

Name:
Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course : Physical Chemistry I
Program : B.Sc. (H) Chemistry
Course Code: CHEM 1004

Semester : I
Time : 03 hrs
Max. Marks: 100

Section A

Instructions:

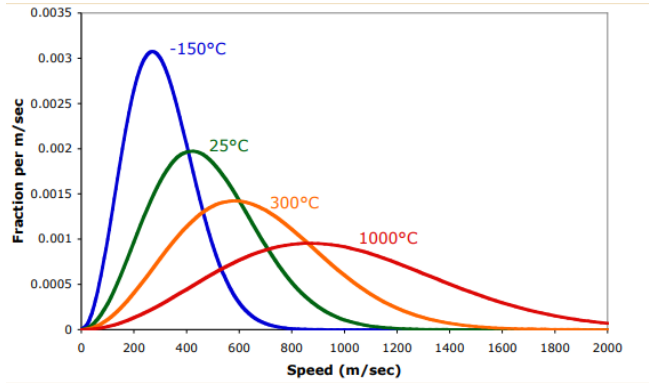
1. Each Question will carry 5 Marks
2. Complete the statement /select the correct answer(s)
3. Answer should be short, fill in blank, true or false.
4. You have to very careful to write the answer.

S. No.	Question	CO
Q 1	(a) Water is a strong electrolyte. True or False (b) Dissociation of weak electrolyte decreases with dilution. True or False (c) Write an example of basic buffer mixture..... (d) The value of ionic product of water at 25 ⁰ C is..... (e) The value of pH + pOH =at 25 ⁰ C.	CO1
Q 2	(a) Colour of the acidic solution in presence of phenolphthalein as indicator would be (b) The value of the pH at the end point of titration of strong acid and strong base is..... (c) Aqueous solution of the NH ₄ Cl salt is acidic or basic. (choose any one) (d) Solubility product is not the property of saturated solution. True or False (e) The value pH of 10 ⁻⁴ M HCl solution is	CO3
Q 3	(a) Number of atoms in FCC unit cell is (b) Percentage of free space in a body centred cubic unit cell is..... (c) In a face-centered cubic lattice, a unit cell is shared equally by how many unit cells? (d) A compound formed by elements X and Y crystallizes in a cubic structure in which atoms X are at the corners of the cube and atoms Y are at the face-centers. The formula of the compound is..... (e) Axis of symmetry is not present in a cubic unit cell. True or False	CO1
Q 4	The value for root mean square velocity of nitrogen molecule will be.....m/s	CO2
Q 5	(a) Unit of viscosity is (b) Unit of van der waal constant "a" is (c) Unit of van der waal constant "b" is..... (d) Unit of surface tension is..... (e) Unit of compressibility factor is.....	CO2

Q 6	Write law of equipartition of energy.	CO1
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 as well as to score higher marks.		
Q 1	(a) Calculate the degree of hydrolysis of 0.1M solution of sodium acetate at 25 °C. (Given that $K_a = 1.75 \times 10^{-5}$ and $K_w = 1 \times 10^{-14}$ at 25 °C) (b) The solubility product of $BaSO_4$ at 25 °C is $1.08 \times 10^{-10} \text{ mol}^2/\text{L}^2$. What is the minimum conc. of SO_4^{2-} ions required to precipitate $BaSO_4$ from a 0.01 M solution of $BaCl_2$?	CO3
Q 2	(a) Calculate the pH of an aqueous solution obtained by mixing 25 ml of 0.2 M HCl with 50 ml of 0.25 M NaOH. ($K_w = 1 \times 10^{-14} \text{ mol}^2/\text{L}^2$). (7 Marks) (b) Explain the common ion effect with the help of example. (3 Marks)	CO1
Q 3	(a) X-ray of wavelength 1.54 \AA diffracted from atom of crystal having interplanar spacing of 0.77 \AA . Considering first order diffraction, Calculate the angle of incident of X-ray. (b) Calculate the packing efficiency in the face centred cubic unit cell.	CO1
Q 4	Explain the factors which led van der Waals to modify the ideal gas equation and hence derive the van der Waals equation of state.	CO2
Q 5	Discuss Andrews Isotherm of Carbon dioxide with suitable graphical representation. OR Give postulates of Kinetic theory of gases and derive the kinetic gas equation	CO1
Section C		
Instructions:		
1. Question is of 20 marks 2. Write long answer. 3. Draw the neat diagram, to justify your answer as well as to score higher marks. 4. Internal choices is there for 12(a) and 12(b), and hence you have to attempt both 12 (a) and 12(b)		
Q	(a) Calculate the temperature at which the root mean square velocity, the average velocity and the most probable velocity of oxygen gas are all equal to 1500 ms^{-1} [10 marks]	CO1

OR

Explain the graph with reference to molecular velocities of gases.



- (b) i) Discuss the effect of temperature on surface tension [5 marks].
ii) What is law of correspondence of state. Explain. [5 marks]

OR

- i) Explain effect of addition of various solutes on surface tension and viscosity. [5 marks]
ii) Derive relation between mean free path and coefficient of viscosity. [5 marks]