OCR
RECOGNISING ACHIEVEMENT

GCSE

PHYSICS B

H

B652/02

Physics B Unit 2 Modules P4, P5, P6

Specimen Paper

1 hour

Candidates answer on the question paper:

Additional materials: ruler (cm/mm), calculator

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 28 printed pages.

 Registered Charity Number: 1066969

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Answer all questions

Section 1

1. (a) Sam rubs a plastic rod with a cloth.

The rod becomes charged.

There are two kinds of electric charge.

(i) Write down the names of these charges.

.....

.....

.....[2]

(ii) Charged particles are transferred between the rod and the cloth.

Write down the name of the charged particles.

.....[1]

(b) Static electricity is used by doctors to restart a patient's heart when it has stopped.

Describe how.

In your answer you should:

- describe what the doctor does
- describe any safety precautions taken

.....

.....

.....

.....[3]

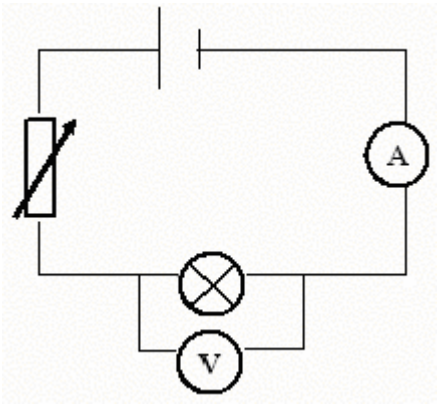
[Total: 6]

2. (a) Jamie does an experiment with electricity.

He makes a circuit.

He measures the current and pd (voltage) across the bulb.

Look at the diagram



The pd (voltage) across the bulb is 12V when the current is 2A.

Calculate the resistance of the bulb

.....

.....

.....

Answer .....ohms [3]

[Total: 3]

3. In medicine, high energy X-rays are often used instead of gamma rays.

(a) **(i)** How are **gamma rays** made?

.....[1]

(ii) How are **X-rays** made?

.....

.....

.....[2]

(iii) Why are X-rays used rather than gamma rays?

.....

.....

.....[1]

(b) When $^{238}_{92}$ Uranium decays, it gives out an alpha particle

What is an **alpha particle**?

.....[1]

(ii) Describe what happens to the nucleus of the Uranium atom when an alpha particle is emitted.

In your answer you should describe changes in:

- the mass number
- the atomic number
- the number of each type of particle in the nucleus
- the uranium atom

You may use the number equation to help explain your answer if you wish

.....

.....

.....

.....[3]

(c) In a nuclear power station, nuclear fuel, such as uranium, gives out energy.

Write down the name of this process.

.....[1]

(d) Explain how scientists stop these reactions going out of control.

.....

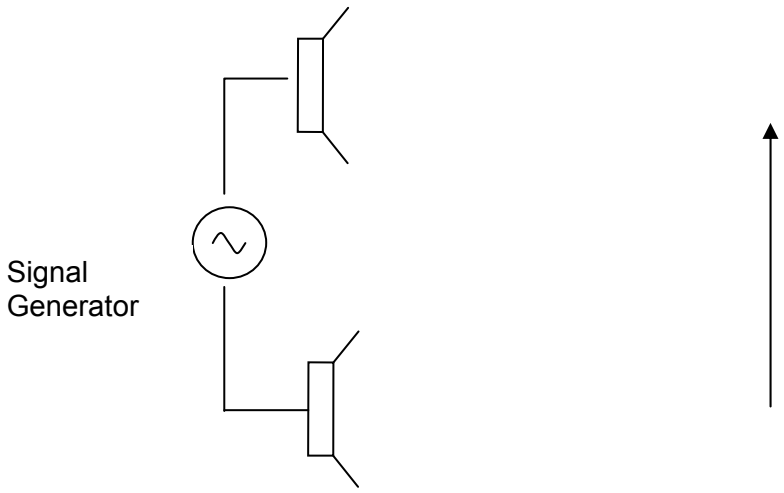
.....

