



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

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**COMBINED SCIENCE**

**5129/02**

Paper 2

**May/June 2012**

**2 hours 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

A copy of the Periodic Table is printed on page 24.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

**For Examiner's Use**

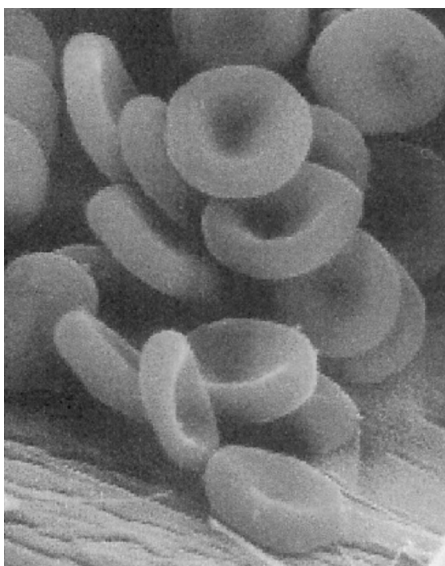
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This document consists of **21** printed pages and **3** blank pages.



- 1 Fig. 1.1 shows a photograph of some red blood cells that have been greatly magnified.

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**Fig. 1.1**

- (a) (i) State the function of red blood cells.

.....  
..... [1]

- (ii) State **two** features of red blood cells that make them efficient in carrying out this function.

feature 1 .....  
feature 2 .....  
[2]

- (iii) Explain the importance of each feature in (a)(ii).

importance of feature 1 .....  
.....  
importance of feature 2 .....  
.....  
[2]

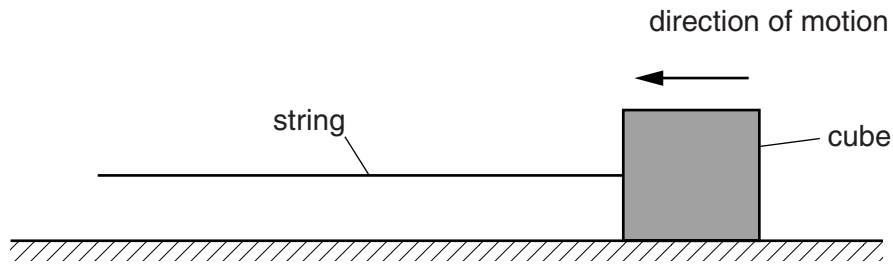
- (b) Name the liquid part of the blood that surrounds the red blood cells.

..... [1]

3

- 2 (a) A string is used to pull a cube across a smooth horizontal surface.

This is shown in Fig. 2.1.



**Fig. 2.1**

The cube has a mass of 0.20 kg. The constant force accelerating the cube is 0.32 N.

Calculate the acceleration of the cube.

acceleration = ..... units ..... [3]

- (b) On Earth, the gravitational field strength  $g = 10 \text{ N/kg}$ .

Calculate the weight of the cube.

weight = ..... N [1]

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- 3 (a) Sodium reacts with chlorine to produce sodium chloride.  
The equation for the reaction is

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The relative molecular mass,  $M_r$ , of sodium chloride is 58.5.  
( $A_r$ : Na, 23; Cl, 35.5)

Complete the following sentences.

46 g of sodium reacts with .....g of chlorine and produces  
.....g of sodium chloride.

4.6 g of sodium reacts with .....g of chlorine and produces  
.....g of sodium chloride.

1.15 g of sodium produces .....g of sodium chloride. [4]

- (b) State the type of bonding present in sodium chloride.

..... [1]

- (c) State why chlorine is used in the purification of water supplies.

.....  
..... [1]

- 4 (a) State the units of the moment of a force. ....

[1]

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- (b) Fig. 4.1 shows a spanner being used to undo a bolt.

