

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

B712/01

**GATEWAY SCIENCE
SCIENCE B**

**Science modules B2, C2, P2
(Foundation Tier)**

FRIDAY 5 JUNE 2015: Afternoon

**DURATION: 1 hour 30 minutes
plus your additional time allowance**

MODIFIED ENLARGED

| | | | |
|-------------------------------|--|------------------------------|--|
| Candidate forename | | Candidate surname | |
|-------------------------------|--|------------------------------|--|

| | | | | | | | | | | |
|--------------------------|--|--|--|--|--|-----------------------------|--|--|--|--|
| Centre number | | | | | | Candidate number | | | | |
|--------------------------|--|--|--|--|--|-----------------------------|--|--|--|--|

**Candidates answer on the Question Paper.
A calculator may be used for this paper.**

OCR SUPPLIED MATERIALS:

A copy of the Periodic Table

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.

Use black ink. HB pencil may be used for graphs and diagrams only.

Answer ALL the questions.

Read each question carefully. Make sure you know what you have to do before starting your answer.

Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

The quality of written communication is assessed in questions marked with a pencil ().

A list of equations can be found on pages 4–5.

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

The total number of marks for this paper is 85.

Any blank pages are indicated.

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EQUATIONS

$$\text{energy} = \text{mass} \times \frac{\text{specific heat}}{\text{capacity}} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{efficiency} = \frac{\text{useful energy output} (\times 100\%)}{\text{total energy input}}$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy supplied} = \text{power} \times \text{time}$$

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{distance} = \text{average speed} \times \text{time}$$

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

power = $\frac{\text{work done}}{\text{time}}$

power = force × speed

KE = $\frac{1}{2}mv^2$

momentum = mass × velocity

force = $\frac{\text{change in momentum}}{\text{time}}$

GPE = mgh

mgh = $\frac{1}{2}mv^2$

resistance = $\frac{\text{voltage}}{\text{current}}$

Answer ALL the questions.

SECTION A – Module B2

1 Look at the food web opposite.

(a) Which organism in the food web takes nitrates from the soil?

_____ [1]

(b) Ticks are parasites.

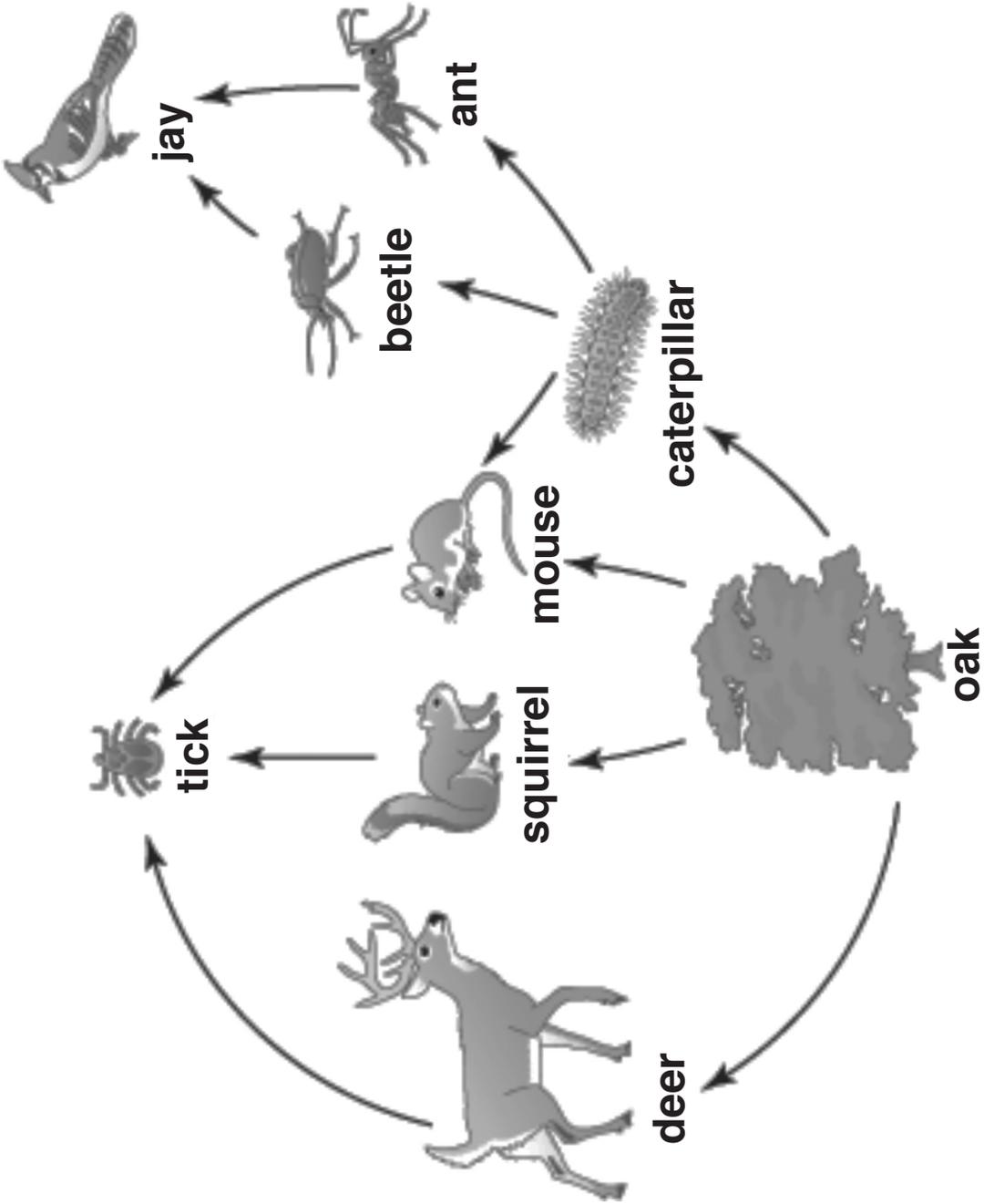
Use the food web and your scientific knowledge to explain why ticks are parasites.

