

**College of Engineering-Pune**  
**Shivajinagar, Pune**

FY BTech  
Chemistry (AS103)  
End-semester Exam (November, 2011)

24/11/2011  
Max Marks: 50

Time: 10.00 am – 1.00 pm  
Total time: 3 hrs

**Instructions:**

- 1) All the questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Draw figures wherever necessary.

**Q. 1.** (a) Discuss the factors which may primarily be responsible to decide on the type of the alloy formed when an element 'X' is mixed with another element 'Y'. [3]

(b) Explain the significance of the Reduced phase rule for discussing phase diagrams of the binary alloy systems. [3]

OR

(b) Discuss the conduction properties of solids using the Band theory. [3]

(c) Write a note on H<sub>2</sub>-evolution mechanism of wet corrosion. [4]

**Q. 2.** (a) A water sample contains Ca<sup>2+</sup> and Mg<sup>2+</sup> ions. 50 ml of this water sample required 18.7 ml of 0.015 M EDTA solution for the titration at pH 10. While at pH 12, 50 ml of the same water sample required 12.5 ml of the same standard EDTA solution for the titration. Calculate the amounts (gm) of Ca<sup>2+</sup> and Mg<sup>2+</sup> ions per liter of the given water sample. (Atomic Weights: Ca = 40, Mg = 24) [4]

(b) Discuss the 'Ion exchange method' for the deionization of water. [3]

OR

(b) Discuss 'Phosphate conditioning', and 'Calgon conditioning' internal treatment methods of boiler feed water. [3]

(c) Write note on any one; (i) Electrochemical Series (ii) Galvanizing [3]

**Q. 3.** (a) Write a note on H<sub>2</sub>-O<sub>2</sub> fuel cell. [4]

(b) Explain any three in the context of batteries; (i) specific power (ii) specific energy (iii) cell capacity (iv) number of charge and discharge cycles of a battery [3]

(c) Discuss the principle, and the process of fractional distillation of crude oil. [3]

**Q. 4.** (a) Answer any two; [Each 3 Marks]

(i) Explain the basic principle behind the gravimetric methods of analysis. Discuss the types of volumetric titrations with suitable examples.

(ii) How the use of an instrumental method could be more advantageous over a classical method to carry out the same chemical analysis?

(iii) A  $4.35 \times 10^{-5}$  M solution of a substance in water, kept in a cell with a thickness of 3 cm, transmits 30% of the incident light at 600 nm. Find out the concentration of the solution of the same substance in water which transmits 45% of light under the same conditions.

(b) Discuss the principle, and theory behind working of Ion selective electrodes. [4]

**Q. 5.** (a) Mention the properties imparted by the individual components of a Portland cement. [4]

(b) Outline the process of setting and hardening of Portland cement with suitable examples. [4]

(c) While verifying the Beer Lambert's law in the laboratory, one may observe the deviation from the law, because.... [2]

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