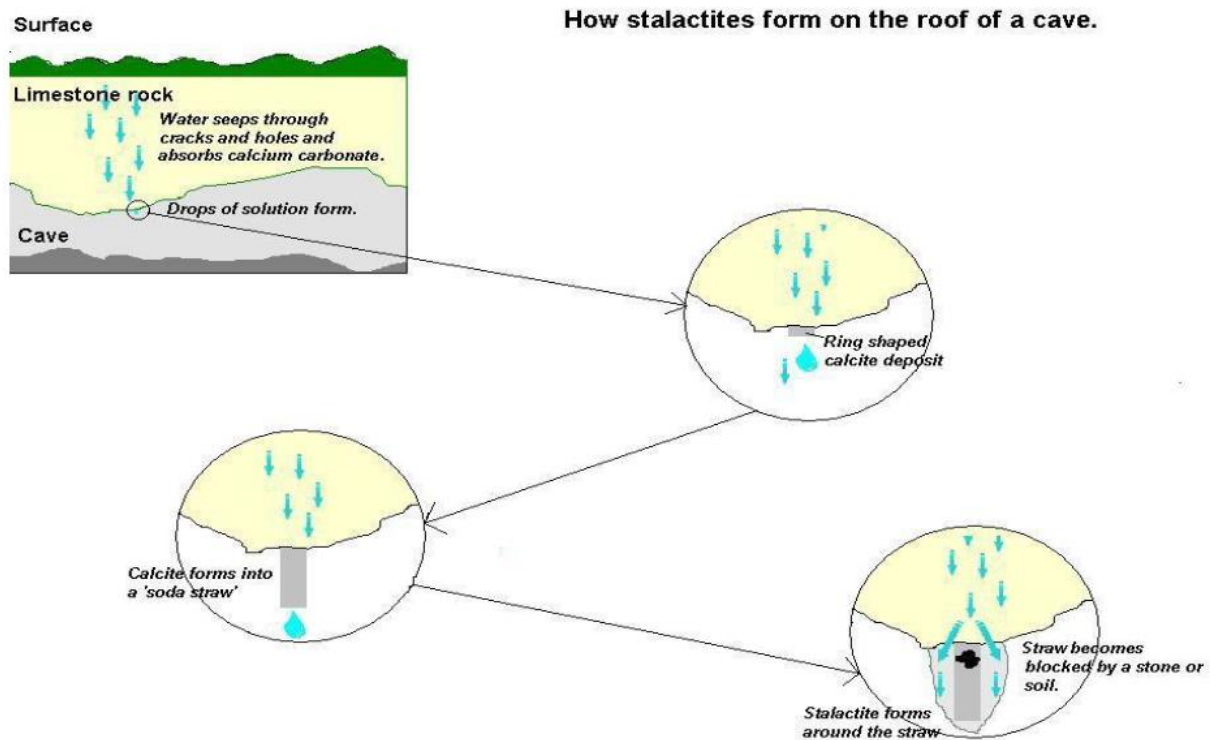


## CAUSE AND RESULT

I. Look at the diagram below. What cause and result relationships are shown there?



II. Complete this description of the process by using words and phrases below.

**as a result, because, causes, consequently, due, give rise to, on account of, results in**

Water leaks slowly into the cave 1..... there are thousands of tiny cracks and holes in the limestone rock. On its way down, the water absorbs the calcium carbonate present in the rock and this 2..... a mineral solution. Small drops of this solution form on the roof of the cave. When each drop falls, it leaves behind a ring-shaped deposit of calcite. This process is repeated many times and 3..... a thin calcite tube is formed. This tube is sometimes called a soda straw 4..... its shape. Occasionally the soda straw gets blocked 5..... to a piece of stone or soil. This 6..... the drops of solution to pour down the outside of the straw. 7....., calcite deposits build up around the straw and these 8..... the typical cone shape of the stalactite. Only the straws that get blocked will eventually become stalactites.

