

Practice Test

Unit 3

Test

GHI: The Mole

Total Marks: 40

Name KEY

Useful constants:

$$N_A = 6.02 \times 10^{23}$$

$$\text{Molar volume of a gas} = 22.4 \text{ L/mol}$$

1. What is the molar mass of $\text{Ca}(\text{MnO}_4)_2$?

- A. 111.0 g/mol
- B. 159.0 g/mol
- C. 245.9 g/mol
- D. 277.9 g/mol

D

2. How many atoms are in 13.0 mol of Br?

- A. 13
- B. 79.9
- C. 7.83×10^{24}
- D. 6.25×10^{26}

C

3. What is the mass of 0.0107 mol of CaF?

- A. 0.6324 g
- B. 0.632 g
- C. 5523.36 g
- D. 5.52×10^3 g

B

4. How many moles are in 9.9 g of Na_3PO_4 ?

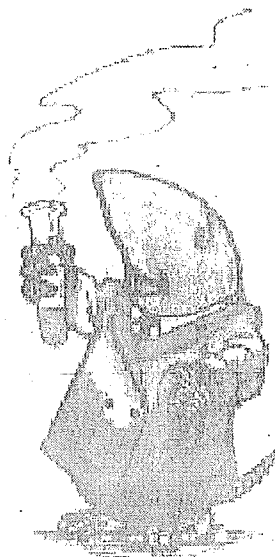
- A. 0.042 mol
- B. 0.093 mol
- C. 233 mol.
- D. 2306 mol

B

NA

Omit.

164g/mol
* 0.60 mol.
0.14 mol 693 mol
1600 mol



5. How many molecules of CH_4 are present in 0.700 moles of CH_4 ?

- A. 4.21×10^{12} molecules
- B. 4.21×10^{23} molecules
- C. 6.02×10^{23} molecules
- D. 6.02×10^{46} molecules

B

6. How many oxygen atoms are in 7.0 mol of SO_2 ?

- A. 2
- B. 14
- C. 4.2×10^{24}
- D. 8.4×10^{24} *

7. The empirical formula of a compound is known to be NH_3 . The molecular mass of this compound is 85.0 g/mol. What is the molecular formula?

- A. NH
- B. NH_3
- C. N_2H_6
- D. N_5H_{15} *

8. What volume is needed to make a 2.00 M solution of HCl if you have 0.333 mol of HCl?

- A. 0.167 L *
- B. 0.666 L
- C. 0.167 mL
- D. 0.666 mL

9. What mass of CuCl_2 is contained in 2.50 L of 1.50 M CuCl_2 solution?

- A. 3.75 g
- B. 35.9 g
- C. 135 g
- D. 504 g *

10. A 12.0 M solution of KOH is diluted from 25.0 mL to 50.0 mL. What is the concentration of the solution after mixing?

- A. 6.00 M *
- B. 0.300 M
- C. 0.250 M
- D. 0.015 M

Written Response

Instructions: You will be expected to communicate your knowledge and understanding of chemical principles in a clear and logical manner.

Your steps and assumptions leading to a solution must be written in the spaces below the questions.

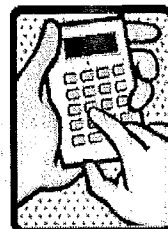
You must include units where appropriate and answers must be given to the correct number of significant figures.

For questions involving calculation, full marks will NOT be given for providing only the answer.

1. How many moles of Na_2CO_3 are in 64.3 g of Na_2CO_3 ? (2 marks)

$$64.3 \text{ g} \times \frac{1 \text{ mol}}{106.0 \text{ g/mol}} = 0.6066$$
$$= \boxed{0.607 \text{ mol}}$$

$MM = 106.0 \text{ g/mol}$



2. How many atoms are in 6.13 moles of gold? (2 marks)

$$6.13 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = \boxed{3.69 \times 10^{24} \text{ atoms}}$$

$L 197.0 \text{ g/mol.}$

3. What is the volume occupied by 142 moles of Xe gas at STP? (2 marks)

$$142 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 3180.8 \text{ L} = \boxed{3180 \text{ L}}$$

$$\text{or } 3.18 \times 10^3 \text{ L}$$

4. How many molecules are in 35.6 L of Cl_2 gas at STP? (3 marks)

$$35.6 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = 9.5875 = \boxed{9.57 \times 10^{23} \text{ molec.}}$$

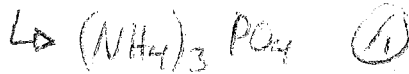
5. What is the mass of 2.98×10^{23} ^{molec.} atoms of P_2O_5 ? (3 marks) $MM = 142.0 \text{ g}$

