BSC102 - Chemistry-I

P. Pages : 2

GUG/W/23/13170 (S)

Time : Three Hours

8340

Max. Marks : 80

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Notes :
1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and Chemical equation should be given wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Discuss the reaction, mechanism wherever necessary.
7. Use of non-programmable calculator is permitted.

1. A water sample contains following impurities:-

$Mg(HCO_3)_2 = 36.5\,ppm$, $CaCl_2 = 55.5\,ppm$, $MgCl_2 = 142.5\,ppm$, $MgSO_4 = 90.0\,ppm$,

$NaCl = 72.0\,ppm$, $SiO_2 = 2.5\,ppm$

Calculate :-

i) Carbonate & non-carbonate hardness. **3**

ii) Amount of lime (90% pure) and soda (95% pure) required to soften 3,00,000 litres of water using $FeSO_4 \cdot 7H_2O$ as a coagulant at the rate of 69.5 ppm. **9**

iii) Hardness of 50,000 litres of above water sample was completely removed by passing through a zeolite softener. Exhausted zeolite bed was subsequently regenerated completely with 600 lit. of NaCl solution. Calculate the concentration of NaCl removing the hardness of water. **4**

OR

2. a) Explain various reactions takes place in Lime-Soda process. **6**

b) Write short note on – Caustic Embrittlement. **4**

c) What are the scales and sludges? Give their formation, disadvantages and preventive measures in boiler. **6**

3. a) Discuss the importance of design and material selection in controlling corrosion. **6**

b) Explain the following- i) Pitting corrosion. **3**

c) Explain the mechanism of electrochemical corrosion by oxygen absorption and H_2 evolution. **7**

OR

4. a) What is 'cathodic protection' for controlling corrosion? How is it controlled by sacrificial anode method? **6**

b) What is differential aeration theory of corrosion? Explain with example. **4**

c) Write short notes on :- **6**
i) Pilling – Bedworth Rule.   ii) Nickel – Cadmium cell.

5. a) A coal sample has following percentage composition :-

$C = 76\%$ $H = 5.2\%$

$O = 12.8\%$ $S = 1.2\%$

$N_2 = 2.7\%$ and remaining being ash.

Calculate :-

i)   Minimum wt. of air required for combustion of 1 kg of coal. **6**

ii) % composition (by volume) of dry products of combustion, if 50% excess air is supplied. **7**

b) Define – Octane number of Petrol and
             Cetane number of Diesel **3**

<div align="center">**OR**</div>

6. a) A coal has following composition by weight. **4**
        $C = 92\%$, $O = 2.0\%$, $S = 0.5\%$, $N = 0.5\%$, ash = 1.5%. Net calorific value of coal was found to be 9,430 Kcal/kg. Calculate % of Hydrogen and higher calorific value of coal.

    b) Explain bubble Tower fractional distillation of crude oil. **4**

    c) Write short notes on :- **8**
        i) Antioxidants & Anti icing agents.   ii) Significance of proximate analysis.

7. a) Explain traditional & green pathways of synthesis of Indigo dye. **8**

    b) Discuss the Goals of Green chemistry. **6**

    c) Define green chemistry. **2**

<div align="center">**OR**</div>

8. a) What are the drawbacks of traditional synthesis of adipic acid? Which is the starting substance in its green route synthesis? What are the advantages of green route synthesis over traditional? **6**

    b) 3.5 moles of a reactant gets converted to products in 2 hours out of 5 moles. Calculate % conversion. **4**

    c) Explain – **6**
        i)   Safer solvents.   ii) Energy efficient process.
        iii) Prevention of waste.

9. a) Write notes on – **8**
        i) Epoxy resin.   ii) Vulcanization.

    b) Explain conducting polymers in detail. **4**

    c) Discuss the free radical mechanism of polymerization. **4**

<div align="center">**OR**</div>

10. a) Explain in detail – **6**
        i) Biodegradable polymers.   ii) Liquid crystalline polymers.

    b) Discuss Thermoplastic and Thermosetting polymer. **4**

    c) Write down the notes on – **6**
        i) Polyacetylene.   ii) Polyaniline.

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