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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 $2H^+ + 2e \rightarrow H_2$ $E^0 = 0$ V ; $Fe^{3+} + 3e \rightarrow Fe$ $E^0 = -0.04$ V; $Fe^{2+} + 2e \rightarrow Fe$ $E^0 = -0.44$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_4OH-NH_4Cl 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 $Mg(HCO_3)_2$, 40.5 mg/L of $Ca(HCO_3)_2$, 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= $^1/_2$ 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 $H_2 - O_2$ 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 of a solid fuel with the help of a neat diagram. (10)

OR

26 a) With the help of a neat labelled diagram, describe the fractional distillation of crude petroleum and name the various products obtained. (5)

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 disadvantages. (6)

b) Discuss the ion-exchange process of softening of water. (4)

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