_____ [1]

(c) The mouse is both a primary and a secondary consumer.

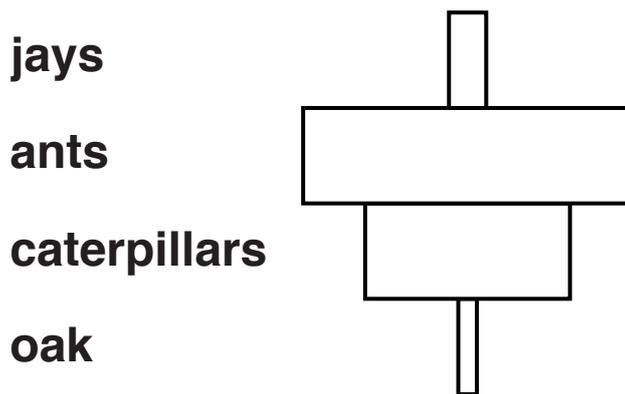
Explain why.

_____ [2]



NOT DRAWN TO SCALE

(d) Look at the pyramid of NUMBERS for one food chain from the food web.



A pyramid of BIOMASS for the food chain would look different to this pyramid of numbers.

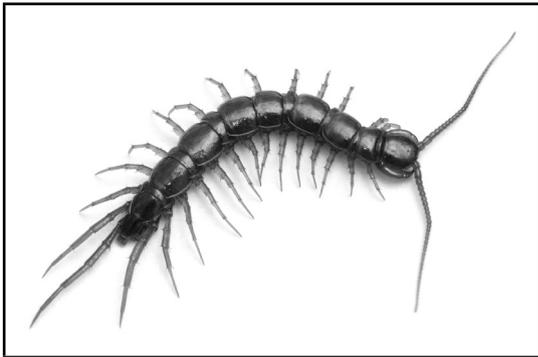
Draw a pyramid of biomass and explain why it is different to the pyramid of numbers.

[2]

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2 Look at the pictures of arthropods.

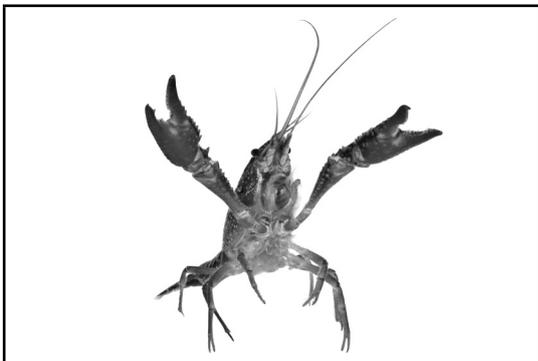
A



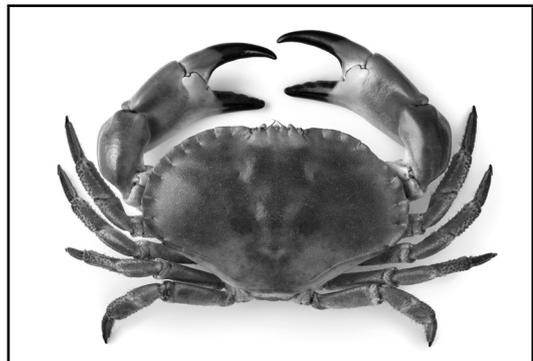
B



C



D



There are four classes of arthropods.

insects

arachnids

crustaceans

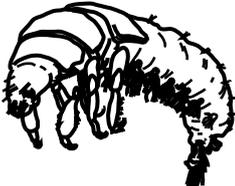
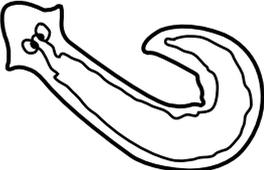
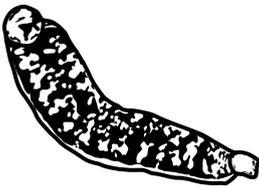
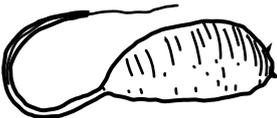
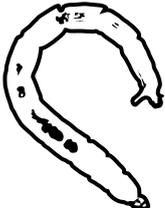
myriapods

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**3 Zack investigates water pollution levels in a stream.
He does this by taking water samples from the stream.**

Zack then looks for INDICATOR SPECIES within the sample.