.....[2]

[Total: 11]

Section 2

4. **(a)** Sam connects two speakers to the same source of sound (signal generator). Sound is produced from both speakers.



Sam walks past in the direction shown by the arrow.

He hears the volume of the sound increase and decrease.

Explain why.

In your answer use your ideas about interference.

.....

.....

.....[2]

(b) There are two types of interference producing the increasing and decreasing levels of sound. What names are they given?

Increasing Sound ..... [1]

Decreasing Sound.....[1]

(c) Explain in terms of waves lengths why the decreasing sound levels happen.

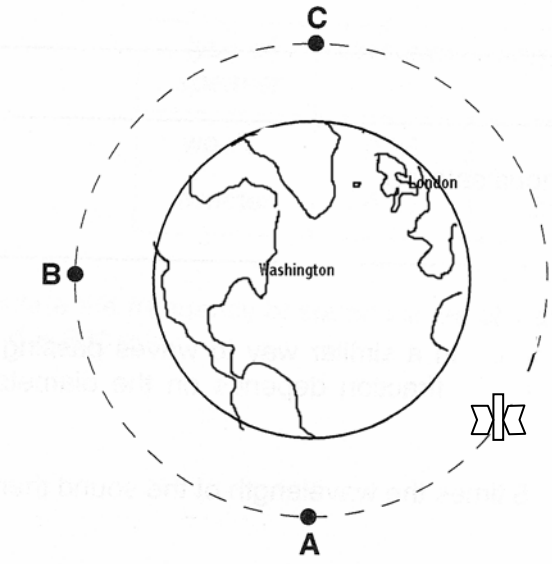
.....[1]

.....

[Total: 5]

5. The diagram shows the orbit of a communications satellite around the Earth.

It is at a height of 40,000 km.



(a) The satellite passes through each point A, B, C in its orbit.

At each position mark with an arrow the direction of the force on the satellite which keeps it in orbit. [1]

(b) This particular satellite is in a Geostationary Orbit. What does **geostationary** mean?

.....[1]

(c) A news reporter wishes to send a live broadcast from Washington to London.

Explain how the report is sent around the world.

.....

.....

.....[2]

(d) If the satellite were in a lower orbit (closer to the Earth) its orbital period would be shorter. This means it travels faster. Give a reason why it needs to travel faster around the Earth in order to stay in a stable orbit.

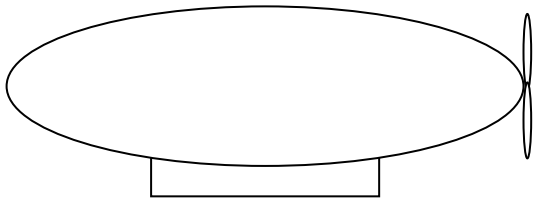
.....[1]

[Total: 5]

6. For his birthday, Simon is brought a Helium filled Airship.

It works by the fan pushing air backwards at a fast speed.

The mass of the airship plus helium is 2 kg.



Every second, 0.5 kg of air is pushed back at a speed of 5 m/s.

(a) The air moves backwards but the airship moves forward. Why?

..... [1]

(b) The momentum is calculated using:

Momentum = mass × velocity

Calculate the momentum gained by the air as it is pushed backwards.

.....

.....

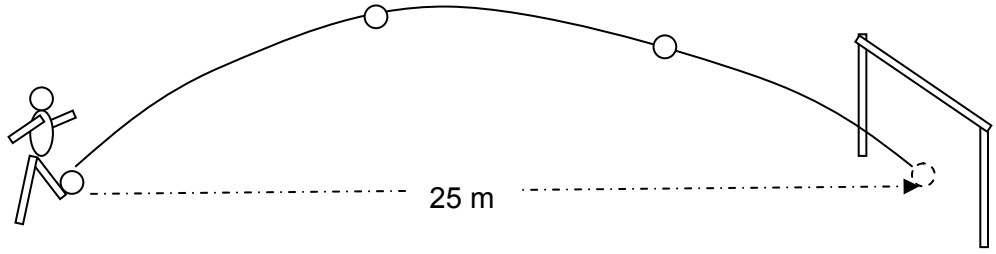
momentum .....[1]

(c) From your answer to (b), find the forward speed of the airship.

