1. What is the name given to the unit mg?
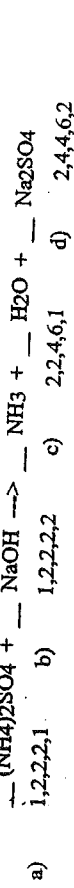
   a) magnesium   b) microgram   c) megagram

   d) milligram   e) metregram

2. How many decimetres are in 3.78×10^1 metres?

   a) 3.78×10^{-2} b) 0.378   c) 3.78

   d) 378   e) 3780

3. If the density of solid NaCl is 2.163 g/mL, what is the mass in kg of a 2.500 L volume of solid NaCl?

   a) 0.8652   b) 1.156   c) 5.408

   d) 865.2   e) not enough information given

4. A chemical plant can produce 2.5×10^1 litres of sulphuric acid in 1.0 minutes. At this rate, how many kilolitres of sulphuric acid would be produced in 1.0 days?

   a) 25   b) 36   c) 9.6×10^2

   d) 2.5×10^3 e) 3.6×10^3

5. Which of the following is a chemical change?

   a) the electrolysis of water   b) the evaporation of sea water

   c) the cutting of a piece of paper   d) both a) and b)

6. Which of the following statements is true?

   a) all elements are made of compounds

   b) all elements are made of molecules

   c) all atoms are made of molecules

   d) all molecules are made of atoms

   e) none of the above statements are true

7. The correct formula for tin(II) sulphide is

   a) SnS   b) TiS   c) SnSO3

   d) TiS2   e) SrSO3

8. In the compound sodium carbonate, the molar ratio of sodium to carbon is

   a) 1:1   b) 1:2   c) 2:1

   d) 1:3   e) 2:3

9. The name for $Mg_3(PO_4)_2$ is

   a) magnesium permanganate   b) magnesium phosphorus

   c) magnesium phosphate   d) trimagnesium diphosphorus

   e) magnesium(II) phosphide

10. The name of NO_3^- is

    a) nitrate   b) nitride   c) nitride

    d) nitrogen trioxide   e) nitrite

11. When oxygen forms an oxide with an unknown metal, the compound that forms is (metal)$_2O_3$. What is the charge of the metal in the compound?

    a) +1   b) +2   c) +3   d) +4   e) not enough information g

12. The Greek prefix "penta" is used to indicate how many atoms of an element in a binary compound?

    a) 3   b) 4   c) 5   d) 6   e) 7

13. The formula of aluminum chloride is

    a) AlCl   b) Al_2Cl_3 c) $AlCl_2$

    d) Al_3Cl_2 e) $AlCl_3$

14. What is the number of significant digits in 0.00007067?

    a) 2   b) 3   c) 7   d) 8   e) infinite

15. What is 15.9994 when rounded to three significant digits?

    a) 15.0   b) 15.9   c) 1.59×10^1

    d) 16.0   e) 16.1

16. The following calculation was performed on a calculator:

    $$(9.753 - 9.512) / 15.9994 = 0.015063065$$

    The answer to the correct number of significant digits is

    a) 1.50×10^{-2} b) 1.506×10^{-2} c) 1.5063×10^{-2}

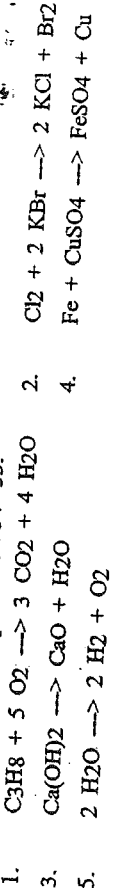   d) 1.506306×10^{-2} e) 1.51×10^{-2}

17. If 36 g of $ZnCl_2$ are added to 100.879 g of water, what will be the mass of the resulting solution to the correct number of significant digits?

a) 136 g   b) 136.8 g   c) 136.879 g

d) 1.369 x 102 g   e) none of the above

18. Accuracy is an indication of

a) the closeness of a value to its accepted value.

b) the consistency between repeated measurements.

c) the difference between a measurement and its averaged value.

d) the precision of a measurement.

e) the uncertainty in a measurement.

19. Which of the following statements contains an uncertain number?

a) The attendance at a concert was 4736.

b) There are 1000 m in one kilometre.

c) The number of eggs in a dozen is 12.

d) The molar mass of aluminum is 27 g/mol.

e) The mass of one atom of carbon - 12 is 12 u.

