Reg. No._____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SECOND SEMESTER B.TECH DEGREE EXAMINATION, MAY 2017

Course Code**: CY100**
Course Name**: ENGINEERING CHEMISTRY**

Max. Marks: 100   Duration: 3 Hours

PART A
Answer all questions, each question carries 2 marks.

1. Chemical shift value of methyl chloride is lower compared to that of methyl fluoride. Why?
2. Can a Ni spatula be used to stir $CuSO_4$ solution? Give reason.
   E^0_{Ni}= -0.23V, E^0_{Cu}= 0.34V
3. Why TLC is superior to column chromatography for checking purity of a compound?
4. List out the advantages of OLEDs.
5. Write the chemical transformation of a vegetable oil to biodiesel.
6. Distinguish between flash point and fire point of a lubricant.
7. Calculate the hardness of a solution obtained by mixing 100ml 0.02M $CaCl_2$ and 200ml 0.02M $MgSO_4$ solutions.
8. What is the chemistry behind the removal of temporary hardness by boiling?

PART B
Answer all questions, each question carries 3 marks.

9. List all the electronic transitions possible for CH_3Cl and HCHO.
10. Derive an expression connecting electrolytic concentration to electrode potential.
11. Compare HPLC and column chromatography.
12. Brief out the preparation of silicones.
13. Calculate GCV and NCV of butane using Dulong's formula.
14. Based on the structure comment on the lubricating action of graphite.
15. Outline a process by which sea water can be made fit for domestic applications.
16. BOD is an index of organic load in waste water. Justify.

PART C
Each question carries 10 marks.

17. (a) Predict the splitting pattern in the nmr spectra of $CH_3CH_2COOCH_3$ and CH_3CHCl_2.
    (b) The fundamental vibrational frequency of carbon monoxide ($^{12}C^{16}O$) is 2140 cm^{-1}.Without calculating force constant, find the fundamental frequency of $^{13}C^{17}O$ in cm^{-1}.   [5+5]

OR

18. (a) Which among the following molecules will give n→π* transition.
    C_2H_6, CH_3CHO, $C_6H_5CONH_2$, C_2H_5OH, C_2H_4. Rationalize your answer.
    (b) Briefly explain chemical shift and factors affecting it.   [5+5]

19. (a) $O_2 + 4H^+ + 4e \rightarrow 2\ H_2O$; $E^0 = 1.23V$. Find the electrode potential for pH=0 and pH=14. Based on this, suggest the condition, (O_2 rich acidic or O_2 rich basic), leading to the faster oxidation of Fe. Also given $Fe^{2+} + 2e \rightarrow Fe$; $E^0 = -0.44V$.
    (b) Describe the working and advantages of H_2 -O_2 fuel cell.   [5+5]

OR

20. (a) How can you estimate an acid using standard alkali with the help of a potentiometer.
    (b) Explain the working of a calomel electrode.   [5+5]

21. (a) Compare the instrumentation and thermo grams of thermo gravimetric and differential thermal analyses.
    (b) What are the various steps involved in column chromatography?   [5+5]

OR

22. (a) Write down the major applications of TGA and DTA.
    (b) Detail the chromatographic technique used for the separation of components in a volatile organic mixture.   [5+5]

23. (a) Write the preparation and important properties of Kevlar and ABS.
    (b) Describe two chemical methods of preparation of nanomaterials.   [5+5]

OR

24. (a) Polypyrrole is a conducting polymer. Substantiate using its structure. Give the preparation and applications of polypyrrole.
    (b) Discuss carbon nanotubes.   [5+5]

25. (a) Explain knocking in petrol engine and define the term used to express antiknocking ability of fuels.
    (b) What are greases? Which are the different types? Under what condition, greases are preferred to liquid lubricants?   [5+5]

OR

26. Describe the principle and working of a Bomb Calorimeter and arrive at an expression for finding HCV of a solid fuel.   [10]

27. (a) Explain the principle and calculations in EDTA method for estimating hardness of a given sample of water.
    (b) With the help of a neat diagram, briefly explain one aerobic process of sewage treatment.   [5+5]

OR

28. (a) Explain the action of Cl_2 as a disinfectant. Mention the merits of breakpoint chlorination.
    (b) In an EDTA experiment, the following values are obtained. Calculate the different types of hardness.
    i) 20ml standard hard water (10g $CaCO_3$ per litre) = 25ml EDTA solution
         ii) 50ml hard water sample = 25ml EDTA solution
         iii) 50ml boiled water sample = 14ml EDTA solution   [5+5]

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