

Candidate forename						Candidate surname					
Centre number						Candidate number					

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**GCSE**

**A217/01**

**TWENTY FIRST CENTURY SCIENCE**  
**ADDITIONAL SCIENCE A**

**Unit 3: Modules B6 C6 P6 (Foundation Tier)**

**WEDNESDAY 20 JUNE 2012: Morning**

**DURATION: 40 minutes**  
**plus your additional time allowance**

**MODIFIED ENLARGED**

**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)**

**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 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 42.**
- **A list of physics equations is printed on pages 4–5.**
- **An enlarged copy of the Periodic Table will be provided.**

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# **TWENTY FIRST CENTURY SCIENCE EQUATIONS**

## **USEFUL RELATIONSHIPS**

### **EXPLAINING MOTION**

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \frac{\text{resultant force}}{\text{force}} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved in the direction of the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

## **ELECTRIC CIRCUITS**

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

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

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

$$\text{power} = \text{potential difference} \times \text{current}$$

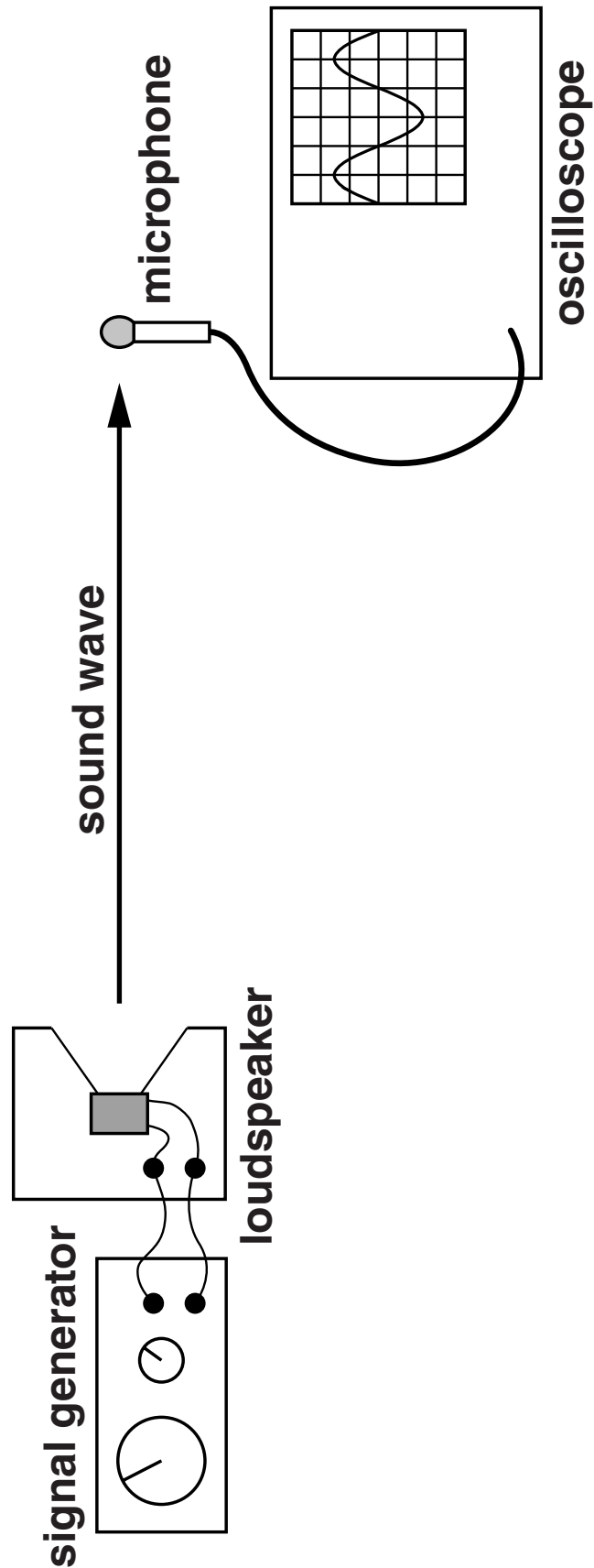
$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

