2013

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 questions : $10 \times 1 = 10$

i) Radial flow is imparted by

a) unbaffled impellers b) turbine impellers

c) both (a) and (b) d) none of these.

ii) Elastic deformation is defined by

a) Young's modulus b) Griffith theory

c) Kick's law d) Hooke's law.

iii) If Δt_1 and Δt_2 are120°C and 40°C respectively in a heat exchanger, then

Δt is equal to

a) 73 °C b) 63°C

c) 60°C d) 53°C.

iv) A mass mixer is mixing 40 kgs of Paracetamol for a batch of 100 kgs. Standard deviation of the Drug before mixing is

a) 0·47 b) 0·57

c) 0·67 d) 0·77.

v) In a agitated vessel which component of fluid velocity is responsible for formation of vortex ?

a) Radial b) Longitudinal

c) Tangential d) All of these.

vi) The mill which is used for size reduction of fibrous material is

a) Cutter mill b) Hammer mill

c) Ball mill d) Roller mill.

vii) Both attrition and impact are the mechanism of size reduction for

a) Roller mill b) Ball mill

c) Colloid mill d) fluid energy mill.

viii) Na_2CO_3, $5H_2O$is

a) Crystal hydrate b) Crystal solvate

c) Isomorph d) Amorphous.

ix) In liquid mixing, Froude No. (F_r) is the ratio of

a) Inertial stress to gravitational force

b) gravitational force to inertial stress

c) gravitational force to viscous force

d) viscous force to gravitational force.

x) The unit for thermal resistance is

a) $(BThU)^{-1}(hr)(^{\circ}F)^{-1}$

b) $(BThU)^{-1}(hr)(^{\circ}F)^{-1}(ft)2$

c) $(BThU)\ (hr)\ (^{\circ}F)^{-1}$

d) none of thes

xi) For preparation of starch paste, the suitable evaporator is

a) open pan b) falling film

c) basket type d) rising film.

xii) Fluid energy mill is a

a) coarse grinder b) fine grinder

c) ultrafine grinder d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. Differentiate between mixing of liquids with that of solids.

3. What is work index ? Derive the relationship between work index and Bond's constant.

4. Differentiate between a 'Black body' and 'Grey body'. Give the characteristics of a 'Black Body'.

5. A soil containing 14% moisture was mixed in large muller mixer with 10 weight per cent of a tracer consisting of dextrose and picric acid. After 3 min of mixing 5 random samples were taken from the mix and analysed for tracer material. The measured concentrations in the sample were, in weight per cent tracer 10·24, 9·30, 7·94, 10·24, 11·08. Calculate mixing index I_P.

6. A flat furnace wall is constructed of a 5 inlayer of refractory brick with a thermal conductivity of 0·06 backed by a 10 inlayer of common brick of conductivity 0·7. The temperature of the inner face of the furnace wall is 16000F and that of the outer face is 1200F

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

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

GROUP – C

(Long Answer Type Questions)

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

7. a) Describe different types of crystalline pharmaceutical powders.

b) Explain the theory of crystallization by process flow diagram.

c) What will be the yield of crystal of Hypo ($Na_2S_2O_3$,$5H_2O$), , if 500 kg of 52% (w/v) solution iscooled to 70°F. Solubility of

$Na_2S_2O_3$ at 70°F is 70 parts per 100 of water. State the basis of calculation with reason.

5 + 4 + 5 + 1

8. a) Differentiate between heat exchanger an heat interchanger. Discuss the role of fluid velocity for both the cases.

b) State the principle of extended surface heat exchangers describing different types.

c) Water flows through a 2·0 inch O.D. steel pipe jacketed with steam. The overall heat transfer coefficient of the system is 300 Btu/(hr)(ft^2) (°F). Calculate the heat gained by water per hr per ft of the pipe, when entrance and exit temperatures are 90° F and 190°F respectively.

3 × 5

9. a) How will you calculate the power consumption of mixer impellers ?

b) Give all the mathematical formulae involved and the graphical representation.

c) Define the various dimensionless quantities and constants used in the equation. 5 + 5 + 5

10. a) Classify pulverisers with respect to size reduction capacity.

b) Mention different applications of pulverisers in industrial pharmacy.

c) Describe with principle, how you will analyze a sample of Resin particles in your laboratory by Stokes law of sedimentation using liquid paraffin.

d) Determine the diameter of a Resin particle of density 1·28 gm/cc. moving by terminal settling velocity takes 12 sec to cover a distance of 18 cm through liquid paraffin of density 0·65 gm/c.c. and viscosity 18 c.p.

3 + 3 + 4 + 5

11. a) What is entrainment ? Explain the role of entrainment separator with a neat sketch.

b) Define thermal conductivity. Differentiate between steady state and non-steady state heat transfer.

c) Explain the working of a Ribbon blender for mixing solids. 5 + 5 + 5

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