## Exercises

I. The parts of the sentences below have been mixed up. Join the parts on the left with the correct ones on the right:

- |   |  |
|---|--|
| 1. The accident occurred <b>because</b>   | a) it needs more and more food.              |
| 2. Some species of fish are in trouble <b>because of</b>                                | b) political conflict and unrest.            |
| 3. In some countries tensions between different national groups <b>have resulted in</b> | c) an excess of demand over supply.          |
| 4. The worsening economic situation in many African countries <b>leads to</b>           | d) the temperature change in the region.     |
| 5. The main living areas are situated on the south side of the house <b>as</b>          | e) are rising sea levels and hotter weather. |
| 6. The country has a growing population; <b>therefore</b>                               | f) violence.                                 |
| 7. Solar energy is at a minimum intensity throughout the winter <b>because of</b>       | g) the road was icy.                         |
| 8. The crash of the New York Stock Exchange in 1929 <b>caused</b>                       | h) sea temperature rises.                    |
| 9. The two main <b>effects</b> of global warming  | i) this catches most of the sun.             |
| 10. Scientists believe that the melting of the glacier <b>is due to</b>                 | j) the low angle of the sun.                 |
| 11. Inflation <b>results from</b>   | k) many people to lose their homes and jobs. |
| 12. Pellagra is <b>brought about by</b>   | l) a deficiency in niacin.                   |

II. Making use of the information in the preceding exercise, complete the following sentences.

Example: Icy road conditions caused the accident.

- Political conflict and unrest in many African countries is \_\_\_\_\_ of the worsening economic situation.
- Sea temperatures rises \_\_\_\_\_ some species of fish to be in trouble.
- Violence in some countries was \_\_\_\_\_ of tensions between different national groups.
- \_\_\_\_\_ the south side of the house catches most of the sun, the main living areas are situated there.
- The country needs more and more food \_\_\_\_\_ its population is growing.
- The low angle of the sun throughout the winter \_\_\_\_\_ solar energy to be at minimum intensity.
- \_\_\_\_\_ the New York Stock Exchange crash was that many people lost their homes and jobs.
- Rising sea levels and hotter weather \_\_\_\_\_ global warming.
- According to scientists, the temperature change in the region \_\_\_\_\_ the melting of the glacier.
- \_\_\_\_\_ an excess of demand over supply is inflation.

*III. Link the sentences showing the cause and result.*

1. People in some parts in the world cannot afford computers. They are too expensive.
2. He didn't have an antivirus program, and a virus attacked his computer.
3. Computer scientists have tried hard to stop spam. The senders of spam have become more sophisticated.
4. TV in the UK went digital in 2012. Everyone had to buy a digital receiver.
5. Batteries are too expensive. The computer is powered by solar energy.
6. Many people forget to back up their computer files. They lose a lot of data.
7. Many users don't empty their mailboxes. They may have problems downloading their mail.
8. There is a serious threat from viruses. Most people install an anti-virus program.
9. Even today many employees do not know how to use basic programs effectively. Many companies offer IT training.
10. People use copies of programs. Manufacturers put in secret codes to detect copies.

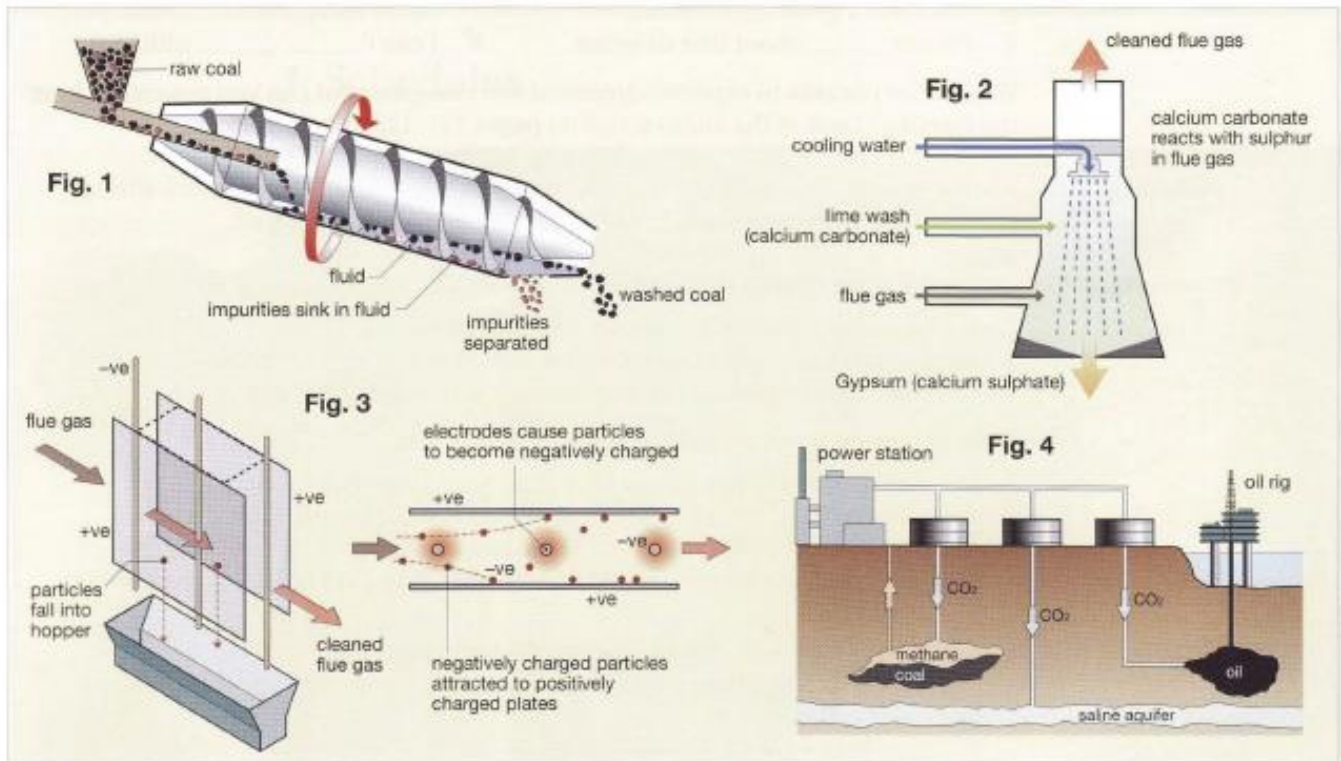
*IV. Complete the sentences describing cause/effect relationships with the correct prepositions. Some sentences do not require a preposition. Prepositions may be used more than once.*

