

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019**

**Course Code: CY100**

**Course Name: ENGINEERING CHEMISTRY**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 2 marks.*

- |   |  | Marks |
|---|--|-------|
| 1 | CHCl <sub>3</sub> protons show a shift in frequency of 728 Hz from TMS signal in a 100MHz NMR instrument, How much would be the shift in frequency for the same proton from TMS in a 300 MHz NMR instrument? | (2)   |
| 2 | If you take a mixture of ZnSO <sub>4</sub> and CuSO <sub>4</sub> solutions in a beaker and a Zinc rod and a Copper rod are inserted in it will you get electricity? Give the reason.                         | (2)   |
| 3 | Explain partition chromatography   | (2)   |
| 4 | What are Carbon nanotubes?   | (2)   |
| 5 | Arrange n-heptane, isooctane, benzene, branched alkanes in increasing order of knocking tendency in petrol engine.   | (2)   |
| 6 | Oils having high viscosity need not be having high viscosity index. Comment.   | (2)   |
| 7 | A water sample contains 204 mg of CaSO <sub>4</sub> per litre. Calculate its hardness in terms of CaCO <sub>3</sub> equivalents.   | (2)   |
| 8 | Define reverse osmosis.  | (2)   |

**PART B**

*Answer all questions, each carries 3 marks.*

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|----|--|-----|
| 9  | What interpretations are obtained from the chemical shifts in a molecule?  | (3) |
| 10 | A Zn rod is dipped in 0.4 M CuSO <sub>4</sub> solution, displacement reaction takes place and allowed to attain equilibrium. Calculate the equilibrium constant and [Cu <sup>2+</sup> ] at equilibrium. Given that $E^0_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$ and $E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{V}$ | (3) |
| 11 | Write the major applications of DTA.   | (3) |
| 12 | What are co-polymers? Illustrate with addition co-polymer and condensation co-polymer.   | (3) |
| 13 | Describe with the significance: i) cloud and pour points ii) Flash and fire points.  | (3) |
| 14 | What is mean by aniline point? How is it determined?   | (3) |
| 15 | How is the exhausted resin regenerated from an ion-exchange process?   | (3) |
| 16 | What is disinfection? How is it carried out using (a) UV light and (b)   | (3) |

Chlorination?

**PART C**

*Answer all questions, each carries 10 marks.*

- 17 a) Discuss the factors affecting chemical shift. (5)  
b) Draw the instrumentation of UV-visible spectrometer, explain the various parts. (5)

**OR**

- 18 a) How will you distinguish the isomers of  $C_4H_{10}$  using NMR spectroscopy? (5)  
b) Calculate the force constant of HF molecule, if it shows IR absorption at  $4138\text{ cm}^{-1}$ . Given that atomic masses of hydrogen and fluorine are 1u and 19u respectively. What would be the wavenumber if hydrogen atoms are replaced by deuterium atoms? (5)
- 19 a) What are the various types of electrodes? (5)  
b) Calculate the single electrode potentials of  $H_2$  electrode at  $25^\circ\text{C}$  and 1 atm pressure when the solution has  $\text{pH}=0$  and  $\text{pH}=14$ . Based on this which metal (Al or Fe) can liberate  $H_2$  only from acids? Which metal can liberate  $H_2$  from both acid and alkali? Given that  $E^0\text{Fe}^{2+}/\text{Fe} = -0.44\text{ V}$  and  $E^0\text{Al}^{3+}/\text{Al} = -1.66\text{ V}$ . (5)

**OR**

- 20 a) Discuss the variation in emf of a Daniel cell with respect to temperature at different concentration ratios of  $\text{Zn}^{2+}$  and  $\text{Cu}^{2+}$  (5)  
b) A cell reaction is given by  $A + B^{n+} \rightarrow A^{n+} + B$  Calculate the  $E^0_{\text{cell}}$  and number of electrons  $n$  involved in cell reaction. Given that concentration ratio of  $A^{n+}$  to  $B^{n+}$  is 0.1 and the cell shows an emf of 1.13006 V at  $30^\circ\text{C}$  and 1.13105 V at  $40^\circ\text{C}$ . (5)
- 21 a) Make a comparison between GSC and GLC. (5)  
b) Discuss the terms i) Carrier gas ii) columns iii) stationary phase iv) detectors (5)

**OR**

- 22 a) Write down the experimental procedures for the measurement of conductivity. (4)  
b) Describe the terms i) cell constant ii) specific conductance iii) conductivity cell (6)
- 23 a) What is poly pyrrole? How will you synthesise it? (6)  
b) Which kind of doping is possible (p or n) in poly pyrrole why? Give two properties and applications. (4)

**OR**

- 24 a) What is ABS? What are its important properties and applications? (6)

- b) What is Buna-S.? Mention the Historical importance? (4)
- 25 a) A sample of coal contains 60% C, 33% O, 6% H, 0.5% S, 0.2% N, and 0.3% Ash. Calculate the GCV and NCV of coal. (4)
- b) What are greases? Under what conditions they are preferred over a liquid lubricant. (6)

**OR**

- 26 a) What is Natural gas? Distinguish between LNG and CNG. What is the technical difficulty to use LNG fuel in a car? (5)
- b) Calculate the HCV and LCV of ethanol using Dulong's formula. (5)
- 27 a) 100 mL sewage water is diluted to 1000 mL with dilution water; the initial dissolved oxygen was 7.6 ppm, dissolved oxygen level after five days of incubation was 3.2 ppm. Find the BOD of the sewage water. (5)
- b) Compare aerobic and anaerobic oxidation of sewage water. (5)

**OR**

- 28 a) Discuss the steps involved in sewage water treatment. (5)
- b) Explain the working of trickling filter process with a neat labelled sketch. (5)

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