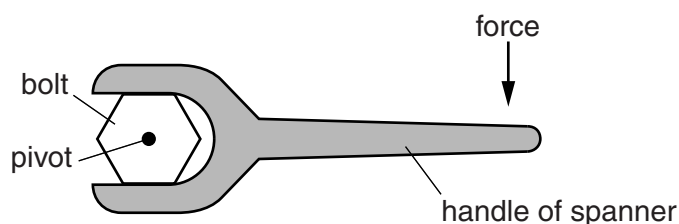


Fig. 4.1

The force needed to undo the bolt is smaller when a spanner with a longer handle is used.

Explain why.

.....  
 .....  
 ..... [2]

- 5 Atoms are made up of electrons, protons and neutrons.

- (a) Complete Fig. 5.1 to show the relative charge and the relative mass of each particle.

| particle | relative charge | relative mass    |
|----------|-----------------|------------------|
| electron |                 | $\frac{1}{1840}$ |
| proton   | +1              |                  |
| neutron  |                 | 1                |

[3]

Fig. 5.1

- (b)  $^{12}\text{C}$  and  $^{14}\text{C}$  are isotopes of the element carbon.

- (i) State how the two isotopes are different.

.....  
 ..... [1]

- (ii) Explain why the two isotopes have the same chemical properties.

.....  
 ..... [2]

6 Fig. 6.1 shows the human digestive system.

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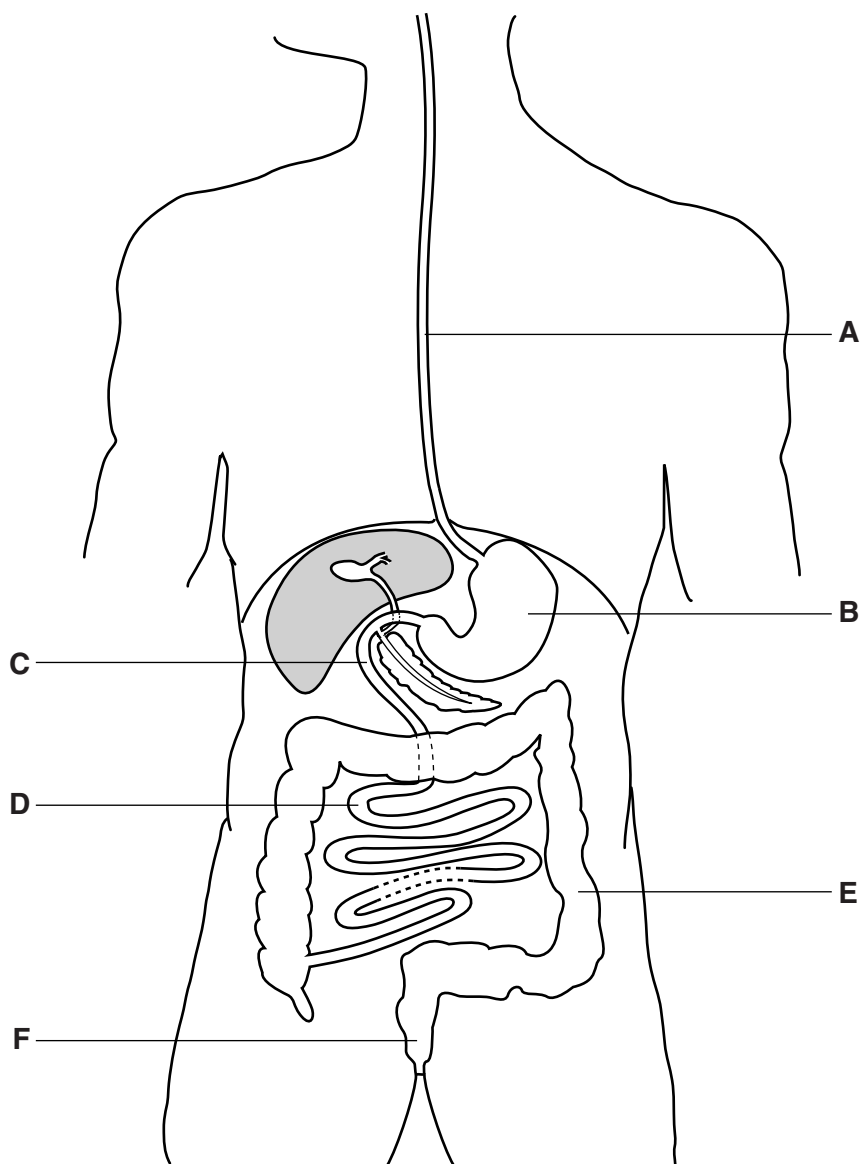