*Prepositions: on – to – behind – in - about*

1. Motivation **lies** \_\_\_\_\_ success.
2. Motivation **contributes** \_\_\_\_\_ success.
3. Motivation **results** \_\_\_\_\_ success.
4. Motivation **has an influence/effect** \_\_\_\_\_ success.
5. Motivation **affects** \_\_\_\_\_ success.
6. Motivation **brings** \_\_\_\_\_ success.
7. Motivation **plays a part** \_\_\_\_\_ success.

## CAUSES

**Start here** 1 Work in small groups. Answer the questions about the four illustrated processes.



- 1 What is the main purpose of the four processes? (The answer concerns *coal*.)
- 2 Look at Fig. 4. What *extra* benefits does this process bring? (The answer concerns *oil* and *methane*.)

**Scanning** 2 Practise your speed reading. Look for the information you need on the SPEED SEARCH pages (116–117). Try to be first to complete these statements.

- 1 There are approximately \_\_\_\_\_ tonnes of coal in the world.
- 2 The coal in the world will last for a maximum of \_\_\_\_\_ years.
- 3 Particulates are removed from flue gas by electrostatic \_\_\_\_\_.

**Reading** 3 Match the questions in 1–6 with the answers in a–f, and with the diagrams in 1.

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1 How are particles removed from flue gas?</li> <li>2 How is sulphur separated from flue gas and removed from it?</li> <li>3 How do you take impurities out of small pieces of coal?</li> <li>4 Isn't it dangerous to store CO<sub>2</sub> in underground saline aquifers?</li> <li>5 How does carbon capture help us to recover methane from underground coal fields?</li> <li>6 Why do you say that CCS can help the oil industry to get oil from old oil wells?</li> </ol> | <ol style="list-style-type: none"> <li>a) The <i>storage</i> of CO<sub>2</sub> in the aquifer is harmless owing to the <i>presence</i> of salt in the water, and because of the depth of the aquifer.</li> <li>b) The <i>force</i> of the oil <i>rise</i> is due to the <i>pressure</i> from the CO<sub>2</sub>.</li> <li>c) The rise of methane to the surface and its <i>recovery</i> from the ground are due to the pressure of the CO<sub>2</sub> in the underground coalfield.</li> <li>d) The <i>desulphurisation</i> of the flue gas happens as a result of a chemical <i>reaction</i>. This is due to the <i>insertion</i> of calcium carbonate and the <i>addition</i> of water to the gas.</li> <li>e) The <i>removal</i> of polluting particles from the flue gas is caused by their <i>attraction</i> to the collection plates. This is due to the negative electric <i>charge</i> that they get from the electrodes.</li> <li>f) The <i>purification</i> of the pulverised coal is due to the <i>rotation</i> of the barrel and the density of the fluid.</li> </ol> |
|--|---|

- Vocabulary** 5 Change the nouns in *italics* in a–f in 3 into verbs. (Sometimes the verb and the noun have the same form).