## **THE WAVE MODEL OF RADIATION**

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

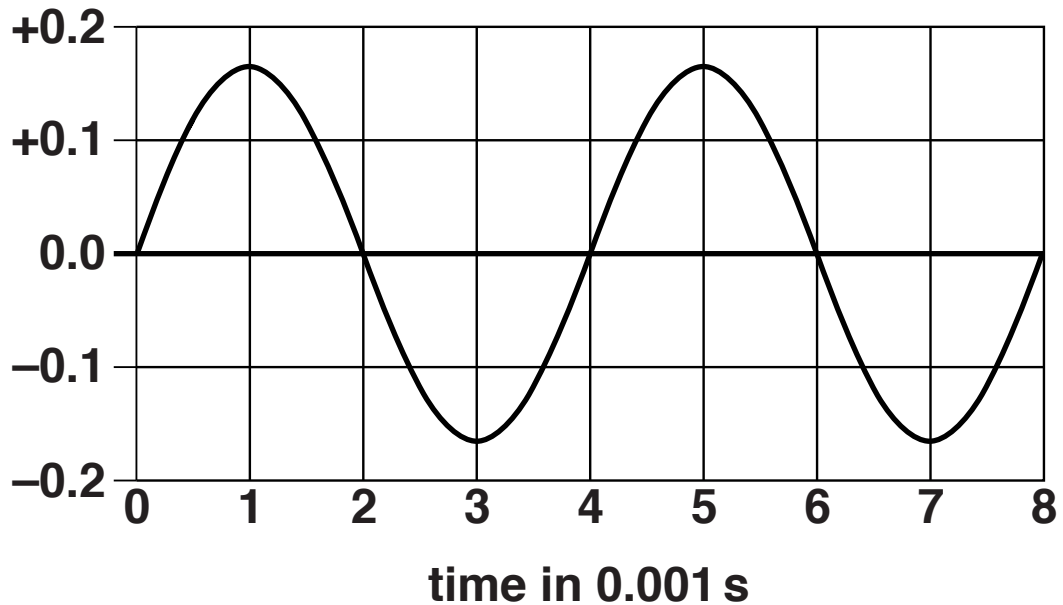
**Answer ALL the questions.**

- 1 Doris investigates sound waves with the apparatus below.**



- (a) The oscilloscope screen shows this voltage-time graph for the microphone signal.

microphone  
signal in V



- (i) How should Doris calculate the frequency of the sound wave?

Put a **ring** around the correct calculation.

$$\frac{1}{8 \times 0.001}$$

$$\frac{1}{6 \times 0.001}$$

$$\frac{1}{4 \times 0.001}$$

$$\frac{1}{2 \times 0.001}$$

[1]

- (ii) Doris alters the signal generator to increase the frequency of the sound wave.

Complete each sentence by putting a tick (✓) in the box next to the correct option.

The frequency of the sound increases.

The speed of the sound ...

... DECREASES	<input type="checkbox"/>
... INCREASES	<input type="checkbox"/>
... STAYS THE SAME.	<input type="checkbox"/>

So the wavelength of the wave ...

... DECREASES	<input type="checkbox"/>
... INCREASES	<input type="checkbox"/>
... STAYS THE SAME.	<input type="checkbox"/>

[1]



