

BOWEN UNIVERSITY IWO, OSUN STATE
COLLEGE OF AGRICULTURE, ENGINEERING AND SCIENCE
INDUSTRIAL CHEMISTRY PROGRAMME

B.SC DEGREE 2022/2023 FIRST SEMESTER EXAMINATION

Course Code: CHM 103

Course Title: General Chemistry Practical I

Date: February 2023

Time Allowed: 25 minutes

Instructions: (a) Answer 40 questions below. Each question carries 1 mark.

1. A Bronsted acid can be described as

- A. a proton donor
- B. a proton acceptor
- C. an electron pair acceptor
- D. none of the above

ANSWER: A

2. A Lewis base can be described as

- A. a proton donor
- B. a proton acceptor
- C. an electron pair donor
- D. an electron acceptor

ANSWER: C

3. The acid/base pair that gives rise to NaCl is

- A. NaCl/NaH
- B. HCl/NaOH
- C. H₂O/NaCl
- D. HNO₃/NaH

ANSWER: B

4. The pH of a given solution can be defined as

- A. $-\log_{10} [H^+]$
- B. $-\log_{10} [H]$
- C. $-\log_5 [H^+]$
- D. $-\log_{10} [OH^-]$

ANSWER: A

5. The pH of a neutral solution is

- A. 3
- B. 7
- C. 8
- D. 6

ANSWER: B

6. The acid/base pair that will produce sodium nitrate is

- A. HNO_3/NaOH
- B. HCl/NaNO
- C. $\text{H}_2\text{CO}_3/\text{NaOH}$
- D. None of the above

ANSWER: A

7. The acid/base pair that will produce K_2SO_4 is

- A. $\text{HSO}_3^-/\text{H}^+$
- B. KCl/KOH
- C. No answer
- D. $\text{H}_2\text{SO}_4/\text{KOH}$

ANSWER: D

8. NH_4Cl can be produced by the following acid/base pair

- A. HCl/NH_3
- B. $\text{HCl}/\text{NH}_4\text{OH}$
- C. Options A and B
- D. None of the above

ANSWER: B

9. The products of the reaction of H_2CO_3 and NaOH are

- A. NaCl and H_2O
- B. Na_2CO_3 and H_2O
- C. NaOH and H_2O
- D. None of the above

ANSWER: B

10. The suitable indicator for a weak acid and a weak base titration is

- A. methyl orange
- B. Phenolphthalein
- C. No suitable indicator
- D. Any indicator

ANSWER: C

11. The acid/base pair that gives rise to the salt Na_2CO_3 are

- A. H_2CO_3 and NaOH
- B. CO_2 and NaO
- C. NaOH and HCO_3^-
- D. NaCl and NaCO^-

ANSWER: A

12. The end point in titrimetric analysis is

- A. the equivalence point of a titration
- B. the point at which the amount of titrant added completely neutralizes the analyte
- C. the point at which the indicator changes colour

D. all of the above

ANSWER: C

13. Equivalence point in titrimetric analysis is

A. the point at which the amount of titrant added completely neutralizes the analyte

B. the end point of a titration

C. the point at which the indicator changes colour

D. None of the above

ANSWER: A

14. A neutralization reaction is one in which

A. the pH of the solution reveals acidity

B. an acid reacts with a base to form salt and water only

C. the solution becomes neutral

D. none of the above

ANSWER: B

15. A suitable indicator for a strong acid and a strong base titration is

A. methyl orange only

B. Phenolphthalein only

C. No suitable indicator

D. Any suitable indicator

ANSWER: D

16. 1.00230 to 2 significant figure is

A. 1.002

B. 1.0

C. 1.0023

D. 0.0023

ANSWER: B

17. $1.373 \times 5.3 \times 0.798$

A. 5.8070

B. 5.807

C. 5.81

D. 5.8

ANSWER: D

18. All the following are glass wares except

A. Burette

B. Pipette

C. Bunsen burner

D. Conical flask

ANSWER: C

19. System errors include the following except:

- A. personal error
- B. operational error
- C. humidity error
- D. errors of method

ANSWER: C

20. In the treatment of data for analysis, which of the statements is false?

- A. only the last figure of the result of the analysis should be uncertain.
- B. significant figures give an indication of the accuracy of results.
- C. standard errors are inevitably rough estimates.
- D. answers of products/quotients should be at least a number of significant figures in the data.

