

**10010**

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, JULY 2016**Course Code: CY100****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 molecule can give an IR spectrum? Give reason. (a)H<sub>2</sub> (b) N<sub>2</sub> (c) HCl (d) Cl<sub>2</sub>
2. What are redox electrodes? Indicate the electrode reaction and electrode potential with a suitable example.
3. Distinguish between the terms conductance and specific conductance.
4. What is Kevlar? Mention its two important properties.
5. Differentiate between HCV and LCV.
6. How does graphite acts as a lubricant?
7. In the deionisation process water is first passed through cation exchanger and then through anion exchanger. Why?
8. A water sample contains 204 mg of CaSO<sub>4</sub> per litre. Calculate the hardness in terms of CaCO<sub>3</sub> equivalent?

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

9. Derive Beer-Lambert's law.
10. Write the origin of electrode potential. Electrode potential of zinc is assigned a negative value, whereas that of copper a positive value. Give reason.
11. What do you mean by R<sub>f</sub> value in chromatography? Give the use of the term in the technique.
12. Give the structure and any two properties of ABS.
13. What are the advantages of liquid fuels over solid fuels?
14. What is the significance of viscosity index of a lubricant? How can you calculate it?
15. How BOD differs from COD?
16. What do you understand by hardness of water? Distinguish between temporary and permanent hardness of water.

### PART C

*Each question carries 10 marks*

17. (a) State the principle of vibrational (IR) spectroscopy. Arrange the following bonds in the order of increasing stretching frequencies C-C, C=C and C≡C; Write suitable explanation for your answer. (5)
- (b) What is spin-spin splitting? Write the splitting pattern in the NMR spectrum of CH<sub>2</sub>Cl-CH<sub>2</sub>-CH<sub>2</sub>Cl. (3)
- (c) Write two important applications of electronic spectroscopy. (2)

**OR**

18. (a) Explain the principle of NMR spectroscopy. Which of the following nuclei can have a presence in NMR spectrum? (i) <sup>16</sup><sub>8</sub>O (ii) <sup>13</sup><sub>6</sub>C (iii) <sup>2</sup><sub>1</sub>H. Reason for your answer. (4)
- (b) Define chemical shift. Interpret the number of signals, the position of signals and the intensity of signals in the NMR spectrum of CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>Cl. (4)
- (c) Most absorption bands in the electronic spectra are very broad. Give reason. (2)
19. (a) How is a calomel electrode constructed? Sketch the electrode. (4)
- (b) Give the working principle of H<sub>2</sub>-O<sub>2</sub> fuel cell with cell reactions. (4)
- (c) A hydrogen electrode at 25°C is immersed in a solution of pH 2.5 and coupled with the half-cell SHE. Calculate the emf of the cell. (2)

**OR**

20. (a) How does a lithium-ion cell work? Write the cell reactions. (4)
- (b) Calculate the emf of the following cell at 25 °C;  
Zn | Zn<sup>2+</sup>(a= 0.0004) || Cd<sup>2+</sup>(a=0.2) | Cd ;  
Given E<sup>0</sup> Zn<sup>2+</sup> | Zn = -0.76 V ; E<sup>0</sup> Cd<sup>2+</sup> | Cd = -0.403 V (3)
- (c) Give the principle of acid-base titration by potentiometry. (3)
21. (a) Draw the block diagram of TGA apparatus. (4)
- (b) State the principle and applications of GC. (4)
- (c) Write the demerits of TGA. (2)

**OR**

22. (a) What is the basic principle of thermo gravimetric analysis? List its important applications. (b) Write experimental arrangement and procedure for measuring conductance of an electrolytic solution. (c) List important applications of TLC. (3+4+3)
23. (a) How is polyaniline synthesised? Mention two applications of polyaniline. (b) Write a note on OLED.