UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV. – DEC. 2018

COURSE NO: 279
COURSE NAME: MINERAL PROCESSING ANALYSIS
CLASS: MN II **TIME: 3 HR**

Name**:** _____Index Number: _____

Answer All questions. Section A by writing TRUE or FALSE as the answer for each QUESTION. Any other form of answer will attract NEGATIVE HALF (-1/2)

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SECTION A

(Answer ALL)

1. Mining is the selective recovery of minerals and materials from the earth crust. **TRUE/FALSE**
2. Comminution begins after the ore has been mined and hauled to the processing plant. **TRUE/FALSE**
3. Mineral processing is a series of processes which involve mechanical separation of the grain of ore mineral from the gangue material. **TRUE/FALSE**
4. Screening, classification and dewatering are intermediate processes of mineral processing technology. **TRUE/FALSE**
5. Comminution is purposely done to liberate the mineral of interest from their interlocked state. **TRUE/FALSE**
6. In mineral processing, we conduct comminution to produce end products for subsequent process. **TRUE/FALSE**
7. Comminution circuit always incorporates merits which seek to improve upon the efficiency usage of energy. **TRUE/FALSE**
8. Screening or classification is not operation used to remove fine materials from entering the next stage and to minimise over reduction. **TRUE/FALSE**
9. Primary crushers are not heavy duty machines designed robustly to fragment ROM ore from about 1.5m to about 2.5mm. **TRUE/FALSE**
10. Crushing is strictly carried out in open circuit. **TRUE/FALSE**

11. The Blake type Jaw crusher has great force and prone to choking because of its large swing. **TRUE/FALSE**

12. The double toggle Jaw crusher consists of the Pitman as one of its components. **TRUE/FALSE**

13. In the gyratory crusher, crushing is effected as the ore compressed between the head and the shell of the machine. **TRUE/FALSE**

14. The main purpose of secondary crusher is to reduce the ore from a size of about 140 mm to a suitable feed size of about 5-20 mm for a grinding mill. **TRUE/FALSE**

15. Oversize materials are taken care of by all types of crushers no matter the size of the ore. **TRUE/FALSE**

16. One of the essential purposes of blending during crushing is to control the hardness of the ore. **TRUE/FALSE**

17. Grinding is the final stage of comminution through which size reduction is effected by the combination of impact and abrasion in suspension with water. **TRUE/FALSE**

18. In mineral processing, grinding is conducted to effect enough liberation of the bulk valuable mineral from the gangue and/or from each other prior to concentration. **TRUE/FALSE**

19. A tumbling mill is a vertical cylindrical shell, provided with renewable wearing liners and a charge of grinding media. **TRUE/FALSE20**. The medium in the Mill is a charge of loose unconnected crushing bodies, which may be steel rods, balls, hard rocks or the ore itself. **TRUE/FALSE**

21. One of the reasons of grinding is to produce an end product that satisfies certain market requirement especially in non-metallic ore beneficiation. **TRUE/FALSE22**. Low Speed of a mill causes the charge to cascade more and comminution is mainly by impact, and this results in fines with increased slimes and liner wear. **TRUE/FALSE**

23. Fast Speed of a mill causes the charge to cataract more and comminution is mainly by abrasion giving courser product at a reduced liner wear. **True/False**

24. When a tumbling mill speeds beyond its critical Speed, the charge centrifuges and there is no meaningful comminution. **TRUE/FALSE**

25. During mineral processing, the mill normally operates within 50-90% of the critical speed. **TRUE/FALSE**

26. Wet grinding is used in mineral processing because of the lower power consumption per tonnage of ore ground. **TRUE/FALSE**

27. Wet grinding enables simple handling and transport of the product using equipment like pump, pipe and launders. **TRUE/FALSE**

28. Dry grinding is employed in mineral processing in order to reduce wear rate of liners and grinding media, increase fines and for materials that undergo physical and chemical change with water. **TRUE/FALSE**

29. Mechanism of Particle Breakage depends on the presence of cracks or flaws in the matrix act as points of stress concentration in the rock. **TRUE/FALSE**

30. When brittle materials are stressed they release stored energy by crack propagation. **TRUE/FALSE**

31. Size reduction is said to be the most efficient operation in mineral processing with regard to energy consumption. **TRUE/FALSE**

32. The theory of comminution assumes all materials to be brittle such that energy is not consumed for mere deformation. **TRUE/FALSE**

33. Rettinger's theory, Kick's Law, and Bond's Law are some of the comminution theories used to address the dependence of product particle size on energy input. **TRUE/FALSE**

34. Rettinger's theory states that the energy consumed in breaking a particle is inversely proportional to the new area of surface produced. **TRUE/FALSE**