Fig. 6.1

(a) State a letter in Fig. 6.1 which shows where

(i) glucose is absorbed, ..... [1]

(ii) most water is absorbed. .... [1]

(b) Some digestion takes place in the stomach.

Suggest and explain the importance of **another** function of the stomach.

function .....

explanation of importance .....

.....

[2]

- (c) There is a tube between the gall bladder and the duodenum.

State and explain how digestion is affected when this tube becomes blocked.

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Use

.....

.....

.....

.....

..... [3]

- 7 (a) Respiration is defined as the release of energy from food substances in living cells.

State **two** differences between aerobic respiration and anaerobic respiration.

1 .....

.....

2 .....

.....

[2]

- (b) The breathing of a student is observed while he is resting.

The student then exercises vigorously and his breathing is observed again.

State two **visible** differences in his breathing before and during exercise.

1 .....

.....

2 .....

.....

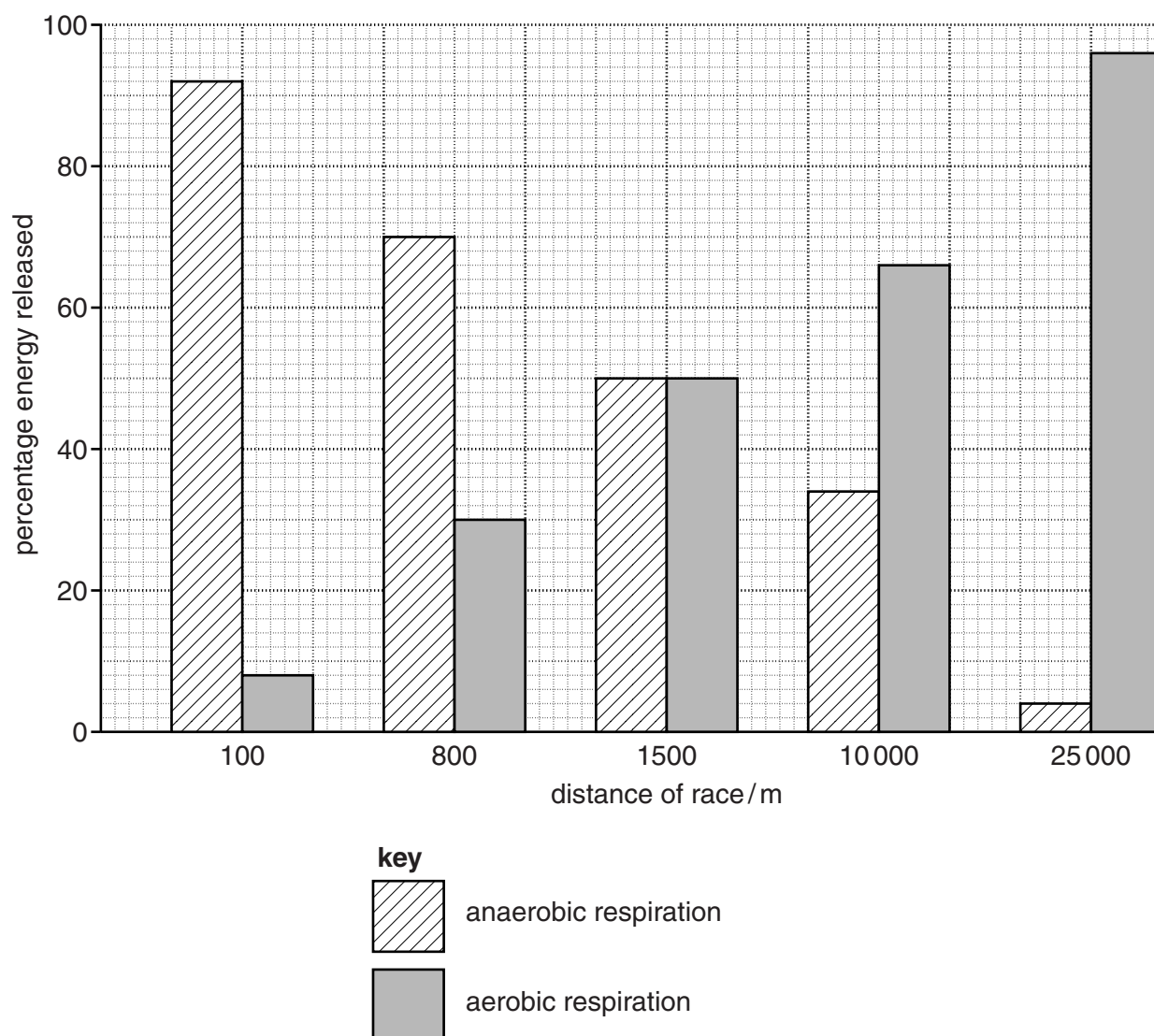
[2]

