**Year 10 Chemical Science End of Topic Practice Test**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mark: \_\_\_\_\_\_\_\_/50 \_\_\_\_\_\_\_%

Time allowed: 50 minutes

**Multiple Choice – 10 marks**

1. In one mole of ammonia, NH3, there are about:
   1. 6 x 1023 atoms
   2. 4 atoms
   3. 1.8 x 1024 atoms
   4. 2.4 x 1024 atoms
2. The molar mass of oxalic acid, H2C2O4. 2H2O is:
   1. 110 gmol-1
   2. 126 gmol-1
   3. 90 gmol-1
   4. 78 gmol-1
3. If 5.0 mol of NH3 and 10.0 mol of O2 react until one of the reagents is completely used up, how many moles of nitrogen dioxide would be produced? (Assume no change in reaction conditions)

4NH3 + 7O2 → 4NO2 + 6H2O

* 1. 4.0 mol
  2. 5.0 mol
  3. 5.7 mol
  4. 10.0 mol

1. Which of the following equations is NOT balanced?
   1. 2H2S + 3O2  2H2O + 2SO2
   2. 2C2H6 + 7O2  4CO2 + 6H2O
   3. HCl + NaOH  H2O + NaCl
   4. 3NO + 2O2  3NO2
2. The reaction of sodium sulfite with hydrogen chloride may be represented by the following equation

Na2SO3 (aq) + 2HCl (aq) → 2NaCl (aq) + H2O (aq)  + SO2 (g)

On the basis of the information that is provided in the equation, which of the following

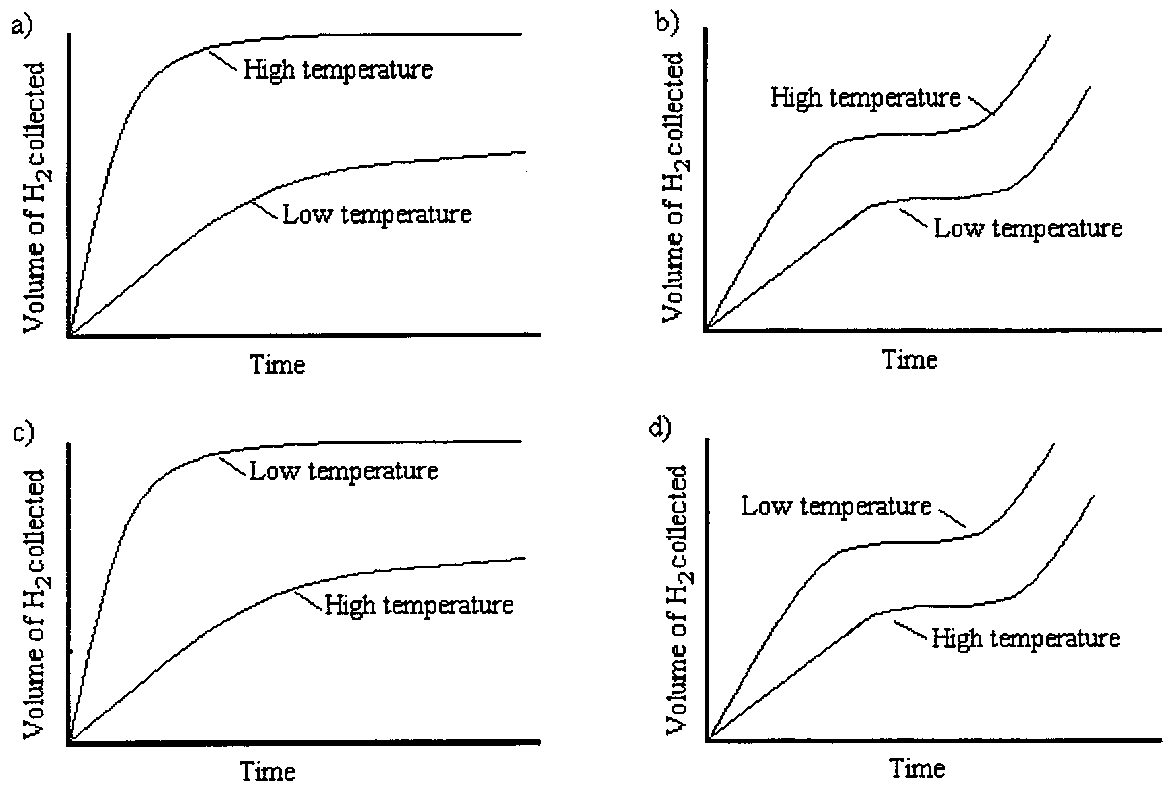
statements is ***correct***?

