

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**B712/02**

**GATEWAY SCIENCE  
SCIENCE B**

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

**FRIDAY 5 JUNE 2015: Afternoon**

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

**MODIFIED ENLARGED 24pt**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.  
A calculator may be used for this paper.**

**OCR SUPPLIED MATERIALS:**

**A copy of the Periodic Table  
Insert for Questions 1, 2, 3, 7, 10 and 14**

**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.**

## **EQUATIONS**

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

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

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

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

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

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

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

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

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

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

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

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**Answer ALL the questions.**

**SECTION A – Module B2**

**1 Look at the food web in the insert.**

**(a) Ticks are parasites.**

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

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**[1]**

**(b) Explain what is meant by the term INTERSPECIFIC competition.**

**Include ONE example from the food web in your answer.**

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**[2]**

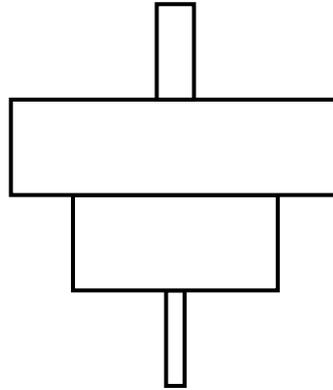
**(c) Look at the pyramid of NUMBERS for one food chain from the food web.**

**jays**

**ants**

**caterpillars**

**oak**



**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]

**(d) Nitrogen is recycled within the food web.**

**The sentences describe one way nitrogen is recycled.**

**Finish the sentences by adding ONE different word in each space.**

**A mouse dies and decomposers**

**convert protein from the mouse**

**into \_\_\_\_\_ .**

**This chemical is then converted into**

**nitrates by \_\_\_\_\_**

**bacteria.**

**The oak can then take up the**

**nitrates from the soil.**

**[2]**

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## **2 Look at the graph in the insert.**

**It shows the estimated number of herring in part of the North Sea and the number of herring that were caught.**

**The safe stock level is the number of fish there needs to be to prevent the risk of extinction.**

**The precautionary level is the number of fish that organisations would like to have to make sure the herring population is safe.**

**Herring in the North Sea are fished by several different countries.**

**Sustainable fishing of the herring was first attempted in 1980.**

**What is sustainable fishing?**

**Evaluate the success of the sustainable fishing in saving the herring population and suggest any problems there might have been.**

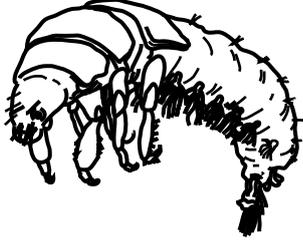
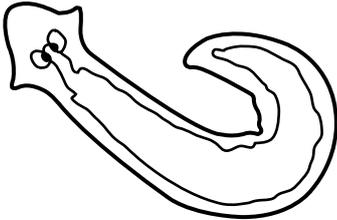
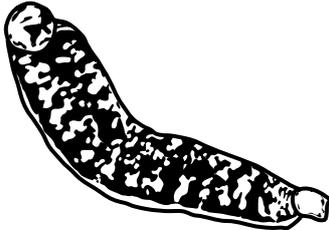
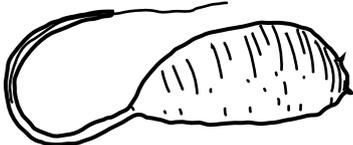
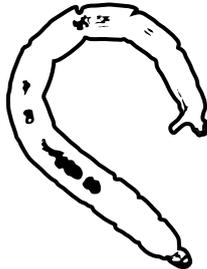


**3 Zack investigates water pollution levels in a stream.**

**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.**

<b>CLEAN WATER</b>	
<b>caddis fly larva</b> 	<b>dragonfly nymph</b> 
<b>SOME POLLUTION IN WATER</b>	
<b>flatworm</b> 	<b>leech</b> 
<b>VERY POLLUTED WATER</b>	
<b>rat-tailed maggot</b> 	<b>bloodworm</b> 

