[Total No. of Questions - 9] [Total No. of Pr)d Pages - 4]
(2066)

16003(J) J-16

B. Tech 2nd Semester Examination

Engineering Chemistry (CBS)

CH-101

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Question No. 9 (Section E) is compulsory. The candidate is required to attempt five questions selecting one question from each section. All questions carry equal marks.

SECTION - A

(a) What are the disadvantages of boiler scales? How the scale formation can be prevented by phosphate conditioning and calgon conditioning? (5)

(b) What are permanent and temporary hardness of water? What are the major disadvantages of using hard water for domestic purposes? (4)

(c) What are BOD and COD of a water sample? Indicate their significance in sewage treatment. (3)

2. (a) Derive Nernst equation. Calculate the potential of the following electrochemical cell at 25°C:

Cu (s) | Cu^{2+} (aq) (0.5 M) || H^+ (0.01M) | H_2 (0.95 atm); Pt

Given: $E°_{cathode}$= 0.00 V and $E°_{anode}$= 0.34 V (5)

(b) Discuss the construction, working and application of hydrogen-oxygen fuel cell. (5)

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(c) Explain the mechanism of power generation by solar cell. (2)

SECTION - B

3. (a) Differentiate between dry and wet corrosion. Discuss sacrificial anodic protection method for controlling corrosion. (5)

(b) Write notes on the followings:

(i) pitting corrosion.

(ii) stress corrosion. (5)

(c) Explain with example that how the nature of oxide film formed on a metallic surface affects its rate of corrosion. (2)

4. (a) Explain the following terms:

(i) chromophore.

(ii) auxochrome. (3)

(b) What are the possible electronic transitions that fall in UV-Vis region? Explain the effect of polar solvents on $n \rightarrow \pi^*$ electronic transitions. (3)

(c) Discuss the basic principle of IR spectroscopy. Explain the effect of hydrogen bonding on the IR stretching frequency. (4)

(d) Why broad absorption bands are found in UV-Vis spectrum instead of sharp peaks? (2)

SECTION - C

5. (a) Explain the mechanism of lubrication used in delicate machines like watches, sewing machine etc. Discuss extreme pressure lubrication. (5)

(b) Write notes on the followings:

(i) Saponification number and iodine number.

(ii) Cloud and pour points.

(iii) Viscosity and viscosity index.

(iv) Aniline point. (7)

6. (a) Explain proximate and ultimate analysis of coal and write their significance. (4)

(b) Write notes on the followings:

(i) Cracking of petroleum fuels.

(ii) Octane number.

(iii) Water gas.

(iv) Catalytic reforming. (8)

SECTION - D

7. (a) Differentiate between thermoplastic and thermosetting polymers with examples. (3)

(b) What are conducting polymers? How the conductivity of a conducting polymer can be increased? (3)

(c) Discuss the synthesis and applications of bakelite and polyurethane. (6)

8. (a) Write notes on the followings:

(i) biodegradable polymers.

(ii) synthetic rubber.

(iii) vulcanization of rubber. (6)

(b) What are nanomaterials? Discuss the preparation, properties and applications of carbon nanotubes. (6)

SECTION - E

9. (a) What is the neutralization number of a lubricant?

(b) Rusting of iron is quicker in saline water than in ordinary water — Why?

(c) Teflon (PTFE) is an addition polymer, but it behaves somewhat like a thermosetting polymer — Give reason.

(d) Compare the IR stretching frequency of C—H and C—D bonds with explanation.

(e) What is cetane number?

(f) Explain fundamental vibration in IR spectroscopy.

(g) How many hexagonal and pentagonal faces are present in fullerene?

(h) Why does corrosion occur in steel pipe connected to copper plumbing?

(i) Explain why a porous plate or a salt bridge is not required in a lead-acid storage cell?

(j) Write Bragg's equation and mention the terms involved.

(k) What is blue shift in UV-Vis absorption spectra?

(l) What is galvanization? (1×12=12)