Seat No.: _____ Enrolment No._____

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.**

			Marks
Q.1	**(a)**	Define hardness of water and differentiate between temporary and permanent hardness	**03**
	(b)	Explain the principle of UV-VIS spectroscopy and list down main components of UV-VIS spectrophotometer.	**04**
	(c)	Distinguish between addition and condensation polymerization and explain the mechanism of free radical addition polymerization.	**07**
Q.2	**(a)**	Draw a well labeled diagram of fractional distillation of crude petroleum showing its various fractions.	**03**
	(b)	Answer the following (i) CFC's (Chlorofloro 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	**04**
	(c)	What do you understand by 'wet or electrochemical corrosion'? Explain mechanism of electrochemical corrosion.	**07**
		OR	
	(c)	(i) Explain how corrosion control can be brought about by the cathodic protection. (ii) Alloying is done to improve usefulness of metals. Justify the statement.	**07**
Q.3	**(a)**	Outline the applications of nanotechnology in catalysis	**03**
	(b)	State Lambert and Beer's law and deduce its mathematical expression.	**04**
	(c)	Differentiate between proximate and ultimate analysis of coal and explain proximate analysis giving its significance.	**07**
		OR	
Q.3	**(a)**	What are the effects of nanoscale dimension on mechanical and optical properties of material?	**03**
	(b)	Write a brief note on interaction of electromagnetic radiation with matter.	**04**
	(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.	**07**
Q.4	**(a)**	What do you infer by following terms: • Quantum dots • Fullerenes • Carbon nanotube	**03**

(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: Li^+ , SCN^- , Al^{3+}, Sn^{4+}, Au^+, Pt^{2+} F^-, 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 $[Ni(CN)_4]^{2-}$

(iii) Categorize following solids as covalent, ionic or metallic solids.
KF, Dry ice, Sand, Iodine, Diamond, Graphite.

(iv) In your wordsgive reason, whyionic 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 biofertlilizer
- 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: $Mg(HCO_3)_2$ = 36.5 mg, $Ca(HCO_3)_2$ = 40.5 mg, NaCl=16.7 mg, $CaSO_4$ = 17 mg, and $MgSO_4$ = 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:- $MgCl_2$ = 95 PPM; $Mg(HCO_3)_2$ = 146 PPM; $CaSO_4$ = 136 PPM; $Ca(HCO_3)_2$ = 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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