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

**Look at the table in the insert.**

**It shows his results.**

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

**(i) Calculate the mean for the leech.**

**Give your answer to the nearest whole number.**

**Mean number of leech**

\_\_\_\_\_ **[2]**

**(ii) Explain how the means show the water in the samples is polluted.**

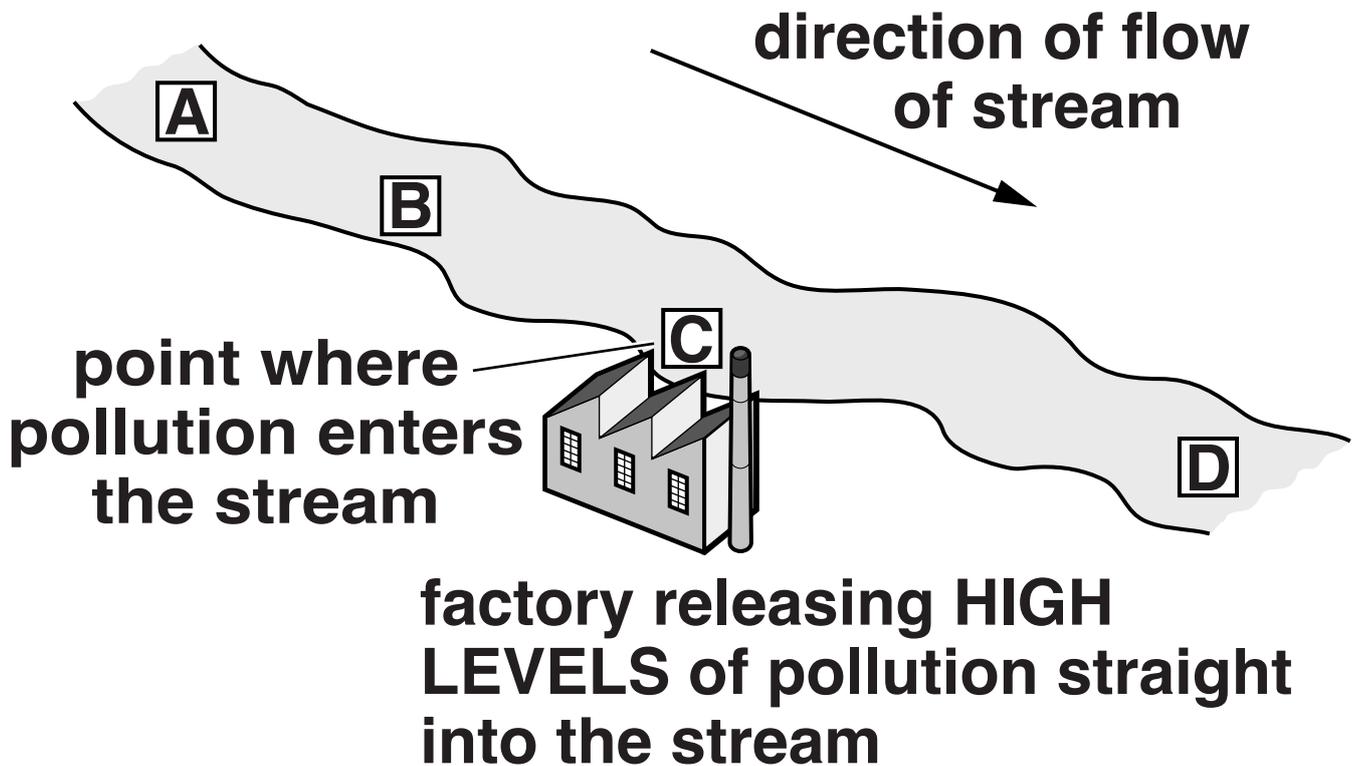
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ **[2]**

**(b) Look at the diagram.**

**It shows four parts of the stream, A, B, C and D.**



**Look at the results.**

**(i) Where did Zack take his samples from?**

**Choose from A, B, C or D**

\_\_\_\_\_

**[1]**

**(ii) Explain your answer.**

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**[2]**

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

Which genus does the pheasant belong to?

