OCR
RECOGNISING ACHIEVEMENT

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B651/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

PHYSICS B

Unit 1 Modules P1 P2 P3 (Higher Tier)

MONDAY 21 JANUARY 2008

Afternoon
Time: 1 hour

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
                                          Ruler (cm/mm)

Candidate Forename		Candidate Surname	

Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

*   Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
*   Use blue or black ink. Pencil may be used for graphs and diagrams only.
*   Read each question carefully and make sure that you know what you have to do before starting your answer.
*   Answer **all** the questions.
*   Do **not** write in the bar codes.
*   Do **not** write outside the box bordering each page.
*   Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

*   The number of marks for each question is given in brackets [ ] at the end of each question or part question.
*   The total number of marks for this paper is 60.
*   A list of physics equations is printed on page two.

FOR EXAMINER'S USE		
Section	**Max.**	**Mark**
A	20	
B	20	
C	20	
TOTAL	60	

This document consists of **20** printed pages.

[Turn over

EQUATIONS

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

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage × current

energy supplied = power × time

energy (kilowatt hours) = power (kW) × time (h)

wave speed = frequency × wavelength

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

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

force = mass × acceleration

work done = force × distance

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

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

potential energy = mgh

weight = mass × gravitational field strength
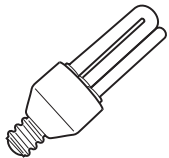
Answer **all** the questions.

Section A – Module P1

1 Mike tries to reduce energy costs in his house.

(a) He uses different light bulbs.

Look at the table.

type	old light bulb	new light bulb
picture		
electrical input in watts	100W	10W
light output in watts	4W	
energy efficiency	0.04 (4%)	0.50 (50%)

(i) Calculate the **light output** for the new light bulb.

....

....

answer .... W   [1]

(ii) Write down **two** advantages of the new type of light bulb.

advantage 1 ....

....

advantage 2 ....

.... [2]

(b) Mike has cavity-wall insulation fitted to his house.

It costs **£800** to fit.

It saves him **£200** each year in fuel bills.

Calculate the **payback time** for cavity-wall insulation.

....

answer.. years   [1]

[Turn over for remainder of question 1

(c) Look at the diagram.

It shows cavity-wall insulation in a new house.

foam containing air pockets

outside wall

shiny silvered surfaces

inside wall
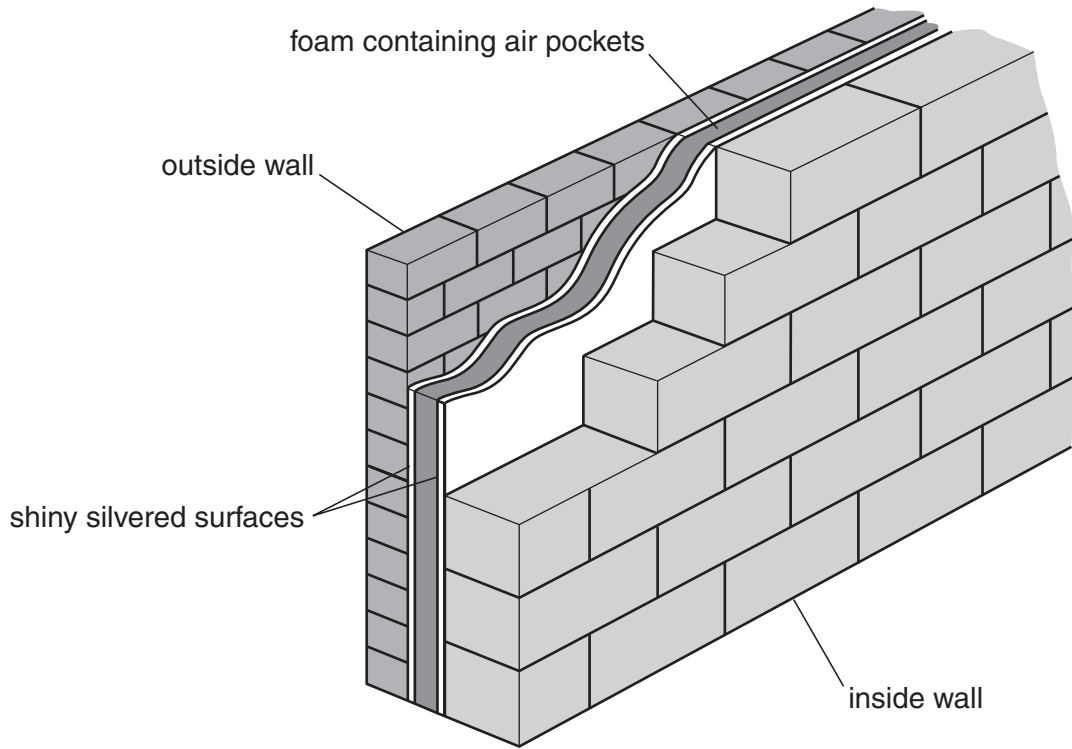
The cavity-wall insulation helps **reduce** energy transfer.

