Uka Tarsadia University(Diwaliba Polytechnic)
Diploma in Chemical Engineering
Objective Type Questions (Mechanical Operations)

Unit 1 Properties and Handling of Particulate Solids

1. Short distance transportation of grain, gravel, sand, ash, asphalt etc. is done by using a _____ conveyor.
   a) Flight
   b) Slat or drag
   c) Ribbon
   d) Screw
2. Equivalent diameter of a particle is the diameter of the sphere having the same
   a) Ratio of surface to volume as the actual volume.
   b) Ratio of volume to surface as the particle.
   c) Volume as the particle.
   d) None of these.
3. If dp is the equivalent diameter of a non-spherical particle, Vp its volume and sp its surface area, then its sphericity is Φs is defined by
   a) Φs = 6 Vp/dp sp
   b) Φs = Vp/dp sp
   c) Φs = 6 dp Sp/Vp
   d) Φs = dp Sp/Vp
4. Which of the following is not categorised as a "mechanical operation" ?
   a) Agitation
   b) Filtration
   c) Size enlargement
   d) Humidification
5. Number of particles in a crushed solid sample is given by (where, m = mass of particles in a sample, Vp = volume of one particle, ρ= density of particles)
   a) m/ρ .Vp
   b) m . ρ/Vp
   c) m . Vp/ρ
   d) Vp/m . ρ
6. For a non-spherical particle, the sphericity
   a) Is defined as the ratio of surface area of a sphere having the same volume as the particle to the actual surface area of the particle.
   b) Has the dimension of length.

c) Is always less than 1.
d) Is the ratio of volume of a sphere having the same surface area as the particle to the actual volume of the particle.

7. The capacity of a belt conveyor depends upon two factors. If one is the cross-section of the load, the other is the _____ of the belt.
   a) Speed
   b) Thickness
   c) Length
   d) None of these
8. The capacity of a pneumatic conveying system depends upon the
   a) Bulk density of materials.
   b) Pressure of the conveying air.
   c) Diameter of the conveying line.
   d) All (a), (b) and (c).
9. For transporting pasty material, one will use a/an
   a) Apron conveyor
   b) Belt conveyor
   c) Screw conveyor
   d) Bucket elevator
10. Shape factor for a cylinder whose length equals its diameter is
    a) 1.5
    b) 0.5
    c) 1.0
    d) 2.0
11. Which of the follwoing mechanical conveyors does not come under the division 'scrapers' ?
    a) Ribbon conveyor
    b) Flight conveyor
    c) Bucket elevators
    d) Drag conveyor.
12. Sphericity of a cubical particle, when its equivalent diameter is taken as the height of the cube, is
    a) 0.5
    b) 1
    c) 2
    d) 3
13. The sphericity of a cylinder of 1 mm diameter and length 3 mm is
    a) 0.9
    b) 0.78
    c) 0.6
    d) 0.5

14. Specific surface area is the surface area of a unit _____ of materials.
    a) Weight
    b) Volume
    c) Either (a) or (b)
    d) Neither (a) nor (b)
15. Driving force in case of filtration by a centrifuge is the
    a) Speed of the centrifuge.
    b) Centrifugal pressure exerted by the liquid.
    c) Narrow diameter of the vessel.
    d) Formation of highly porous cake.
16. Sphericity is the ratio of the surface area of a spherical particle having the same volume as the particle to the surface area of the particle. Which of the following has the maximum value of sphericity ?
    a) Sphere
    b) Cube
    c) Cylinder (L/D = 1)
    d) Raschig rings
17. _____ conveyor is the most suitable for long distance transportation of cold, non-abrasive granular/irregular shape/fine materials.
    a) Bucket
    b) Belt
    c) Screw
    d) Apron
18. Width and speed of a conveyor belt depends upon the _____ of the material.
    a) Lump size
    b) Bulk density
    c) Both (a) & (b)
    d) Neither (a) nor (b)
19. _____ conveyor is the most suitable for short distance transportation of non-abrasive loose materials like garbage, grain, food wastes etc.
    a) Flight
    b) Screw
    c) Drag
    d) Belt
20. Sphericity of pulverised coal is
    a) 1
    b) <1
    c) >1
    d) ∞
21. Which of the following is the hardest material ?
    a) Calcite
    b) Quartz

c) Corundum
d) Gypsum

22. Size measurement of ultrafine particles can be best expressed in terms of
    a) Centimetre
    b) Screen size
    c) Micron
    d) Surface area per unit mass
23. For a sphere falling in the constant drag co-efficient regime, its terminal velocity depends on its diameter (d) as
    a) d
    b) d
    c) d^2
    d) 1/d
24. For spheres, the surface shape factor is given by (where, A = area, V = volume, and D = diameter)
    a) π(=A/D2)
    b) π/6(=V/D3)
    c) $\frac{AD}{V}$
    d) None of these.
25. Which of the following is the softest material ?
    a) Talc
    b) Feldspar
    c) Corundum
    d) Calcite
26. _____ conveyors are also called scrapers.
    a) Apron
    b) Screw
    c) Helical flight
    d) both (b) & (c)
27. The specific surface of sherical particles is proportional to (where, Dp = diameter of particle).
    a) D2p
    b) Dp
    c) 1/Dp
    d) 1/D2p
28. Which of the following conveyors cannot be recommended for transportation of abrasive materials ?
    a) Belt conveyor
    b) Apron conveyor
    c) Flight conveyor
    d) Chain conveyor
29. Hot, lumpy & abrasive materials are best transported by using a/an _____ conveyor.

a) Apron
b) Belt
c) Screw
d) Flight

30. The maximum slope of a belt conveyor can be
    a) 15°
    b) 30°
    c) 45°
    d) 60°
31. _____ mean diameter of particles is given by
    a) Mass
    b) Volume
    c) Arithmetic
    d) Volume surface
32. Screw conveyors are
    a) Run at very high rpm.
    b) Suitable for sticky materials.
    c) Suitable for highly abrasive materials.
    d) All (a), (b) and (c)
33. For spheres, the specific surface shape factor is given by
    a) AD/V
    b) D/V
    c) A/V
    d) AV/D
34. Screen efficiency is
    a) Recovery/rejection
    b) Recovery
    c) Rejection
    d) None of these
35. Handling of ashes and similar materials can be done best by a _____ conveyor.
    a) Flight
    b) Drag or slat
    c) Belt
    d) Ribbon.
35. Apron conveyors are used for
    a) Heavy loads & short runs.
    b) Small loads & long runs.
    c) Heavy loads & long runs.
    d) None of these.
36. The specific surface of spherical particles is given by (where D and ρ are diameter and density of particle).

a) $\frac{6}{D.\rho}$
b) $\frac{2}{D.\rho}$
c) $\frac{4}{D.\rho}$
d) $\frac{12}{D.\rho}$

37. The sphericity of a solid particle of cubical shape is
    a) π
    b) (π/6)1/3
    c) (π/6)1/2
    d) π/3
38. Vertical transportation of materials can be done by a/an
    a) Apron conveyor
    b) Pneumatic conveyor
    c) Bucket elevator
    d) Both(b)&(c)
39. The ratio of the area of openings in one screen (Taylor series) to that of the openings in the next smaller screen is
    a) 1.5
    b) 1
    c) 2
    d) none of these
40. For raschig rings, the sphericity is
    a) 0.5
    b) 1
    c) <1
    d) 3
41. The most suitable equipment for the transportation of 200 mesh size particles is a
    a) Bucket elevator
    b) Pneumatic conveyor
    c) Screw conveyor
    d) Belt conveyor
42. Reciprocal of sphericity is termed as the
    a) Specific surface ratio
    b) Shape factor
    c) Sauter diameter
    d) Surface area per unit mass
43. Pick out the wrong statement.
    a) Hammer crushers operate by impact action.
    b) Standard screens have circular opening.

c) With increase in mesh number of screens, their diameter in microns decreases.
d) 200 mesh screen has 200 openings per linear cm.