The chart shows the indicator species he looks for.

| CLEAN WATER | |
|---|---|
| caddis fly larva  | dragonfly nymph  |
| SOME POLLUTION IN WATER | |
| flatworm  | leech  |
| VERY POLLUTED WATER | |
| rat-tailed maggot  | bloodworm  |

Zack takes five water samples from the same part of a stream.

Look at the table opposite.

It shows his results.

(a) The mean number of leech is missing from the table.

Calculate the mean for the leech.

Give your answer to the nearest whole number.

Mean number of leech _____

[2]

| Indicator species | Number in each sample | | | | | Mean |
|-------------------|-----------------------|----------|----------|----------|----------|------|
| | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Sample 5 | |
| caddis fly lava | 3 | 2 | 4 | 3 | 4 | 3 |
| dragonfly nymph | 2 | 3 | 5 | 4 | 5 | 4 |
| flatworm | 6 | 6 | 9 | 8 | 7 | 7 |
| leech | 7 | 5 | 9 | 10 | 7 | |
| rat-tailed maggot | 4 | 0 | 2 | 2 | 1 | 2 |
| bloodworm | 3 | 1 | 1 | 3 | 0 | 2 |

(b) Zack draws a bar chart, opposite, to show his results.

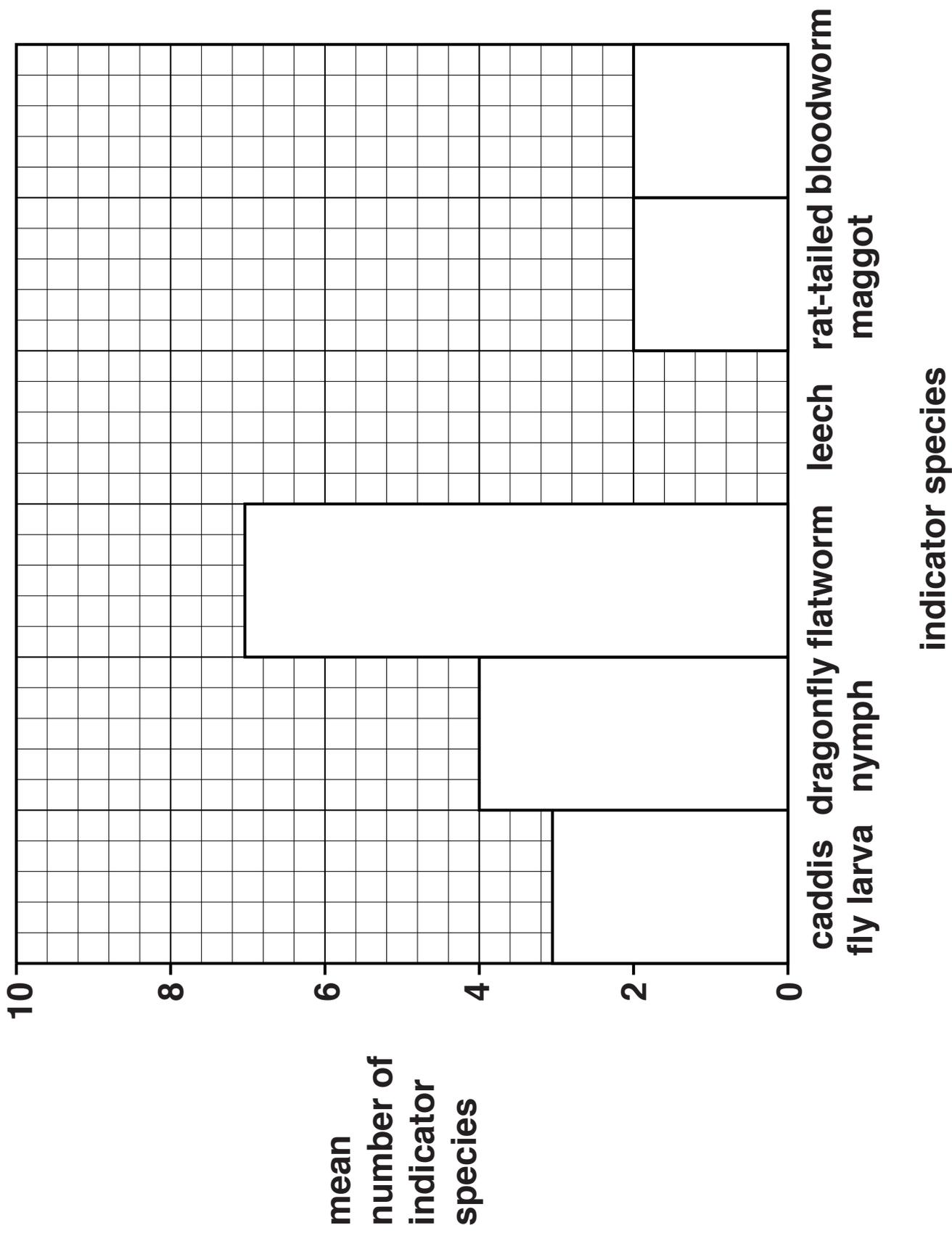
(i) Finish the bar chart by adding the mean for leech. [1]

(ii) Write down TWO conclusions that can be made from the bar chart.