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[1]

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

**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]**

**(c) Male pheasants are brightly coloured to attract a mate.**

**The pheasants evolved to have bright colours because of natural selection.**

**Look at the list of stages in natural selection.**

**organisms show variation**

**there is competition for resources**

**features are inherited**

**Which stage of natural selection is missing?**

\_\_\_\_\_ **[1]**

**(d) Darwin and Lamarck both had different theories about natural selection.**

**Explain why an understanding of genetics has made scientists favour Darwin's ideas.**

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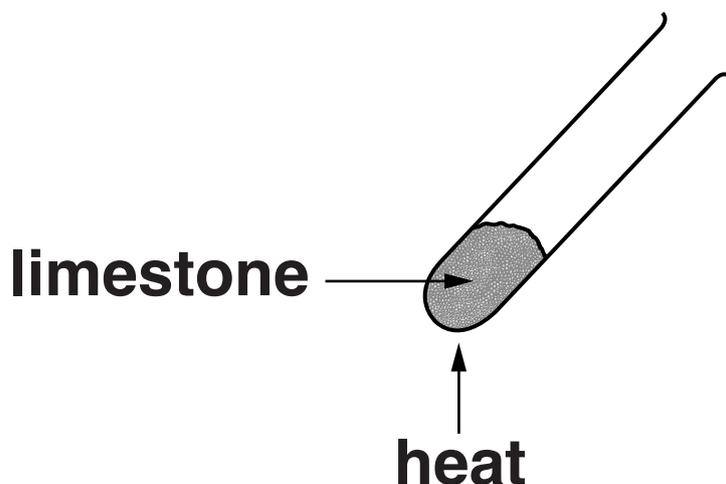
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**[2]**

## SECTION B – Module C2

5 Bob and Gill heat some limestone.



Limestone is calcium carbonate,  
 $\text{CaCO}_3$ .

Calcium carbonate thermally  
decomposes to make calcium oxide  
and carbon dioxide.

(a) Write a **BALANCED SYMBOL**  
equation for this reaction.

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[2]

**(b) What is meant by THERMAL DECOMPOSITION?**

\_\_\_\_\_ [1]

**(c) Cement is made using limestone.**

**Write about how cement can be made from limestone.**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

**(d) Bob and Gill also investigate the hardness of different minerals.**

**Look at the table. It shows their results.**

<b>MINERAL</b>	<b>DESCRIPTION OF TEST</b>
<b>limestone</b>	<b>scratched by a copper penny</b>
<b>granite</b>	<b>not scratched by a steel knife but scratches steel</b>
<b>talc</b>	<b>scratched by a fingernail</b>
<b>marble</b>	<b>steel knife scratches it easily</b>

**Steel is harder than copper.**

**Place the minerals in order of their hardness.**

**Put the hardest first.**

**hardest** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**softest** \_\_\_\_\_

**[2]**

**(e) Granite and limestone have different hardnesses.**

**Use ideas about rock types to explain why.**

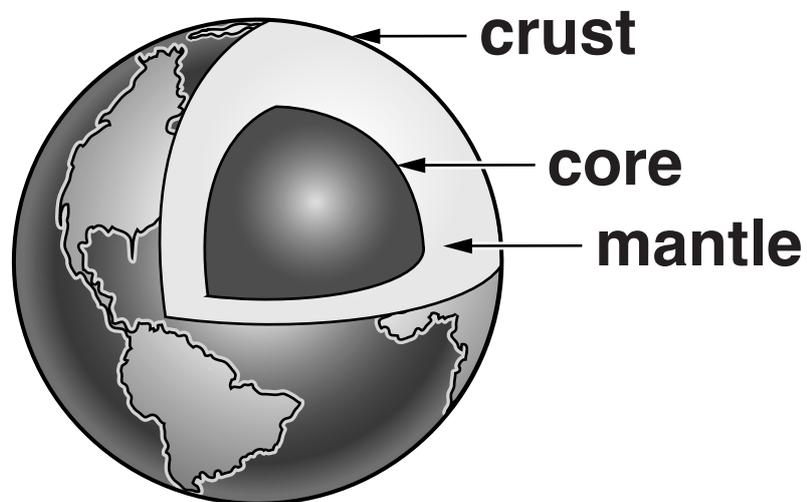
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**[2]**

