UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV. /DEC. 2018

COURSE NO: MR 271

COURSE NAME: COMMINUTION

CLASS: MR II **TIME: 3** HOURS

Name**:** _____Index Number: _____

Answer ALL questions in the Booklet and Neat work will be REWARDED.

SECTION A

(Answer ALL)

1. The main purpose of a mineral beneficiation is not to separate the valuable components of ores from the worthless constituents and concentrate the minerals of interest to make a saleable product. **True/False**
2. Particles can be characterized by parameters such as size, shape and density. **True/False**
3. Size analysis is used to determine the quality of grinding and to establish the degree of liberation of mineral. **True/False**
4. Sub-seive methods employed in size analysis are preferred when the particles are finer than 40 µm. **True/False**
5. Size analysis is not a process of estimating particle size composition and distribution in a product. **True/False**
6. Sieves can be arranged during size analysis based on constant difference using the Modern series (fourth root of 2 (1.189)) only. **True/False**
7. Sieve analysis is performed on dry or wet materials depending on clay or slime content of the materials. **True/False**
8. Sedimentation is the act of settling solid particles in a fluid medium under force of gravity. **True/False**
9. Elutriation Method of separating particles is by means of a current of water moving upward through a sorting column at varying velocity. **True/False**
10. An electrical resistance method used in particle size analysis is the coulter counter where the particle passes through an electrolyte one at a time and the size range is usually between 5.0 – 400 µm. **True/False**
11. In the electrical resistance method of particle size analysis, the resistance caused by particle between electrodes measured in volts is inversely proportional to the volume of the particle. **True/False**

12. Laser granulometry is based on diffraction of a coherent light beam by particles. **True/False**
13. Laser granulometry size analysis, the samples are prepared by dispersing the powder in a liquid by means of an ultrasonic bath and circulated through a glass cell. **True/False**
14. In the Laser granulometry process, the values of illumination of the beam, with and without the sample are read by a detector and the results given in cumulative percent undersize. **True/False**
15 Microscopic techniques are utilized in determining the size of single particles based on its projected area where the optical microscope is very suitable in the range 0.025 – 50 µm. **True/False**
16. In the electron microscopic technique of size analysis determination, the electron microscope can handle particles as small as 0.005 µm. **True/False**
17. During screening of particles, two screen products (oversize and undersize) are obtained to prevent the entry of undersize into crushing machines thereby increasing their capacity and efficiency. **True/False**
18. During screening, factors such as moisture content of feed, stickiness of particles, electrostatic bunching, density and percentage of near mesh particles of the feed material adversely influence the performance. **True/False**
19. The capacity of a screen increases with increasing width, surface area and not active section of the screen. **True/False**
20. Forces that act on a particle in fluid include the fluid resistance force, the upthrust on the particle and not the weight of particle. **True/False**
21. During classification of particles in a fluid, free settling is predominant when the pulp is more than 15 % solids by weight. **True/False**
22. Stokes law describes the motion of a particle during free settling and is applicable to size ranges greater than or equal to 50 µm **True/False**
23. Newton's law describes the motion of a particle during free settling and is applicable to size ranges greater than or equal to 500 µm. **True/False**
24. In a classifier where hindered settling prevails, density has a marked effect on separation. **True/False**
25. Motions of particles which are mainly due to turbulence during settling obey Newton's law. **True/False**
26. Teeter Bed occurs in a chamber with particles which are not heavy enough to fall nor light enough to move up with the current of water and usually occurs in classifiers which use hydraulic water for separation. **True/False**
27. Mechanical classifiers use a horizontal current to effect separation. **True/False**