1. When one mole of is treated with acid one mole of sulfur monoxide will always be produced
2. and must always be present in the mole ratio 1:2 for a reaction to take place
3. The ratio by mass of  to in a reaction mixture of stoichiometric proportions is 1:2
4. 0.4 moles of water will be produced when 0.8 moles of reacts completely with excess 
5. Which one of the following ***does not*** change during any chemical reaction?
6. total number of molecules in the system
7. total volume of the system
8. total mass of the system
9. temperature of the system
10. 160 g of calcium contains as many atoms as
    1. 28 g of carbon
    2. 92 g of sodium
    3. 160 g of silver
    4. 256 g of sulfur
11. Which of the following contains the greatest number of atoms?
12. 12 g of water
13. 17 g of ammonia
14. 2 mol of nitrogen molecules
15. 6 x 1023 oxygen molecules
16. Consider the reaction between magnesium metal and dilute hydrochloric acid:

Mg(s) + 2HCl(aq)  MgCl2(aq) + H2(g)

A student wants to see what effect temperature has on the rate of this reaction. She performs this experiment at two different temperatures and measures the volume of hydrogen gas produced over time.

Using your knowledge of reaction rates, which graph best represents the expected results of this experiment?



1. Consider the reaction between marble chips (calcium carbonate) and dilute hydrochloric acid:

CaCO3(s) + 2H+(aq)  Ca2+(aq) + CO2(g) + H2O(l)

Which one of the following would increase the *rate* at which the marble chips react?

* 1. Decreasing the concentration of the hydrochloric acid.
  2. Adding more water to the solution.
  3. Crushing the marble chips into powder form.
  4. Decreasing the temperature of the acid solution added.

**Short Answer – 33 marks**

1. For each of the following substances, determine whether it is soluble or insoluble, and assign a state (or subscript?) to each.

(3 marks)

* 1. KCl

Soluble (aq)

* 1. PbSO4

Insoluble (s)

* 1. Al(OH)3

Insoluble (s)

1. Use the solubility table to write an IONIC equation if a chemical reaction takes place when the following solutions are combined. If no precipitate forms write NR (No reaction).

(5 marks)

* 1. barium nitrate + potassium chloride

NR 1 mark

* 1. ammonium sulfide + aluminium nitrate

2Al3+(aq) + 3S-2(aq) 🡪 Al2S3(s)

*1 mark for correct balanced equation*

*1 mark for subscripts*

* 1. sodium hydroxide + magnesium iodide

Mg2+(aq) + 2OH-(aq) 🡪 Mg(OH)2(s)

*1 mark for correct balanced equation*

*1 mark for subscripts*

1. Name a **pair** of substances that could be used to produce the following salts

(2 marks)

* 1. Iron (II) sulfate

Any of the following combinations:

FeCO3 + H2SO4

FeO + H2SO4

Fe(OH)2 + H2SO4

Not Fe + H2SO4 as has more than one ion possibility

* 1. Barium ethanoate

Any of the following combinations:

BaCO3 + CH3COOH

BaO + CH3COOH

Ba(OH)2 + CH3COOH

Ba + CH3COOH

1. Write balanced chemical equations for each of the following reactions

(10 marks)

1. Phosphoric acid is added to sodium carbonate.

2H3PO4 + 3Na2CO3 → 2Na3PO4 + 3CO2 + 3H2O

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1 mark correct formula

1 mark correctly balanced

1. Hydrochloric acid and calcium carbonate

2HCl + CaCO3 → CaCl2 + H2

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1 mark correct formula

1 mark correctly balanced

1. The action of heat on barium hydrogen carbonate.

Ba(HCO3)2 → BaCO3 + H2O + CO2

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1 mark correct formula

1 mark correctly balanced

1. A neutralisation equation which results in aluminium chloride being produced.

3HCl + Al(OH)3 → AlCl3 + 3H2O

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1 mark correct formula

1 mark correctly balanced

1. An acid is added to a substance. Two products of this reaction are hydrogen gas and magnesium sulphate.

H2SO4 + Mg → MgSO4 + H2

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1 mark correct formula

1 mark correctly balanced

1. To make some carbon dioxide a chemist put some large pieces of marble in a 0.10 M solution of hydrochloric acid. The rate of production of carbon dioxide was too slow.