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(c) Athletes compete in races of different distances.

Fig. 7.1 shows the percentage of energy released by aerobic respiration and anaerobic respiration during these races.

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**Fig. 7.1**

- (i) Use Fig. 7.1 to find the length of race for which the athlete gains 50% of his energy from aerobic respiration.

length of race = ..... m [1]

- (ii) What does Fig. 7.1 show about the type of respiration and the length of race?

.....

.....

.....

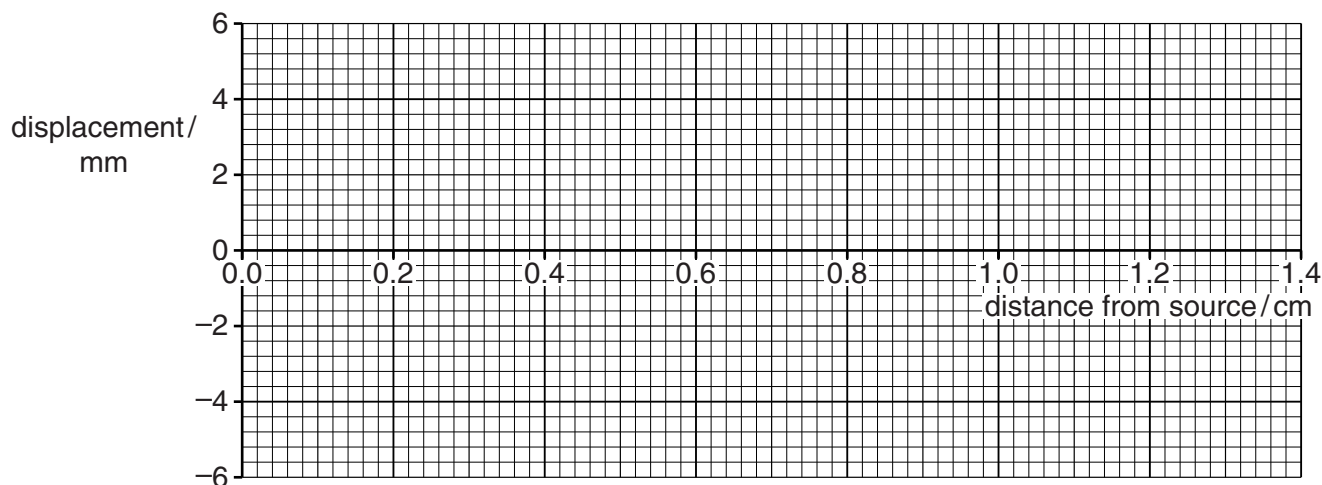
..... [2]

- 8** A ripple tank is used to show wave motion on the surface of water.