35. Kick's Law states that the work required in breaking a material is inversely proportional to the reduction in volume of the particles concerned. **TRUE/FALSE**

36. Bond's Law states that the work input in a material is proportional to the new crack length produced in the particle breakage and this is equivalent to the difference in works represented by the product and the feed. **TRUE/FALSE**

37. Rettinger's theory applies in fine grinding range (1-1000μm). **TRUE/FALSE**

38. Kick's law is fairly accurate for crushing above 1cm. **TRUE/FALSE**

39. The purpose of screening is to retain oversize material in a given section or circuit in order to prevent it from being fed into a machine not specified to deal with it. **TRUE/FALSE**

40. Screening is affected by the shape of particle relative to the shape of screen aperture.

TRUE/FALSE

41. A Trommel screen is a slightly inclined, rotating cylindrical screen, which can be used wet or dry. **TRUE/FALSE**

42. Trommels can handle material from 55 mm down to 6 mm, and even smaller sizes can be handled under wet screening conditions. **TRUE/FALSE**

43. Shaking screens have a reciprocating movement mechanically induced in the horizontal direction and are mounted either horizontally or with a gentle slope and they operate in the range of 60-800 strokes per minute. **TRUE/FALSE**

44. Reciprocating screens employ a horizontal gyratory motion to the feed end of a rectangular screen by means of an unbalanced rotating shaft, rotating at about 1000 rev min. **TRUE/FALSE**

45. The gyratory screen imparts gyratory motion throughout the whole screen cloth and is widely used for fine-screening applications down to 40 μm. **TRUE/FALSE**

46. Performance of a Screen is the ability of a screen to separate a material such that the oversize will remain on the screen whiles the undersize passes through the screen. **TRUE/FALSE**

47. Particle Size Analysis is the process used to obtain quantitative data about the size and size distribution of particles in the material. **TRUE/FALSE**

48. Classification is a process of sorting a mixture of mineral into two or more products based on the velocities with which the mineral grains fall through a fluid medium. **TRUE/FALSE**

49. Free settling regime involves sinking of particle through suspension medium around 45% solids such that particle crowding is negligible and particles fall at their own settling velocities. **TRUE/FALSE**

50. Hindered settling takes place when the particle falls through a suspension medium of relatively low density such that settling is affected by particle crowding leading to a decrease in falling rate and sharpness of settling. **TRUE/FALSE**

51. The cyclone is used for continuous classification of particles by utilizing centrifugal force to increase the rate of settling. **TRUE/FALSE**

52. The cyclone consists of an upper cylindrical part fixed with a tangential feed opening and an axially mounted overflow pipe at the top via a vortex finder, which extends across the

feed inlet to avoid short-circuiting and a lower conical section with an underflow discharge area called the apex. **TRUE/FALSE**

53. The slurry is introduced into the cyclone at a low pressure through the tangential feed opening to generate a vortex motion in the cyclone with a low-pressure zone along the vertical axis. **TRUE/FALSE**

54. A Cyclone requires less floor space, consumes less power and have a sharper separation ability. **TRUE/FALSE**

55. Concentration or mineral upgrading is the separation of the mineral of interest from the unwanted minerals basically by the use of physical means. **TRUE/FALSE**

56. Ore Sorting has been the oldest (indigenous) method used in separating mineral particles from the gangue material based on distinct physical properties. **TRUE/FALSE**

57. Gravity concentration is the separation of minerals according to the difference in their specific gravities and their response to gravity and other fluid resistant forces. **TRUE/FALSE**

58. Sluices, Jigs, Shaking tables and Centrifugal pans are types of gravity concentrators. **TRUE/FALSE**

59. Generally gravity separation is relatively easier for G>± 2.5 and is not commercially feasible for G <±1.25 where G is the gravity concentration criterion. **TRUE/FALSE**

60. Dewatering is used to decrease the quantity of water of a slurry after mineral processing so that the water can be recycled. **TRUE/FALSE**

Section B (Answer ALL Questions)

Question 1

a. In a tabular form, write the differences between single and double toggle Blake Jaw crushers.
b. State two types of classifiers which are employed in mineral processing.
c. There are two types of forces which are utilized in cyclones. Name these forces and list particle size ranges within which they are applicable.
d. Why will you as the Process Engineer of a gold mine, select a hydrocyclone as a better classifier in closed circuit grinding compared to any other classifier?
e. Cyclones work efficiently when certain operational factors are strictly observed. What are these factors?

Question 2

a. List the advantages of dry and wet grinding.
b. Draw a well labelled diagram of the motion a charge in a tumbling mill.
c. Explain the effects of low and fast rotation motion speeds on particles in a tumbling mill.
d. Draw and label opened and closed circuits in grinding of ores?
e. What are some of the causes of circulating loads in milling circuits of a mineral processing plant?

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