		Sanjay Ghodawat University, Kolhapur Established as State Private University under Govt. of Maharashtra. Act No XL, 2017		2018-19
Year and Program: 2018-19/ S.Y. B. Sc.		School of Science		Department of Chemistry
Course Code: CHS 202		Chemistry-IV		Semester – Even (IV)
Day and Date: Thursday, 23/05/2019		End Semester Examination		Time: 3 hrs, Max Marks: 100 (2.30 to 5.30 pm)
PRN:		Seat No:		Section A Marks out of 20:
Signature of Students		Signature of Supervisor		

Section A

Instructions:

- 1) All Questions are compulsory.
- 2) For MCQs mark tic (✓) for correct answer. No marks for multiple tics (✓).
- 3) Section A should be submitted to Jr. Supervisor immediately after first 30 min.

Q.1 Multiple choice questions.

		Marks	level	CO
		20		
1	What is maximum oxidation state shown by Mn? a. +4 b. +6 c. +7 d. +5	1	1	1
2	Color of transition metals can be attributed to-----. a. Small size of metal ion b. Absorption of UV light c. Complete <i>s</i> subshell d. Incomplete <i>d</i> shell	1	2	1
3	Most common oxidation state in lanthanides is -----. a. +2 b. +3 c. +4 d. +5	1	2	1
4	Complexes with CN=4 can exhibit -----and-----geometries. a. Tetrahedral and Sq. planner b. Octahedral c. linear and tetrahedral	1	1	2

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- d. None of these
- 5 ----- is high spin complex. 1 2 2
- a. $[\text{Co}(\text{NH}_3)_6]^{3+}$
- b. $[\text{Co}(\text{CN})_6]^{3-}$
- c. $[\text{CoF}_6]^{3-}$
- d. None of these
- 6 Valence bond theory was applied to complexes by----- 1 2 2
- a. Linus Pauling
- b. Alfred Werner
- c. Sidgwick
- d. None of these
- 7 The surface area of the gas molecule of collision diameter ' σ ' is given by ----. 1 2 3
- a. $\pi \sigma^2$
- b. $\pi \sigma$
- c. σ^2/π
- d. $4 \pi \sigma^2$
- 8 A gas cannot be liquefied if for the gas the temperature is greater than -----, 1 2 3
- a. Critical temperature
- b. Critical pressure
- c. Critical volume
- d. Critical density
- 9 Which of the following is a unit of viscosity coefficient of gas? 1 2 3
- a. $\text{gm.cm}^{-1}\text{s}^{-1}$
- b. $\text{gm.cm}^{-1}\text{s}$
- c. gm.cm s^{-1}
- d. $\text{cm.gm}^{-1}.\text{s}^{-1}$
- 10 If rms velocity of gas is 100 cm s^{-1} , its average velocity is -----, 1 3 3
- a. 100 cm s^{-1}
- b. 0.01 cm s^{-1}
- c. 92.13 cm s^{-1}

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- d. 81.64 cm s^{-1}
- 11 If at STP condition the mean free path of a gas is $2.1 \times 10^{-5} \text{ cm}$ then under ----- atmosphere pressure, the mean free path of a gas becomes 1 cm. 1 3 3
- a. 1
b. 2.1×10^{-5}
c. 2.1
d. 2.1×10^5
- 12 If rates of diffusion of two gases A and B are 4:1, the ratio of their densities is ----. 1 3 3
- a. 1 : 16
b. 1 : 4
c. 1 : 8
d. 1 : 2
- 13 Which of the following parameter does not affect the surface tension of liquids? 1 2 3
- a. Pressure
b. Temperature
c. Composition
d. mass
- 14 If the property of solid is different in different direction, then solid is said to exhibit ---. 1 1 4
- a. Isotropy
b. Anisotropy
c. Allotropy
d. enantiotropy
- 15 Cubic crystal exhibit ----- rectangular and ---- diagonal plane of symmetry. 1 2 4
- a. 2 and 3
b. 3 and 2
c. 3 and 6
d. 6 and 3