44. Sphericity for a non-spherical particle is given by (where, V and S are volume and surface area respectively of one particle. and, D = equivalent diameter of particle).
a) $\frac{6.V}{D.S}$
b) $\frac{V}{6D.S}$
c) $\frac{D.S}{V}$
d) $\frac{V}{D.S}$

45. Pick out the correct statement.
a) The capacity and the effectiveness of a screen are the same.
b) The capacity and the effectiveness of screen are opposing factors.
c) The screening surface of a 'reel' (a revolving screen used in flour mills) is made of silk bolting cloth supported by wire mesh.
d) both (b) and (c).

46. A belt conveyor used for the transportation of materials can
a) Run upto 1 km.
b) Travel at a speed upto 300 metres/minute.
c) Handle materials upto 5000 tons/hr.
d) All (a), (b) and (c).

47. _____ is a cohesive solid.
a) Wheat
b) Sand
c) Wet clay
d) None of these

48. What is φs?
a) Sphere
b) Cubicity
c) Sphericity
d) Void age

49. The two basic methods of analysis are _____
a) Cumulative and Affirmative
b) Cumulative and Frequency
c) Frequency and Affirmative
d) Affirmative and Conservative

Unit 2 Screen Analysis and Screening

1. For sizing of fine materials, the most suitable equipment is a
   a) Trommel
   b) Grizzly
   c) Shaking screen
   d) Vibrating screen
2. The distribution given by microscopic analysis of powder is
   a) Number
   b) Length
   c) Area
   d) Volume
3. Pick out the correct statement:
   a) Removal of iron from ceramic material is necessitated (by magnetic separation method) so as to avoid discolouration of ceramic products.
   b) The operating cost of shaking screen is more than that of a vibrating screen.
   c) Screen capacity does not depend upon the specific gravity of the minerals.
   d) Asphalt is best crushed using toothed roll crusher.
4. Jigging is a technique by which different particles can be
   a) Separated by particle size.
   b) Separated by particle density.
   c) Separated by particle shape.
   d) Mixed.
5. 200 mesh screen means 200 openings per
   a) cm^2
   b) cm
   c) inch
   d) $inch^2$
6. Trommels separate a mixture of particles depending on their
   a) Size
   b) Density
   c) Wettability
   d) Electrical & magnetic properties
7. Screen capacity is not a function of
   a) Its openings size.
   b) Screening mechanism.
   c) Screening surface.
   d) Atmospheric humidity.
8. increasing the capacity of a screen _____ the screen effectiveness.
   a) Decreases.
   b) Increases
   c) Does not effect

d) None of these

9. The crushed material received for separation is called feed or
   a) Tailing
   b) Heading
   c) Concentrate
   d) Middling
10. For spheres, volume shape factor is given by
   a) $\pi(=A/D2)$
   b) $2\pi(=2A/D2)$
   c) $\pi/6(=V/D3)$
   d) AD/V
11. _____ is defined as the geometric mean of the relative rejections and the relative recoveries of two minerals.
   a) Separation efficiency
   b) Selectivity index
   c) Concentration ratio
   d) none of these
12. Pulverised coal passing through 200 mesh screen has a diameter of 0.074 mm (74 micron). The same passing through 50 mesh screen will have a dia of _____ mm.
   a) 0.007
   b) 0.30
   c) 50
   d) 0.014
13. What is the selectivity index, if the grade of tailings & concentrate is the same ?
   a) 0
   b) ∞
   c) 1
   d) 0.5
14. Mesh indicates the number of holes per
   a) Square inch
   b) Linear inch
   c) Square foot
   d) Linear foot
15. Trommels employ _____ for screening of materials.
   a) Fibrous cloth
   b) Woven wire screen
   c) Punched plate
   d) None of these
16. A widely used size reduction equipment for _____ is Bradford breaker.
   a) Talc
   b) Coal
   c) Iron core

d) Wheat

17. Gizzlies are used for separating _____ solids.
    a) Coarse
    b) Fine
    c) Any size
    d) None of these

18. Higher is the mesh number, smaller will be the aperture size of the screen. It means that the aperture size of a 200 mesh screen will be smaller than that of 20 mesh screen. This is valid for
    a) British standard screens.
    b) German standard screens (DIN 1171) etc.
    c) American standard screens (ASTM and Tyler standard screens).
    d) all (a), (b) and (c).
19. Pick out the wrong statement.
    a) Cummulative analysis for determining surface area is preferred over differential analysis, because of the assumption that "all particles in a simple fraction equal in size" is not needed for cummulative anslysis unlike differential anlaysis.
    b) A gate diagram is a plot of cummulative percent by weight undersize vs. the reciprocal of diameter, in which the area beneath the curve represents the surface.
    c) Capacity of crusher in choke feeding is increased.
    d) Rolling of pebbles/balls from top to bottom of the heap in tumbling mills is called 'cascading and throwing of the balls through the air to the toe of the heap is called 'cataracting'.
20. Ore concentration by jigging is based on the difference in the _____ of the particles.
    a) Specific gravities
    b) Wettability
    c) Shape
    d) None of these
21. Reciprocating screens are normally inclined at an angle of 5° with the horizontal and employ gyratory motion at feed end & reciprocating motion at the discharge end. They are not suitable for the screening of the
    a) Light metal powder down upto 4 meshsize.
    b) Dry chemicals.
    c) Heavy tonnages of rocks or gravel.
    d) Powdered food & granular materials.
22. With increase in the capacity of screens, the screen effectiveness
    a) Remains unchanged
    b) Increases
    c) Decreases
    d) Decreases exponentially
23. As particle size is reduced

a) Screening becomes progressively more difficult.
b) Screening becomes progressively easier.
c) Capacity and effectiveness of the screen is increased.
d) None of these.

24. In screen analysis, the notation +5 mm/-10 mm means particles passing through
a) 10 mm screen and retained on 5 mm screen.
b) 5 mm screen and retained on 10 mm screen.
c) Both 5 mm and 10 mm screens.
d) Neither 5 mm nor 10 mm screen.

25. Optimum ratio of operating speed to critical speed of a trommel is
a) 0.33-0.45
b) 1.33-1.45
c) 0.5-2
d) 1.5-2.5

26. RPM of a trommel at critical speed is given by (where, D = Diameter of trommel in ft)
a) $\frac{76.65}{D}$
b) $\frac{76.75}{\sqrt{D}}$
c) $\frac{76.75}{D^2}$
d) 76.75 D

27. Trommels are revolving screens which normally operate in the range of _____ rpm.
a) 1 - 2
b) 15 - 20
c) 40 - 50
d) 60 - 75

28. Screen capacity is expressed in terms of
a) Tons/hr
b) Tons/ft^2
c) Both (a) & (b)
d) Tons/hr-ft^2

29. A screen is said to be blinded, when the
a) Oversizes are present in undersize fraction.
b) Undersizes are retained in oversize fraction.
c) Screen is plugged with solid particles.
d) Screen capacity is abruptly increased.

30. The opening of a 200 mesh screen (Taylor series) is
a) 0.0074 cm
b) 0.0074 mm

c) 0.0047 cm
d) 74 mili-microns

31. The critical speed of a trommel (N) is related to its dia (D) as
    a) $N \propto$
    b) $N \propto D$
    c) $N \propto D$
    d) $N \propto$
32. Mass flow of granular solid (M) through a circular opening of dia, D follows
    a) $M \propto D$
    b) $M \propto D^2$
    c) $M \propto D^3$
    d) $M \propto D$
33. Sauter mean diameter is the same as the _____ mean diameter.
    a) Mass
    b) Arithmetic
    c) Volume-surface
    d) Geometric
34. A sand mixture was screened through a standard 10-mesh screen. The mass fraction of the oversize material in feed, overflow and underflow were found to be 0.38, 0.79 and 0.22 respectively. The screen effectiveness based on the oversize is
    a) 0.50
    b) 0.58
    c) 0.68
    d) 0.62
35. Wet seiving is employed, when the product contains _____ materials.
    a) Abrasive
    b) Large quantity of very fine
    c) Coarse
    d) Non-sticky
36. Vibrating screens have capacity in the range of _____ tons/ft2 .mm mesh size.
    a) 0.2 to 0.8
    b) 5 to 25
    c) 50 to 100
    d) 100 to 250
37. Cumulative analysis for determining surface is more precise than differential analysis, because of the
    a) Assumption that all particles in a single fraction are equal in size.
    b) Fact that screening is more effective.
    c) Assumption that all particles in a single fraction are equal in size, is not needed.
    d) None of these.
38. 200 mesh seive size corresponds to _____ microns.

