**Chemistry 20: Practice final # 1**

**Name** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Score \_\_\_\_\_\_\_\_\_\_\_\_\_\_ /100

1. An element with 6 valence electrons would be found in group \_\_\_ of the periodic table.

|  |  |
| --- | --- |
| a | 1 |
| b | 2 |
| c | 16 |
| d | 17 |

1. An example of an **element** is \_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Water |
| b | Iron powder |
| c | Copper (II) sulfate penta hydrate |
| d | lead (IV) fluoride |

1. A valence electron is \_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | The electron closest to the nucleus of an atom |
| b | Any electron in the highest energy level of an atom |
| c | The electron that is gained when an anion is formed |
| d | Any electron in the lowest energy level of an atom |

1. The electron dot diagram for an oxygen atom is

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **a** | **. .**  **:O:** | b | **.**  **:O: .** | c | **..**  **. O:**  **.** | d | **..**  **:O:**  **..** |

1. The element chorine forms the ion chloride (Cl-(aq)) by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Gaining one electron |
| b | Losing one electron |
| c | Gaining one proton |
| d | Losing one proton |

1. The element, fluorine, has an atomic number of 9. An atom of fluorine has \_\_\_\_\_ lone pair(s) of electrons and \_\_\_\_\_ bonding electron(s).

|  |  |  |
| --- | --- | --- |
| a | 1 | 6 |
| b | 6 | 1 |
| c | 1 | 3 |
| d | 3 | 1 |

1. Which of the following combined atoms would include a polar covalent bond?

|  |  |
| --- | --- |
| a | Hydrogen - hydrogen |
| b | Carbon – hydrogen |
| c | Nitrogen – nitrogen |
| d | Chlorine - chlorine |

1. Which formula represents a non-polar molecule

|  |  |
| --- | --- |
| a | NH3(g) |
| b | HF(g) |
| c | CCl4(l) |
| d | H2O(l) |

1. The compound that contains a trigonal planar shape about one of its central atoms is \_\_\_\_\_

|  |  |
| --- | --- |
| a | C4H10(g) |
| b | C2H4(g) |
| c | C6H6(l) |
| d | C2H5OH(l) |

1. The number of electrons that are shared in a hydrogen – carbon bond is \_\_\_\_\_\_

|  |  |
| --- | --- |
| a | One |
| b | Two |
| c | Three |
| d | four |

1. The number of bonds between nitrogen atoms in a nitrogen molecule is \_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 1 |
| b | 2 |
| c | 3 |
| d | 4 |

1. Of the molecules listed below, the one exhibiting pyramidal shape around its central atom is \_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | SO2(g) |
| b | CH4(g) |
| c | NH3(g) |
| d | C2H4(g) |

1. The shape around each C atom in C2H2(g) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Linear |
| b | V-shaped |
| c | Pyramidal |
| d | tetrahedral |

1. The transfer of electrons from sodium atoms to chlorine atoms results in the formation of a/an \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bond.

|  |  |
| --- | --- |
| a | Polar covalent |
| b | Coordinate covalent |
| c | Non polar covalent |
| d | Ionic |

1. Which is the formula of a non-polar molecule containing non-polar bonds?

|  |  |
| --- | --- |
| a | CO2(g) |
| b | H2(g) |
| c | NH3(g) |
| d | H2O(l) |

1. Which statement best explains why CCl4(l) is a non-polar molecule?

|  |  |
| --- | --- |
| a | C and Cl are non metals |
| b | The C-Cl bonds are polar |
| c | CCl4(l) is a liquid at room temperature |
| d | The CCl4(l) molecule is symmetrical in shape |

1. Hydrogen bonds are the strongest between molecules of \_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | HF |
| b | HCl |
| c | HBr |
| d | HI |

1. Dipole-dipole attraction forces are the strongest between molecules of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | H2(g) |
| b | CH4(g) |
| c | H2O(l) |
| d | CO2(g) |

1. Which molecule is the MOST polar?

|  |  |
| --- | --- |
| a | H2O(l) |
| b | H2S(g) |
| c | H2Te(s) |
| d | H2Se(s) |

