

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER- I & II (NEW) EXAMINATION – WINTER 2019****Subject Code: 3110001****Date: 02/01/2020****Subject Name: Chemistry****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		<b>Marks</b>
<b>Q.1</b>	(a) Define hardness of water and differentiate between temporary and permanent hardness	<b>03</b>
	(b) Explain the principle of UV-VIS spectroscopy and list down main components of UV-VIS spectrophotometer.	<b>04</b>
	(c) Distinguish between addition and condensation polymerization and explain the mechanism of free radical addition polymerization.	<b>07</b>
<b>Q.2</b>	(a) Draw a well labeled diagram of fractional distillation of crude petroleum showing its various fractions.	<b>03</b>
	(b) Answer the following	<b>04</b>
	(i) CFC's (Chlorofluro Carbons) are considered very stable. Draw the Lewis dot structure of $CF_2Cl_2$ and explain for their stability.	
	(ii) Giving reason, arrange the following elements in increasing order of electro negativity: C,F,N,O	
(c) What do you understand by 'wet or electrochemical corrosion'? Explain mechanism of electrochemical corrosion.	<b>07</b>	
<b>OR</b>		
(c)	(i) Explain how corrosion control can be brought about by the cathodic protection.	<b>07</b>
	(ii) Alloying is done to improve usefulness of metals. Justify the statement.	
<b>Q.3</b>	(a) Outline the applications of nanotechnology in catalysis	<b>03</b>
	(b) State Lambert and Beer's law and deduce its mathematical expression.	<b>04</b>
	(c) Differentiate between proximate and ultimate analysis of coal and explain proximate analysis giving its significance.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) What are the effects of nanoscale dimension on mechanical and optical properties of material?	<b>03</b>
	(b) Write a brief note on interaction of electromagnetic radiation with matter.	<b>04</b>
	(c) (i) Octane number is used to predict about the efficiency of gasoline. Comment on it. (ii) Define calorific values of a fuel. Distinguish between gross and net calorific value and give relation between these two.	<b>07</b>
<b>Q.4</b>	(a) What do you infer by following terms: <ul style="list-style-type: none"><li>• Quantum dots</li><li>• Fullerenes</li><li>• Carbon nanotube</li></ul>	<b>03</b>

- (b) Answer the following: 04  
 (i) Distinguish between hard acid/base and soft acid/base. Classify following as hard acid/base or soft acid/base:  $\text{Li}^+$ ,  $\text{SCN}^-$ ,  $\text{Al}^{3+}$ ,  $\text{Sn}^{4+}$ ,  $\text{Au}^+$ ,  $\text{Pt}^{2+}$ ,  $\text{F}^-$ ,  $\text{OH}^-$   
 (ii) Which atom has smaller atomic radii: Be (atomic number = 4) or F (atomic number = 9). Give reason.
- (c) Explain ethanol production using fermentation technology with a neat and labeled process flow diagram, showing all the steps involved. 07

**OR**

- Q.4** (a) Give an outline of Bottom up approach of synthesis of nanomaterial 03
- (b) Answer the following: 04  
 (i) Based on their positions in the periodic table, predict which has the smallest first ionization energy: Li, Cs, N, F, I.  
 (ii) write coordination number and shape of  $[\text{Ni}(\text{CN})_4]^{2-}$   
 (iii) Categorize following solids as covalent, ionic or metallic solids. KF, Dry ice, Sand, Iodine, Diamond, Graphite.  
 (iv) In your words give reason, why ionic compounds are hard but brittle .

- (c) (i) Discuss the role of biotechnology in food industry and medicines 07  
 (ii) Give examples of following:  
 • A microorganism used as biofertilizer  
 • A biosurfactant  
 • Organism used in acetic acid production.

- Q.5** (a) Differentiate between ferrous and nonferrous alloys. 03
- (b) What are the draw backs of natural rubber? How are its properties improved? 04
- (c) Give a comparative account of Zeolite process and Ion exchange process used for softening of water. 07  
 Calculate temporary and permanent hardness in ppm, for a water sample, one litre of which show following result on analysis:  $\text{Mg}(\text{HCO}_3)_2 = 36.5$  mg,  $\text{Ca}(\text{HCO}_3)_2 = 40.5$  mg,  $\text{NaCl} = 16.7$  mg,  $\text{CaSO}_4 = 17$  mg, and  $\text{MgSO}_4 = 15$  mg.

**OR**

- Q.5** (a) Answer the following: 03  
 (i) State Pilling bedworth rule and describe its significance.  
 (ii) The Copper equipment should not possess a iron nail in it. Give reason
- (b) Explain the preparation, properties and any one specific use of the following polymers:- 04  
 (a) Buna-S rubber  
 (b) Nylon-2-nylon-6
- (c) Write principle of softening of hard water by Lime soda process. 07

Calculate the quantities (in Kg) of lime and soda required to soften 50,000 liters of hard water containing the following salts:-  
 $\text{MgCl}_2 = 95$  PPM;  $\text{Mg}(\text{HCO}_3)_2 = 146$  PPM;  $\text{CaSO}_4 = 136$  PPM;  $\text{Ca}(\text{HCO}_3)_2 = 162$  PPM. Assume that the lime used is only 85% pure and soda is only 95% pure.

(Given: Atomic mass of Ca = 40; Mg = 24; H = 1; O = 16; S = 32; C = 12; Cl = 35.5).

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