

Candidate forename						Candidate surname					
Centre number						Candidate number					

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE

B651/02

GATEWAY SCIENCE
PHYSICS B

Unit 1 Modules P1 P2 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.**
- **The total number of marks for this paper is 60.**

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

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

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

$$\text{fuel energy input} = \text{waste energy output} + \text{electrical energy output}$$

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

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

$$\text{energy (kilowatt hours)} = \text{power (kW)} \times \text{time (h)}$$

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

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

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

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

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

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

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

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

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

Answer ALL the questions.

SECTION A – MODULE P1

1 Alfie has high fuel bills for his house in winter.

He uses energy saving methods to reduce his fuel bills.

(a) Alfie has cavity foam insulation added to his house.

It costs £900.

It saves him £200 each year in fuel bills.

Calculate the PAYBACK TIME for cavity foam insulation.

answer _____ years [1]

- (b) Alfie has a new gas fire fitted. He thinks it is better than his old fire.

Look at the information in the table.

	OLD FIRE	NEW FIRE
ENERGY INPUT BY GAS IN J	2000	_____
HEAT OUTPUT TO ROOM IN J	880	900
WASTED ENERGY THROUGH EXHAUST GASES IN J	1120	_____
EFFICIENCY	_____	_____

Alfie's new fire has **TWICE** the efficiency of the old fire.

Complete the table for both fires.

CALCULATE THE EFFICIENCY OF THE OLD FIRE FIRST.

The equations on page 3 may help you.

[3]

[Total: 4]

2 This question is about waves.

- (a) Of all the radiations in the electromagnetic spectrum gamma radiation has the highest frequency.**

What does FREQUENCY mean?

[1]

- (b) LASER BEAMS are used in CD players.**

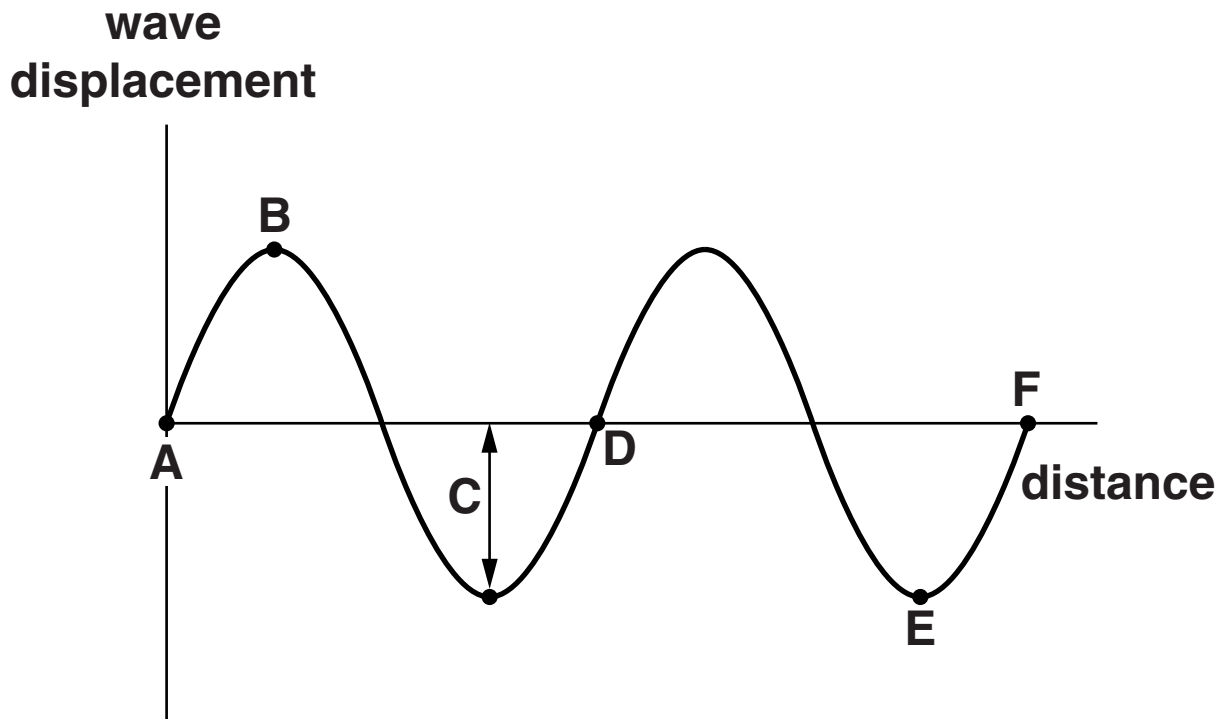
Explain how a laser beam is used in a CD player.

