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| Candidate forename | | | | | | Candidate surname | | | | | |
| Centre number | | | | | | Candidate number | | | | | |

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B623/02

GATEWAY SCIENCE
ADDITIONAL SCIENCE B

Unit 1 Modules B3 C3 P3 (Higher Tier)

WEDNESDAY 30 MAY 2012: Afternoon

DURATION: 1 hour
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.
- A list of physics equations is printed on page three.
- An enlarged copy of the Periodic Table will be provided.
- The total number of marks for this paper is 60.

EQUATIONS

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

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

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

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

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

$$\text{kinetic energy} = \frac{1}{2} mv^2$$

$$\text{potential energy} = mgh$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

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

Answer all the questions.

SECTION A – MODULE B3

1 This question is about growth.

(a) Human growth occurs because new cells are produced by cell division.

Name the type of cell produced and this type of cell division.

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

- | | | |
|-----------------------|--------------------------|------------|
| diploid | <input type="checkbox"/> | |
| haploid | <input type="checkbox"/> | |
| meiosis | <input type="checkbox"/> | |
| mitosis | <input type="checkbox"/> | |
| multiplication | <input type="checkbox"/> | [2] |

(b) How does growth in humans differ from growth in plants?

_____ **[1]**

(c) Look at the table.

It shows the gestation period (length of pregnancy) of different mammals.

| MAMMAL | GESTATION PERIOD IN DAYS |
|-----------------|---------------------------------|
| dog | 61 |
| hamster | 16 |
| human | 266 |
| rhino | 480 |
| sea lion | 360 |

Suggest why the gestation periods for different mammals are NOT the same.

_____ **[1]**

(d) Stem cells are UNDIFFERENTIATED.

What is meant by undifferentiated?

_____ **[1]**

- (e) Some microorganisms are multi-cellular. Other microorganisms are the same size but are single-celled.**

Explain why being multi-cellular allows easier movement of materials into and out of the cells.

[1]

[Total: 6]

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Question 2 follows on page 8

2 Ranjit has poor circulation.

His doctor says that Ranjit has a very high cholesterol level in his blood.

(a) Describe how cholesterol can damage Ranjit's circulation.

[2]

(b) In the UK, the average cholesterol level is 5.7 mmol per litre of blood.

Statins are drugs that lower cholesterol levels in the blood.

Ranjit has a cholesterol level of 8.5 mmol per litre of blood.

He takes a statin that lowers his blood cholesterol level by 40%.

Calculate how much lower his blood cholesterol will be than the UK average.

answer _____ mmol per litre of blood [3]

(c) Statins are taken as tablets that are swallowed.

Statins are absorbed in the small intestine by diffusion.

Describe what is meant by diffusion.

_____ [1]

(d) The small intestine is adapted for absorption of food.

Write down TWO adaptations that help the small intestine to absorb food efficiently.

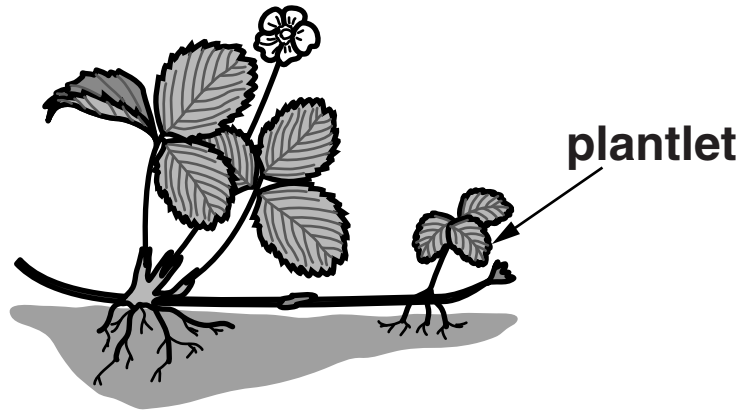
1 _____

2 _____

_____ [2]

[Total: 8]

3 Look at the drawing of a strawberry plant.



- (a) (i) Scientists can produce strawberry plants that survive freezing temperatures.**

Strawberries can now be grown in parts of the world where they could not be grown before.

