LESSON 3 — Machines, processes, and cycles

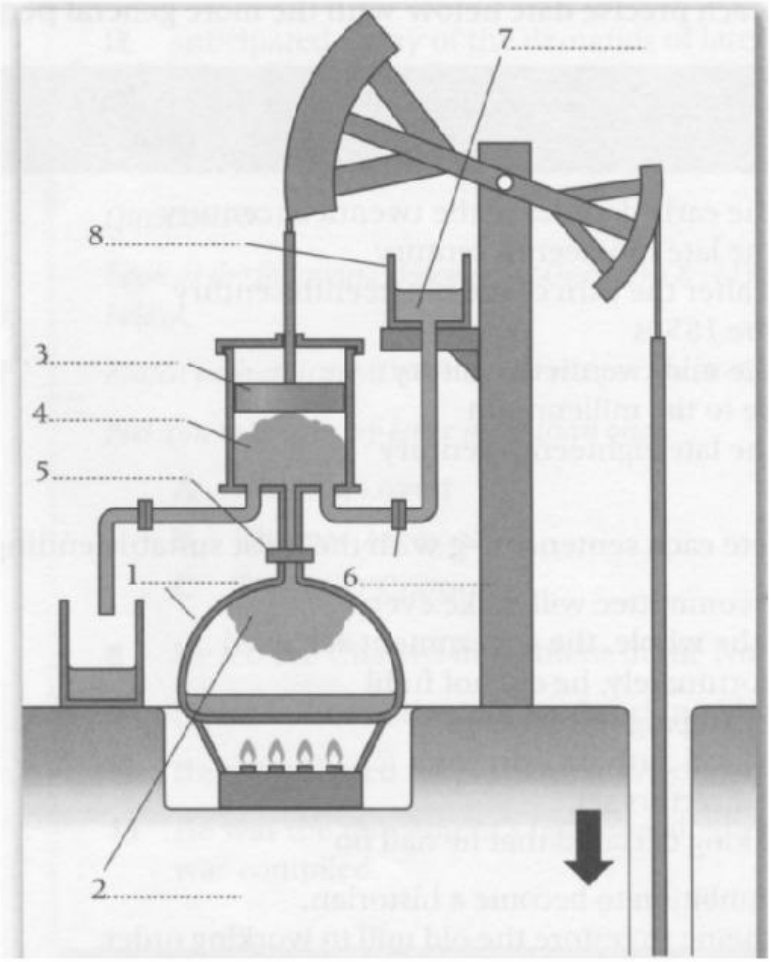
Unit aims: Labelling a diagram (1) • Completing tables • Completing flowcharts

Labelling a diagram (1)

1/ Look at the diagram and answer questions a and b.

a/ What does the diagram show?

b/ What types of words are needed to label the diagram? Make some predictions.



2/ Label the diagram using no more than TWO words from the passage below for each blank space.

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Thomas Newcomen's steam engine was one of the first devices to use the power of steam for mechanical work. It was originally used to pump water from mines. A boiler, encased in brick and sitting over a coal fire, generated steam, which drove the piston in the open top cylinder above the boiler. When the steam built up, the pressure opened a valve allowing the steam to fill the cylinder and push the piston up. When the piston reached the top of the cylinder, the first valve was closed and the second valve opened. This second valve sprayed cold water into the cylinder from a cistern, condensing the steam and creating a vacuum. The air pressure from the open-top cylinder pushed the piston down again, thus pulling the rod down with it. The cycle then repeated itself all over again.

3/ Decide if the following sentences about machines are true or false. Use a dictionary to help you.

☐ A washing machine contains a pump and a motor.

☐ An air conditioning unit contains a coil and a fan.

☐ A photocopier has various components, including rollers and a piston.

☐ A filter and a tube can be found in a television.

☐ A lever and a spring are component parts of a toaster.

☐ A valve and a switch can be found in an aerosol spray.

☐ Inside a hoover, there is a filter and rotating brushes.

4/ Name one object for each of the following components.

battery axle blade handle lens turbine switch

5/ Before you look at the passage below, decide which of the following words are associated with advantage and which with disadvantage.

downside benefit drawback stumbling block problem upside plus handicap

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The future of energy sources

A The future for petroleum use at the moment looks rather uncertain, despite enjoying the major benefit of a very advanced infrastructure already in place. The downsides from the environmental point of view are patently obvious: harm to public health through carbon dioxide emissions in exhaust fumes, which are linked to respiratory problems, and to precious ecosystems from oil spills and seepage. But the most significant weakness is that oil is a finite resource.

B The picture for natural gas is similarly mixed. While its main strength lies in its being a relatively clean fuel involving little processing and being easily transportable via pipelines, natural gas requires compression or low temperatures if it is to be used for cars or other vehicles. Thus, it has not previously been a serious contender to provide private transportation. There are now signs, however, that this obstacle may have been overcome.

