GCSE

PHYSICS B

Physics B Unit 1 Modules P1, P2, P3

Specimen Paper

Candidates answer on the question paper:
Additional materials: ruler (cm/mm), calculator

H

B651/02

1 hour

Candidate Name	

Centre Number						Candidate Number				

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers on the dotted lines unless the question says otherwise.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- There is a space after most questions. Use it to do your working. In many questions marks will be given for a correct method even if the answer is incorrect.
- Do not write in the bar code. Do not write in the grey area between the pages.
- DO NOT WRITE IN THE AREA OUTSIDE THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60.**

This specimen paper consists of 26 printed pages.

BLANK PAGE

Answer all questions.

Section 1

1. Danni is sunbathing.

She makes sure that she has sunscreen rubbed onto her back.

(a) Danni is using a sunscreen with a sun protection factor number SPF 15.

Without sunscreen, Danni can stay in the sun for 20 minutes without burning.

What is the longest time she can safely stay in the sun when using the sunscreen?

longest time = ...hours   [2]

(b) Danni's friend, Joshua, has a darker coloured skin.

Explain why he can stay in the sun for longer without getting burnt.

....

....[1]

(c) A layer of a gas in the Earth's atmosphere reduces the amount of ultraviolet radiation which reaches the Earth's surface.

(i) Write down the name of this gas.

....[1]

(ii) Why is this layer becoming thinner?

....

....[1]

[Total: 5]

2. Tina has bought a house with little insulation.

She decides to have cavity wall insulation put in.

Cavity wall insulation is made from foam.
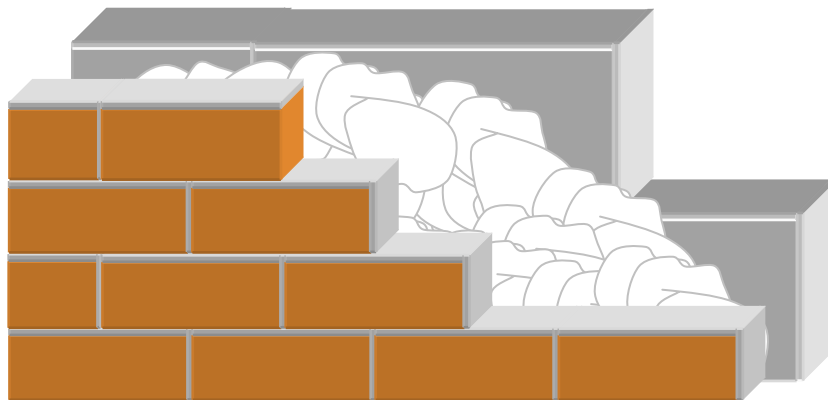
(a) Why does cavity wall insulation reduce energy loss by conduction?

....

....[1]

(b) Explain why it is important to have foam instead of just an air gap.

....

....

.... [2]
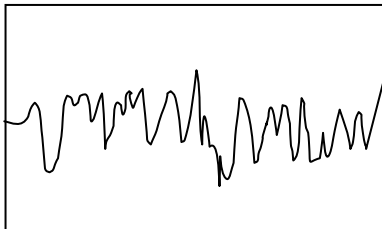
(c) Tina decides to have cavity wall insulation because there is a short **payback time**.

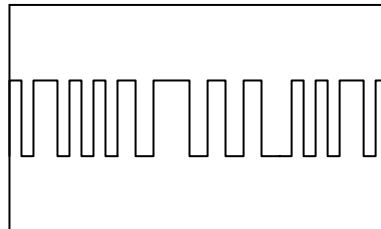Explain what is meant by **payback time**.

....

....

....[1]

[Total: 4]

3. **(a)** The diagrams show two signals.

| **Analogue** | **Digital** |

Other than cost, what are the advantages of using digital signals for transmission of data?

....

....[2]

(b) Signals can be sent along an optical fibre.

