

## Review for Exam # 4 (Module 5-Reactions and Module 6-Stoichiometry and Moles)

Solve all the Questions and then check Answers from Ans key provided at the end.

Feel as if you are taking the Real Exam.

Note- Print out the Periodic table located under label study materials in module 3.

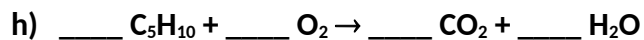
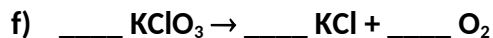
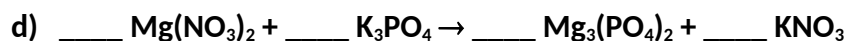
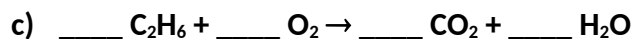
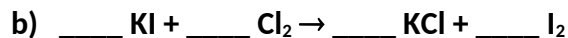
### Ques.1. Fill in the blanks:

- a) According to Law..... mass can be neither created nor destroyed in any ordinary chemical reaction.
- b) ..... are the starting substances that undergo change in a chemical reaction.
- c) ..... are the substances produced as a result of a chemical reaction.
- d) Two reactants combined to form one product is known as.....
- e) A reaction in which a substance reacts with oxygen and which proceeds with the evolution of heat and usually also a flame.....
- f) A single reactant breaks down to form two or more products is known as.....

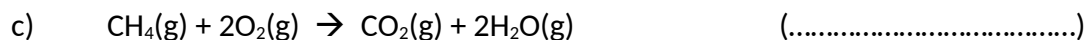
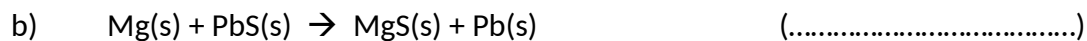
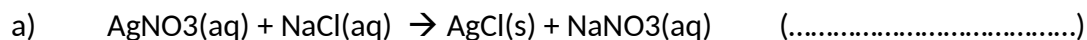
### Ques. 2. Indicate whether the Chemical Equations are balanced (B) OR unbalanced (UB)

- a)  $2\text{Fe}(\text{OH})_3 + 3\text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O}$
- b)  $\text{Al} + \text{O}_2 \rightarrow \text{AlO}_3$
- c)  $\text{Mg} + \text{HBr} \rightarrow \text{MgBr}_2 + \text{H}_2$
- d)  $\text{WO}_3 + 3\text{H}_2 \rightarrow \text{W} + 3\text{H}_2\text{O}$
- e)  $\text{C}_5\text{H}_{10}\text{O} + 7\text{O}_2 \rightarrow 5\text{H}_2\text{O} + 5\text{CO}_2$
- f)  $\text{AgNO}_3 + \text{KCl} \rightarrow \text{KNO}_3 + 3\text{AgCl}$

**Ques. 3.** Balance the following Equations:



**Ques. 4.** Classify each reaction type ?



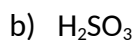
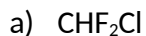
**Ques.5. Fill in the blanks**

- a) Mass of 1 Nitrogen atom is equal to 14.01 .....
- b) Mass of 1 mole of Fluorine atom is equal to 19.00.....
- c) 1 mole of Oxygen molecules is equal to.....molecules.
- d) The law of ..... states that a chemical compound always contains exactly same proportion of elements by mass.

**Ques. 6. Indicate whether the following statements are True or False**

- a) Formula mass of  $\text{ClNO}_3$  is 97.46 amu.
- b) 1 mole of Mg atom is equal to  $6.022 \times 10^{23}$  Mg atoms
- c) Molar mass of  $\text{NH}_3$  is equal to 18.04 g
- d) 1 mole of Chlorine is equal to 32.00 g Chlorine

**Ques. 7. Calculate the formula mass for these compounds using significant rule and proper units? [Hint : Section 5.6, page 141 of textbook or see lecture video on Moles](#)**



**Ques. 8. How many moles are there in  $8.333 \times 10^{24}$  molecules of CO?**

- a) 14.00 moles of CO
- b) 12.22 moles of CO
- c) 13.84 moles of CO
- d) None

**Ques. 9. How many atoms of Sodium are there in 2.384 moles of Sodium?**

- a)  $1.436 \times 10^{24}$  atoms
- b)  $1.336 \times 10^{24}$  atoms
- c)  $1.436 \times 10^{22}$  atoms
- d)  $1.436 \times 10^{20}$  atoms