Speed =.....m/s [2]

7. This question is about projectiles.

During a football match a player kicks the ball towards the goal from 25 m away.



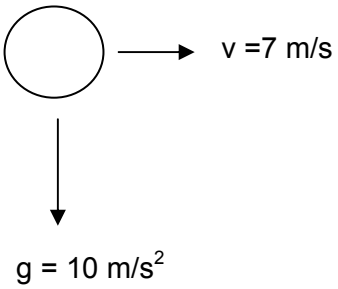
(a) The diagram shows the path of the ball.

What is this type of trajectory called?

.....[1]

(b) At the top of its trajectory the ball is 15m above the ground.

Its velocity and the force of gravity acting on it are shown in the diagram.



How long will it take the ball to fall back down to the ground.

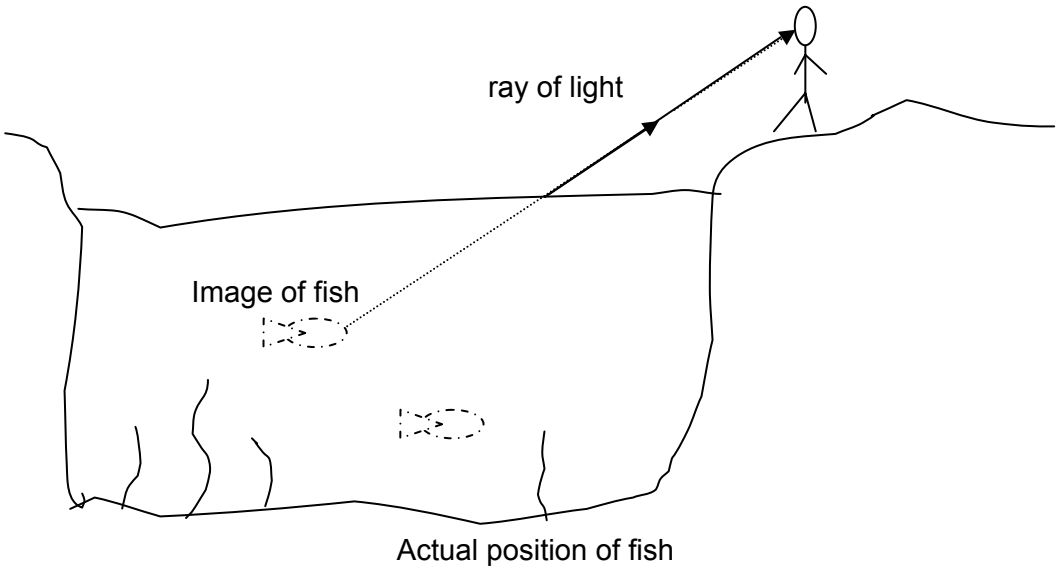
This equation will be helpful:

$$S = ut + \frac{1}{2}at^2$$

Time = ... seconds [2]

[Total: 3]

8. A girl stands by a pond and sees a fish swimming under the surface.



In actual fact the fish is not in that position but appears to be there due to the refraction of light as it passes from the water into the air.

(a) Draw a ray of light from the actual position of the fish to show how the girl sees the fish.

[1]

(b) Explain carefully why the light follows this path and not a straight line.

.....

.....

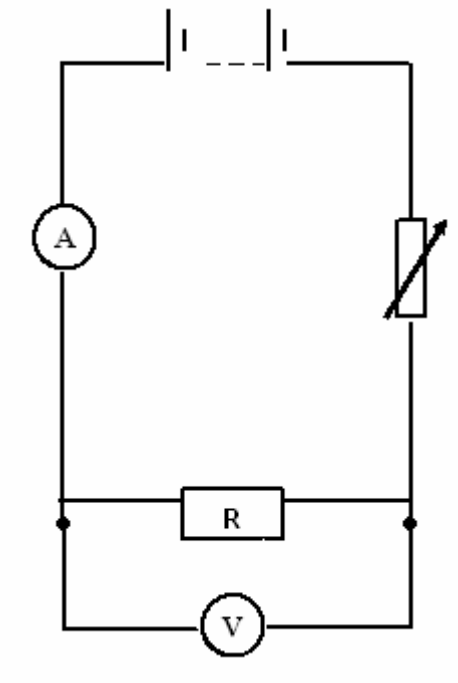
.....[2]

Section 3

9. Michelle connects an electrical circuit.

She wants to find out how the current and voltage change in this circuit when there is a resistor in the circuit.

