



**STEM**

OPPORTUNITIES IN AVIATION & AEROSPACE

## Civil Aviation Authority – DofE Skill Activity Logbook

# Hydrogen

Participant name: \_\_\_\_\_

Participant age: \_\_\_\_\_

eDofE ID: \_\_\_\_\_

DofE Level (Bronze, Silver, Gold): \_\_\_\_\_

Start Date: \_\_\_\_\_



**DURATION**  
6 months



**MATERIAL REQUIRED**

Pen and paper (optional), glass container, 9v battery,  
paper clips, salt, photo or video recording device

Help and support for this program may also be provided through our STEM team at the CAA (DofE@[caa.co.uk](mailto:caa.co.uk)).

# The Duke of Edinburgh's Award Hydrogen

Thank you for choosing the Hydrogen course through the UK Civil Aviation Authority. We are passionate on sharing our knowledge with the next generation of talent to enter the aviation industry and giving you the opportunity to learn a new talent. This course will contain key skills such as learning how to make hydrogen and how hydrogen works in an airport.

The below is a series of signposts of work that can be undertaken in any order. Each activity should last a minimum of one hour per week for the minimum time suggested. This course is designed for Silver level award lasting 6 months (26 weeks), and can also be used to combine to achieve Gold awards.

After completion of the course please confirm you have done so by emailing [dofe@caa.co.uk](mailto:dofe@caa.co.uk) with your eDofE ID so we can process your skills award.

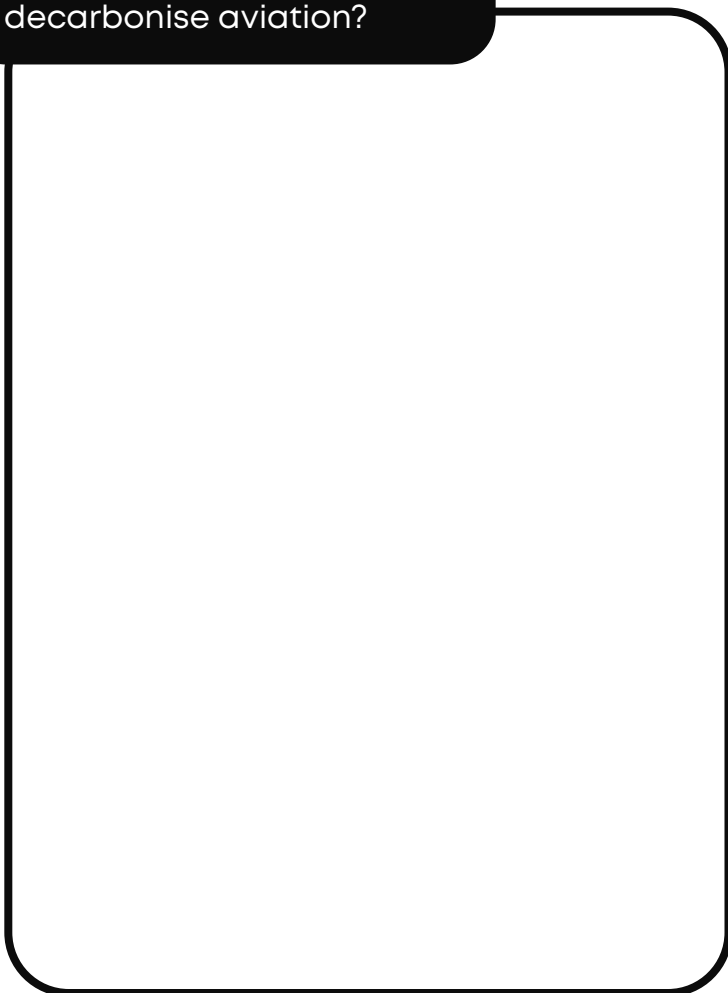
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You may fill the sheet digitally, or handwrite answers before scanning them for submission.