**(b) Doris knows that sound is a longitudinal wave.**

**Here are some statements about longitudinal waves moving FORWARDS through solid matter.**

**Put a tick (✓) in the box next to the correct statement.**

**They carry matter with them as they pass through.** ☐

**They do not have any effect on the matter as they pass through.** ☐

**They make matter move from side to side as they pass through.** ☐

**They make matter move backwards and forwards as they pass through.** ☐

**[1]**

**(c) Complete the sentence about waves. Choose words from this list.**

**ELECTROMAGNETIC**

**EMPTY SPACE**

**SOLIDS**

**SOUND**

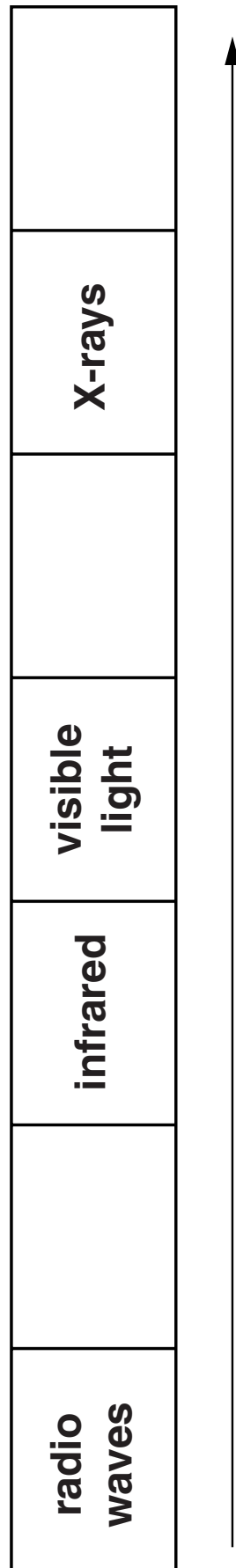
\_\_\_\_\_ waves cannot pass

through \_\_\_\_\_ .

**[1]**

**[Total: 4]**

**2 Here is an incomplete diagram of the electromagnetic spectrum.**



- (a) What wave property always increases from left to right in the diagram?

Put a ring around the correct property.

**AMPLITUDE**

**FREQUENCY**

**SPEED**

**WAVELENGTH**

[1]

- (b) Write MICROWAVES in the correct place on the diagram of the spectrum opposite.

[1]

**(c) Mark uses a microwave oven to cook some food.**

**The walls of the oven are made of metal and the door contains a metal grid.**

**Explain how microwaves can cook food safely inside the oven.**

**Your answer should include**

- **how the microwaves cook the food**
- **why the walls and door of the oven are made of metal.**

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**[3]**

**[Total: 5]**

- 3 Jack and Jill use two-way radios to communicate when they are apart.**

**(a) Jack speaks into his radio.**

**How does this affect the radio waves emitted by the aerial?**

**Put a ring around the correct word.**

**ACCELERATES**

**DIFFRACTS**

**MODULATES**

**REFRACTS**

**[1]**

- (b) Here are some possible reasons why radio waves might be used for communication.**