In your answer write about

- what a laser beam is**
- how information is stored on the CD**
- how information is retrieved from the CD using the laser beam.**

[4]

(c) Look at the diagram of a wave.



The distance between A and F is 8 cm.

The frequency of the wave is 0.6 Hz.

What is the SPEED of the wave?

The equations on page 3 may help you.

Choose from

0.15

2.4

4.8

7.4

8.6

answer _____ cm/s [1]

(d) Microwaves are used to cook food.

(i) A potato is cooked in a microwave oven.

Explain what happens to the potato when it absorbs microwaves.

Use ideas about particles in your answer.

_____ **[1]**

(ii) Microwave ovens have SHINY metal walls inside.

Explain why.

_____ **[1]**

(iii) Ready meals for the microwave oven cook quickly.

These meals are usually about 2 cm thick.

Suggest why.

_____ **[1]**

(iv) Microwave turntables and dishes are made of glass.

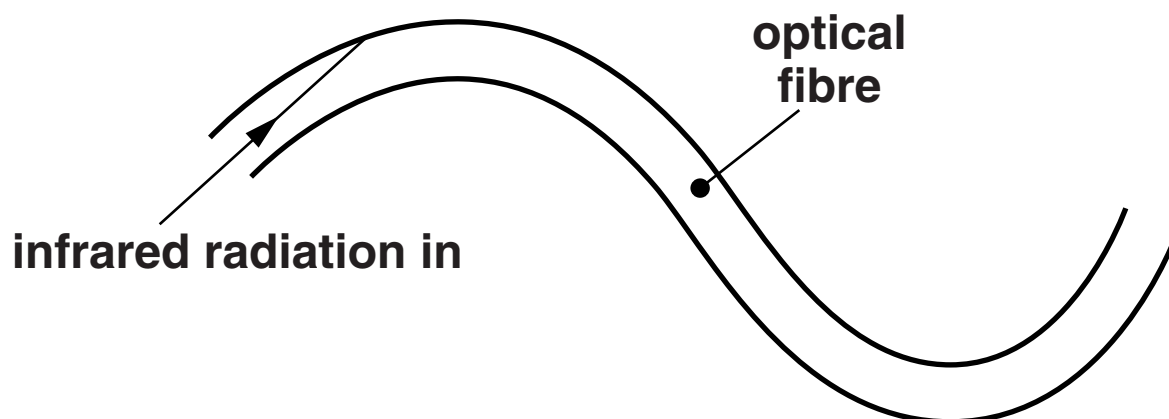
Explain why.

[1]

[Total: 10]

3 This question is about communicating using waves.

(a) (i) Look at the diagram of an optical fibre.



Infrared radiation travels along the fibre from one end to the other.

Describe HOW the infrared radiation travels along the fibre.

[2]

(ii) Optical fibres are used to transmit information.

Information can be carried by ANALOGUE or DIGITAL signals.

Describe analogue AND digital signals to show how they are DIFFERENT.

[2]

(b) ANALOGUE and DIGITAL signals are used to transmit radio broadcasts.

Explain the ADVANTAGES of using DIGITAL SIGNALS for radio broadcasts.

[2]

[Total: 6]

Answer ALL the questions.

SECTION B – MODULE P2

4 Energy from the Sun can be harnessed in different ways.

(a) Bus shelters in some parts of China have panels of photocells on the top.

The panels provide energy to light the shelter at night.

(i) The following sentences describe how electricity is produced in the photocells.

Complete the sentences.

The photocells _____ light energy from the Sun and transfer it to electricity.

The light energy causes _____ to be _____ from the silicon atoms.

The _____ of _____ creates a current in the circuit.

[2]

(ii) The photocells charge a battery during the day.

**At night the battery delivers a current of 2.5 A
at a voltage of 12V for 8 hours.**

Calculate the POWER output from the battery.