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## Decarbonisation

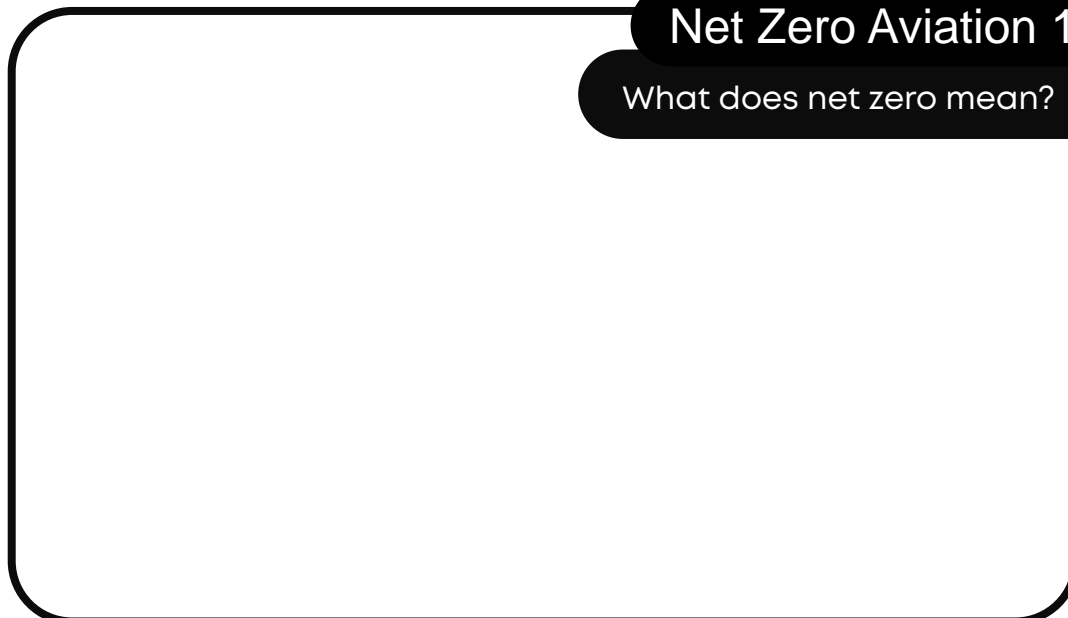
Why is it difficult to decarbonise aviation?



2

## Net Zero Aviation 1

What does net zero mean?



You may fill the sheet digitally, or handwrite answers before scanning them for submission.

3

### Net Zero Aviation 2

What year does the UK aim to reach net zero aviation emissions and why has this target been put in place?

4

### Net Zero Aviation 3

From the research carried out for question 3, is there another name used when discussing net zero, if yes what is it?

5

### Current Aviation Emissions

What emissions do current aircraft engines produce using kerosene as an aviation fuel?

You may fill the sheet digitally, or handwrite answers before scanning them for submission.

6

### CO<sub>2</sub> Emissions

In 2019, what percentage of CO<sub>2</sub> emissions did domestic and international aviation account for?

7

### Non CO<sub>2</sub> Emissions

What are the definitions of CO<sub>2</sub>, NO<sub>x</sub>, and contrails?

8

### Hydrogen

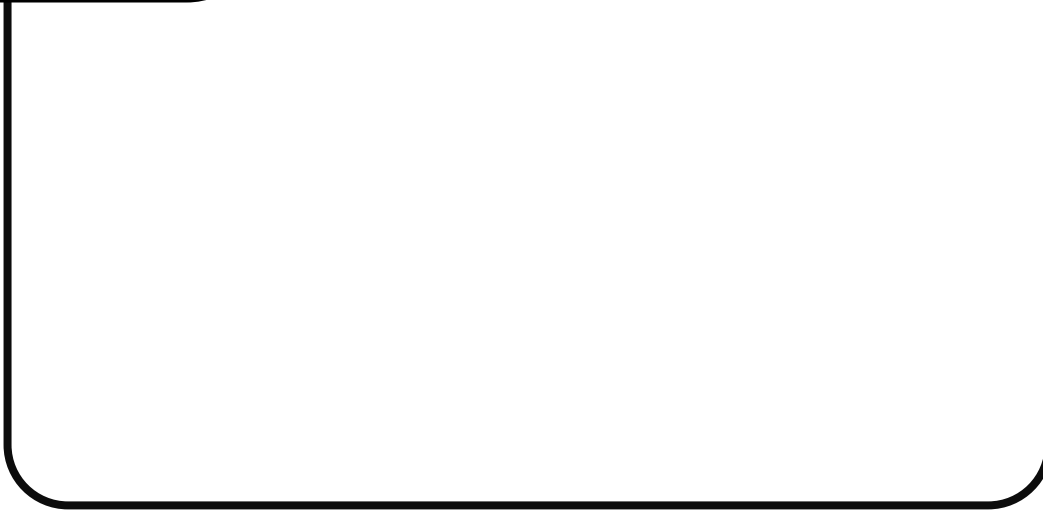
What is hydrogen?