**Put a tick (✓) in the box next to the correct reason.**

**Radio waves cannot be reflected.** ☐

**Radio waves are absorbed by the ground.** ☐

**Radio waves travel slower than sound waves.** ☐

**Radio waves pass through the air without being absorbed.** ☐

**[1]**

**(c) Jill walks away from Jack as she listens to him on her radio.**

**The sound quality from her radio becomes poorer as she walks further away.**

**Explain why the sound quality decreases as Jill moves away.**

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**[3]**

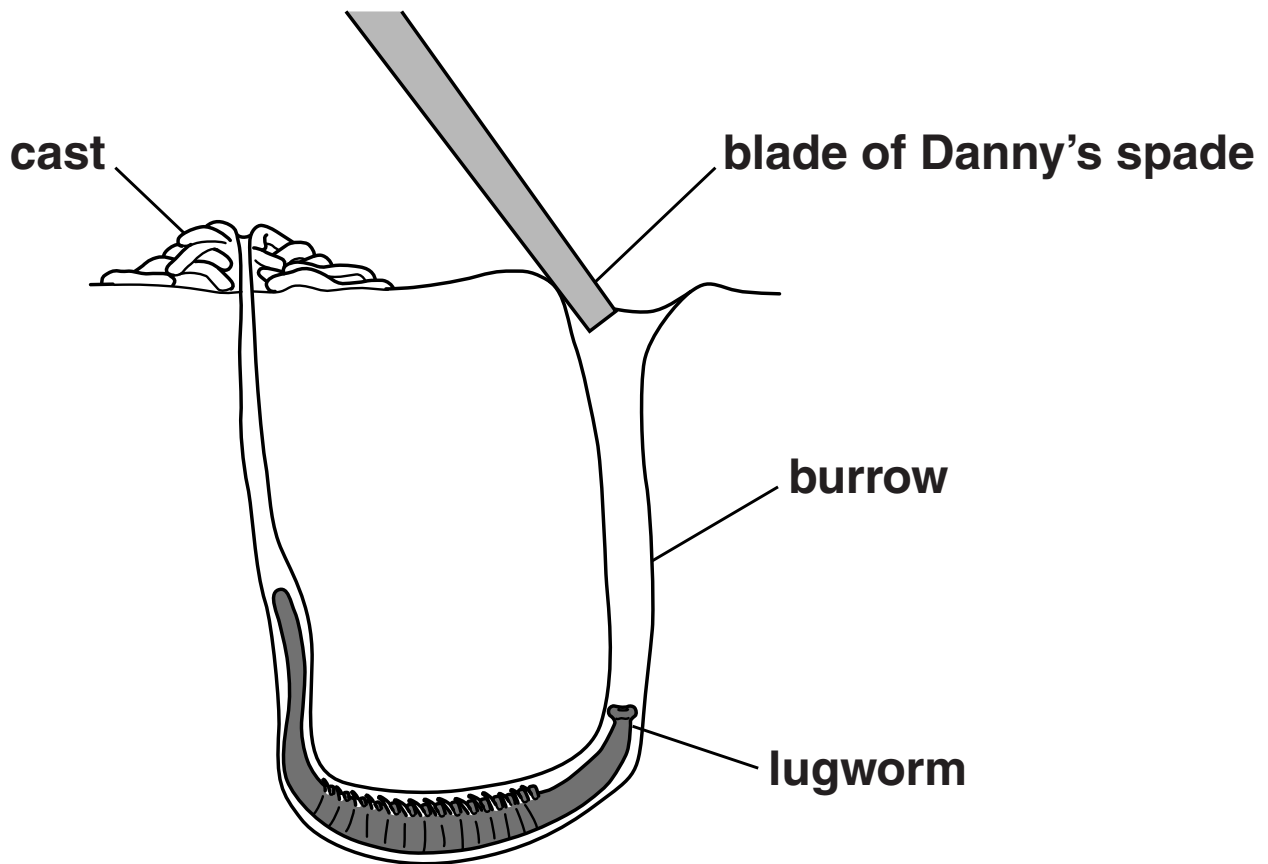
**[Total: 5]**

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**TURN OVER FOR QUESTION 4**

**4 Danny and James are digging for lugworms on the beach.**

**Lugworms are simple animals that burrow in the sand.**





- (a) When Danny digs, the worm's muscles contract, helping it to escape.

Put a tick (✓) in the box next to the correct word to complete each sentence.

The sound of Danny digging is a

RECEPTOR	<input type="checkbox"/>
RESPONSE	<input type="checkbox"/>
STIMULUS	<input type="checkbox"/>

for the lugworm.

The lugworm escapes using a

COMPLEX	<input type="checkbox"/>
SIMPLE	<input type="checkbox"/>
VOLUNTARY	<input type="checkbox"/>

reflex.

Lugworms rely on reflexes for

MOST	<input type="checkbox"/>
NONE	<input type="checkbox"/>
ALL	<input type="checkbox"/>