She is measuring the current through, and the voltage across, the fixed resistor, R.

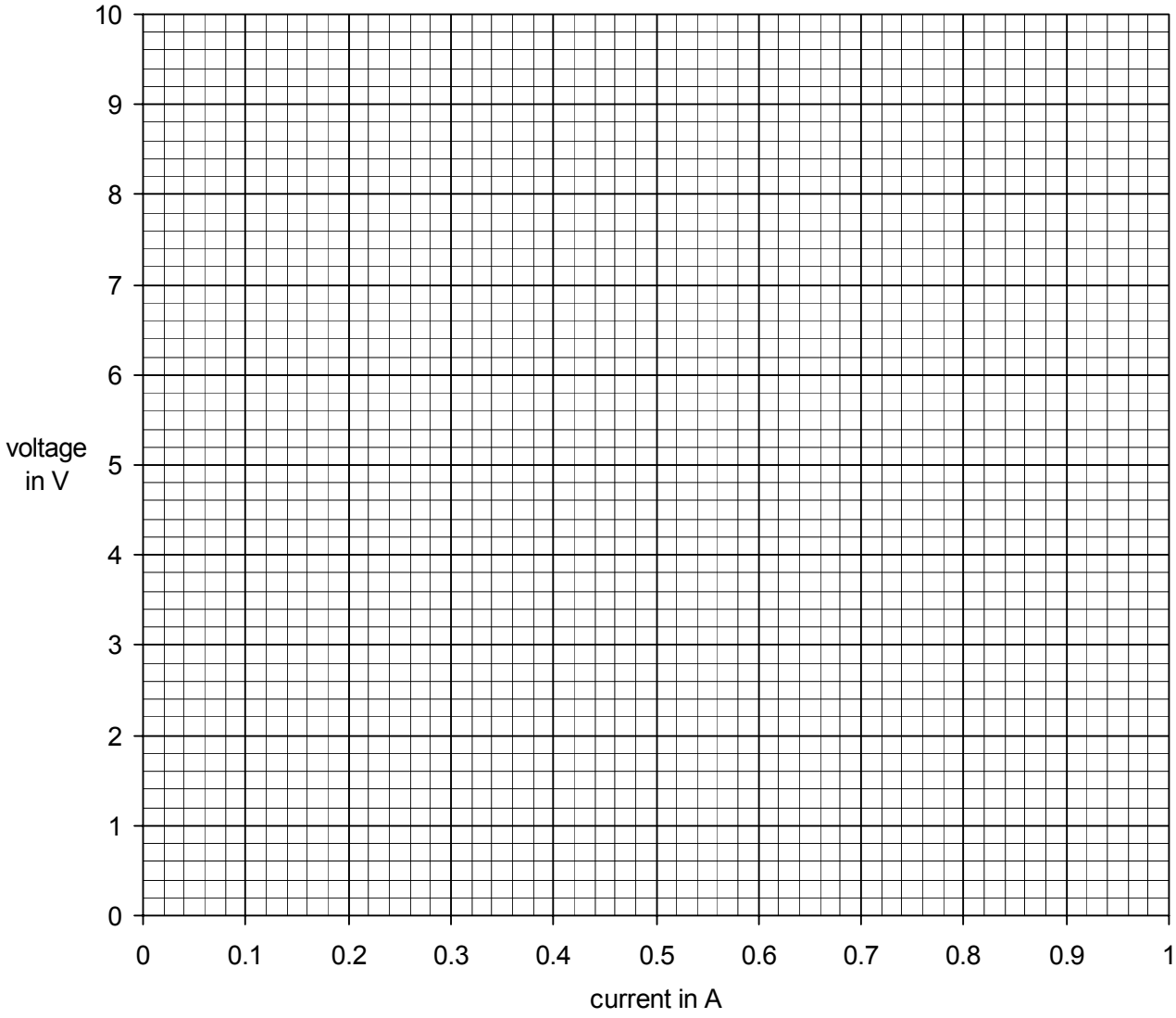


She adjusts the variable resistor and records five sets of values for voltage and current.

