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**Question Paper Code : 30508**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

CY 3151 – ENGINEERING CHEMISTRY

(Common to: All Branches (Except Marine Engineering))

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the harmful effects of silica present in boiler feed water.
2. What is caustic embrittlement? Mention any one method to prevent it.
3. What are nanoparticles?
4. Write the principle involved in the sol-gel process.
5. What are the uses of a phase diagram?
6. Name any two applications of fiber reinforced laminates.
7. Define octane number. How can it be improved?
8. What is trans - esterification?
9. What are the drawbacks of nuclear energy?
10. Will the emf of a battery vary with size? Give reason.

PART B — (5 × 16 = 80 marks)

11. (a) (i) List the important requirements for drinking water. Briefly describe the various steps involved in the treatment of water for domestic purpose. (8)
- (ii) What is desalination? Explain reverse osmosis process and mention any two advantages of reverse osmosis. (8)

Or

- (b) (i) Explain the mechanism of ion exchange process of water treatment. Give any two advantages of it over zeolite process. (8)
- (ii) What are internal conditioning of water? How is internal treatment of boiler feed water carried out using phosphate and calgon conditioning? (8)
12. (a) (i) What are carbon nanotubes? Write the fabrication and structure of carbon nanotubes. (8)
- (ii) Write a note on the size dependence properties of nanomaterials. (8)
- Or
- (b) Explain the applications of nanomaterials in medicine, agriculture, energy and catalysis.
13. (a) (i) Draw and discuss the phase diagram of Pb-Ag system. Discuss Pattinson process based on phase rule. (8)
- (ii) Draw schematically the phase diagram of the water system and apply the Gibbs phase rule to interpret it. (8)
- Or
- (b) Explain the various constitution of composites with elaborate examples. (16)
14. (a) (i) Calculate the higher and lower calorific values of a coal sample having the following composition:  
Carbon = 80%, Hydrogen = 7%, Oxygen = 3%, Sulphur = 3.5%, Nitrogen = 2.1% and ash = 4.4%. (8)
- (ii) Explain the process involved in the preparation of liquid fuels from solid coal. (8)
- Or
- (b) Explain the principle working and significance of flue gas analysis by Orstat's method.
15. (a) (i) Write a note on breeder reactor. (8)
- (ii) How is wind energy harnessed? Mention its advantages and limitations. (8)
- Or
- (b) (i) Explain the construction and working of lead acid battery. (8)
- (ii) Describe the construction and working  $H_2$ - $O_2$  fuel cells. (8)