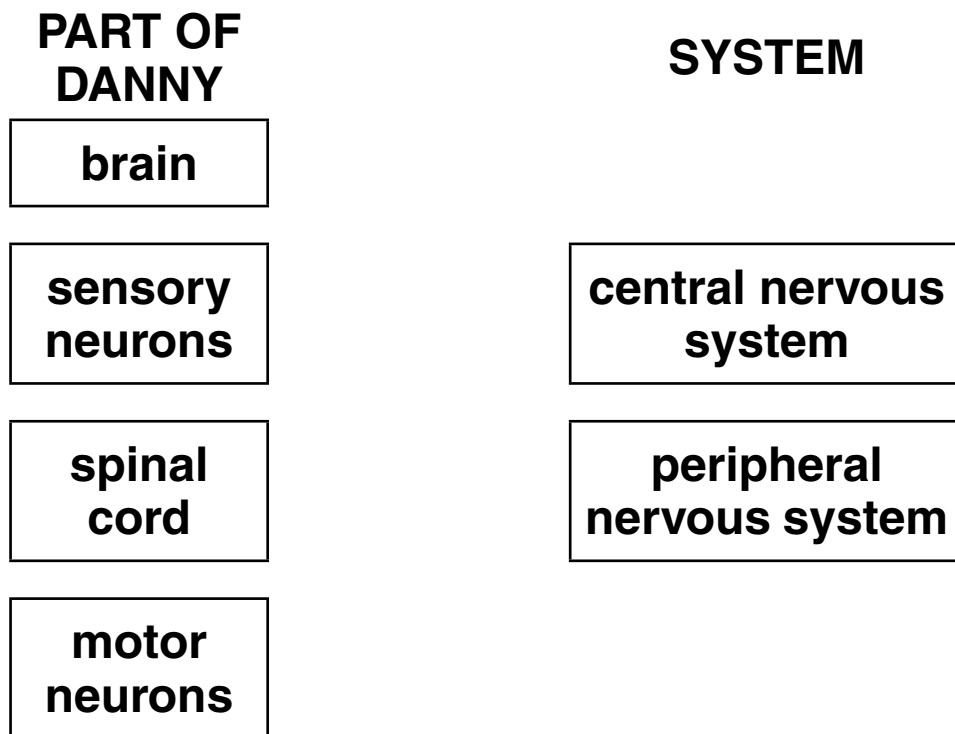
of their escape behaviour.

[2]

**(b) Danny's nervous system is more complex than the lugworm's.**

**Draw straight lines to connect each PART OF DANNY to the correct SYSTEM.**

**You should draw FOUR lines.**



**[2]**

- (c) (i) On his previous holiday, James was told how to catch lugworms.

He remembers how to do this.

Put rings around the TWO words which correctly describe memory.

TRANSLATING

LOSS

RETRIEVAL

STORAGE

UNDERSTANDING

[2]

- (ii) James uses this memory from last year to catch lugworms.

Put a tick (✓) in the box next to the correct word to complete the sentence.

James is using his

SHORT-TERM	<input type="checkbox"/>
MEDIUM-TERM	<input type="checkbox"/>
LONG-TERM	<input type="checkbox"/>

verbal memory.

[1]

[Total: 7]

