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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech examinations (S) September 2020 S1/S2 (2015 Scheme)

Course Code: CY100

Course Name: ENGINEERING CHEMISTRY

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 2 marks.

		Marks
1	Calculate the gyro magnetic ratio of protons if protons resonate with 200MHz radiofrequency in 4.7 tesla magnetic field.	(2)
2	Write the fuel cell reactions taking place at anode and cathode in H_2- O_2 fuel cell when an acid electrolyte is used.	(2)
3	Define the terms stationary phase and mobile phase.	(2)
4	What are OLEDs?	(2)
5	Gasoline containing tetra ethyl led (TEL) was used in internal combustion engines. Give reasons. Why the use of it was banned?	(2)
6	What is cetane number?	(2)
7	What is the reason for hardness of water? How is it expressed?	(2)
8	What is the significance of BOD and COD in the sewage water treatment?	(2)

PART B

Answer all questions, each carries 3 marks.

9	There are two oxygen isotopes ^{16}O and ^{18}O in CO gas sample. If $^{12}C=^{16}O$ shows IR absorption at 2140 cm^{-1}. What will be the IR absorption wavenumber of $^{12}C=^{18}O$ molecule, assume that both molecules have the same force constant.	(3)
10	Which material is used as positive electrode in Li-ion battery? Write the reaction taking place at positive electrode during charging. Why the cells become explosive on 100% charging (ie, x=1)?	(3)
11	Discuss the classification of chromatography.	(3)
12	Distinguish between 1,2 addition and 1,4 addition polymers give example for each.	(3)
13	Compare the merits and demerits of solid, liquid and gaseous fuels?	(3)
14	What is Biodiesel? Explain the preparation.	(3)
15	Calculate the carbonate and non carbonate hardness of a sample water	(3)

containing 7.3 mg/L of $Mg(HCO_3)_2$, 40.5 mg/L of $Ca(HCO_3)_2$, 13.6 mg/L of $CaSO_4$.

16 What is dissolved oxygen? What are the factor affecting amount of DO? (3)

PART C

Answer all questions, each carries10 marks.

17 a) Explain the principle and applications of MRI imaging. (5)

b) What are the applications of UV-visible spectroscopy? (5)

OR

18 a) Sketch the high resolution NMR spectrum of CH_3-CH_2-CH_2-O-CH_3 How it differs from its isomer CH_3-CH_2-O-CH_2-CH_3? (5)

b) What are the various types of electronic transitions possible in UV-visible region? What kind of electronic transition is taking place in red coloured dye of tomato? (5)

19 a) What is glass electrode? Discuss the construction and electrochemical reactions in it. What is the use of the electrode? (5)

b) Write the cell reactions, cell representation of Cu-Ag cell given that E^0Ag^+/Ag =+0.80 V and E^0 Cu^{2+}/Cu = +0.34 V. Calculate the emf of the cell at 25 °C when $[Ag^+]$ = 0.1 M and $[Cu^{2+}]$ = 0.1 M. (5)

OR

20 a) What is electrochemical series? What are its applications? (6)

b) Oxygen electrode in acid medium is given by $O_2+4H^++4e \rightarrow 2H_2O$ E^0 =+1.23 V. Find the electrode potential of the electrode when pH= 0 and pH =14. Judge whether acidic oxygen rich condition or basic oxygen rich condition is capable of oxidising Fe^{2+} to Fe^{3+} given that $Fe^{3+} + e \rightarrow Fe^{2+}$ E^0 = +0.77 V. (4)

21 a) Give the instrumentation and procedure of TGA (6)

b) Mention the important differences and advantages of TGA over DTA (4)

OR

22 a) Write a note on HPLC with a neat labelled diagram. (5)

b) How do you separate organic compounds using HPLC? (3)

c) Name two types of detectors used in HPLC. (2)

23 a) What is poly butadiene rubber? What are the different types of polybutadienes obtained under different Ziegler-Natta catalysts? Which stereo isomer is resembled to natural rubber? (5)

b) What are the applications of nanomaterials? (5)

OR

24 a) How do you synthesis polyaniline? Give two properties and applications (5)

b) What are silicone rubbers? Write the structure and Give two properties and applications (5)

25 a) A sample of coal containing 92%C; 5%H; 3%ash. When this coal was tested in laboratory for its calorific value in the bomb calorimeter, the following data were obtained: (5)

Weight of coal burnt =0.92g; Weight of water taken =2000g; Water equivalent of bomb and calorimeter=700g; Rise in temperature=2.68 °C; Cooling correction=0.03 °C; Fuse wire correction =12.0 cal; Acid correction=62.0cal, calculate the Net and Gross calorific value in Cal/g. (latent heat of condensation of steam =580cal/g.

b) What are lubricants? Gives the functions of lubricant. Explain the classification based on their physical state with suitable examples. (5)

OR

26 a) What are the various properties of a liquid lubricant? How do you measure them? (10)

27 a) What is reverse osmosis? Discuss some of its merits and demerits. (6)

b) With a labelled sketch, explain the breakpoint of chlorination. (4)

OR

28 a) Discuss any two methods of chlorination employed in the domestic water treatment. (3)

b) Compare UASB and trickling filter water treatment processes. (7)

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