AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.5.2.1

Cells and batteries

Past-paper questions

Tier	**Higher**
Question groups	**2**
Available paper years	**2007–2018**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.5.2.1 Cells and batteries

Question 01

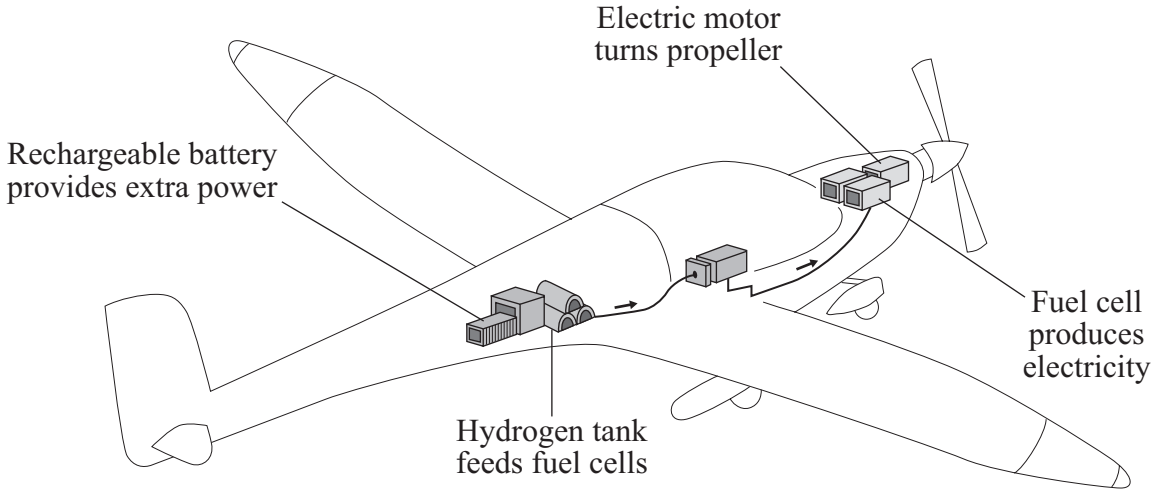
June 2007 | CHY1A | Original Q9 | Legacy

QUESTION NINE

This information is an edited newspaper article about aircraft research.

Greening the skies

'Emission-free aircraft'



Conventional aircraft use very large volumes of kerosene fuel which is a mixture of hydrocarbons. Research is being carried out into the use of hydrogen as a fuel.

In the fuel cell, hydrogen is chemically combined with oxygen to produce electricity, to drive a motor which turns the propeller. Fuel cells are bulky and expensive but have no moving parts and run silently.

Most commercially produced hydrogen is obtained from natural gas, and carbon dioxide is generated as a by-product. It has been called 'black hydrogen' by some groups.

As an aircraft fuel, mass for mass, hydrogen will deliver about three times as much energy as kerosene; however, the volume of the hydrogen is much greater.

One problem with kerosene fuel is that aircraft sometimes have to dump large volumes of fuel, if, for example, they are turned back to the take-off airport.

4.5.2.1 Cells and batteries

Question 01 · continued

9A There are several reasons why this research is being carried out.

Which of the following is **not** one of those reasons?

1 There could be a shortage of kerosene in the future.

2 There is political pressure to reduce air travel.

3 Kerosene is obtained from a non-renewable source.

4 There is political pressure to reduce emission of gases which may cause global warming.

9B In this article, 'emission free' means . . .

1 there are no waste products when hydrogen is used in a fuel cell.

2 the fuel cell only produces carbon dioxide and water as waste.

3 there are no harmful gases produced by the fuel cell.

4 the fuel cell reduces noise pollution from aircraft.

9C One reason why some groups refer to the commercially produced hydrogen as 'black hydrogen' is that . . .

1 the hydrogen is impure.

2 the hydrogen is made from a fossil fuel.

3 the hydrogen burns to produce more carbon dioxide.

4 sulfur dioxide is a by-product of the process.

9D Even if hydrogen-powered aircraft are used commercially in the future, there will probably still be pressure groups against increased air travel.

One reason for objection to increased air travel could be that . . .

1 hydrogen-powered aircraft are too noisy.

2 hydrogen is a dangerous fuel to use in an aircraft.

3 agricultural land will be lost to the building of new runways.

4 dumping large volumes of hydrogen is dangerous.

END OF TEST

4.5.2.1 Cells and batteries

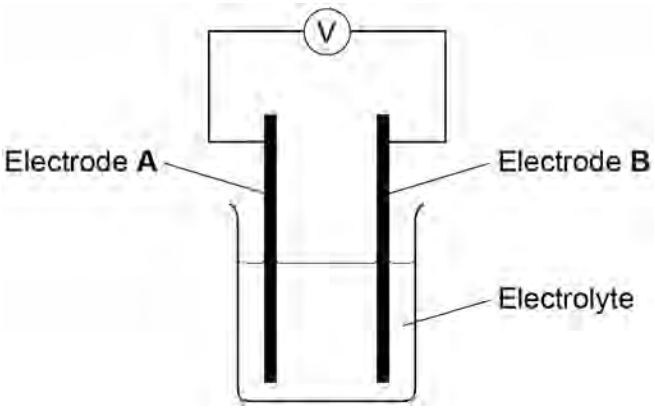
Question 02

June 2018 | 8462/1H | Original Q3

0 3 Chemical reactions can produce electricity.

0 3 . 1 **Figure 2** shows a simple cell.

Figure 2



Which of these combinations would **not** give a zero reading on the voltmeter in **Figure 2**?

[1 mark]

Tick **one** box.

Electrode A	Electrode B	Electrolyte	
Copper	Copper	Sodium chloride solution	☐
Zinc	Zinc	Water	☐
Copper	Zinc	Sodium chloride solution	☐
Copper	Zinc	Water	☐

4.5.2.1 Cells and batteries

Question 02 · continued

Alkaline batteries are non-rechargeable.

0 3 . 2 Why do alkaline batteries eventually stop working?

[1 mark]

0 3 . 3 Why can alkaline batteries **not** be recharged?

[1 mark]

Question 3 continues on the next page

Question 02 · continued

Hydrogen fuel cells and rechargeable lithium-ion batteries can be used to power electric cars.

0 3 . 4 Complete the balanced equation for the overall reaction in a hydrogen fuel cell.

[2 marks]

$$_____ H_2 + _____ \rightarrow _____ H_2O$$

0 3 . 5 **Table 1** shows data about different ways to power electric cars.

Table 1

	Hydrogen fuel cell	**Rechargeable lithium-ion battery**
Time taken to refuel or recharge in minutes	5	30
Distance travelled before refuelling or recharging in miles	Up to 415	Up to 240
Distance travelled per unit of energy in km	22	66
Cost of refuelling or recharging in £	50	3
Minimum cost of car in £	60 000	18 000

Evaluate the use of hydrogen fuel cells compared with rechargeable lithium-ion batteries to power electric cars.

Use **Table 1** and your own knowledge.

[6 marks]

4.5.2.1 Cells and batteries

Question 02 · continued

June 2018 | 8462/1H | Original Q3