Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Pharm (NEW)/SEM-3/PT-307/2009-10

2009
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) The venturi discharge co-efficient (C_V) is

   a) 0·61 b) 0·82

   c) 0·91 d) 0·98.

   ii) The semi-log plot is applicable for equation of the type

   a) $y = x^n$ b) $x^2 = y$

   c) $x + y = 2$ d) $y = ba^{cx}$.

   iii) If $N_{Re} < 3{,}000$, flow of fluid is

   a) turbulent b) laminar

   c) transition d) critical.

   iv) Dimension of Fanning's friction factor (f) is

   a) $ML^{-1}T^{-1}$ b) $ML^{-2}T^{-1}$

   c) MLT^{-1} d) Dimensionless.

v) Kozeny-Carman equation is related to the theory of
   a) filtration b) centrifugation
   c) heat transfer d) mass transfer.

vi) Which of the following is variable area meter ?
   a) rotameter b) orifice meter
   c) venturi meter d) both (b) & (c).

vii) Addition of filter aid to the slurry before filtration is done to
   a) increase the porosity of cake
   b) decrease the porosity of cake
   c) increase the mass of cake
   d) none of these.

viii) Which one of the following is reciprocating pump ?
   a) jet pump b) plunger pump
   c) gear pump d) peristaltic pump.

ix) Fuller's earth is an example of
   a) filter media b) filter aid
   c) surfactant d) emulsifier.

x) Which of the following types of filter is used to filter gelatinous precipitate ?
   a) rotary filter b) leaf filter
   c) plate and frame filter d) all of these.

xi) *Vena-contracta* is formed in case of
   a) pitot tube b) orifice meter
   c) venturi meter d) rotameter.

xii) Filtration at higher temperature
   a) increases the filtration rate
   b) decreases the filtration rate
   c) does not change the filtration rate
   d) can't be said.

GROUP – B
(Short Answer Type Questions)

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

2. Distinguish between time-dependent and time-independent fluid.

3. Determine the difference in forces in a flowing liquid between the two ends of a pipe of 3 cm I.D. at a distance of 5 metres, when average velocity of the liquid at laminar condition is 6 cm/sec. Viscosity of the liquid at flowing temperature is 0·015 poise.

4. Define first aid. What is the first aid treatment for acid & alkali burns ?

5. Calculate the mass in pound of hundred litre methane at 27° C and 720 mm Hg pressure.

6. What are the advantages of reciprocating pump over centrifugal pump ?

GROUP – C
(Long Answer Type Questions)

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

7. a) State the importance of conveying in pharmaceutical industry. Describe the construction and working of a belt conveyer system. 8

   b) What is the principle of centrifugation ? Describe different types of industrial centrifuges. Describe the construction and working principle of a solid bow L centrifuge. 7

8. A pump draws a liquid of specific gravity 1·84 from a storage tank of large cross-section through a pipe having an I.D. of 3 inch. The velocity in the suction line is 2 f.p.s. The pump discharges the liquid to an overhead tank through a pipe having an I.D. of 2 inch. Both the storage and overhead tanks are open to atmosphere. The end of the discharge line is 120 ft above the level of liquid in the storage tank. Frictional losses in the entire system are 20 ft^2/sec^2. What pressure must the pump developed. What is the theoretical horse power (h.p.) of the pump if efficiency of the pump is 70% ? 15

9. a) What are filter aids ? Name the important filter acids. 5

   b) What are the applications of filtration in pharmaceutical industry ? 5

   c) With the help of a neat diagram, describe the working principle of a rotary vacuum filter. 5

10. a) What is venturi meter ? How is it used to determine the mass flow rate (m) of a liquid through a pipeline ? Derive the relevant equation. 8

    b) Water flows in a pipeline with Reynolds No. 6,000. Internal dia of the pipe is 2·5 cm. The viscosity and density of the water at the operating conditions are 0·01 poise and 0·995 gm/cm^3 respectively. Calculate the mass flow rate in kg/min. 7

11. Define the terms dimensional equations & dimensional analysis. Deduce the pressure drop (Δp) expression for laminar flow by dimensional analysis. 5 + 10