Finish these sentences about the process the scientists use.

Choose words from this list.

**BREED INSERT MODIFICATION
MUTATE RESISTANCE SENSITIVITY**

**Scientists select the desired antifreeze
characteristic from an arctic fish and isolate
that gene. The scientists then**

**_____ the antifreeze
gene into the cells of the strawberry plant.**

The strawberry plant can now make the antifreeze protein that increases its

_____ to frost. [2]

- (ii) This new type of strawberry plant can be cloned to produce large numbers of plants.**

Cloning plants is easier than cloning animals.

Explain why.

_____ [2]

- (b) The antifreeze gene in arctic fish codes for a protein.**

Explain how the DNA base code in genes determines the structure of proteins.

_____ [2]

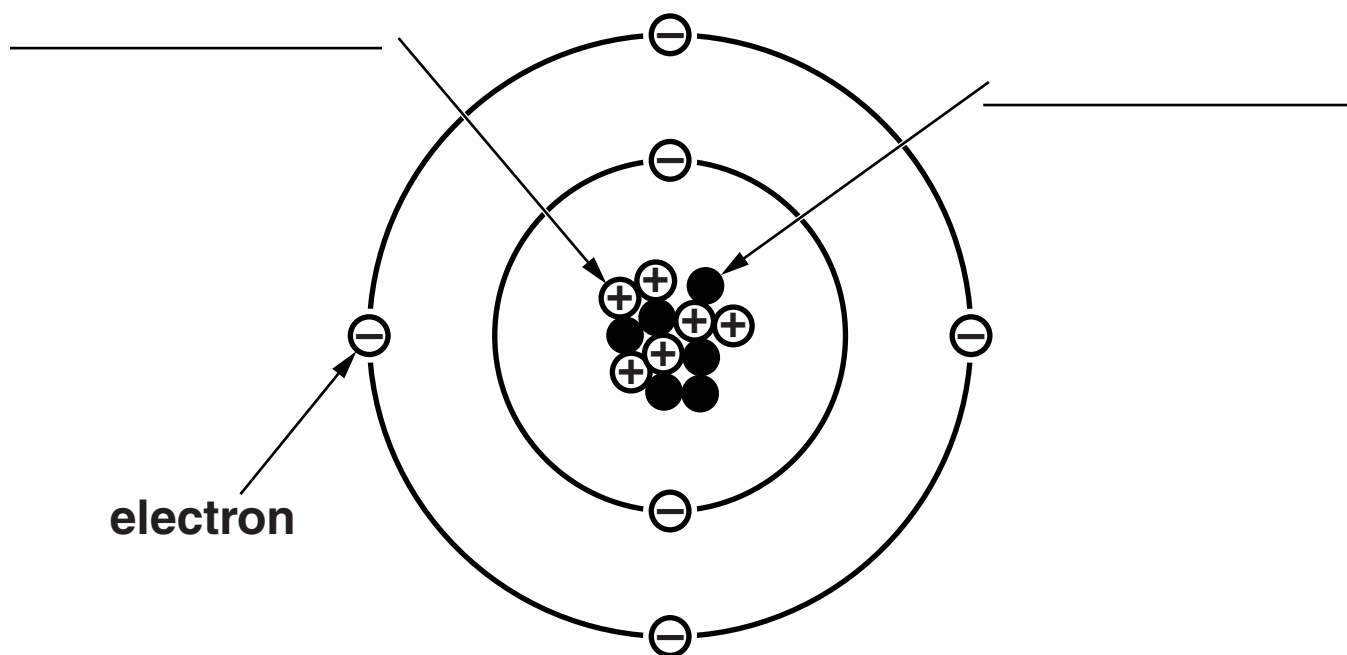
[Total: 6]

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SECTION B – MODULE C3

4 This question is about atoms.

(a) The diagram shows the particles in a carbon atom and their charges.