**6 The diagram shows the structure of the Earth.**



**NOT TO SCALE**

**(a) The lithosphere is part of the structure of the Earth.**

**What is meant by the LITHOSPHERE?**

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[1]

**(b) Geologists have problems studying the structure of the Earth.**

**Write about ONE of these problems.**

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**[1]**

**(c) The theory of plate tectonics did not exist in 1900.**

**The theory of plate tectonics is now widely accepted by scientists.**

**Describe some of the stages in the development of the theory of plate tectonics.**

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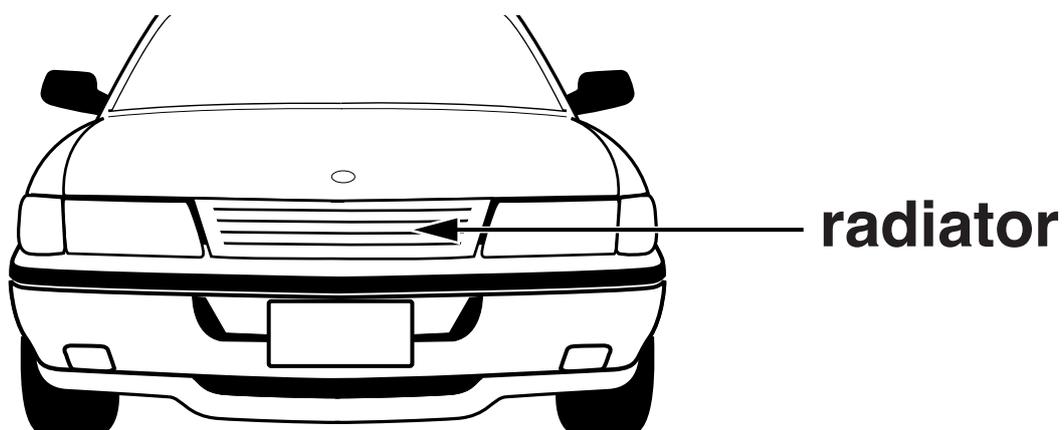
**[2]**

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**7 Brass is an alloy of copper and zinc.**

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

**(a) Car engines are fitted with radiators.**



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

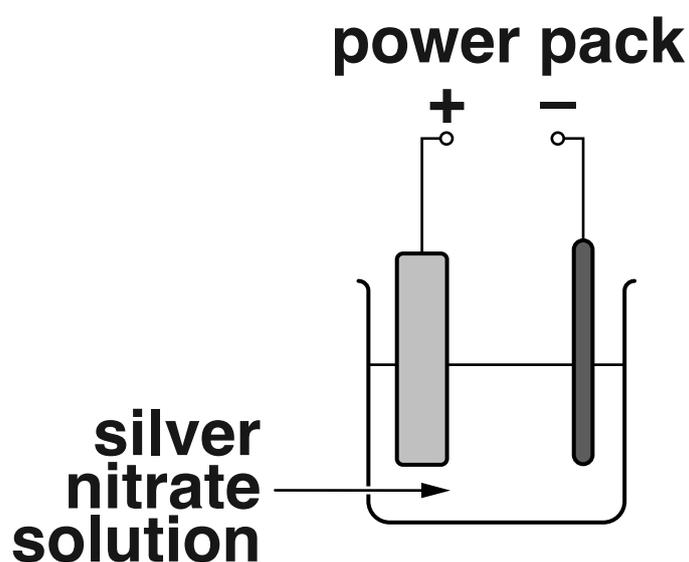
**Evaluate each of the metals and alloys in the table to make a car radiator.**



