

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018**

**Course Code: CY100**

**Course Name: ENGINEERING CHEMISTRY**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each question carries 2 marks*

Marks

1. How many signals are observed in the  $^1\text{H}$  NMR spectrum of  $\text{Cl}-\text{CH}_2-\text{CH}_2-\text{Cl}$ ? Substantiate your answer. (2)
2. Draw a schematic, neatly labelled diagram of Saturated Calomel Electrode. (2)
3. Define  $R_f$  value of a compound. (2)
4. Give any two applications of carbon nanotubes. (2)
5. Suggest any two methods for increasing the octane number of a fuel. (2)
6. Comment on the significance of viscosity index of a lubricant. (2)
7. What are ion exchange resins? Give one example. (2)
8. State the importance of measuring dissolved oxygen in water. (2)

**PART B**

*Answer all questions, each question carries 3 marks*

9. Calculate the molar absorptivity of  $0.5 \times 10^{-3}\text{M}$  dye solution in ethanol, which shows an absorbance of 0.17, when 1.3cm cuvette is used. (3)
10. Describe the principle and working of glass electrode. Give the standard representation. (3)
11. List out any three important applications of HPLC. (3)
12. Explain the preparation and properties of Kevlar. (3)
13. How is aniline point determined? (3)
14. What are biofuels? Comment on their environmental benefits. (3)
15. Suggest an anaerobic process for the treatment of waste water. Explain the principle. (3)
16. Explain temporary hardness of water. How is it removed? (3)

**PART C**

*Answer all questions, each question carries 10 marks*

17. a) Sketch the modes of vibrations possible for  $\text{CO}_2$ . Which are IR active? Give reason. (4)
- b) Explain spin-spin splitting in the  $^1\text{H}$ NMR spectrum of ethanol. (6)

**OR**

18. a) What are the various electronic transitions possible for a molecule? (4)
- b) Discuss the instrumentation of UV spectroscopy with labelled sketch. (6)
19. a) Explain how the single electrode potential of an electrode is determined using (5)

standard hydrogen electrode, with a suitable example.

- b) Discuss the working of Li-ion cell with electrode reactions. (5)

**OR**

20. a) Derive Nernst equation for Daniel cell. Explain the significance. (6)

- b) Calculate the emf of the cell  $\text{Fe}/\text{Fe}^{2+}(0.01)/\text{Ag}^+(0.1)/\text{Ag}$  at 298K if standard electrode potentials of Fe and Ag are  $-0.42\text{V}$  and  $0.8\text{V}$  respectively. (4)

21. a) Illustrate the instrumentation of DTA. Mention the advantages compared to TGA. (6)

- b) Explain with an example how TG data is used to determine the composition of binary mixtures? (4)

**OR**

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

- b) Interpret the TGA curve of calcium oxalate monohydrate. (5)

23. a) Write a short note on OLED. (5)

- b) Describe any two methods for the preparation of nanomaterials. (5)

**OR**

24. a) Discuss the structure and properties of BS and ABS. (5)

- b) Explain the synthesis and applications of silicone rubber. (5)

25. a) Differentiate between: (6)

i) Flash point and Fire point ii) Cloud point and Pour point

- b) On burning 0.95g of a solid fuel (H = 5%) in a bomb calorimeter, the temperature of 700g water increased by  $2.48^\circ\text{C}$ . Water equivalent of calorimeter and latent heat of steam are 2000g and 587cal/g respectively. Calculate HCV and LCV. (4)

**OR**

26. a) How lubricants are classified based on physical state? Explain with examples. (7)

- b) Compare CNG and LNG. (3)

27. a) Detail the principle and advantages of UV disinfection of water. (4)

- b) Define BOD. How is it determined? Give the significance. (6)

**OR**

28. a) Explain the trickling filter process used in sewage water treatment. (5)

- b) A water sample from an industry had the following data:  $\text{Mg}(\text{HCO}_3)_2 = 16.8\text{mg/L}$ ,  $\text{MgCl}_2 = 19\text{mg/L}$ ,  $\text{CaCO}_3 = 20\text{mg/L}$  and  $\text{MgSO}_4 = 24.0\text{mg/L}$ . Calculate the temporary, permanent and total hardness of the water sample. (5)

\*\*\*\*