Name: ___________________________ Date: _____________

1. A student performs an experiment to determine the density of a sugar solution. He obtains the following results: 4.11 g/mL, 4.81 g/mL, 4.95 g/mL, 3.75 g/mL. If the actual value for the density of the sugar solution is 4.75 g/mL, which statement below best describes his results?
   A) His results are neither precise nor accurate.
   B) **His results are precise, but not accurate.**
   C) **His results are accurate, but not precise.**
   D) **His results are both precise and accurate**
   E) It isn't possible to judge the precision and accuracy with the information given.

2. What answer should be reported, with the correct number of significant figures, for the following calculation? (433.621 - 333.9) × 11.900
   A) 1.19×10^{3}
   B) 1.187×10^{3}
   C) 1.1868×10^{3}
   D) 1.8680×10^{3}
   E) 1.186799×10^{3}

3. How many mg does a 433 kg sample contain?
   A) 4.33×10^{8} mg
   B) 4.33×10^{-4} mg
   C) 4.33×10^{7} mg
   D) 4.33×10^{-3} mg
   E) 4.33×10^{6} mg

4. If a liquid contains 60% sugar and 40% water throughout its composition then what is it called?
   A) homogeneous mixture
   B) substance
   C) compound
   D) heterogeneous mixture
   E) mixrure

5. Which one of the following statements is FALSE according to Dalton's Atomic Theory?
   A) **An atom of nitrogen can be broken down into smaller particles that will still have the unique properties of nitrogen.**
   B) **Atoms combine in simple whole number ratios to form compounds.**
   C) All atoms of chlorine have identical properties that distinguish them from other elements.
   D) **One carbon atom will combine with one oxygen atom to form a molecule of carbon monoxide.**
   E) Atoms of sodium do not change into another element during a chemical reaction with chlorine.

6. Predict the name and formula when Al and S reacts.
   A) Al_2S_3 (Aluminium sulfide)
   B) Al_2S_3 (Aluminium(III) sulfide)
   C) Al_2S_3 (dialuminium trisulfide)
   D) Al_3S_2 (Aluminium(III) sulfide)
   E) Al_3S_2 (trialuminium disulfide)

7. Determine the number of protons (p^+), neutrons (n) and electrons (e^-) in the following:

   $^{40}_{18}X$

   A) $p^+ = 18$ $n = 22$ $e^- = 18$
   B) $p^+ = 18$ $n = 18$ $e^- = 22$
   C) $p^+ = 22$ $n = 18$ $e^- = 18$
   D) $p^+ = 18$ $n = 22$ $e^- = 40$
   E) $p^+ = 40$ $n = 22$ $e^- = 18$

8. Calculate the atomic mass of element "X", if it has 2 naturally occurring isotopes with the following masses and natural abundances:

X-45	44.8776 amu	32.88%
X-47	46.9443 amu	67.12%

   A) 46.26 amu
   B) 45.91 amu
   C) 46.34 amu
   D) 46.84 amu
   E) 44.99 amu

9. What is the limiting reactant when 3.41 g of nitrogen react with 2.79 g of hydrogen to produce ammonia and how many grams of ammonia are produced?
   A) Nitrogen is the limiting reactant and 4.15 g of ammonia are produced.
   B) Hydrogen is the limiting reactant and 0.22 g of ammonia are produced.
   C) Nitrogen is the limiting reactant and 2.07 g of ammonia are produced.
   D) Hydrogen is the limiting reactant and 23.5 g of ammonia are produced.
   E) Hydrogen is the limiting reactant and 15.7 g of ammonia are produced.

10. Indium reacts with chlorine gas to form $InCl_3$. In the balanced equation for this reaction, the coefficient of $InCl_3$ is
   A) 2
   B) 1
   C) 3
   D) 4
   E) 5

11. A 0.8715 g sample of organic acid is burned completely in oxygen to give 2.053 g of carbon dioxide and 0.5601 g of water. The empirical formula of organic acid is
   A) C_3H_4O
   B) CH_2O
   C) CH_4O_3
   D) $C_3H_4O_2$
   E) $C_2H_4O_2$

12. How many grams of sulfur are there in 6.00 g of $Fe_2(SO_4)_3$?
   A) 1.44 g
   B) 0.920 g
   C) 6.00 g
   D) 0.480 g
   E) 2.40 g

13. What is the chemical formula of the salt produced by the neutralization of nitric acid with calcium hydroxide?
   A) $Ca(NO_3)_2$
   B) Ca_2NO_3
   C) $Ca_3(NO_3)_2$
   D) $Ca_2(NO_3)_3$
   E) $CaNO_3$

14. In the following chemical reaction the *oxidizing agent* is

$5S + 6KNO_3 + 2CaCO_3 \rightarrow 3K_2SO_4 + 2CaSO_4 + CO_2 + 3N_2$

A) KNO_3
B) S
C) N_2
D) $CaSO_4$
E) $CaCO_3$

15. When 20.0 mL of a 0.250 M $(NH_4)_2S$ solution is added to 150.0 mL of a solution of $Cu(NO_3)_2$, a CuS precipitate forms. The precipitate is then filtered from the solution, dried, and weighed. The recovered CuS is found to have a mass of 0.3491 g. Assuming all copper ions precipitated, what was the concentration of copper ions in the original $Cu(NO_3)_2$ solution?

A) 2.43×10^{-2} M
B) 4.87×10^{-2} M
C) 3.65×10^{-3} M
D) 1.22×10^{-2} M
E) 3.33×10^{-2} M

16. Which are the oxidation numbers for Ca, Cl and O elements in $Ca(ClO)_2$ respectively?

A) +2, +1, –2
B) +2, –2, +1
C) +2, –3, +2
D) +2, +2, –2
E) +2, +3, –2

17. A system that does no work but receives heat from the surroundings has

A) $q = \Delta U$
B) $q < 0, \Delta U > 0$
C) $q > 0, \Delta U < 0$
D) $q = -\Delta U$
E) $w = \Delta U$

18. A system expands from a volume of 1.00 L to 2.00 L against a constant external pressure of 1.00 atm (1.013×10^5 J = 1 atm m^3). The work (w) done by the system, in J, is
    A) 1.01×10^2 J
    B) 1.01 J
    C) 2.01 J
    D) 1.01×10^5 J
    E) 1.01×10^3 J

19. Calculate the heat evolved per gram of ZnS when ZnS is heated to convert to ZnO according to the following reaction:

$$2ZnS\ (s) + 3O_2(g) \rightarrow 2ZnO\ (s) + 2SO_2\ (g) \quad \Delta H = -879\ kJ$$

    A) 4.51 kJ/g
    B) 8.79 kJ/g
    C) 4.40 kJ/g
    D) 3.25 kJ/g
    E) 87.9 kJ/g

20. A sheet of gold weighing 10.0 g and at a temperature of 18.0 °C is placed flat on a sheet of iron weighing 20.0 g and at a temperature of 55.6 °C. What is the final temperature of the combined metals? Assume that no heat is lost to the surroundings. (The heat gained by the gold must be equal to the heat lost by the iron). The specific heat of gold = 0.129 J/g °C and the specific heat of iron = 0.444 J/g °C.
    A) 50.7°C
    B) 35.0°C
    C) 59.6°C
    D) 45.2°C
    E) 37.8°C

Answer Key

1. A
2. A
3. A
4. A
5. A
6. A
7. A
8. A
9. A
10. A
11. A
12. A
13. A
14. A
15. A
16. A
17. A
18. A
19. A
20. A