

Seat No.: _____

Enrolment No. _____

(CH-1)

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. all Sem-I Examination December 08/January 09

Chemistry (110001)

DATE: 26-12-2008, Friday

TIME: 12.00 to 2.30 p.m.

MAX. MARKS: 70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**

Q.1.

- (a) What is meant by softening of water? **07**
With a neat schematic diagram, describe any one industrial method of softening of water.
- (b) What is biogas? Explain the manufacture of biogas from animal (cow) dung. **04**
Giving two illustrations for each bring out the differences between
- (c) thermoplastics and thermosetting plastics. **03**

Q.2.

- (a) With a neat diagram of fractional distillation column, discuss about refining of crude oil. **07**
- (b) Explain break point chlorination. What are its advantages? **03**

OR

- (b) What is the principle of reverse osmosis? How is it used for desalination? **03**
- (c) A sample of water, on analysis, was found to contain the following impurities in mg/L: $\text{Ca}(\text{HCO}_3)_2 = 32.4$; $\text{Mg}(\text{HCO}_3)_2 = 14.6$; $\text{CaSO}_4 = 27.2$; $\text{MgSO}_4 = 30.0$; $\text{CaCl}_2 = 11.1$. Calculate the temporary hardness and the permanent hardness of water. Given: Molecular weight of $\text{Ca}(\text{HCO}_3)_2 = 162$; $\text{Mg}(\text{HCO}_3)_2 = 146$; $\text{CaSO}_4 = 136$; $\text{MgSO}_4 = 120$; $\text{CaCl}_2 = 111$. **04**

OR

- (c) Calculate the amount of lime and soda required to soften 20,000 liters of water having the following analysis: **04**
 $\text{Ca}(\text{HCO}_3)_2 = 40.5$ ppm; $\text{Mg}(\text{HCO}_3)_2 = 36.5$ ppm; $\text{CaSO}_4 = 34.0$ ppm; $\text{MgSO}_4 = 30.0$ ppm; $\text{CaCl}_2 = 27.75$ ppm; $\text{NaCl} = 5.85$ ppm.

Q.3.(a)

- What are the raw materials required for manufacturing cement?
With a neat diagram of rotary kiln, describe how Portland cement is manufactured by wet process. **06**
- (b) Why does natural rubber need vulcanization? Discuss the process of vulcanization in brief. **04**
- (c) With a schematic diagram, describe the process of melt spinning of fibres. **04**

OR

Q.3.

- (a) State ISI specification of cements. Discuss about setting and hardening of Portland cement with the sequence of chemical reactions involved in it. **06**
- (b) Mention the compounding materials used in plastics and indicate their functions. **04**

- (c) Explain the following terms and their effects on the environment: **04**
(i) Green house effect; (ii) Ozone depletion.

Q.4.

- (a) What are the purposes of alloy making? Illustrate with suitable examples. **06**
Name two non-ferrous alloys and their applications
- (b) Give the factors responsible for corrosion of a boiler. Discuss the measures for its prevention. **04**
- (c) What is cathodic protection? With an illustration, explain sacrificial anode method of controlling corrosion. **04**

OR

Q.4.

- (a) What is the function of carbon in steel? **06**
Discuss the following methods of heat treatment of steel and their effects on alloys: (i) Annealing; (ii) Hardening; (iii) Tempering.
- (b) Define the term lubricant. **04**
Explain the following properties of lubricants and their significance.
(i) Viscosity; (ii) Flash point.
- (c) Distinguish between paint and varnish. **04**
Mention the essential constituents of paint and their functions.

Q.5.

- (a) State the conditions favourable for fermentation. **06**
Cite two industrial fermentation processes in which enzymes are used and discuss about them in brief.
- (b) What are the characteristics of a good fuel? **04**
Why is compressed natural gas (CNG) preferred over liquefied petroleum gas (LPG)?
- (c) One gram of an air-dried coal sample was weighed in a silica crucible. After heating for 1 hour at 105° - 110° C, the dry coal weighed 0.980 g. The crucible was covered with lid and then heated strongly for exactly 7 minutes at $950^{\circ} \pm 20^{\circ}$ C. The residue weighed 0.750 g. The crucible was then heated strongly in air, until a constant weight was obtained. The residue was found to weigh 0.100 g. Give the proximate analysis of coal. **04**

OR

Q.5.

- (a) Differentiate between scale and sludge. **06**
How does the formation of sludge and scales affect boiler performance?
Give a method of prevention of scales.
- (b) Discuss about the environmental problems due to over utilization of natural sources. **04**
- (c) One gram of accurately weighed coal sample was burnt in a current of oxygen in a combustion apparatus. Carbon and hydrogen of the coal sample were converted into CO_2 and H_2O respectively, which were then absorbed respectively in KOH and CaCl_2 tubes of known weight. The increase in the weight of KOH tube was 3.0 g and the increase in weight of CaCl_2 tube was 0.9 g. Find the percentage of carbon and hydrogen. **04**