**8 John wants to purify some impure silver.**

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

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



**Silver nitrate solution contains silver ions,  $\text{Ag}^+$ .**

**Suggest how John could purify impure silver by electrolysis.**

**Your answer should include the equations for the reactions at the positive and negative electrodes.**

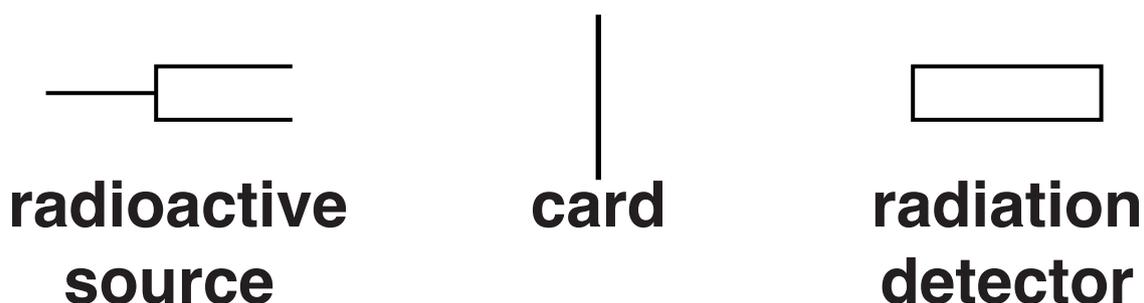


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## SECTION C – Module P2

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

Look at the diagram.



**(a) Look at the table of results opposite.**

**It shows the count rates in counts per minute (cpm) for three radioactive sources.**

**Each source in the table gives out only one type of radiation.**

**Use the results to identify the TYPE of radiation given out by each source A, B and C.**

**Source A \_\_\_\_\_**

**Source B \_\_\_\_\_**

**Source C \_\_\_\_\_**

**[2]**

<b>Radioactive source</b>	<b>Radiation detected in cpm for different thicknesses of card</b>					
	<b>no card</b>	<b>0.05 mm</b>	<b>0.10 mm</b>	<b>0.15 mm</b>	<b>0.20 mm</b>	<b>0.25 mm</b>
<b>A</b>	<b>2010</b>	<b>1995</b>	<b>2008</b>	<b>2012</b>	<b>1992</b>	<b>2010</b>
<b>B</b>	<b>2010</b>	<b>23</b>	<b>24</b>	<b>22</b>	<b>23</b>	<b>24</b>
<b>C</b>	<b>2010</b>	<b>1900</b>	<b>1252</b>	<b>808</b>	<b>612</b>	<b>452</b>

**(b) Industries that use radioactive materials and nuclear experiments produce waste.**

**These are two types of waste:**

- 1 contaminated work clothing that has a low level of radioactivity**
- 2 radioactive materials that will remain radioactive for a long time but are no longer useful.**

**Write about the ways that these types of waste can be disposed of safely.**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_ **[2]**

**10 Louis has several electrical appliances in his home.**

**(a) Look at the information in the table in the insert.**

**(i) Calculate the energy used each week by the television.**

**answer \_\_\_\_\_ kWh [1]**

**(ii) Electricity costs 16 p per unit.**

**Calculate the total cost of the electricity for the tumble dryer AND the kettle each week.**

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**answer \_\_\_\_\_ pence [2]**

