



Name :
Roll No. :
Invigilator's Signature :

CS/B.PHARM (NEW)/SEM-3/PT 307/2011-12

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 :
 $10 \times 1 = 10$
- i) One atmospheric pressure is equal to
 - a) 1.01325×10^5 pascal
 - b) 1.3101325×10^7 pascal
 - c) 1.01325×10^3 pascal
 - d) 1.01325×10^9 pascal.
 - ii) Dimensional formula for Fanning Friction Factor is equal to
 - a) $QL^{-2} \theta^{-1} T^{-1}$
 - b) $ML^{-1} \theta^{-1}$
 - c) $QL^{-1} \theta^{-1} T^{-1}$
 - d) $M^0 Q^0 L^0 \theta^0 T^0$.
 - iii) Separation of liquids of same volatility and different densities is possible by
 - a) Distillation
 - b) Filtration
 - c) Centrifugation
 - d) Extraction.

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- iv) A 10% change in porosity of cake can produce change in volume by
 - a) 3-folds
 - b) 2-folds
 - c) 4-folds
 - d) 5-folds.
- v) Flow of filtrate through pores of filter cake is considered to follow
 - a) Poiseuille's equation
 - b) Fick's equation
 - c) Stokes equation
 - d) none of these.
- vi) Which of the following types of filter is used to filter gelatinous precipitate ?
 - a) Rotary filter
 - b) Leaf filter
 - c) Plate and frame filter.
- vii) Supercentrifuge is a
 - a) filtration centrifuge
 - b) sedimentation centrifuge
 - c) ultracentrifuge
 - d) none of these.
- viii) De Laval clarifier is called
 - a) conical disc centrifuge
 - b) tubular bow centrifuge
 - c) basket
- ix) Detonation is the sudden violent change of
 - a) volume
 - b) pressure
 - c) temperature
 - d) humidity.
- x) Unit of kinematic viscosity is
 - a) dynes/cm²
 - b) stokes
 - c) dynes.sec/cm
 - d) poise.



- xi) Which of the following valves is used for unidirectional flow of fluids ?
- a) Ball valve b) Check valve
c) Diaphragm valve d) Gate valve.
- xii) Mole fraction of O₂ in a gaseous mixture is 0.25. The mole per cent will be
- a) 30 b) 40
c) 25 d) 35.

GROUP - B

(Short Answer Type Questions)

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

- Explain Prandtl boundary layer of fluid flow in a pipeline with a suitable sketch.
- Write a short note on joints and valves in pipelines.
- Water is flowing in a pipe (I.D 3.0 cm) with the Reynolds number 3500. The viscosity and density of water at the operating condition are 0.01 poise and 0.99537 gm/cc. Calculate mass flow rate.
- The heat transfer co-efficient of an organic liquid is $350 \text{ BTU} / (\text{ft}^2) (\text{hr}) (^\circ\text{F})$ what would be its value in $\text{kcal} / (\text{m}^2) (\text{hr}) (^\circ\text{C})$.
- Deduce the pressure drop (ΔP) expression for turbulent flow by dimensional analysis.



GROUP - C

(Long Answer Type Questions)

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

7. a) Write a short note on graphical integration.
b) Write a note on material balance and energy balance.
c) Explain mole fraction and weight fraction. $5 + 5 + 5$
8. a) What is inclined tube manometer ? Derive the relevant equation. What is the utility of inclination ?
b) Describe the principle, construction and industrial application of a U-tube manometer. $9 + 6$
9. With the help of diagrams, describe the design and working of non-washing and washing types of plate and frame filter presses. What are the advantages, disadvantages and applications of filter press. $5 + 5 + \left(2 \times 2 \frac{1}{2}\right)$
10. The power (P, ft - lb/sec) required to rotate a given impeller in an agitation tank is a function of few variables. Derive empirical correlation of power with its variable by dimensional analysis method where shape factors are ignored & liquid is assumed to be Newtonian.
11. a) A gas mixture has the following composition by volume —
 $\text{SO}_2 = 8.5\%$
 $\text{O}_2 = 10\%$
 $\text{N}_2 = 81.5\%$
Determine —
i) Composition by weight
ii) Average molecular weight of the mixture
iii) The density of gas mixture at a temperature of 473K (200°C) and 202.65 kPa
- b) What are the possible industrial hazards ? How can they be controlled ? $7 + 8$

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