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Roll No. ....

BE-101

B. E. (First Semester) EXAMINATION, April, 2009

(Common to all Branches)

ENGINEERING CHEMISTRY

(BE – 101)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Parts of the question should be attempted together.

1. (a) Describe ion-exchange process for softening of hard water. Give comparison of ion-exchange process with zeolite process.   10

   (b) A sample of polluted water on analysis gave the following results :   6

   Suspended matter = 200 mg/L; $MgCl_2$ = 190 mg/L

   $CaSO_4$ = 250 mg/L; H_2SO_4 = 98 mg/L

   $MgSO_4$ = 240 mg/L;   Organic matter = 750 mg/L

   (i) Calculate total hardness of water sample.

   (ii) Calculate amounts of lime and soda needed per litre for its treatments if purity of lime is 90% and that of soda is 98%.

   (c) State whether the following statements are True or False :   4

   (i) Phosphate conditioning is done by using calcium phosphate.

   (ii) Silicates forms the hardest scale.

   (iii) Sodium aluminate act as coagulant simultaneously as softening agent.

   (iv) $CaCO_3$ equivalent of 219 ppm of magnesium bicarbonate is 150 ppm.

P. T. O.

Or

(a) (i) How scale formation takes place in boilers ? Write its disadvantages.   5

   (ii) Discuss Calgon conditioning method for water softening.   5

(b) 100 ml of a water sample required 5 ml of N/10 acid solution for titration while using phenolphthalein as indicator. 100 ml of the sample of water was again taken and methyl orange was used as indicator when 15 ml of the same acid solution was required for neutralisation. Determine the type and extent of alkalinity.   6

(c) Write an informatory note on caustic embrittlement.   4

2. (a) Distinguish between the following :   10

   (i) Proximate and ultimate analysis

   (ii) Thermal and catalytic cracking

   (iii) Octane and cetane number

   (iv) Coal and coke

   (b) A sample of flue gas has the following analysis :   6

   CO_2 = 12·5%, O_2 = 7·5%, N_2 = 80%

   Calculate excess air supplied assuming that there is no nitrogen in the fuel.

   (c) State whether the given statements are True or False :   4

   (i) GCV is less than NCV.

   (ii) The octane number of a hydrocarbon can be increased by branching in the hydrocarbon structure.

   (iii) Doctor's treatment may be given to remove sulphur compounds from gasoline.

   (iv) 1 k cal/kg = 1·8 B. Th. U./1 b.

Or

(a) Describe the Otto-Hoffmann's process for preparing coke. What are its advantages over the other methods ?   10

(b) A sample of fuel on analysis gave the following results :

   C = 87%, H = 4%, N = 1·2%, S = 2%, O = 4% Ash = 1·8%

   Calculate the minimum weight of air required for complete combustion of 500 g of this fuel.   6

(c) Write significant factors for selecting coal for different uses.   4

3. (a) Define Lubrication. Write the functions of lubricants. Give classification of lubricants with examples.   10

   (b) Define and write the significance of the following :   6

       (i)   Oiliness   (ii) Pour-point

   (c) State whether the following statements are True *or* False :   4

       (i)   Ramsbottom apparatus is used to determine Aniline point.

       (ii) A good lubricant should have a low S. E. N.

       (iii) Graphite is a semisolid lubricant.

       (iv) The viscosity index of standard Gulf oil and Pennsylvanian oil are 100 and 0 respectively.

Or

   (a) Discuss mechanism of lubrication by explaining :   10

       (i)   Fluid film lubrication   (ii) Boundary lubrication

   (b) Explain why ?   6

       (i)   Graphite act as a good lubricant on the surface of moon.

       (ii) A lubricant should have high aniline point.

   (c) Write a brief note on Greases.   4

4. (a) Write method of preparation and applications of :   10

       (i)   HDPE   (ii) Dacron

       (iii) Bakelite   (iv) Flucon

   (b) Distinguish between the following :   6

       (i)   Thermoplastic and Thermosetting resins

       (ii) Addition and Condensation polymerisation

   (c) State whether the following statements are True *or* False :   4

       (i)   Gutta percha is transpolymer of isoprene.

       (ii) If phenol to formaldehyde ratio is less than 1 in alkaline medium, then Novolac is obtained.

       (iii) Borazole is an inorganic polymer.

       (iv) Styrene butadiene rubber is represented as Buna-S rubber.