Section A:

1. Write the general equation for reaction of a metal and acid.

   _____

2. Complete the table below to show the formulae and ions in different acids.

Name of acid	**Molecular Formula**	**Ions formed when in solution**
Hydrochloric acid		
Nitric acid		
Sulphuric acid		

3. Complete the sentences below about the salts formed from metal and acid reactions.

- *Hydrochloric acid forms salts ending in 'chloride'.*
- *Nitric acid forms salts ending in '_____.*
- *Sulfuric acid forms salts ending in '_____.*

4. Complete the word equations below:

   (a) Copper + nitric acid → _____

   (b) Zinc + hydrochloric acid → _____

   (c) Aluminium + nitric acid → _____

   (d) Lead + sulfuric acid → _____

   (e) Sodium + hydrochloric acid → _____

5. Complete the gaps in the equations below

Word equation: calcium + ☐ → calcium sulfate + hydrogen

Chemical equation: $Ca_{(s)} + H_2SO_{4(aq)} \rightarrow CaSO_{4(aq)} +$ ☐

Ionic equation: ☐ → $Ca^{2+}_{(aq)} + H_{2(g)}$

Half equations: $Ca_{(s)} \rightarrow$ ☐ (oxidation)

$2H^+_{(aq)} + 2e^- \rightarrow$ ☐ ☐

Section B

For each of the following reactions of metals and acids, write

(a) the word equation
(b) the chemical equation
(c) the ionic equation
(d) the two half equations – labelling each as either reduction or oxidation

Use the guidance in this box for support with writing half equations.

Steps for writing half equations:

1. **Pick one element** that's on both sides of the equation
2. Write down **reactant** → **product**, copying from the equation exactly
3. **Balance the atoms and ions**
4. **Add up the charges** on both sides
5. **Balance the charges** with electrons

1. **Lithium and nitric acid**

(a) _____

(b) _____

(c) _____

(d) _____

_____

2. **Magnesium and hydrochloric acid**

(a) _____

(b) _____

(c) _____

(d) _____

_____

3. **Aluminium and hydrochloric acid**

(a) _____

(b) _____

(c) _____

(d) _____

_____

Section C

Calcium and hydrochloric acid react to form a salt and hydrogen gas.

1. State which salt is produced in this reaction.

   _____

2. Give the test for hydrogen gas.

   Describe the result of the test if hydrogen is present.

   Test _____

   _____

   Result_____

   _____

3. Write the ionic equation for this reaction

   _____

   _____

4. Explain which species is reduced in this reaction.

   Write the half equations to support your answer.

   _____

   _____

   _____

   _____

   _____

5. A scientist carried out this reaction using 40 g of calcium and 72 g hydrochloric acid.

   At the end of the reaction 2 g of hydrogen gas was collected.

   Calculate the mass of calcium chloride formed.

   _____

   _____

6. Calculate the relative formula mass of hydrochloric acid.

   _____

   _____