Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.PHARM(NEW)/SEM-4/PT-407/2011

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) Both attrition & impact are the mechanism of size reduction for

      a) roller mill b) ball mill

      c) colloid mill d) fluid energy mill.

   ii) A loose aggregation of molecules/ions to form crystals is called

      a) Cluster b) Embryo

      c) Nucleus d) Aggregates.

iii) According to B.P., moderately fine powder can be represented by

a) 22/60 b) 44/85

c) 10/44 d) none of these.

iv) Free escape of vapour from the surface of the liquid below its boiling point is

a) Evaporation b) Prying

c) Vacuum drying d) Sublimation.

v) Economy of an evaporator is expressed as

a) Total mass of vapour produced/Total mass of steam supplied

b) Total mass of vapour produced × Total mass of steam supplied

c) Total mass of steam supplied / Total mass of vapour produced

d) Total mass of vapour produced / Total mass of solvent.

vi) One of these evaporators is used for evaporation of viscous liquid

a) Evaporating pan

b) Climbing film evaporator

c) Forced circulation evaporator

d) Horizontal film evaporator.

vii) For efficient crushing in a roll crusher, the co-efficient of friction (μ) and angle of nip (θ) have a relation

a) $2 \tan^{-1} \mu > \theta$ b) $\tan^{-1} \mu < \theta$

c) $\tan^{-1} \mu > \theta$ d) none of these.

viii) *Jaw crusher* uses forces by

a) compression b) impact and attrition

c) impact d) none of these.

ix) Which of the following is true for *absorptivity (α)*

a) It is the property of body surface

b) It is dependent on the temperature of the body

c) It is dependent on the wave length of incident radiation

d) All of these.

x) The material of construction for a tablet machine's punch set is

a) high carbon ligh cromium

b) carbon steel

c) stainless steel

d) none of these.

xi) Crystal Solvates are called

a) Polymorphs b) Pseudomorphs

c) Isomorphs d) Amorphous.

xii) In a steam jacketted kettle, the dimensionless group responsible for heat transfer in liquid is

a) Grashof no. b) Reynold no.

c) Prandtle no. d) Nusselt no.

GROUP – B

(Short Answer Type Questions)

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

2. Define the different standards for powder according to the British Pharmacopoeia.

3. What is equilibrium solubility curve. Explain its utility in crystallization process.

4. A laboratory ball mill of 10 cm diameter uses 4-balls of each 1·5, 2·0, 2·5 and 3·0 cm diameters respectively for crushing. What will be the operational speed in r.p.m., when 70% of critical speed is required for effective crushing ?

5. What is the importance of the unit operation "size separation", in pharmacy ? Give suitable examples.

6. A 20% (W/W) solution is to be concentrated to 80% (W/W). If 2000 kg/hr of product is required, calculate the amount of solvent evaporated.

GROUP – C

(Long Answer Type Questions)

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

7. a) Define mixing. Write in brief, justifying why mixing is important in pharmaceutical field.

   b) Derive the equation for calculating mixing index.

   c) Describe the different types of impeller mixer with neat sketch. 4 + 5 + 6

8. a) Define size reduction.

   b) Explain with neat sketch the principle construction and working of a ball mill.

c) Why determination of critical speed of a ball mill is important ?

d) What is the importance of particle size in *stability of suspension*, mixing of powder, manufacturing of tablet, cake filtration and sedimentation ? 1 + 5 + 1 + 8

9. a) Classify and explain the different types of nucleation formed in a crystallizer.

b) Explain with mathematical derivation the diffusional mass transfer during crystal growth.

c) Express the crystal growth rate with a mathematical expression. 6 + 6 + 3

10. a) Derive an equation for heat transmission through a circular pipe from Fourier's Law.

b) A flat furnace wall is constructed of a 5 in. layer of refractory brick with a thermal conductivity of 0.06 backed by a 10 in. layer of common brick of conductivity 0.7. The temperature of the inner face of the furnace wall is 16000 F and that of the outer face is 1200 F.

(i) Calculate the heat lost through 4 sq. ft of wall area in 12 hrs.

(ii) What is the temperature of the interface between the refractory brick and the common brick ?

10 + 5

11. a) Discuss different methods of feeding in a multiple effect evaporator with neat sketches.

b) A triple effect evaporator is concentrating a liquid having no appreciable elevation in boiling point. The temperature of the steam admitted to the first effect is 227°F (5 Psig). Vacuum in the last effect is 26 inch (125°F). The overall heat transfer co-efficients are 550, 400, 200 B tu/(hr) (ft^2) (°F) for first, second and third effects respectively. What are the approximate temperatures at which the liquid will boil in the first and second effects ? 8 + 7