The wave has a wavelength of 0.5 cm and an amplitude of 4.0 mm.

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- (a)** Complete Fig. 8.1 to show at least one wavelength of a wave with this wavelength and amplitude. [2]



**Fig. 8.1**

- (b)** The wave has a frequency of 6.0 Hz.

Calculate the speed of the wave.

speed = ..... cm/s [2]

- 9 (a) In Fig. 9.1, the boxes on the left give the names of some elements.

The boxes on the right show the reaction of elements with water.

Draw a line to link each element to its reaction with water.

| element   | reaction with water                     |
|-----------|-----------------------------------------|
| copper    | reacts vigorously with steam            |
| magnesium | reacts vigorously with cold water       |
| iron      | no reaction                             |
| potassium | reacts slowly with cold water and steam |

[4]

Fig. 9.1

- (b) When a metal reacts with water, hydrogen gas is released.

State the test for hydrogen gas.

test .....

result .....

[2]

10 Use words from the list to complete the sentences below.

**mesophyll**

**osmosis**

**respiration**

**phloem**

**photosynthesis**

**xylem**

**root hair**

**transpiration**

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Use*

Each word may be used once, more than once or not at all.

Water enters a plant by moving into the ..... cells by  
the process of .....

Water moves from cell to cell across the plant by the same  
process until it reaches the .....

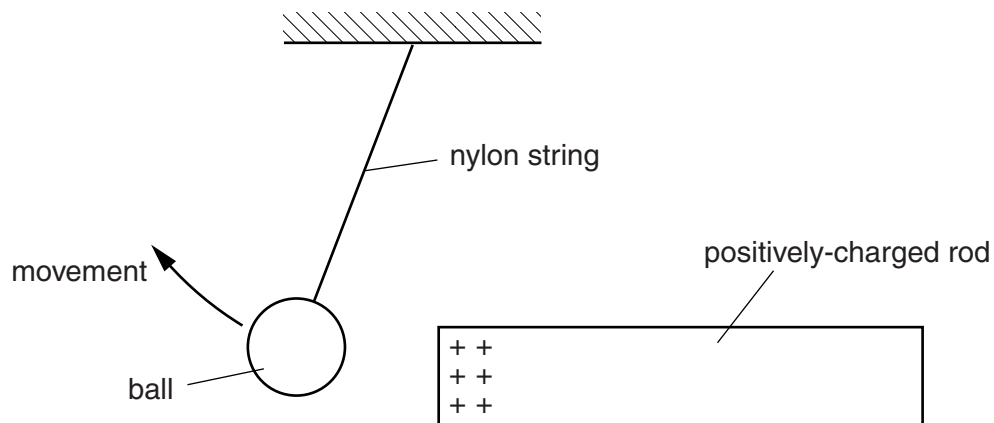
Water moves upwards to the leaves where it is lost through  
the stomata. This process is called ..... .

[4]

**11** A ball on the end of a nylon string is given a charge.

A positively-charged rod is brought close to the ball.

The ball moves away from the positive charge, as shown in Fig. 11.1.



**Fig. 11.1**

**(a)** Explain why the ball moves away from the positively-charged object.

.....  
 ..... [2]

**(b)** A spark is seen between two charged objects.

A spark is a flow of charge.

State the name given to the rate of flow of charge.

..... [1]

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12 A lamp is marked '240V, 60W'.

(a) The lamp is working normally.

Calculate

(i) the current in the lamp,

current = ..... A [2]

(ii) the electrical energy converted in 10 minutes.

energy = ..... J [2]

(b) Some lamps may produce waves in the infra-red, the visible or the ultraviolet regions of the electromagnetic spectrum.

State the name given to a component of the spectrum with wavelengths that are

(i) longer than those of infra-red radiation, ..... [1]

(ii) shorter than those of ultraviolet radiation. .... [1]

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13 Butane, natural gas and petrol are fossil fuels.

