Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-2019

EN3BS04 Engineering Chemistry

Programme: B.Tech. Branch/Specialisation: All

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. EDTA used in complexometry titration of hardness is a multidentate ligand. Choose the correct answer; **1**

(a) Bidentate (b) Tridentate
(c) Hexadentate (d) Tetradentate

ii. Sodium Hexa Meta Phosphate is known as: **1**

(a) Calgon (b) Gypsum (c) Zeolite (d) Lime

iii. Choose the correct match: **1**

(a) 1 BTU = 200 Cal (b) 1kcal = 3.97 BTU
(c) 1 BTU = 1 ft^3 (d) 1 kcal/kg = 2 BTU / 1b

iv. Iso-octane has an octane rating of: **1**

(a) 0 (b) 100 (c) 200 (d) Above 1000

v. A lubricant should possess high: **1**

(a) Volatility (b) Acidity (c) Oilness (d) None of these

vi. Which one of the following is not a condensation polymer? **1**

(a) Dacron (b) Neoprene (c) Melamine (d) Glyptal

vii. Gypsum is: **1**

(a) $CaSO_4.2H_2O$ (b) $CaSO_4.1/2\ H_2O$
(c) $CaSO_4.3H_2O$ (d) $CaSO_4.3/2H_2O$

viii. Fullerene or bucky ball is made up of ____ carbon atoms: **1**

(a) 100 (b) 60 (c) 20 (d) 75

ix. Which element is used in gas-chromatography: **1**

(a) He (b) H (c) Pb (d) All of these

P.T.O.

	x.	The colour of electrolytes in solution is due to it: (a) Ions (b) Solvation (c) Electrolysis (d) Dissolution	**1**
Q.2	i.	50 ml of sample contains 840 ppm of DO. After 5 days, the DO value becomes 230 ppm, after the sample has been diluted to 80 ml. Calculate the BOD of sample.	**4**
	ii.	Water sample using $FeSO_4.7H_2O$ as a coagulant at the rate of 139 ppm gave the following results for raw water. Ca^{2+}= 320 ppm, Mg^{2+}= 120 ppm, CO_2 = 88 ppm and HCO_3^- = 732 ppm. Calculate the quantities of lime and soda required for softening 50,000 litres of hard water sample.	**6**
OR	iii.	What are the disadvantages of hard water? Describe ion exchange process of softening of hard water in detail.	**6**
Q.3	i.	Write a detail note on Power Alcohol.	**3**
	ii.	What is calorific value and Give its type? Write the Principle of Bomb calorimeter and Draw a well labelled diagram for the determination of calorific value of solid fuel. Also mention the formula for the determination of theoretical calorific value.	**7**
OR	iii.	A sample of coal was found to have the following % composition by weight: C=70%, H=5 %, O=17.3%, N=4.2% and ash=3.5%. Calculate (a) The minimum amount of oxygen and air necessary for complete combustion of 1 kg of coal sample. (b) Volume of air required; if 30% excess air is supplied (c) Also calculate the dry product Composition	**7**
Q.4	i.	A lubricating oil has Saybolt universal viscosity of 58 seconds at 210^0F and 564 seconds at 100^0F. The low viscosity index standard Gulf oil has Saybolt universal viscosity of 58 seconds 210^0F and 758 seconds at 100^0F. The high viscosity index standard Pennsylvanian oil gave the Saybolt universal viscosity value of 58 seconds at 210^0F and 420 seconds at 100^0F. Calculate viscosity index of the lubricating oil.	**4**

	ii.	Explain Hydrodynamic and Boundary lubrication mechanism.	**6**
OR	iii.	Write short note on: (a) Vulcanization of rubber (b) Polythene	**6**
Q.5	i.	Discuss setting and hardening of Portland cement with chemical reactions involved in it.	**4**
	ii.	Write detail note on the following: (a) Optical Fibres (b) Superconductors	**6**
OR	iii.	Define refractory. How are they classified? Give one example of each refractory.	**6**
Q.6	i.	Define EMF. Write the applications of EMF measurements.	**4**
	ii.	Discuss Principle, Instrumentation and applications of IR spectroscopy.	**6**
OR	iii.	Discuss Principle, Instrumentation and applications of UV-VIS spectroscopy.	**6**