(i) Complete the labels on the diagram. [1]

(ii) Write down the MASS NUMBER of this carbon atom.

_____ [1]

- (b) Carbon reacts with oxygen to form carbon dioxide, CO_2 .**

The atoms join together by sharing electrons.

**Look at the dot and cross diagrams opposite.
Only the electrons in the outer shell of each atom are drawn.**

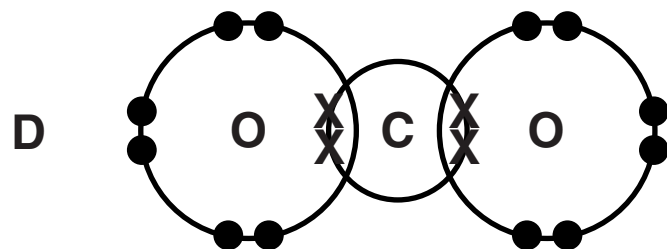
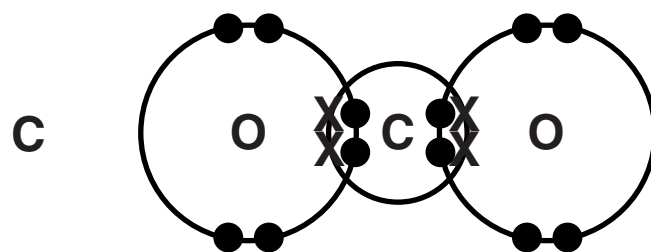
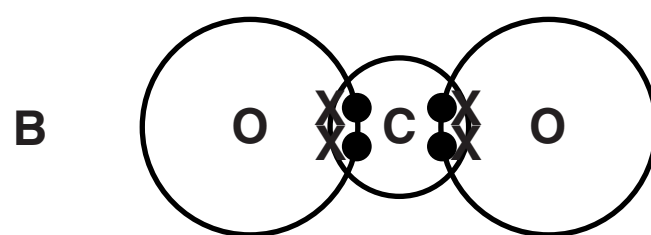
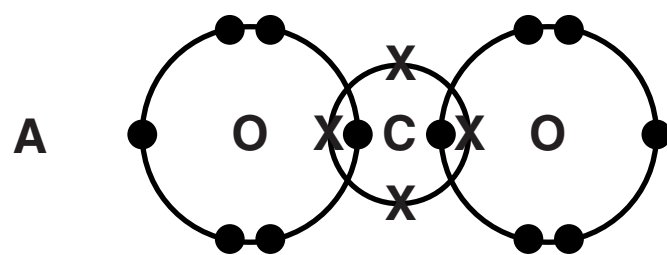
- (i) Which diagram shows the bonding in carbon dioxide?**

Choose A, B, C or D.

answer _____ [1]

- (ii) What is the TYPE OF BONDING that holds the atoms together in carbon dioxide?**

_____ [1]



(c) Carbon dioxide

- has a low melting point
- does not conduct electricity.

Explain why.

Use ideas about the structure of carbon dioxide and the forces between the molecules.

[2]

[Total: 6]

5 This question is about Group 1 metals.

Read the following newspaper article.

SODIUM BLAZE AT FACTORY

A large drum containing sodium metal burst into flames when it reacted with rainwater at a factory. The factory owner believes that the sodium, which is normally stored under oil, had been left uncovered outside by accident.

A fireman who put out the fire said, “These Group 1 metals are very dangerous.”

(a) The Group 1 metals all react with water in a similar way.

Explain why.

Use ideas about electrons.

_____ **[1]**

(b) In the accident at the factory, sodium reacted with water.

Sodium hydroxide, NaOH, and hydrogen, H₂, were made.

Write a BALANCED SYMBOL equation for the reaction.