1 _____

2 _____

[2]



(iii) Zack cannot decide if his data shows whether the water is polluted or not.

He decides to extend his investigation.

How should Zack EXTEND his investigation?

Put a tick (✓) next to the correct answer.

Take another sample from the same place as sample 1.

Measure the pollution levels another way to collect more evidence.

Return to the stream to look for more bloodworms.

Count the animals in the samples again.

[1]

4 Look at the picture of a red fox.



(a) The fox is a predator.

Predators are adapted to hunt food.

Put a tick (✓) next to ONE way predators are adapted to hunt food.

have binocular vision

have bushy tail

have short legs

have warning colouration

[1]

(b) The fox hunts hares. Look at the picture of the hare.



Explain how prey like the hare are adapted to avoid being eaten.

[2]

- 5 (a) The binomial name for the Mikado pheasant is *Syrmaticus mikado*.

Which genus does the pheasant belong to?

_____ [1]

- (b) The pheasant is under threat of becoming an **ENDANGERED SPECIES**.

- (i) To become endangered the number of pheasants must fall below a certain level.

What is this level called?

Choose from the list.

critical

crucial

quota

vital

viable

answer _____ [1]

(ii) Species can become endangered because of hunting.

To stop the Mikado pheasant becoming endangered, hunting has been banned.

Write about OTHER ways the Mikado pheasant could be helped to stop it becoming endangered.

[2]

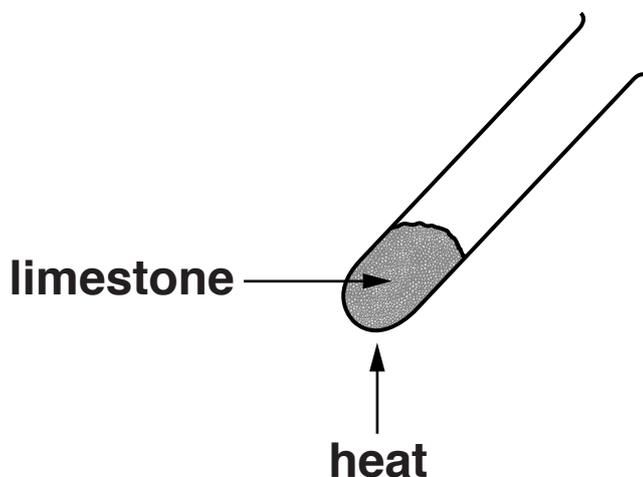
SECTION B – Module C2

6 Bob and Gill heat some limestone, CaCO_3 .

(a) What is the CHEMICAL name for limestone?

_____ [1]

(b) Look at the diagram. It shows the apparatus they use.



Bob and Gill find the mass of the limestone before and after heating.

They repeat the experiment three more times.

Limestone breaks down when heated. Calcium oxide and carbon dioxide are made.

Look at their results.

| Mass of limestone in g | Mass of calcium oxide in g | Mass of carbon dioxide given off in g |
|-------------------------------|-----------------------------------|--|
| 1.00 | 0.56 | 0.44 |
| 2.00 | 1.12 | 0.88 |
| 3.00 | 1.68 | 1.32 |
| 4.00 | 2.24 | _____ |

(i) Complete the table. [1]

(ii) Bob makes a prediction.

He says 'If I heat 10 g of limestone, I will make 4.40 g of calcium oxide and 5.60 g of carbon dioxide.'

Is Bob right? Explain your answer.

_____ [2]

(iii) Limestone breaks down when it is heated.

Calcium oxide and carbon dioxide are made.

What is the name of a process in which a compound is broken down when it is heated?

_____ [1]

(c) Cement is made using limestone.

Write about how cement can be made from limestone.

_____ [2]

7 Look at the picture of a volcano.



(a) MAGMA and LAVA are both molten rock.

What is the DIFFERENCE between magma and lava?

_____ [1]

(b) IGNEOUS rocks are made when molten rock cools.

Some igneous rocks have large crystals and others have small crystals.

Explain why the size of the crystals is different.

_____ [2]

(c) Some people choose to live near active volcanoes.