- 16 In the cubic crystal the edge centered atom is shared by -----, 1 3 4
 a. 2 unit cells
 b. 1 unit cell
 c. 4 unit cell
 d. 8 unit cell
- 17 The adjacent (100) planes in simple cubic crystal are separated 1 2 4
 by 6.22 \AA , and then the unit cell length of crystal is ----- \AA .
 a. 3.11
 b. 6.22
 c. 12.44
 d. 1.00
- 18 If half-life period of a reaction is independent of initial 1 1 4
 concentration of reactants, then order of reaction is ----.
 a. 0
 b. 1
 c. 2
 d. 3
- 19 On plotting $\log_{10} k$ versus $1/T$, the slope of the straight line 1 2 4
 gives -----.
 a. E_a/R
 b. $-E_a/R$
 c. $E_a/2.303R$
 d. $-E_a/2.303R$
- 20 The first order reaction is 75% completed in 32 minutes. For 1 1 4
 50% completion it will take ----.
 a. 4 min
 b. 8 min
 c. 16 min
 d. 32 min

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Course Code: CHS 202	Chemistry-IV	Semester –Even (IV)
Day and Date: Thursday, 23/05/2019	End Semester Examination	Time: 3 hrs, Max Marks: 100 2:30 to 5:30 pm
PRN:	Seat No:	Section B Marks out of 80:

Section B

		Marks	level	CO
Q.2	Answer the following questions (Solve any Two)	12		
a)	What are actinides? Discuss their electronic configurations.	6	2	1
b)	Describe the separation of lanthanides using ion exchange separation method.	6	2	1
c)	Write note on magnetic properties of 3d transition elements.	6	1	1
Q.3	Answer the following questions (Solve any Two)	12		
a)	Define stereoisomerism and explain types of isomerism.	6	2	2
b)	Explain the relation between crystal field splitting parameters of octahedral and tetrahedral complexes and calculate CFSE for d^5 and d^7 in strong field complex.	6	3	2
c)	Explain the VBT on the basis of geometry of $CN=4$ and $CN=6$ compound with suitable example.	6	4	2
Q.4	Answer the following questions (Solve any Two)	12		
i)	Using equation of kinetic theory of gases, derive Boyle's law, Charles's law and Graham's law of diffusion.	6	4	3
ii)	Derive an equation for the mean free path and discuss pressure dependence of mean free path of gas.	6	3	3
iii)	Describe use of Ostwald's viscometer to determine the viscosity of liquids.	6	2	3

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b) Answer the following questions (Solve any Four)		16		
i)	Calculate root mean square velocity of oxygen molecules in the lungs at normal body temperature, 37°C .	4	3	3
ii)	Physical significance of Maxwell-Boltzmann distribution law of molecular velocities of gas.	4	2	3
iii)	The number of drops of water counted in falling drop method using stalagmometer is 100, whereas the number of drops of an organic liquid is 280. Calculate the surface tension of organic liquid if surface tension of water is 0.07275 Nm^{-1} and the densities of water and organic liquid are $0.998 \times 10^3 \text{ kg m}^{-3}$ and $0.755 \times 10^3 \text{ kg m}^{-3}$ respectively.	4	3	3
iv)	'The product of pressure and volume of one mole of a gas at constant temperature decreases with increase of pressure reaches to minimum and again increases with increase of pressure', justify the statement with the van der waals equation.	4	3	3
v)	Prove that the excluded volume per molecule of a gas is four times the volume of single molecule.	4	1	3
Q.5 a) Answer the following questions (Solve any Two)		16		
i)	Draw suitable schematic diagram of X-ray powder diffraction photographic method. How the lines on photograph are indexed? What information regarding lattice structure is obtained?	8	2	4
ii)	Derive kinetic equation of first order reaction. Show that half life-time of first order reaction is independent of initial concentration of reactant. Half-life time of first order reaction is 30 minutes. How long it will be for 90% completion of this reaction?	8	1	4
iii)	Calculate the interplaner spacing of planes (100), (110) and (111) of simple, body centered and face centered cubic crystals. How the ratio of reciprocals of interplaner spacing is useful in investigating type of space lattice?	8	3	4

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b)	Answer the following questions (Solve any Three)	12		
i)	State and explain law of mass action.	4	1	4
ii)	Draw structure of unit cell of NaCl crystal and show that it has four NaCl molecules per unit cell.	4	2	4
iii)	Comment on factors influencing rate of a chemical reaction.	4	1	4
iv)	The first order reflection of monochromatic beam of X-ray from a cubic crystalline material from planes (100), (110) and (111) planes occurs at angle 5.9° , 8.4° and 5.2° respectively. Find the type of space lattice of crystalline material.	4	2	4

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