1. Liquid ammonia reacts with oxygen to product nitric acid and water. The balanced equation for this process is \_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | NH4(l) + O2(g) 🡪 NO2(g) + H2(g) heat |
| b | NH3(g) + O2(g) 🡪 HNO3(aq) + H2O(l) |
| c | 2O2(g) +2 NH4(l) 🡪 H2O(l) + 2HNO3(aq) |
| d | 2O2(g) + NH3(l) 🡪 H2O(l) + HNO3(aq) |

1. Which one of the following represents a double replacement reaction?

|  |  |
| --- | --- |
| a | Sulfuric acid and potassium hydroxide 🡪 water + potassium sulfate |
| b | Calcium + water 🡪 hydrogen + calcium hydroxide |
| c | Methane + oxygen 🡪 carbon dioxide + water |
| d | Hydrogen + oxygen 🡪 hydrogen peroxide |

1. Calcium sulfate and cesium dichromate 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | CeSO4(s) + CaCr2O(s) |
| b | CaS + Cs(CrO4)2(s) |
| c | Ce2S(s) + Ca(Cr2O7)2(s) |
| d | Cs2SO4(s) + CaCr2O7(s) |

1. The correct formula for ammonium phosphate is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | NH4PO4(s) |
| b | (NH4)3PO4(s) |
| c | NH4(PO4)3(s) |
| d | (NH3)4PO4(s) |

1. The correct name for Pb3(PO4)2(s) would be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Trilead diphosphate |
| b | Plumbic phosphate |
| c | Lead (II) phosphate |
| d | Lead (III) phosphate |

1. The formula for calcium chloride at SATP is best written as \_\_\_\_\_\_

|  |  |
| --- | --- |
| a | CaCl2(l) |
| b | CaCl2(s) |
| c | CaCl2(g) |
| d | CaCl2(aq) |

1. Which of the following observations is **not** evidence for a chemical reaction?

|  |  |
| --- | --- |
| a | Zn(s) + 2HCl(aq) 🡪 ZnCl2(aq) + H2(g) |
| b | Color is changed |
| c | Precipitate is formed |
| d | H2O(s) 🡪 H2O(g) |

1. A concentrated solution is one in which there is \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Large amount of solute in a large amount of solvent |
| b | Large amount of solute in a small amount of solvent |
| c | Small amount of solute in a large amount of solvent |
| d | Small amount of solute in a small amount of solvent |

1. Consider the following unbalanced reaction

**\_\_\_\_ Cl2(g) + \_\_\_\_ C10H16(l) 🡪 \_\_\_\_\_C(s) + \_\_\_\_ HCl(g)**

When the above reaction is balanced with the smallest whole numbers possible, the coefficient for Cl2(g) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 1 |
| b | 4 |
| c | 8 |
| d | 16 |

1. A mole is correctly defined as

|  |  |
| --- | --- |
| a | 22.4 L of a gas |
| b | One gram of a substance |
| c | One molecule of a substance |
| d | One molar mass of a substance |

1. Consider the following unbalanced reaction

**\_\_\_\_ AsCl3(aq) + \_\_\_\_\_ H2S(aq) 🡪 \_\_\_\_\_ As2S3(s) + \_\_\_\_\_\_\_\_ HCl(aq)**

Which of the following statements is TRUE when the equation above is correctly balanced?

|  |  |
| --- | --- |
| a | The sum of the moles of reactants must equal the sum of the moles of the products |
| b | 9 mol of H2S(aq) will combine with 4 mol of AsCl3(aq) |
| c | 4 mole of AsCl3(aq) will produce 12 mol of HCl(aq) |
| d | There is no relationship between the number of moles of reactants and the number of moles of products. |

1. How many moles of CO2(g) are there in 176 g of carbon dioxide?

|  |  |
| --- | --- |
| a | 21.1 x 1023 |
| b | 6.02 X 1023 |
| c | 44.0 |
| d | 4.00 |