ANSWER: B

21. How many significant figures do 1300 has?

- A. 1
- B. 2
- C. 3
- D. 4

ANSWER: B

22. One of the following statements is not true about the Q-Test

- A. helps to decide whether to retain or reject questionable values.
- B. the questionable value is rejected when the value of Q exceeds the critical value given in the Q-Table.
- C. the questionable value is retained when the value of Q exceeds the critical value given in the Q-Table.
- D. results could be rejected by visual inspection of replicate analysis.

ANSWER: C

23. What is the number of significant figures given in the following values: 3.42, 0.00443, 28.4 and 0.0180.

- A. 1
- B. 2
- C. 4
- D. 3

ANSWER: D

24. Accuracy is expressed by _____ while precision is expressed by _____

- A. error, true value
- B. standard deviation, variance
- C. mean, median
- D. error, standard deviation

ANSWER: B

25. An ideal experimental procedure will produce both _____

- A. precision and accuracy.
- B. error and standard deviation
- C. error and true value
- D. mean and median

ANSWER: A

26. How close a measurement is to the true value is known as _____

- A. Accuracy
- B. Precision
- C. Estimate
- D. Significant

ANSWER: A

27. Which of the following formula is correct for calculating standard deviation for cases where $n > 10$?

A. $\sqrt{\frac{\sum(X - X_i)^2}{n}}$

B. $\sqrt{\frac{\sum(X_i - X)^2}{n-1}}$

C. $\sqrt{\frac{\sum(X_i - X)}{n}}$

D. $\sqrt{\frac{\sum(X_i - X)^2}{n}}$

ANSWER: A

28. What is the purpose of an indicator in the solution with an unknown concentration?

- A. It indicates when the equivalence point is reached.
- B. It indicates when there is enough acid in the solution.
- C. It allows easy detection of end point
- D. All of the above.

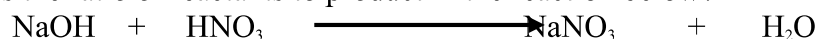
ANSWER: D

29. The concentration of NaOH is 0.1 M, what volume of 0.2 M HCl is needed to titrate 50 mL of NaOH?

- A. 10 mL
- B. 2.5 mL
- C. 0.5 mL
- D. 100 mL

ANSWER: B

30. What is the ratio of reactants to product in the reaction below?



- A. 1:1
- B. 2:1
- C. 1:2
- D. 2:2

ANSWER: A

31. The Molar mass of hydrochloric acid is given as

- A. 36.5 g
- B. 36.5 mol
- C. 36.5 gmol⁻¹
- D. 36.5 Jmol⁻¹

ANSWER: C

32. The number of decimal places is purely a matter of what _____ is used.

- A. mass
- B. unit
- C. weight
- D. length

ANSWER: B

33. Which of these statements is not correct?

- A. On no account must an unauthorized experiment be carried out by any student.
- B. Loud conversations and noise making are completely out of place in a laboratory.
- C. Eating and drinking in the laboratory is prohibited.
- D. Eating and drinking in the laboratory is not prohibited.

ANSWER: D

34. The number of decimal places gives an indication of _____

- A. absolute precision
- B. absolute accuracy
- C. standard deviation
- D. standard error

ANSWER: A

35. The error which affects an experiment, may be conveniently divided into _____

- A. systematic and random errors.
- B. systematic and relative errors
- C. systematic and relational errors
- D. systematic and reactive errors

ANSWER: A

36. In the titration of strong acid against strong base, the indicator that is usually used is _____

- A. methyl red
- B. methyl orange
- C. phenolphthalein
- D. All of the options

ANSWER: D

37. How many significant figures does 2000.06 has?

- A. 2
- B. 4
- C. 5
- D. 6

ANSWER: D

38. During the titration of ethanoic acid against sodium hydroxide, which of these compounds is usually put in the burette?