Explain how.

In your answer write about

- conduction
- convection
- radiation.

....

....

....

....

.... [3]

[Total: 7]

2 This question is about communications.

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

light in
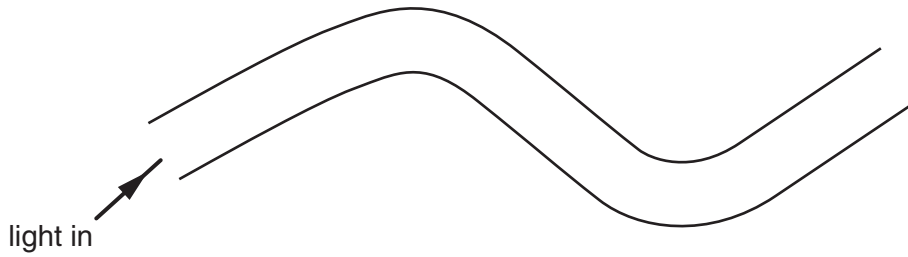
A ray of light travels in the fibre.

It comes out at the other end.

Describe how the light travels through the fibre.

You may draw on the diagram to help your answer.

....

....

.... [2]

(ii) Optical fibres are used to transmit information.

The information can be carried by **analogue** or **digital** signals.

Write down two **differences** between analogue and digital signals.

1 ....

....

2 ....

.... [2]

[Turn over for remainder of question 2

(b) Digital signals carry **more information** with **less interference** than analogue signals.

   (i) Explain why **more information** can be carried.

   ....

   .... [1]

   (ii) Explain why there is **less interference**.

   ....

   .... [1]

[Total: 6]

3 John puts ice cubes in a glass.

He heats the ice cubes in his microwave oven.

The microwave has metal sides.

(a) The microwaves transfer energy to the ice cubes.

Explain how.

In your answer write about

- penetration

- kinetic energy

- reflection.

....

....

....

....

.... [4]

(b) The ice cubes melt at 0 °C.

They stay at 0 °C for a long time.

Suggest why.

....

.... [1]

[Total: 5]

[Turn over

4 CD players use **laser** light to read information from the disc.

 (a) The laser produces an intense beam of light.

 What is special about the waves in the beam?

 ....

 .... [1]

 (b) How does the laser beam read information from the disc?

 ....

 .... [1]

[Total: 2]

Section B – Module P2

5 The Sun produces a lot of energy.

Photocells transfer light energy from the Sun into electricity.

(a) (i) Describe one **advantage** of using photocells.

....

.... [1]

(ii) Describe one **disadvantage** of using photocells.

....

.... [1]

(b) Describe how homes can be kept warm by **passive** solar heating.

....

....

....

.... [2]

[Total: 4]

[Turn over

6 Look at the diagram.

coil

N   S
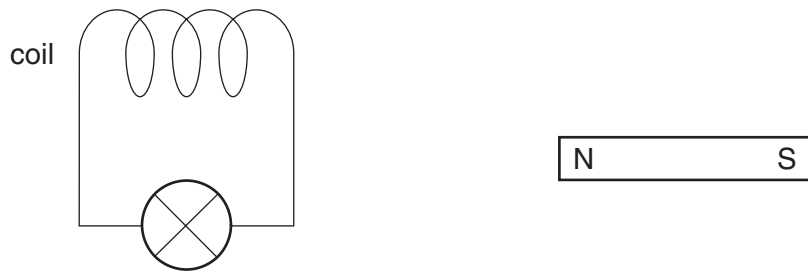
Rob makes electricity by moving the magnet into the coil.