**Write about the ADVANTAGES and
DISADVANTAGES of living near active
volcanoes.**

[2]

8 Brass is an alloy of copper and zinc.

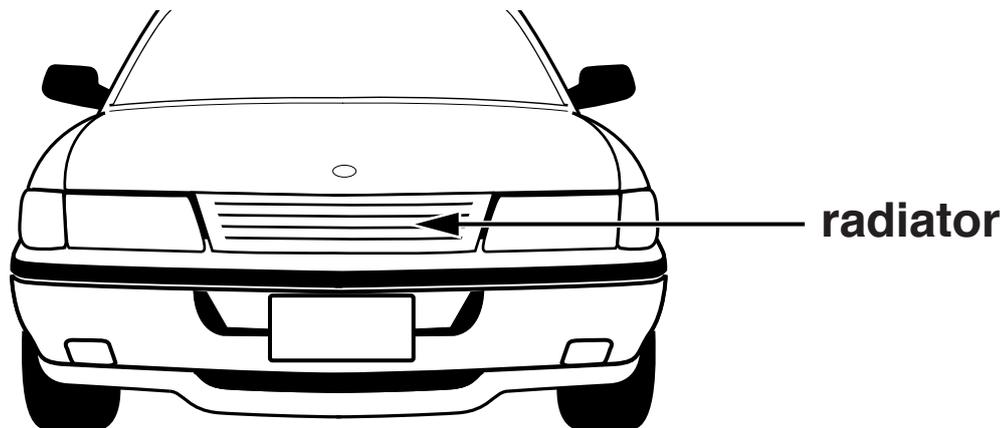
Look at the table opposite. It shows some properties of brass, copper and zinc.

(a) Write about how the properties of brass compare to the properties of copper and zinc.

[3]

| METAL OR ALLOY | PROPERTY | | | | |
|-------------------------------|------------------|--------------------------------|--------------------------------|--|--|
| | Colour | Melting point in °C | Boiling point in °C | Density in g/cm³ | Relative conductivity of heat |
| brass | gold | 900 | 2200 | 8.4 | 109 |
| copper | red/brown | 1083 | 2567 | 8.9 | 401 |
| zinc | grey | 420 | 907 | 7.1 | 116 |

(b) Car engines are fitted with radiators.



Hot water from the engine gives out heat in the radiator to keep the engine cool.

Which metal or alloy from the table would be the best material for making a car radiator?

Explain your answer.

[2]

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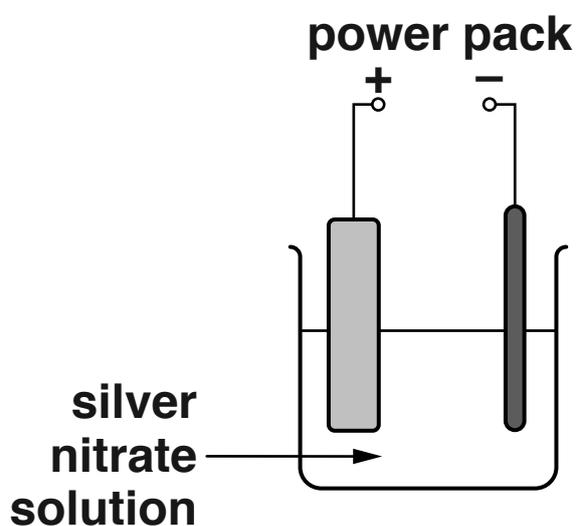
9 John is extracting some silver from its ore.

He also wants to purify the silver.

John's friend tells him that silver is extracted IN A SIMILAR WAY TO COPPER.

Silver is also purified IN A SIMILAR WAY TO COPPER.

Look at the diagram of the apparatus John uses to purify silver.



10 This question is about acids, alkalis and indicators.

Complete the sentences.

(a) When litmus solution is added to an acid, the colour of the litmus changes to

_____ . [1]

(b) The difference between a base and an alkali is that

alkalis are all _____

in water. [1]

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SECTION C – Module P2

11 This question is about electrical power.

Jimmy has a smart meter that shows the cost of using each electrical appliance.

He uses each appliance for one hour.

Look at the table. It shows the smart meter readings for 4 different appliances.

| Appliance | Time used in hours | Cost in pence |
|----------------|--------------------|---------------|
| Lamp | 1 | 0.2 |
| Radio | 1 | 1.0 |
| Vacuum cleaner | 1 | 20.0 |
| Electric fire | 1 | 60.0 |

(a) Which appliance has the highest power rating?

Choose from:

lamp

radio

vacuum cleaner

electric fire

answer _____ [1]

(b) The lamp operates on a 12V supply, but is plugged into the 230V mains supply.

(i) What electrical component must be connected between the mains supply and the lamp to change the 230V into 12V?

_____ [1]

(ii) The lamp needs a current of 2 A.

Calculate the power of the lamp.

answer _____ W [2]

12 (a) Most power stations need a fuel that gives out energy when burnt.