The equations on page 3 may help you.

answer _____ W [2]

**(b) Winds blowing on Earth are caused by energy
from the Sun.**

**The energy of the wind can be harnessed using
wind turbines.**

**A factory in the North of England gets about 10%
of its energy from wind turbines.**

**Describe one ADVANTAGE and one
DISADVANTAGE of using wind turbines.**

ADVANTAGE _____

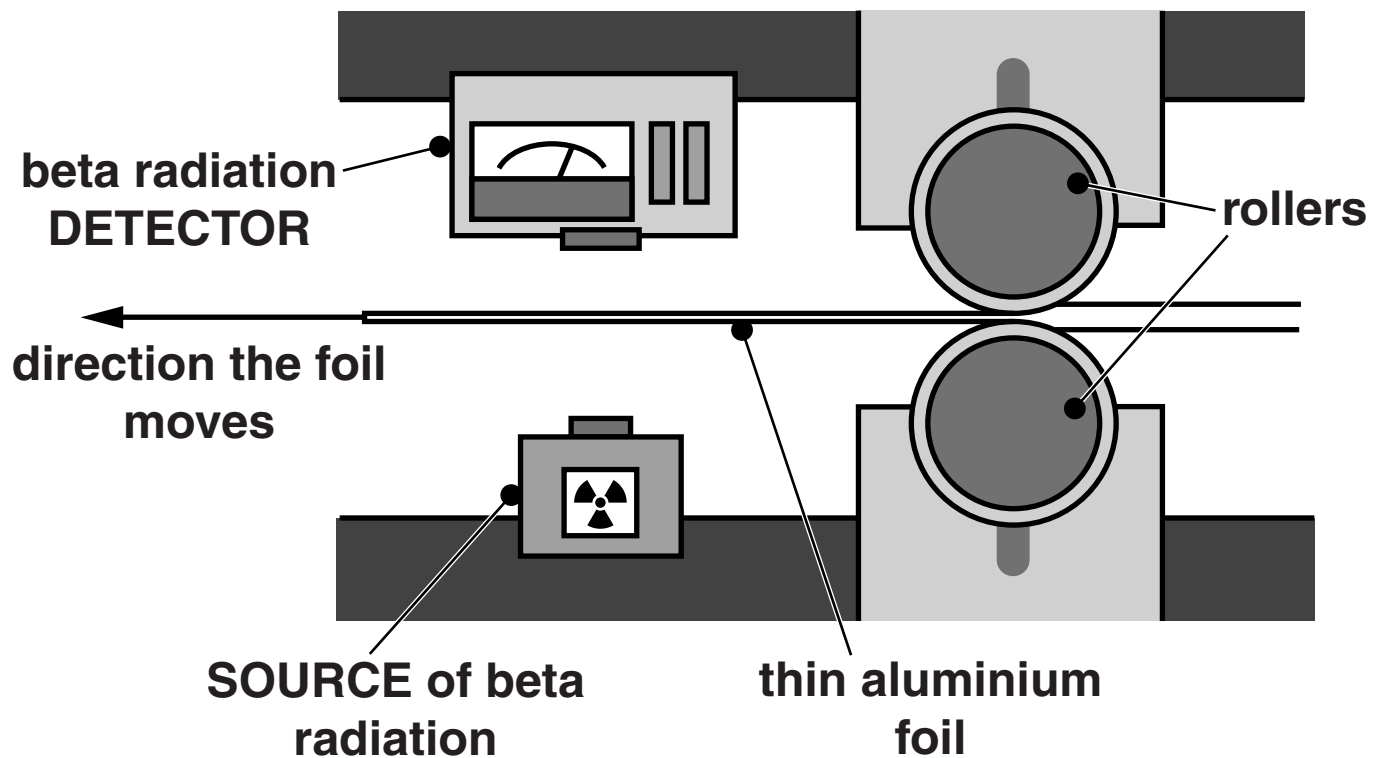
DISADVANTAGE _____

_____ [2]

[Total: 6]

- 5 Beta radiation is used in a factory to monitor the thickness of aluminium cooking foil.

The diagram shows the system being used.



- (a) The source of radiation and the radiation detector are fixed in place.

As the foil passes between the source and the detector, the amount of beta radiation detected suddenly drops.

Suggest why this happens.

[1]

(b) Why is alpha radiation NOT used for monitoring the thickness of the foil?

_____ [1]

(c) The radioactivity of the beta source decreases over time.

When it is no longer useful, it becomes radioactive waste that cannot be disposed of in a landfill site.

Describe ONE way of safely disposing of it.

_____ [1]

[Total: 3]

6 Solar flares are given out by the Sun.

Solar flares and the Sun are both examples of objects in the Solar System.

(a) Look at the objects in the Solar System and the statements which describe them.