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## Hydrogen Properties

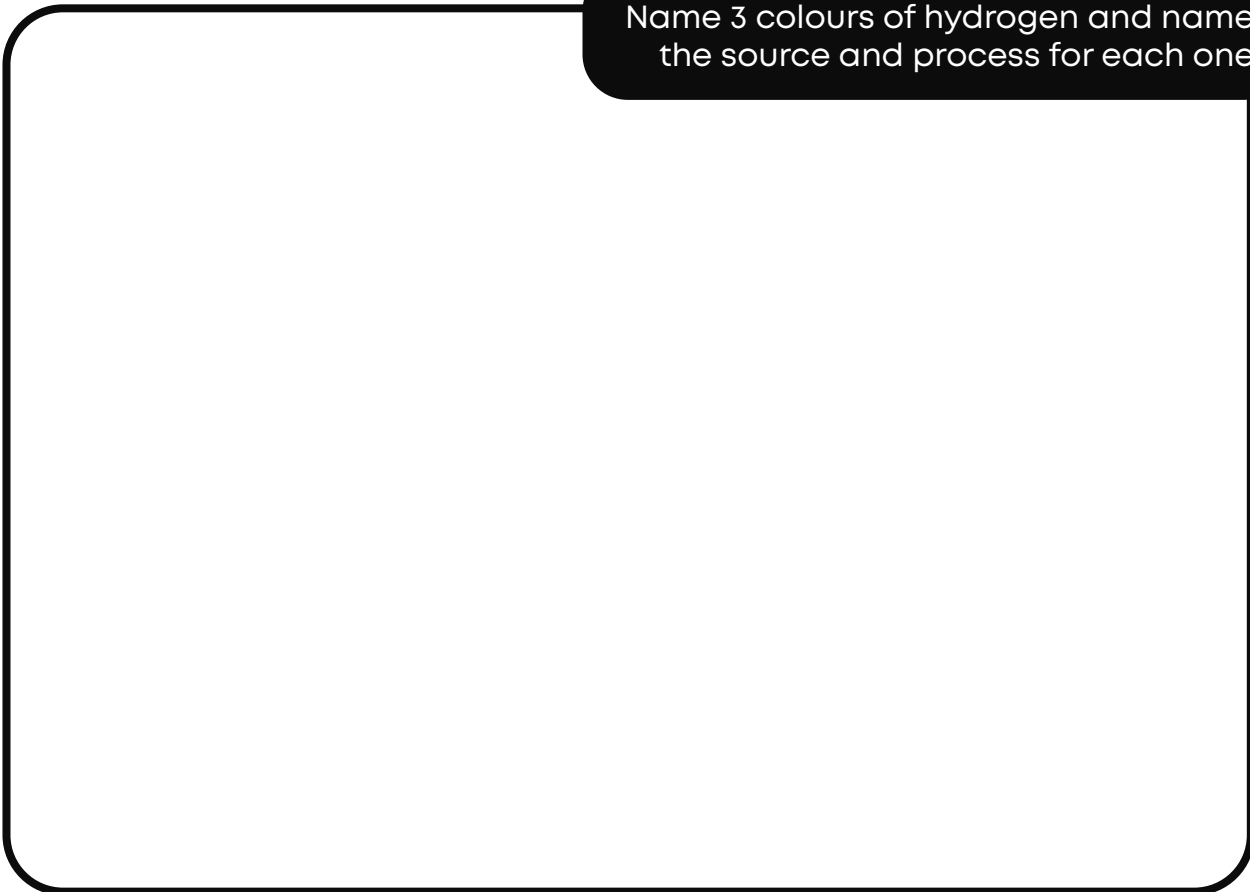
Can you name 5 properties of hydrogen?



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## Hydrogen Colours

Name 3 colours of hydrogen and name the source and process for each one



You may fill the sheet digitally, or handwrite answers before scanning them for submission.

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## Hydrogen Process

Using the findings for the above questions, what happens to the CO<sub>2</sub> in each of these processes?

12

## Making Hydrogen

How to make hydrogen  
– Electrolysing Water –  
Splitting hydrogen and  
oxygen from water.

<https://www.wikihow.com/Make-Hydrogen-%28Science-Experiment%29>

Please carry out with adult supervision.

Equipment needed:

- 1 x glass container
- 1 x 9v battery
- 2 x paper clips
- 1 x tablespoon of salt (to add to the water)
- water

Complete the experiment and video the process of completing the task, alternatively take pictures of the steps you took. Remember to add these to the submission labelled week 12,13.

