MINGA DAY SECONDARY SCHOOL

GRADE 12 CHEMISTRY TEST 1 – TERM 1 – 2023

DURATION: 1 HOUR 45 MINUTES **MARKS: 50**

NAME: ..... **CLASS:** .....

SECTION A [10 MARKS]

Answer all the questions by crossing out the best answer **A, B, C** or **D** with an **X**

1. How many atoms are there in 6.0g of carbon atoms?
   A. 3×10^{23} C. 1.2×10^{24}
   B. 6×10^{23} D. 6×10^{24}
2. How many oxygen atoms are 1.6g of sulphur trioxide, SO_3?
   A. 3 C. 3.6×10^{22}
   B. 4.8 D. 9.6×10^{23}
3. Determine the relative molecular mass of lead (IV) chloride, $PbCl_4$.
   A. 249 C. 278
   B. 349 D. 378
4. What is the mass of 0.2 moles of chlorine molecules?
   A. 142g C. 71g
   B. 14.2g D. 7.1g
5. Which gas contains the same of number of molecules as 9g of water?
   A. 2g of hydrogen C. 14g of nitrogen
   B. 32g of oxygen D. 44g of carbon dioxide
6. 1.00dm^3 of ammonia gas is passed over heated copper (II) oxide.

   $$3CuO_{(s)} + 2NH_{3(g)} \rightarrow 3Cu_{(s)} + N_{2(g)} + 3H_2O_{(l)}$$

   What is the volume of nitrogen formed when measured at the same temperature and pressure as the ammonia?
   A. 0.25dm^3 C. 0.60dm^3
   B. 1.00dm^3 D. 2.00dm^3
7. Using the Periodic Table for the relative atomic masses, which has the least mass?
   A. 0.1 moles of silicon dioxide, SiO_2 C. 0.5 moles of oxygen, O_2
   B. 0.5 moles of lithium, Li D. 1.0 moles of ammonia, NH_3
8. Sodium hydrogencarbonate decomposes on heating.

   $$2NaHCO_{3(s)} \rightarrow Na_2CO_{3(s)} + CO_{2(g)} + H_2O_{(l)}$$

   In an experiment, a 0.5mol sample of sodium hydrogencarbonate is heated.
   Which volume of carbon dioxide, measured at room temperature and pressure, is evolved?
   A. 24dm^3 C. 36dm^3
   B. 48dm^3 D. 60dm^3
9. Calcium carbonate, $CaCO_3$, decomposes according to the following equation;

   $$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$$

   What volume of carbon dioxide, measured at room temperature and pressure is produced when 50g of calcium carbonate is decomposed?
   A. 12.0dm^3 C. 24.0dm^3
   B. 48.0dm^3 D. 120dm^3

10. On strong heating copper (II) nitrate decomposed to produced copper (II) oxide, nitrogen dioxide and oxygen according to the balanced chemical equation below;

$$2Cu(NO_3)_2 \rightarrow 2CuO + 4NO_2 + O_2$$

Calculate the mass of copper (II) oxide obtained when 56.4g of copper (II) nitrate decomposed.

A. 24.0g
C. 40.0g
B. 80.0g
D. 160.0g

11. Methane burns completely in oxygen according to the equation below;
If 0.2mol of methane is burned completely, which volume of carbon dioxide measured at r.t.p. is formed?

A. 0.2dm^3
C. 0.6dm^3
B. 2.4dm^3
D. 4.8dm^3

12. What is the concentration of a solution conatining 1.0g of sodium hydroxide in 250cm3 of solution?

A. 0.025mol/dm^3
C. 0.10mol/dm^3
B. 0.25mol/dm^3
D. 1.0mol/dm^3

13. 15.0cm^3 of 1.0mol/dm^3 potassium hydroxide just neutralise 20.0cm^3 of a solution of nitric acid.
What is the concentration of the acid?

A. 0.75mol/dm^3
C. 1.0mol/dm^3
B. 1.5mol/dm^3
D. 7.5mol/dm^3

14. In an experiment 264g of strontium reacts with 213g of chlorine.
What is the formula of strontium chloride?

A. $SrCl$
C. $SrCl_2$
B. $SrCl_3$
D. Sr_2Cl

15. Calcium burns in oxygen according to the following equation;
If 5.2g of calcium burns completely, what will be the mass of calcium oxide produced?