C Yet there is another problem with natural gas. It may produce less carbon dioxide than other fossil fuels, but the major stumbling block to its use is that the methane released lives for a long time in the atmosphere. In addition, as it is a non-renewable energy source like petroleum, in coming years natural gas will not be in use. But in the short term at least, the situation looks rosy.

D Ethanol, despite the drawback of a dearth of commercial outlets, heralds a new dawn for the energy market. But, before we consider ethanol in depth, let us look at hydrogen. It is perhaps the most attractive of all renewable fuels. Its greatest appeal is that it is readily available everywhere in the form of water (H_2O). Solar energy is used to split the water into hydrogen and oxygen and then recombine it, with water being the waste by-product in the form of steam in vehicles. Perhaps its main drawback is making the hydrogen production units small enough to fit cars. But once this happens, the future of hydrogen is bright indeed.

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6/ Scan the passage for the words in 5, or other words with similar meanings, and underline them.

Completing tables

7/ The table below is taken from a Table completion task. Look at the headings at the top and side of the table. Which headings give you the topic of the passage? Which help you with the organization?

Types of fuel	Main advantage	Main disadvantage	Future
Petroleum	Very advanced infrastructure	1	Uncertain
Natural Gas	Relatively clean	Produces 2	3 .....
Ethanol	None given	Lack of 4	Signals a 5 .....
Hydrogen	6	Hydrogen production units for cars not small enough	7 .....

8/ Complete the table. Use no more than TWO words from the text above.

9/ In Table completion tasks, it is important to understand the relationship between the headings and the details. Look at the extract from a table below and insert four headings from the list in spaces 1–4.

Method Types of power Types of organization Types of environmental risks Location Homes supplied Environmental impact

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1	2	3	4 .....
South Coast	wave	high	sufficient for 26,000
Mouth of river	tidal	low	sufficient for 15,000
At sea	wind	low	sufficient for 31,000

10/ What other words do you know for the nouns method, types, and impact?

Completing flowcharts

11/ Flowchart tasks normally relate to processes or sequences. Match each linking phrase below with a stage from the flowchart in 12? Which can relate to any stage? Which cannot relate to any stage? The first one is done for you.

Linking phrase	Stage	Linking phrase	Stage
firstly	stage one	finally	.....
thirdly	.....	at first	.....
after that	.....	in the next phase	.....
subsequently	.....	following that	.....
simultaneously	.....		

12/ The flowchart below is taken from a Flowchart completion task. Skim the flowchart, and where possible predict the words to complete the chart.

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The production of ethanol for fuel

Stage	Process
Before production	field planted with 1 ..... grain transported to 2 .....
Stage one	before 3 ....., the corn prepared by grinding and then cooking
Stage two	4 ..... to remove solid matter
Stage three	5 ..... takes place liquid transported to 6 .....
Stage four	7 ..... of ethanol and petroleum to form E-10 or E-15 liquid then into 8 ..... before 9 .....

13/ Now complete the chart using no more than TWO WORDS from the passage below.

The production of fuel-ethanol or 'grain spirit' from grain is relatively straightforward. It is made from harvested crops. As the demand for alternative 'clean' fuels increases, farmers are switching from planting crops for consumption to fuel crops like corn, barley, wheat, or others that produce oil like palm oil and rape seed. The growing process is no different from that of any crop. A farmer simply plants a field of corn, which is then harvested. Instead of being taken to a mill to produce flour, the corn is delivered by lorry to a distillery where it goes through four main stages before it can be used as fuel. First, during a preparation phase, the grain is ground and then cooked prior to the fermentation process commencing. Then, before the distillation of the liquid to produce the ethanol takes place, solid matter has to be removed by filtration. At a fuel-ethanol plant, the blending of ethanol and petroleum is carried out to produce E-10, a mix of 10 per cent ethanol and 90 per cent petroleum, or E-15, which is 15 per cent

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ethanol and 85 per cent petroleum. The liquid is then put into storage and the distribution process is ready to begin.

14/ Stages in a flowchart are often expressed in note form. Turn sentences a–e into notes as in the flowchart above.

Example: Ethanol is produced once the filtering is completed.
Ethanol produced once filtering completed.

a Diamonds are formed deep below the surface of the earth.

b Filtration is followed by fermentation.

c Heat is generated by the waste buried in the ground.

d Electricity is generated by the rotating blades.

e The recording is published, sold, and played on the radio.

Reading Passage 3

Technique: Read the title and the questions first. Use the information from these to predict the content.

You should spend 20 minutes on questions 1–14 which are based on Reading Passage 3.