**(b) Louis uses off peak electricity for some of his energy.**

**He does not use off peak electricity for his vacuum cleaner.**

**Explain why.**

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**[2]**

**11 A new power station needs to be built.**

**There are two proposals:**

**a nuclear power station**

**a coal fired power station.**

**Describe and explain the advantages and disadvantages of using each of the fuels to produce electricity.**



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

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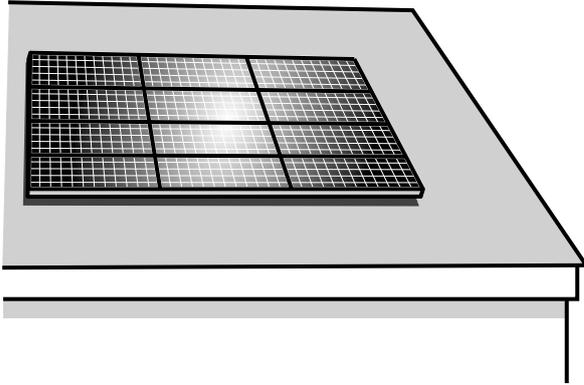
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**[6]**

## 12 The solar panels on this house are made up of photocells.



(a) Mia investigates how the current output of photocells depends on:

light intensity

surface area.

Look at her results.

Area in $\text{m}^2$	0.30	0.30	1.20
Intensity in $\text{W}/\text{m}^2$	200	400	400
Current in A	0.5	1.0	4.0

Mia says ‘If you double the surface area and also double the light intensity then the current doubles.’