A. 6.8g
C. 7.3g
B. 7.8g
D. 8.0g

16. Calcium reacts with water as shown.

$$Ca_{(s)} + 2H_2O_{(l)} \rightarrow Ca(OH)_{2(aq)} + H_{2(g)}$$

What is the total mass of the solution that remains when 40g of calcium reacts with 100g of water?

A. 58g
C. 74g
B. 138g
D. 140g

17. Which of the following is likely to be the molecular formula of a hydrocarbon containing 85.7% carbon and 14.3% hydrogen by mass?

A. C_2H_6
C. C_3H_8
B. C_5H_{12}
D. C_6H_{12}

18. A compound has the empirical formula CH_2O and a relative molecular mass of 60. What is the molecular formula of this compound?

A. C_2H_4O
C. $C_3H_4O_2$
B. $C_3H_4O_3$
D. $C_2H_4O_2$

19. An oxide of hydrogen has a percentage composition by mass H = 5.9% and O = 94.1%. Its relative molecular mass is 34. Calculate the molecular formula of the oxide.

A. HO
C. H_2O
B. H_2O_2
D. H_2O_3

20. What is the percentage yield when 6.4g of copper are heated in air and 7.6g of copper (II) oxide is obtained?

A. 20%
C. 80%
B. 95%
D. 98%

SECTION B [30 MARKS]

Answer all questions in this section in the spaces provided

21. Barium sulphate ($BaSO_4$) is an insoluble salt which is prepared by precipitation.

(a) Using sodium as one of the reactants;

i. Name the other reactant you would use to prepare barium sulphate. [1]

ii. Write a balanced chemical equation for the reaction, include state symbols. [2]

iii. Write an ionic equation for the reaction. [1]

(b) Briefly explain how you obtain a fairly pure dry sample of the slat. [3]

(c) Name one salt that can be prepared by the reaction of a metal with a dilute acid. [1]

(d) Calcium chloride ($CaCl_2$) can be prepared by reacting calcium carbonate and dilute hydrochloric acid as shown in the equation below;

$$CaCO_{3(s)} + 2HCl_{(aq)} + CO_{2(g)} + H_2O_{(l)}$$

Calcuate the mass of calcium chloride produced by 150g of calcium carbonate. [3]

TOTAL [10]

22. Calculate the number of moles in the following species;

a. 1.76×10^{20} atoms of calcium [2]

b. 30g of glucose, $C_6H_{12}O_6$ [2]

TOTAL [4]

23. What is the volume occupied by each of the following gases at r.t.p.?

a. 0.25 moles of nitrogen [2]

b. 88g of carbon dioxide [2]

TOTAL [4]

24. (a) Work out the relative formula mass, Mr of the following;

i. $Ca(HCO_3)_2$ [1]

ii. $Al_2(SO_4)_3$ [1]

(b) When water containing dissolved calcium hydrogencarbonate is boiled, the calcium hydrogencarbonate decomposes according to the equation below;

$$Ca(HCO_3)_{2(aq)} \rightarrow CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$$

i. Name the white solid formed in this reaction. [1]

ii. If the water boiled contained 16.2g of calcium hydrogencarbonate, calculate the mass of $CaCO_3$ formed. [2]

TOTAL [5]

25. (a) Explain what is meant by limiting reactant. [1]

(b) 2.4g of magnesium reacts with 0.30mol of hydrochloric acid.

i. Write a balanced chemical reaction for the reaction. [2]

ii. Determine the limiting reactant. [2]

iii. Calculate the mass in excess for the substance which is in excess. [1]

TOTAL [5]

26. When 12.35g of copper (II) carbonate was heated in a crucible, 7.0g of copper (II) oxide was produced. Calculate the percentage yield of copper (II) oxide.

$$CuCO_{3(s)} \rightarrow CuO_{(s)} + CO_{2(g)}$$

TOTAL [2]