The current produced is very small.

(a) Describe **two** ways in which he can make the current bigger.

1 ....
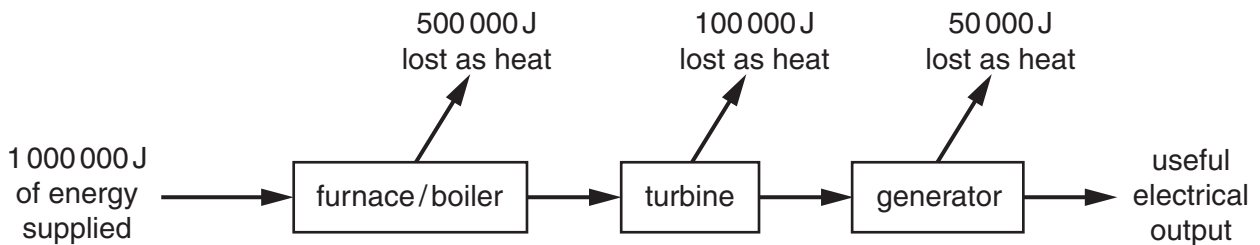
....

2 ....

.... [2]

(b) Look at the diagram.

It shows how electricity is generated in a power station.

500 000 J   100 000 J   50 000 J
lost as heat   lost as heat   lost as heat

1 000 000 J   useful
of energy → │ furnace / boiler │ → │ turbine │ → │ generator │ → electrical
supplied   output

Calculate the efficiency of the power station.

The list of equations on page 2 may help you.

....

....

....

....

....

.... [3]

(c) Power is transmitted from the power station over large distances.
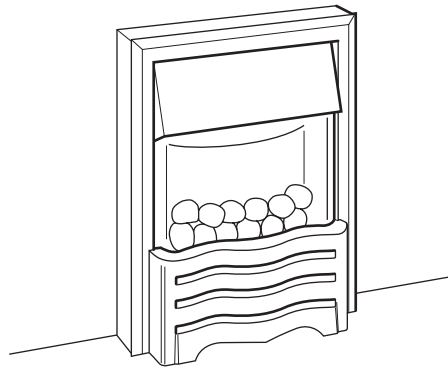
A high voltage is always used.

Explain why.

....

....

....

.... [2]

[Total: 7]

[Turn over

7 Una has an electric fire.

Look at the diagram.

She connects it to the 230V mains and switches on.

There is a current of 8 amps.

(a) Calculate the **power rating** of the electric fire.

The list of equations on page 2 may help you.

....

....

....

answer .... W   [2]

(b) Most of our electricity is made from burning fossil fuels.

Some of our electricity is made from nuclear fuel.

What are the advantages and disadvantages of using nuclear fuel?

advantages ....

....

....

disadvantages ....

....

.... [3]

[Total: 5]

8 This question is about the Solar System.

Asteroids orbit our sun.

(a) Complete the sentence.

The Asteroid belt is between the planet ………………… and the planet ………………… . [1]

(b) Scientists sometimes use manned spacecraft to investigate space.

Manned spacecraft have not been used to go from Earth to other planets.
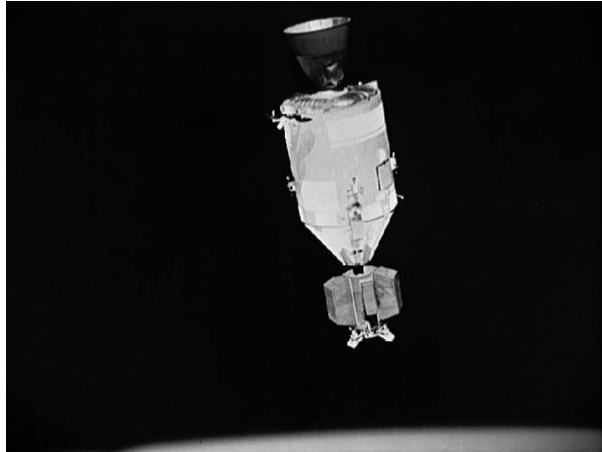
© NASA Johnson Space Center, http://images.jsc.nasa.gov/
Apollo spacecraft in orbit

Describe some of the difficulties in sending **manned** space craft safely to distant planets.