1. The molar mass of Al2(CO3)3(s) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ g

|  |  |
| --- | --- |
| a | 86.99 |
| b | 207.01 |
| c | 209.97 |
| d | 233.99 |

1. The mass of 0.250 mol of a compound with the molecular formula LZ3(s) is 17.0 g. If the molar mass of the element L is 11.00, then the molar mass of Z is \_\_\_\_\_\_\_ 

|  |  |
| --- | --- |
| a | 19.0 |
| b | 28.5 |
| c | 33.0 |
| d | 6.00 |

**Use the following information to answer questions 34 & 35.**

**137 g of Mg(OH)2(s) is reacted according to the following equation**

**\_\_\_\_ Mg(OH)2(s) + \_\_\_\_ HBr(aq) 🡪 \_\_\_\_H2O(l) + \_\_\_\_ MgBr2(s)**

1. The number of moles of Mg(OH)2(s) that is reacted is \_\_\_\_\_\_\_\_ mol

|  |  |
| --- | --- |
| a | 1.54 |
| b | 2.35 |
| c | 3.32 |
| d | 4.57 |

1. The mass of water produced when 473 g of MgBr2(s) is produced will be \_\_\_\_\_\_ g

|  |  |
| --- | --- |
| a | 55.4 |
| b | 92.6 |
| c | 85.4 |
| d | 169 |

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. The quantity of NaOH(s) that is equal in mass to 2.00 mol of CaCO3(s) is \_\_\_\_ mol

|  |  |
| --- | --- |
| a | 2.00 |
| b | 2.50 |
| c | 5.00 |
| d | 33.3 |

1. Consider the following unbalanced equation

\_\_\_ Na3PO4(s) + \_\_\_\_ CaO(s) 🡪 \_\_\_\_ Na2O(s) + \_\_\_\_ Ca3(PO4)2(s)

The TRUE statement about the reaction

|  |  |
| --- | --- |
| a | 0.20 mol of Na3PO4(s) reacts with 0.30 mol CaO(s) |
| b | 1.5 mol of CaO(s) produces 4.5 mol Ca3(PO4)2(s) |
| c | 1.0 mol Na3PO4(s) produces 2.5 mol Na2O(s) |
| d | 2.0 mol of Na3PO4(s) produces 2.0mol Ca3(PO4)2(s) |

1. Substances that dissolve each other in any proportion are said to be \_\_\_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
| a | Saturated |
| b | Diluted |
| c | Miscible |
| d | Aqueous |

1. The number of moles of sodium nitrate in a 40.0 mL sample of 0.150 solution is \_\_\_\_\_\_\_\_\_\_ mol

|  |  |
| --- | --- |
| a | 6.00 |
| b | 2.67 x 10-1 |
| c | 3.75 x 10-3 |
| d | 6.00 x 10-3 |

1. Consider the equation for the electrolysis of water

2H2O(l) 🡪2 H2(g) + O2(g)

The number of moles of O2(g) produced by the reaction using 90 g of H2O(l) is \_\_\_\_ mol

|  |  |
| --- | --- |
| a | 1.0 |
| b | 2.0 |
| c | 2.5 |
| d | 5.0 |

1. The concentration of a salt solution that contains 77.4 g of KBr(s) in 500 mL of water is \_\_\_\_\_ 

|  |  |
| --- | --- |
| a | 0.00130 |
| b | 0.130 |
| c | 1.30 |
| d | 5.00 |

1. What mass of sodium hydroxide is contained in 200 mL of a saturated 19.1 solution?

|  |  |
| --- | --- |
| a | 19.6 g |
| b | 138 g |
| c | 153 g |
| d | 76.4 g |

1. The molar concentration of a solution made by diluting 10.0mL of a 0.740 KCl(aq) solution to a volume of 250 mL is \_\_\_\_\_\_\_ 

|  |  |
| --- | --- |
| a | 0.0338 |
| b | 0.0296 |
| c | 0.0200 |
| d | 0.0185 |

