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   $CHCl_3$ protons show a shift in frequency of 728 Hz from TMS signal in a   (2)
    100MHz NMR instrument, How much would be the shift in frequency for the
    same proton from TMS in a 300 MHz NMR instrument?

2   If you take a mixture of $ZnSO_4$ and $CuSO_4$ solutions in a beaker and a Zinc rod   (2)
    and a Copper rod are inserted in it will you get electricity? Give the reason.

3   Explain partition chromatography   (2)

4   What are Carbon nanotubes?   (2)

5   Arrange n-heptane, isooctane, benzene, branched alkanes in increasing order of   (2)
    knocking tendency in petrol engine.

6   Oils having high viscosity need not be having high viscosity index. Comment.   (2)

7   A water sample contains 204 mg of $CaSO_4$ per litre. Calculate its hardness in   (2)
    terms of $CaCO_3$ equivalents.

8   Define reverse osmosis.   (2)

PART B
Answer all questions, each carries 3 marks.

9   What interpretations are obtained from the chemical shifts in a molecule?   (3)

10 A Zn rod is dipped in 0.4 M $CuSO_4$ solution, displacement reaction takes place   (3)
    and allowed to attain equilibrium. Calculate the equilibrium constant and $[Cu^{2+}]$
    at equilibrium. Given that $E^0_{Cu2+/Cu} = +0.34V$ and $E^0_{Zn2+/Zn} = -0.76V$

11 Write the major applications of DTA.   (3)

12 What are co-polymers? Illustrate with addition co-polymer and condensation   (3)
    co-polymer.

13 Describe with the significance: i) cloud and pour points ii) Flash and fire   (3)
    points.

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 carries10 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   (5)
        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?

19 a) What are the various types of electrodes?   (5)

    b) Calculate the single electrode potentials of H_2 electrode at 25 ^{o}C and 1 atm   (5)
        pressure when the solution has pH=0 and 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 Fe^{2+}/Fe= - 0.44 V and E^0 Al^{3+}/Al = - 1.66 V.

OR

20 a) Disuses the variation in emf of a Daniel cell with respect to temperature at   (5)
        different concentration ratios of Zn^{2+} and Cu^{2+}

    b) A cell reaction is given by A+ B^{n+} $\rightarrow$ A^{n+}+ B Calculate the E^0cell and number   (5)
        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 ^{o}C and 1.1.3105 V at
        40 ^{o}C.

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   (6)
        cell

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   (4)
        properties and applications.

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%   (4)
           Ash. Calculate the GCV and NCV of coal.

     b)   What are greases? Under what conditions they are preferred over a liquid   (6)
           lubricant.

<div align="center">**OR**</div>

26   a)   What is Natural gas? Distinguish between LNG and CNG.   What is the   (5)
           technical difficulty to use LNG fuel in a car?

     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   (5)
           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.

     b)   Compare aerobic and anaerobic oxidation of sewage water.   (5)

<div align="center">**OR**</div>

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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