The diagram shows the path of a ray of light along an optical fibre.
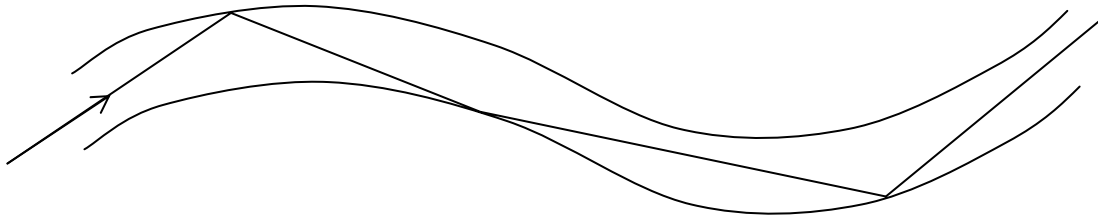
(i) Finish this sentence.

Total internal reflection occurs when the angle of incidence is larger than the

....angle [1]

(ii) Explain the advantages of using optical fibres instead of copper wires for

communication over long distances.

....

....

....[3]

....[Total: 6]

4. Fred adds 15 g of ice to 200 g of drink to cool it down.

The ice cubes melt.

(a) The specific latent heat of ice is 330 J/g.

Calculate the energy transferred from the drink to the ice as it melts.

You are advised to show how you work out your answer.

energy transferred = ...

....

....J [3]

(b) When Fred heats 200 g of his drink, he finds that it needs 452 kJ of energy to evaporate the drink **at its boiling point**.

Calculate the specific latent heat of evaporation of the drink.

You are advised to show how you work out your answer.

specific latent heat = ...

....

....J/g [2]

[Total: 5]

Section 2

5.   Adrian visits a South American village, near to the equator that wants to produce electricity. The villagers could use a photocell to collect energy from the Sun.

   (a)   One advantage of using the Sun is that it is a renewable energy source. What does

   renewable energy source mean?

   ....

   ....[1]

   (b)   State one other **advantage** and one **disadvantage** of using photocells to produce electricity.

   Advantage ....[1]

   Disadvantage ....[1]

   (c)   When light shines onto a photocell, electricity is produced.

   Use your ideas about electrons to describe how electricity is produced in a photocell.
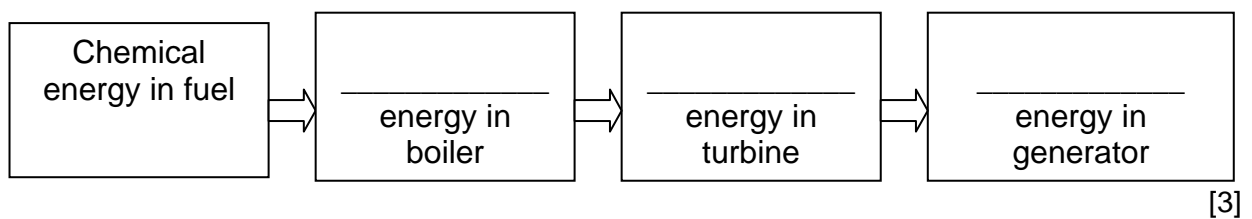
   ....

   ....

   ....[2]

[Total: 5]

6. Coal fired power stations are the main method of producing electricity in the UK.

Draxpower ©

(a) Starting with the Chemical energy in the fuel, complete the useful energy transfers in the power station.

Chemical energy in fuel	→	_____ energy in boiler	→	_____ energy in turbine	→	_____ energy in generator

[3]

(b) For every 45 MJ of coal burnt only 20 MJ of electrical energy are generated.

**(i)** State the formula for efficiency in terms of total energy input and useful energy output.

....

....[1]

(ii) Find the efficiency of the power station from the data given. You are advised to show all of your working out.

Answer ....

....

