B.TECH. DEGREE EXAMINATIONS: NOV/DEC 2010

Third Semester

BIO TECHNOLOGY

BTY106: Principles of Chemical Engineering

Time: Three Hours   **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Which one of the following is derived unit in SI system
   a) Mass   b) Volume   c) Time   d) Length

2. The temperature of a chemical process was found to be 80°C. What is the temperature in °F?
   a)353°F   b) 636°F   c) 176°F   d) -193°F

3. Exothermic reaction refers to
   a) Absorption of heat   b) Release of heat   c) Neutralization   d) Interconversion

4. Recycling in a chemical process facilitates
   a) Increased yield   b) Enrichment of product   c) Heat conservation   d) Decreased yield

5. The quantity of heat that cannot be measured by using a temperature measuring device
   is known as
   a) Latent heat   b) Sensible heat   c) Specific heat   d) Preheat

6. Which of the following is a thermodynamic property of a system?
   a) Concentration   b) Mass   c) Temperature   d) Entropy

7. Which of the following is a Newtonian fluid?
   a) Rubber latex   b) Sewage sludge   c) Quick sand   d) Non-colloidal solution

8. With increase in temperature, viscosity of a fluid
   a) Increases   b) Decreases   c) Remains constant   d) Depends on the fluids

9. The pump used for irrigation purpose is generally designed for
   a) Large capacity & high head   b) Large capacity & low head
   c) Small capacity & high head   d) Small capacity & low head

10. For pumping slurry, one can use …………… pump
    a) Pneumatic   b) Centrifugal   c) Diaphragm   d) Reciprocating

PART B (10 x 2 = 20 Marks)

11. Pure carbon is completely burnt in oxygen. The flue gas analysis is 70% CO_2, 20%

CO and 10% O_2. Find the percentage excess oxygen.

12. Convert 11°C to °F and °K

13. What is recycling?

14. What is meant by conservation of mass?

15. State the first law of thermodynamics

16. Define latent heat

17. State two applications of Fluid mechanics in chemical engineering.

18. What are incompressible fluids? Give an example

19. What is NPSH in pumping?

20. What type of pump you would select:

   (i) for transportation of volatile liquids.

  (ii) for transportation of viscous liquids

PART C (5 x 14 = 70 Marks)

21. a) Express the composition of mixtures and solution in weight percent, volume
   percent, mole percent and mole fraction.

OR

  b) (i) Write Redlich-Kwong equation and its importance   (4)

     (ii) What volume of air at NTP is needed for the combustion of 1 m^3 of a gas with the
       following composition?   (10)

Hydrogen	= 50%
CH_4	= 35%
CO	= 8%
C_2H_4	= 2%
Non-combustible admixtures	= 5%

	100%
	-------

22. a) (i) Describe the basic steps to be followed in material balance calculations.   (6)

(ii) Estimate the required quantities of 96% NaCl and 93% H_2SO_4 for the production of 500 kg of HCl if the conversion is 92%. Also calculate the amount of Na_2SO_4 produced during the process. HCl is produced according to the reaction   (8)

$$2\ NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2\ HCl$$
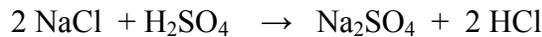
(OR)

b)   The feed to a continuous fractioning column analysis by weight 28% benzene and 72% toluene. The analysis of distillate shows 52% by weight benzene and 5% by weight benzene was found in bottom product. Calculate the amount of distillate and bottom product per 1000 kg of feed/hr. Also calculate the percentage recovery of benzene.

23. a)   Write short notes on

   (i) Kopp's rule   (4)

   (ii) Law of Hess   (3)

   (iii) Effect of temperature on heat of reaction   (7)

(OR)

b)   A sample of petrol contains 15% H_2 and 85% C by weight. Calculate the amount of air needed for the combustion of 1 kg of the petrol. Find the volumetric composition of the dry products of combustion, if 15% excess air is supplied.

24. a)   Explain the working principles of various manometers with neat sketchs.

(OR)

b)   Derive the Bernoulli's equation for the steady flow of fluids. Give some applications of Bernoulli's equation.

25. a) (i) Classify various types of pumps and mention their industrial applications.   (7)

   (ii) Describe the various phenomena of fluidization.   (7)

(OR)

b) (i) With a neat sketch explain the operating principle of venturimeter and orificemeter.

****