

B

B2802

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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 $\text{Cl-CH}_2\text{-CH}_2\text{-Cl}$ ? 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*

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|---|-----|
| 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*

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|--|-----|
| 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**

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|---|-----|
| 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  $587\text{cal/g}$  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:  $\text{Mg}(\text{HCO}_3)_2 =$  (5)

$16.8\text{mg/L}$ ,  $\text{MgCl}_2 = 19\text{ mg/L}$ ,  $\text{CaCO}_3 = 20\text{ mg/L}$  and  $\text{MgSO}_4 = 24.0\text{ mg/L}$ .

Calculate the temporary, permanent and total hardness of the water sample.

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