

# CAMBRIDGE

## INTERNATIONAL EXAMINATIONS

### On-line Science Simulations - Electrolysis Student Worksheet

#### Task 1

##### Experiment 1

Select sulphuric acid and set the concentration to  $5.0 \text{ mol/dm}^3$  and the potential to 30 volts. Press the start button and record the ammeter reading in Table 1 below.

When the reaction has stopped, use the cursor to read the volume of the gases produced at each electrode and record the volumes in Table 1.

Table 1

	concentration of acid / $\text{mol/dm}^3$	potential / V	ammeter reading / A	volume of gas at positive electrode / $\text{cm}^3$	volume of gas at negative electrode / $\text{cm}^3$
Experiment 1	5.0	30			
Experiment 2	2.5	30			
Experiment 3	2.5	15			

Identify the gases produced at each electrode.

Gas produced at the positive electrode is .....

Gas produced at the negative electrode is .....

##### Experiment 2

Change the concentration to  $2.5 \text{ mol/dm}^3$  but do not change the potential. Press the start button and record the ammeter reading and when the reaction has stopped read the volume of the gases produced at each electrode and record the volumes in Table 1.

##### Experiment 3

Leave the concentration at  $2.5 \text{ mol/dm}^3$  but change the potential to 15 volts. Press the start button and record the ammeter reading and when the reaction has stopped read the volume of the gases produced at each electrode and record the volumes in Table 1.

Using your results, what conclusions can you draw about the volume of the two gases produced during this experiment?



#### Experiment 4

Select hydrochloric acid and chose a sensible set of values for the concentration of te acid and potential, record these values in Table 2. Press the start button and record the ammeter reading and when the reaction has stopped read the volume of the gases produced at each electrode and record the volumes in Table 2.

Table 2

	concentratio n of acid / mol/dm <sup>3</sup>	potential / V	ammeter reading / A	volume of gas at positive electrode / cm <sup>3</sup>	volume of gas at negative electrode / cm <sup>3</sup>
Experiment 4					

Identify the gases produced at each electrode.

Gas produced at the positive electrode is .....

Gas produced at the negative electrode is .....

## Task 2

The apparatus can be used to investigate the electrolysis of either sulphuric acid or hydrochloric acid. The concentration of the acid and the potential that is applied can be altered.

The graph shows the volumes of the gases produced at the positive electrode (red line) and at the negative electrode (blue line).

### Experiment 1

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When the reaction has stopped, use the cursor to read the volume of the gases produced at each electrode and record the volumes in Table 1.

Table 1

	concentration of acid / $\text{mol/dm}^3$	potential / V	ammeter reading / A	volume of gas at positive electrode / $\text{cm}^3$	volume of gas at negative electrode / $\text{cm}^3$
Experiment 1	5.0	30			
Experiment 2	2.5	30			
Experiment 3	2.5	15			

Identify the gases produced at each electrode.

Gas produced at the positive electrode is .....

Gas produced at the negative electrode is .....

### Experiment 2

Change the concentration to  $2.5 \text{ mol/dm}^3$  but do not change the potential. Press the start button and record the ammeter reading and when the reaction has stopped read the volume of the gases produced at each electrode and record the volumes in Table 1.

### Experiment 3

Leave the concentration at  $2.5 \text{ mol/dm}^3$  but change the potential to 15 volts. Press the start button and record the ammeter reading and when the reaction has stopped read the volume of the gases produced at each electrode and record the volumes in Table 1.

Using your results, what conclusions can you draw about the volumes of the two gases produced during this experiment?

By using your answer to the question above, what conclusion can you draw about the number of electrons required to produce one mole of the gas at the positive electrode compared to the number of electrons required to produce one mole of the gas at the negative electrode?

By comparing the results of Experiments 1 & 2, suggest how the concentration of the acid affects the volumes of the gases produced during the electrolysis.

By comparing the results of Experiments 2 & 3, suggest how the potential affects the volumes of the gases produced during the electrolysis.

Suggest the volumes of the gases which would be produced at the two electrodes if the experiment was carried out using the conditions shown in Table 2.

Table 2

concentration of acid / mol/dm <sup>3</sup>	Potential / V	volume of gas at positive electrode / cm <sup>3</sup>	volume of gas at negative electrode / cm <sup>3</sup>
3.0	50		

#### Experiment 4

Select hydrochloric acid and chose a sensible set of values for the concentration of the acid and potential, record these values in Table 3. Press the start button and record the ammeter reading and when the reaction has stopped read the volume of the gases produced at each electrode and record the volumes in Table 3.

Table 3

	concentration of acid / mol/dm <sup>3</sup>	potential / V	ammeter reading /A	volume of gas at positive electrode / cm <sup>3</sup>	volume of gas at negative electrode / cm <sup>3</sup>
Experiment 4					

Identify the gases produced at each electrode.

Gas produced at the positive electrode is .....

Gas produced at the negative electrode is .....