_____ [2]

(c) Potassium reacts more violently than sodium.

Explain why.

Use ideas about electrons.

_____ [1]

[Total: 4]

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6 Look at the table opposite.

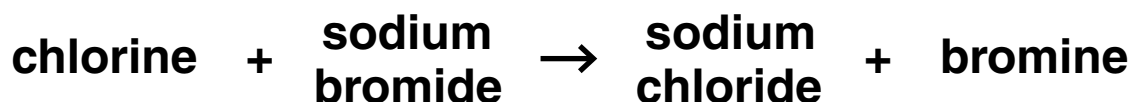
It shows some properties of Group 7 elements.

(a) Complete the table.

Use ideas about trends down a group. [3]

(b) In the table, the Group 7 elements are listed in order of their reactivity.

Look at the equation. It shows a displacement reaction of a Group 7 element.



(i) Write a WORD EQUATION for the reaction between bromine and sodium iodide.

_____ [1]

(ii) When chlorine, Cl_2 , reacts with sodium bromide, chloride ions, Cl^- , are made.

Write an IONIC EQUATION to show how chloride ions are made from a chlorine molecule.

Use e^- to represent an electron.

_____ [2]

[Total: 6]

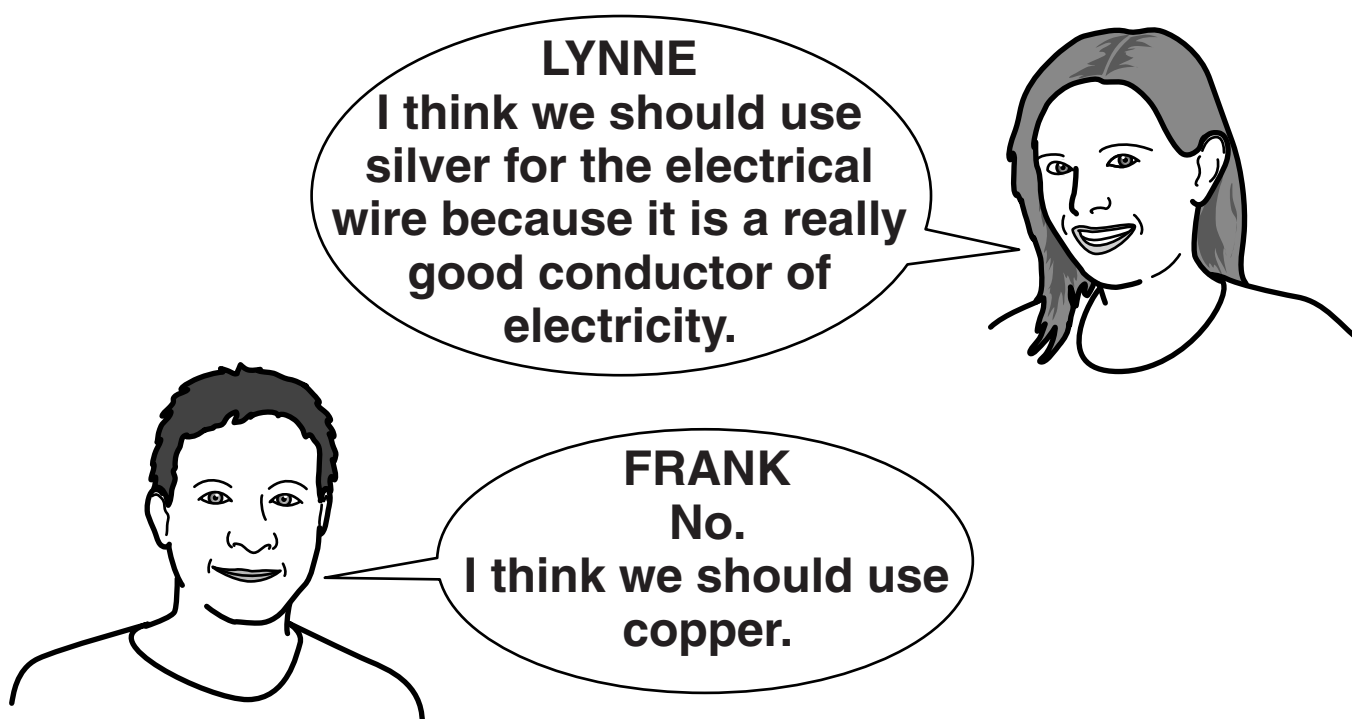
| ELEMENT | MOLECULAR FORMULA | STATE AT ROOM TEMPERATURE | COLOUR | RADIUS OF AN ATOM IN nm | ORDER OF REACTIVITY |
|----------|-------------------|---------------------------|-------------|-------------------------|--|
| fluorine | F_2 | gas | pale yellow | 0.072 | <div> <div>most reactive</div> <div>↓</div> <div>least reactive</div> </div> |
| chlorine | Cl_2 | _____ | pale green | 0.099 | |
| bromine | Br_2 | liquid | _____ | 0.114 | |
| iodine | I_2 | solid | grey | 0.150 | |
| astatine | At_2 | solid | black | _____ | |

