OCR
Oxford Cambridge and RSA

F

Friday 5 June 2015 – Afternoon

GCSE GATEWAY SCIENCE
SCIENCE B

B712/01 Science modules B2, C2, P2 (Foundation Tier)

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

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 30 minutes

B712/01

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. 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).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- 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**.
- This document consists of **32** pages. Any blank pages are indicated.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

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

distance = average speed × 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

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

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

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

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Question 1 begins on page 4

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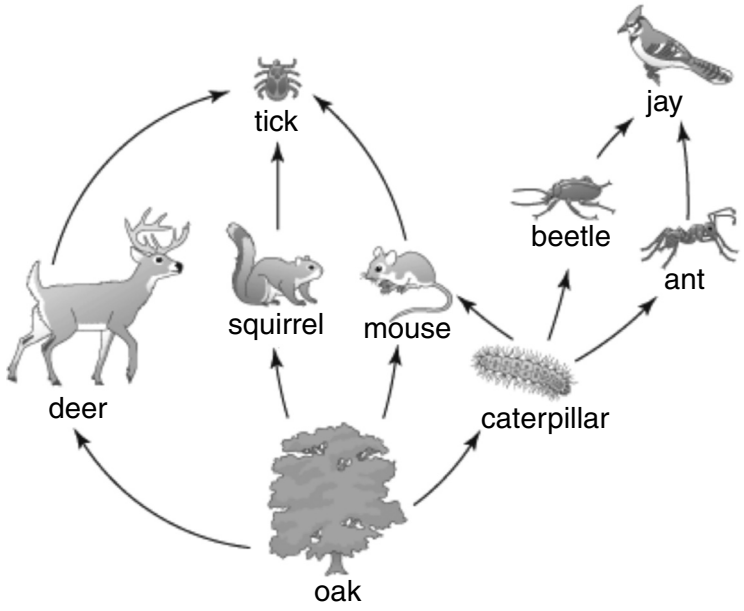
Answer **all** the questions.

SECTION A – Module B2

1 Look at the food web.



Not drawn to scale

(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.

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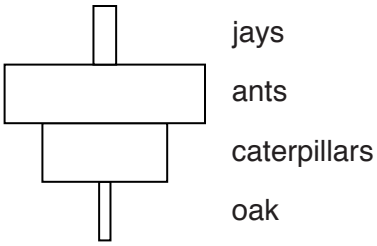
..... **[2]**

(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.

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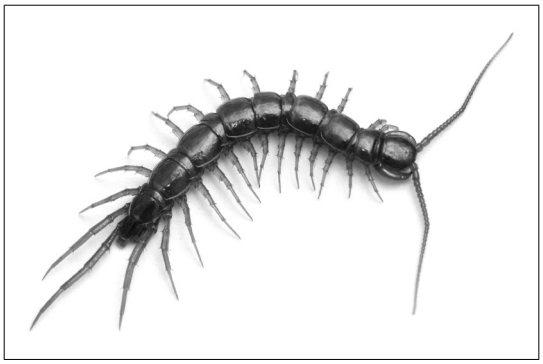
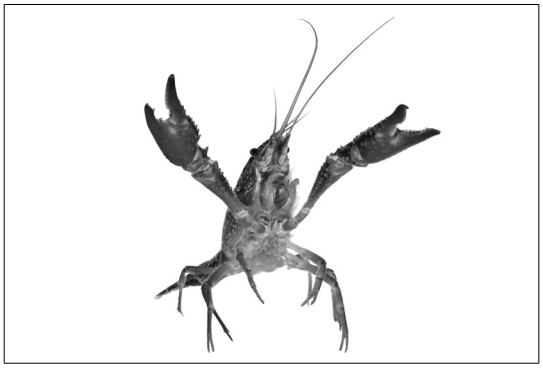
..... **[2]**