Draw ONE line from each OBJECT to the correct 1st STATEMENT.

Draw ONE line from each 1st STATEMENT to the correct 2nd STATEMENT.

OBJECT	1st STATEMENT	2nd STATEMENT
Earth and Moon	centre of Solar System	ejected at very high speed
solar flare	formed when planets collided	planets orbit it
Sun	clouds of charged particles	iron cores merged when created

[2]

(b) Complete the sentences about asteroids and comets.

Asteroids are made of rock and are left over from

_____ .

A comet is made of _____ and

_____ .

[2]

[Total: 4]

7 Electricity is produced on a large scale in power stations.

(a) Some power stations use NUCLEAR FUEL rather than a fossil fuel.

Describe the advantages AND disadvantages of NUCLEAR power stations.

[3]

(b) The diagram opposite represents the energy use in a power station.

The efficiency of the power station is 40%.

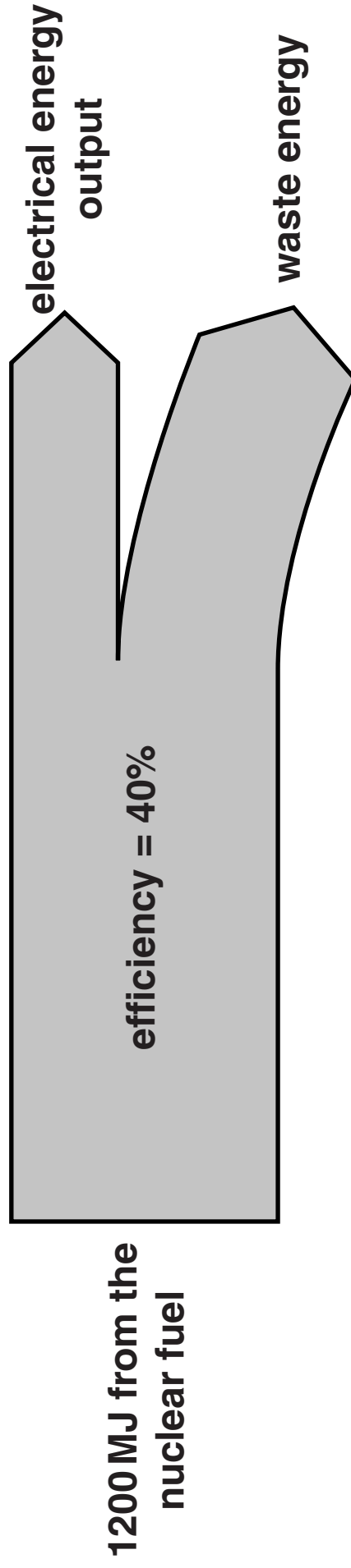
Calculate the WASTE ENERGY for each 1200 MJ of energy from the nuclear fuel.

The equations on page 3 may help you.

answer _____ MJ

[2]

[Total: 5]



8 Sanjay is learning about the Big Bang at the start of the Universe.

He starts to make some notes.

Complete Sanjay's notes.

According to the Big Bang theory, the Universe started with a huge explosion.

The Universe is still expanding.

**Most galaxies are moving _____
_____ .**

**but distant galaxies are moving _____
_____ .**

**Scientists detect _____ radiation
from the Big Bang coming from all parts of the
_____ .**

[2]

[Total: 2]

Answer ALL the questions.

SECTION C – MODULE P3

9 Pujitha and Anna have different cars.

Pujitha's car runs on electricity.

Anna's car runs on petrol.

(a) How does the ELECTRIC car get its energy?

[2]

(b) Pujitha thinks that his electric car does NOT pollute the environment in any way.