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(a) Name the main constituent of natural gas. .... [1]

(b) Petrol is a mixture of different hydrocarbons.

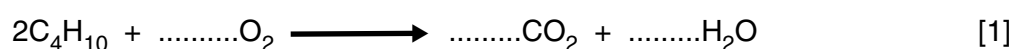
Explain the meaning of the term *hydrocarbon*.

.....

.....

..... [2]

(c) Balance the equation for the combustion of butane.



(d) Some fossil fuels contain sulfur compounds.

(i) State the name of a compound of sulfur that is formed when these fuels are burned.

..... [1]

(ii) State and explain an environmental problem associated with this compound of sulfur.

.....

.....

..... [2]

14 Fig. 14.1 shows part of a food web.

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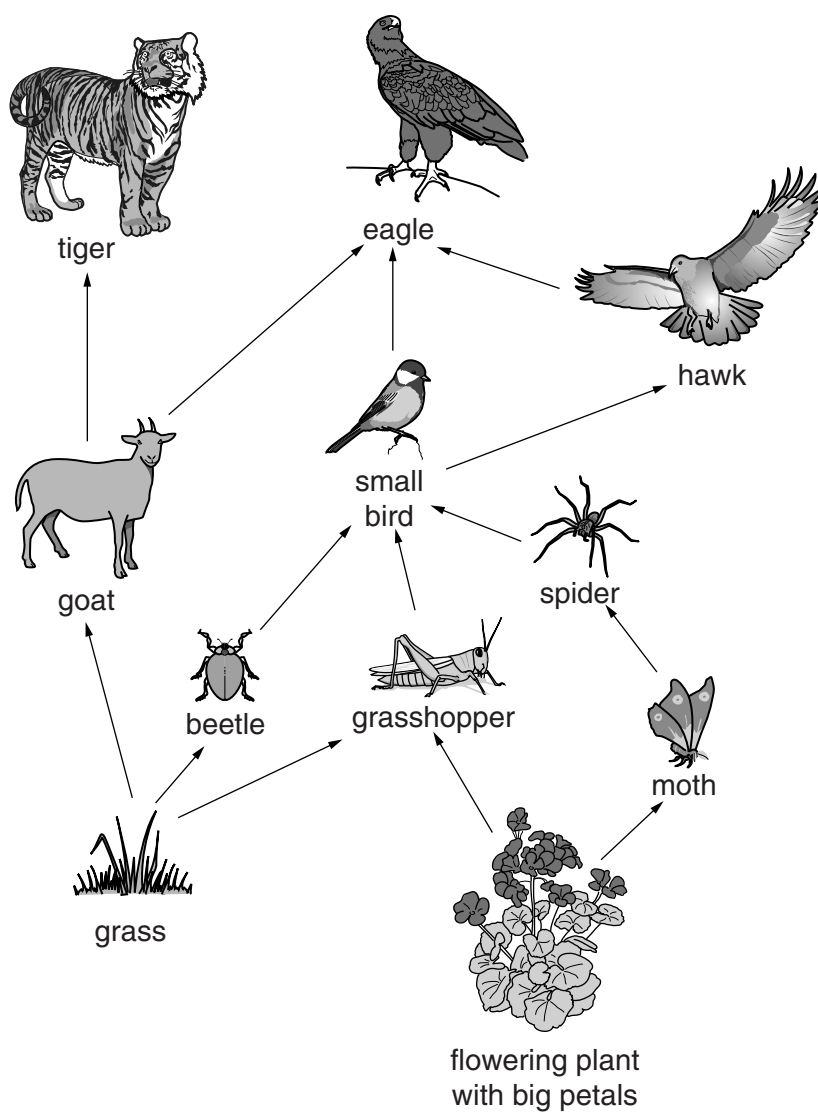


Fig. 14.1

(a) (i) State the source of energy for this food web.

..... [1]

(ii) State the form of this energy.

..... [1]

- (b) (i) State how many species of herbivore and how many species of carnivore are shown in the food web.