7 This question is about metals.

Look at the table opposite. It shows the properties of some metals.

- (a) Lynne and Frank are making a string of lights to hang on the outside of their house.**

Look at what they say about the wire for the lights.



Suggest why Frank thinks they should use copper.

Use the table to help you.

[2]

| METAL | MELTING POINT IN °C | DENSITY IN g/cm³ | RELATIVE ELECTRICAL CONDUCTIVITY | COST PER TONNE IN £ |
|------------------|--------------------------------|--|---|--------------------------------|
| aluminium | 660 | 2.7 | 40 | 1350 |
| copper | 1083 | 8.9 | 64 | 3800 |
| iron | 1535 | 7.9 | 11 | 400 |
| silver | 962 | 10.5 | 67 | 20000 |

- (b) Saucepans made from iron often have copper bases.**

Suggest a property of copper, NOT GIVEN IN THE TABLE, that makes it useful for the base of a saucepan.

_____ **[1]**

- (c) Metals have HIGH MELTING POINTS.**

Put a tick (✓) next to the statement which explains why metals have high melting points.

Metals have electrons that can move. ☐

Metals have particles in a regular arrangement. ☐

Metals have strong metallic bonds. ☐

Metals are superconductors. ☐ **[1]**

[Total: 4]

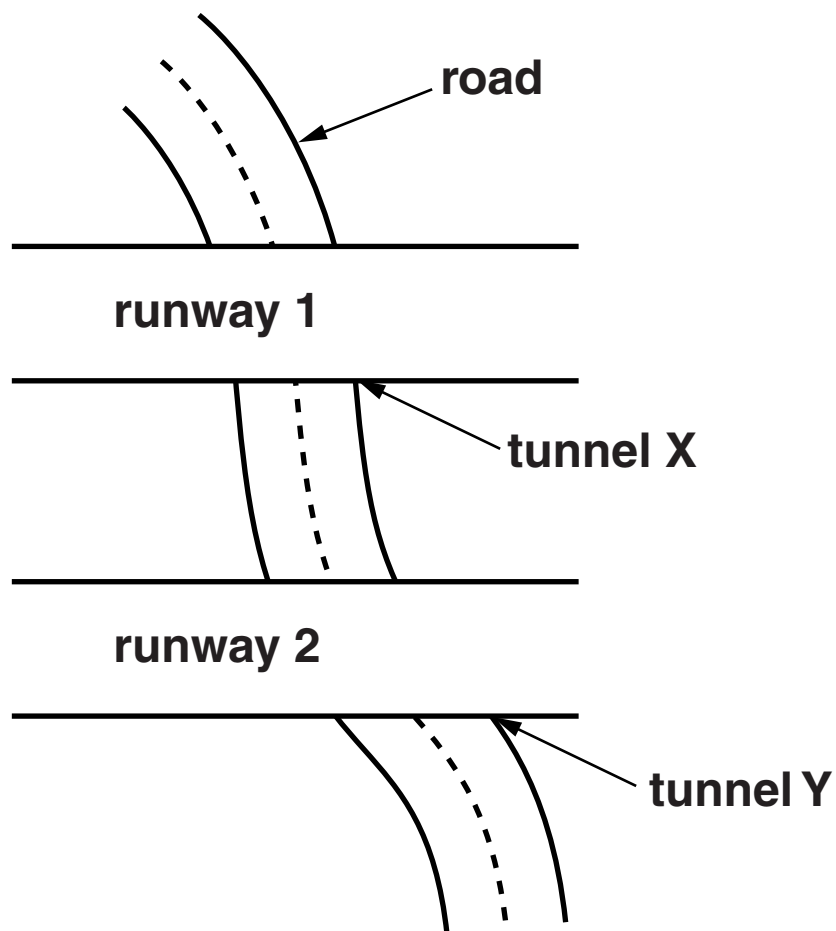
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SECTION C – MODULE P3