Look at the list of possible fuels for a power station:

coal

manure

oil

straw

wood

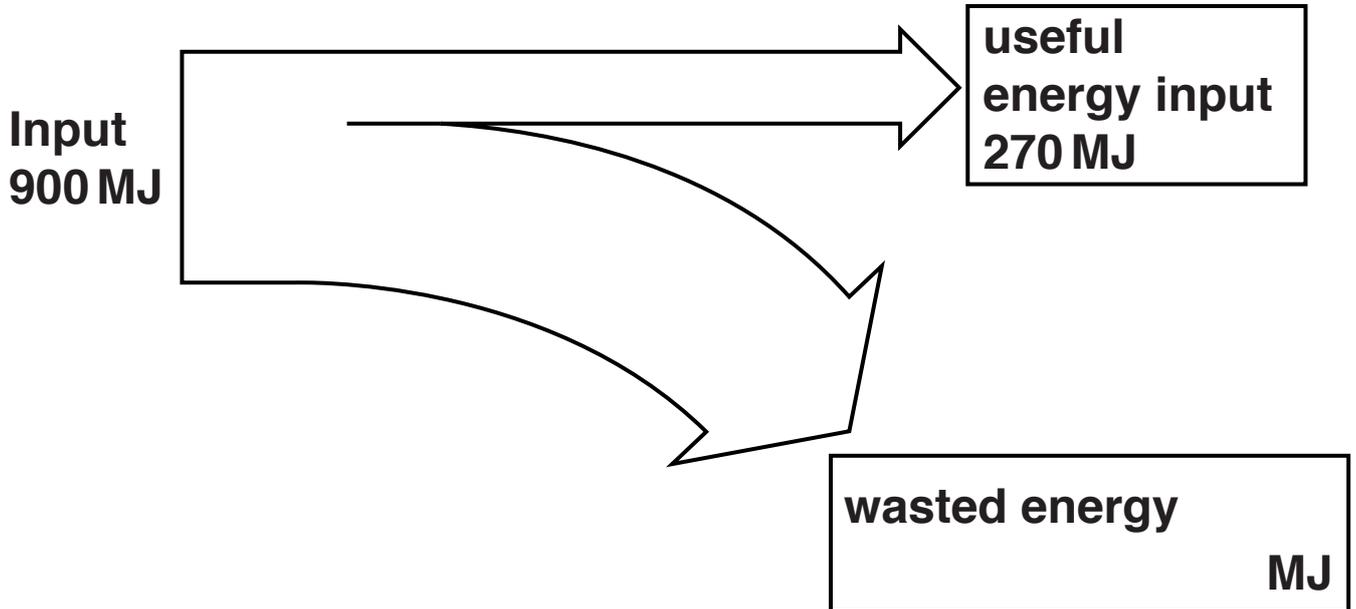
How many of these fuels are renewable?

answer _____

[1]

(b) Lots of energy is wasted in a power station.

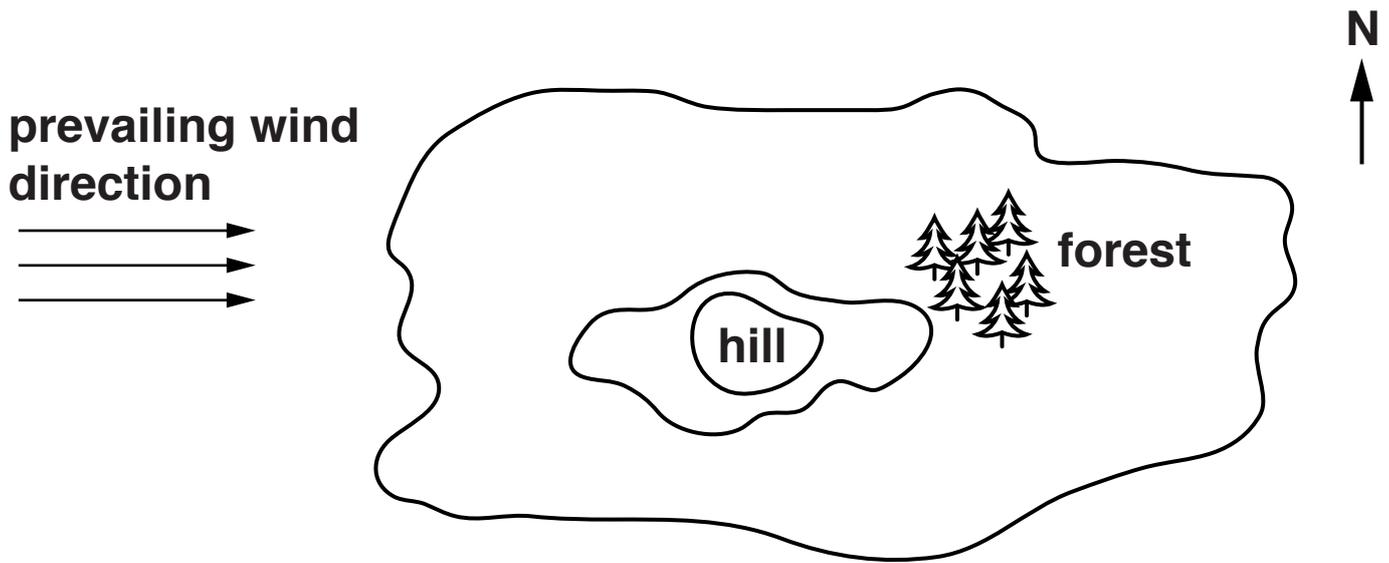
Look at the Sankey diagram for this power station.



