

**PARTICLE & FLUID PARTICLE PROCESSING
(CHE2101)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) What is Φ_s ?
(a) Sphere (b) Cubicity
(c) Sphericity (d) Void age.
- (ii) Which of the following terminology is not used for size reduction of materials to fine sizes or powders?
(a) Comminution (b) Dispersion
(c) Pulverisation (d) Compression.
- (iii) Size measurement of ultrafine particles can be expressed in terms of
(a) Centimetre (b) Screen size
(c) Micron (d) Surface area per unit mass
- (iv) Energy requirement (per unit mass of material crushed/ground) is highest for
(a) Jaw crusher (b) Rod mill
(c) Ball mill (d) Fluid energy mill
- (v) What does the below equation represent?
$$\frac{P}{m} = \frac{K_b}{\sqrt{D_p}}$$

(a) Bond's law (b) Kick's law
(c) Rittingers law (d) Camp law.
- (vi) In the Newton's Law region terminal velocity of particle is proportional to
(a) Square root of particle diameter (b) Particle diameter
(c) Square of particle diameter (d) Cube root of particle diameter
- (vii) The unloading time depends upon the _____.
(a) Torque (b) Radial (c) Axial (d) Longitudinal
- (viii) Froth floatation is the most suitable for treating _____.
(a) Iron ores (b) Supplied ores (c) Quartile (d) Iron ores

- (ix) Which of the following is an example of a sorting classifier?
 (a) Bag filter (b) Cyclone separator
 (c) Elutriator (d) Centrifuge.
- (x) As the solids are deposited, the cake resistance will _____.
 (a) decrease (b) increase (c) constant (d) stable.

Fill in the blanks with the correct word

- (xi) Aperture length is _____.
- (xii) Gizzlies are used for separating _____ solids.
- (xiii) The Ergun equation is used to calculate the _____.
- (xiv) To obtain largest throughput, rate of sedimentation should be _____.
- (xv) Addition of filter aid to the slurry before filtration is done to _____ of the cake.

Group - B

2. (a) How do the physical and chemical properties of particulate solids affect their behavior in processing and product performance? [[CO1](Remember/LOCQ)]
- (b) Describe the effect of feed rate on screen efficiency with schematic diagram. [[CO2](Apply/IOCQ)]
- (c) Define ideal screen. [[CO3](Analyse/HOCQ)]
- 6 + 4 + 2 = 12**
3. (a) State the name of the various types of industrial screen equipment for the solid particles. [[CO1](Apply/IOCQ)]
- (b) What are the key considerations for handling and storing solid particles to prevent damage, contamination, and safety hazards? [[CO1](Remember/LOCQ)]
- (c) Describe the operating principle of Gyrotor screen and Trommels screen. [[CO1](Remember/LOCQ)]
- 3 + 3 + 6 = 12**

Group - C

4. (a) Explain Rittinger's Law of Comminution, including its assumptions and limitations. [[CO2](Remember/LOCQ)]
- (b) A material is crushed in a jaw crusher in which feed of average size of 70 mm is reduced to 30 mm while consuming 15 kW/(kg/s) energy. Compute the energy consumption to crush the same material of 90 mm average size to 20 mm. use Kick's and Rittinger's laws. [[CO2](Apply/IOCQ)]
- 6 + 6 = 12**
5. (a) Define Nip angle. Explain the working principle of roll crushers with neat schematic diagram. [[CO3](Analyse/HOCQ)]
- (b) Explain the process of nucleation and growth of particles. [[CO4](Remember/LOCQ)]
- (2 + 6) + 4 = 12**

Group - D

6. (a) For agitating a large volume of a moderately viscous liquid, what type of agitator would you select? Explain. *[[CO3)(Analyse/HOCQ]]*
(b) Define terminal settling velocity for a moving particle and its importance in the drag force. *[[CO2)(Apply/IOCQ]]*
8 + 4 = 12
7. (a) State the significance of Ergun and Kozeny Carman equation. *[[CO3)(Analyse/HOCQ]]*
(b) Define forth flotation. Describe the basic operation of forth flotation process. *[[CO4)(Remember/LOCQ]]*
4 + 8 = 12

Group - E

8. (a) Describe the different types of nanomaterial synthesis methods in a block diagram. *[[CO4)(Remember/LOCQ]]*
(b) Describe the working principle of cyclone separator with a neat schematic diagram. *[[CO4)(Remember/LOCQ]]*
6 + 6 = 12
9. (a) Describe the working principle of continuous rotary drum filter. *[[CO4)(Analyse/HOCQ]]*
(b) Describe the working principle of electrostatic precipitator with a neat schematic diagram. *[[CO4)(Apply/IOCQ]]*
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	46.88	23.96	29.16