8 This question is about speed and acceleration.

Look at the drawing. It shows the two runways at Manchester Airport. A road passes through tunnels underneath the runways.

The tunnels are of equal length.



- (a) Look at the information Katy collects about five cars passing through tunnel X and then through tunnel Y.

| CAR | TIME TAKEN TO DRIVE THROUGH TUNNEL X IN SECONDS | TIME TAKEN TO DRIVE THROUGH TUNNEL Y IN SECONDS |
|-----|---|---|
| A | 20 | 22 |
| B | 25 | 24 |
| C | 27 | 27 |
| D | 27 | 21 |
| E | 23 | 26 |

In the tunnels, each car travels at a steady speed.

Between the tunnels, the cars change speed uniformly.

Which car **DECELERATES** the most between tunnel X and tunnel Y?

Choose from A B C D E

answer _____

[1]

(b) Car A is travelling at 30 m/s through tunnel X.

Calculate the LENGTH of tunnel X.

The equations on page 3 may help you.

answer _____ m [1]

(c) Katy buys a new car.

It has a mass of 900 kg.

The car can accelerate from 0 to 20 m/s in 4 seconds.

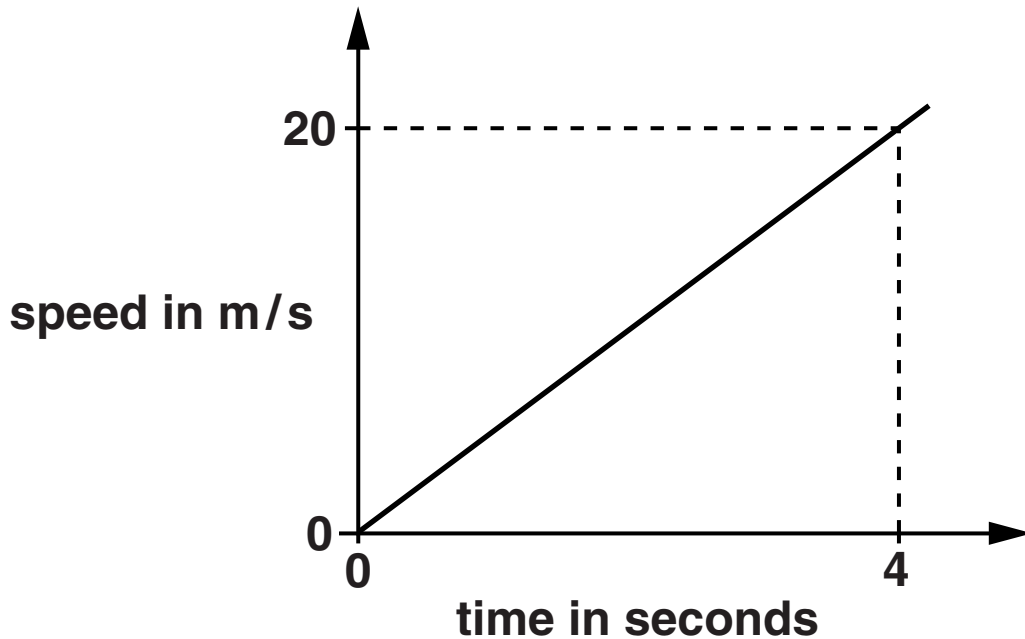
Calculate the accelerating FORCE.