2 Look at the pictures of arthropods.

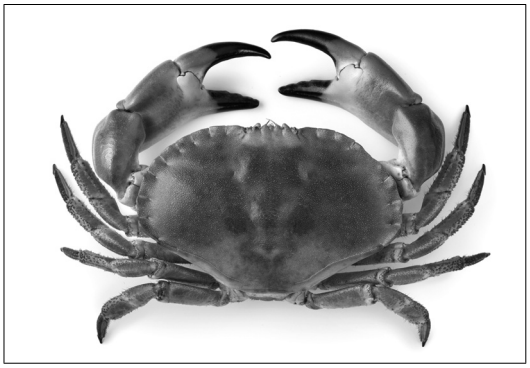


A

B



C



D

There are four classes of arthropods.

- insects
- arachnids
- crustaceans
- myriapods

7

Classify the arthropods **A**, **B**, **C** and **D** in the pictures into their correct class.

Explain why you have put each of the arthropods into its class.

The classes can be used once, more than once or not at all.

The quality of written communication will be assessed in your answer to this question.

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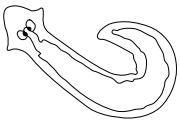
..... **[6]**

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		Some pollution in water		Very polluted water	
caddis fly larva 	dragonfly nymph 	flatworm 	leech 	rat-tailed maggot 	bloodworm 

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

Look at the table.

It shows his results.

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

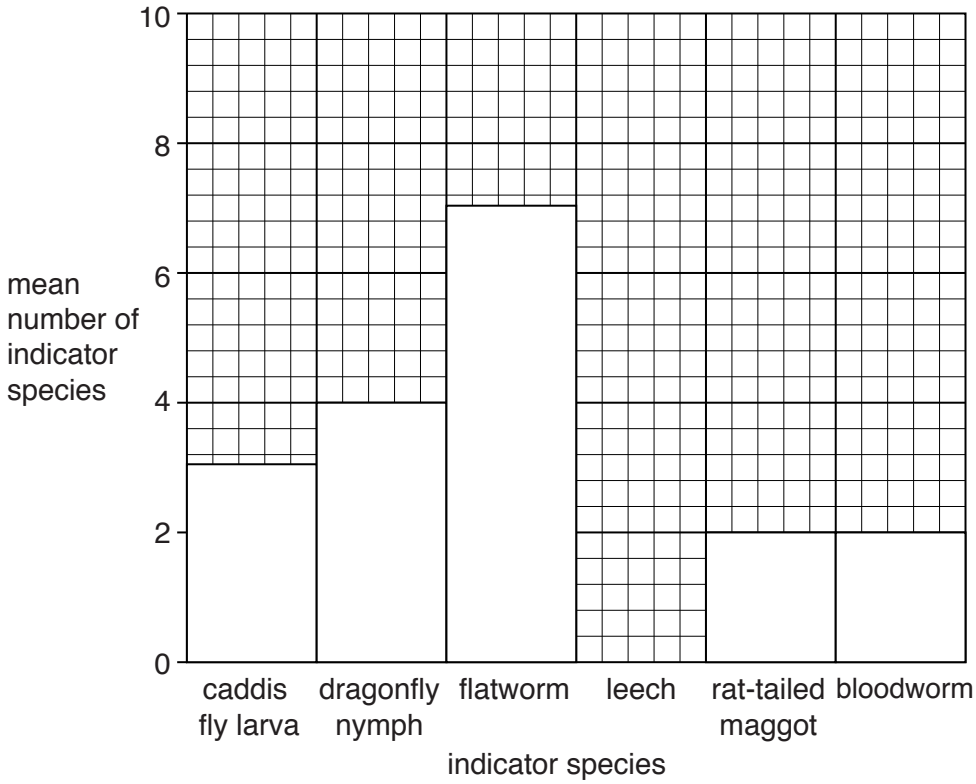
(a) The mean number of leech is missing from the table.

Calculate the mean for the leech.

Give your answer to the nearest whole number.

Mean number of leech ..... **[2]**

(b) Zack draws a bar chart 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.