1. In order to dilute 50.0 mL of a 6.00 HCl(aq) to a concentration of 0.150 , water should be added until the final volume is \_\_\_\_\_\_\_\_\_\_ L

|  |  |
| --- | --- |
| a | 2.00 |
| b | 2.50 |
| c | 3.00 |
| d | 4.00 |

1. Which of the following combinations are immiscible?

|  |  |
| --- | --- |
| a | Hydrochloric acid and water |
| b | Ethanol and water |
| c | Gasoline and oil |
| d | Gasoline and water |

1. A technician took 50.0 mL of distilled water and gradually added it to a solution of HCl(aq). The effect on moles of solute, volume of solution and concentration of solution respectively are \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| a | Increased | Increased | Increased |
| b | Decreased | Decreased | Decreased |
| c | Unchanged | Increased | Decreased |
| d | Unchanged | Decreased | increased |

1. An adjustment was made to the concentration of a solution as shown in the table

|  |  |  |  |
| --- | --- | --- | --- |
|  | Moles of solute (mol) | Concentration | Volume (L) |
| Initial | 0.50 | 0.25 | X |
| Final | 0.50 | 0.15 | Y |

How does the volume X compare to the volume Y?

|  |  |
| --- | --- |
| A | X is greater than or equal to volume Y |
| B | X is greater than volume Y |
| C | X is less than volume Y |
| D | X is equal to volume Y |

1. The molar concentration of a solution is expressed in units of \_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Moles per litre |
| b | Percent by mass |
| c | Parts per million |
| d | Percent by volume |

1. An acidic solution does **NOT** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Conduct an electric current |
| b | Turn red litmus blue |
| c | React with an active metal to produce hydrogen gas |
| d | Neutralize a base |

1. According to the Arrhenius definition, a base is a substance that when dissolved in water \_\_\_\_\_

|  |  |
| --- | --- |
| a | Turns blue litmus paper red |
| b | Turns red litmus paper blue |
| c | Increases the hydrogen ion concentration |
| d | Increases the hydroxide concentration |

1. The products of neutralization are \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| a | Salt | Water |
| b | Salt | Base |
| c | Salt | Acid |
| d | Acid | base |

1. When the pH of a solution changes from 10 to 8, the [OH-(aq)] \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Increases and the solution becomes more acidic |
| b | Decrease and the solution becomes less acidic |
| c | Increases and the solution becomes more basic |
| d | Decreases and the solution becomes less basic |

1. Acids are substances which have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | High [OH-(aq)] and low pH |
| b | High [OH-(aq)] and high pH |
| c | Low [ H3O+(aq)] and high pH |
| d | High [ H3O+(aq)] and low pH |

1. If [ H3O+(aq)] of a solution is 7.5 x 10-4 , then the [OH-(aq)] is \_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 1.3 x 10-11 |
| b | 2.5 x 10-11 |
| c | 7.5 x 10-4 |
| d | 2.5 x 10-4 |

1. If the [OH-(aq)] of a solution is 3.2 x 10-6 , then the [ H3O+(aq)] is \_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 3.2 x 10-6 |
| b | 6.8 x 10-8 |
| c | 3.1 x 10-9 |
| d | 3.4 x 10-10 |

1. The [ H3O+(aq)] of grapefruit juice is about 6.3 x 10-4 . The pH of this juice is \_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 0.80 |
| b | 3.20 |
| c | 3.40 |
| d | 10.80 |

1. The [OH-(aq)] of a cracker is 2.3 x 10-6 . The pH of the cracker is \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 5.64 |
| b | 6.36 |
| c | 8.36 |
| d | 9.63 |

1. If 2.5 mol of barium hydroxide (Ba(OH)2(s) )is dissolved in 60 L of water, the pH of the solution would be \_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 12.92 |
| b | 1.08 |
| c | 1.38 |
| d | 12.62 |

1. The sauerkraut in a Reuben sandwich has a pH of 3.58. The [ H3O+(aq)] of the sauerkraut is \_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 2.6 x 10-11 |
| b | 3.8 x 10-11 |
| c | 2.6 x 10-4 |
| d | 3.8 x 10-4 |