The equations on page 3 may help you.

answer _____ N [3]

- (d) The graph shows how the speed of Katy's car changes with time.

Look at the graph.



How can she use the graph to find the **DISTANCE** travelled in the first four seconds?

[1]

[Total: 6]

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- 9 This question is about thinking, braking and stopping distances.

(a) Look at the table.

Put ticks (✓) in the boxes to show which distance is affected by each condition in the table.

The first one has been done for you.

| CONDITION | THINKING DISTANCE | BRAKING DISTANCE |
|--------------------------|----------------------|---------------------|
| increased speed | ✓ | ✓ |
| icy road | | |
| bald tyres | | |
| tired driver | | |
| driver has drunk alcohol | | |

[2]

(b) Two cars travel at the same speed in the same lane of a motorway.

Car B is behind car A.

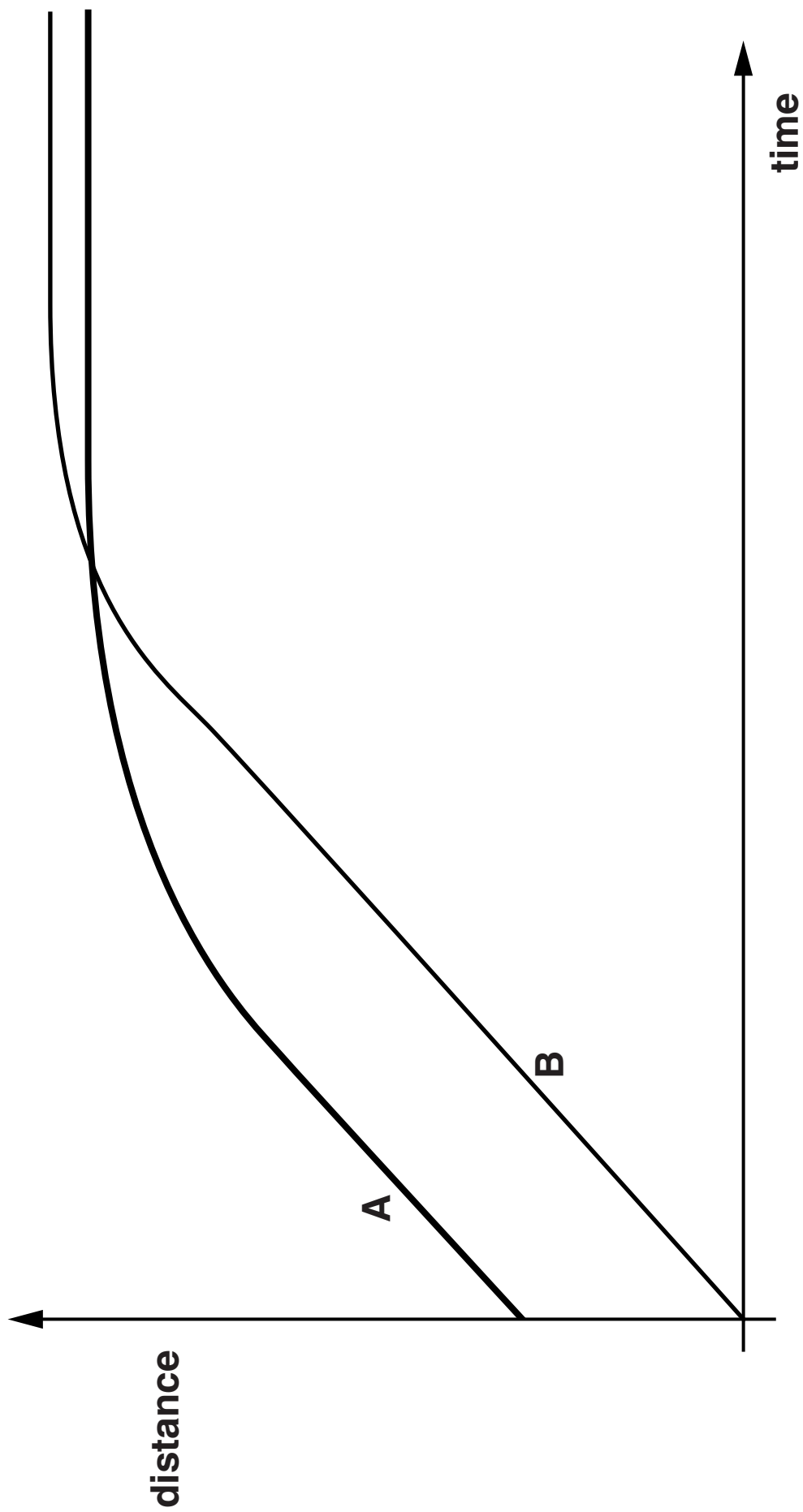
Look at the sketch graph opposite.