....[2]

(c) To distribute the electricity to house and factories a series of wires called the National Grid are used. During this distribution some energy is lost from the wires to the environment.

pylons supporting
transmission lines
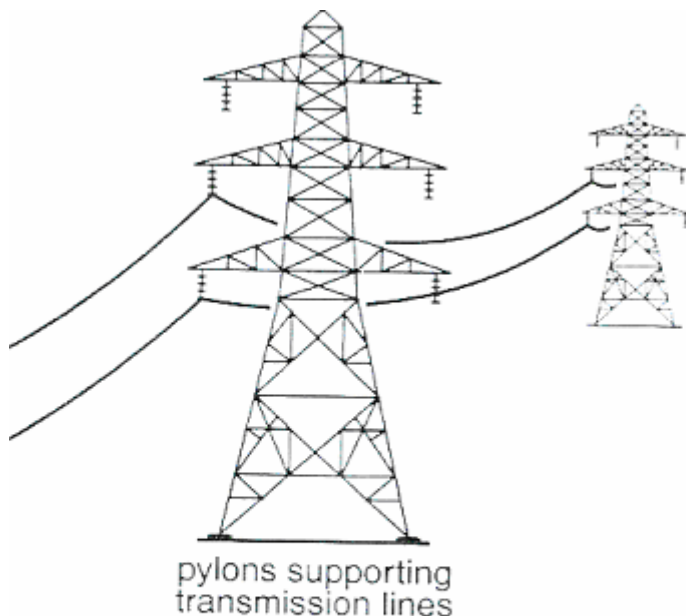
Increasing the voltage in the wires reduces the amount of energy lost.

Describe one other change to the transmission lines which reduces the amount of energy lost.

....

....

....[2]

[Total: 8]

7. Nearly all of the energy we use on earth comes from the Sun.

Explain how this is true for the energy stored in coal.

....

....

....

....

....[3]

[Total: 3]

8. A new Nuclear power station is to be built in your local area. Suggest **two** ways that scientists could tell people about the advantages and disadvantages of the project.

....

....

....[2]

[Total: 2]

9. In 2004 the President of the USA suggested a manned mission to the Planet Mars this is what he said

"Our first goal is to complete the International Space Station by 2010. We will finish what we have started…We will focus our future research aboard the station on the long-term effects of space travel on human biology. The environment of space is hostile to human beings. Research on board the station and here on Earth will help us better understand and overcome the obstacles that limit exploration. Through these efforts we will develop the skills and techniques necessary to sustain further space exploration."

Describe some of the "obstacles that limit exploration".

....

....

....

....[2]

[Total: 2]

Section 3

10. Look at the information in the table.

It shows the stopping distances for an average driver.

Speed of car in m/s	Thinking distance in m	Braking distance in m	Stopping distance in m
10	5	5	10
20	10	20	30
40	20	80	100

Calculate the **thinking time** for the driver.

....

....

answer...s [3]

(b) Higher speed makes the **braking distance** longer.

    (i) Write down 2 **other** factors that make the braking distance longer.

        1st factor ....

        2nd factor ....   [2]

(ii) How does speed affect the braking distance?

In your answer write about

- The **detailed** connection between **speed and braking distance**

- **Kinetic** energy

....

....

....[3]

(c) Higher speed is one factor that increases **thinking distance**.

Write down two other factors that increase thinking distance.

1st factor...

2nd factor ....[2]

[Total: 10]

11. Cars have **safety features**.

These safety features help reduce injuries in a crash.

One safety feature in cars is **crumple zones**.

They absorb energy in a crash.

Look at the diagram.

Rear crumple zone
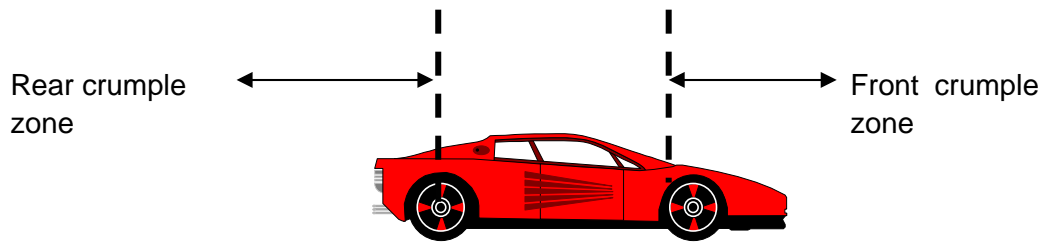
Front crumple zone

Microsoft ©

How do **crumple zones** help reduce injuries in a crash?

