

Roll No.

TCH-101

B. TECH. (FIRST SEMESTER)
END SEMESTER EXAMINATION, Jan., 2023
ENGINEERING CHEMISTRY

Time : Three Hours

Maximum Marks : 100

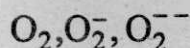
Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) Based on molecular orbital diagrams arrange the following molecule/ion in order of their increasing bond length :



Give explanation with proper diagrams. (CO1)

- (b) What is the necessary condition for a molecule to be IR active ? Give the difference between UV-visible and IR spectroscopy. (CO1)

- (c) What do you mean by nanosized materials ? Classify nanomaterials and discuss their applications. (CO1)

P. T. O.

2. (a) Why does hard water consume a lot of soap ? Explain ion exchange method of water softening. Also discuss regeneration of exhausted ion exchanger. (CO2)

(b) Differentiate the following : (CO2)

(i) Ion exchange process and zeolite process

(ii) Cold lime soda process and hot lime soda process

(c) A water sample contains the following impurities per litre :

$\text{Ca}(\text{HCO}_3)_2$ = 16.2 mg, $\text{Mg}(\text{HCO}_3)_2$ = 7.3 mg, CaSO_4 = 6.8 mg,
 MgSO_4 = 12.0 mg, KCl = 200 mg

Calculate temporary and permanent hardness in water. Determine the quantity of lime and soda required in kg for softening 10000 liters of water if the purity of lime and soda are 75% and 90% respectively.

(CO2)

3. (a) What are the applications of conducting polymer with suitable examples. Explain the conductive nature of polymers. (CO3)

(b) Explain the environmental significance of biodegradable polymers. State the preparation and uses of the following types of biodegradable polymers : (CO3)

(i) Biodegradable polymers having ester linkage

(ii) Biodegradable polymers having amide linkage

(c) (i) What are liquid crystal polymers ? Give structure and uses of any one liquid crystal polymer.

(ii) Discuss the following terms by giving suitable examples : (CO3)

(A) Functionality of monomer

(B) Thermoplastics

4. (a) Write characteristics of good fuel and discuss classification of fuels with merits and demerits of each class. (CO4)

(b) Why is net calorific value less than gross calorific value ? Calculate GCV and NCV of a fuel sample from following data : (CO4)

Mass of fuel = 0.95 gm

Water equivalent mass of calorimeter = 650 gm

Amount of water taken in calorimeter = 2.5 kg

Rise in temperature = 1.5°C

Fuse wire correction = 10 cal

Cotton thread correction = 8 cal

Acid correction = 11 cal

% of H = 7%

(c) Differentiate between addition and condensation polymerization with suitable examples. Explain the free radical mechanism of formation of polymers. (CO4)

P. T. O.

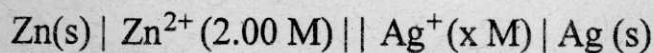
5. (a) What is meant by concentration cell ? Two copper rods are placed in copper sulphate solution of concentration 0.2 M and 0.1 M separately in the form of a cell. Write scheme of the cell and calculate its EMF at 298 K. (CO5)

(b) (i) Differentiate between electrochemical cell and electrolytic cell with examples.

(ii) Derive Nernst's equation and explain the terms involved in it.

(CO5)

(c) A voltaic cell has an E_{cell} value of 1.536 V. What is the concentration of Ag^+ in the cell ? (CO5)



Given $E^\circ_{[\text{Zn}^{2+}/\text{Zn}]} = -0.76\text{V}$; $E^\circ_{[\text{Ag}^+/\text{Ag}]} = 0.80 \text{ V}$