



Name :
Roll No. :
Invigilator's Signature :

CS / B.PHARM / SEM-7 / PT-707 / 2010-11

2010-11

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) Freeze-drying is related to the phenomenon of
 - a) Sublimation
 - b) Occlusion
 - c) Animation
 - d) Nitration.
 - ii) Spray-drying technique is suitable for
 - a) Thermolabile substance
 - b) Milk product
 - c) Granular sample
 - 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 superheated vapour
 - c) feed is at its boiling point
 - d) none of these.

7328

[Turn over]



- iv) The solid residue remaining after extraction is termed as
 a) Menstruum b) Miscella
 c) Mare d) none of these.
- v) The temperature at which a given mixture of water vapour and air is saturated is called
 a) wet bulb temperature
 b) dew point
 c) saturation temperature
 d) both (a) and (c).
- vi) During drying 'dry spots' begin to appear in
 a) constant rate period b) 1st falling rate period
 c) 2nd falling rate period d) none of these.
- vii) The principal objective(s) of steam distillation is / are
 a) separation of volatile oil
 b) preparation of aromatic water
 c) separation miscible liquid mixture with low boiling points
 d) both (a) and (b).
- viii) In a desiccator, the material used as desiccant is
 a) Conc. H_2SO_4
 b) Anhydrous $CaCl_2$ (fused)
 c) NaCl
 d) both (a) and (b).
- ix) Solute migration during drying is associated with
 a) Tray dryer b) Fluidized bed dryer
 c) Freeze dryer d) both (a) and (b).
- x) Which one of the following is a centrifugal extractor ?
 a) Podbielniak extractor
 b) Rotocel extractor
 c) York-Scheibel extractor
 d) None of these.
- xi) Removal of bound moisture of a material
 a) is possible
 b) is impossible
 c) depends on the material to be dried
 d) none of these.



- xii) For molecular distillation the important parameter is
 a) boiling point b) mean free path
 c) none of these d) all of these.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

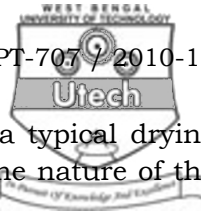
2. Differentiate between the following : $2 \times 2\frac{1}{2}$
 - i) Equilibrium distillation and differential distillation.
 - ii) Wet bulb temperature and adiabatic saturation temperature.
3. Write short notes on the following :
 - i) Total reflux ratio
 - ii) Minimum reflux ratio
 - iii) Optimum reflux ratio.
4. Write a note on dorr agitator.
5. A solid is to be dried in batch operation under such condition that the rate of drying during constant rate period is 45 kg of water removed per hour. The critical moisture content is 0.35 kg of water per kg of dry solid. Equilibrium moisture content of the material is 0.04 kg of water per kg of dry solid. If the material contains 600 kg of dry solid and 500 kg of water at the start of drying, estimate the drying time needed per constant rate period.
 Amount of dry solid = 600 kg.
6. State Raoult's Law. What is its significance ?

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7.
 - a) What are the different factors to be considered for optimization of liquid-liquid extraction process ?
 - b) From the assumptions of McCabe-Thiele method, derive that in case of rectification, the no. of gm-moles of liquid phase descending from plate to plate is same and no. of gm-moles of vapour phase ascending from plate to plate is also same. $10 + 5$



8. a) What do you mean by drying ? Sketch a typical drying rate curve for a porous solid & explain the nature of the curve. What is critical moisture content ?
- b) With a neat sketch describe the working principle of a spray drier. What are the advantages of spray drier ?

9 + 6

9. a) Explain the concept of wet bulb temperature. Explain briefly the wet bulb theory. What are the factors influencing wet bulb temperature ?
- b) For a mixture of air and water vapour at 70°C, calculate
- humidity when air is saturated
 - humidity when relative humidity of air is 50%
 - specific volume of saturated air as cc/gm of dry air
- Data : Vapour pressure of water at 70°C = 233.7 mm Hg.

8 + 7

10. a) What does the term 'dehumidification' mean ? Write a note on the application of dehumidification.
- b) With a neat diagram explain principle and working of an air conditioner.

8 + 7

11. a) Slabs of paper pulp 100 cm × 100 cm × 1.5 cm are to be dried under constant drying conditions from 67% to 30% moisture. The value of equilibrium moisture for the material is 0.5%. If the critical moisture content is 60% and the rate of drying at the critical point is 1.5 kg (m².h), calculate the drying time. The dry weight of each slab is 2.5 kg. All moisture contents are on weight basis. The falling rate may be assumed to be linear.
- b) Describe with a diagram, the principle of separation of ethanol from azeotropic mixture of ethanol and water.
- c) Describe the working principle of Podbielniak extractor.

5 + 6 + 4

=====