**Ques. 10. How many moles of Ethanol,  $\text{C}_2\text{H}_6\text{O}$ , are present in 25.1 grams?**

- a) 0.545 moles of Ethanol
- b) 0.233 moles of Ethanol
- c) 0.111 moles of Ethanol
- d) 0.324 moles of Ethanol

**Ques. 11.** What is the mass in grams of 1.55 moles of  $\text{CH}_4$ ?

- a) 23.0 g
- b) 23.2 g
- c) 24.9 g
- d) 24.0 g

**Ques. 12.** Calculate the molecular formula of compound whose empirical formula is CHN and empirical mass is 27.02 grams/mole. The molecular formula mass (molar mass) of the compound is 135.15 grams/mole.

- a)  $\text{C}_2\text{H}_2\text{N}_2$
- b)  $\text{C}_3\text{HN}_3$
- c)  $\text{C}_5\text{H}_5\text{N}_5$
- d)  $\text{C}_2\text{HN}_2$

**Ques. 13.** Formula mass is used for ..... and Molecular mass is used for.....

- a) covalent compound ; ionic compound
- b) ionic compound ; covalent compound
- c) coordinate compound ; ionic compound
- d) none of the options are correct

**Ques. 14.** Molecular formula of dinitrogen tetra hydride is  $\text{N}_2\text{H}_4$  What will be the Empirical Formula of this compound ? [Hint: See lecture video / PPT notes on moles](#)

- a)  $\text{N}_2\text{H}$
- b)  $\text{NH}$
- c)  $\text{NH}_2$
- d)  $\text{N}_2\text{H}_2$

**Ques. 15.** Formula unit of Aluminum oxide is  $\text{Al}_2\text{O}_3$  What will be the Empirical Formula of the compound ?

- a)  $\text{Al}_2\text{O}_3$
- b)  $\text{Al O}_3$
- c)  $\text{Al}_2\text{O}$
- d)  $\text{AlO}_{1.5}$

**Ques. 16.** Calculate the molar mass of  $\text{C}_{12}\text{H}_{22}\text{O}_{11}$  Show work in the space provided with proper units .

To calculate molar mass of Sugar you will first multiply # atoms to individual element mass and then add all the masses so you will get molar mass at decimal 2 places.

$$\text{C}_{12}\text{H}_{22}\text{O}_{11} \rightarrow 12 (12.02 \text{ g/ mol}) + 22 (1.01 \text{ g/mol}) + 11 (16.00 \text{ g/ mol})$$

$$= 144.12 \text{ g/ mol} + 22.2 \text{ g/ mol} + 176.00 \text{ g/ mol}$$

$$= 342.332 \text{ g/ mol ( calculator answer) and } 342.2 \text{ g/mol ( correct answer according to addition rounding of rule you learned in measurement)}$$

Hint : molar mass is mass of molecule in 1 mole. See lecture video or PPT notes on moles

**Ques. 17.** Calculate the mass percentage composition (percentage by mass of each element) in  $\text{C}_2\text{H}_6$ ? Show work in the space provided with proper units .

$$\text{Hint: \% Element} = (\text{mass of element} / \text{Total molecular mass}) \times 100$$

**Ques. 18.** What is the mass percentage of fluorine in  $\text{SF}_6$ ?

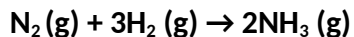
$$\text{Hint: \% Element} = (\text{mass of element} / \text{Total molecular mass}) \times 100$$

**Ques. 19.** Naphthalene, the compound causing the characteristic smell of mothballs, has a percent composition of 93.71% carbon and 6.29% hydrogen. Find the empirical formula of naphthalene. Hint: Example given in textbook on page 179 in chapter- Counting atoms

**Ques. 20.** A compound is found to contain 23.3% Magnesium, 30.7% Sulfur and 46.0% Oxygen. What is the empirical formula of this compound? Show work in the space provided with proper units .

