

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: CY100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks.

- | | | Marks |
|---|--|-------|
| 1 | Which of the following molecules can give IR absorption spectrum? Write the condition for IR activity. (a) O ₂ (b) H ₂ (c) CO (d) CO ₂ | (2) |
| 2 | An iron nail is dipped in 1 M HCl, what are the redox reactions taking place? Justify it based on the following standard reduction potentials $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$ $E^0 = 0 \text{ V}$; $\text{Fe}^{3+} + 3\text{e}^- \rightarrow \text{Fe}$ $E^0 = -0.04 \text{ V}$; $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}$ $E^0 = -0.44 \text{ V}$ | (2) |
| 3 | Draw the thermo gram of Calcium oxalate. | (2) |
| 4 | What are Copolymers? | (2) |
| 5 | What are the advantages of liquid fuels over solid and gaseous fuels? | (2) |
| 6 | What are semi solid lubricants? | (2) |
| 7 | Dissolved oxygen of a water sample is inversely proportional to its temperature. Justify. | (2) |
| 8 | In the determination of hardness of water by EDTA method NH ₄ OH-NH ₄ Cl buffer solution is used. Why? | (2) |

PART B

Answer all questions, each carries 3 marks.

- | | | |
|----|--|-----|
| 9 | A 100 ppm standard solution of Fe ³⁺ after developing colour with excess ammonium thiocyanate solution shows a transmittance of 0.4 at 622 nm, while an unknown solution of Fe ³⁺ after developing colour with excess ammonium thiocyanate solution shows a transmittance of 0.6 at same wave length. Calculate the concentration of Fe ³⁺ in unknown solution. | (3) |
| 10 | Calculate single electrode potential of calomel electrode at 25 °C when the concentration of KCl solution is 0.1M, given that E ⁰ standard calomel electrode = 0.2810 V. | (3) |
| 11 | Differentiate TGA and DTA. | (3) |
| 12 | How do you classify Nanomaterials based on dimensions? | (3) |

- 13 Explain what are solid lubricants with suitable examples? (3)
- 14 Explain the preparation of Bio-diesel. What are the important constituents of Bio-diesel? (3)
- 15 Plot a diagram of break point chlorination and What is its significance? (3)
- 16 Calculate the carbonate and non carbonate hardness of a sample water containing 7.3 mg/L of $\text{Mg}(\text{HCO}_3)_2$, 40.5 mg/L of $\text{Ca}(\text{HCO}_3)_2$, 13.6 mg/L of CaSO_4 . (3)

PART C

Answer all questions, each carries 10 marks.

- 17 a) What are the various types of electronic transitions in UV-visible spectroscopy? (5)
- b) Discuss the applications of IR spectroscopy. (5)

OR

- 18 a) What are the different types of NMR active nuclei? How many spin orientations are possible in a magnetic field when $I = \frac{1}{2}$ and $I = 1$ give examples. (5)
- b) Explain the terms shielding and de-shielding in NMR spectroscopy. (5)
- 19 a) What are fuel cells? Explain the construction and working of $\text{H}_2 - \text{O}_2$ fuel cell. (6)
- b) What are the advantages and disadvantages of a fuel cell? (4)

OR

- 20 a) What are reference electrodes? Give examples for primary reference and secondary reference electrodes and give their electrode reactions. (6)
- b) Explain how single electrode potential of Zn electrode is determined? (4)
- 21 a) Write down the principle and instrumentation of DTA with a neat diagram. (5)
- b) Draw the DTA of calcium oxalate and explain the different reactions. (5)

OR

- 22 a) Explain the principle and classification of chromatography. (5)
- b) Write a note on column chromatography. (5)
- 23 a) Discuss the working of OLED with diagram. Give its two important advantages over conventional display devices. (5)
- b) How do you synthesise polyaniline, Give two properties and applications. (5)

OR

- 24 a) What are conducting polymers? Give the classification. (5)
- b) How will you dope a conducting polymer? Give the mechanism of conduction in doped polymer. (5)

- 25 Write the working of Bomb calorimeter for the determination of calorific value (10) of a solid fuel with the help of a neat diagram.

OR

- 26 a) With the help of a neat labelled diagram, describe the fractional distillation of (5) crude petroleum and name the various products obtained.
- b) What are the major characteristics required for a good lubricating oil? (5)
- 27 a) Explain the working of trickling filter process with a neat labelled sketch. (6)
- b) How is exhausted resins regenerated in an ion-exchange method? (4)

OR

- 28 a) Explain reverse osmosis with a labelled figure and mention its advantages and (6) disadvantages.
- b) Discuss the ion-exchange process of softening of water. (4)
