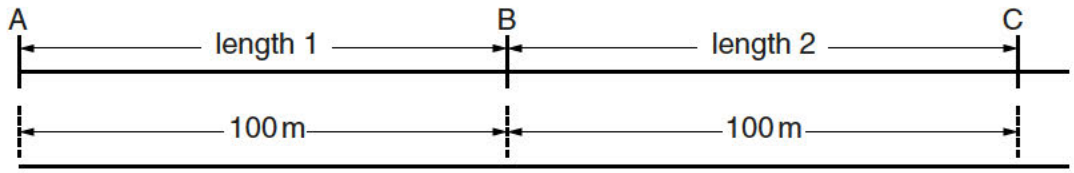
1 This question is about speed.

(a) Pupils at a school measure the time cars take to travel two 100 m lengths.

Look at the diagram.



Look at the results that they collect for four cars passing the school.

Type of car	**Time taken to travel length 1 in seconds**	**Time taken to travel length 2 in seconds**
Golf	9	8
Fiat	8	8
Jaguar	8	9
Skoda	7	7

(i) Which car's speed is increasing as it travels from **A** to **C**?

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

(ii) The speed limit on the road in front of the school is 13 m/s.

Calculate the time it takes for a car travelling at a speed of 13 m/s to travel 100 m.

Use your answer to explain if any of the cars are travelling faster than the speed limit.

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

(b) Look at the information about thinking distance and braking distance for cars travelling at 13 m/s.

Driver	Thinking distance in metres	Braking distance in metres
Sam	9	14
Chris	9	25
Jo	15	14
Ben	7	10

One of the drivers is tired after driving for several hours.

Suggest which driver is tired.

answer .....

Explain fully why you chose this driver .

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One of the drivers was driving on an icy road.

Suggest which driver was driving on an icy road.

answer .....

Explain fully why you chose this driver.

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[2]

(c) Sam's car uses a biofuel.

She says that, over time, this does not increase the amount of carbon dioxide in the atmosphere.

Is she correct?

Explain your answer.

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(d) Some cars are fitted with ABS brakes to reduce injuries and save lives.

Describe how **ABS** works and under what conditions it is used.

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2 (a) Ben is considering buying a new car.

He investigates how the cost of a journey changes with the speed of the car and the distance travelled.

He does this for a car with a petrol engine and a car with a diesel engine. Both cars have the same size engine.

Look at the table for a petrol car.

	Speed in km/hr	Cost of fuel per km for different distances in pence		
		5 km	25 km	100 km
Petrol	10	38.2	38.2	38.2
	40	17.8	17.8	17.8
	80	10.0	10.0	10.0
	120	17.4	17.4	17.4

Look at the table for a diesel car.

	Speed in km/hr	Cost of fuel per km for different distances in pence		
		5 km	25 km	100 km
Diesel	10	30.6	30.6	30.6
	40	14.2	14.2	14.2
	80	8.4	8.4	8.4
	120	13.9	13.9	13.9

What conclusions can Ben make about the costs of fuel per km travelled using this data?

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(b) Battery powered cars cost much less to drive per km than petrol or diesel cars but they have some disadvantages.

Write down one disadvantage of using a battery powered car rather than a petrol or diesel car.

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

3 Daisy is going to buy a car.

She looks at some data about five cars.

Car	Engine size in cm^3	Maximum speed in km/h	Emission of CO_2 in g/km	Fuel used per 100 km in litres
A	1000	157	109	4.6
B	1000	157	110	4.7
C	1300	166	104	3.9
D	1400	214	148	6.3
E	2000	206	155	5.5

(a) (Which car is the most economical to run over a journey of 50 km?

Choose from: **A**

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

(ii) Daisy takes car **A** for a long test drive.

The manufacturer's data states that it will use 4.6 litres of fuel for a journey of 100 km.

She finds that it uses more fuel than this.

Suggest reasons why.

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(b) Daisy considers getting an electric car.

Her friend tells her that they have lots of disadvantages compared with petrol or diesel cars.

Write about the advantages and disadvantages of electric cars.

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[Total: 6]

4 Scientists investigate the safety of seat belts.

They use two cars. Each car has an identical dummy in the driver's seat.

Both cars are crashed, at the same speed, into identical barriers.

In one car, the dummy is wearing a seat belt. In the other car, the dummy is not wearing a seat belt and hits the windscreen in the collision.



Look at the results.

	Crash with seat belt	**Crash without seat belt**
Mass of dummy	60 kg	60 kg
Distance travelled by dummy whilst stopping	60 cm after seat belt locked	20 cm after hitting windscreen
Time taken for dummy to stop moving	0.08 sec	0.03 sec
Deceleration	175 m/s^2	467 m/s^2
Stopping force	10500 N	

Calculate the missing data and use the information in the table to explain how seat belts reduce injury in a crash.



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

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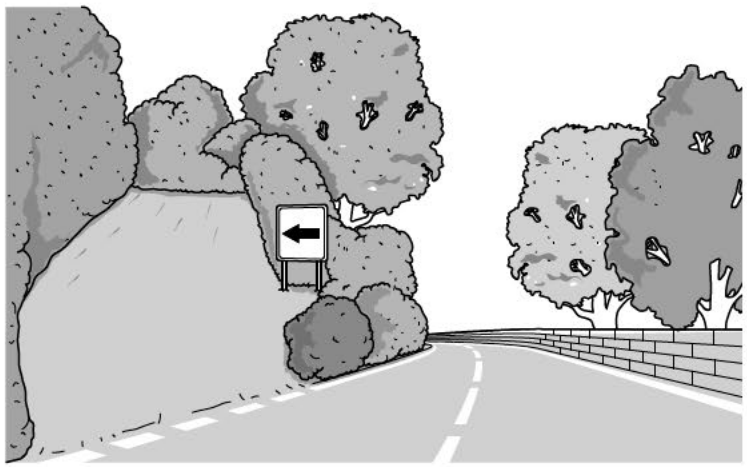
..... **[6]**

[Total: 6]

5 (a) There can be problems with vehicles travelling too fast down long steep hills.

For safety there are often escape lanes near the bottom of steep hills.

Look at the picture.



These escape lanes are filled with sand and sometimes slope upwards.

They allow vehicles to stop safely in an emergency when the brakes are not very effective.

Explain how these escape lanes can reduce the braking force needed by the vehicle, when the driver makes an emergency stop.

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(b) In the UK, it is illegal to travel in a car without wearing a seatbelt.

Some passengers do not like wearing seatbelts.

Write about the **risks and benefits** of wearing seatbelts for the passengers and for the wider community.

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[Total: 5]

6 Look at the extract from a newspaper article promoting electric cars.

> *Will electric cars take over our roads?*
>
> - *no need for fuel*
> - *no emissions*
> - *silent*
> - *economic to purchase*
> - *easy to charge batteries*

Electric cars could become more popular than petrol and diesel cars.

Use the points raised in the extract to identify the arguments **for** and **against** increasing the use of electric cars.

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

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[Total: 6]

7 Rufus is driving to work in his car.

In the first part of his journey he drives at a speed of 10 m/s on a dry road.

In the second part of his journey he drives at a speed of 20 m/s and it starts to rain.

Explain how the higher speed and the wet road affect:

- Rufus' thinking distance
- the car's braking distance.

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[Total: 3]