Coffee rust

Why do the British drink so much tea? The answer to this question can be traced back, unexpectedly, to a humble fungus, HEMILEIA vastatrix, which attacks the leaves of coffee plants causing a disease popularly known as coffee rust. The appearance of this disease was first reported in the British colony of Ceylon (now Sri Lanka) in 1867. Over the next twenty years, coffee production in Asia and Africa was virtually wiped out. Following a period of severe economic and social upheaval, planters in British colonies shifted to planting tea, and the British were gradually transformed into a nation of tea drinkers.

Under British rule, the island of Ceylon was stripped of its forests to turn over every available acre to coffee production. By the 1870s,

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Ceylon was exporting nearly 100 million pounds of coffee a year, much of it to England. This empire, however, was swiftly devastated by the arrival of the coffee rust fungus. The rust organism can be recognized by the presence of yellowish powdery lesions on the undersides of the leaves of the coffee plant. Occasionally green shoots and even the green coffee berries can be infected. The infected leaves drop prematurely, leaving long expanses of bare twigs. This defoliation causes shoots and roots to starve and consequently to die back, reducing the number of nodes on which coffee can be produced the following season.

The rust fungus is dispersed by both wind and rain. By observing the patterns of infection on individual leaves, it can be deduced that splashing rain is the most important means of local, or short-range dispersal. Dispersal over wider areas is primarily by wind, although insects such as flies and wasps may also play a small part. How the fungus first made its way from its native Ethiopia to Ceylon is unknown, but human intervention seems to be the only plausible explanation. Insects as carriers can be ruled out, and it is doubtful whether the fungus could have been blown so far.

The coffee growers probably hoped at first that the disease would disappear as quickly and unaccountably as it had begun. By 1879, however, it was clear that it was not going away, and the Ceylon government made an appeal for someone to be sent to help. The British Government responded by sending Harry Marshall Ward, whose brief was to investigate the coffee rust phenomenon and hopefully come up with a cure.

Ward recommended that to effectively protect the plant from invasion, the leaves should be treated with a coating of fungicide (lime-sulphur). Unfortunately in the case of the Ceylon plantations, the rust epidemic was too well established for this protective measure to save the coffee trees. He also pointed out the risks of intensive

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monoculture. The continuous planting of coffee trees over the island, without even the benefit of windbreaks, had created a perfect environment for a fungus epidemic to spread. Despite Ward's warning, when the coffee trees were replaced with tea bushes, they were planted at the same density. It was only by good fortune that no similar fungus arrived to invade the tea bushes and that improved fungicides were soon available to protect the crop.

With the destruction of the coffee plantations in Ceylon and subsequent arrival of coffee rust in Java and Sumatra, the world's coffee production shifted to the Americas. Plantations were swiftly established in the tropical highlands of Brazil, Colombia, and Central America, and Brazil soon became the world's major coffee supplier, closely followed by Colombia.

Coffee rust was successfully excluded from the Americas for over 100 years by careful quarantine measures. However, in 1970, the fungus was discovered in Brazil, again probably brought in accidentally by humans. Once the barrier of the oceans had been breached, wind dispersal came into play. Infected trees were isolated by creating an 80 kilometres 'safety zone' around the infected area, but within eighteen months the rust had jumped the gap in the direction of the prevailing winds. Today, the fungus has spread throughout all the coffee-growing areas, including Colombia and the countries of Central America.

Fungicide applications are now part of the routine production practices on coffee plantations, despite the expense for small growers. Good cultural management, taking into account the density of planting and the climate, is also paramount. Rust-resistant strains of coffee have also been developed but the crop is of poorer quality. Unless a truly rust-resistant variety with more desirable genetic traits can be produced, coffee rust will have to be managed as a continuous epidemic on a perennial crop.

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Questions 1–7

Complete the chart below. Choose NO MORE THAN THREE WORDS from Reading Passage 3 for each answer.

Technique: Labelling a diagram

1/ Study the diagram and identify the type of word for each gap.