Example: a) *store*; *be present*

- 6 Study the information in the table. Then guess the meanings of the words below. Say whether they are nouns or verbs. When you have finished, check your answers in a dictionary or reference book.

These suffixes indicate <i>causation</i> .	
verb	noun
-ify <i>purify</i> (= to make something pure)	-ification <i>purification</i> (= the process of purifying)
-efy <i>liquefy</i> (= to change something into liquid)	-efaction <i>liquefaction</i> (= the process of liquefying)
-ise (BrE); -ize (AmE) <i>sulphurise</i> (= to make something contain sulphur)	-isation (BrE); -ization (AmE) <i>sulphurisation</i> (= the process of sulphurising)

Note: BrE *sulphur sulphurise sulphurisation*; AmE *sulfur sulfurize sulfurization*

- 1 *humidify* (noun / verb) \_\_\_\_\_
- 2 *ionisation* (noun / verb) \_\_\_\_\_
- 3 *ozonification* (noun / verb) \_\_\_\_\_
- 4 *gasification* (noun / verb) \_\_\_\_\_
- 5 *solidify* (noun / verb) \_\_\_\_\_
- 6 *pulverise* (noun / verb) (Note: *pulver-* is Latin for *dust*)  
\_\_\_\_\_

#### Language Ways of expressing causation

using a verb		using a noun	
because	the barrel <b>rotates</b>	due to	the <b>rotation</b> of the barrel
	water <b>is added</b>	owing to	the <b>addition</b> of water
	the chemicals <b>react</b>	caused by	the <b>reaction</b> of the chemicals
	the CO <sub>2</sub> <b>pressurises</b> the oil	as a result of	the <b>pressure</b> of the CO <sub>2</sub> on the oil

- 7 Rewrite each sentence to give a similar meaning, making these changes

- replace *because* with the phrase in brackets.  
Example: *because* → *owing to*
- replace the verbs in *italics* with related nouns.  
Example: *rotate* → *rotation*

Example: 1 We have to use international time zones *owing to the rotation of the earth*.

- 1 We have to use international time zones because the earth *rotates*. (owing to)
- 2 There's no need to pump the oil, because the CO<sub>2</sub> *pressurises* it. (due to)
- 3 The iron filings are moving because the magnet *is attracting* them. (as a result of)
- 4 The pressure on the methane is because CO<sub>2</sub> *is injected*. (caused by)
- 5 People must not drink this water because impurities *are present*. (owing to)
- 6 This concrete has flaws because too much water *was added*. (caused by)
- 7 Our astronauts are safe because the capsule *was recovered* from the sea. (due to)
- 8 We emit no carbon because our CO<sub>2</sub> *is stored* underground. (as a result of)



### **Introduction**

There are more than one trillion tonnes of coal in the world. But coal emits harmful pollutants when it is burned. The purpose of clean coal technology (CCT) is to reduce these harmful emissions. There are four main CCT processes.

#### **1 Cleaning coal before burning**

The coal is ground into smaller pieces and passed through a special fluid inside a gravity separator. The fluid causes the coal to float, and allows the impurities to sink. The impurities are then removed and the cleaned coal is pulverised (ground into dust).

#### **2 Desulphurisation**

Sulphur is removed from the flue gas (the gas emitted from burning coal) by spraying a mixture of limestone and water over the gas. The fluid reacts with the  $\text{SO}_2$  in the gas to form gypsum, which is then removed.

#### **3 Removal of particulates**

Particulates (small polluting particles) are removed from the flue gas by electrostatic precipitators. An electrical field is generated in the particles, which are then attracted by collection plates and removed via hoppers.

#### **4 Carbon capture and storage (CCS)**

Carbon dioxide emissions are captured and stored deep underground to prevent the greenhouse gas from entering the atmosphere. The  $\text{CO}_2$  can be pumped (1) into disused coal fields, displacing methane which can be used as fuel, (2) into saline aquifers (water channels), where it can be stored safely, or (3) into oil fields, which helps maintain pressure, making extraction easier.

### **Conclusion**

There is enough coal in the world to last for 150–200 years. Provided that the processes detailed above are applied, coal can be transformed into a low-carbon-emission clean energy source