a) 24
b) 74
c) 154
d) 200

39. Which of the following is not an industrial screening equipment?
    a) Sharpies centrifuge
    b) Vibrating screen
    c) Grizzly
    d) Trommel
40. For Indian standard (IS) screens, the mesh number is equal to its aperture size expressed to the nearest deca-micron (0.01 mm). Aperture width of IS screen of mesh number 50 will be approximately _____ microns.
    a) 5
    b) 50
    c) 500
    d) 5000
41. Which of the following screens has the maximum capacity ?
    a) Grizzlies
    b) Trommels
    c) Shaking screen
    d) Vibrating screen
42. Vibrating screens are used for handling large tonnages of materials. The vibrating motion is imparted to the screening surface by means of
    a) Electromagnets
    b) Cams or eccentric shafts
    c) Unblanced fly wheels
    d) Either (a), (b) or (c).
43. Screen capacity is proportional to (where, S = screen aperture)
    a) S
    b) 1/S
    c) S2
    d) S
44. The ratio of the actual mesh dimension of Taylor series to that of the next smaller screen is
    a) 2
    b) 2
    c) 1.5
    d) 3
45. Which is not screening equipment?
    a) Trommel screen
    b) Vibrating Screen
    c) Disc Screen
    d) Thichner

46. Which characteristic impacting screening performance
    a) Particle size distribution
    b) Particle shape
    c) Bulk density
    d) All of above
47. In screeing, metaerial which pass through screen is known as
    a) Underflow
    b) Overflow
    c) Heading
    d) Middling
48. In screeing, metaerial which does not pass through screen is known as
    a) Underflow
    b) Overflow
    c) Heading
    d) Middling
49. A screening machine consist of a
    a) Drive
    b) Screen media
    c) Deck
    d) All of above

Unit 3 Size Reduction

1. Power required to drive a ball mill with a particular ball load is proportional to (where, D = diameter of ball mill)
   a) D
   b) 1/D
   c) D2.5
   d) 1/D2.5
2. Pick out the wrong statement.
   a) Recycled coarse material to the grinder by a classifier is termed as circulating load.
   b) Wear and tear in wet crushing is more than that in dry crushing of materials.
   c) Size enlargement (opposite of size reduction) is not a mechanical operation.
   d) A 'dust catcher' is simply an enlargement in a pipeline which permits the solids to settle down due to reduction in velocity of the dust laden gas.
3. Pebble mills are tumbling mills widely used for grinding in the manufacture of paints & pigments and cosmetic industries, where iron contamination in the product is highly objectionable. Pebbles used in pebble mill are made of
   a) Bronze
   b) Stainless steel
   c) Flint or porcelain
   d) Concrete
4. Which of the following relationships between co-efficinet of friction (μ) between rock & roll and a (half of the angle of nip) of the particle to be crushed is correct ?
   a) $\mu > \tan \alpha$
   b) $\mu \geq \tan \alpha$
   c) $\mu > \tan 2\alpha$
   d) $\mu \leq \tan \alpha$
5. Pick out the wrong statement pertaining to the roll crushers.
   a) Maximum feed size determines the required roll diameter.
   b) For hard material's crushing, the reduction ratio should not exceed 4.
   c) Both the rolls run necessarily at the same speed.
   d) Reduction ratio and differential roll speed affect production rate & energy consumed per unit of surface produced
6. Which of the following is not an ultrafine grinder (colloid mill)?
   a) Micronizers
   b) Agitated mills and fluid energy mills
   c) Toothed roll crusher
   d) Hammer mills with internal classification
7. Ball mills and tube mills with flint or porcelain balls are used for size reduction of
   a) Asbestos
   b) Rubber

c) Non-metallic ores
d) Limestone

8. Size reduction of _____ is accomplished in steam heated rollers and roll crushers.
   a) Resins
   b) Gums
   c) Hard rubber
   d) Waxes
9. Which of the following is not a part of the Blake jaw crusher?
   a) Hanger
   b) Check plates
   c) Toggles
   d) Pitman
10. Which of the following mineral dressing operations is termed as 'comminution'?
   a) Panning
   b) Spiralling
   c) Tabling
   d) None of these
11. Pick out the wrong statement.
   a) Close circuit grinding is more economical than open circuit grinding.
   b) Cod oil, beef tallow or aluminium stearates are used as grinding aids in cement 'industries'.
   c) The equipment used for the removal of traces of solids from a liquid is called a classifier.
   d) Size enlargement is a mechanical operation exemplified by medicinal tablet making.
12. The energy required per unit mass to grind limestone particles of very large size to 100 μm is 12.7 kWh/ton. An estimate (using Bond's law) of the energy to grind the particles from a very large size to 50 μrn is
   a) 6.35 kWh/ton
   b) 9.0 kWh/ton
   c) 18 kWh/ton
   d) 25.4 kWh/ton
13. The value of 'angle of nip' is generally about
   a) 16°
   b) 32°
   c) 52°
   d) 64°
14. Size reduction of the _____ can be suitably done by ball mills, crushing rolls and rod mills.
   a) Metalliferrous ores
   b) Non-metallic ores
   c) Basic slags
   d) Asbestos & mica

14. The main size reduction operation in ultrafine grinders is
    a) Cutting
    b) Attrition
    c) Compression
    d) Impact
15. In case of a hammer crusher,
    a) Crushing takes place by impact breaking.
    b) Maximum acceptable feed size is 30 cms.
    c) Reduction ratio can be varied by adjusting the distance from cage to hammers.
    d) All (a), (b) and (c).
15. Crushing of mineral particles is accomplished in a 'cage mill', when one or more alloy steel bars are revolved in opposite directions. It is a type of _____ mill.
    a) Impact
    b) Roll
    c) Vibratory
    d) None of these
16. Balls for ball mills are never made of
    a) Forged/cast steel
    b) Lead
    c) Cast iron
    d) Alloy steel
17. Energy consumed for crushing one ton of material ranges from _____ kWh.
    a) 0.01 to 0.1
    b) 0.5 to 1.5
    c) 2 to 3.5
    d) 4 to 5.
18. A tube mill compared to a ball mill
    a) Has a higher length/diameter ratio.
    b) Produces a coarser product.
    c) Has a higher diameter/length ratio.
    d) Uses much larger balls.

19. Basic slag is not ground in
    a) Jaw crushers
    b) Ball mills
    c) Compartment mills
    d) Tube mills
20. Grindability of a material does not depend upon its
    a) Elasticit
    b) Hardness
    c) Toughness
    d) Size

21. In case of a hammer crusher, the
    a) Feed may be highly abrasive (moh's scale >5).
    b) Minimum product size is 3 mm.
    c) Maximum feed size may be 50 mm.
    d) Rotor shaft carrying hammers can be vertical or horizontal.
22. Rittinger's number designates the new surface created per unit mechanical energy absorbed by the material being crushed. Larger value of rittinger's number of a material indicates its
    a) Easier grindability
    b) Poor grindability
    c) High power consumption in grinding
    d) None of these
23. Capacity (in tons/hr) of jaw/gyratory crusher is equal to (where, L = length of the receiving opening, cm S = greater width of the discharge opening, cm)
    a) L.S
    b) B. 0.087 L.S
    c) C. L.S
    d) D. L.S/0.087
24. General crushing equation is given by . Bond's crushing law isobtained by solving this equation for n = _____ and feed of infinite size.
    a) 1
    b) 1.5
    c) 2
    d) 2.5
25. Length/diameter ratio of a ball mill is
    a) 1.5
    b) 1
    c) < 1
    d) > 1
26. Feed size of ≥ 25 cms can be accepted by
    a) Ball mill
    b) Rod mill
    c) Fluid energy mill
    d) Jaw crusher
27. Ball mill is used for
    a) Crushing
    b) Coarse grinding
    c) Fine grinding
    d) Attrition
28. In case of a ball mill,
    a) Coarse feed requires a larger ball.
    b) Fine feed requires a larger ball.
    c) Operating speed should be more than the critical speed.