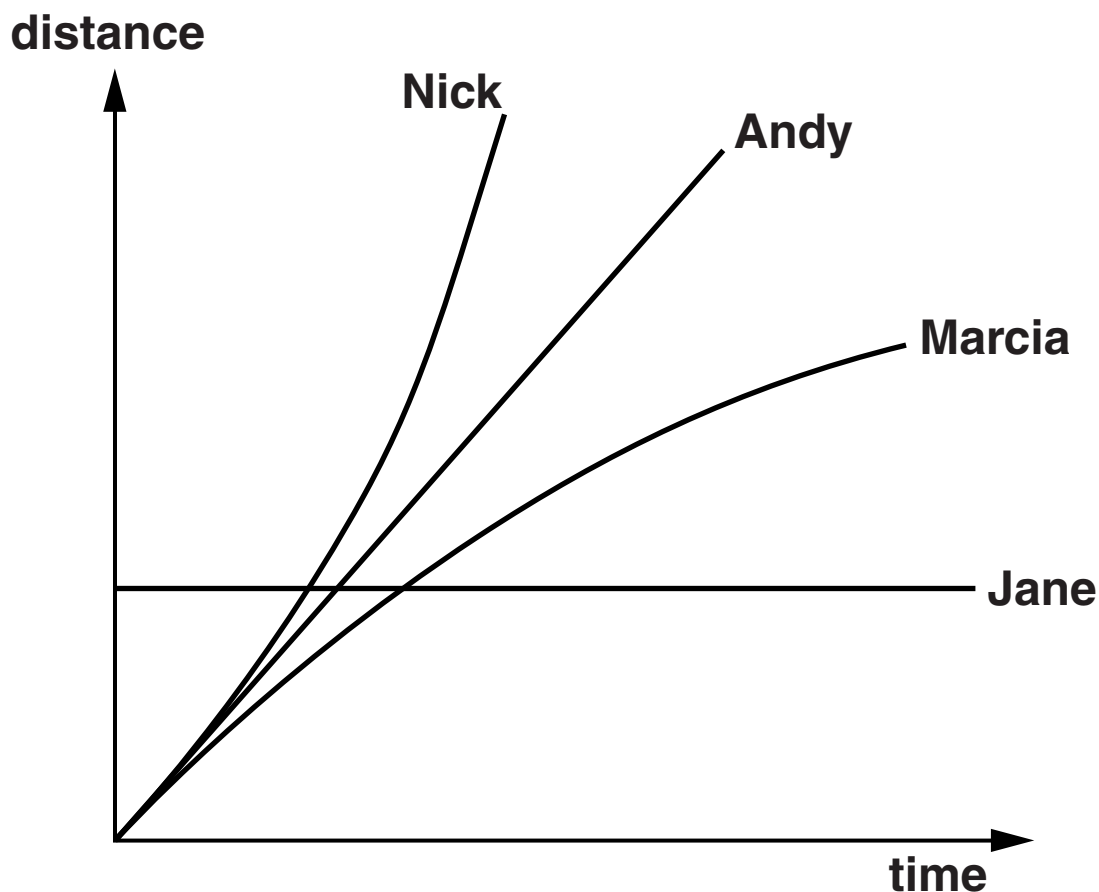
Anna says that Pujitha's electric car does cause pollution.

Explain why Anna is correct.

[1]

[Total: 3]

10 Look at the distance-time graphs for four runners.



(a) Which runner has the HIGHEST average speed?

Choose your answer from

ANDY

JANE

MARCIA

NICK

answer _____ **[1]**

(b) Andy runs at a steady speed of 4.5 m/s for 110 s.

Calculate the DISTANCE he runs.

The equations on page 3 may help you.

answer _____ m [2]

[Total: 3]

11 Gita and Dan are free-falling parachutists.

They jump from an aeroplane and start to accelerate.

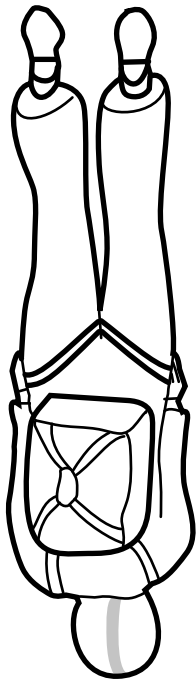
(a) Complete the sentences.

**Acceleration is the change in _____
per unit _____ .**

**They start to accelerate because . _____
_____ [2]**

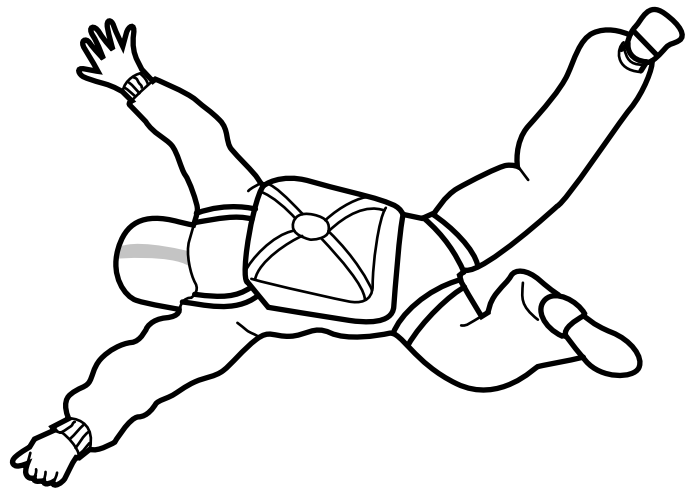
(b) Gita and Dan have the SAME weight.

