

# Nature's Chemistry 1

## Fuels - The "Burning" Question



Name \_\_\_\_\_

Class \_\_\_\_\_

Teacher \_\_\_\_\_

# Fuels, The Burning Question – Lesson 1

## **Aim: What is a Fuel?**

*“Most fuels release **energy** after they ignite and **react with oxygen** in the air (often known as “**burning**” or “**combustion**”. This energy that is stored in fuels can then be used to make things move such as vehicles used for transport or generators to make electricity. There are various other exothermic chemical reactions and nuclear reactions, such as nuclear fission or nuclear fusion that use fuels to produce energy. Fuels are also used in the cells of organisms in a process known as “respiration”, where organic molecules react to release usable energy. The most common types of chemical used as fuels are “hydrocarbons”, but many other substances, such as radioactive metals, are currently used as well.”*

### **1. What is a fuel?**

A fuel is a substance \_\_\_\_\_ burns to produce energy. This \_\_\_\_\_ can be used to make \_\_\_\_\_ move.

### **2. How is the energy in fuels released?**

The energy in fuels is \_\_\_\_\_ by burning or combusting them. \_\_\_\_\_ involves igniting them and allowing \_\_\_\_\_ to react with oxygen in \_\_\_\_\_ air.

### **3. What is the energy in fuels used for?**

The energy in fuels can \_\_\_\_\_ used to make things move \_\_\_\_\_ as cars, buses, planes or trains. \_\_\_\_\_ can also be used to \_\_\_\_\_ electricity by using a generator.

## Fuels, The Burning Question – Lesson 2

### **Aim: What do we use fuels for?**

*The first use of fuel was burning wood or sticks for heat and cooking by our ancestors nearly 2 million years ago. Throughout the majority of human history fuels made from plant or animal fat were the only ones available for human use. Charcoal, which comes from wood, has been used since at least 6,000 BCE to extract metals from their ores. It was only replaced by coke, derived from coal, as the forests started to become depleted around the 18th century. Charcoal briquettes are now commonly used as a fuel for barbecue cooking.*

*Coal was first used as a fuel around 1000 BCE in China. With the development of the steam engine in 1769, coal came into more common use for driving ships and trains. By the 19th century, gas extracted from coal was being used for street lighting in London. In the 20th century, the primary use of coal was for the generation of electricity, providing 40% of the world's electrical power supply in 2005.*

#### **1. Give three uses of fuels**

Fuels can be used for \_\_\_\_\_,  
\_\_\_\_\_ and \_\_\_\_\_.

#### **2. Use the information in the video to answer these questions?**

**What fuel does the power station in the video use?**

**What is the name of the Canadian province where the power station is?**

**What do the pulverisers do?**

**What does the steam do to the turbines?**

**What is the turbine attached to?**

**What particles flow to create electricity?**

## Fuels, The Burning Question – Lesson 3

**Aims:** *What types of fuels are there? How do we make electricity?*

### 1. 300 Years of FOSSIL FUELS in 300 Seconds

a. What was the first fuel that Great Britain Ran Out of?

F \_\_\_\_\_

b. What fuel did we burn instead?

C \_\_\_\_\_

c. What combine to make a railroad?

R \_\_\_\_\_ and S \_\_\_\_\_ E \_\_\_\_\_

d. What was burned to make electricity?

C \_\_\_\_\_

e. What fuel did the Wright Brothers use for Aviation?

O \_\_\_\_\_

f. What was the first fossil-fuelled conflict?

W \_\_\_\_\_ W \_\_\_\_\_

g. What happened in the 70s?

O \_\_\_\_\_ S \_\_\_\_\_

h. Who is burning half the world's coal?

C \_\_\_\_\_

i. What does the video say we need to learn to live without?

F \_\_\_\_\_ F \_\_\_\_\_

j. What is the third fuel type mentioned?

G \_\_\_\_\_

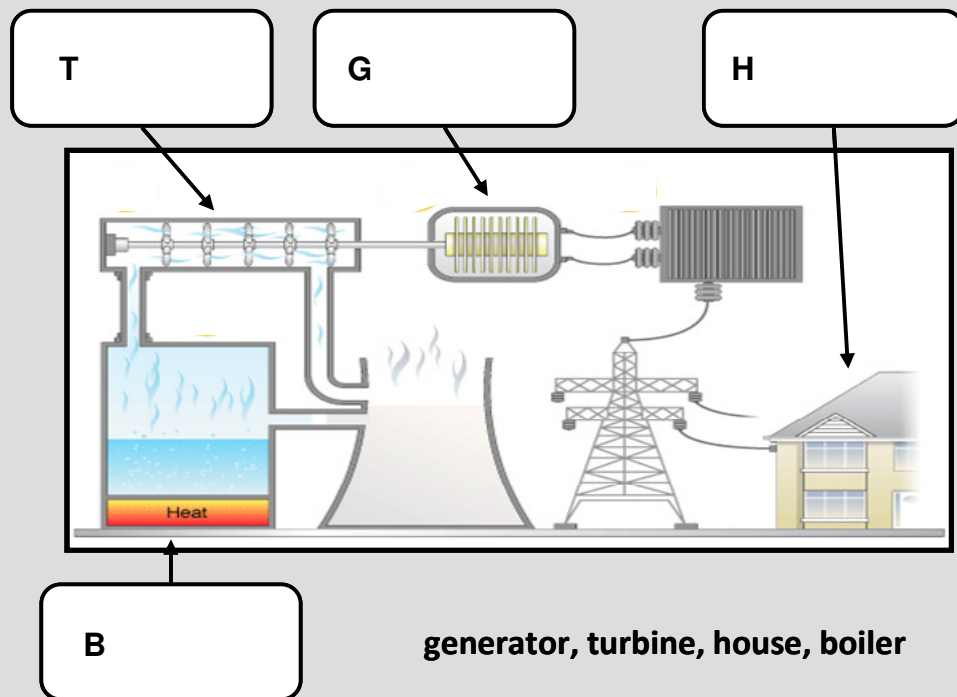
k. In what way do you agree/disagree with the video?

