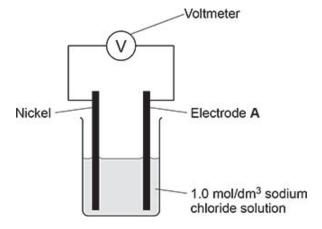
All questions are for separate science students only

Q1.

A student investigated the voltage produced by different pairs of metal electrodes in a chemical cell.

The figure below shows the apparatus.



This is the method used.

- 1. Place a nickel electrode and an electrode made from a different metal (electrode **A**) in 1.0 mol/dm³ sodium chloride solution.
- 2. Measure the voltage produced.
- 3. Repeat using different metals for electrode A.

The table below shows the results.

Electrode A	Symbol of metal	Voltage in volts
Copper	Cu	-0.59
Magnesium	Mg	2.12
Nickel	Ni	0.00
Silver	Ag	-1.05
Zinc	Zn	0.51

(a) Write the symbols of the five metals in the above table in order of reactivity.

Justify your answer. (chemistry only)

Most reactive ₋	· · · · · · · · · · · · · · · · · · ·	 	 	Least reactive	Э
Justification _		 	 		

(Total 11 marks)

(b) The voltage produced by a chemical cell depends on the concentration of the electrolyte solution.

Plan an experiment to investigate how the voltage produced by a chemical cell varies with the **concentration** of the electrolyte solution. **(chemistry only)**

The following substances are available:

- the metal electrodes in the table above
- 1.0 mol/dm³ sodium chloride solution

pure water.
Describe how a hydrogen fuel cell produces a potential difference. (chemistry only)