Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Pharm (New)/SEM-5/PT-507/2011-12

2011

PHARMACEUTICAL ENGINEERING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Fractional distillation can be used for the separation of

      a) water and chloroform

      b) water and benzene

      c) water and ethanol

      d) none of these.

   ii) The term " Bubble point temp." is used for

      a) Boiling point of water

      b) Boiling point of pure solvent

      c) Boiling point temperature range for mixture of liquid

      d) none of these.

iii) In case of rectification, the slope of q-line is ZERO when

a) feed is a saturated vapour

b) feed is a super-heated vapour

c) feed is at its boiling point

d) none of these.

iv) By compression, we can

a) increase the humidity of air

b) decrease the humidity of air

c) both (a) & (b)

d) none of these.

v) In case of azeotropic mixture, relative volatility is

a) 1 b) 1·5

c) 0·5 d) 0·7.

vi) Humidity charts are called

a) psychometric charts

b) psycometric charts

c) psychrometric charts

d) psyco charts.

vii) Rayleigh equation is related to distillation of the ..... type.

a) differential

b) fractional

c) molecular

d) azeotropic.

viii) A one tonne of refrigeration can remove heat from a substance by

a) 14,000 kJ/hr

b) 13,000 kJ/hr

c) 12,000 kJ/hr

d) 10,000 kJ/hr.

ix) Which one of the following is a agitated tower extractor ?

a) Podbielniak extrator

b) Rotocel extractor

c) York-Scheibel extractor

d) None of these.

x) Stefan's technique is an experimental method for

a) estimation of diffusion coefficient

b) calculation of critical moisture content

c) calculating number of total theoretical plates for rectification

d) determination of triple point.

xi) The principle of "Freeze Drying" is based on

a) Evaporation

b) Sublimation

c) Fusion

d) None of these.

xii) Iodine is purified by

a) sublimation

b) fractional distillation

c) steam distillation

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Describe the working principle of lyophilizer.

3. "Vaporization of water into steam is a heat transfer operation, rather than a mass transfer operation." Explain.

4. 150 kg of nicotine-water solution containing 1% nicotine is to be extracted with 250 kg of kerosene at 20°C. Water and kerosene are essentially immiscible in each other. Determine the percentage extraction of nicotine after one stage operation. At the dilution end of the system, the equilibrium relationship is $Y = 0{\cdot}798X$, where Y and X are expressed as kg nicotine/kg kerosene and kg nicotine/kg water respectively.

5. Explain the principle of dehumidification.

6. Air in the laboratory at 110°F and atmospheric pressure contains 0·021 lb of water vapour per lb of dry air. Determine the percentage humidity and percentage relative humidity. Equilibrium vapour pressure of liquid water at 110°F is 1·3 psia.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is the advantage of sieve plate column over bubble cap colum.

   b) What are the advantages and disadvantages of Raschig ring.

   c) Describe, with diagram, the principle of separation of ethanol from azeotropic mixture of ethanol and water.

   2 + 6 + 7

8. a) Explain the terms 'diffusivity', 'diffusion flux' and 'molecular flux'.

   b) A narrow tube is partially filled with liquid and maintained at a constant temperature. A gentle stream of a gas is passed across the open end of the tube. As the liquid evaporates the level drops slowly. At a given time t, this level in the tube is z from the top. Derive an expression to calculate the value of diffusivity of liquid vapour in the gas. 6 + 9

9. Define and explain the terms, 'humidity', 'relative humidity', 'percentage humidity', 'humid heat' and 'humid volume'. How a humidity chart can show relationship among the above factors along with temperature ? What is dew point ? How will you use humidity chart for showing dew point, dry bulb temperature and wet bulb temperature. 5 + 2 + 2 + 6

10. a) Explain the construction and uses of traingular phase diagrams for solid-liquid extraction.

    b) Define 'extract', 'raffinate' & 'half-miscella'.

    c) Discuss the working of Dorr agitator. 5 + 5 + 5

11. a) Define critical moisture content. What is drying rate curve ?

    b) Explain the mechanism of a spray dryer with working principle and neat sketch.

    c) A wet solid is to be dried from 80 to 5% moisture on wet basis. Calculate the amount of moisture to be evaporated per 100 kg of the dried product. 5 + 5 + 5