List 4 ways in which the chemist could alter the conditions so that the carbon dioxide is produced more rapidly. Explain **how** each way would speed up the production of carbon dioxide.

(8 marks)

Method increase concentration of HCl

Explanation more reacting species per unit volume

∴ more collision per unit time &

same proportion of successful collisions

∴ faster rate

Method increase state of subdivision of marble (ie crush marble)

Explanation greater surface area

more collision per unit time &

same proportion of successful collisions

∴ faster rate

Method increase temperature

Explanation increase number of particles with sufficient activation energy

∴ more collisions and more energetic collisions

∴ faster rate

Method Use a catalyst if available

Explanation creates an alternative pathway at a lower activation energy

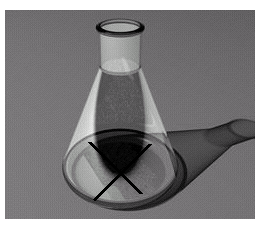
∴ faster rate as more reactions can take place

1. A group of students decided to conduct an investigation into reaction rate. The reaction between sodium thiosulfate solution and hydrochloric acid produces tiny particles of sulphur which are suspended in water. When the amount of S becomes too high, the solution becomes opaque.

Na2S2O3(aq) + 2HCl(aq) → S(s) + SO2(g) + H2O(l) + 2NaCl(aq)

An ionic equation better shows the chemistry involved.

S2O3-2(aq) + 2H+(aq) → S(s) + SO2(g) + H2O(l)

The time it takes to hide a black cross marked on a piece of paper under the flask is used as a measure of reaction rate. The less time taken for the cross to disappear the faster the reaction rate.

The students used 0.250 mole L-1 Na2S2O3 solution, 2.0 mole L-1 HCl and some distilled water.

The total volume of Na2S2O3 solution, distilled water and HCl in each conical flask was kept at 50.0mL. The students always added 5.0 mL of the HCl to each flask and the remaining 45.0mL volume was a combination of set amounts of Na2S2O3 solution and distilled water.

1. What was the dependent and independent variable in this investigation?

(2 marks)

Dependent \_\_\_\_\_Time taken for cross to disappear\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Independent Concentration of sodium thiosulfate solution due to dilution with water

1. What was a variable that the students controlled?

(1 mark)

Controlled \_\_\_\_Concentration of hydrochloric acid\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is a hypothesis the students could have been testing in this investigation?

(2 marks)

\_\_As the concentration of sodium thiosulfate in a reaction with 5.0ml of 2M HCl is

decreased the time taken for the cross below the conical flask to disappear will also

decrease. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 mark relationship stated between the two variables in the experiment

1 mark appropriately written hypothesis

**Calculations – 17 marks**

1. Calculate the number of moles in the following:

(2 marks)

* 1. 364 grams of KOH

n = m/Mr

= 364 / (39.1+ 16 + 1.008)

= 364 / 56.108

= 6.49 mol 1 mark

* 1. 9.03 x 1024 atoms of aluminium

n = N / 6.02 x 1023

= 9.03 x 1024 / 6.02 x 1023

= 15 mol 1 mark

1. Calculate the number of moles of sulfur in 260 g of Fe2S3

(3 marks)

n(Fe2S3) = m / Mr

= 260 / [(2 x 55.85)+(3 x 32.06)]

= 260 / 207.88 1 mark molar mass correct

= 1.25 mol 1 mark

There are 3 moles of S in 1 mol of Fe2S3

∴ n(S) = 3 x n(Fe2S3)

= 3 x 1.25

= 3.75 mol 1 mark

1. What is the mass of 4.36 moles of magnesium bromide?

(2 marks)

m(MgBr2) = n x Mr

= 4.36 x [24.3 + (2 x 79.9)] 1 mark

= 4.36 x 184.1

= 802.6 = 803 g 1 mark

**END OF TEST**