In your answer use ideas about

- Acceleration

- Force

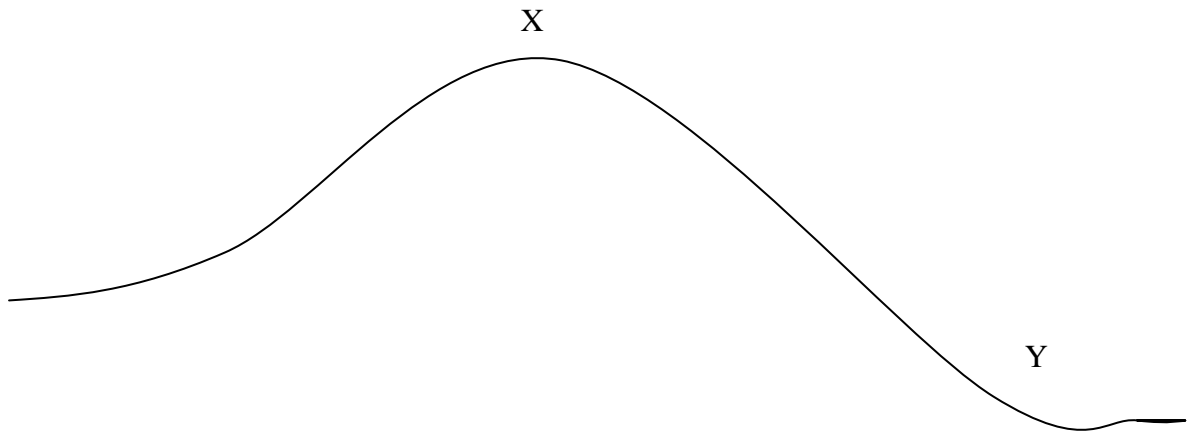...

....

....[2]

[Total: 2]

12. Look at the diagram.

(a) A ball is lifted to position X.

The height of the lift is 20m. The force used is 10 000N.

Calculate the work done on the ball when it is lifted to position X.

Answer ....J[3]

(b) The ball is at position X.

It is still.

At X it has the maximum potential energy.

The ball starts to roll down the hill. It passes part Y.

This is the **fastest** part of the journey.

Suggest why point Y is the **fastest** part of the journey.

In your answer use the idea of energy.

....

....[1]

[Total: 4]

13. Ellie is a parachutist.

She jumps from an aeroplane.

Look at the simple graph of her speed as she falls.

Speed in m/s

Time in s
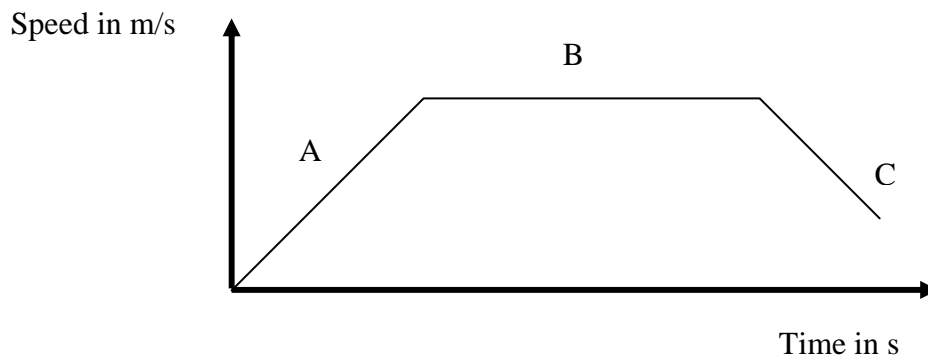
(a) Look at **part A**

Ellie accelerates.

Explain why. Use ideas about forces in your answer.

....

....[1]

(b) Look at **part B**.

Write down what happens to Ellie's speed in part B. Explain your answer.

....

....[2]

(c) Look at **part C**.

Ellie opens her parachute and slows down.

Explain why she slows down. Use ideas about forces in your answer.

....[1]

[Total: 4]

BLANK PAGE

GCSE

PHYSICS B

Physics B Unit 1 Modules P1, P2, P3

Specimen Mark Scheme

Maximum mark for this paper is [60]

H **B651/02**

1 hour

This specimen mark scheme consists of 4 printed pages.