....

....

....

.... [2]

(c) Comets move through our Solar System.
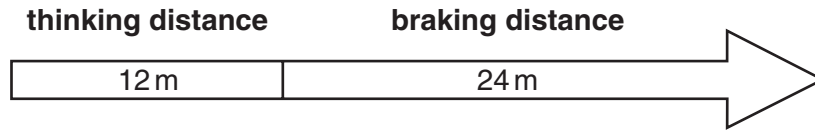
They speed up as they get near to the Sun.

Explain why.

....

....

....

.... [1]

[Total: 4]

[Turn over

Section C – Module P3

9 This question is about stopping distances.

(a) Look at the diagram about the stopping distance for a car at 16 m/s.

thinking distance	braking distance
12 m	24 m

(i) Two cars travel along a road at the same speed of 16 m/s.

One car follows close behind the other.

The second driver travels **8 m** behind the first car.

This is **dangerous**.

Why is this dangerous? Use the information in the diagram to explain your answer.

....

....

....

.... [2]

(ii) Higher speed increases the braking distance.

Name two **other** factors that will increase the braking distance.

1 ....

2 .... [2]
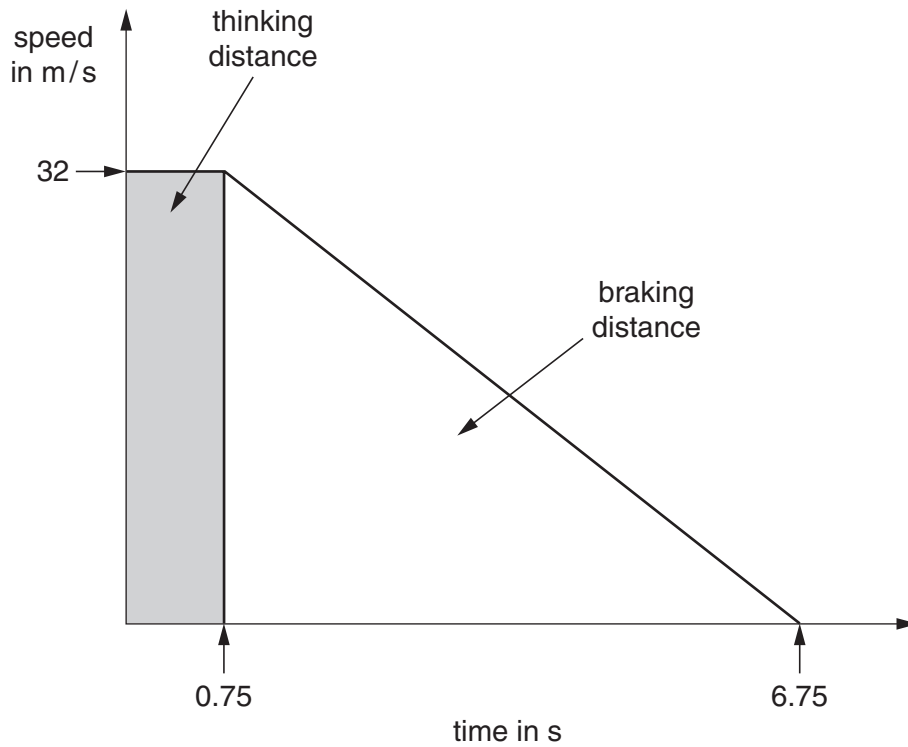
(b) The first car goes faster.

The car moves at 32 m/s.

(i) The driver reacts then brakes on a dry road.

It takes 6 s to brake.

Look at the graph. It shows the car stopping.

The thinking distance is 24 m.

Calculate the total **stopping** distance.

....

....

....

answer .... m [3]

[Turn over for remainder of question 9

(ii) The car now carries more passengers.