Complete the Sankey diagram AND calculate the % efficiency of the power station.

answer _____ % [3]

13 Look at the aerial view of an island. No fossil fuels are available on the island.



The Sun is south at mid-day

A group of scientists is working on the island.

**They need to provide electricity for their experiments.
They need electricity 24 hours a day.**

**14 (a) (i) Asteroids are in orbit around the Sun.
Complete the sentences:**

**The orbit of most asteroids is between the
planet _____ and the
planet _____ .**

**They were formed from material left over when
the _____
was formed. [2]**

**(ii) Scientists think that in the past there was a
collision between a large asteroid and the
Earth.**

**This caused a large dust cloud in the
atmosphere.**

**The dust cloud affected the temperature of the
Earth.**

**How was the temperature of the Earth
affected?**

Explain your answer.

[2]

(b) Look at the information about planets in our Solar System.

| Planet | Mercury | Mars | Saturn | Neptune |
|--|----------------|-------------|---------------|----------------|
| Average distance from the Sun in million km | 57 | 228 | 1430 | 4500 |
| Time to orbit the Sun in days | 88 | 687 | 10832 | 60 190 |

(i) How does the distance of a planet from the Sun affect the time for one orbit around the Sun?

[1]

(ii) Venus is a distance of 108 million km from the Sun.

Use the data in the table to suggest the time it takes Venus to make one orbit of the Sun.

Choose from:

60 days

220 days

5000 days

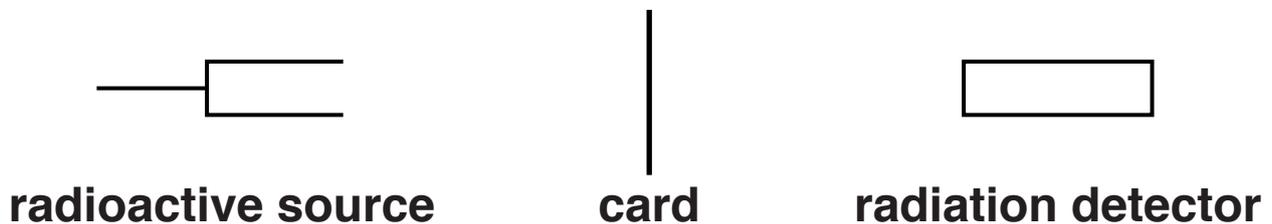
41 000 days

answer _____ [1]

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15 Katy investigates how the count rate from radioactive sources changes when different thicknesses of card are placed between a source and a radiation detector.

Look at the diagram.



(a) Look at the table of results.

It shows the count rate at the radiation detector in counts per minute (cpm) for three radioactive sources, A, B and C.

| Radioactive source | Radiation detected in cpm for different thicknesses of card | | | | |
|---------------------------|--|----------------|----------------|----------------|----------------|
| | 0.05 mm | 0.10 mm | 0.15 mm | 0.20 mm | 0.25 mm |
| A | 2008 | 1995 | 2012 | 2010 | 1992 |
| B | 3 | 4 | 2 | 3 | 4 |
| C | 2001 | 1252 | 808 | 612 | 452 |

A card manufacturer uses radioactive source C to monitor the thickness of card.

Explain why.

[2]

(b) (i) The radioactive source used by the card manufacturer is dangerous.

It is in a fixed position in the machinery and is in use 24 hours per day.

What precautions are needed to make sure that the operators working close to the source are not harmed?

[2]

- (ii) After some time the radioactive source used by the card manufacturer must be disposed of safely because it is still dangerous.

Look at the methods of disposal.

- A put in the bin with normal household waste
- B melt down and use again
- C bury deep underground encased in glass
- D dump at sea

Which method of disposal is most suitable for this radioactive source?

Choose from: A B C D

answer _____ [1]

SECTION D

16 A rugby team wants to improve the fitness of its players.

Five players were put on a special diet.

The aim of the diet was to reduce body fat and increase muscle.

Look at the table.

It shows the body fat percentage and muscle percentage for the five players before and after the diet.

| Player | Body fat percentage | | | Muscle percentage | | |
|--------|---------------------|-------|------------|-------------------|-------|------------|
| | Before | After | Difference | Before | After | Difference |
| A | 25.6 | 20.2 | -5.4 | 56.6 | 61.0 | +4.4 |
| B | 16.5 | 15.9 | -0.6 | | 62.5 | +2.8 |
| C | 22.5 | 20.1 | | 52.6 | 54.4 | +1.8 |
| D | 13.6 | 11.9 | -1.7 | 60.0 | 63.4 | +3.4 |
| E | 25.5 | 22.4 | -3.1 | 54.6 | 57.8 | +3.2 |

(a) Complete the table by filling in the two blanks. [1]

