



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 × 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.

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[Turn over



- 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.

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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.

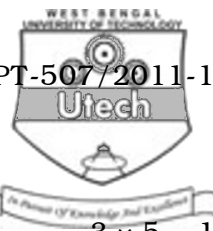
ix) Which one of the following is a agitated tower extractor ?

- a) Podbielniak extractor
- b) Rotocel extractor
- c) York-Scheibel extractor
- d) None of these.

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- 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 $Y = 0.798X$, 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 column.
- 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

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10. a) Explain the construction and uses of triangular phase diagrams for solid-liquid extraction. 5 + 5 + 5
- b) Define 'extract', 'raffinate' & 'half-miscella'.
- c) Discuss the working of Dorr agitator.
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