These are her results.

current in A	voltage in V
0.2	1.9
0.4	4.1
0.6	6.0
0.8	8.2
1.0	9.8

(a) Plot the points on the grid. [2]



(b) Finish the graph by drawing the line of best fit [1]

(c) Use the **graph** to calculate the resistance of the resistor,

You must show clearly **on the graph** how you work out your answer.

resistance = ……Ω [2]

[Total: 5]

10. Step-up transformers are used at power stations to increase the voltage before electricity is transmitted to the National Grid.

This transformer increases the voltage from 18 000 V to 225 000 V.

The current in the primary coil is 16 kA (1600A).

(a) Explain how the construction of the transformer allows the voltage to be stepped up by this amount.

.....

.....

.....[2]

(b) Explain why electricity is transmitted at such high voltages.

In your answer use your ideas about

- Energy loss
- Current and voltage

.....

.....[2]

(c) Calculate by how much the power loss is reduced by stepping up the voltage to 225 000 V.

.....

.....

.....[2]

[Total: 6]

11. (a) A single diode produces half-wave rectification.

This is what the voltage output looks like:

(i) Full wave rectification can be produced by using a number of diodes.

This is what the voltage full-wave rectification output looks like:

Describe how diodes can be used to produce full-wave rectification.

In your answer include:

How many diodes are used

How the diodes are arranged

Where the input and output connections are placed.

You can draw a diagram to help you answer this question.

.....

.....

.....

.....

.....

.....[1]

(ii) Some devices need a more constant output than this.

Write down the name of the device that can help to smooth the rectified output.

.....[1]

13. Alan is building a logic circuit.

(a) He knows that truth tables are important when designing logic circuits.

(i) Finish the truth table for an OR gate by writing in the shaded boxes.

input A	**input B**	**output**
0	0	
0	1	
1	0	
1	1	

[2]

(ii) Finish the truth table for a NOR gate by writing in the shaded boxes.

input A	**input B**	**output**
0	0	
0	1	
1	0	
1	1	

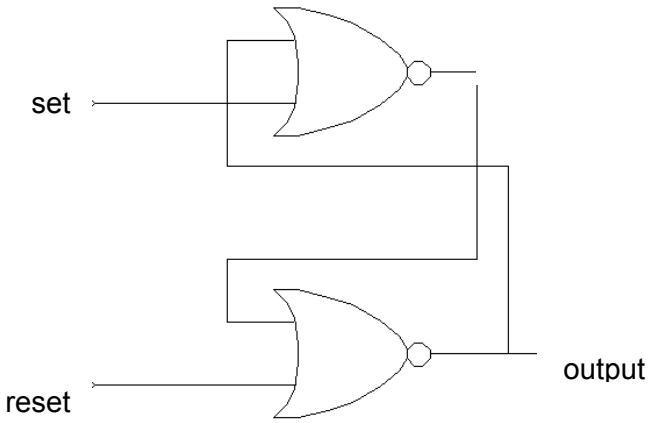
[1]

(b) The output from a logic gate is not used to switch a mains operated machine on and off directly.

Give **one** reason why.

.....[1]

(c) The diagram shows a NOR gate latch.



What happens to the output signal if there is a brief high signal at the **set** input?

.....[1]

[Total:5]

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B652/02

Physics B Unit 2 Modules P4, P5, P6

Specimen Mark Scheme

1 hour

Maximum mark for this paper is [60]

This specimen mark scheme consists of 5 printed pages.