**Their speeds increase until they both reach
TERMINAL SPEED.**



GITA

terminal speed = 60 m/s



DAN

terminal speed = 55 m/s

Dan's terminal speed differs from Gita's terminal speed.

Explain why.

[3]

(c) At terminal speed Dan's kinetic energy does NOT increase.

At terminal speed his potential energy does decrease.

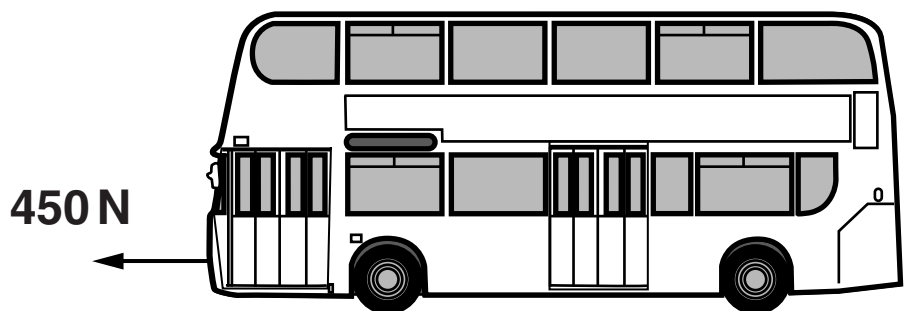
What happens to the POTENTIAL ENERGY?

[1]

[Total: 6]

12 This question is about force and motion.

(a) Look at the information in the diagram.



The bus moves a distance of 120 m in 8 s.

The driving force of the bus is 450 N.

Calculate the WORK DONE by the bus.

The equations on page 3 may help you.

answer _____ J [2]

(b) Look at the diagrams opposite of the five different vehicles.

They show the speed and mass of each vehicle.

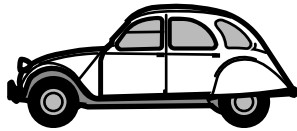
All these vehicles have KINETIC ENERGY.

The bus has the MOST kinetic energy.

Explain why.

[1]

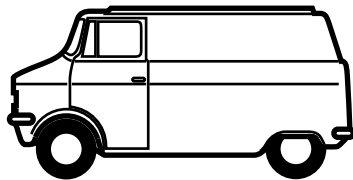
[Total: 3]