28. A cyclone is a classifying device that makes use of centrifugal force to increase the settling rate of particles **True/False**.
29. Hydrocyclone feed is not introduced under pressure through feed inlet, tangential to the cylindrical section of the cyclone. **True/False**
30. Particles in a cyclone are always subjected to outward centrifugal force and inward drag force. **True/False**
31. Finer and lighter particles in a hydrocyclone are carried by upward stream through the vortex finder as underflow. **True/False**
32. Cyclones work best on particles of size less than 150 μm but greater than 5 μm. **True/False**
33. Cyclones are preferred to mechanical classifiers because oxidation of particles within the circuit is increased. **True/False**
34. Crushing is a coarse particle disintegration process and is accomplished by surfaces in rigidly constrained motion paths. **True/False**
35. Crushing is classified into primary, secondary and tertiary depending on the stage. **True/False**
36. The Gyratory crushing head is made to gyrate, recede from and approaching all points on the periphery of the outer shell. **True/False**
37. The Gyratory crusher crushes on a half cycle thereby having higher capacity than a jaw crusher of the same feed opening. **True/False**
38. For crushing equipment in closed circuit, the material passes through the crusher several times. **True/False**
39. The control system of a crusher station involves keeping all sections in balance and responding promptly to signals and alarms from time to time. **True/False**
40. Run-off-mine ore generally contains no proportion of foreign material. **True/False**
41. Regarding crushing plant control and safety, Oil level in the equipment should not be kept at acceptable level at all times for efficiency and long life of the crushing system. **True/False**
42. During crushing, the crusher set is adjusted if the crusher product is coarser than expected. **True/False**
43. Blending during crushing is always necessary to provide feed (ore) with constant grade of metal and also appropriate (right) hardness and size to the subsequent stage of processing. **True/False**
44. In the industry, equipment, switches or valves should be used if there is a danger tag attached to it. **True/False**

45. Grinding is not the final stage of comminution designed to reduce the particle to a size fine enough to complete liberation. **True/False**
46. The speed of rotation of a tumbling mill is important as it determines the nature of product. **True/False**
47. Operating a tumbling mill, the cascading regime produces coarser grinding whereas the cataracting regime produces finer grinding and the centrifuging regime produces no grinding. **True/False**
48. In a typical tumbling mill, the essential parts of the mill are the shell, the trunions and not the liners. **True/False**
49. In the operation of the SAG mill, a combination of ore particle and balls act as the grinding media. **True/False**
50. Circulating load is the material sent back to the mill from classifier for re-grinding. **True/False**
51. The ball loading is a fraction of the mill volume filled by the grinding medium and is one of the factors which affect the performance of the mill. **True/False**
52. During mill circuit control and safety, noise has the potential to cause health problems. **True/False**
53. Trouble shooting and general operation is strictly adhered to in order to monitor the efficiency of the machines and processes in order to minimize down time. **True/False**
54. The appropriate PPE's especially the ear plugs is important around the mill in order to reduce the effect of noise in the area. **True/False**
55. Mills are differentiated from each other by their dimensions, dimension ratios, shape of milling volume, sizes and shapes of grinding media among others. **True/False**
56. Double toggle and single toggle crushers are two types of Blake jaw crushers often used in mineral processing operations. **True/False**
57. Chemically held water and water in fractures of particles have no effect on screening. **True/False**
58. There is always an optimum thickness of material on the screen at which maximum screening rate is obtained. **True/False**
59. Grizzlies are often used in screening very coarse material and to safeguard primary crushers against overload. **True/False**
60. In mineral processing, most movable screens are usually flat and are inclined to facilitate the flow of feed. **True/False**

Section B (Answer ALL Questions)

Question 1.

a. Define the term "Grinding" as pertains to valuable mineral liberation.
b. State the advantages of dry and wet grinding.
c. Draw a well labeled diagram of the motion a charge in a tumbling mill.
d. What are the effects of low and fast rotation motion speeds on particles in a tumbling mill.
e. What are open and closed circuits in grinding of ores?

Question 2.

a. Briefly explain the manner in which the jaws of single and double toggle crushers work.
b. Briefly explain classification of mineral particles?
c. State two types of classifiers which are employed in mineral processing.
d. There are two types of forces which are utilized in cyclones. Name these forces and list particle size ranges within which they are applicable.
e. Why will you as the Mineral Engineer of a gold mine, select a hydrocyclone as better classifier in close circuit compared to rake classifier?
f. Cyclones work efficiently when certain operational factors are strictly observed. What are these factors?

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