Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS / B.PHARM (OLD) / SEM-5 / PT-507 / 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 :

$10 \times 1 = 10$

i) For a ball mill of mill diameter R and ball diameter r, the critical speed is

a) $\frac{1}{2\pi}\sqrt{\frac{R-r}{9}}$ b) $\frac{1}{2\pi}\sqrt{\frac{G}{R-r}}$

c) $2\pi\sqrt{\frac{G}{R-r}}$ d) none of these.

ii) For black body, emissivity is

a) 0 b) < 1

c) > 1 d) 1.

iii) Maximum thermal conductivity among copper, silver, gold, aluminium is

a) sliver b) copper

c) gold d) aluminium.

iv) Size reduction is done for micronized aspirin and griseofulvin by

a) fluid energy mills b) colloid mill

c) ball mill d) all of these.

v) Bond's law is stated as

a) $\text{work} \propto \frac{4}{\sqrt{\text{Particle size}}}$ b) $\text{work} \propto \sqrt{\text{Particle size}}$

c) $\text{work} \propto \frac{1}{\sqrt{\text{Particle size}}}$ d) none of these.

vi) Vortex liquid circulation pattern occurs with

a) mixing device set at an angle

b) mixing device set centrally

c) mixing device set centrally and vertically

d) none of these.

vii) Relation between the rate of evaporation and vapour pressure of liquid is

a) directly proportional

b) inversely proportional

c) rate of evaporation is proportional to square root of the vapour pressure of the liquid

d) none of these.

viii) Long-tube vertical-type evaporator is also named as

a) climbing film evaporator

b) rising film evaporator

c) long-tube evaporator

d) all of these.

ix) A body which absorbs all the incident energy, means

a) $\alpha = 1,\ \nu = 0,\ \Gamma = 0$ b) $\alpha = 0,\ \nu = 1,\ \Gamma = 0$

c) $\alpha = 0,\ \nu = 0,\ \Gamma = 1$ d) None of these.

x) Which type of glass is preferred for storage chemicals and pharmaceuticals ?

a) Soda-lime glass

b) Treated soda-lime glass

c) Borosilicate glass

d) None of these.

xi) Jaw crusher is a / an

a) Ultra-fine grinder b) Fine grinder

c) Coarse grinder d) None of these.

xii) Propeller is a

a) Radial flow impeller

b) Axial flow impeller

c) Tangential flow impeller

d) None of these.

GROUP – B

(Short Answer Type Questions)

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

2. What do you mean by corrosion and erosion ? Discuss on different types of rubbers used to prevent such problems.

3. What is vortex formation ? What are the disadvantages of vortex formation ? What are the ways to eliminate vortex formation ?

4. What is Stoke's law ? How does the law used to determine average diameter of particles ?

5. Write short note on inorganic materials as materials of construction.

6. What are the applications of heat exchangers in the process plant and their functions ?

GROUP – C

(Long Answer Type Questions)

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

7. a) What is Crystal growth ? What are the steps of crystal formation ? Give a labelled diagram and working of agitated batch crystallizer.

   b) Explain Mier's supersaturation theory. What are the limitations of the theory ? 8 + 7

8. a) What do you mean by evaporation ? Differentiate it with distillation. Explain material and energy balance in an evaporator.

   b) What are entratainment and entrainment separator ?

   c) What is multiple effect evaporator ? Draw the connection and sequence of flows in a multiple effect evaporator. 5 + 4 + 6

9. a) Define mixing. What is the importance of mixing in pharmaceutical industries ?

   b) What are the different types of mixing impeller and respective flow pattern ?

   c) What is the shape factor of mixing vessels ?

   d) Briefly discuss the design and working of Silversion mixer emulsifier. 3 + 4 + 3 + 5

10. a) What do you mean by size reduction ? State its importance in control of particle size in pharmaceutical industry with examples.

    b) Distinguish crushing and grinding. Explain with line diagram of open and closed circuit operation. Write the advantage of wet grinding. (1 + 6) + (3 + 3 + 2)

11. a) A hot solution containing 2000 kg of $MgSO_4$ and water at 330 K and with a concentration of 30% wt $MGSO_4$ is cooled to 293 K and $MgSO_4$, $7H_2O$ crystals are removed. The solubility at 293 K is 35·5 kg $MgSO_4$ / 100 kg total water. The average heat capacity of the feed solution is 2·93 kJ/kgK. The heat of solution is 293 K is – 13·31 NO^3 kJ/Kg mol $MgSO_4$, 7 H_2O. Calculate the yield of crystals and make a heat balance.

    Given : Mol.wt of $MgSO_4$ = 120·35

    Mol.wt. of 7 H_2O = 126·14

    Mol.wt of $MgSO_4$, 7 H_2O = 246·49.

b) A furnace is constructed with 2 m of firebrick, 0·1 m of insulating and 0·2 m of building brick. The inside temperature is 1200 K and the outside temperature is 330 K. If the thermal conductivity are as K = 1·4 w/mk, 0·21 w/mk, 0·7 w/mk respectively, estimate the heat loss per unit area and the temperature of the junction of the firebrick and the insulating brick. 8 + 7

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