1. Limburger cheese has a pH of 4.80 The [OH-(aq)] of the cheese is \_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | 6.3 x 10-4 |
| b | 2.0 x 10-5 |
| c | 1.6 x 10-5 |
| d | 6.3 x 10-10 |

1. The [OH-(aq)]of an egg white is 3.4 x 10-7 . The egg is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Slightly basic |
| b | Highly basic |
| c | Highly acidic |
| d | Slightly acidic |

1. The pH of a solution is 5.80. The TRUE statement about this solution is \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | The solution is acidic with a [ H3O+(aq)] of less than 10-7 |
| b | The solution is acidic with a [ H3O+(aq)] of greater than 10-7 |
| c | The solution is basic with a [ OH-(aq)] of less than 10-7 |
| d | The solution is basic with a [ OH-(aq)] of greater than 10-7 |

1. A lime pie has a pH of 1.2 The pie filling is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Highly acidic |
| b | Slightly acidic |
| c | Highly basic |
| d | Slightly basic |

1. A solution with a pH of 9.00 is \_\_\_\_\_\_\_\_\_\_\_\_\_ and has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| a | Acidic | [ H3O+(aq)] = 10-9 |
| b | Basic | [ OH-(aq)] = 10-9 |
| c | Acidic | [ OH-(aq)] = 10-9 |
| d | Basic | [ H3O+(aq)] = 10-9 |

1. A solution was made with 2.00 g of Na2CO3(s) dissolved in 100 mL of water. A 25.0 mL sample was then reacted with 15.5 mL of HCl(aq). What is the concentration of the acid?

|  |  |
| --- | --- |
| a | 0.258 |
| b | 0.304 |
| c | 0.609 |
| d | 1.22 |

1. What was the concentration of Na2CO3(aq) in question #65.

|  |  |
| --- | --- |
| a | 0.0189 |
| b | 0.0200 |
| c | 0.189 |
| d | 1.89 |

1. What volume of 0.24 sodium hydroxide solution is needed to neutralize 0.50 L of sulfuric acid with a pH of 1.83?

|  |  |
| --- | --- |
| a | 30.8 m |
| b | 61.6 mL |
| c | 92.4 mL |
| d | 123 mL |

1. Which statement is TRUE about decreasing the volume of a given amount of gas at a constant temperature in a container?

|  |  |
| --- | --- |
| a | There are fewer molecules |
| b | The molecules are moving more slowly |
| c | The molecules are striking the container with increased force |
| d | There are more molecules |

1. A gas mixture contains O2(g), N2(g), and CO(g). The total pressure of the three gases is 280 kPa. If the partial pressure of the O2(g) is 74 kPa and the partial pressure of the CO(g) is 88 kPa, then the partial pressure of the N2(g) is \_\_\_\_\_\_\_\_\_ kPa.

|  |  |
| --- | --- |
| a | 118 |
| b | 128 |
| c | 152 |
| d | 162 |

1. If 28 L of air at 30oC is warmed to 100oC, the new volume will be \_\_\_\_ L. Assume the pressure is held constant.

|  |  |
| --- | --- |
| a | 8.4 |
| b | 22.7 |
| c | 34.5 |
| d | 93.3 |

1. The boiling point of liquid nitrogen is -196oC. An equivalent temperature on the Kelvin scale will be \_\_\_\_\_ K

|  |  |
| --- | --- |
| a | -196 |
| b | 77 |
| c | 153 |
| d | 273 |

1. A balloon filled with helium increases in volume as it ascends to a higher altitude. The expansion of the balloon is primarily due to \_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | A decrease in the number of molecules inside the balloon. |
| b | An increase in the average kinetic energy of the helium atoms inside the balloon |
| c | An increase in the rate of collisions of the atmosphere molecules on the outside walls of the balloon |
| d | A decrease in the rate of collisions of the atmosphere molecules on the outside walls of the balloon |

