



**EQUATIONS**

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

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

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{work done} = \text{force} \times \text{distance}$$

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

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

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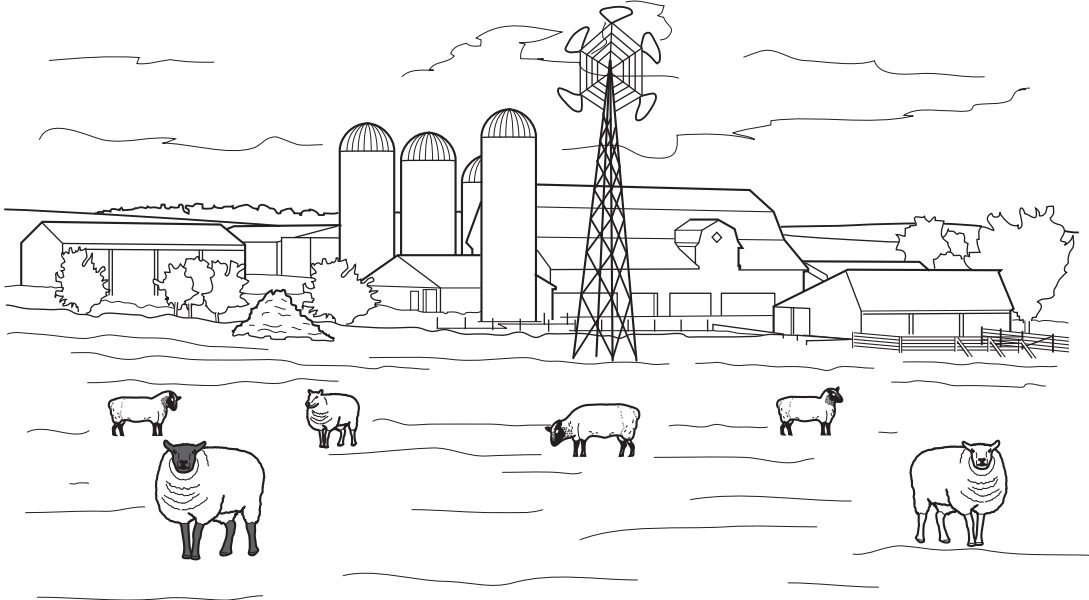
**Question 1 starts on page 4.**

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Answer **all** the questions.

**Section A – Module B3**

1 Rob has a sheep farm.



He wants to improve his flock of sheep to make more money.

(a) Look at the list of features.

**Two** features would improve his sheep to make more money.

Put a tick (✓) in the box next to these two features.

big ears

big eyes

fast growth

thick wool

wide hooves

[2]

(b) Rob chooses sheep with the best features and breeds them together to get lambs.

This is called selective breeding.

(i) Could any of the lambs be **clones** of their **parents**? .....

Explain your answer .....

..... [1]

(ii) Could any of the lambs be **clones** of **each other**? .....

Explain your answer .....

..... [1]

(c) The flock of sheep could also be improved by transferring genes from other organisms into sheep embryos.

(i) What scientific term describes transferring genes from one organism to another?

..... [1]

(ii) Suggest **one** advantage of improving sheep by transferring genes compared with selective breeding.

.....

..... [1]

[Total: 6]

2 Ethan is two years old.

His body mass has been measured every three months.

The table shows his results.

<b>age in months</b>	0	3	6	9	12	15	18	21	24
<b>mass in kg</b>	2.4	5.0	6.3	7.6	8.8	9.6	9.9	10.1	10.2

(a) Look at the table.

(i) In which three month period did Ethan's mass increase the **most**?

answer: from age ..... months to age ..... months [1]

(ii) In which three month period did Ethan's mass increase the **least**?

answer: from age ..... months to age ..... months [1]

(b) What phase of growth is Ethan in?

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

adolescence

childhood

infancy

maturity

old age

[1]

(c) Ethan started life when a sperm cell from his father joined with an egg cell from his mother.

Complete the following sentences.

The joining of a sperm cell and an egg cell is called .....

As a baby grows, more cells are formed by cell .....

