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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S1 (S,FE) S2 (S,FE) Examination May 2024 (2015 Scheme)

Course Code: CY 100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all Questions. Each question carries 2 Marks Marks

1 State the law which governs absorption of radiation by matter. (2)

2 Calculate the EMF of the following cell at 25 °C:- (2)
$K_{(s)} | K^+_{(aq)}$ (0.75 M) || $Ag^+_{(aq)}$ (2.45 M)/$Ag_{(s)}$, $E^0_{K+/K} = -2.93$ V,
$E^0_{Ag+/Ag} = +0.80$ V

3 List any two applications of Gas Chromatography. (2)

4 Why is polyaniline used in smart windows and electrochromic displays? (2)

5 What is meant by cloud point and pour point of a lubricant? (2)

6 Define calorific value of a fuel? (2)

7 How do we distinguish hard water and soft water? (2)

8 What is Break point chlorination? (2)

PART B

Answer all questions. Each question carries 3 Marks

9 Define the terms (i) chemical shift and (ii) λmax. (3)

10 List any three merits of potentiometric titration over ordinary acid-base titration method. (3)

11 Draw the differential thermogram of hydrated calcium oxalate and explain the different peaks. (3)

12 What are carbon nanotubes? Give two uses of carbon nanotubes. (3)

13 Define Aniline point. How is it determined experimentally? (3)

14 Calculate the gross and net calorific value of a coal sample having the following composition.C=82%, H=8%, O=5%, S=2.5%, N=1.4% and ash=1.1% using Dulong's formula. (3)

15 Calculate the temporary, permanent and total hardness of a water sample having the following composition: (3)
$Ca(HCO_3)_2$= 4 ppm, $Mg(HCO_3)_2$= 6ppm, $CaSO_4$= 8ppm, $MgSO_4$ =10ppm

16 What is trickling filter method? (3)

PART C

Answer all questions. Each question carries 10 Marks

17 (a) What are the various types of electronic transitions possible in UV-visible spectroscopy? (4)

(b) Explain the various modes of vibrations possible for CO_2, HCl and H_2O Which of them are IR active? (6)

OR

18 (a) Give any four factors affecting chemical shift. (4)

(b) Explain the instrumentation of a UV spectrophotometer with the help of a diagram. (6)

19 (a) Write the overall cell reaction and derive the Nernst equation for EMF of Daniel cell. (4)

(b) Discuss the effect of temperature on EMF of Daniel cell when, (6)
(i) $[Zn^{2+}] = [Cu^{2+}]$, (ii) $[Zn^{2+}] > [Cu^{2+}]$ and (iii) $[Zn^{2+}] < [Cu^{2+}]$

OR

20 (a) How will you explain the working of hydrogen oxygen fuel cell? Draw a neat labelled diagram of the cell and give suitable equations for the reactions taking place. (7)

(b) What is electrochemical series? Give two applications of electrochemical series. (3)

21 (a) Draw a block diagram and explain the instrumentation of HPLC (5)

(b) List five applications of DTA. (5)

OR

22 (a) Write the procedure for performing Thin Layer Chromatography. (4)

(b) Explain the principle, instrumentation and block diagram of Thermogravimetric Analysis. (6)

23 Explain the principle, construction and working of an OLED with the help of a labelled diagram. (10)

OR

24 (a) What are intrinsically conducting polymers? Explain how they are classified further. (5)

(b) Give any five applications of nanomaterials. (5)

25 How can we determine the higher and lower calorific values of a solid fuel using Bomb calorimeter? Explain with the help of a diagram. Also include necessary corrections for obtaining accurate results. (10)

OR

26 (a) What is viscosity index with reference to lubricants? Write the equation used for determining viscosity index and explain the terms involved. (4)

(b) What is biodiesel? How is it prepared? List any three advantages of biodiesel. (6)

27 (a) What is the basic principle involved in the EDTA titration method for estimating hardness of water? (4)

(b) What is reverse osmosis? How is it employed in desalination of brackish water? Explain with the help of a diagram. (6)

OR

28 (a) With the help of a diagram and suitable equations, explain the ion exchange process for softening water. (6)

(b) Compare BOD and COD (4)

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