The Wonders of the Olympic Torch

The Story

On 10 May, 2012 the **Olympic flame** will be started in the temple of Hera in **Olympia**, Greece by concentrating the **sun's rays** with a lens and creating enough heat to start a fire. In Greek mythology, fire was given to humans by the gods. The sun is regarded as a god, so even today the Olympic flame is given to humans by the gods.

The Olympic flame will travel to Britain in a gold painted British Airways aeroplane. During this journey, the flame will travel in a special safety lantern, similar to the Davy Safety Lamps originally used in mines. This requires permission from the Civil Aviation Authority because normally you cannot carry a flame on a plane.

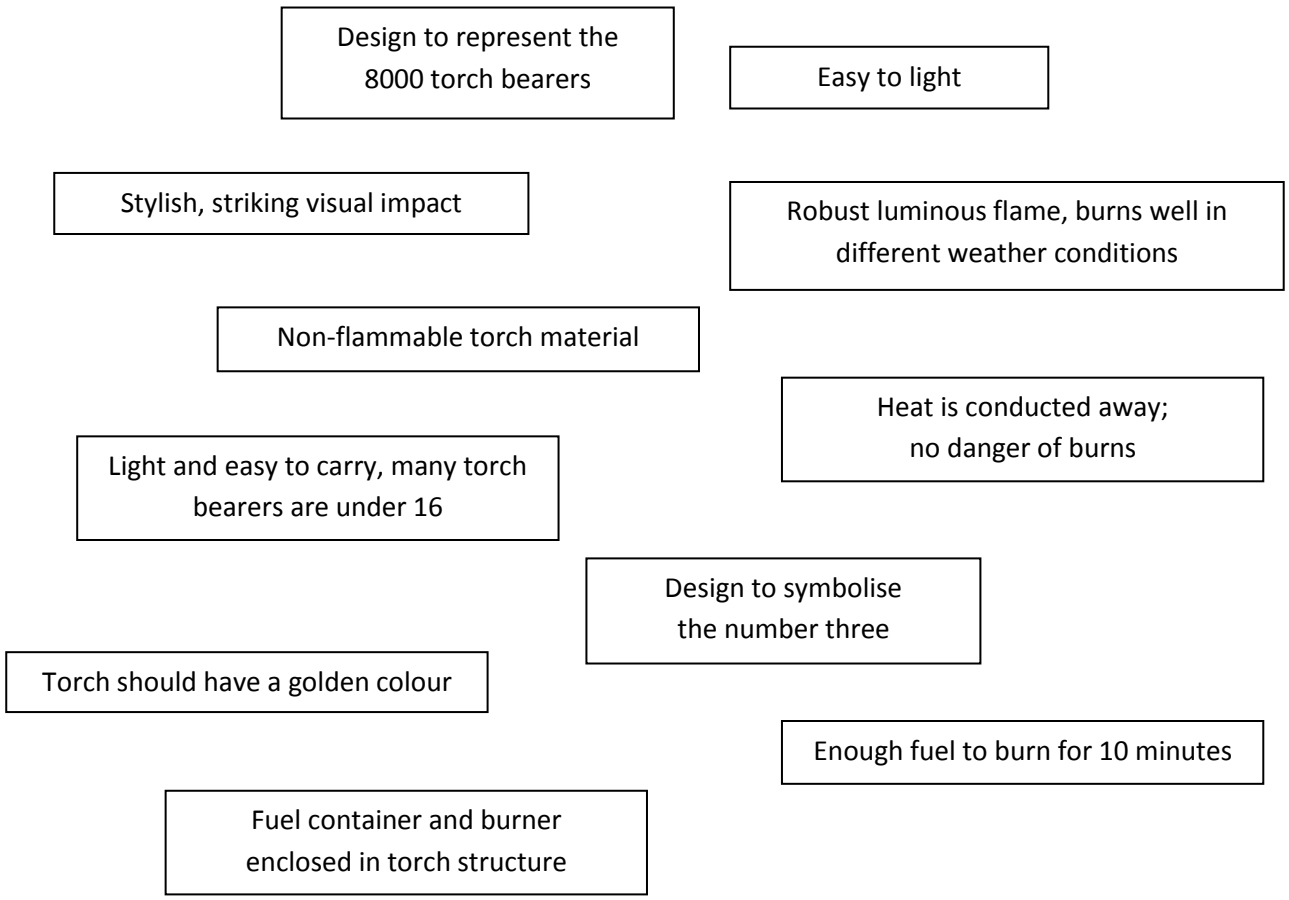
The Torch Relay

The Olympic flame will be carried around Britain in 8000 torches by 8000 torch bearers and will arrive in the Olympic stadium during the **opening ceremony** to light the cauldron with the Olympic fire which will burn for the 16 days of the Olympic Games.

A Special Design

For each Olympic Games, a new torch design is commissioned.

Criteria



Questions for the Torch Designer

Participation is everything…

1. What type of material conducts heat well and is non-flammable?

2. Which metal is light?

3. Which type of fuel is light and easy to ignite?

4. Which gases are commonly used as fuel?

5. Write an equation for the combustion of propane.

6. How can you stop the torch from getting too hot and at the same time make it lighter?

7. The fuel container is filled with a mixture of propane and butane. Why is methane not used?

8. The torch is made of aluminium. How can the golden colour be achieved?

9. The torch is designed to burn for 10 minutes. How much gas is needed to burn for 10 minutes?

   We need to some extra information; we need to know the flow rate of the gas through the valve.

   Let's assume that the flow rate is 40 cm^3 per second.

   - What volume of gas will flow in 10 minutes?

   - How many moles of propane is this?

   - What mass of propane does the gas canister contain?

   - The canister of gas actually contains a mixture of propane and butane.

     Let's assume that it is a 1:1 mixture.

10. What is a flame? What gives the colour of the flame?

11. A propane/butane flame with a plentiful supply of air is blue. A gas flame with a slightly insufficient supply of air is orange.

    - What could explain the difference in colour? Think in terms of energy and temperature.

12. For a flame to work well, molecules have to be vaporised and heated up. Hot gases rise. This means that a flame always rises upwards and comes into contact with a fresh supply of oxygen. Experiments in space have shown that flames don't work, even if there is oxygen.

    What explanation would you give for this?

The Olympic torch design

The triangular structure represents the power of 3.

2012 is the third time the games have come to London.

The three Olympic values are faster, stronger, higher.

Made from aluminium alloy mesh, making the torch strong and light.

The torch is 800 mm high. It looks stylish and makes a striking visual impact.

The 8000 circles in the structure represent the 8000 torch bearers who will carry the Olympic flame around Britain.

The fuel canister, valve and burner are housed in the centre of the torch.

The mesh structure makes the torch light and allows heat to escape.