**5 Emma is learning the steps of a new dance.**

**Complete the sentences opposite by choosing the best words from this list.**

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

**BILLIONS OF**

**DIRECTIONS**

**NEURONS**

**LESS**

**HUNDREDS OF**

**A FEW**

**MORE**

**PATHWAYS**

**EQUALLY**

**Emma's brain has \_\_\_\_\_ neurons.**

**These can make new \_\_\_\_\_ as she practises the new steps.**

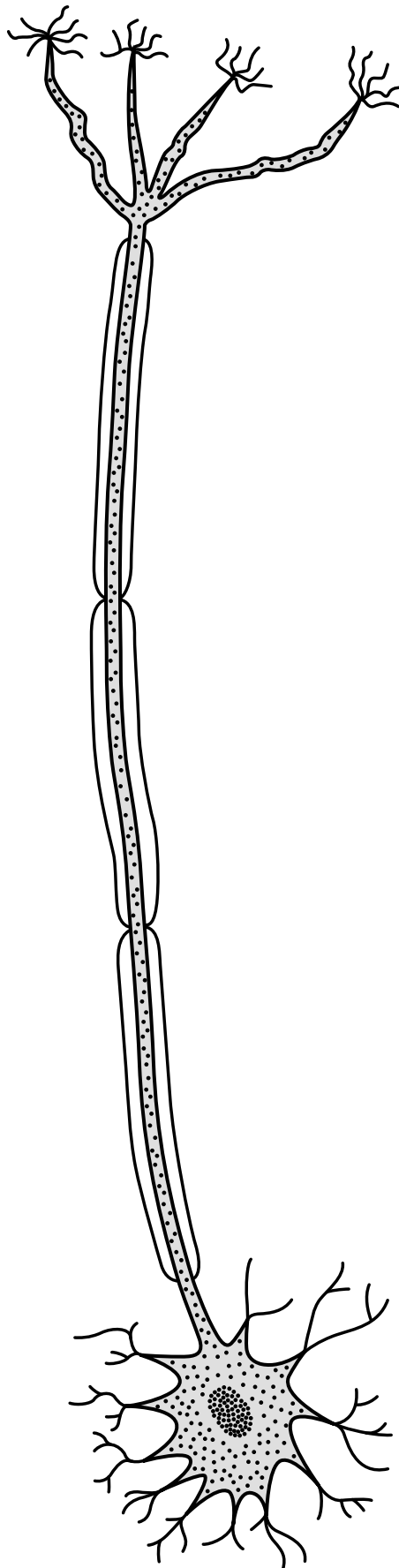
**When Emma repeats the steps, these parts of her brain are \_\_\_\_\_**

**likely to transmit impulses.**

**[3]**

**[Total: 3]**

- 6 This is a diagram of a motor neuron involved in a reflex arc.**



- (a) Explain how this helps to produce rapid responses to changes in the environment.**

**Include ideas about the neuron and the reflex arc in your answer.**

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**[3]**

- (b) The motor neuron can link to different cell types.**

**Put ticks (✓) in the boxes next to the TWO types of cell this motor neuron might send impulses to.**

**muscle cells**

☐

**skin cells**

☐

**retina cells**

☐

**hormone secreting cells**

☐

**cerebral cortex cells**

☐

**[1]**

**[Total: 4]**

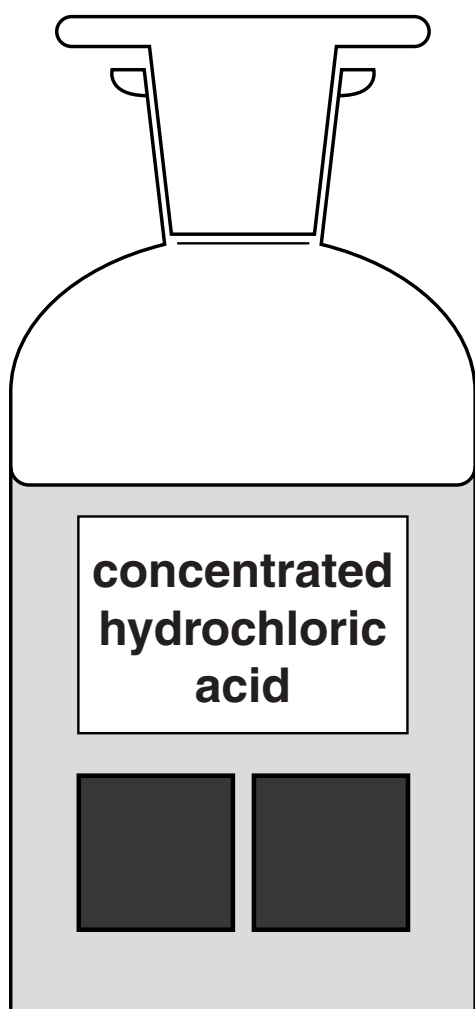
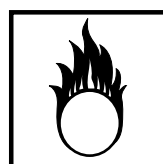
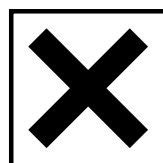
**7 Nick's water tank is blocked up with limescale.**