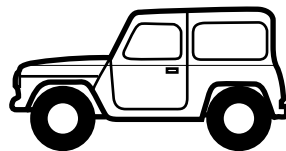
← 20 m/s
600 kg



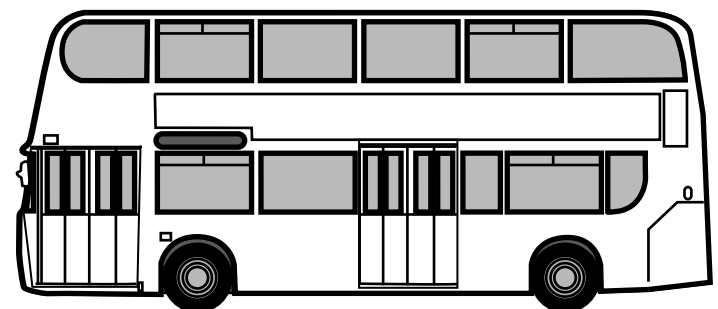
← 12 m/s
900 kg



← 9 m/s
2000 kg

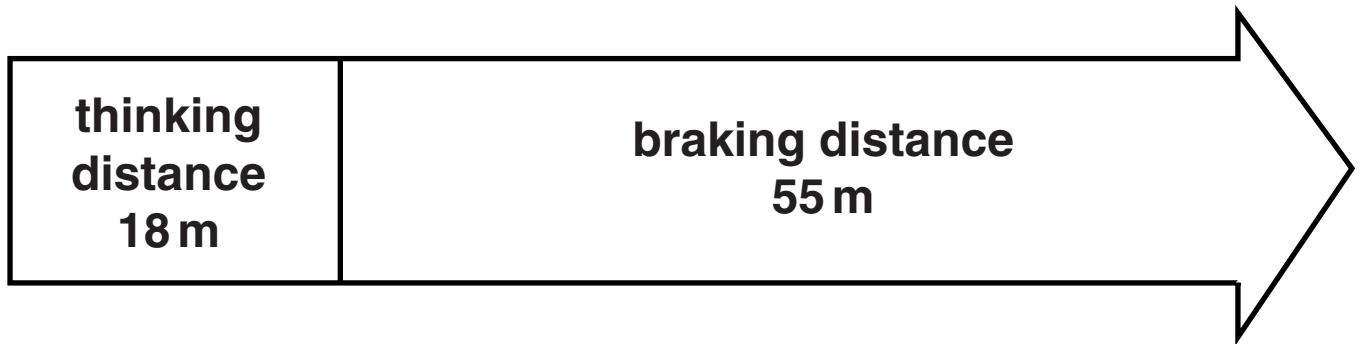


← 12 m/s
1500 kg



← 22 m/s
8000 kg

13 Look at the information about the stopping distance for a car travelling at 30 m/s.



(a) The THINKING DISTANCE at this speed is 18 m.

Write down two things that INCREASE thinking distance at this speed.

1 _____

2 _____ [1]

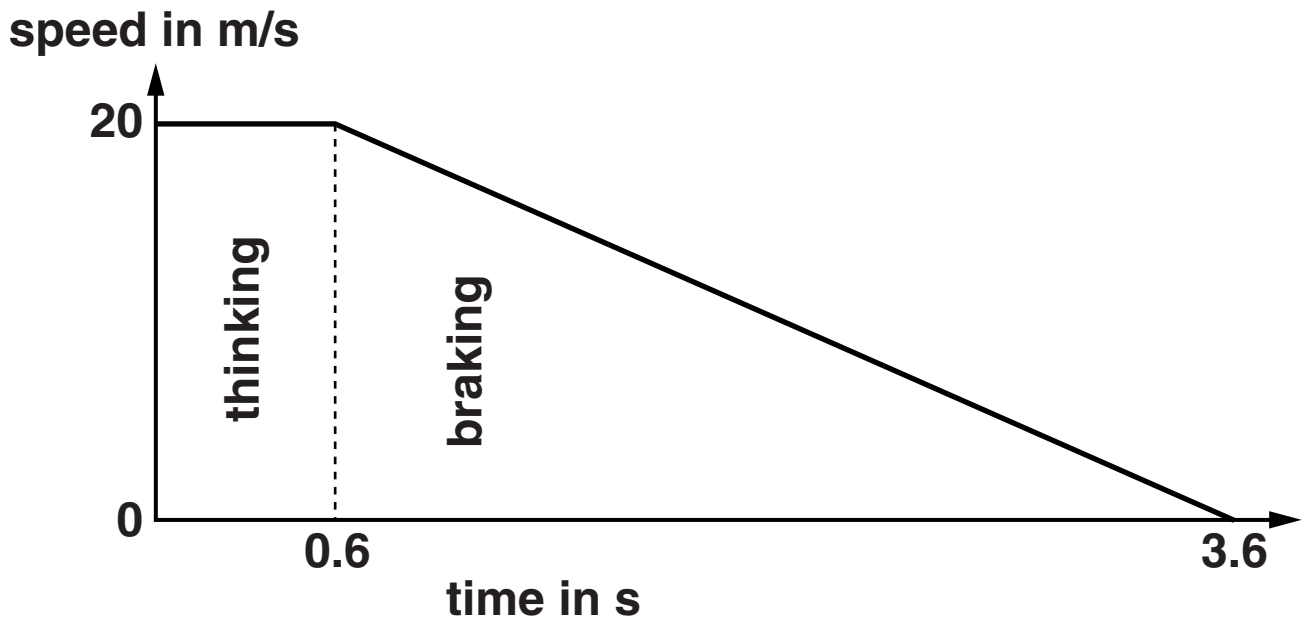
(b) Poor brakes increase BRAKING DISTANCE.

Write down two other things that INCREASE braking distance at this speed.

1 _____

2 _____ [1]

(c) Look at the graph of a car stopping from a speed of 20 m/s.



The thinking TIME for the driver is 0.6 s.

Calculate the STOPPING distance for the car.

answer _____ m [3]

[Total: 5]

END OF QUESTION PAPER

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