d) None of these

29. Maximum size reduction in a ball mill is done by the, _____ action.
    a) Attrition
    b) Compression
    c) Impact
    d) Cutting
30. Bond crushing law
    a) Calls for relatively less energy for the smaller product particles, than does the rittinger law.
    b) Is less realistic in estimating the power requirements of commercial crushers.
    c) States that the work required to form particle of any size from very large feed is proportional to the square root of the volume to surface ratio of the product.
    d) States that the work required for the crushing is proportional to the new surface created.
31. Which of the following is used for primary crushing of very hard lumpy materials ?
    a) Toothed roll crusher
    b) Gyratory crusher
    c) Ball mill
    d) Tube mill
32. Coal is finally pulverised to 200 mesh size for burning in boilers by a
    a) Hammer crusher
    b) Ball mill
    c) Roll crusher
    d) Gyratory crusher
33. Crushing efficiency is the ratio of the
    a) Surface energy created by crushing to the energy absorbed by the solid.
    b) Energy absorbed by the solid to that fed to the machine.
    c) Energy fed to the machine to the surface energy created by crushing.
    d) Energy absorbed by the solid to the surface energy created by crushing.
34. Cement clinker is reduced to fine size by a
    a) Roll crusher
    b) Ball mill
    c) Tube mill
    d) Hammer mill
35. The operating speed of a ball mill should be _____ the critical speed..
    a) Less than
    b) Much more than.
    c) At least equal to
    d) Slightly more than
36. Fibrous material is broken by a
    a) Rollcrusher
    b) Squirrel-cage disintegrator
    c) Ball mill

d) Tube mill

37. Out of the following size reduction equipments, the maximum feed size can be accepted by the
    a) Tube mill
    b) Ball mill.
    c) Jaw crusher
    d) Jet pulveriser
38. _____ balls capable of grinding the feed in a ball mill gives the maximum efficiency.
    a) Cast iron.
    b) Minimum size
    c) Maximum size
    d) Elliptical
39. Colloid mills achieve size reduction mainly by
    a) Impact
    b) Attrition
    c) Cutting
    d) Compression
40. For achieving maximum capacity of the ball mill, the ball charge should be equal to about _____ percent of the ball mill volume.
    a) 10
    b) 25
    c) 50
    d) 75
41. According to Bond crushing law, the work required to form particle of size 'D' from very large feed is (where (S/V)p and (S/V)f are surface to volume ratio of the product and feed respectively).
    a) (S/V)p
    b) (S/V)p
    c) (S/V)2p
    d) (S/V)f
42. Which of the following gives the work required for size reduction of coal to -200 mesh in a ball mill most accurately ?.
    a) Rittinger's law
    b) Kick's law
    c) Bond's law
    d) none of these
43. Electrical energy consumed by a jaw crusher is not a function of the
    a) Average feed size
    b) Average product size
    c) Machine capacity
    d) None of these
44. Size reduction mechanism used in Jaw crushers is

a) Attrition
b) Compression
c) Cutting
d) Impact

45. _____ mill is a revolving mill divided into two or more sections by perforated partitions in which preliminary grinding takes place at one end and the finishing grinding at the discharge end.
    a) Compartment
    b) Tube
    c) Rod
    d) Pebble.
46. The constants (kb, kr and kk) used in the laws of crushing (i.e., bond's law, rittinger's law and kick's law) depend upon the
    a) Feed material
    b) Type of crushing machine.
    c) Both (a) & (b).
    d) Neither (a) nor (b).
47. Size reduction does not occur due to compression in case of
    a) Rod mills
    b) Gyratory crushers
    c) Jaw crushers
    d) Smooth roll crushers
48. Rod mills employed for grinding
    a) Employ a steel shell having l/d ratio of 1.5 to 3.0.
    b) Is useful for handling sticky materials.
    c) Employ steel rods of 2-12 cms diameter extending over full length of the mill.
    d) All 'a', 'b' & 'c'.
49. Production rate _____ with increased fineness, with a given energy input to the size reduction machine..
    a) Decreases
    b) Increases
    c) Remains unchanged
    d) May increase or decrease; depends on the machine
50. Run of mine (rom) coal is crushed by a _____ for use in domestic ovens.
    a) Jaw crusher
    b) Hammer crusher
    c) Ball mill
    d) Tube mill
51. Size reduction of asbestos and mica is done by
    a) Hammer mills
    b) Rod mills
    c) Gyratory crushers

d) Crushing rolls

52. Horsepower required for a roll crusher is directly proportional to its
    a) Reduction ratio.
    b) Capacity.
    c) Both (a) & (b).
    d) Neither (a) nor (b).

Answer: Option C

53. 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
54. _____ mills are termed as impactors.
    a) Hammer
    b) Cage
    c) Rolling-compression
    d) None of these
55. To get a fine talc powder from its granules, the equipment used is
    a) Roller crusher
    b) Ball mill
    c) Jaw crusher
    d) Gyratory crusher
56. Which of the following size reduction equipments employs mainly attrition for ultrafine grinding ?
    a) Jet mills
    b) Fluid energy mill
    c) Micronizer
    d) all (a), (b) and (c)
57. As the product becomes finer, the energy required for grinding
    a) Decreases
    b) Increases
    c) Is same as for coarser grinding
    d) Is 1.5 times that for coarser grinding
58. Which of the following grinding mills has the horizontally arranged rods as the grinding elements thereby delivering more uniform granular products with minimum fines ?
    a) Compartment mill
    b) Rod mill
    c) Pebble mill

d) Tube mill.

59. Which is a secondary crusher for a hard & tough stone ?
    a) Jaw crusher
    b) Cone crusher
    c) Impact crusher
    d) Toothed roll crusher
60. Temperature of the product during ultrafine grinding
    a) Increases
    b) Decreases
    c) Remains constant
    d) May increase or decrease ; depends on the material being ground
61. A fluid energy mill is used for
    a) Cutting
    b) Grinding
    c) Ultra grinding
    d) Crushing
62. Which of the following crushers can be considered as a combination of a jaw crusher and a roller crusher ?
    a) Rod mill
    b) Fluid energy mill
    c) Gyratory crusher
    d) Ball mill
63. Which of the following comes in the category of primary crusher for hard and tough stone ?
    a) Jaw crusher
    b) Cone crusher
    c) Gyratory crusher
    d) None of these
64. In closed circuit grinding as compared to open circuit grinding, the
    a) Specific surface of product is more.
    b) Product has lesser size uniformity.
    c) Production rate at a given limiting size is lower.
    d) Operation is economical.
65. Angle of nip of the crushing rolls does not depend upon the.
    a) Diameter of the rolls
    b) Speed of the rolls
    c) Product size
    d) Feed size
66. Close circuit grinding by a ball mill with air sweeping employs a
    a) Classifier.
    b) Cyclone separator between mill & classifier.
    c) Both (a) & (b).
    d) Neither (a) nor (b).

67. Wheat is ground into flour in a
    a) Hammer crusher
    b) Roller crusher
    c) Impact mill
    d) Fluid energy mill
68. Colloidal mills are used for _____ grinding.
    a) Coarse
    b) Intermediate
    c) Fine
    d) Ultrafine
69. Which of the following is not a cutting machine
    a) Dicers
    b) Knife cutters
    c) Slitters
    d) Tube mills
70. _____ baffles are provided in ball mills.
    a) Horizontal
    b) No
    c) Only two
    d) None of these
71. Stamp mills are generally used for crushing
    a) Iron ores
    b) Gold ores
    c) Talc
    d) Diamond