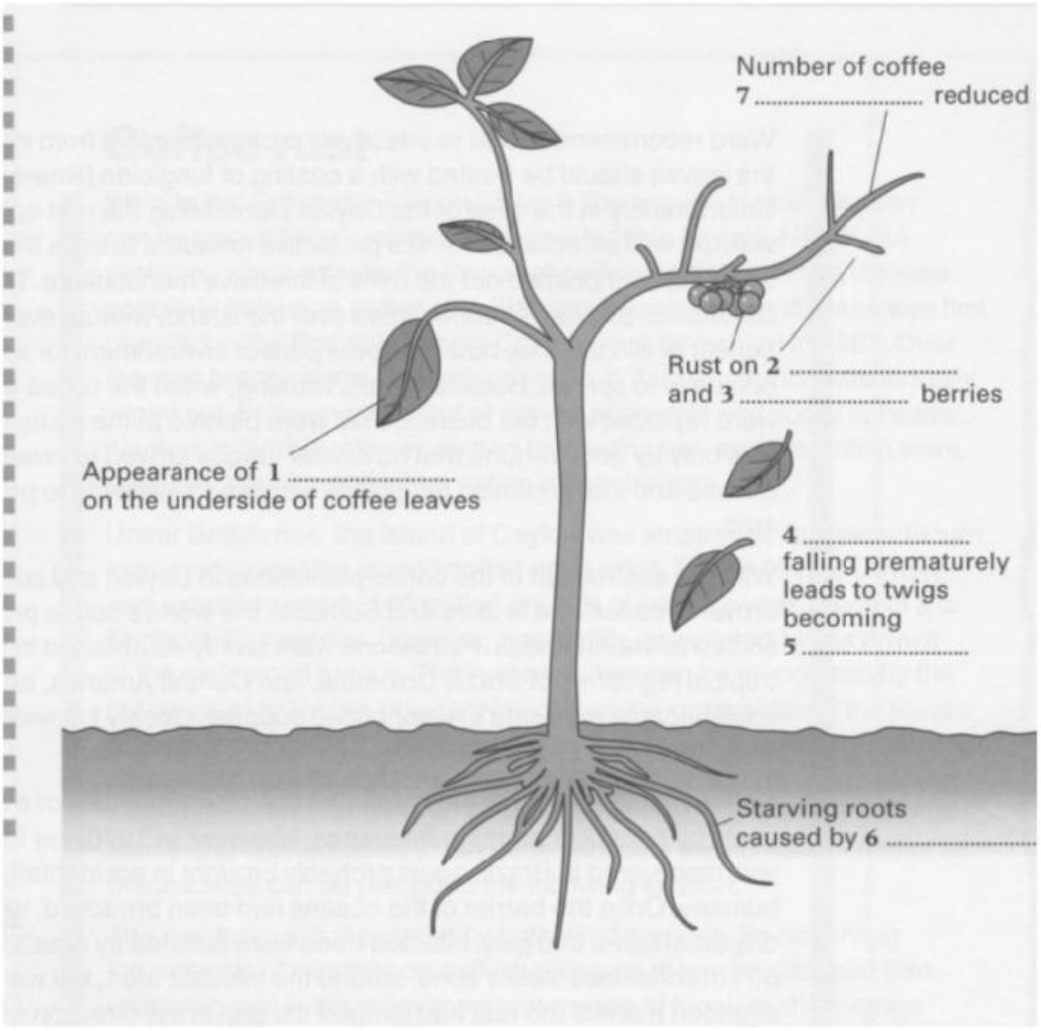
2/ Underline scan words. Try to predict some of the answers.

3/ Scan the text to identify which section describes the information in the diagram.

4/ Read the section carefully and complete the gaps, using the scan words to guide you to the answers.

5/ Remember the sequence will probably follow the same order as the numbers on the diagram.

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Questions 8 and 9

Choose the correct letter, A, B, C or D.

8/ The most important means of long-range dispersal is

A rain.

B wind.

C wasps.

D flies.

9/ Coffee rust spread easily in Ceylon

A due to the density of the coffee trees.

B due to the windbreaks.

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C because the fungicide didn't work.

D because it was well established.

Questions 10–14

Complete each sentence with the correct ending, A–G from the box below.

10/ The move of coffee production to the Americas was triggered by .....

11/ Before 1970, American plantations were protected through .....

12/ Attempts by the Americans to isolate the infected trees failed due to .....

13/ The coffee trees now have to be protected continuously by .....

14/ In the management of the coffee crops, it is also important to consider .....

A the density of planting and the climate.

B the application of fungicide.

C the coffee rust devastation in Ceylon.

D increased demand for coffee in Europe.

E careful quarantine measures.

F the genetic traits of the coffee tree.

G the prevailing winds.

Improve your IELTS word skills

1/ Complete the following descriptions by inserting the verbs in the correct tense. Choose from present active, present passive, or infinitive with to.

store react filter distribute extract blend

Firstly, plant seeds are crushed (1) ..... the oil. Then this oil (2)..... to take out the impurities. Next, hydrogen is added to it

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under high pressure. This hydrogen (3)..... with the oil and makes it hard. Following this, the oil (4) ..... with other vegetable oils. Finally, the margarine (5)..... in tubs until it (6)..... to the shops.

fix carry grow fall spread

A seed (7)..... from a tree to the forest floor or (8)..... along by the wind, or by a bird or other animal. Lying dormant until the arrival of spring, the seed then sprouts roots (9)..... it to the ground. The seed begins (10)..... and in time develops into a fragile sapling. Eventually, the sapling grows into a tree, whose seeds in turn (11)..... by the wind.

2/ Which text describes a life cycle and which describes a production process? Create a suitable title for each text.

3/ Change the verbs in 1 into nouns. Be careful with the spelling.

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