the order of the chemical reaction. **(2*5=10 marks)**	**CO2**
Q 3	(i) Discuss in detail about the differences between Lithium and other alkali metals. (ii) Describe the structure of the Orthosilicates, Pyrosilicates. **(2*5=10 marks)**	**CO1**
Q 4	Discuss the synthesis of any three Oxoacids of halogens, citing their structures too. **(10 marks)**	**CO1**
Q 5	Starting from van der Waal's equation, derive the values of critical volume (V_c) and critical pressure (P_c) in terms of van der Waal's constant 'a' and 'b'. Calculate the V_c and P_c for CO_2, if the values of 'a' is 3.6 atm dm^6/ mol^2 and of 'b' is 4.28 x10^{-2} dm^3/mol respectively. **OR** Derive the kinetic gas equation considering the appropriate assumptions. **(10 marks)**	**CO3**

Section C

Instructions:

1. Question is of 20 marks
2. Write long answer of 2-3 page.
3. Draw the neat diagram to justify your answer.
4. Internal choices is there and hence you have to attempt only one question.

Q 1	**(i)** Derive a relationship between the interplaner spacing of a crystal and the wavelength of X-ray diffracted by it. **(ii)** Water passes through a viscometer in 30 seconds. The same volume of oil required 2263.7 seconds. If the viscosity of water is 0.00101 kg/m-sec, density of water is 998 kg/m^3 and density of the oil is 1100 kg/m^3, find out the viscosity of the oil. **OR** **(i)** Discuss the working principle and details of the Ostwald method for the determination of the viscosity. **(ii)** A body centered cubic element of density 10.3 gm/cm^3 has a cell edge of 314 pm. Find out the atomic mass of the element, considering the N_A= 6.023 x 10^{23} gm/mole. **(12+8= 20 marks)**	**CO3**