**He removes the limescale with concentrated hydrochloric acid.**

**(a) Concentrated hydrochloric acid is toxic and corrosive.**

**Which two symbols should go on a bottle of the acid?**

**Put ticks (✓) in the boxes next to the TWO correct answers.**

☐☐☐☐☐

**[1]**



**(b) Limescale is made of calcium carbonate,  $\text{CaCO}_3$ . It reacts with hydrochloric acid,  $\text{HCl}$ , to make calcium chloride,  $\text{CaCl}_2$ , and water and a gas.**

**(i) What is the name of the gas?**

**Put a ring around the correct answer.**

**CARBON DIOXIDE**

**HYDROGEN**

**CHLORINE**

**OXYGEN**

**[1]**

**(ii) One of the substances made is a salt.**

**What is the name of this salt?**

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

- (c) Nick adds a cupful of the acid to the limescale in the tank to remove it.**

**Not all the limescale is removed.**

**When the acid is used up, he adds another cupful.**

**How can he tell when the acid is used up?**

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

**It stops fizzing.**

☐

**The acid goes green.**

☐

**The liquid disappears.**

☐

**The limescale catches fire.**

☐

**[1]**

- (d) When Nick descales his kettle he uses a different acid.**

**He knows that when you put any acid into water it always produces the same ion.**

**What is this ion?**

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

**[Total: 5]**

**8 Mary reacts pieces of zinc with sulfuric acid to make zinc sulfate and hydrogen gas.**

**(a) Put a tick (✓) in the box next to the correct equation for this reaction.**



**[1]**

**(b) It takes time for the zinc to react.**

**Mary knows that the reaction does not keep going at the same rate all the time.**

**She wants to find out how the rate of the reaction changes.**

**What should she measure, and when should she take her measurements?**

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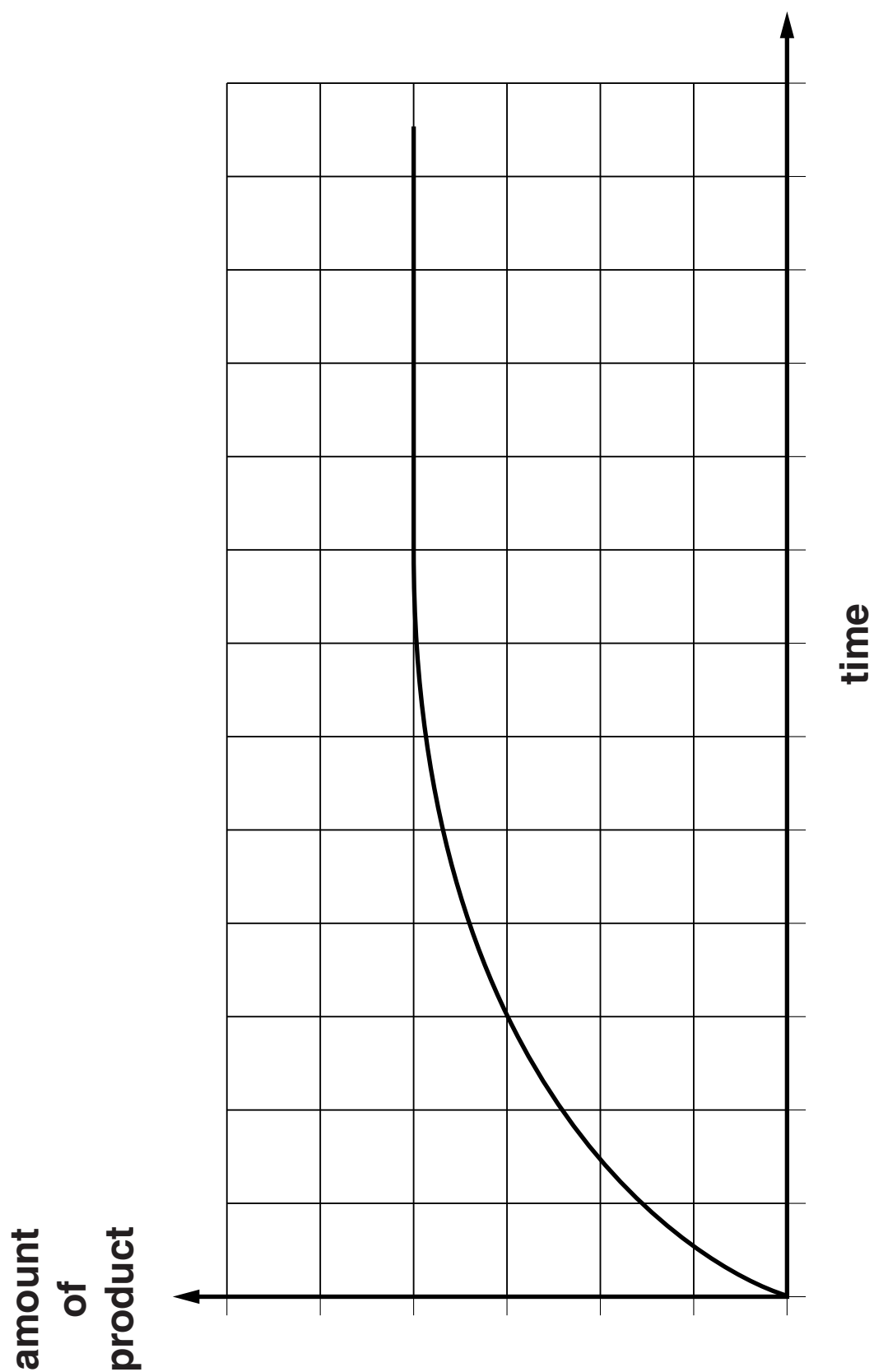
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**[3]**