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Marking Scheme
EN3BS04 Engineering Chemistry

Q.1	i.	EDTA used in complexometry titration of hardness is a multidentate ligand. Choose the correct answer; (c) Hexadentate	**1**
	ii.	Sodium Hexa Meta Phosphate is known as: (a) Calgon	**1**
	iii.	Choose the correct match: (b) 1kcal = 3.97 BTU	**1**
	iv.	Iso-octane has an octane rating of: (b) 100	**1**
	v.	A lubricant should possess high: (c) Oilness	**1**
	vi.	Which one of the following is not a condensation polymer? (b) Neoprene	**1**
	vii.	Gypsum is: (a) $CaSO_4.2H_2O$	**1**
	viii.	Fullerene or bucky ball is made up of ____ carbon atoms: (b) 60	**1**
	ix.	Which element is used in gas-chromatography: (a) He / (b) H	**1**
	x.	The colour of electrolytes in solution is due to it: (a) Ions	**1**

Q.2	i.	Calculate the BOD of sample.		**4**
		BOD = $[DO_b\text{-}DO_1] \times$ Dilution factor	1 mark	
		$= (DO_b\text{-}DO_1) \times \frac{\text{ml of sample after dilution}}{\text{ml of sample before dilution}}$	1 mark	
		$= (840\text{-}230) \times \frac{80}{50}$		
		= **976 ppm**	2 marks	
	ii.	Calculate the quantities of lime and soda required for softening 50,000 litres of hard water sample.		**6**
		Lime requirement Ans = 49.95 kg	3 marks	
		Soda requirement Ans = 39.75 kg	3 marks	
OR	iii.	Disadvantages of hard water	2 marks	**6**
		Ion exchange process of softening of hard water		
		Process + diagram	2 marks	
		Reaction + advantages / disadvantages	2 marks	

Q.3	i.	Power Alcohol.		**3**
		Definition	1 mark	
		Advantage	1 mark	
		Disadvantages	1 mark	
	ii.	Definition calorific value and its type	2 marks	**7**
		Principle of Bomb calorimeter	2 marks	
		Diagram for the determination of calorific value of solid fuel	2 marks	
		Formula	1 mark	
OR	iii.	Calculate		**7**
		Given data	1 mark	
		Oxygen required	1 mark	
		Air required	1 mark	
		Volume of air	1 mark	
		Dry product composition	3 marks	

Q.4	i.	Calculate viscosity index of the lubricating oil.		**4**
	ii.	Hydrodynamic lubrication mechanism	3 marks	**6**
		Boundary lubrication mechanism.	3 marks	
OR	iii.	Write short note on:		**6**
		(a) Vulcanization of rubber	3 marks	
		(b) Polythene	3 marks	

Q.5	i.	Setting of Portland cement with chemical reactions involved in it	2 marks	**4**
		Hardening of Portland cement with chemical reactions involved in it.	2 marks	
	ii.	Write detail note on the following:		**6**
		(a) Optical Fibres	3 marks	
		(b) Superconductors	3 marks	
OR	iii.	Definition refractory	2 marks	**6**
		Classification	3 marks	
		One example of each refractory.	1 mark	

Q.6	i.	Definition EMF	2 marks	**4**
		Applications of EMF measurements.	2 marks	
	ii.	Principle IR spectroscopy	2 marks	**6**
		Instrumentation IR spectroscopy	2 marks	
		Four Applications of IR spectroscopy 0.5 mark for each (0.5 mark * 4)	2 marks	
OR	iii.	Principle of UV-VIS spectroscopy	2 marks	**6**
		Instrumentation of UV-VIS spectroscopy	2 marks	
		Applications of UV-VIS spectroscopy	2 marks	

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