It moves at 32 m/s on a **wet** road.

The driver brakes.

The **braking distance** increases.

Explain why.
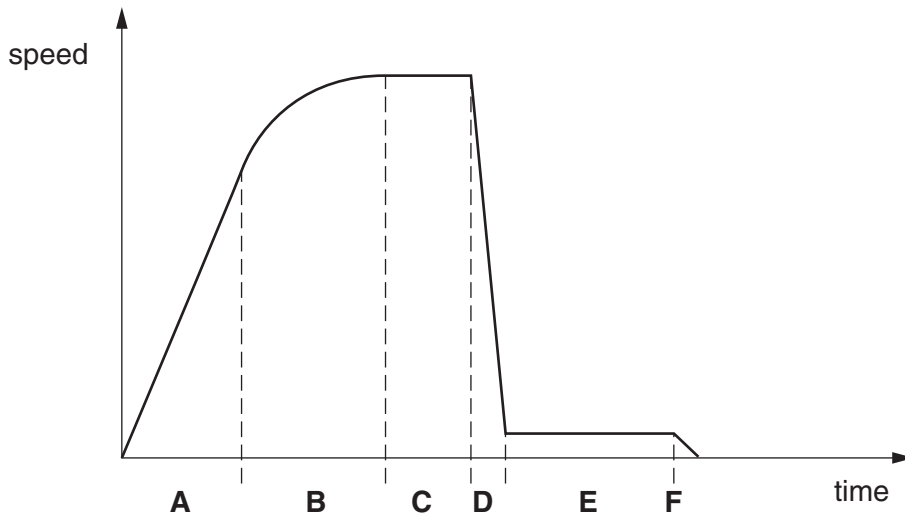
Use ideas about

- force

- mass.

....

....

....

....

.... [3]

[Total: 10]

10 Amy investigates parachutes at school.

Look at the graph of a falling parachute.

(a) There are two forces acting on the parachute – **weight** and **drag**.

In **part C** the speed is **steady**.

Explain why. Use ideas about weight and drag in your answer.

....

.... [1]

(b) **Part C** is the terminal speed **before** the parachute opens.

Part E is the terminal speed **after** the parachute opens.

Explain why the open parachute has a **lower** terminal speed.

Use ideas about forces in your answer.

....

....

.... [2]

[Total: 3]

[Turn over

11 Look at the data on cars.

	Georgio's car	**Glenn's car**	**Sue's car**
fuel consumption in kilometres per litre	10	6	12
maximum driving force in newtons	5 000	3 000	1 500

(a) Georgio's car uses 8 litres of fuel.

Suggest how far it travels on 8 litres of fuel.

....

answer .... km [1]

(b) When Sue drives her car, it has a fuel consumption of 12 kilometres per litre.

When Glenn drives Sue's car, the fuel consumption is only 9 kilometres per litre.

Suggest **two** reasons why.

first reason ....

....

second reason ....

.... [2]

(c) Look at the diagram of Georgio's car.
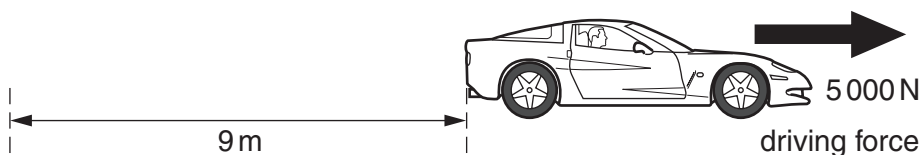
The driving force is 5 000 N. It moves the car 9 m.

Calculate the **work done** on the car.

The list of equations on page 2 may help you.

....

....

answer .... J [2]

(d) These cars harm the environment. This is because they

- use fossil fuels

- produce carbon dioxide (a greenhouse gas)

- pollute the city with fumes.

Sue is looking for a new car.

She thinks an **electric car** will be much better for the environment. Electric cars have rechargeable batteries.

(i) An electric car may be **better** for the environment.

Suggest one reason why.

....

.... [1]

(ii) An electric car may still **harm** the environment.

Suggest one reason why.

....

.... [1]

[Total: 7]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE