

Please read all the questions VERY carefully before answering. If you do not understand any question, please ask. Use the reverse side of the question paper as scratch. Use the periodic table and constant chart in the last page. No outside paper is allowed. Total points =  $54+(25 \times 3)=75=129$

SHORT ANSWER. Please write the set-up equation first, then insert the raw data with units in the equation before doing your calculations. Points will be deducted if your answer is not clear.

1) An element has atomic mass of 35.45 amu. It has two stable isotopes: Iso-1 with mass 34.9689 amu & Iso-2, with mass 36.9695 amu. Show your calculation to find the natural abundances of Iso-1 & Iso-2. (10 pts.) 1) \_\_\_\_\_

2) Calculate the number of atoms in 39.7 g chlorine gas (Note the formula of Chlorine gas). (6 pts.) 2) \_\_\_\_\_

3) Write the formula for (2 pts. each; Total 6 pts.): 3) \_\_\_\_\_

(a) Ammonium phosphate:

(b) Lead (IV) hydrogen phosphate:

(c) Dichlorine sulphide:

4) Calculate the amount (in grams) of potassium in a 42.7 gram sample of potassium nitrate. (10 pts.) 4) \_\_\_\_\_

5) An acid has 40% C, 6.7% H, 53.3% O and its molar mass is 60.05 g/mol. Show your calculation to find the molecular formula of the acid? (10 pts.) 5) \_\_\_\_\_

6) Write the name next to the formula for (2 pts. each; Total 6 pts.): 6) \_\_\_\_\_

(a)  $\text{Ca}(\text{HSO}_4)_2$ :

(b)  $\text{Al}_2(\text{CrO}_4)_3$ :

(c)  $\text{Co}(\text{ClO}_4)_2$ :

7) If a mixture of salt and sand contained 45.9% salt then calculate the amount of sand present in 25.68 g of the mixture (6 pts.) 7) \_\_\_\_\_

MULTIPLE CHOICE. On scantron, answer the questions starting from number 8. Choose the one alternative that best completes the statement or answers the question. (3 points each)

- 8) What is the mass percent of chlorine in hydrochloric acid? 8) \_\_\_\_\_  
A) 35.5  
B) 70.1  
C) 97.2  
D) 2.8  
E) none of the above
- 9) How many of each type of atoms are there in the formula  $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ ? 9) \_\_\_\_\_  
A) N = 1, H = 3, C = 2, O = 2  
B) N = 4, H = 7, C = 2, O = 2  
C) N = 1, H = 7, C = 2, O = 2  
D) N = 1, H = 4, C = 2, O = 2  
E) none of the above
- 10) Which among the following elements does NOT exist as a diatomic molecule in nature? 10) \_\_\_\_\_  
A) nitrogen  
B) fluorine  
C) hydrogen  
D) neon  
E) none of the above
- 11) Ammonium fluoride is considered which of the following? 11) \_\_\_\_\_  
A) atomic element  
B) molecular compound  
C) ionic compound  
D) molecular element  
E) none of the above
- 12) What is the formula for an ionic compound made of aluminum and oxygen? 12) \_\_\_\_\_  
A)  $\text{Al}_3\text{O}_2$   
B)  $\text{AlO}$   
C)  $\text{Al}_2\text{O}_3$   
D)  $\text{AlO}_2$   
E) none of the above
- 13) What is the name of the compound made from lithium and oxygen? 13) \_\_\_\_\_  
A) lithium(I) oxide  
B) oxygen lithide  
C) lithium dioxide  
D) lithium oxide  
E) none of the above

