PREPARATION OF SOLUTIONS

Class: _____ Group No. _____ Date: _____

Index number	First name	Middle name	Last name

Question 1 Calculate the molar concentration of 96% sulphuric acid (weight percent).

Using following atomic mass "H: 1.01, O: 16.00, S: 32.07" calculate to three digit significant figures.

Data; Sulphuric acid (H_2SO_4): molar mass ( )g/mol, density 1.83g/ml (g/cm^3)

If we have 1,000g of the 96% sulphuric acid, ( )g of the liquid is sulphuric acid.

The molar mass of the acid is

$$\frac{(\quad)\text{g}}{(\quad)\text{g/mol}} = (\quad)\text{mol}$$

and the volume of 1000g sulphuric acid is

$$\frac{1000\text{g}}{(\quad)\text{g/ml}} = (\quad)\text{ml}$$

The molar concentration is calculated as follows.

$$\frac{(\quad)\text{mol}}{(\quad)\text{ml}} \times 1000\ \text{ml/l} = (\quad)\text{mol/ml} \times 1000\text{ml/l} = (\quad)\text{mol/l}$$

NOTE: If you want to dilute a certain liquid to 1/N times with water, you can mix 1 volume of original liquid and (N-1) volume of water.

Question 2 Explain how to dilute 18mol/l sulphuric acid to make 6.0mol/l sulphuric acid.

Since we must dilute the original liquid to 1/3, we need 1 volume of sulphuric acid and ( ) volume of water.

If we use 100ml of 18mol/l sulphuric acid, we need ( )ml water.

We must not add (water / 18mol/l sulphuric acid) to (water / 18mol/l sulphuric acid). If you add water in the acid, it starts boiling suddenly.

Question 3 Explain how to dilute 18mol/l sulphuric acid to make 600ml of 3mol/l sulphuric acid.

Pour ( )ml water in a big beaker and add ( )ml of 18mol/l sulphuric acid very slowly.

Question 4 Explain how to dilute 3mol/l sulphuric acid to make 600ml of 0.5mol/l sulphuric acid.

Pour ( )ml water in a big beaker and add ( )ml of 3mol/l sulphuric acid very slowly.

Question 5 Calculate the molar concentration of 37% hydrochloric acid (weight percent).

Using following atomic mass "H: 1.0, Cl: 35.5" calculate to three digit significant figures.

Data; Hydrochloric acid (HCl): molar mass ( )g/mol, density 1.18g/ml (g/cm^3)

If we have 1,000g of the 37% hydrochloric acid, ( )g of the liquid is hydrochloric acid.

The molar mass of the acid is

$$\frac{(\quad)g}{(\quad)g/mol} = (\quad)mol$$

and the volume of 1000g hydrochloric acid is

$$\frac{1000g}{(\quad)g/ml} = (\quad)ml$$

The molar concentration is calculated as follows.

$$\frac{(\quad)mol}{(\quad)ml} \times 1000\ ml/l = (\quad)mol/ml \times 1000ml/l = (\quad)mol/l$$

Question 6 Explain how to dilute 12mol/l hydrochloric acid to 1.0mol/l hydrochloric acid.

Since we must dilute the original liquid to 1/12, we need 1 volume of acid and ( ) volume of water.

If we use 100ml of 12mol/l hydrochloric acid, we need ( )ml water.

Question 7 How to make 200ml of 1.0 mol/l sodium hydroxide solution.

Using following atomic mass "H: 1.01, O: 16.00, Na: 23.00"

Put a 200ml glass beaker on top of an electric balance (chemical balance) and measure ( )g sodium hydroxide pellets. Place the beaker on the table and pour about 100ml water, then stir the liquid with a glass rod. After the pellets are dissolved perfectly, pour the liquid into a 200ml measuring flask. Add small amount of water in the empty beaker and pour the water to the measuring flask. Repeat it several times. Then add ( ) into the measuring flask up to the 200ml line very gently.

The sodium hydroxide pellets absorbs water vapour in the air easily. Measure the pellet swiftly.

We should determine the accurate concentration of the aqueous solution by titration with oxalic acid $(COOH)_2$ because of the deliquescence of the pellet.

Question 8. How to make 1000ml of 0.100mol/l sodium carbonate solution.

Using following atomic mass "H: 1.0, C: 12.0, Na: 23.0"

The common sodium carbonate powder is decahydrate; $Na_2CO_3 \cdot 10H_2O$.

One mole Na_2CO_3 weights ( )g.

One mole $Na_2CO_3 \cdot 10H_2O$ weights ( )g

Measure ( )g sodium carbonate decahydrate powder using an electric balance. Put the powder in a 1000ml glass beaker and pour about 800ml distilled water in the beaker and stir with a glass rod until the powder is completely dissolved. Then pour the liquid in a 1,000ml measuring flask. Rinse the beaker with water and pour the water into the measuring flask. Repeat it several times. Then add water into the measuring flask up to the 1000ml line gently.