2. What are the three main types of fuels?

The three \_\_\_\_\_ types of fuels are \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

*Fuels such as coal, oil and gas are burnt to produce heat energy. This makes water boil to produce steam which drives turbine, making it rotate. The rotating turbine turns a generator which produces electricity for us to use in our homes.*

3. Use the information in the text above to label the diagram of a power station.



**4 Complete the table with the parts of the power station**

<b>Part</b>	<b>What it does</b>	<b>What would happen if it was missing?</b>
<b>Boiler</b>		
<b>Turbine</b>		
<b>Generator</b>		

## Fuels, The Burning Question – Lesson 4

**Aim: How are fossil fuels formed?**

### 1. Fossil Fuel Formation

a. How many people are on planet earth?

\_\_\_\_\_ billion

b. Where does most energy begin its journey?

The S \_\_\_\_\_

c. Where do we need to dig?

D \_\_\_\_\_ into the u \_\_\_\_\_ l \_\_\_\_\_ of our p \_\_\_\_\_

d. What is the first thing to realise?

Not all a \_\_\_\_\_ a \_\_\_\_\_ and

p \_\_\_\_\_ become f \_\_\_\_\_ f \_\_\_\_\_.

e. What is an example of a saturated environment?

A s \_\_\_\_\_

f. What does “anaerobic” mean?

No o \_\_\_\_\_ around

g. What is pressure?

A f \_\_\_\_\_ pushing d \_\_\_\_\_ on or

a \_\_\_\_\_ something

h. What are the 4 things needed for something to become a fossil fuel?

A s \_\_\_\_\_ environment, a \_\_\_\_\_

conditions, lots of p \_\_\_\_\_ and high t \_\_\_\_\_

i. What areas have the ideal conditions for plant growth?

T \_\_\_\_\_ areas

j. What did the changes in the environment cause

S \_\_\_\_\_ l \_\_\_\_\_ to r \_\_\_\_\_

k. What happened without oxygen?

The p \_\_\_\_\_ did not fully r \_\_\_\_\_ a \_\_\_\_\_

l. What were the layers a bit like?

A s \_\_\_\_\_

m. Where do we see layers of coal today?

U \_\_\_\_\_ in parts of S \_\_\_\_\_

**2. Stick the statements in the correct order in the box below**



*Something that is **infinite** will never end or run out. Something that is **finite** will end or run out at some point*

**3. Are fossil fuels finite or infinite? Explain your answer.**



In 2012, the **total energy** produced was **380 BTU** (British Thermal Units). **118 BTU** was from coal, **124 BTU** from oil and **91 BTU** from gas.

**4. What percentage of world energy is produced from each of coal, oil and gas?**

$$\text{Coal} = (118 \div 380) \times 100 = \underline{\hspace{2cm}} \%$$

$$\text{Oil} = (124 \div 380) \times 100 = \underline{\hspace{2cm}} \%$$

$$\text{Gas} = (91 \div 380) \times 100 = \underline{\hspace{2cm}} \%$$

## Fuels, The Burning Question – Lesson 5

### **Aim: What is made when fuels are burnt?**

*Air is made of 78 % nitrogen gas, 20 % hydrogen gas and 2 % carbon dioxide gas.*

*When things burn, they are reacting with oxygen in the air.*

**1. What are the names of the three gases in the air?**

The gases in the air \_\_\_\_\_ oxygen, nitrogen and  
c\_\_\_\_\_ dioxide.

**2. Which gas in the air is used when fuels burn?**

When fuels \_\_\_\_\_, oxygen is \_\_\_\_\_ used.

*When most fuels are burnt, carbon dioxide and water are produced. A chemistry would write this in the **word equation**:*

*Fuel + oxygen → carbon dioxide + water*

*If the fuel is “methane” (natural gas), this can be written as:*

*Methane + oxygen → carbon dioxide + water*

**3. Write a word equation for the burning of each of the fuels “ethane”, “butane”, “propane” and “dodecane”.**

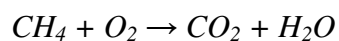
\_\_\_\_\_ + oxygen → carbon dioxide + water

*Butane + oxygen → \_\_\_\_\_ + water*

*Propane + \_\_\_\_\_ → carbon dioxide + water*

*Dodecane + oxygen → carbon dioxide + \_\_\_\_\_*

Instead of writing words, we can use **chemical formulae** to write the equation. The formula for methane is “CH<sub>4</sub>”, oxygen is “O<sub>2</sub>”, carbon dioxide is “CO<sub>2</sub>” and water is “H<sub>2</sub>O”. This leads to the **formula equation**:



4. Write a formula equation for the burning of each of the fuels “ethane” (“C<sub>2</sub>H<sub>6</sub>”), “butane” (“C<sub>4</sub>H<sub>10</sub>”), “propane” (“C<sub>3</sub>H<sub>8</sub>”) and “dodecane” (“C<sub>12</sub>H<sub>14</sub>”).