You may fill the sheet digitally, or handwrite answers before scanning them for submission.

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## Hydrogen Benefit and Challenges

Find 3 benefits and find 3 challenges of using hydrogen to power aircraft.

15 16 17

## Hydrogen Airport

Design a small green hydrogen airport with the following requirements:

- Terminal building(s)
- 10 x aircraft stands
- 2 x vertiports
- Runway(s)
- Taxi ways
- Hydrogen fuel storage area
- 1 x air traffic control tower
- Ground support equipment for use at the airport

Within the design, outline:

- how the hydrogen will get to the airport
- how the airport will create green electricity
- other sustainable technologies that an airport can use to decrease their CO<sub>2</sub> emissions.

Draw or create on PowerPoint your airport design. Remember to submit this labelled week 15,16,17.



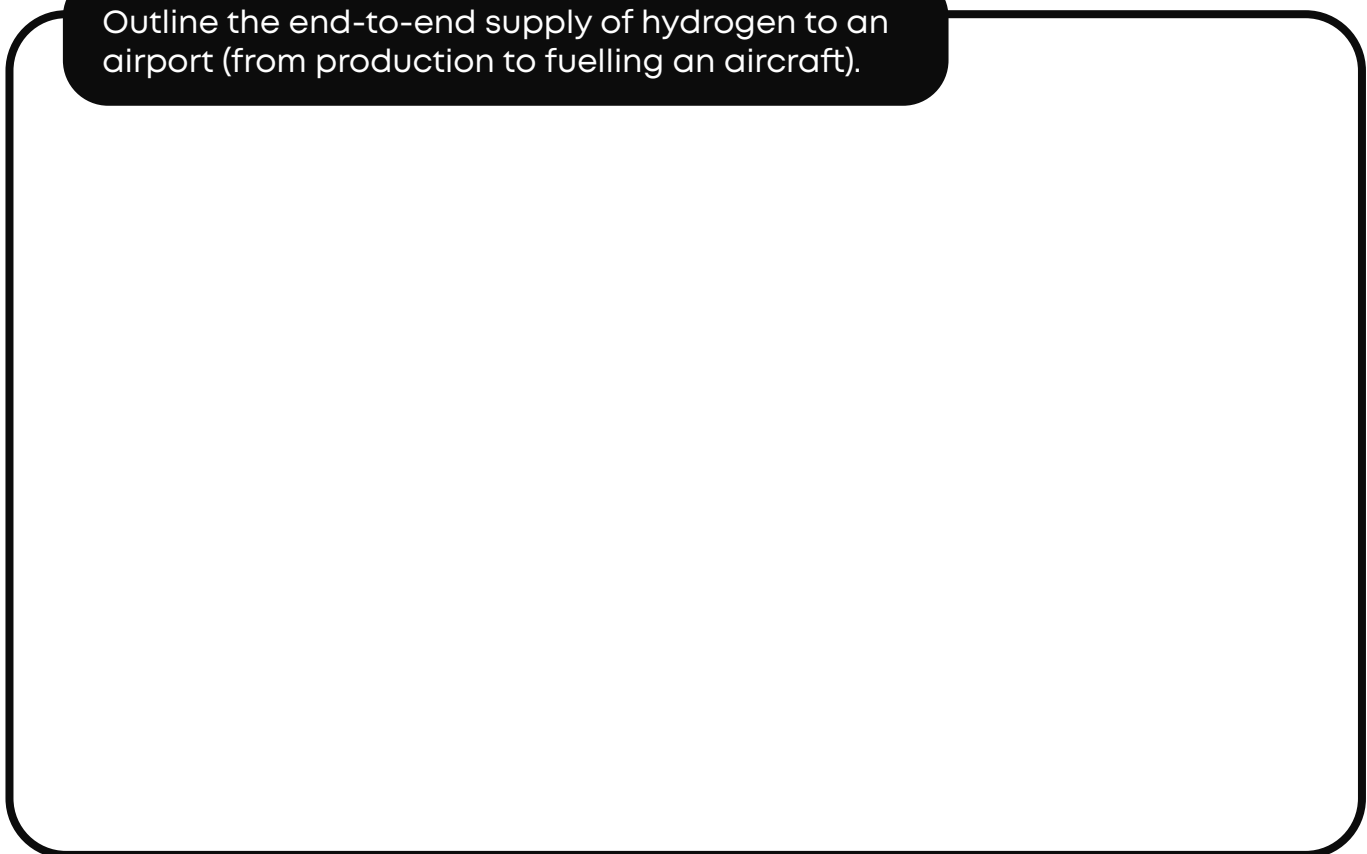


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18 19

## Hydrogen Supply

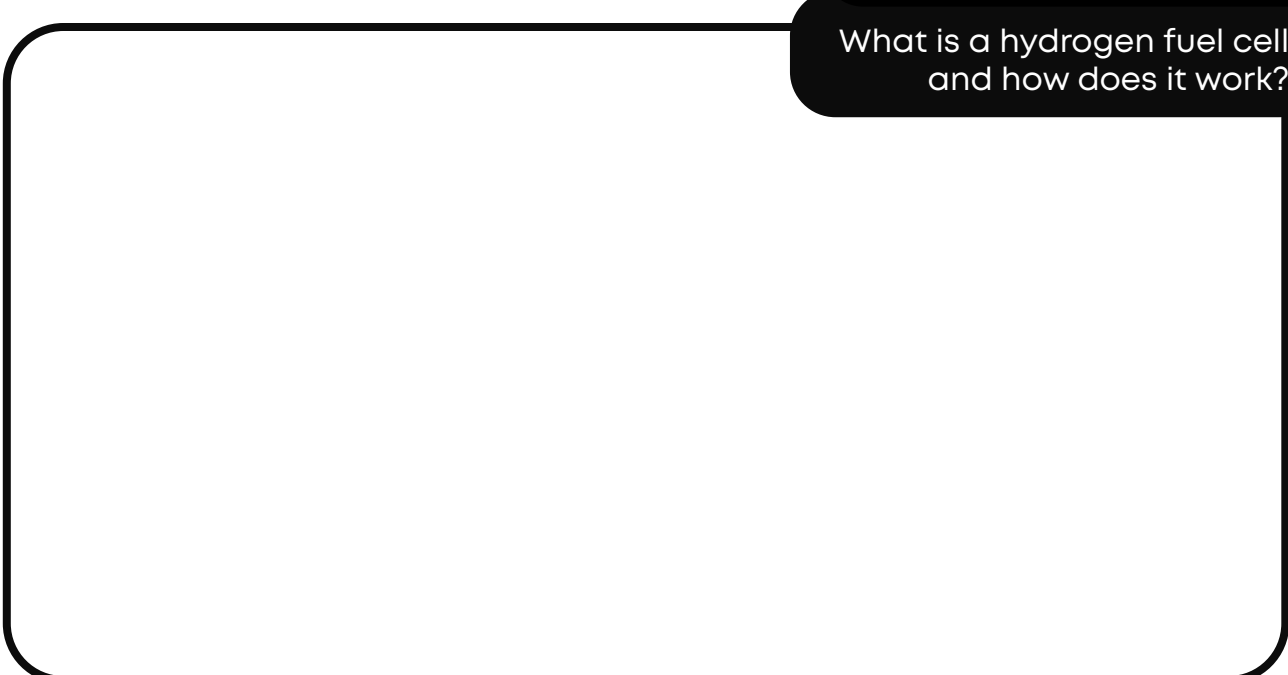
Outline the end-to-end supply of hydrogen to an airport (from production to fuelling an aircraft).



20

## Hydrogen Fuel Cell 1

What is a hydrogen fuel cell and how does it work?



You may fill the sheet digitally, or handwrite answers before scanning them for submission.

21

## Hydrogen Fuel Cell 2

Using the information from task Hydrogen Fuel Cell 1, what is fed into the anode and cathode of a fuel cell and what are the end products from the process?

22

## Hydrogen Temperatures

What temperature is hydrogen stored at in a gaseous and liquid form?

23

## LH<sub>2</sub> Risks and Challenges

Name 3 risks and 3 challenges of using liquid hydrogen?

You may fill the sheet digitally, or handwrite answers before scanning them for submission.

24 25 26

## Hydrogen Airline Route Map

Using your local airport in the UK, use the Great Circle Map (<https://www.greatcirclemap.com/?routes=>) to plan 15 routes for a domestic (UK) hydrogen airline (these do not have to be an international airport it can be a local, small general aviation aerodrome). You are allowed to fly to 15 destinations, these destinations must be a mixture of places in England, Scotland, Wales, Northern Ireland, and Channel Islands.

The restrictions are your aircraft can only fly 500 nautical miles on one tank of fuel before needing to refuel (Nautical miles can be turned on in settings).

When you have your 15 routes, list them in the space below with your starting airport code and your finishing airport code with the Nautical miles listed as well.