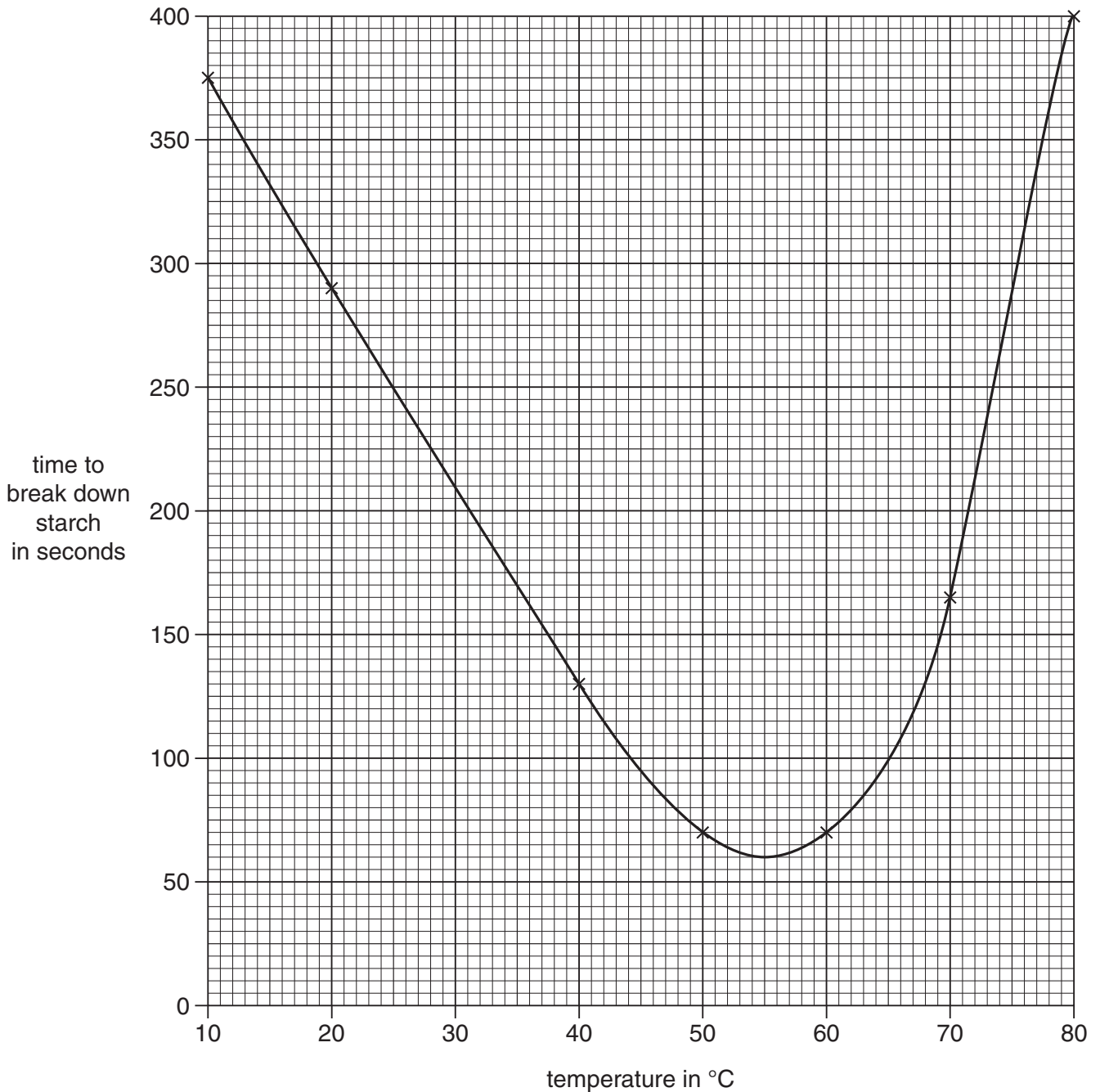
New **types** of cells are formed by cell ..... [3]

[Total: 6]

3 Amylase is an enzyme that breaks down starch.

(a) Ann investigates how quickly one type of amylase breaks down starch at different temperatures.

The graph shows her results.



Look at the graph. What is the optimum temperature of this amylase?

answer ..... °C

[1]

(b) In the digestive system, amylase helps break down starch molecules into glucose molecules.

The glucose molecules are absorbed into the blood.

(i) By what process are glucose molecules absorbed into the blood?

..... [1]

(ii) Starch has to be broken down into glucose before it can be absorbed into the blood.

Suggest why starch has to be broken down before it can be absorbed.

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

(iii) In which part of the digestive system is glucose absorbed into the blood?

..... [1]

(c) Glucose is absorbed into the blood so it can be transported around the body.

(i) Which part of the blood transports glucose?

..... [1]

(ii) Blood moves around the body because of the action of the heart.

Describe how each side of the heart moves blood around the body.

In your answer include

- how the heart moves blood
- where each side of the heart moves blood to.

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

[Total: 8]





5 Jenny investigates using different metals for electrical wiring.

Look at the table.

It shows information about four different metals.

metal	density in g/cm <sup>3</sup>	relative electrical conductivity	melting point in °C	relative thermal conductivity
iron	8	10	1536	80
aluminium	3	38	660	237
copper	9	60	1084	401
magnesium	2	23	650	156

(a) (i) Iron is the cheapest of the four metals.

