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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017
Course Code: CY100
Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each carries 2 marks.

1   Which of the following nuclei do not show NMR spectrum? why?
     $^1H, \ ^{12}C, \ ^{19}F, \ ^{16}O, \ ^{14}N$
2   Calculate the equilibrium constant for the reaction, $Zn + Cd^{2+}$ (aq)$\rightleftharpoons$ Zn^{2+}(aq)+Cd, E_0 cell is 0.36V at 25^0C
3   What is meant by R_f in chromatography? What is its use?
4   What is ABS polymer? Give two important uses.
5   Write two advantages of CNG over gasoline.
6   What is the need of determining aniline point of a lubricant?
7   Distinguish between carbonate hardness and non-carbonate hardness of water.
8   Why is hardness of water expressed in terms of $CaCO_3$ equivalent?

PART B
Answer all questions, each carries 3 marks.

9   List the electronic transitions possible when UV light is absorbed by the following molecules.
     i) CH_4 ii) CH_3Cl iii) HCHO
10   You are provided with a zinc container and silver container. Which container can be used to store $CuSO_4$ solution? Give reason with proper chemical explanation.
11   A conductivity cell is found to have two parallel plates of area $1.5cm^2$ kept at 9.8cm apart. It gives a resistance 1500ohm when filled with the electrolytic solution. Find the cell constant and conductivity of the solution.
12   Howis silicone rubber prepared from dimethyl silicon chloride?Write the chemical reaction and two uses of silicone rubber.
13   Explain why graphite is employed as a lubricant.
14   What is the principle involved in the determination of calorific value ofa solid fuel using bomb calorimeter?

15   What is brackish water? Explain the procedure for converting brackish water into pure water?
16   A water sample contains 272mg $CaSO_4$per litre. Calculate the hardness in terms of $CaCO_3$ equivalent.

PART C
Each question carries 10 marks.

17 a) Predict the number of signals in the NMR spectrum of the following compounds? (4)
        i) Cyclobutane ii) 1,2- Dichloro ethane   iii) 2-Chloropropane   iv) Vinyl chloride

    b)   Draw the structure of the following compounds satisfying the given NMR   (6) spectral data: -
i) C_3H_7Cl – one doublet (6H) and one septet (1H)
ii) $C_4H_{10}O$- one singlet (3H), one doublet (6H) and one septet (1H)

OR

18 a)   a) Write the principle behind IR spectroscopy b) How will you distinguish   (5) between intermolecular and intramolecular hydrogen bonding using IR spectroscopy?

    b)   What are the different kinds of electronic transitions possible in organic   (5) molecules? Give two applications of UV-Visible spectroscopy.

19 a)   Calculate the potential of a Cu electrode dipped in 0.206M $CuSO_4$ solution at 24^0 (4) C. E^0_{Cu} is 0.34 V.

    b)   Explain the working of H_2-O_2 fuel cell with a neat diagram   (6)

OR

20 a)   How can the standard electrode potential of Zn electrode be measured using a   (5) saturated calomel electrode? Draw the experimental set up for this.

    b)   Explain the working of Li ion battery. Write the electrode reactions.   (5)

21   Write the principle and instrumentation of TGA and HPLC.   (10)

OR

22 a)   Describe the following: -   (6)
i) Retention volume   ii) Retention time   iii) Elution in chromatography.

    b)   List out two applications of DTA and TGA.   (4)

23 a)   Explain the chemical synthesis of poly aniline. Write three applications of poly   (5) aniline.

    b)   What is Kevlar? Explain the exceptional properties of Kevlar based on the   (5) structure.

OR

24 a)   What are carbon nanotubes? How are they classified? Give two applications.   (5)

    b)   Explain the following methods for the preparation of nanomaterials: -   (5)
i) Hydrolysis ii) Reduction

25 a)   Give the composition, properties and advantages of natural gas.   (4)

    b)   Write a short note on knocking of liquid fuels.   (6)

OR

26   Describe any five properties of lubricants with their significance.   (10)

27 a)   Explain ion-exchange process of softening water.   (7)

    b)   Write three differences between aerobic oxidation and anaerobic oxidation of   (3) sewage.

OR

28   100ml water sample required 13.5ml 0.02M EDTA solution for hardness   (10) estimation. Another 100ml water sample from the same source was boiled and removed precipitate by filtration. This filtrate required 6ml 0.02M EDTA for titration. Calculate total hardness, permanent hardness and temporary hardness of water sample.

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