Unit 4 Filtration

1. In continuous filtration (at a constant pressure drop), filtrate flow rate varies inversely as th
   a) Square root of the velocity.
   b) Square of the viscosity.
   c) Filtration time only.
   d) Washing time only.
2. Which of the following is a pressure filter ?
   a) Leaf filter (moore filter).
   b) Plate and flame filter.
   c) Rotary drum filter.
   d) Sand filter.
3. Filter aids like asbestos, kieselguhr, diatomaceous earth etc. Are used to increase the porosity of the final filter cake & reducing the cake resistance during filtration. Filter aid is
   a) Added to the feed slurry.
   b) Precoated on the filter medium prior to filtration.
   c) Separated from the cake by dissolving solids or by burning it off.
   d) All 'a', 'b'&'c'.
4. Diatomaceous earth is a/an
   a) Explosive
   b) Filter aid
   c) Filter medium
   d) Catalyst
5. In washing type plate and frame filter press, the ratio of washing rate to the final filtrate rate is
   a) 4
   b) 1/4
   c) 1
   d) 1/2
6. Filter aid is used to
   a) Increase the rate of filtration..
   b) Decrease the pressure drop.
   c) Increase the porosity of the cake.
   d) Act as a support base for the septum.
7. Range of compressibility co-efficient of the commercial compressible cake obtained in filtration operation is
   a) 0.01 to 0.1
   b) 0.1 to 0.3
   c) 0.2 to 0.8
   d) 0.2 to 0.4
8. _____ is the most commonly used 'filter aid'.
   a) Diatomaceous earth

b) Fuller's earth
c) Vermiculite
d) Semi-plastic clay

9. Vacuum is applied in _____ zone, in case of a general type continuous rotary drum vacuum filter.
   a) Filtering
   b) Washing
   c) Drying
   d) All (a), (b) & (c)
10. Which of the following is a vacuum filter ?
   a) Filter press
   b) Rotary disc filter
   c) Batch basket centrifuge
   d) Tank filter (Nutsch filter)
11. Filtration of water in a paper mill is done by a/an _____ filter.
   a) Open sand
   b) Plate and frame
   c) Vacuum leaf
   d) Sparkler
12. Moore filter is a _____ filter.
   a) Leaf
   b) Press
   c) Rotary
   d) Sand
13. Flow of filtrate through the cake in a plate and frame filter press is best described by the _____ equation.
   a) Kozney-Karman
   b) Hagen-Poiseulle's
   c) Fanning's
   d) Kremser
14. The controlling resistance in a rotary drum vacuum filter is the _____ resistance.
   a) Piping
   b) Cake
   c) Filter medium
   d) None of these
15. The resistance offered by the filter used in a bag filter is proportional to (where, c = dust concentration, and s = particle size)
   a) c/s
   b) s/c
   c) s . c
   d) 1/s . c

16. For removal of very small amounts of precipitate from large volume of water, the most suitable filter is the _____ filter.
    a) Plate & frame
    b) Shell & leaf
    c) Sand
    d) Rotary vacuum
17. The most common filter aid is
    a) Diatomaceous earth
    b) Calcium silicate
    c) Sodium carbonate
    d) Silica gel
18. For separation of sugar solution from settled out mud, we use a _____ filter.
    a) Sparkler
    b) Plate and frame
    c) Centrifugal
    d) Rotary drum vaccum
19. The speed of a rotary drum vacuum filter may be about _____ rpm.
    a) 1
    b) 50
    c) 100
    d) 500
20. Which of the following represents the plot of filtrate volume versus time for constant pressure filtration ?
    a) Parabola
    b) Straight line
    c) Hyperbola
    d) Exponential curve
21. The unit of specific cake resistance is
    a) gm/cm^2
    b) cm/gm
    c) cm/gm^2
    d) gm/gm
22. The specific cake resistance for compressible sludges is a function of the pressure drop
    a) Over cake
    b) Over medium
    c) Overall
    d) None of these
23. Addition of filter aid to the slurry before filtration is done to ..... of the cake.
    a) Increase the porosity
    b) Increase the compressibility co-efficient
    c) Decrease the porosity
    d) Decrease the compressibility co-efficient

24. In filtration, the use of 'filter aid' helps in
    a) Reducing the filtration pressure.
    b) Accelerating the rate of filtration.
    c) Deplugging the filter medium.
    d) Enhancing the cake porosity in case of a dense impermeable cake.
25. Tank filter (e.g., Nutsch filter) is
    a) A high pressure filter.
    b) A continuous filter.
    c) Used for small scale filtration work.
    d) A leaf filter.
26. In bag filters, filter fabrics are never made of
    a) Metallic wire woven mesh
    b) Polyester fibres
    c) Cotton fibres
    d) Nylon fibres
27. Use of 'grinding aids' is done in _____ grinding.
    a) Dry
    b) Wet
    c) Ultrafine
    d) Intermediate
28. Which of the following is the most suitable filter for separation of abrasive solids suspended in a corrosive liquid ?
    a) Sand bed filter
    b) Plate and frame filter press
    c) Vacuum filter
    d) Batch basket centrifuge.
29. All resistances during washing of cake
    a) Increases
    b) Decreases
    c) Remain constant
    d) None of these
30. A straight line is obtained on plotting reciprocal of filtration rate vs. the volume of filtrate for _____ flow of filtrate.
    a) Compressible cakes and laminar
    b) Incompressible cake and laminar
    c) Compressible cake and turbulent
    d) Incompressible cake and turbulent
31. Filtration capacity of a rotary drum vacuum filter depends upon the
    a) Cake thickness.
    b) Characteristics of the feed slurry.
    c) Both (a) & (b).
    d) Neither (a) nor (b).

32. For laminar flow of filtrate through the cake deposited on septum, which of the following will be valid ?
    a) Kozney-Karman equation
    b) Leva's equation
    c) Blake-Plummer equation
    d) none of these
33. Which of the following is a continuous filter?
    a) Plate and frame filter
    b) Cartridge filter
    c) Shell and leaf filter
    d) None of these
34. During washing of filter at the end of constant pressure filtration, the rate of washing equals the rate of filtration
    a) At time zero.
    b) At the end of filtration.
    c) When half the filtrate has been obtained.
    d) At the end of filtration, but decreases with time subsequently.
35. The cake resistance increases steadily with the time of filtration in a plate and frame filter employing constant _____ filtration.
    a) Rate
    b) Pressure
    c) Both (a) & (b)
    d) Neither (a) nor (b)
36. Filtration rate through a filter cake is proportional to (where, S = filtering surface R = specific cake resistance μ = viscosity of the filtrate)
    a) S
    b) 1/R
    c) $1/\mu$
    d) all (a), (b) & (c)
37. Which one is a filter aid ?
    a) Convas fabric
    b) Diatomaceous earth
    c) Calcined lime
    d) None of these
38. Percentage of drum submerged in the slurry in case of rotary drum filter is
    a) 3
    b) 30
    c) 85
    d) 25
39. Filter medium resistance is that offered by the
    a) Filter cloth.
    b) Embedded particles in the septum.

c) Filter cloth and the embedded particle collectively.
d) None of these.

40. Filtration operation carried out by continuous increase of the inlet pressure of slurry, is called the _____ filtration.
    a) Constant rate
    b) Varying pressure
    c) Varying rate
    d) Constant pressure
41. Filtration operation carried out by continuous increase of the inlet pressure of slurry, is called the _____ filtration.
    a) Constant rate
    b) Varying pressure
    c) Varying rate
    d) Constant pressure
42. Gelatinous solid (which plug the septum) can be filtered by a _____ filter.
    a) Sparkler
    b) Plate and frame
    c) Vacuum leaf
    d) Precoat
43. During the washing of cake
    a) All the resistances are constant.
    b) Filter medium resistance increases.
    c) Filter medium resistance decreases.
    d) Cake resistance decreases.
44. The most suitable filter for the removal of very small amount of precipitate from very large volumes of water is the _____ filter.
    a) Vacuum
    b) Sand
    c) Plate & frame
    d) Rotary
45. Shell and leaf filter as compared to plate and frame filter
    a) Entails less labor cost.
    b) Facilitates filtration under higher pressure.
    c) Provides more effective washing.
    d) All (a), (b) & (c)
46. Metallic wire mesh is used as a filtering medium for the separation of dust from dust laden gas in case of a/an

    a) Air filter
    b) Bag filter
    c) Venturi scrubber
    d) Hydrocyclones

47. The specific cake resistance for incompressible sludges is (where ΔP = pressure drop over cake)
    a) $\propto \Delta P$
    b) $\propto 1/\Delta P$
    c) $\propto \Delta P$
    d) independent of ΔP
48. In constant pressure filtration,
    a) Resistance decreases with time
    b) Rate of filtration is constant
    c) Rate of filtration increases with time
    d) Rate of filtration decreases with time
49. Filtration should be stopped in a filter press, if the
    a) Cake becomes very dense.
    b) Liquor stops flowing out to the discharge.
    c) Filtration pressure rises suddenly.
    d) Both(b)&(c).
50. Vacuum filter is most suitable for the
    a) Removal of fines from liquid.
    b) Liquids having high vapour pressure.
    c) Liquids of very high viscosity.
    d) None of these.
51. The porosity of a compressible cake is
    a) Minimum at the filter medium.
    b) Minimum at the upstream face.
    c) Maximum at the filter medium.
    d) Same throughout the thickness of cake.
52. The filter medium resistance is controlled by
    a) Pressure drop alone
    b) Flow rate alone
    c) Both pressure drop and flow rate
    d) Cake thickness
53. The unit of filter medium resistance is
    a) cm^{-1}
    b) gm/cm^{-1}
    c) cm/gm^{-1}
    d) gm^{-1}
54. Which of the following may prove unsuitable for filtering volatile liquids ?
    a) Pressure filter
    b) Gravity filter
    c) Centrifugal filter
    d) Vacuum filter
55. Cake resistance is

a) Important in the beginning of filtration.
b) Decreased with the time of filtration.
c) Independent of pressure drop.
d) None of these.

