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Roll No. .....

BE-101

B. E. (First/Second Semester) EXAMINATION, June, 2010

(Common for all Branches)

ENGINEERING CHEMISTRY

(BE – 101)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any *one* question from each Unit. Parts of question should be attempted together.

Unit – I

1. (a) Discuss ion-exchange process of water softening. 8

   (b) Differentiate between scale and sludge. How are scales formed ? What are disadvantages of scales ? 7

   (c) State whether the following statement is True *or* False : 5

   (i) Treatment of water during steaming inside the boiler, is called Internal Treatment.

   (ii) Chlorine is used in purification of drinking water for coagulation.

   (iii) $Ca(HCO_3)_2$ causes permanent hardness in water.

P. T. O.

(iv) The determination of hardness of water by EDTA method is a complexometric method.

(v) 13·6 mg/L $CaSO_4$ is equivalent to 10 ppm of $CaCO_3$.

Or

2. (a) Discuss any *two* internal conditioning methods of water softening. 8

   (b) 100 ml of a water sample required 25 ml of N/50 H_2SO_4 for neutralisation to phenolphthalein end point. After this, methyl orange indicator was added and further acid required was again 25 ml. Calculate the type and extent of alkalinity. 7

   (c) Fill in the blanks : 5

   (i) The hardness causing ions in natural water are mainly .....

   (ii) 1 ppm = ... °Cl.

   (iii) The formation of loose and slimmy precipitate during steaming in a boiler is called .....

   (iv) Chemical name of calgon is .....

   (v) Exhausted zeolite bed is regenerated by passing a solution of ..... .

Unit – II

3. (a) What is Cracking ? Describe fixed bed catalytic cracking. 8

   (b) Differentiate between proximate and ultimate analysis of coal giving significance. 7

(c) State whether the following statement is True *or* False : 5

(i) Iso-octane has Octane No. zero.

(ii) Highest carbon content is found in Anthracite.

(iii) The calorific value of a coal sample is higher, if its moisture content is high.

(iv) Bomb calorimeter is used for determining the calorific value of solid and liquid fuel.

(v) Decomposition of higher molecule into simpler molecule is called knocking.

Or

4. (a) Describe Otto-Hoffmann's process for preparing coke. Write the advantages of this process. 8

(b) Calculate the minimum weight of air required for complete combustion of 1 kg of fuel containing C = 85% ; H = 5% ; O = 4%, S = 1%, N = 0·5% and ash = rest. 7

(c) Fill in the blanks : 5

(i) In the proximate analysis of coal, the moisture is determined at a temperature of .....

(ii) ..... is mixed with galotrine to improve the anti-knocking property of gasoline.

(iii) The cetane no. of hexadecane is .....

(iv) 1 kcal/kg = ... B. Th. U./lb.

(v) In metallurgy, the allotropic form of carbon used is .....

Unit–III

5. (a) Define Lubricants. Explain the following properties with their significance : 8

(i) Flash and Fire point

(ii) Cloud and Pour point

(b) Describe the mechanism of hydrodynamic lubrication. 7

(c) State whether the following statement is True *or* False : 5

(i) The V. I. of Pennsylvanian oil is zero.

(ii) Talc is an example of solid fuel.

(iii) Mineral oils have least oiliness.

(iv) Estimation of carbon residue is carried out by 'Conradson's Apparatus'.

(v) The mode of heating by air both for determination of flash point is done in Abel's apparatus.

Or

6. (a) What are the functions of a lubricating oil ? 8

(b) What are greases ? Discuss various types of greases with uses. 7

(c) Fill in the blanks : 5

(i) A good lubricating oil should have ..... S. E. N.

(ii) Unit of viscosity is .....

(iii) V. I. of high viscous oils is determined by .....

(iv) A high aniline point indicates ..... aromatic content.

(v) When graphite is dispersed in oil, it is called .....

Unit – IV

(a) What are polymers ? Distinguish between : 8

(i) Thermoplastic and Thermosetting resins

(ii) Natural and Synthetic rubber

(b) Write preparation, properties and uses of the following : 7

(i) Bakelite

(ii) Nylon 6 : 6

(c) State whether the following statement is True *or* False : 5

(i) GR-S rubber is an example of copolymerisation.

(ii) Tetraflouroethylene is the monomer of PVC.

(iii) Common catalyst used in addition polymerisation is Ziegler-Natta catalyst.

(iv) Chemical formula of natural rubber is $(C_5H_8)_n$.

(v) Protein is a synthetic polymer.

Or

8. (a) Explain why natural rubber needs vulcanisation ? How is it carried out ? 8

(b) Write preparation, properties and uses of the following : 7

(i) Dacron

(ii) Polyethylene

(c) Fill in the blanks : 5

(i) A plastic which can be softened on heating and hardened on cooling, is called .....

(ii) Phenol and formaldehyde react together to give .....

(iii) The monomer in natural rubber is called .....

(iv) Polymers have ..... molecular weight.

(v) The monomer unit in Flucon is .....

Unit – V

9. (a) What are refractories ? How are the properties of Thermal spalling and Refractoriness under load important, when the refractories are put to industrial use ? 8

(b) State Beer-Lambert's law. Discuss instrumentation and experimental technique of colorimetry. 7

(c) State whether the following statement is True *or* False : 5

(i) The mode of excitation of molecule in IR spectroscopy is vibrational.

(ii) Major component of portland cement is tricalcium silicate.

(iii) If gypsum is not added, then the cement sets quickly.

(iv) Gas chromatography is called fingerprint technique.

(v) In acidic environment, preferably the refractory should not be basic.

Or

10. (a) Describe principle, instrumentation and applications of Gas chromatography. 8

(b) Discuss mechanism of setting of cement. 7

(c) Fill in the blanks : 5

(i) Silica refractories are ..... in nature.

(ii) Identification of functional groups in a compound can be established by using ..... spectroscopy.

(iii) Hertz is the unit of .....

(iv) In rotary cement kiln, quicklime is obtained at a temperature of about .....

(v) The chemical formula of Plaster of Paris is.....