Iron is **not** used for electrical wiring in houses.

Explain why. Use information from the table.

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

(ii) The picture shows some overhead power cables.



Aluminium is used for making overhead power cables instead of copper.

Aluminium is cheaper than copper.

Suggest one **other** reason why aluminium is used. Use information from the table.

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

(b) Complete the sentences about metals.

Use words from the list.

**alkalis**

**ionic**

**metallic**

**random**

**regular**

**superconductors**

The particles in a solid metal are in a ..... arrangement.

The particles in a metal are held together by ..... bonds.

At low temperatures some metals can be used as .....

**[3]**

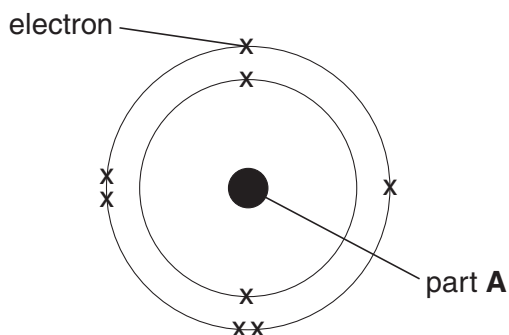
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12  
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6 This question is about atomic structure.

The diagram shows the structure of an oxygen atom.



Complete the crossword puzzle using the clues given. One has been done for you.

**clues across**

- 2 Part **A** is called the \_\_\_\_\_.
- 3 A particle with a relative mass of 1 is called a \_\_\_\_\_.
- 5 A charged atom is called an \_\_\_\_\_.

**clues down**

- 1 The space around part **A** is occupied by e l e c t r o n s.
- 4 The electrical charge on an electron is \_\_\_\_\_.

clues across →

			1 e		
2			l		
			e		
			c		
3			t	4	
			r		
			o		
			n		
			s		
				5 i	

↓ clues down

[4]

[Total: 4]

Turn over

7 Trevor works for a firework company.



(a) Trevor has seen flame tests done in a laboratory.

He wants to make a firework that gives red and lilac colours.

He needs to use two different metal compounds.

Which **two** should he use?

Choose from the list.

**copper chloride**

**iron(II) chloride**

**lithium chloride**

**sodium chloride**

**potassium chloride**

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

(b) Lithium, sodium and potassium are Group 1 elements.

(i) The Group 7 elements are called the halogens.

What are the Group 1 elements called?

..... [1]

(ii) The Group 1 elements are stored under oil.

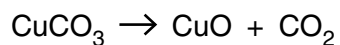
Explain why.

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

[Total: 5]

- 8 Copper carbonate decomposes when heated.

The symbol equation for this reaction is



- (a) Write down the formula for a reactant in this reaction.

.....

[1]

- (b) Copper carbonate has the formula  $\text{CuCO}_3$ .

How many **atoms** are there in this formula?

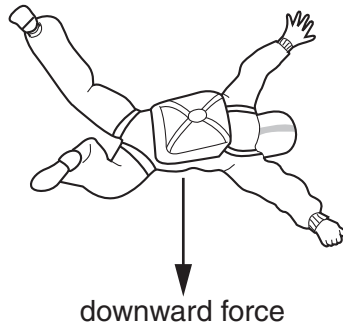
.....

[1]

[Total: 2]

## Section C – Module P3

- 9 (a) Patrick jumps out of an aeroplane wearing a parachute.



- (i) Write down the **name** of the **downward** force acting on Patrick.

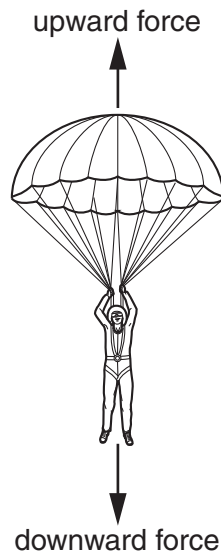
..... [1]

- (ii) What happens to Patrick's **speed** just after he jumps from the plane?

..... [1]

- (b) Patrick opens his parachute.

After a short time he falls at a steady speed.



- (i) The upward force on Patrick acts against the downward force.

Write down the **name** of the **upward** force acting on Patrick.

..... [1]



(ii) Jane wants to calculate Patrick's **speed** as he falls.

What two **measurements** will Jane need to take to calculate speed?