ANSWERS

Question 1 Calculate the molar concentration of 96% sulphuric acid (weight percent).

Using following atomic mass "H: 1.01, O: 16.00, S: 32.07" calculate to three digit significant figures.

Data; Sulphuric acid (H_2SO_4): molar mass (98.1)g/mol, density 1.83g/ml (g/cm^3)

If we have 1,000g of the 96% sulphuric acid, (960)g of the liquid is sulphuric acid.

The molar mass of the acid is

$$\frac{(\ 960\ )g}{(\ 98.1\ )g/mol} = (\ 9.79\ )mol$$

and the volume of 1000g sulphuric acid is

$$\frac{1000g}{(\ 1.83\ )g/ml} = (\ 546.4\ )ml$$

The molar concentration is calculated as follows.

$$\frac{(\ 9.76\ )mol}{(\ 546.4\ )ml} \times 1000\ ml/l = (\ 0.0179\ )mol/ml \times 1000ml/l = (\ 17.9\ )mol/l$$

NOTE: If you want to dilute a certain liquid to 1/N times with water, you can mix 1 volume of original liquid and (N-1) volume of water.

Question 2 Explain how to dilute 18mol/l sulphuric acid to make 6.0mol/l sulphuric acid.

Since we must dilute the original liquid to 1/3, we need 1 volume of sulphuric acid and (2) volume of water.

If we use 100ml of 18mol/l sulphuric acid, we need (200)ml water.

We must not add (water / ~~18mol/l sulphuric acid~~) to (~~water~~ / 18mol/l sulphuric acid). If you add water in the acid, it starts boiling suddenly.

Question 3 Explain how to dilute 18mol/l sulphuric acid to make 600ml of 3mol/l sulphuric acid.

Pour (500)ml water in a big beaker and add (100)ml of 18mol/l sulphuric acid very slowly.

Question 4 Explain how to dilute 3mol/l sulphuric acid to make 600ml of 0.5mol/l sulphuric acid.

Pour (500)ml water in a big beaker and add (100)ml of 3mol/l sulphuric acid very slowly.

Question 5 Calculate the molar concentration of 37% hydrochloric acid (weight percent).

Using following atomic mass "H: 1.0, Cl: 35.5" calculate to three digit significant figures.

Data; Hydrochloric acid (HCl): molar mass (36.5)g/mol, density 1.18g/ml (g/cm^3)

If we have 1,000g of the 37% hydrochloric acid, (370)g of the liquid is hydrochloric acid.

The molar mass of the acid is

$$\frac{(\ 370\ )g}{(\ 36.5\ )g/mol} = (\ 10.1\ )mol$$

and the volume of 1000g hydrochloric acid is

$$\frac{1000g}{(\ 1.18\ )g/ml} = (\ 847\ )ml$$

The molar concentration is calculated as follows.

$$\frac{(\ 10.1\ )mol}{(\ 847\ )ml} \times 1000\ ml/l = (\ 0.0119\ )mol/ml \times 1000ml/l = (\ 11.9\ )mol/l$$

Question 6 Explain how to dilute 12mol/l hydrochloric acid to 1.0mol/l hydrochloric acid.

Since we must dilute the original liquid to 1/12, we need 1 volume of acid and (11) volume of water.

If we use 100ml of 12mol/l hydrochloric acid, we need (1100)ml water.

Question 7 How to make 200ml of 1.0 mol/l sodium hydroxide solution.

Using following atomic mass "H: 1.01, O: 16.00, Na: 23.00"

Put a 200ml glass beaker on top of an electric balance (chemical balance) and measure (8.0)g sodium hydroxide pellets. Place the beaker on the table and pour about 100ml water, then stir the liquid with a glass rod. After the pellets are dissolved perfectly, pour the liquid into a 200ml measuring flask. Add small amount of water in the empty beaker and pour the water to the measuring flask. Repeat it several times. Then add (water) into the measuring flask up to the 200ml line very gently.

The sodium hydroxide pellets absorbs water vapour in the air easily. Measure the pellet swiftly.

We should determine the accurate concentration of the aqueous solution by titration with oxalic acid $(COOH)_2$ because of the deliquescence of the pellet.

Question 8. How to make 1000ml of 0.100mol/l sodium carbonate solution.

Using following atomic mass "H: 1.0, C: 12.0, Na: 23.0"

The common sodium carbonate powder is decahydrate; $Na_2CO_3 \cdot 10H_2O$.

One mole Na_2CO_3 weights (106)g.

One mole $Na_2CO_3 \cdot 10H_2O$ weights (286)g

Measure (28.6)g sodium carbonate decahydrate powder using an electric balance. Put the powder in a 1000ml glass beaker and pour about 800ml distilled water in the beaker and stir with a glass rod until the powder is completely dissolved. Then pour the liquid in a 1,000ml measuring flask. Rinse the beaker with water and pour the water into the measuring flask. Repeat it several times. Then add water into the measuring flask up to the 1000ml line gently.