**Use the information in the table to explain why Mia's statement is incorrect.**

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**[2]**

**(b) In some parts of the world electricity is produced using solar power stations.**

**A solar power station has a useful output of 60 MJ/s and an input of 333 MJ/s.**

**Calculate the percentage efficiency of this power station.**

**answer \_\_\_\_\_ % [2]**

**(c) Each solar panel produces a current of 2.5 A at a voltage of 20V.**

**(i) Calculate the power output of the solar panel.**

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**answer \_\_\_\_\_ W [1]**

**(ii) Calculate the number of these solar panels needed to produce an output of 60 MW.**

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**\_\_\_\_\_ [1]**

**13 (a) There are several theories about how the Earth-Moon system was formed.**

**One of these theories is that the Moon was formed in a collision between the Earth and another planet.**

**Suggest why this theory has become more popular since the Moon landings in the 1970s.**

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**[2]**

**(b) A force causes the Moon to orbit the Earth.**

**What is the name of this force and how does it keep the Moon in orbit?**

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**[2]**

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## **SECTION D**

**14 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 in the insert.**

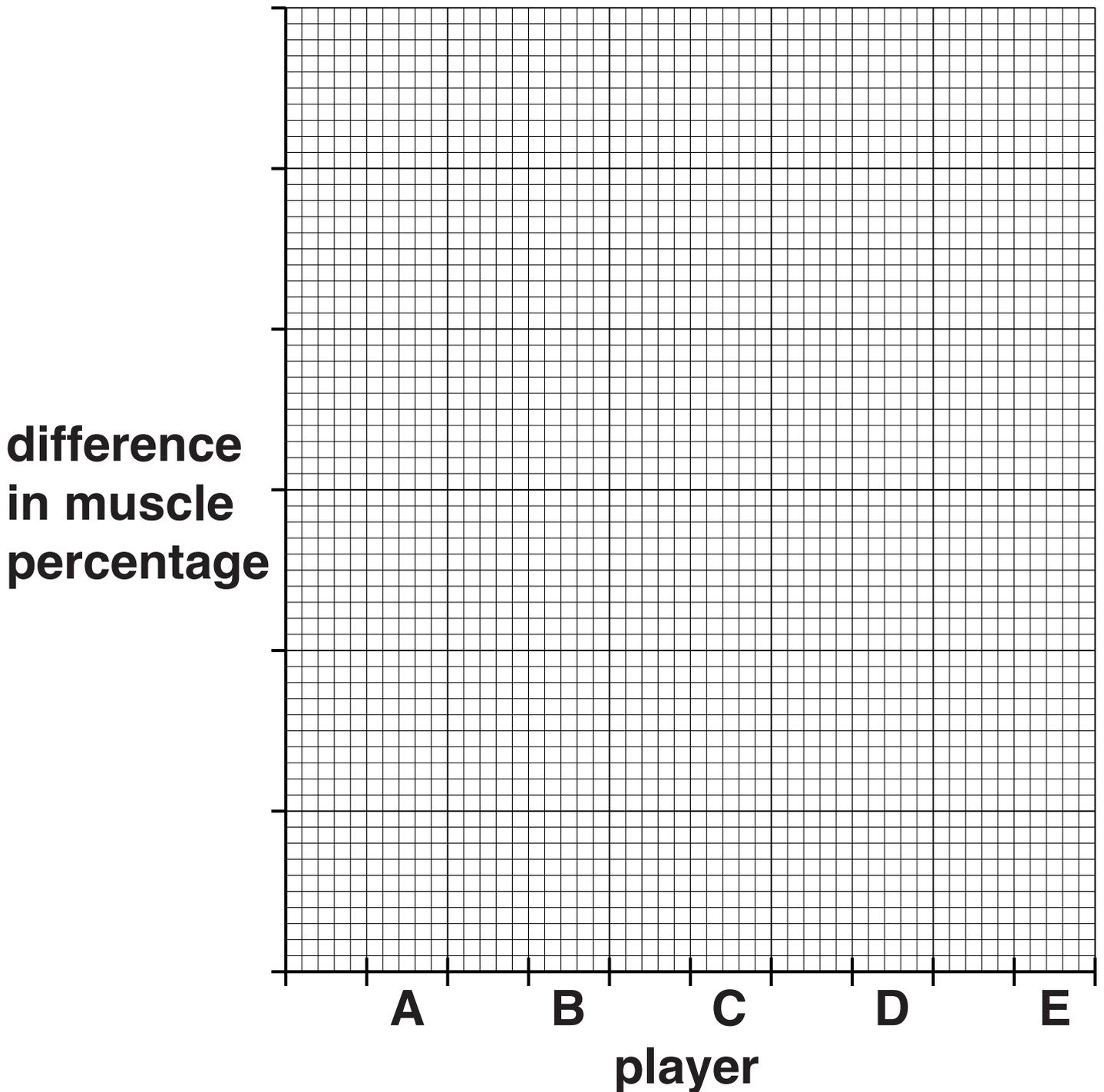
**It shows the body fat percentage and muscle percentage for the five players before and after the diet.**

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

**answer \_\_\_\_\_ % [2]**

**(b) 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.**



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

**Player** \_\_\_\_\_

**Explain your answer.**

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**[2]**

**(d) The team doctor recommends a HIGH PROTEIN but LOW FAT diet for the players.**

**Look at Table 1. It shows the protein and fat content of some foods.**

**TABLE 1**

<b>Food</b>	<b>Protein in g per 100 g</b>	<b>Fat in g per 100 g</b>
<b>steak</b>	<b>25</b>	<b>15</b>
<b>pork</b>	<b>23</b>	<b>29</b>
<b>salmon</b>	<b>20</b>	<b>13</b>
<b>venison</b>	<b>35</b>	<b>6</b>
<b>bacon</b>	<b>12</b>	<b>70</b>
<b>rabbit</b>	<b>27</b>	<b>8</b>

**Look at Table 2. It shows some of the food that three of the players eat in one day.**

**TABLE 2**

<b>Player A</b>		<b>Player B</b>		<b>Player C</b>	
<b>Food eaten</b>	<b>Mass eaten in g</b>	<b>Food eaten</b>	<b>Mass eaten in g</b>	<b>Food eaten</b>	<b>Mass eaten in g</b>
<b>venison steak</b>	<b>200 200</b>	<b>salmon rabbit</b>	<b>200 200</b>	<b>pork bacon</b>	<b>300 100</b>

**Evaluate, using calculations, the protein and fat content of each player's diet.**

**Which player has the most protein and the least fat in their diet?**

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[4]

**END OF QUESTION PAPER**

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