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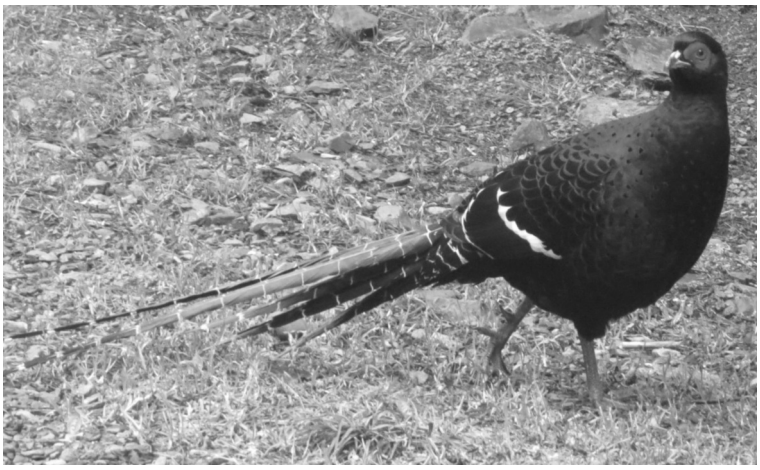
..... **[2]**

5 This is a picture of the Mikado pheasant.



(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.

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.....

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

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Section B begins on page 14

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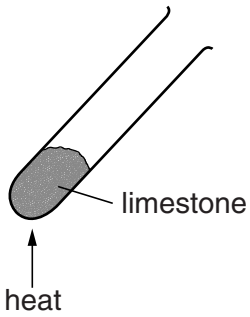
SECTION B – Module C2

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.

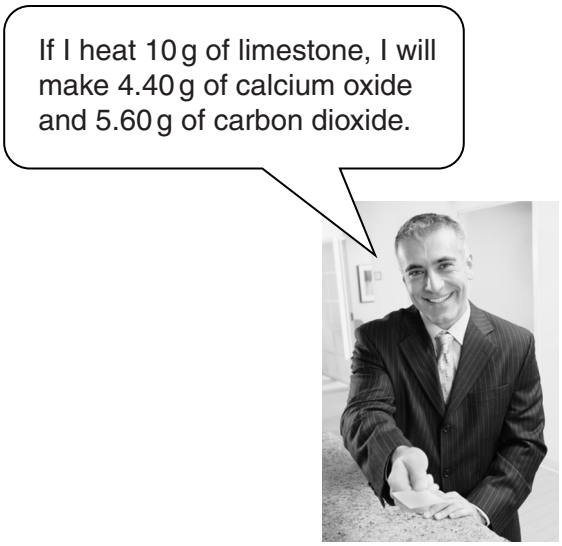
Limestone breaks down when heated. Calcium oxide and carbon dioxide are made.

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.



Is Bob right? Explain your answer.

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..... **[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.

.....

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..... **[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.

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

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

Write about the **advantages** and **disadvantages** of living near active volcanoes.

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

8 Brass is an alloy of copper and zinc.

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

Metal or alloy	Property				
	Colour	**Melting point in °C**	**Boiling point in °C**	**Density in g/cm^3**	**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

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

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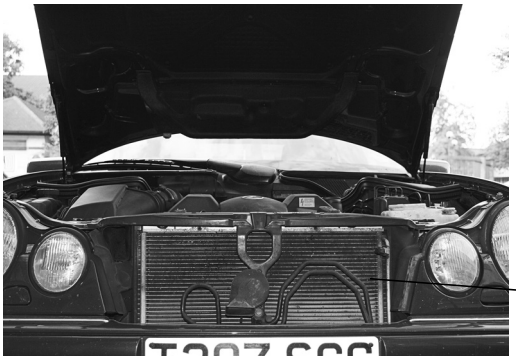
..... **[3]**