1. An empty 2 L plastic milk container is rinsed out with hot water and then sealed. What will happen to the container if it is placed in a cool storage room for ten minutes

|  |  |
| --- | --- |
| a | It will swell |
| b | The sides will collapse inwards |
| c | It will remain the same size |
| d | Its temperature will increase |

1. At a constant pressure, what will happen to the temperature of a gas when the volume is increased?

|  |  |
| --- | --- |
| a | It will increase |
| b | It will decrease |
| c | It will remain unchanged |
| d | The gas will solidify |

1. Which change below will cause an increase in the pressure of a gaseous system?

|  |  |
| --- | --- |
| a | Increase the size of the container and reduce temperature |
| b | Increase the temperature |
| c | Release some gas from the container |
| d | Reduce the temperature |

1. If the temperature of a gas is held constant, but the volume is reduced to one half, the pressure of the gas will \_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Be reduced by ½ |
| b | Remain the same |
| c | Double |
| d | Quadruple |

1. In the reaction below 10 moles of ammonia reacted with 8 moles of oxygen at STP. The excess reagent is \_\_\_\_\_\_\_\_\_\_\_ and it has \_\_\_\_\_\_\_\_\_\_\_\_\_ moles left over

**2NH3(g)  + O2(g) 🡪 2NO(g) + 3H2O(l)**

|  |  |  |
| --- | --- | --- |
| a | Oxygen | 6.4 |
| b | Oxygen | 3.6 |
| c | Ammonia | 4.5 |
| d | Ammonia | 2.5 |

1. If the pressure of a gas in a rigid container at 200oC is 240 kPa, what will be the temperature of the gas when the pressure is reduced to 100 kPa? Express as \_\_\_\_ oC

|  |  |
| --- | --- |
| a | -76.0 |
| b | 83.3 |
| c | 197 |
| d | 480 |

1. If the valve between the two containers below is opened, what would be the total pressure of the mixed gases?

Assume the temperature holds constant.

|  |  |
| --- | --- |
| a | 5.25 kPa |
| b | 33.3 kPa |
| c | 150 kPa |
| d | 167 kPa |

1. The gaseous product of a reaction was collected in a 4.0 L container at 27oC and 77.9 kPa. If the gas is diatomic and has a mass of 4.0 g, then the gas is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Chlorine |
| b | Fluorine |
| c | Nitrogen |
| d | oxygen |

1. **Numerical response question:**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

A 72 mg sample of a toxic compound is dissolved in 2.5 L of water. The concentration of this compound is \_\_\_\_\_\_\_\_ ppm.

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

A cation with a charge of 3+ is reduced to its metal by adding sufficient electrons. The number of electrons needed per mole of the cation will be \_\_\_\_\_\_\_\_\_\_

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

The pressure of 2.40 atm is equivalent to \_\_\_\_\_\_\_\_\_\_\_\_ kPa.

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

The mass of 0.50 mole of copper (II) sulfate pentahydrate is \_\_\_\_\_\_\_\_\_ kg.

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

If 16 mol of oxygen gas at STP is reacted with 24 mol of hydrogen gas at STP to form water vapour, give the moles of excess reagent that is left over. Round the answer to the **nearest tenth**.

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**Consider the following oxidation reduction reaction**

2Al3+(aq) + 3Fe(s) 🡪 3Fe2+(aq) + 2Al(s)

The chemicals reagents from this reaction are assigned numbers as follows:

|  |  |
| --- | --- |
| 1 | Al(s) |
| 2 | Fe(s) |
| 3 | Al3+(aq) |
| 4 | Fe2+(aq |

In the first box, give the chemical reagent that undergoes reduction

In the second box, give the chemical reagent that undergoes oxidation

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**Samantha and Erin have a 500 mL sample of 0.0123 HCl(aq)**

**Express the concentration of [OH-(aq)] found in this solution in the form a.b x 10‑cd**

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**In the a molecule of HCN(g) , there is/ are \_\_\_\_ triple bonds, \_\_\_\_\_ double bonds and \_\_\_\_\_ single bond**