~~$$2.98 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molec.}} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ molec.}} \times \frac{142 \text{ g}}{1 \text{ mole}} = 9.4053$$~~

$$2.98 \times 10^{23} \text{ molec.} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molec.}} \times \frac{142.0 \text{ g}}{1 \text{ mol}} = 70.29$$

$$= \boxed{70.3 \text{ g}}$$

6. How many atoms of ^{hydrogen} bromine are in 13.0 moles of ammonium phosphate? (4 marks)



$$13.0 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} \times \frac{12 \text{ atoms}}{1 \text{ molec.}} = \boxed{9.39 \times 10^{25} \text{ atoms}}$$

7. Calculate the percent by mass of barium in Ba_3P_2 ? (2 marks)

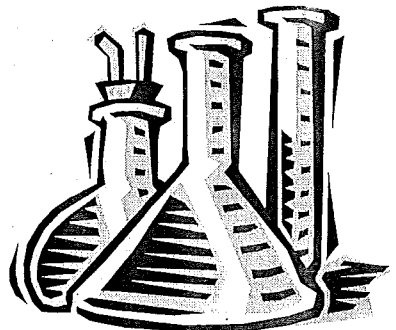
$$\text{Ba} = 3 \times 137.3 = 411.9$$

$$\text{P} = 2 \times 31.0 = \frac{62.0}{473.9}$$

\rightarrow

$$\frac{411.9}{473.9} = 0.869$$

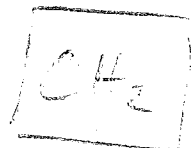
$$= \boxed{87\%} \text{ Barium.}$$



8. Given a carbon hydrogen compound, C_xH_y , containing 24.0 g of carbon and 4.0 g of hydrogen, what is the **empirical** formula of the compound? (2 marks)

$$C = \frac{24.0g}{12.0g} = \frac{2 \text{ mol}}{2} = 1$$

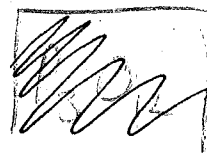
$$H = \frac{4.0g}{1.0g} = \frac{4 \text{ mol}}{2} = 2$$



9. The empirical formula of certain compound containing phosphorous and oxygen is ~~P_2O_5~~ P_2O_5 . The molecular mass of this compound has been found to be 285 g/mol. What is the molecular formula of this compound? (2 marks)

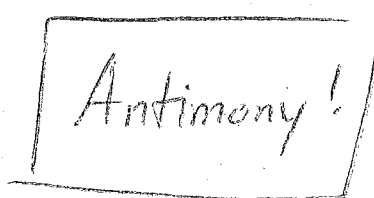
$$EM \text{ of } P_2O_5 = 142$$

$$\frac{285 \text{ g/mol}}{142} = 2$$



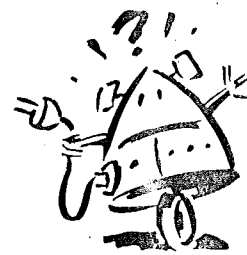
10. Analysis reveals that 0.500 moles of a certain element has a mass of 60.9 grams. Identify the element. (It is not necessary to show a calculation here.) (1 mark)

$$60.9 \times 2 = 121.8g$$



11. What is the concentration of a solution in which 6.10 moles of silver phosphate are dissolved in enough water to make 13.0 liters of solution? (2 marks)

$$C = \frac{n}{V} = \frac{6.10 \text{ mol}}{13.0L} = \boxed{0.469M}$$



lead sulphide.
~~Copper~~

0.562 L

Li_2CO_3 , $M = 73.89$
mol

12. What is the mass of lithium carbonate in 562 mL of a 3.61 M lithium carbonate solution? (3 marks)

$$n = C \cdot V = 0.562 \text{ L} \times 3.01 \text{ M} = 2.02882 \text{ mol}$$

$$2.02882 \text{ mol} \times \frac{73.89 \text{ g}}{\text{mol}} = 149.726 \text{ g}$$

$$= 150 \text{ g}$$

13. What is the new concentration of a solution of 9.50 M HCl if it is diluted by adding 150.0 mL to the original 75.0 mL solution? (2 marks)

0.075 L

$$\text{Total} = 0.075 \text{ L} + 0.150 \text{ L} = 0.225 \text{ L}$$

$$\frac{9.50 \text{ M} \times 0.075 \text{ L}}{0.225 \text{ L}} = 3.17 \text{ M}$$

The End !!!