B **B1B006** **Total Pages:3**

Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

Course Code: **CY 100**

Course Name: **ENGINEERING CHEMISTRY**

Max.Marks : 100 Duration: 3 Hours

PART-A

Answer all Questions. Each question carries 2 marks.

1. Which of the following molecules can give IR absorption? Give reason.
   a) O_2 b) HCl c) N_2 d) CO_2
2. What do you mean by single electrode potential?
3. The Specific conductance of a decinormal solution of KCl at 18^0C is 0.0112ohm^{-1}cm^{-1}. The resistance of the cell containing the solution at 18^0C was found to be 55 Ω. What is cell constant?
4. What is Poly aniline? Give its Structure.
5. What is Octane number?
6. Define Viscosity index.
7. Calculate the hardness of 0.05M $CaCl_2$ solution.
8. What do you understand by hard water and soft water? Give the causes of hardness.

PART-B

Answer all Questions. Each question carries 3marks.

9. The fundamental vibrational frequency of CO is 2140cm^{-1}. Calculate force constant of the bonds if reduced mass of CO is 1.14 x 10^{-26} Kg.
10. What is electrochemical series? Give its two applications.
11. What are the methods employed for visualization of spots in TLC
12. Write the structural formula of the following polymers
    i) Kevlar ii) Polybutadiene iii) ABS
13. What is Biodiesel? How it is prepared? Give its two advantages.
14. Explain the following i) Aniline point ii) Flash point
15. Explain breakpoint of chlorination.
16. Differentiate between aerobic and anaerobic oxidation.

PART-C

17. a) Explain Spin-Spin splitting .Write the splitting patternin theNMR spectrum of

$CH_2Cl - CH_2 - CH_2Cl$.

b) Explain the various modes of vibrations possible for H_2O. Which of them are IR active? Give reasons.

c) A solution shows a transmittance of 20 % when taken in a cell of 2.5cm thickness.Calculate its concentration if the molar absorption coefficient is 12000 dm^2mol^{-1} (4+3+3)

OR

18. a) What is Chemical Shift? Explain Shielding and Deshielding

b) Give a neat labelled sketch of UV-Visible Spectrometer.

(6+4)

19. a) Explain the Construction and Working of Lithium ion cell

b) Explain with a suitable example, the variation of EMF of a cell with temperature.

c) Derive Nernst equation for electrode potential. (5+2+3)

OR

20. a) Potential of H_2 electrode set Up in an acid solution of nknown strength is 0.295 volts at 25^0c when coupled with SHE.Find the pH of the solution

b) What do you mean by potentiometric titrations? Explain the principle of Redox titration by potentiometric method.

c) Write the electrode reaction and expression for electrode potential of the following electrodes.

i) Metal- Metal ion electrode ii) Gas electrode

iii) Redox electrode (2+5+3)

21. a) What is thermal analysis? List two techniques of it. Compare their principles.

b) Explain the principle, instrumentation and application of HPLC. (5+5)

OR

22. a) Differentiate between DTA thermogram and TGA thermogram graphically. Give one important application of each type.

b) State the Principle, Instrumentation and Applications of GC. (5+5)

23. a) What is Silicon rubber?How it is prepared? List two important applications.

b) Write notes on fullerenes.

c) What are carbon nanotubes? How are they classified? State their two applications. (4+3+3)

OR

24. a) What are conducting polymers? Write the structure of two conducting polymers and give their method of preparation.

b) Write a note on OLED.

c) What are copolymers? Give two examples. (5+3+2)

25. a) Explain knocking of Diesel.

b) On burning 0.83 g of a solid fuel in a bomb calorimeter, the temperature of 3500g of water increased from 26.5 to 29.2^{0}C Water equivalent of calorimeter and latent heat of steam are 385g and 587cal/g respectively. If the fuel contains 0.7% hydrogen calculate HCV and LCV of the fuel.

c) Distinguish between Flash and Fire point and write their significance. (3+4+3)

OR

26. a) Describe how calorific value of a fuel is determined using a Bomb Calorimeter experiment.

b) Distinguish between HCV and LCV and derive the relation between them. (5+5)

27. a) Describe EDTA method for The estimation of hardness of water.

b) 1.0 g of $CaCO_3$ was dissolved in HCl and diluted to 1litre.50ml of this standard hard water requires 48 ml of EDTA while 50 ml of hard water sample requires 15ml of EDTA. On the other hand 50ml of boiled hard water sample requires 10ml of EDTA solution. Calculate total, temporary and permanent hardness of water. (5+5)

OR

28. a)With the help of a neat diagram explain the Reverse Osmosis process.

b) Explain Trickling filter process.

c) A water sample contains $Ca(HCO_3)_2$=6.48ppm,$CaSO_4$=8.16ppm, $MgSO_4$=6ppm. Find its temporary and permanent hardness.

(At.Wt. of Ca=40, Mg=24, C=12, S=32, O=16,H=1) (4+3+3)