Question Number	Answer	Max Mark
Section 1		
1(a)	15 x 1/3 ; 5;	**[2]**
1(b)	more radiation absorbed;	**[1]**
1(c)i	Ozone;	**[1]**
1(c)ii	pollution / CFCs;	**[1]**
	Total marks	**[5]**
2(a)	air is an insulator / poor conductor;	**[1]**
2(b)	trapped air ;	**[2]**
	reduces energy loss by convection;	
2(c)	time taken to recover installation cost in energy saving owtte;	**[1]**
	Total marks	**[4]**
3(a)	more information can be transmitted ;	**[1]**
	any interference to signal during transmission can be removed;	**[1]**
3(b)i	critical;	**[1]**
3(b)ii	does not corrode ;	**[1]**
	much less signal loss;	
	less frequent amplification ;	**[1]**
	no heating effect / mention of current / resistance;	**[1]**
	Total marks	**[6]**
4(a)	energy = mass x specific latent heat;	**[1]**
	15 x 330;	**[1]**
	4950;	**[1]**
4(b)	452 000 ÷ 200 ;	**[1]**
	2260;	**[1]**
	Total marks	**[5]**

Question Number	Answer	Max Mark
Section 2		
5(a)	Idea of being replaced quickly **(allow never runs out);**	**[1]**
5(b)	Idea of no chemical pollution/no fuel costs;	**[1]**
	Expensive to set up/only works in the day/	**[1]**
5(c)	Energy is absorbed;	**[1]**
	Electrons are knocked loose;	**[1]**
	Total marks	**[5]**
6(a)	Heat energy in Boiler;	**[1]**
	Kinetic energy in turbine;	**[1]**
	Electrical energy in Generator;	**[1]**
6(b)i	Efficiency = Useful energy out/total energy in	**[1]**
6(b)ii	20 / 45;	**[1]**
	44.4	**[1]**
6(c)	Change diameter;	
	Increase diameter;	**[2]**
	Total marks	**[8]**
7(a)	Plants crushed to make coal;	**[1]**
	Plants store energy;	**[1]**
	Plants get energy from sun by photosynthesis;	**[1]**
	Total marks	**[3]**
8(a)	**Any two:** Public meeting; local newspaper; local news program;talk in school;	**[2]**
	Total marks	**[2]**
9	**Any two:** Radiation effects humans; Huge costs of space flight; enough fuel; keeping warm; having enough oxygen; time required; providing enough food;	**[2]**
	Total marks	**[2]**

Question Number	Answer	Max Mark
Section 3		
10(a)	t= distance / speed;	**[1]**
	t = 5/10 or 10/20 or 20/40;	**[1]**
	t = 0.5 (s);	**[1]**
10(b)i	Any **one** road condition from:	
	Icy / wet / muddy / oily road / AW **(accept slippy road)**	**[1]**
	Any **one** car condition from:	**[1]**
	Worn tyres / worn brakes / AW **(accept poor suspension/greater load AW);**	
10(b)ii	Maximum of two from:	
	If speed doubles braking distance more than doubles; (1)	
	but if speed doubles braking distance quadruples (2)	
	Maximum of two from:	
	if speed doubles kinetic energy more than doubles (1)	
	But if speed doubles kinetic energy quadruples; (2) **Max 3 marks**	**[3]**
10(c)	Any **two** from:	
	Alcohol / drugs;	
	Tiredness / distractions / lack of concentration;	**[2]**
	Total marks	**[10]**
11	Any **two** from:	
	Less acceleration	
	so less force (needed)	
	Longer stopping time / longer stopping distance;	**[2]**
	Total marks	**[2]**
12(a)	W = F X D	**[1]**
	W = 10 000 X 20;	**[1]**
	W = 200 000 (J);	**[1]**
12(b)	At X – Most KE / Least PE / all PE is converted / AW;	**[1]**
	Total marks	**[4]**
13(a)	Unbalanced force / weight is greater than drag;	**[1]**
13(b)	Terminal / steady / maximum speed / AW;	**[1]**
	Weight = drag / AW;	**[1]**
13(c)	Drag is greater then weight / AW;	**[1]**
	Total marks	**[4]**
	Overall marks	**[60]**