- 14) Which formula shown is incorrect for the name given? 14) \_\_\_\_\_  
A) calcium nitrate:  $\text{Ca}(\text{NO}_3)_2$   
B) ammonium cyanide:  $\text{NH}_4\text{CN}$   
C) strontium carbonate:  $\text{SrCO}_3$   
D) lithium sulfate:  $\text{LiSO}_4$   
E) potassium acetate:  $\text{KC}_2\text{H}_3\text{O}_2$
- 15) What is the formula mass of copper(II) fluoride? 15) \_\_\_\_\_  
A) 101.55  
B) 90.00  
C) 146.10  
D) 165.10  
E) none of the above
- 16) You have 10.0 g each of Na, C, Pb, Cu and Ne. Which contains the smallest number of moles? 16) \_\_\_\_\_  
A) Ne                      B) Na                      C) Pb                      D) C                      E) Cu
- 17) How many moles of carbon are in 3.5 moles of calcium carbonate? 17) \_\_\_\_\_  
A) 7  
B) 3.5  
C) 100.09  
D) 10.5  
E) none of the above
- 18) Determine the empirical formula of a compound containing 83% potassium and 17.0% oxygen. 18) \_\_\_\_\_  
A)  $\text{K}_2\text{O}$   
B)  $\text{KO}$   
C)  $\text{K}_2\text{O}_3$   
D)  $\text{KO}_2$   
E) none of the above
- 19) What are the coefficients for the following reaction when it is properly balanced? 19) \_\_\_\_\_  
\_\_\_\_nitrogen monoxide + \_\_\_\_carbon monoxide  $\rightarrow$  \_\_\_\_nitrogen + \_\_\_\_carbon dioxide  
A) 1, 1, 2, 2  
B) 2, 2, 2, 1  
C) 2, 2, 1, 2  
D) 2, 1, 1, 2  
E) none of the above
- 20) When the equation  $\_\_\text{NO}_2 + \_\_\text{H}_2\text{O} + \_\_\text{O}_2 \rightarrow \_\_\text{HNO}_3$  is balanced, the coefficient of  $\text{HNO}_3$  is 20) \_\_\_\_\_  
A) 3.  
B) 5.  
C) 4.  
D) 2.  
E) none of the above

- 21) The compound sodium sulfate is soluble in water. When this compound dissolves in water, which ion listed below would be present in solution? 21) \_\_\_\_\_
- A)  $S^{2-}$
  - B)  $Na_2^{2+}$
  - C)  $SO_4^{2-}$
  - D)  $O^{2-}$
  - E) none of the above
- 22) A precipitate is expected to be formed when an aqueous solution of sodium sulfate is added to an aqueous solution of 22) \_\_\_\_\_
- A) iron(III) chloride.
  - B) potassium chloride.
  - C) barium chloride.
  - D) magnesium chloride.
  - E) none of the above
- 23) What type of reaction is the generic equation  $AB + CD \rightarrow AD + CB$ ? 23) \_\_\_\_\_
- A) double-displacement
  - B) decomposition
  - C) synthesis/combination
  - D) single displacement
  - E) none of the above
- 24) How many grams of sodium metal are needed to make 29.3 grams of sodium chloride? 24) \_\_\_\_\_  
Given the reaction:  $2Na + Cl_2 \rightarrow 2NaCl$
- A) 5.75
  - B) 23.0
  - C) 11.5
  - D) 46.0
  - E) not enough information
- 25) Suppose two chemical reactions are linked together in a way that the  $O_2$  produced in the first reaction goes on to react completely with Mg to form MgO in the second reaction. 25) \_\_\_\_\_  
Reaction one:  $2 KClO_3 \rightarrow 3 O_2 + 2 KCl$   
Reaction two:  $2 Mg + O_2 \rightarrow 2 MgO$   
If you start with 4 moles of  $KClO_3$ , how many moles of MgO could eventually form?
- A) 12 moles
  - B) 2 moles
  - C) 4 moles
  - D) 6 moles
  - E) none of the above
- 26) How many grams of sodium metal are needed to make 29.3 grams of sodium chloride? 26) \_\_\_\_\_  
Given the reaction:  $2Na + Cl_2 \rightarrow 2NaCl$
- A) 5.75
  - B) 11.5
  - C) 46.0
  - D) 23.0
  - E) not enough information

- 27) Iron metal reacts with oxygen to produce iron(III) oxide. If you have 12.0 moles of iron for complete reaction, you need 27) \_\_\_\_\_
- A) 12.0 moles of  $O_2$  and produce 24.0 moles of  $Fe_2O_3$ .
  - B) 9.0 moles of  $O_2$  and produce 6.0 moles of  $Fe_2O_3$ .
  - C) 9.0 moles of  $O_2$  and produce 3.0 moles of  $Fe_2O_3$ .
  - D) 4.5 moles of  $O_2$  and produce 3.0 moles of  $Fe_2O_3$ .
  - E) none of the above

TRUE/FALSE. On scantron, choose "A" for a true answer and "B" for wrong answer. (3 points each)

- 28) The numerical value of the mole is defined as being equal to the number of atoms in exactly 12 grams of pure carbon-12. 28) \_\_\_\_\_
- 29) One mole of  $I_2$  has more atoms in it than one mole of Na. 29) \_\_\_\_\_
- 30) The formation of a gas is evidence of a chemical reaction while the emission of light is not. 30) \_\_\_\_\_
- 31) The formula of a compound comprised of two nitrogen atoms and one oxygen atom should be written properly as  $ON_2$ . 31) \_\_\_\_\_
- 32) The conversion factor between mass and moles for a compound is the molar mass. 32) \_\_\_\_\_