Prep for Basic Chemistry: Competency 9  PRACTICE

1) About how many moles of aluminum does $3.42 \times 10^{23}$ atoms of aluminum equal?

- **A** $1.27 \times 10^{22}$
- **B** $9.23 \times 10^{24}$
- **C** $6.02 \times 10^{23}$
- **D** 0.57

2) How many moles are in 453.8 grams of $C_3H_8$?

- **A** 1.03
- **B** 10.3
- **C** 0.0969
- **D** 19967.2

3) The percent composition of carbon in $C_2H_6$ is ______.

- **A** 20%
- **B** 60%
- **C** 40%
- **D** 80%

4) One mole of water, $H_2O$, contains _____ particles of water molecules, _____ particles of hydrogen atoms, and _____ particles of oxygen atom.

- **A** $6.02 \times 10^{23}$, $6.02 \times 10^{23}$, $6.02 \times 10^{23}$
- **B** $12.04 \times 10^{23}$, $6.02 \times 10^{23}$, $6.02 \times 10^{23}$
- **C** $6.02 \times 10^{23}$, $12.04 \times 10^{23}$, $6.02 \times 10^{23}$
- **D** $18.06 \times 10^{23}$, $12.04 \times 10^{23}$, $6.02 \times 10^{23}$

5) One mole of sulfuric acid, $H_2SO_4$, contains _____ mole(s) of $H^+$, _____ mole(s) of $SO_4^{2-}$, _____ mole(s) of S atom, and ___ mole(s) of oxygen atom.

- **A** 2; 1; 1; 4
- **B** 2; 2; 2; 4
- **C** 2; 2; 1; 4
- **D** 1; 1; 1; 4

6) How many atoms are there in 3.64 moles of water?

- **A** $6.02 \times 10^{23}$
- **B** $6.58 \times 10^{24}$
- **C** $2.19 \times 10^{24}$
- **D** $4.38 \times 10^{24}$

7) How many atoms of aluminum is 0.43 moles of aluminum?

- **A** cannot be determined
- **B** $6.02 \times 10^{23}$
- **C** $1.40 \times 10^{24}$
- **D** $7.14 \times 10^{25}$
- **E** $2.59 \times 10^{23}$

8) What is the mass in grams of 54.2 moles of $C_3H_8$?

- **A** 0.812 g
- **B** 2380 g
- **C** $3.26 \times 10^{25}$ g
- **D** 1.23 g
9) What is the gram molecular mass of CH₄?
   A. 16.0 grams  
   B. 1.0 grams  
   C. 13.0 grams  
   D. 12.0 grams

10) What is the mass of 3.53 x 10¹¹ atoms of silicon?
   A. 1.64 x 10⁻¹¹ grams  
   B. 5.86 x 10⁻¹³ grams  
   C. 2.13 x 10⁻¹⁵ grams  
   D. 1.64 x 10⁻¹¹ milligrams

11) The mass of carbon in 132 grams of C₂H₆ is _______.
   A. 105.6 g  
   B. 12 g  
   C. 0.182 g  
   D. 24 g

12) A mole of water contains three times Avogadro's number of atoms.
   A. True  
   B. False

13) 28.1 grams of silicon is equivalent to one mole of silicon.
   A. True  
   B. False

14) Avogadro's number can be used to count particles, including atoms, ions, and molecules.
   A. True  
   B. False

15) 28.1 grams of silicon atoms contains more numbers of atoms than 1.0 grams of hydrogen atoms.
   A. True  
   B. False

16) One mole of any substance always contains approximately 6.02 x 10²³ representative particles of that substance.
   A. True  
   B. False

17) C₂H₂ and C₆H₆ have the same empirical formula.
   A. True  
   B. False

18) The empirical formula of water is the same as its molecular formula.
   A. True  
   B. False

19) One mole of CO contains the same mass as one mole of CO₂.
   A. True  
   B. False
20) One mole of water, H$_2$O, contains the same number of molecules as one mole of nitrogen gas, N$_2$.
   A  True
   B  False

21) An empirical formula is...
   A  the mass of one mole of a substance with units usually in terms of grams per mole.
   B  a chemical formula with the simplest whole number ratio of the atoms in a compound.
   C  the volume of one mole of a gas at STP, equivalent to 22.4 liters.

22) Percent composition is...
   A  the mass of one mole of a substance with units usually in terms of grams per mole.
   B  a chemical formula with the simplest whole number ratio of the atoms in a compound.
   C  the relative amount of each element in a compound expressed as a percentage.

23) A mole (mol) is...
   A  the SI unit that measures the amount of a substance containing $6.02 \times 10^{23}$ representative particles of a substance.
   B  the mass of one mole of a substance with units usually in terms of grams per mole.
   C  the experimentally determined number of particles in one mole of a substance, approximately equivalent to $6.02 \times 10^{23}$.

24) Avogadro's number is...
   A  a chemical formula with the simplest whole number ratio of the atoms in a compound.
   B  an experimentally determined number of particles in one mole of a substance, equivalent to approximately $6.02 \times 10^{23}$.
   C  standard conditions of 0ºC and 1 atmosphere of a gas.

25) If the percent composition of a compound with a molecular mass of 26.0 is 92.3% carbon and 7.7% hydrogen, what is its:

   a. empirical formula? ____________________________

   b. molecular formula? ____________________________