(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]**

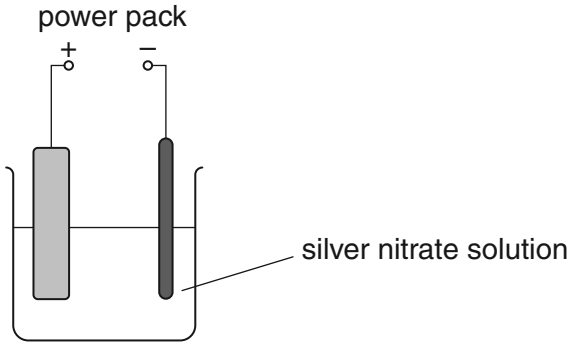
9 John is extracting some silver from its ore.

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.



Suggest how John **extracts** silver from its ore and how he then **purifies** the silver.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

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]**

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.

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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

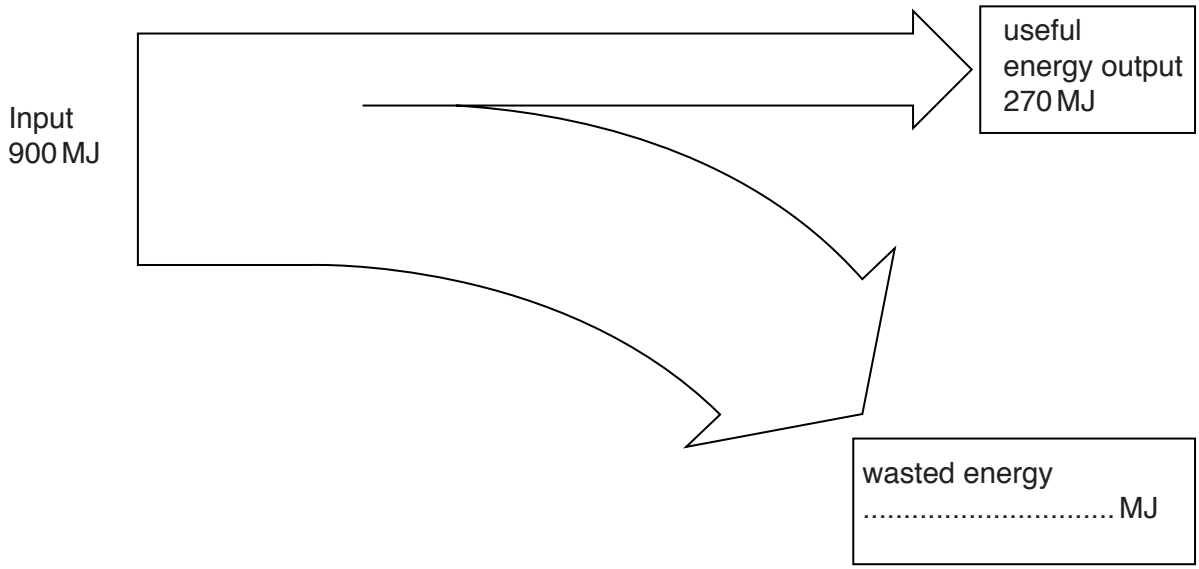
wood

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.