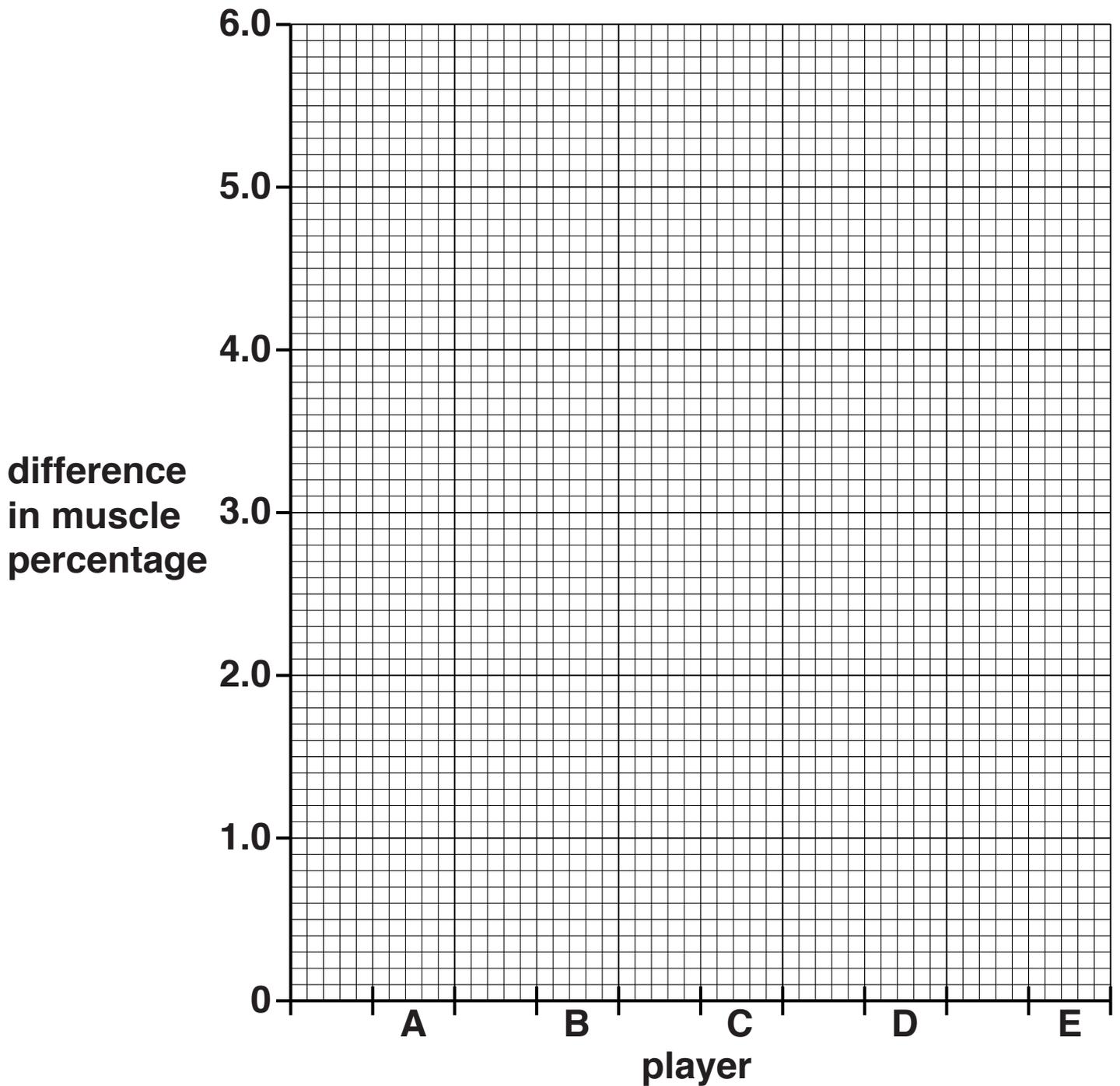
(b) Calculate the mean value for the DIFFERENCE in BODY FAT PERCENTAGE for the five players.

answer _____ %

[2]

(c) Look at the data for muscle percentage.

Draw a bar chart to show the DIFFERENCE in MUSCLE PERCENTAGE for players A, B, C, D and E.



[2]

(d) Use your bar chart and the table to decide which player benefited the MOST from the diet.

Player _____

Explain your answer.

[2]

(e) The team doctor recommends a high protein but low fat diet for the players.

Look at the table. It shows the protein, fat and water content of some foods.

| Food | Protein in g per 100 g | Fat in g per 100 g | Water in g per 100 g |
|------------------|-----------------------------------|-------------------------------|---------------------------------|
| egg white | 9 | 0 | 89 |
| turkey | 23 | 2 | 74 |
| salmon | 20 | 13 | 66 |
| venison | 35 | 6 | 57 |
| cod | 21 | 1 | 77 |

- (i) Which food contains the MOST water per 100 g?

_____ [1]

- (ii) Mary says that venison is the best food for the rugby players.

John says that salmon is the best food for the rugby players.

Using only the data in the table, which of these two foods should the doctor recommend?

Explain why.

_____ [2]

END OF QUESTION PAPER

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