- A. NaOH
- B. H₂SO₄
- C. CH₃COONa
- D. CH₃COOH

ANSWER: D

39. Given that the volume of strong acid used in a titration against strong base is 34.50 cm³ with molarity of 0.1 M, calculate its number of moles.

- A. 3.45x10⁻¹mols
- B. 3.45x10⁻²mols
- C. 3.45x10⁻³mols
- D. 3.45x10⁻⁴mols

ANSWER: C

40. Absolute errors (ϵ) is defined as:

- A. true value – arithmetic mean
- B. arithmetic mean – true value
- C. variance – coefficient of variance
- D. coefficient – variance

ANSWER: B

41. The square of the standard deviation, 'S²' is called

- A. variance
- B. variable
- C. value observed
- D. standard deviation

ANSWER: A

42. One of the following best describes random errors

- A. Random errors arise from the inability of an individual to make observations.
- B. Random errors are due to steadiness of temperature or other natural conditions.
- C. Random errors are irregular and variable both in magnitude and sign.
- D. Random errors are erratic.

ANSWER: C

43. The objective of determining the 'line of best fit' while drawing a graph after an experiment is to:

- A. graphically express the results of one's experiment
- B. allow the effective determination of the slope of the graph
- C. for correct determination of the equation of the graph
- D. All of the option

ANSWER: D

44. In a graph of density against mass, Abel drew a straight line graph and picked points A (6, 6) and B (10, 8) to determine the slope. What will be the value?

- A. $\frac{1}{2} \text{ g/cm}^3$
- B. 2 g/cm
- C. 2 cm^{-3}
- D. $\frac{1}{2} \text{ cm}^{-3}$

ANSWER: D

45. The equation of a graph was given as $y = 1.81x - 0.73$. The slope and the intercept of the graph respectively are:

- A. 1.81 & 0.73
- B. 0.73 & 1.81
- C. -0.73 & 1.81
- D. 1.81 & -0.73

ANSWER: D

46. In plotting of graphs, X axis is also known as _____

- A. ordinate
- B. independent
- C. abscissa
- D. b and c

ANSWER: D

47. In plotting of graphs, Y axis is also known as _____

- A. ordinate
- B. independent
- C. abscissa
- D. b and c

ANSWER: A

48. Which of the Microsoft office package is used to plot graphs?

- A. MS word
- B. MS power point
- C. MS notepad
- D. MS excel

ANSWER: D

49. After plotting of graph on a Microsoft office package, one of the following commands is used to connect all the points together.

- A. add axis label
- B. add data labels
- C. add trendline
- D. add linetrend

ANSWER: C

50. Which of the charts is used to draw a straight-line graph on the Microsoft office package used in plotting graphs?

- A. line
- B. Scatter
- C. straight
- D. Hierarchy

ANSWER: B

51. A line of best fit should be drawn if the points on a graph _____

- A. are on a straight line
- B. are too large
- C. show considerable scatter
- D. are not relevant

ANSWER: C

52. If the equation of a straight line graph is given as $y = mx - c$, the intercept will then be _____

- A. +m,
- B. -m
- C. +c
- D. -c

ANSWER: D

53. A volumetric flask is used to measure which of the following?

- A. Gases
- B. Liquids
- C. Solids
- D. Masses

ANSWER: B

54. The following are volumetric apparatus except _____

- A. standard flask
- B. measuring cylinder
- C. burette
- D. weighing balance

ANSWER: D

55. The calibration of a pipette is carried out by which of the following methods?

- A. Gravimetric method
- B. Titrimetric method
- C. Centroid method
- D. Volumetric method

ANSWER: A

56. How close a measurement is to the true value is called _____

- A. Estimate
- B. Precision
- C. Significant
- D. Accuracy

ANSWER: D

57. How close a measurement is to each other is called _____

- A. Estimate
- B. Precision
- C. Significant
- D. Accuracy

ANSWER: D

58. Why are experiments carried out more than once?

- A. to minimize error
- B. to get plenty data
- C. all of the above
- D. none of the options