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**The number of moles of lithium nitrate found in 400 mL of 3.75  solution is \_\_\_\_\_\_ mol.**

1. **Numerical response question**

Left justify the answer in the boxes provided

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

A 2.00 mL sample of nitrogen gas as STP is changed to 290 K and 120 kPa. The new volume of this gas will be \_\_\_\_\_\_\_ mL

1. Long answer:
   1. A 25.0 mL sample of 1.50 **** solution of barium nitrate and and a 30 mL sample of 2.50 **** solution of aluminium sulfate undergo a double replacement reaction
      1. Write the NON, total and Net ionic equations (3 marks)
   2. Identify the limiting reagent \_\_\_\_\_\_\_\_\_\_\_\_\_ and the excess reagent \_\_\_\_\_\_\_\_\_\_\_\_\_\_. (2 marks)
2. A 100 mL sample of 0.0340 **HCl** has 840 mL of water added to it.
   1. What is the pH of the undiluted acid? (1 mark) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. What is the pH of the diluted acid? (2 marks) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fill in the expected colors for the indicators given below (3 marks)

|  |  |  |
| --- | --- | --- |
| Indicator | Color in Undiluted acid | color in Diluted acid |
| H2Cr |  |  |
| HMv |  |  |
| HOr |  |  |

**Answers:**

Multiple choice questions (1 mark each = 80)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | C | 16 | D | 31 | D | 46 | C | 61 | A | 76 | C |
| 2 | B | 17 | A | 32 | D | 47 | C | 62 | B | 77 | B |
| 3 | B | 18 | C | 33 | A | 48 | A | 63 | A | 78 | A |
| 4 | C | 19 | A | 34 | B | 49 | B | 64 | D | 79 | D |
| 5 | A | 20 | D | 35 | B | 50 | D | 65 | c | 80 | D |
| 6 | D | 21 | A | 36 | C | 51 | A | 66 | C |
| 7 | B | 22 | D | 37 | A | 52 | D | 67 | B |
| 8 | C | 23 | B | 38 | C | 53 | D | 68 | C |
| 9 | B | 24 | C | 39 | D | 54 | A | 69 | A |
| 10 | B | 25 | B | 40 | C | 55 | C | 70 | C |
| 11 | C | 26 | D | 41 | C | 56 | B | 71 | B |
| 12 | C | 27 | B | 42 | C | 57 | C | 72 | D |
| 13 | A | 28 | C | 43 | B | 58 | A | 73 | B |
| 14 | D | 29 | D | 44 | A | 59 | C | 74 | A |
| 15 | B | 30 | C | 45 | D | 60 | D | 75 | B |

Numerical response questions (1 mark x 10 = 10)

|  |  |  |  |
| --- | --- | --- | --- |
| 81 | 29 | 86 | 32 |
| 82 | 3 | 87 | 8113 |
| 83 | 243 | 88 | 101 |
| 84 | 0.12 | 89 | 1.50 |
| 85 | 4.0 | 90 | 1.79 |

**Long answer:**

91. a) Non 3Ba(NO3)2(aq) + Al2(SO4)3(aq) 🡪 3BaSO4(s) + 2Al(NO3)3(aq) Total 3Ba2+(aq) + 6NO3-(aq) + 2Al3+(aq) + 3SO42-(aq) 🡪 3BaSO4(s) + 2Al3+(aq) + 6NO3-(aq) NET 3Ba2+(aq ) + 3SO42-(aq) 🡪 3BaSO4(s)

b) Moles of Ba(NO3)2(aq) = 0.0375

moles of Al2(SO4)3(aq) = 0.075 mol

Limiting reagent = Ba(NO3)2(aq)

Excess reagent = Al2(SO4)3(aq)

1. **pH of undiluted acid = 1.469 pH of diluted acid 2.442**

|  |  |  |
| --- | --- | --- |
| Indicator | Color in Undiluted acid | color in Diluted acid |
| H2Cr | Yellow | yellow |
| HMv | Green | blue |
| HOr | orange | orange |