**(c) Mary plots a graph of the progress of her reaction.**

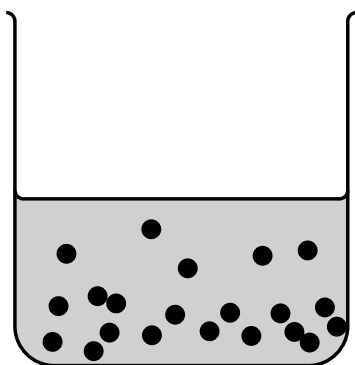


**She does the experiment again.**

**The only difference is that this time she adds a catalyst.**

**On the graph opposite draw a line to show the results of the experiment using the catalyst. [2]**

- (d) At the end of the reaction there is a solution of zinc sulfate with small pieces of zinc in the liquid.**



**Mary wants to make a clean, dry sample of the zinc sulfate.**

**She puts the zinc sulfate solution and zinc into a filter funnel.**



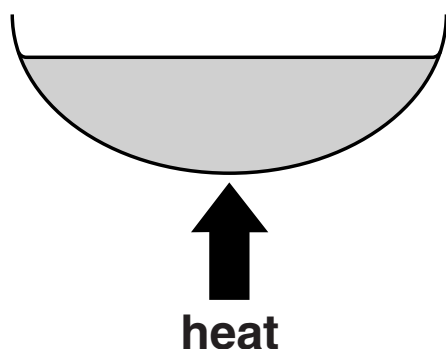
**Put ticks (✓) in the correct boxes to complete the sentences.**

**This leaves**

<b>WATER</b>	<input type="checkbox"/>
<b>ZINC</b>	<input type="checkbox"/>
<b>ZINC SULFATE</b>	<input type="checkbox"/>

**behind in the filter paper.**

**She heats the zinc sulfate solution.**



**Water from the solution goes into the air.**

**The water has ...**

<b>... CRYSTALLISED.</b>	
<b>... DISSOLVED.</b>	
<b>... EVAPORATED.</b>	
<b>... NEUTRALISED.</b>	

**So that crystals can grow, she stops heating when ...**

<b>... ALL THE WATER HAS GONE.</b>	
<b>... HALF THE WATER HAS GONE.</b>	

**She washes the crystals and then she puts them in a warm oven to ...**

<b>... DRY.</b>	
<b>... MELT.</b>	
<b>... PURIFY.</b>	

**[Total: 9]**

**[3]**

**END OF QUESTION PAPER**

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