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Section 1

Question Number	Answers	Max Mark
Section 1		
1(a)i	positive; negative;	
1(a)ii	electrons;	**[3]**
1(b)	paddles charged;	
	good electrical contact;	
	with patients chest /AW;	
	charge passed through patient;	
	to make heart contract;	
	care taken not to shock operator; **(any three)**	**[3]**
	Total marks	**[6]**
2	$R = \frac{V}{I} = \frac{12}{2} = 6\Omega$	**[3]**
	(Correct answer on its own gives 3)	
	Total marks	**[3]**
3(a)i	By disintegration of radioactive atom/nucleus;	**[1]**
3(a)ii	High speed electrons;	**[1]**
	colliding with metal target;	**[1]**
3(a)iii	they are easier to control;	**[1]**
3(b)i	helium nucleus;	**[1]**
3(b)ii	mass number decreases by 4;	
	atomic number decreases by 2;	
	neutrons change from 146 to 144 / become 144;	
	protons change from 92 to 90 /become;	**[3]**
	uranium changes to a new element/thorium; **(any three)**	**[1]**
3(c)	Fission;	
3(d)	Control rods/rods of boron;	
	Are placed into the reactor;	
	To absorb neutrons; **(any two)**	**[2]**
	Total marks	**[11]**

Section 2		
4(a)	Moves through points where the waves from each speaker overlap; crosses points of constructive and destructive interference where waves from each speaker meet	**[2]**
4(b)	Increasing – constructive; Decreasing - destructive	**[2]**
4(c)	wavelengths out of phase	**[1]**
	Total marks	**[5]**
5(a)	3 arrows all pointing in towards the centre of Earth;	**[1]**
5(b)	It maintains the same position in the sky relative to a point on Earth. / fixed position above the Earth's surface;	**[1]**
5(c)	the report is transmitted to and received by the satellite; this is then retransmitted / relayed to London;	**[2]**
5(d)	the gravitational pull of the Earth is stronger.	**[1]**
	Total marks	**[5]**
6(a)	Every action has an opposite reaction / there is a force forward / forward thrust / AW;	**[1]**
6(b)	= 0.5 x 5 = 2.5 kg m/s	**[1]**
6(c)	2.5 kgm/s = 2 kg x v v = 1.25 m/s	**[2]**
	Total marks	**[4]**
7(a)	a parabola with max height midway between player and goal.	**[1]**
7(b)	$s = ut + \frac{1}{2}at^2$ $15 = 0 + \frac{1}{2}(10)t^2$ t = 1.7s	**[2]**
	Total marks	**[3]**
8(a)	a ray is drawn from the fish up to the surface to join the original ray.	**[1]**
8(b)	light bends away from normal due to speed increasing	**[2]**
	Total marks	**[3]**

Section 3		
9(a)	3 – 4 points correctly plotted = 1	
	5 – 6 points correctly plotted = 2	**[2]**
9(b)	straight line through origin drawn with ruler	**[1]**
9(c)	connect corresponding V and I values divided;	**[1]**
	indication on graph of measuring gradient ;	**[1]**
	10 (Ω)	
	Total marks	**[5]**
10(a)	$V_p \div V_s = n_p \div n_s$;	**[1]**
	12.5 times number of turns on secondary compared to primary	**[1]**
10(b)	power loss in cables is reduced;	**[1]**
	power is conserved / $V_pI_p = V_sI_s$;	**[1]**
	increasing voltage by 12.5 reduces current by 12.5 / reduces current to 1280 A (max 3)	**[1]**
10(c)	power loss depends on I^2 ;	**[1]**
	power loss reduced to 1/156, or reduced by 1/12.5 x 1/12.5	
	Total marks	**[6]**
11(a)i	bridge circuit ;	**[1]**
	input / output opposite sides ;	**[1]**
	diode directions correct	**[1]**
11(a)ii	capacitor	**[1]**
	Total marks	**[4]**
12(a)i	0 correct ;	**[1]**
	1s correct	**[1]**
12(a)ii	0s and 1s opposite to (i)	**[1]**
12(b)	current too low ;	
	isolating system **(Any 1)**	**[1]**
12(c)	output is high and stays high;	
	allow 'stays on'	**[1]**
	Total marks	**[5]**