56. With increase in drum speed, in a rotary drum filter, the filtration rate
    a) Increases
    b) Increases linearly
    c) Decreases
    d) Is not affected
57. In froth floatation, chemical agent added to cause air adherence is called
    a) Collector
    b) Frother
    c) Modifier
    d) Activator
58. A compressible cake has the
    a) Maximum porosity at the upstream side.
    b) Maximum porosity at the filter medium.
    c) Same porosity throughout the cake thickness.
    d) None of these.
59. Which of the following is not used as a filter medium in case of corrosive liquids ?
    a) Nylon
    b) Glass cloth
    c) Metal cloth of monel or stainless steel
    d) Cotton fabric
60. Filter medium resistance is important during the _____ of filtration.
    a) Early stages.
    b) Final stages.
    c) Entire process.
    d) None of these.
61. In case of a plate and frame filter press, filtrate flow through the cake follows _____ flow.
    a) Plug
    b) Turbulent
    c) Laminar
    d) None of these
62. Which of the following is not used as filter aid?
    a) Asbestos
    b) Diatomaceous earth
    c) Purified wood cellulose
    d) Rice husk
63. The filtrate flow rate in constant pressure filtration
    a) Continuously increases.

b) Continuously decreases.
c) Remains constant throughout.
d) May increase or decrease ; depends on the pressure.

64. The inlet pressure in a constant rate filtration
    a) Increases continuously
    b) Decreases gradually
    c) Remains constant
    d) None of these
65. With increase in the pressure drop across the cake, the specific cake resistance for the compressible sludge
    a) Increases
    b) Decreases
    c) Remains constant
    d) Increases linearly
66. A filter press is
    a) batch filter
    b) Not suitable, if the liquid is the main product.
    c) Having prohibitively high maintenance cost.
    d) Not suitable for wide range of materials under varying operating conditions of cake thickness and pressure.
67. Xanthates are used in the froth floatation process as a/an
    a) Conditioner
    b) Frother
    c) Collector
    d) Activator
68. Introduction of slurry in a plate and frame filter press is done through a plate in each frame. The plate of this filter has a _____ surface.
    a) Plane
    b) Curved
    c) Ribbed
    d) Either (a) or (b)
69. Use of grinding aids results in the
    a) Enhanced production rate.
    b) Finer products.
    c) Both (a) & (b).
    d) Neither (a) nor (b).
70. During filtration operation, the filtrate encounters the resistance of the
    a) Filter medium.
    b) Cake.
    c) Channel carrying the slurry to the upstream side of the cake and filtrate away from the filter medium.
    d) All (a), (b) and (c)

71. Filtration rate does not depend upon the
    a) Pressure drop & area of filtering surface.
    b) Resistance of the cake & the septum.
    c) Properties of the cake & the filtrate.
    d) None of these.

Unit 5 Separation based on motion of Particulate through the fluids

1. Tabular bowl centrifuges as compared to disk bowl centrifuges
   a) Operate at higher speed.
   a) Employ bowl of larger diameter.
   b) Can not be operated under pressure/vacuum.
   c) Can't be used for separation of fine suspended solids from a liquid.
2. Two particles are called to be equal settling, if they are having the same.
   a) Size.
   b) Specific gravity.
   c) Terminal velocities in the same fluid & in the same field of force.
   d) None of these.
3. _____ centrifuge is normally used in sugar mills.A.
   a) Tubular bowl
   b) Disc-bowl
   c) Suspended batch basket
   d) Perforated horizontal basket continuous
4. Solid particles separation based on the difference in their flow velocities through fluids is termed as the
   a) Clarification
   b) Classification
   c) Elutriation
   d) Sedimentation
5. If a force greater than that of gravity is used to separate solids & fluids of different densities, the process is termed as the
   a) Sedimentation
   b) Flocculation
   c) Dispersion
   d) Centrifugation
6. Gravity settling process is not involved in the working of a
   a) Hydrocyclone
   b) Classifier
   c) Dorr-thickener
   d) Sedimentation tank
7. Froth floatation is the most suitable for treating
   a) Iron ores
   b) Sulphide ores
   c) Quartzite
   d) None of these
8. Which of the following is the most suitable for cleaning of fine coal dust (<0.5 mm) ?

a) Trough washer
b) Baum jig washer
c) Spiral separator
d) Froth floatation

9. Sulphuric acid mist is arrested by using a _____ scrubber.
   a) Packed wet
   b) Hollow wet
   c) Venturi
   d) Co-current
10. Where the density difference of the two liquid phase to be separated is very small (as in milk cream separator), the most suitable separator is a
   a) Disc bowl centrifuge.
   b) Sharpies supercentrifuge.
   c) Batch basket centrifuge.
   d) Sparkler filter.
11. Dust laden air can be purified using a
   a) Cyclone separator
   b) Bag filter
   c) Gravity settler
   d) Tubular centrifuge
12. Pine oil used in froth floatation technique acts as a/an
   a) Collector
   b) Modifier
   c) Frother
   d) Activator
13. The most suitable equipment for removing the fine dust particle (< 1 micron dia.) From air below its dew point will be a/an
   a) Bag filter
   b) Electrostatic precipitator
   c) Cyclone separator
   d) Wet scrubber
14. _____ are used for the separation of coarse particles from a slurry of fine particles.
   a) Thickeners
   b) Classifiers
   c) Hydrocyclones
   d) Decanters
15. Traces of solids are removed from, liquid in a
   a) Classifier
   b) Clarifier
   c) Sparkler filter
   d) Rotary vacuum filter
16. Ultra centrifuges are used for the separation of _____ solid particles.

a) Coarse
b) Fine
c) Colloidal
d) Dissolved

17. Gold ore concentration is mostly done using
    a) Jigging
    b) Tabling
    c) Froth floatation
    d) Elutriation
18. The study on washability of coal is done by using the _____ technique.
    a) Tabling
    b) Elutriation
    c) Heavy media separation
    d) None of these
19. Moisture can be removed from lubricating oil using
    a) Tubular centrifuge
    b) Clarifier
    c) Sparkler filter
    d) Vacuum leaf filter
20. Tabling process used for separating two materials of different densities by passing the dilute pulp over a table/deck, which is inclined from the horizontal surface at an angle of about
    a) 1 to 2°
    b) 2 to 5°
    c) 5 to 10°
    d) 10 to 15°
21. Cyclones are used primarily for separating
    a) Solids
    b) Solids from fluids
    c) Liquids
    d) Solids from solids
22. There is practically no alternative/competitor to _____ in the beneficiation treatment of sulphide ores.
    a) Classification
    b) Tabling
    c) Jigging
    d) Froth floatation
23. Separation of isotopes is generally done using a/an _____ centrifuge.
    a) Ultra
    b) Disk-bowl
    c) Both (a) & (b)
    d) Neither (a) nor (b)

24. Separation of materials of the same density based on their sizes by using then-different rates of flow is called
    a) Sorting
    b) Sizing
    c) Flocculation
    d) Elutriation
25. Agglomeration of individual particles into clusters (flocs) is called flocculation. To prevent flocculation, the most commonly used dispersing agents are
    a) Carbonates
    b) Sulphates
    c) Silicates & phosphates
    d) Bi-carbonates