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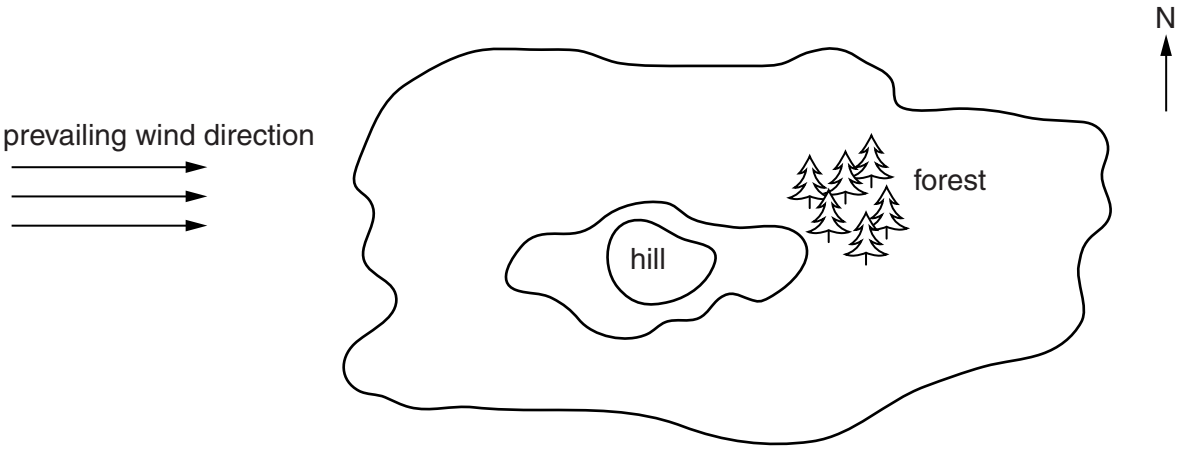
answer ..... % **[3]**

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.

Describe how the scientists could provide the electricity they need, how they could provide a continuous supply for 24 hours a day and where they should put the equipment.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

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.

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..... **[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	60190

(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.

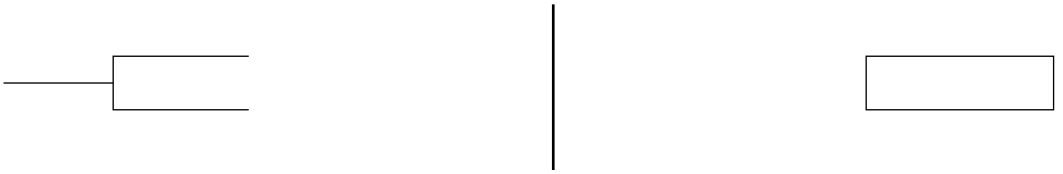
Use the data in the table to suggest the time it takes Venus to make one orbit of the Sun.

Choose from: **60 days** **220 days** **5000 days** **41000 days**

answer ..... **[1]**

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.

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..... **[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?

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..... **[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

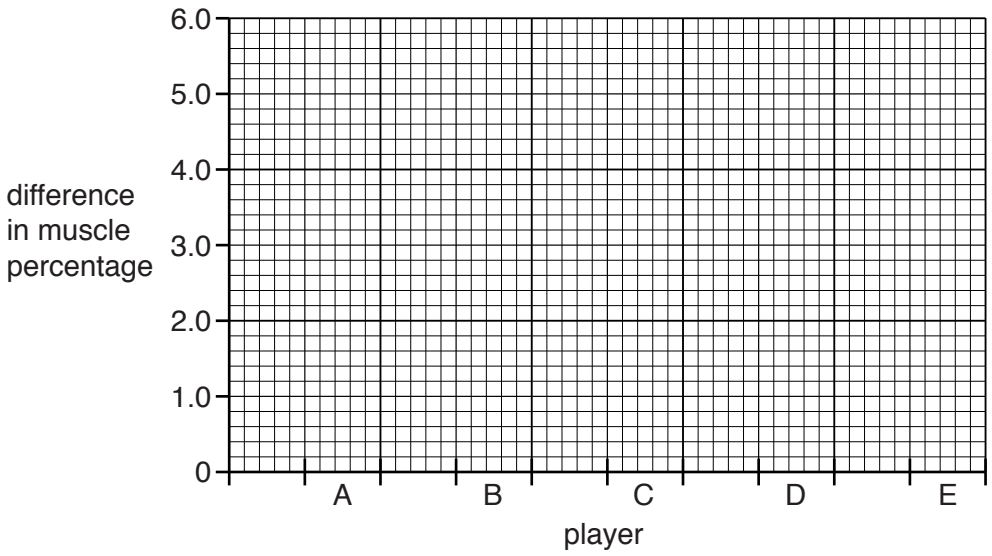
(a) Complete the table by filling in the two blanks. **[1]**

(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.

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

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.