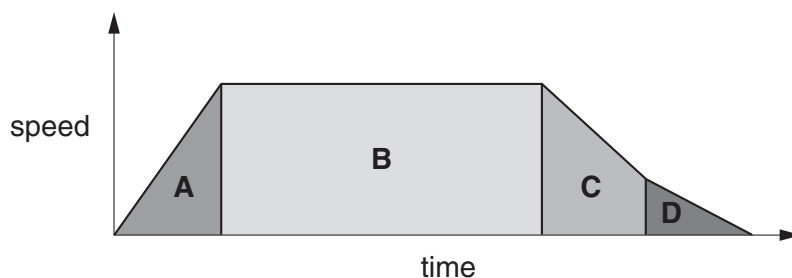
1 .....

2 ..... [2]

[Total: 5]

10 Fernando is a racing driver.

Look at the graph. It shows the speed of his car during part of a race.



(a) (i) Which part of the graph shows the car travelling at a **constant speed**?

Choose from **A B C D**

answer ..... [1]

(ii) Which part of the graph shows the car **speeding up**?

Choose from **A B C D**

answer ..... [1]

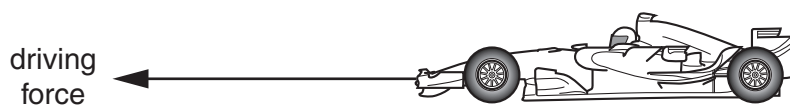
(b) In a different part of the race Fernando makes the car **accelerate** quickly.

(i) Complete the sentence.

Acceleration is the ..... in speed per unit ..... [1]

(ii) The acceleration of the car is  $5 \text{ m/s}^2$ .

The total mass of the car and driver is 1200 kg.



Calculate the **driving force**.

The equations on page 2 may help you.

.....  
 .....

answer ..... N [2]

(iii) Fernando drives the car along a **straight** part of the racing circuit.

The length of the straight part of the racing circuit is 200 m.

The driving force is now 8000 N.

The driving force stays the same along the straight part of the racing circuit.

Calculate the **work done** by the car's engine.

The equations on page 2 may help you.

.....  
.....  
.....

answer ..... J

[2]

[Total: 7]

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11 Hybrid cars are becoming more popular with motorists.



Some hybrid cars run on fuels made from fossil fuels. They store and reuse energy from braking.

Look at the table.

type of car	type of fossil fuel	engine size	fuel consumption in kilometres travelled per litre of fuel
hybrid	petrol	medium	25
non-hybrid	petrol	medium	12
non-hybrid	diesel	medium	16
non-hybrid	petrol	small	14

These cars have the same shape and mass.

Suggest how cars can be made **more efficient**.

Use the information in the table to write about

- the type of car
- the type of fossil fuel used by the car
- the engine size.

.....

.....

.....

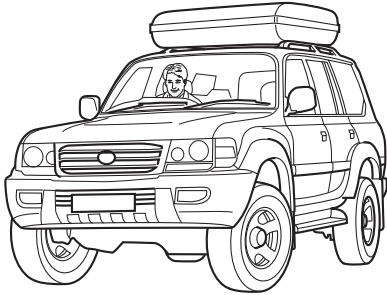
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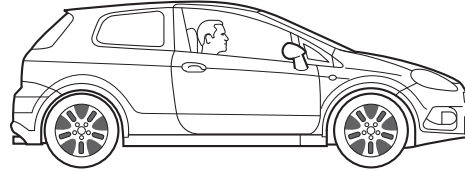
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12 Look at the two cars.

They have the same size engine.



**car A**  
four wheel drive SUV  
mass = 2000 kg  
top speed = 140 km/h



**car B**  
super-mini  
mass = 1400 kg  
top speed = 170 km/h

(a) (i) Both cars accelerate.

Car **B** has higher acceleration.

Suggest **one** reason why car **B** has **higher** acceleration.

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

(ii) The cars are driven up a hill to the same height.

Car **A** has more gravitational **potential** energy (PE) than car **B**.

Why does car **A** have **more** potential energy?

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

(iii) What is the unit for **energy**?

Choose from the list.

- joule
- metre
- newton
- watt

answer ..... [1]

(b) Car **A** then travels down the hill.

The car travels at **twice** the speed that it did on the way up.

Complete the sentence to show how much the kinetic energy (KE) of the car changes.

As the **speed** of the car doubles, the KE of the car ..... [1]

(c) Both cars have similar safety features.

They both have crumple zones, air bags and seat belts.

These safety features can reduce injuries in a **crash**.

Look at the statements.

Which one is correct?

<b>A</b>	in a crash the safety features <b>produce</b> energy
<b>B</b>	in a crash the safety features <b>destroy</b> energy
<b>C</b>	in a crash the safety features <b>absorb</b> energy
<b>D</b>	in a crash the safety features <b>increase</b> the energy

answer .....

[1]

[Total: 5]

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