ANSWER: A

59. All of the following apparatus can be calibrated except _____

- A. thermometer
- B. burette
- C. pipette
- D. none of the options

ANSWER: D

60. The molar mass of Nitric acid is _____

- A. 74 gmol^{-1}
- B. 52 gmol^{-1}

- C. 63 gmol^{-1}
- D. None of the above

ANSWER: C

61. Which of the following salts is likely to have a pH of 3-4?
- A. NaNO_3
 - B. CH_3COONa
 - C. NaCO_3
 - D. FeCl_3

ANSWER: D

62. The acid/base pair that will produce CH_3COONa is
- A. $\text{CH}_3\text{COOH}/\text{NaOH}$
 - B. $\text{CH}_3\text{CH}_2\text{COOH}/\text{NaH}$
 - C. $\text{CH}_3\text{COOH}/\text{NaH}$
 - D. $\text{CH}_3\text{CH}_2\text{COOH}/\text{NaOH}$

ANSWER: A

63. Christopher mistakenly spilled dilute NaOH solution on her hand. His first aid measure should be to _____
- A. quickly run some water over the affected part
 - B. quickly run to the clinic
 - C. quickly bandage the portion
 - D. quickly clean it with a towel

ANSWER: A

64. The wearing of lab coats in the laboratory is ideal because
- A. it will protect one's clothing and invariably skin from spills
 - B. it is for self-protection and defense
 - C. it is a compulsory laboratory outfit

D. all of the above

ANSWER: A

65. One of the following is not correct about laboratory precautions:

A. Do not point a test-tube you are heating at yourself or at your neighbour.

B. Never place a highly inflammable substance near a naked flame.

C. Glass tubing or rod must be fire-polished before use.

D. None of the following.

ANSWER: D

66. All experiments involving the production of poisonous (toxic) or noxious gases MUST be carried out in a _____

A. cupboard

B. hood

C. preparatory room

D. None of the above

ANSWER: B

67. When determining the odour of a reagent or of the gas resulting from a reaction, do not ____

A. place your nose in direct contact with the issuing gas or directly over the container of the reagent.

B. placing the container from which the odour is issuing at a distance of about 10 cm away from your nose.

C. use your hand to gently fan the vapour in the direction of your nose.

D. Ensure that as little as possible of the vapour is inhaled only for a brief moment.

ANSWER: A

68. Add the following numbers and give the answer to the appropriate decimal places: $14.344137 + 17.347799 + 44.313$.

A. 76.005

B. 76.0049

C. 76.00494

D. 76.004936

ANSWER: A

69. What is the relationship between standard deviation and variance?

- A. standard deviation is the square root of variance
- B. standard deviation is the square of variance
- C. variance is the square root of standard deviation
- D. all of the options

ANSWER: A

70. The following are reasons behind calibration except to check the

- A. accuracy of the instrument
- B. reliability of the instrument
- C. functionality of the instrument
- D. None of the options

ANSWER: D

9.86

71. Solve this, $\frac{9.86}{0.95}$ and give the answer to the correct significant figures.

- A. 10
- B. 10.379
- C. 10.38
- D. 10.4

ANSWER: D

72. Solve this arithmetic, $58.2 + 0.037 - 2.10576$ and give the answer to the correct decimal places.

- A. 56.131
- B. 56.13
- C. 56.1
- D. 56

ANSWER: C

73. Give the correct number of significant figures in 4250

- A. 1

B. 2

C. 3

D. 4

ANSWER: C

74. Give the correct number of significant figures in 0.08060

A. 1

B. 2

C. 3

D. 4

ANSWER: D

75. Give the correct number of significant figures in 500.0

A. 1

B. 2

C. 3

D. 4

ANSWER: D

75. While plotting a graph, line of best fit is drawn in such a way that _____

A. All the points fall on the line.

B. Most of the points fall on the line.

C. Points outside the line are distributed almost equally across the line.

D. All of the options.

ANSWER: C

76. In a graph of Energy against Volume, with the equation $E = 1.8562V - 1.5845$. The quantity, slope divided by intercept is equal to _____

A. 1.1715 J

B. -1.1715 J/ m³

C. 1.1715 m³

D. -1.1715 m³

ANSWER: D

77. The product of ionic equation between carbonate ion and water gives _____

- A. Ammonia and water
- B. carboxylic acid and hydroxy ion
- C. hydrogen carbonate ion and hydroxy ion
- D. Iron (III) hydroxide and hydrogen ion