20. What volume of 6.0 M HCl solution is needed to make 5.0 litres of a 0.10 M HCl solution?

a) 83 mL   b) 120 mL   c) 0.012 L

d) 3.0 L   e) not enough information given

21. A balloon contains 4.00 mol of helium gas, how many atoms of helium are in the balloon?

a) 6.64 x 10-24   b) 4.00   c) 2.41 x 1024

d) 4.82 x 1024   e) 9.63 x 1024

22. How many atoms of oxygen can be found in 19.8 g of Fe_2O_3?

a) 7.46 x 1022   b) 2.24 x 1023   c) 3.73 x 1023

d) 4.98 x 1023   e) 8.55 x 1024

23. How many atoms are contained in 6.4 g of sodium chloride?

a) 0.22   b) 1.3 x 1023   c) 2.6 x 1023

d) 1.1 x 1025   e) 4.6 x 1026

24. The molar mass of $Al_2(SO_4)_3$ in grams is

a) 75   b) 187   c) 214   d) 278   e) 342

25. How many grams of water are in 22.0 g of $ZnSO_4 \cdot 6 H_2O$?

a) 0.490   b) 1.22   c) 1.47   d) 4.08   e) 8.82

26. The percent by mass composition of calcium, sulphur, and oxygen respectively in calcium sulphate is

a) 16.7%, 16.7%, 66.7%

b) 29.4%, 23.6%, 47.0%

c) 3.00 x 101%, 3.00 x 101%, 4.00 x 101%

d) 45.5%, 36.4%, 18.2%

27. 16.4 grams of $CuCl_2$ is dissolved in enough water to make 5.0 L of solution. What is the molarity of this solution?

a) 0.024   b) 0.30   c) 0.61   d) 3.3   e) 41

28. How many mol of H_2SO_4 are contained in 3.6 L of a 1.5 M solution?

a) 0.42   b) 2.4   c) 5.4

d) 3.3 x 1024   e) 2.3 x 1025

29. A compound contains 29.1% sodium, 40.5% sulphur, and 30.4% oxygen by mass. Calculate the empirical formula of the compound.

a) $NaSO_2$ b) $Na_2S_2O_3$ c) $Na_2S_3O_2$

d) Na_2S_4O e) $Na_4S_4O_3$

30. A compound was analyzed and found to contain 5.52 g of carbon and 0.93 g of hydrogen. If the molar mass of the compound is 56 g/mol, what is its molecular formula?

a) CH_2 b) C_2H c) C_2H_4

d) C_3H_2O e) C_4H_8

31. In an exothermic reaction, the enthalpy of the products is _____ the enthalpy of the reactants which gives ΔH a _____ value.

a) less than, negative   b) less than, positive   c) equal to, unchanged

d) greater than, negative   e) greater than, positive

2. The missing coefficient in the following equation is

$$4 \; Fe(NO_3)_3 \cdot 6 H_2O \longrightarrow 2 \; Fe_2O_3 + 12 \; NO_2 + 3 \; O_2 + \underline{\quad} H_2O$$

a) 4   b) 6   c) 10   d) 12   e) 24

33. The coefficients of the following equation when balanced are:

___ (NH4)2SO4 + ___ NaOH --> ___ NH3 + ___ H2O + ___ Na2SO4

a) 1,2,2,1 b) 1,2,2,2 c) 2,2,4,2 d) 2,4,4,6,2

The following equations refer to questions # 34 - 35:

1. $C_3H_8 + 5\ O_2 \longrightarrow 3\ CO_2 + 4\ H_2O$
2. $Cl_2 + 2\ KBr \longrightarrow 2\ KCl + Br_2$
3. $Ca(OH)_2 \longrightarrow CaO + H_2O$
4. $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$
5. $2\ H_2O \longrightarrow 2\ H_2 + O_2$

34. Which of the equations is a single replacement reaction?
a) none of them b) 1 only e) 2 only
d) both 2 and 4 e) both 3 and 5

35. Which of the equations is a decomposition reaction?
a) none of them b) both 2 and 4 c) 3 only
d) both 3 and 5 e) all of them

36. If 4 atoms of magnesium react with 2 molecules of oxygen gas, the total number of product molecules will be
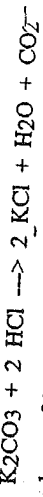a) 1 b) 2 c) 4 d) 6 e) 8

37. How many mol of sodium are required to react completely with 6 mol of oxygen gas in a synthetic reaction?
a) 2 d) 4 c) 6 d) 12 e) 24

