Question Paper

Exam Date & Time: 04-Jul-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER B.TECH. EXAMINATIONS (MIT MANIPAL) - JUNE/JULY 2022
SUBJECT : CHM 1051 - ENGINEERING CHEMISTRY

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1A)	Explain the construction, working and any two applications of lithium ion batteries.	(4)
1B)	Discuss the origin of single electrode potential. Give reason: The emf of a cell cannot be measured accurately by using voltmeter.	(3)
1C)	For the cell $Zn/Zn^{2+}_{(1 \times 10^{-4}\ M)}// Mg^{2+}_{(1 \times 10^{-3}\ M)}/ Mg$, the standard reduction potential of zinc and magnesium electrodes are -0.764 V and -2.364 V, respectively. Find E^0_{cell}, ΔG and predict if the cell reaction is spontaneous or not.	(3)
2A)	Explain the measurement of decomposition potential of an electrolyte with a neat labelled diagram. Mention any two factors affecting it. Give two differences between hard and decorative chromium plating.	(4)
2B)	About 0.25 g of sample of coal was analysed by combustion method. The increase in weight of $CaCl_2$ tube and potash bulbs at the end of the operation was found to be 0.15 g and 0.55 g respectively. Same amount of coal was Kjehldahlised and NH_3 gas evolved was absorbed in 50.0 mL of 0.1 N HCl. After absorption, the excess acid required 6.25 mL of 0.1N NaOH for exact neutralization. Calculate the percentage of carbon, hydrogen and nitrogen in the coal sample.	(3)
2C)	Define cracking and reforming of petroleum. Explain the reactions that occur during catalytic reforming process.	(3)
3A)	Explain in detail the secondary factors affecting the rate of corrosion.	(4)
3B)	Sketch and explain anodic protection with a neatly labeled diagram. Write any two differences between anodic and cathodic protection.	(3)
3C)	Write any two differences between the following: i) Galvanic and emf series. ii) Cathodic and anodic inhibitors. iii) Galvanizing and tinning process.	(3)
4A)	i) Explain CVD technique with a suitable example. List any two advantages of this technique. ii) Discuss the Calamitic and Polycatenar liquid crystals with an example for each.	(4)
4B)	Explain the principle of gravimetric analysis. Write any four limitations of Beer-Lambert's law.	(3)
4C)	The concentration of yeast t-RNA in an aqueous solution is 10 M. The absorbance is found to be 0.229 when this solution is placed in a 1.00 cm cuvette and 268 nm radiation is passed through it. i) Calculate the specific absorptivity of yeast t-RNA. ii) What will be the absorbance if the solution is 5 M? iii) What will be the absorbance if the path length of the original solution is increased to 5.00 cm?	(3)
5A)	i) Discuss the sol-gel and ball milling methods for synthesizing nanoparticles. ii) Write any two desirable characteristics of biomaterials.	(4)
5B)	Give reasons for the following:	(3)

i) Ionic compounds are soluble in polar solvents.
ii) HF has higher boiling point than HCl.
iii) PVC has more tensile strength than polythene.

5C) A polymer has the following composition: 100 molecules of molecular mass 1000 g/mol, 200 molecules of molecular mass 2000 g/mol and 500 molecules of molecular mass 5000 g/mol. Calculate the number average and weight average molecular weights of the polymer and its polydispersity index. (3)

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