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

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-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. The permissible limit for dissolved oxygen in potable water is **1**
(a) 8 ppm (b) 2 ppm (c) 5 ppm (d) 6 ppm

ii. Chloramine is used in drinking water for **1**
(a) Sterilization (b) Purification
(c) Disinfection (d) None of these

iii. Octane rating was introduced by **1**
(a) Dalton (b) 2 Bohr (c) Heisenberg (d) Edger

iv. Power alcohol is **1**
(a) Ethanol + Petrol (b) Ethanol + Diesel
(c) Methanol + Petrol (d) Methanol + Diesel

v. Most commonly used solid lubricant is: **1**
(a) KOH (b) Graphite
(c) Carbon block (d) Sulphur

vi. Which of the following is a Natural polymer? **1**
(a) Nucleic acid (b) Protein
(c) Cellulose (d) All of these

vii. Alumina refractory is **1**
(a) Acidic (b) Basic
(c) Both (a) and (b) (d) Neutral

viii. The phenomenon on which optical fibre work is **1**
(a) Resonance (b) Scattering
(c) Total internal reflection (d) Polarization

P.T.O.

ix. A mixture of volatile compounds can be easily separated by **1**
(a) Column chromatography (b) Thin layer chromatography
(c) Gas chromatography (d) Paper chromatography

x. Identification of functional groups in a compound can be done by **1**
(a) IR Spectroscopy (b) UV Spectroscopy
(c) ESR Spectroscopy (d) All of these

Q.2 i. What is carbonate and non-carbonate hardness? How it can be removed from hard water. **2**

ii. Explain the disinfection methods with reactions. **3**

iii. Differentiate between permutit and ion exchange process. Also write the reactions and draw well labelled diagram **5**

OR iv. A sample of water on analysis gives the following: **5**
Ca^{2+} = 40 ppm, Mg^{2+} = 50 ppm, CO_2 = 60 ppm, HCO_3^- = 100 ppm, K^+ = 10 ppm. Sodium meta aluminate is used at the rate of 139ppm Calculate the lime (85% pure) and soda (95% pure) required to soften 1 million litres of water. Also calculate total hardness and alkalinity of water sample.

Q.3 i. Define calorific value and its type **2**

ii. Differentiate between octane number and cetane number **3**

iii. A sample of coal was found to have the following % composition by weight: C=75%, H=5.2%, O=12.1%, N=3.2% and ash=4.5%. Calculate: **5**
(a) The minimum amount of O_2 and air by weight necessary for complete combustion of 1 Kg of coal
(b) Weight of air required; if 40% excess air is supplied
(c) Gross and net calorific value of coal sample using Dulong's formula.
(d) Dry product percentage composition by weight.

OR iv A producer gas has following composition by volume: CH_4 = 4%, CO=26.0%, H_2=10%, CO_2 = 10%, N_2=50%. Calculate: **5**
(a) Minimum quantity of air required for complete combustion of 1 m^3 of the fuel gas.

(b) Percentage composition of dry products of combustion by volume when 20% excess air is used.

Q.4 i. Define lubricants. Explain different types of mechanism of lubrication with example. **4**

ii. Define following properties with significance **6**
(a) Viscosity and viscosity index
(b) Flash and fire point

OR iii. Discuss the preparation, properties and uses of the following: **6**
(a) HDPE (b) Nylon 6:6

Q.5 i. What are refractories. Explain pyrometric Segar cone test method for testing refractory material. **4**

ii. Explain the complete process for the formation of cement with reactions in different zone. Also draw well labelled diagram. **6**

OR iii. Write short note with applications. **6**
(a) Optical Fibre (b) Super conductivity
(c) Carbon nanotubes

Q.6 Attempt any two:

i. State Lambert's Beer law and write its applications and limitations. **5**

ii. Explain the principle of IR Spectroscopy and its applications. **5**

iii. Define the term chromatography. Write the principle, diagram and applications of gas chromatography. **5**

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Marking Scheme
EN3BS04 Engineering Chemistry

Q.1	i.	The permissible limit for dissolved oxygen in potable water is (a) 8 ppm		**1**
	ii.	Chloramine is used in drinking water for (c) Disinfection		**1**
	iii.	Octane rating was introduced by (d) Edger		**1**
	iv.	Power alcohol is (a) Ethanol + Petrol		**1**
	v.	Most commonly used solid lubricant is: (b) Graphite		**1**
	vi.	Which of the following is a Natural polymer? (d) All of these		**1**
	vii.	Alumina refractory is (a) Acidic		**1**
	viii.	The phenomenon on which optical fibre work is (c) Total internal reflection		**1**
	ix.	A mixture of volatile compounds can be easily separated by (c) Gas chromatography		**1**
	x.	Identification of functional groups in a compound can be done by (a) IR Spectroscopy		**1**
Q.2	i.	Carbonate and non-carbonate hardness It can be removed from hard water	1 mark 1 mark	**2**
	ii.	Disinfection methods with reactions.		**3**
	iii.	Difference b/w permutit and ion exchange process Reactions Diagram	3 marks 1 mark 1 mark	**5**
OR	iv.	Equation Formula Substance Ans with unit Total hardness and alkalinity of water sample.	1 mark 1 mark 1 mark 1 mark 1 mark	**5**
Q.3	i.	Calorific value	1 mark	**2**
		Its type	1 mark	
	ii.	Difference b/w octane number and cetane number 1 mark for each difference	(1 mark * 3)	**3**
	iii.	Calculate: (a) The minimum amount of O_2 and air by weight necessary for complete combustion of 1 Kg of coal (b) Weight of air required (c) Gross and net calorific value of coal sample using Dulong's formula. (d) Dry product percentage composition by weight	2 marks 1 mark 1 mark 1 mark	**5**
OR	iv	Calculate: (a) Minimum quantity of air required for complete combustion of 1 m^3 of the fuel gas. (b) Percentage composition of dry products of combustion by volume when 20% excess air is used.	3 marks 2 marks	**5**
Q.4	i.	Definition of lubricants Types of mechanism of lubrication with example	1 mark 3 marks	**4**
	ii.	Define following properties with significance (a) Viscosity and viscosity index (b) Flash and fire point	3 marks 3 marks	**6**
OR	iii.	Discuss the preparation, properties and uses of the following: (a) HDPE (b) Nylon 6:6	3 marks 3 marks	**6**
Q.5	i.	Refractories Pyrometric Segar cone test method	1 mark 3 marks	**4**
	ii.	Process for the formation of cement With reactions in different zone Diagram	2 marks 2 marks 2 marks	**6**
OR	iii.	Write short note with applications. (a) Optical Fibre (b) Super conductivity (c) Carbon nanotubes	2 marks 2 marks 2 marks	**6**
Q.6		Attempt any two:		

i.	State Lambert's Beer law	3 marks	**5**
	Its applications	1 mark	
	Limitations	1 mark	
ii.	Principle of IR Spectroscopy	2 marks	**5**
	Its applications	3 marks	
iii.	Definition of chromatography	1 mark	**5**
	Principle	1 mark	
	Diagram	1 mark	
	Applications of gas chromatography	2 marks	

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