Hint: Assume % as g , Convert g to moles, Identify smallest mole and divide element mole by smallest to get whole number, Use the number as subscript to make Empirical formula . (Exceptional cases- Sometimes you do not get whole number but fraction (1.4 or 1.5) then you have to multiply all moles by lowest whole number 2)

**Ques. 21.** Calculate moles of Ammonia could be produced when 2.2 mole of hydrogen gas would be used in given reaction? [Hint: Stoichiometry concept \(chapter 8 of textbook\). Look for examples explained there or in lecture video on Stoichiometry.](#)



- a) 2.3 moles of Ammonia
- b) 1.5 moles of Ammonia
- c) 2.0 moles of Ammonia
- d) 3.0 moles of Ammonia

**Ques. 22.** Sodium metal will react with gaseous ammonia to produce solid sodium amide,  $\text{NaNH}_2$  and  $\text{H}_2$  gas. The unbalanced equation for this reaction is :  $\text{Na}(\text{s}) + \text{NH}_3(\text{g}) \rightarrow \text{NaNH}_2(\text{s}) + \text{H}_2(\text{g})$

Write the balanced equation for this reaction, then calculate how many moles of Sodium amide can be produced from 32.0 g of Na?

[Hint: Convert g to moles of Na and then moles of  \$\text{NaNH}\_2\$ . You will stop here since g  \$\text{NaNH}\_2\$  is not asked.](#)

[Stoichiometry concept \(chapter 8 of textbook\). Look for examples explained there or in lecture video on the concept in Module -6](#)

### Ans. Key for Review # 4

Ques. 1. a) Law of Conservation of mass                      b) Reactant            c) Product            d) Synthesis  
e) Combustion    f) Decomposition

Ques 2. a) B        b) UB    c) UB    d) B        e) B        f) UB

Ques 3:

- a)  $2\text{N}_2 + 3\text{O}_2 \rightarrow 2\text{N}_2\text{O}_3$
- b)  $2\text{KI} + \text{Cl}_2 \rightarrow 2\text{KCl} + \text{I}_2$
- c)  $2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$
- d)  $3\text{Mg}(\text{NO}_3)_2 + 2\text{K}_3\text{PO}_4 \rightarrow \text{Mg}_3(\text{PO}_4)_2 + 6\text{KNO}_3$
- e)  $2\text{NBr}_3 + 3\text{NaOH} \rightarrow \text{N}_2 + 3\text{NaBr} + 3\text{HBrO}$
- f)  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$
- g)  $\text{K}_3\text{PO}_4 + 3\text{HCl} \rightarrow 3\text{KCl} + \text{H}_3\text{PO}_4$
- h)  $2\text{C}_5\text{H}_{10} + 15\text{O}_2 \rightarrow 10\text{CO}_2 + 10\text{H}_2\text{O}$

Ques 4. a) Double displacement reaction                      b) Single displacement reaction  
c) Combustion reaction                      d) Synthesis reaction

Ques 5. a) amu                      b) grams                      c)  $6.022 \times 10^{23}$                       d) Definite Proportions

Ques 6. a) True                      b) True                      c) False                      d) False

Ques 7. a) 86.47 amu                      b) 82.09 amu                      c) 110.98 amu

Ques 8 . Ans. 13.84 moles of CO

Ques 9. Ans.  $1.436 \times 10^{24}$  atoms

Ques 10. a) 0.545 mole Ethanol

Ques 11. c) 24.9 g CH<sub>4</sub>

Ques 12. c) C<sub>5</sub>H<sub>5</sub>N<sub>5</sub>

Ques 13. b) ionic compound ; covalent compound

Ques 14. c) NH<sub>2</sub>

Ques 15. a) Al<sub>2</sub>O<sub>3</sub>

Ques 16. Ans 342.34 g / mol

Ques 17. Ans %C= 79.85 %        %H = 20.15 % (show all the steps with proper units)

Ques 18. Ans % Fe = 70.05 %

Ques 19. C<sub>5</sub>H<sub>4</sub>

Ques 20. Ans MgSO<sub>3</sub> (Show all the steps with proper units and sig fig.)

Ques 21. Ans 1.5 moles of Ammonia

Ques 22. Ans 1.39 mol NaNH<sub>2</sub>