For  
Examiner's  
Use

Write your answers in Table 14.1.

**Table 14.1**

| type of organism | number of species |
|------------------|-------------------|
| herbivore        |                   |
| carnivore        |                   |

[2]

- (ii) State the number of species in the longest food chain shown in Fig. 14.1.

..... species [1]

- (iii) Explain why a short food chain is more efficient than a long food chain.

.....

.....

..... [2]

- (c) Predict what would happen on the food web if 90% of the moths died. Explain why.

prediction .....

explanation .....

.....

[2]

- 15** An athlete runs on a circular track.

He runs 400 m in 50 s.

- (a)** Calculate the average speed of the runner.

speed = ..... m/s [2]

- (b)** The athlete maintains a constant speed on the circular track.

Explain why his velocity is not constant.

.....  
..... [1]

- 16** Brass and stainless steel are both alloys.

- (a)** Name the two elements present in brass.

..... and ..... [2]

- (b) (i)** State one use of stainless steel.

..... [1]

- (ii)** Explain how and why alloys are made.

.....  
.....  
..... [2]

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- 17 (a) Explain what is meant by the *principle of energy conservation*.

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.....  
..... [1]

- (b) Coal is burned to generate electrical energy.

Complete the following sentences.

The energy in coal is ..... energy.

When coal is burned this energy is converted into ..... energy.

Steam is produced and used to turn a turbine.

The turbine has ..... energy. [3]

- 18 The following is a list of substances.

**aluminium oxide      ammonium sulfate      calcium carbonate**

**potassium nitrate      sodium hydroxide      sodium oxide**

Use the list to complete the following sentences.

Each substance may be used once, more than once or not at all.

- (a) ..... is used to remove acidic impurities  
during the extraction of iron in a blast furnace. [1]

- (b) A substance that reacts with both acids and alkalis is  
..... [1]

- (c) A substance that contains two of the elements essential for  
plant growth is ..... [1]

- (d) A substance that reacts with dilute sulphuric acid to produce  
a colourless gas is ..... [1]

19 Fig. 19.1 shows a basic transformer.

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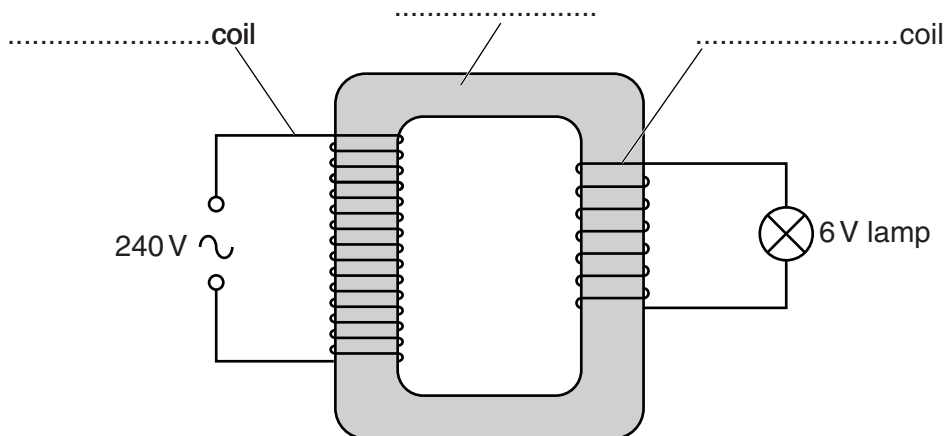


Fig. 19.1

(a) Complete the labels on Fig. 19.1. [2]

(b) The output of a transformer is connected to a lamp.

Explain why the lamp does not light when the input to the transformer is direct current.

.....  
 .....  
 ..... [2]

20 Explain what is meant by the *half-life* of a radioactive source.

.....  
 .....  
 ..... [2]

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[illegible]

The volume of one mole of any gas is  $24\text{dm}^3$  at room temperature and pressure (r.t.p.).