When the driver of car A brakes, the driver of car B sees the brake lights and also brakes.

Use information in the graph to explain why car B was too close to car A, and needed to swerve to avoid car A.

[2]

[Total: 4]



10 (a) Lucy investigates road safety.

She collects data for three different road safety features.

Look at the data.

| SAFETY FEATURE | INITIAL CAR SPEED IN m/s | STOPPING DISTANCE IN METRES | TIME FOR CAR TO STOP IN SECONDS |
|--------------------------------|---|--|--|
| escape lane | 30 | 20 | 1.30 |
| metal crash barrier | 30 | 4.5 | 0.30 |
| concrete barrier | 30 | 0.5 | 0.03 |

Use the data in the table to explain which safety feature is likely to result in MOST injury.

Use ideas about forces and acceleration in your answer.

[3]

(b) The braking distance depends on the deceleration of the car.

The frictional force between the tyres and the road is reduced by slippery road conditions.

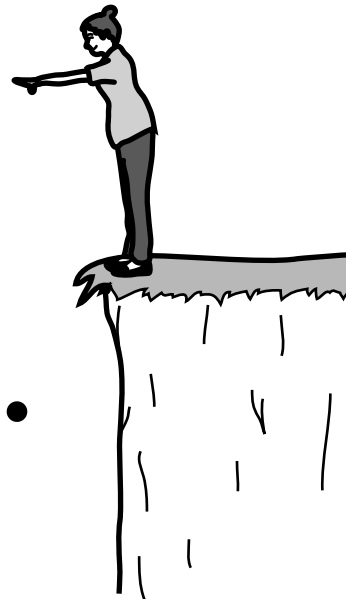
Explain why braking distance is increased by slippery road conditions.

The equations on page 3 may help you explain your answer.

[2]

[Total: 5]

11 Jenny drops a ball from a cliff.



(a) Draw LABELLED arrows to show the forces acting on the ball as it falls. [2]

(b) The speed of the ball increases until it reaches terminal velocity.

(i) Explain in terms of the forces acting on the ball what happens at terminal velocity.

[1]

- (ii) The gravitational potential energy and the kinetic energy of the ball change during the fall.

Describe these changes from the moment the ball is dropped until just before it hits the ground.

gravitational potential energy _____

kinetic energy _____

_____ [2]

[Total: 5]

END OF QUESTION PAPER

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