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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 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. Which of the following molecules show UV-visible absorption spectrum?   (2)
   Explain (a) methane   (b) benzene   (c) 1,3-butadiene   (d) cyclohexene

2. Calculate the amount of electric energy available from a dry cell which   (2)
   consume 6.55g Zn. given that emf of the cell is 1.5 V and atomic weight of Zn
   is 65.5 u

3. Explain elution.   (2)

4. What is ABS?   (2)

5. Calculate the HCV of CH_4 using Dulong's formula.   (2)

6. Why graphite can act as a solid lubricant?   (2)

7. Define temporary and permanent hardness of water with examples.   (2)

8. Give the advantages and disadvantages of chlorination of water.   (2)

PART B
Answer all questions, each carries 3 marks.

9. Sketch the molecular orbital energy diagram of 1,3 butadiene and show HOMO   (3)
   and LUMO transition. What happens to wavelength of absorption maximum
   when more double bods come in conjugation?

10. What are the functions of a salt bridge?   (3)

11. List out the applications of TGA.   (3)

12. Sketch OLED display device, Which region (p or n) is emissive layer, why?   (3)

13. What are Greases? Where they are used? Give the composition of calcium-   (3)
    based grease and axial grease.

14. Define a chemical fuel. How are they classified? Give suitable examples.   (3)

15. Explain the steps involved in the treatment of water for drinking purpose.   (3)

16. Define COD and BOD. Why COD is always greater than BOD?   (3)

PART C
Answer all questions, each carries 10 marks.

17. a) State Beer-Lambert's law and derive its integrated form.   (5)

    b) Draw high resolution NMR spectrum of $CH_3-CH_2-O-CH_2-CH_3$. Explain the   (5)
   reason for chemical shift and spin-spin splitting pattern.

OR

18 a) Discuss the number of vibrational modes in HCl, CO_2 and H_2O molecules,   (5)
        sketch them.

    b) Give the expression for vibrational energy of a diatomic molecule, draw the   (5)
        energy level diagram.

19 a) Derive Nernst's Equation for half-cell and complete cell.   (6)

    b) What is a reversible cell? Give one example each for reversible cell and   (4)
        irreversible cell.

OR

20 a) What is potentiometric titration? How will you follow the end point of an acid   (6)
        base titration potentiometrically?

    b) How redox titrations are done potentiometrically? Explain with an example.   (4)

21 a) Explain the instrumentation and working of TGA with a neat labelled diagram.   (5)

    b) Discuss the role of thermo gram in TGA analysis using suitable example.   (5)

OR

22 a) Explain the principle and instrumentation of gas chromatography with a   (5)
        labelled diagram.

    b) Define i) Gas chromatogram ii) Retention time.   (3)

    c) Mention the applications of Gas chromatography.   (2)

23 a) What are carbon nanotubes? Give the classification, What are the important   (5)
        properties? Give any two applications.

    b) What is Kevlar? Give two important applications.   (5)

OR

24 a) What is silicone rubber? How is it prepared? Give any two methods of   (6)
        vulcanisation of silicone rubber. Give two impotent applications.

    b) Give the structure of Kevlar. Show the Hydrogen bonding between the chains.   (4)

25 a) A sample of coal contains C = 93%, H = 6%, and Ash=1%. The following data   (5)
        were obtained when the above coal was tested in Bomb calorimeter. 1) Weight
        of coal burned = 0.92gm 2) Weight of water taken = 2200gm 3) water
        equivalent of Bomb calorimeter = 550gm 4) rise in temperature = 2.42°C 5)
        Fuse wire correction = 10cal 6) Acid correction= 50cal. Calculate the Gross
        and Net calorific value of the coal sample.
        (Latent heat of condensation of steam = 580cal/kg.

    b) Differentiate between vegetable oil and mineral oil lubricants.   (5)

OR

26 a) Enumerate the important characteristics of good fuel.   (5)

    b) How is aniline point determined? Why do we say a higher aniline point is   (5)
        desirable for lubricants?

27   a)   Describe the process of demineralization of water using ion-exchange resins with equations.   (6)

     b)   Compare aerobic and anaerobic oxidation of sewage water.   (4)

OR

28   a)   Explain the principle and procedures of EDTA method with equations.   (6)

     b)   50 ml of a water sample requires 9 ml of an EDTA solution for the titration. 11 ml of the same EDTA solution was required for the titration of 50 ml of standard hard water containing 1 gm of $CaCO_3$ per litre. Calculate the hardness of water sample in ppm.   (4)

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