26. Dust collection efficiency of electrostatic precipitator can be as high as 99.9%. Maximum temperature and pressure of dust laden gas that can be cleaned in an electrostatic precipitator is respectively.
    a) 200°c and 5 atm.
    b) 1000°c and 10 atm.
    c) 500°c and 50 atm.
    d) 1000°c and 500 atm.
27. The process opposite to 'dispersion' is termed as the
    a) Flocculation
    b) Sedimentation
    c) Filtration
    d) None of these.
28. Solid particles of different densities are separated by
    a) Filters
    b) Thickness
    c) Cyclones
    d) Sorting classifier
29. To remove dirt from the flowing fluid, we use a
    a) Coagulant
    b) Gravity settler
    c) Strains
    d) Clarifier
30. Separation of solid suspended in liquid into a supernatant clear liquid and a denser slurry employs a process termed as the
    a) Coagulation
    b) Flocculation
    c) Sedimentation
    d) Clarification

31. A gravity decanter is meant for the separation of two _____ density.
    a) Immiscible liquids of different
    b) Miscible liquids of different
    c) Immiscible liquids of same
    d) Miscible liquids of same
32. Separation of solid particles based on their densities is called
    a) Sizing
    b) Sorting
    c) Clarification
    d) Dispersion
33. The process by which fine solids is removed from liquids is termed as
    a) Decantation
    b) Flocculation
    c) Sedimentation
    d) Classification
34. Sorting classifiers employing differential settling methods for separation of particles make use of the differences in their
    a) Particle sizes
    b) Densities
    c) Terminal velocities
    d) None of these
35. Separation of particles of various sizes, shapes and densities by allowing them to settle in a fluid is called
    a) Classification
    b) Froth floatation
    c) Thickening
    d) Clarification
36. Which of the following minerals is not subjected to magnetic separation method?
    a) Rutile
    b) Galena
    c) Chromite
    d) Siderite
37. Traces of liquid tar fog present in coke oven gas is separated using
    a) Electrostatic precipitator
    b) Cyclone separator
    c) Strainer
    d) None of these
38. Pick out the wrong statement:
    a) Magnetic separation method can be employed to treat both dry & wet ores.
    b) Reduction ratio in crushing operation is defined as the ratio of minimum feed size to the maximum product size.
    c) Gyratory crusher is used for coarse crushing.

d) Screens are of stationary, moving and vibratory types.

39. For classification of potable (drinking) water, we use a _____ filter.
    a) Gravity sand
    b) Plate and frame
    c) Vacuum leaf
    d) Rotary vacuum
40. Additives used for promoting the floccula-tion of particles is a/an
    a) Electrolyte
    b) Surface active agent
    c) Both (a) & (b)
    d) Neither (a) nor (b)
41. The capacity of a classifier in 'tons of solid/hr' is given by (where, A = cross-sectional area, m2 V = rising velocity of fluid, m/sec.S = percentage of solids in the suspension by volume.ρ = density of solids, kg/m3)
    a) 3.6 AVS.ρ
    b) 3.6 A.V.ρ
    c) 3.6 A.S. ρ
    d) 3.6 AVS/ρ
42. Fluid medium used in the classification technique of mineral beneficiation is
    a) Air
    b) Water
    c) Either (a) or (b)
    d) Neither (a) nor (b)
43. Which of the following can be most effectively used for clarification of lube oil and printing ink?
    a) Sparkler filter
    b) Precoat filter
    c) Disc-bowl centrifuge
    d) Sharpies supercentrifuge
44. Ultracentrifuges running at speeds upto 100000 rpm is normally used for the
    a) Separation of isotopes based on their density or molecular weights difference.
    b) Concentration of rubber latex.
    c) Separation of cream from milk.
    d) Dewaxing of lubricating oil.
45. Sizing of very fine particles of the order of 5 to 10 microns is done by elutriation, which is a _____ operation.
    a) Clarification
    b) Sedimentation
    c) Flocculation
    d) Classification
46. In the cyclone separator used for separation of dust from dust laden gas, the gas
    a) Enters the cyclone from the top.

b) Is admitted tangentially at high velocity.
c) Develops a helical motion inside the chamber.
d) Both (b) and (c).

47. _____ is used for producing a thick suspension from a thin slurry.
a) Cartridge filter
b) Rotary drum vacuum filter
c) Pressure filter thickener
d) Plate and frame filter press

48. To remove very small amount of tiny solid impurities from liquid, we use a
a) Pressure filter
b) Vacuum filter
c) Centrifugal filter
d) Coagulant

49. Sedimentation on commercial scale occurs in
a) Classifiers
b) Thickeners
c) Rotary drum filters
d) Cyclones

50. A cottrel precipitator makes use of the _____ for dusty air cleaning.
a) Electric spark
b) Corrona discharge
c) Alternating current
d) None of these.

51. If radius of a batch basket centrifuge is halved & the r.p.m. Is doubled, then the
a) Linear speed of the basket is doubled.
b) Linear speed of the basket is halved.
c) Centrifugal force is doubled.
d) Capacity of centrifuge is increased.

52. Which of the following is not a wet classifier ?
a) Sharpies supercentrifuge
b) Hydrocyclones
c) Dorr oliver rake classifier
d) None of these

53. _____ mills are termed as disintegrators.
a) Cage
b) Compartment
c) Pebble
d) All tumbling

54. Supporting legs of a plate and frame filter is normally made of
a) Stainless steel
b) Cast iron
c) High speed steel

d) Wooden plank

55. Pine oil and cresylic acid are used as _____ in the froth floatation process.
    a) Frother
    b) Collector
    c) Depressor
    d) Conditioner
56. Float and sink test determines the possibility of cleaning of coal by a process based on the
    a) Gravity separation
    b) Wettability
    c) Particle shape
    d) None of these
57. Chance process is used for the
    a) Cleaning of coal.
    b) Concentration of iron ore.
    c) Concentration of pyrites.
    d) Water treatment
58. Which of the following is a batch sedimentation equipment ?
    a) Dust catcher
    b) Filter thickener
    c) Dry cyclone separator
    d) Rotary sprayer scrubber.
59. The most efficient equipment for the removal of sub-micronic dust particles from blast furnace gas is the
    a) Venturi atomiser
    b) Gravity settling chamber
    c) Electro-static precipitator
    d) Cyclone separator
60. Particle size range in which dust catcher (gravity settling chamber) works most effectively and efficiently is _____ microns.
    a) < 5
    b) 10 to 25
    c) < 74
    d) 1000
61. _____ centrifuge is the most suitable for separation of non-friable crystals.
    a) Tubular bowl
    b) Disc-bowl
    c) Perforated horizontal basket continuous
    d) Suspended batch basket
62. For benefication of iron ore, the most commonly used method is
    a) Flocculation.
    b) Froth floatation.
    c) Jigging & tabling.

d) None of these.

63. _____ employs a set of screen across a flow channel for the separation of dirt/rust from a flowing liquid stream.
    a) Thickener
    b) Classifier
    c) Strainer
    d) Clarifier
64. Separation of a suspension or slurry into a supernatant clear liquid (free from particles) and a thick sludge containing a high concentration of solid is called
    a) Classification
    b) Sedimentation
    c) Clarification
    d) Decantation
65. Which of the following is not used as a surface active agent in a flocculation operation?
    a) Sodium silicate
    b) Quartz
    c) Lime
    d) Alumina
66. _____ mill is not a revolving mill.
    a) Pebble
    b) Compartment
    c) Cage
    d) Tube

Unit 6 Mixing and Agitation

1. Which of the following is the most suitable for handling fibrous and dense slurries?
   a) Propeller agitator
   b) Cone type agitator
   c) Turbine agitator
   d) Radial propeller agitator
2. Highly viscous liquids & pastes are agitated by
   a) Propellers
   b) Turbine agitators
   c) Multiple blade paddles
   d) None of these
3. _____ mixer is used for devulcanisation of rubber scrap & making water dispersion & rubber solution.
   a) Tumbler
   b) Banbery
   c) Muller
   d) Rubbon blender
4. Which of the following mechanical conveyors does not come under the division 'carriers' ?
   a) Belt conveyor
   b) Bucket elevator
   c) Screw conveyor
   d) Apron conveyor.
5. Which is the most suitable conveyor for transportation of sticky material ?
   a) Apron conveyor
   b) Belt conveyor
   c) Screw conveyor
   d) Pneumatic conveyor
6. Laminar flow region is said to exist during agitation of a liquid in an agitator, when the value of Reynolds number is
   a) >10
   b) <10
   c) >100
   d) <100
7. The power number for a stirred tank becomes constant at high Reynolds number. In this limit, the variation of power input with impeller rotational speed (N) is proportional to
   a) N°
   b) N^{1}
   c) N^{2}
   d) N^{3}
8. Which of the following agitators having a large blade area, rotating at slow speed is used for mixing high viscosity liquids (> 50000 centipoise) ?