ANSWER: C

78. Which of the following apparatus can be used to measure a specific volume of a liquid accurately?

- A. Beaker
- B. Conical flask
- C. Measuring cylinder
- D. Pipette

Answer D

79. Which of the following applications would most likely utilize a burette as a measurement tool?

- A. Separating silver metal from liquid silver waste.
- B. Finding the quantity of acid in fruit juice.
- C. Finding the percent of gold in an unknown solid mineral sample.
- D. Finding the quantity of helium in a sample of air.

Answer B

80. A burette is graduated. What does this mean?

- A. It gets bigger at the top.
- B. The colour of the solution in the burette fades as the titration proceeds.
- C. It has calibrated lines for measuring volume precisely.
- D. None of these answers are correct.

Answer C

81. When reading volume from a burette, what is a best practice?

- A. Estimate the last decimal place.
- B. Read the bottom of the meniscus.
- C. Place an index card behind the burette to reduce glare.
- D. All of these answers are correct

Answer B

82. Volumetric flasks are used to measure which of the following in chemistry?

- A. Gases
- B. Liquids
- C. Solids
- D. All of the answers are correct.

Answer B

83. What does the mark on the neck of a volumetric flask indicate?

- A. The calibrated volume level for the flask (1 ml, 10 ml, 20 ml, etc.)
- B. The calibrated liquid level for the flask
- C. How much of one liquid to add before filling the flask with a second liquid to make a solution
- D. None of these answers are correct.

Answer A

84. Room temperature range is usually indicated by which one of the following?

- A. 10-15 degrees Celsius
- B. 20-25 degrees Celsius
- C. 30-37 degrees Celsius
- D. 40-42 degrees Celsius

Answer B

85. Given that water at 20 degree Celsius has a density of 0.9982g/mL, and a mass of 50g when discharged from a burette, what will be the volume of the water?

- A. 50.09 ml
- B. 51.00 ml
- C. 50.11 ml
- D. 51.09 ml

Answer A

86. What will be the density of water (50ml) having a mass of 50g at 20 degrees Celsius?

- A. 1.000g/ml
- B. 0.9982g/mL
- C. 0.9682g/mL
- D. 0.9782g/mL

Answer B

87. The degree of hotness or coldness of water in the laboratory is termed

- A. heat
- B. ice
- C. temperature
- D. thermometer

Answer C

88. _____ can be used to take the weight of water in the laboratory during experiments.

- A. weight
- B. Mass balance
- C. Weighing Scale
- D. Mass

Answer C

89. Which of the following cannot be calibrated?

- A. Weighing balance
- B. Thermometer
- C. Standard flask
- D. None of the above

Answer D

90. To calibrate means _____

- i. to ascertain the calibre of (something)
- ii. to determine, rectify, or mark the graduations of (something, such as a thermometer tube)
- iii. to standardize (something, such as a measuring instrument) by determining the deviation from a standard so as to ascertain the proper correction factors.

- A. ii only
- B. i only
- C. i,ii,iii
- D. i and iii only

Answer C

91. The primary significance of calibration is that it does the following except ____

- A. maintains accuracy
- B. standardization and repeatability in measurements
- C. assuring reliable benchmarks and results
- D. gives unreliable readings from apparatus

Answer D

92. Without regular calibration, all the following are possible except

- A. equipment can fall out of spec
- B. equipment can provide inaccurate measurements and threaten quality
- c. safety and equipment longevity.
- D. possibility of instrumental failure

Answer D

93. Graph is important because it _____

- A. Beautify your work
- B. Summarise your work
- C. Arranges your data
- D. All of the above

ANSWER: D

94. Which of these applications can be used for plotting of graph?

- A. Origin
- B. MS Excel
- C. R-Statistic
- D. All of the above

ANSWER: D

95. Why is scale important while plotting graph?

- A. for accuracy of data
- B. for best line of fit
- C. for appropriate display of graph
- D. All of the above

ANSWER: C

96.