38. What mass of KClO3 must decompose to produce 5.0 g of potassium chloride (the other product is oxygen gas)?
a) 5.5 g b) 6.3 g c) 8.2 g d) 12 g e) 13 g

39. According to the equation:

$K_2CO_3 + 2\ HCl \longrightarrow 2\ KCl + H_2O + CO_2$

what volume of 1.50 M HCl is required to completely react with 2.50 g of K2CO3?
a) 12.1 mL b) 24.1mL c) 27.1 mL
d) 54.3 mL e) 461 mL

40. When 10.0 g of potassium chlorate are decomposed by heating, potassium chloride and oxygen gas are produced. The mass of potassium chloride collected was 4.62 g. What was the percent yield of potassium chloride?
a) 8.16% b) 24.0% c) 46.2% d) 76.0%

41. Which of the following statements is true?
a) Cathode ray tubes were used to discover atoms.
b) Cathode rays cannot be deflected by a magnetic field.
c) Cathode rays are streams of negatively charged particles.
d) Rutherford developed the first cathode ray tube.
e) Cathode rays can be deflected toward a negative charge.

42. Which of the following represents the correct order for the dates of discovery of each of the sub-atomic particles?
a) electron, neutron, proton b) proton, electron, neutron
c) electron, proton, neutron d) proton, neutron, electron
e) neutron, electron, proton

44. The discovery that atoms possess a very small region in which protons are found was accomplished by
a) anode ray tube experiments. b) mass spectrometer experiments.
c) cathode ray tube experiments. d) the "oil-drop" experiment.
e) the "gold foil" experiment.

45. An ion of element "X" has 60 protons, 58 electrons, and 80 neutrons. Its mass number is ___ and its charge is ___
a) 60, 2+ b) 118, 2- c) 138, 2-
d) 138, neutral e) 140, 2+

60. 12.6 grams of potassium chlorate decompose to form solid potassium chloride and oxygen gas. What is the volume of oxygen gas produced at STP?
a) 0.154 L b) 0.290 L c) 2.30 L
d) 3.45 L e) 12.6 L

61. One container of gas holds a pure gas. Another holds a mixture of gases. The containers have equal volumes. Under the conditions necessary for Avogadro's Hypothesis to apply, the two samples of gas must
a) have equal masses. b) have an equal number of moles.
c) be at different pressures. d) be at different temperatures.

62. How many litres of hydrogen gas are needed to produce 3.0 L of ammonia, NH_3? The other reactant is nitrogen gas. Assume that all gases are measured under the same conditions.
   a) 1.0 L   b) 2.0 L   c) 2.5 L
   d) 3.0 L   e) 4.5 L

63. Which of the following elements could be expected to have chemical properties that differ from the rest?
   a) oxygen   b) selenium   c) strontium
   d) sulphur   e) tellurium

65. Which of the following would have the highest ionization energy?
   a) Ar   b) K   c) Na   d) S   e) Si

66. Which of the following would have the smallest radius?
   a) Ca^{2+} b) Cl^- c) K^+ d) P^{3-} e) S^{2-}

71. The first three ionization energies of an element are listed below:
   IE1 = 224 kJ/mol   IE2 = 4670 kJ/mol   IE3 = 5899 kJ/mol
   What would be the charge of the most common and stable ion of this element?
   a) 1-   b) 1+   c) 2-   d) 2+   e) 3+

72. Which of the following compounds contains a covalent bond?
   a) AgCl   b) BaS   c) CO   d) LiF

73. When two atoms share bonding electrons equally, the bond is
   a) dipolar   b) ionic
   c) nonpolar covalent   d) polar

74. How many lone pair of electrons are on the nitrogen atom in the molecule NH_3?
   a) 0   b) 1   c) 2   d) 3

76. What is the maximum number of valence electrons that an atom of oxygen can have?
   a) 2   b) 8   c) 10   d) 12   e) 18

77. How many bonds connect the nitrogen atoms in a molecule of N_2?
   a) 1   b) 2   c) 3   d) 4

78. How many valence electrons are present in a molecule of propane, C_3H_8?
   a) 12   b) 18   c) 20
   d) 22   e) not enough information given

79. What is the name given to Group 2 elements of the Periodic Table?
   a) alkali metals   b) alkaline earth metals   c) halides
   d) halogens   e) noble gases

80. Which Group Number of the Periodic Table will combine with Group 16 in a 1 : 1 ratio?
   a) 1   b) 2   c) 3   d) 17   e) 18

- The End - (Life Lesson # 39 - do not eat yellow snow!)