a) Propeller
b) Helical screw
c) Flat blade turbine
d) Curved blade turbine

9. Use of baffles in agitators help in minimising the _____ tendency.
   a) Swirling
   b) Vortexing
   c) Both (a) & (b)
   d) Neither (a) nor (b)
10. _____ is the most suitable for compounding rubber and plastic solids.
   a) Banbery mixer
   b) Pan mixer
   c) Pug mill
   d) Charge can mixer
11. Bucket elevators are not suitable for the vertical lifting of _____ materials.
   a) Fine (e.g. - 200 mesh size coal)
   b) Sticky (e.g. Clay paste)
   c) Small lumpy (e.g. Grains and sand)
   d) Free flowing
12. The most suitable equipment used to devulcanise rubber scrap and to make water dispersion & rubber solution is a
   a) Boundary mixer.
   b) Propeller agitator.
   c) Sharpies centrifuge.
   d) None of these.
13. Mixing of light fine powder such as insecticides is done by
   a) Banbery mixer
   b) Pug mill
   c) Impact wheels
   d) Kneader
14. Which of the following clay mixing devices is vacuum operated for deairation of clay?
   a) Banbery mixer
   b) Pug mill
   c) Muller-mixer
   d) None of these
15. In case of a revolving mill, wet grinding compared to dry grinding
   a) Requires more energy.
   b) Has less capacity.
   c) Complicates handling & classification of the product.
   d) None of these.
16. A _____ mixer resembles a ball mill without balls.
   a) Banbery

b) Pug mill
c) Tumbling
d) Pan

17. Molten ammonium nitrate is mixed with ground limestone in fertilizer plant in a
    a) Pug mill
    b) Mixer-extruder
    c) Banbury mixer
    d) Muller mixer
18. Pick out the wrong statement pertaining to the turbine agitator.
    a) Recommended peripheral speed for the turbine agitator is 200-250 metres/minute.
    b) Pitched blade turbine agitator gives only radial flow with complete absence of the axial flow.
    c) Generally, the diameter of the agitator is kept between l/3rd to l/6th of the tank diameter while the blade length is l/4th of agitator diameter (with central disc, it is l/8th of the agitator diameter).
    d) Turbine agitator should be located at a height not less than one agitator diameter length from the bottom. If the depth of liquid in the tank is more than twice the agitator diameter, two agitators should be used.
19. During agitation of liquids, power consumption during laminar flow is not proportional to the
    a) Density of the liquid
    b) Viscosity of the liquid
    c) Cube of impeller diameters
    d) Square of rotational speed.
20. Ribbon blenders are exclusively meant for
    a) Blending miscible liquids.
    b) Non-flowing powder and thin pastes.
    c) Bath mixing.
    d) Continuous mixing.
21. _____ are mixed using ribbon blenders.
    a) Lumpy solids and low viscosity liquids
    b) Dry powders
    c) High viscosity liquids
    d) Thick pastes
22. During agitation of liquids, the
    a) Froude number is independent for the curves between power number and Reynolds number in baffled system.
    b) Power number becomes independent of impellers Reynolds number at high Reynolds number, but is dependent on the geometry of the impeller.
    c) Froude number is used to account for the effect of surface (e.g., the centre vortex) on the power number.
    d) all (a), (b) and (c).

25. Paddle agitator
    a) Is suitable for mixing low viscosity liquids.
    b) Produces axial flow.
    c) Moves at very high speed.
    d) None of these.
23. In paint industries, blending of light paste is done by using a
    a) Masticator
    b) Charge can mixer
    c) Kneader
    d) None of these
24. In a mixer, the quantity, (v. L/D) is termed as _____ number(where, v = longitudinal velocity of material, L = length of the mixer, D = diffusivity in axial mixing).
    a) Weber
    b) Peclet
    c) Brinkman
    d) Schmidt
25. Weber number is significant and is concerned with the
    a) Solid-liquid mixing.
    b) Liquid-liquid mixing.
    c) Dispersion of liquid in liquid.
    d) Suspension of solid in liquid.
26. Power consumption during turbulent flow in agitation tank is proportional to the _____ of the liquid.
    a) Viscosity
    b) Thermal conductivity
    c) Surface tension
    d) Density
27. Mixer used for rubber compounding is
    a) Mixer-extruder
    b) Banbury internal mixer
    c) Muller mixer
    d) Pug mill
28. Which of the following must be stored in silos and not in open yard ?
    a) Coke breeze
    b) High V.M. bituminous coal
    c) Sand
    d) None of these
29. Which of the following is not accomplished by agitation of liquids in agitators?
    a) Dispersing gas in liquid.
    b) Blending of immiscible liquids.
    c) Dispersing immiscible liquid in form of emulsion.
    d) Suspending solid particles.

30. Mixing of plastic solids is generally facilitated by
    a) Dispersion
    b) Mastication
    c) Kneading
    d) None of these
31. Helical screw agitator is used for
    a) Mixing highly viscous pastes.
    b) Blending immiscible liquids.
    c) Mixing liquids at very high temperature (> 250 °c).
    d) None of these.
32. Mixing mechanism employed in a pan mixer is by
    a) Mulling
    b) Kneading
    c) Dispersion
    d) None of these
33. A propeller agitator
    a) Produces mainly axial flow.
    b) Is used for mixing high viscosity pastes.
    c) Runs at very slow speed (2 rpm).
    d) All (a), (b) and (c)
34. Which of the following with respect to mixing is true?
    a) It is used to distribute heat uniformly to all the components of the mixture
    b) Mixing becomes difficult when one of the phases to be mixed is in minor quantity
    c) Solid-solid mixing is more difficult than other phases
    d) All of the mentioned
35. Statement 1: Root mean square is denoted by σ^2.
    Statement 2: σ^2 will show the variation of a composition obtained after mixing. Hence the lesser it is, the more efficient is the mixing.
    a) True, False
    b) True, True
    c) False, False
    d) False, True
36. Mixing index is applicable for mixing of solids at zero time.
    a) True
    b) False
37. Which of the following conditions show that a certain industrial mixer is the best?
    a) Power load for mixing is minimum
    b) Standard deviation is minimum
    c) Time required for mixing is minimum
    d) All of the mentioned
38. Mixing Index is a ratio of the standard deviation of various products during mixing to that at zero mixing.

a) True
b) False

39. Rate of mixing at any time is given by the extent of mixing at that particular time.
    a) True
    b) False
40. The force used for mixing by mixing equipment for pastes and dough is _____
    a) Centrifugal smearing
    b) Impact
    c) Tumbling
    d) All of the mentioned
41. The clearance between the impeller and the vessel in a mixer is usually kept _____
    a) High
    b) Low
    c) Cannot be determined
    d) None of the mentioned
42. Statement 1: Kneaders are specially used for pastry/viscous liquids in the food industry.
    Statement 2: Kneaders are used for mixing dough with fats and making them homogeneous mixtures.
    a) True, False
    b) True, True
    c) False, False
    d) False, True
43. Statement 1: Effectiveness of mixing in kneaders depends on the blade design.
    Statement 2: Kneaders have a high clearance between the two oppositely rotating blades and the vessel.
    a) True, False
    b) True, True
    c) False, False
    d) False, True
44. Statement 1: Which mixture is used when one of the components is very less in quantity?
    Statement 2: This mixer is used to mix items in savory or a snack item.
    a) Ribbon mixer, planetary mixer
    b) Planetary mixer, double cone mixer
    c) Double cone mixer, double cone mixer
    d) Planetary mixer, planetary mixer
45. Which of the following is true with respect to mixing operations in the food industry?
    a) Ice creams
    b) Confectionery products
    c) Chlorinated waters
    d) All of the mentioned