

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2009



PHYSICS
Unit Physics P3

PHY3H
H

Higher Tier

Wednesday 10 June 2009 1.30 pm to 2.15 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler <p>You may use a calculator.</p>
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Time allowed: 45 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice

- In all calculations, show clearly how you work out your answer.

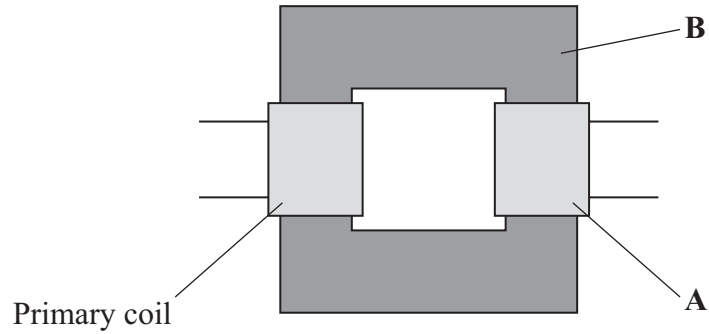
For Examiner's Use			
Question	Mark	Question	Mark
1		3	
2		4	
		5	
		6	
		7	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			



J U N O 9 P H Y 3 H O 1

Answer **all** questions in the spaces provided.

- 1 (a) The diagram shows a transformer.



- 1 (a) (i) What is part **A**?

.....
(1 mark)

- 1 (a) (ii) What is part **B** and what is it made of?

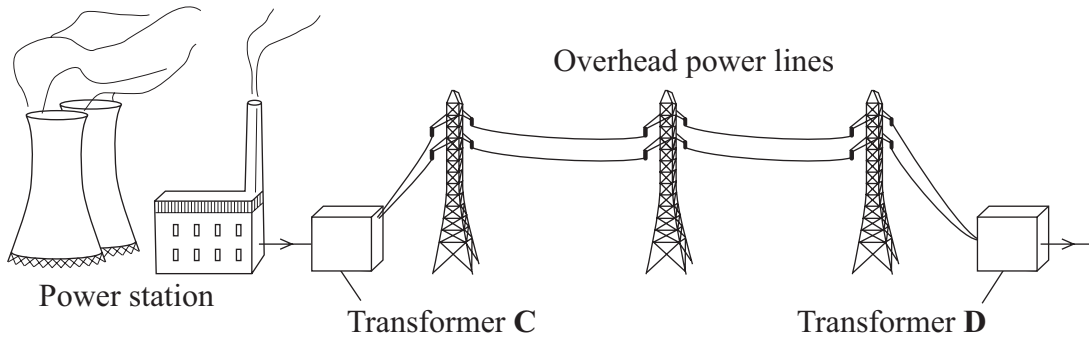
.....
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(2 marks)

- 1 (a) (iii) When there is an alternating current in the primary coil, what is produced in part **B**?

.....
.....
(2 marks)



1 (b) Transformers are used in the National Grid. The diagram shows part of the National Grid.



Complete the **two** spaces in the sentence.

Transformer C is a transformer and transformer D is a transformer. (1 mark)

1 (c) This is an item from a newspaper.

Health at risk from power lines?

Are high voltage power lines a health risk to people who live near them?

Some scientists think that scientific evidence shows that they are.

Other scientists do not think that the scientific evidence supports this conclusion.

Which **two** suggestions would reduce the possible risk to people's health? Put a tick (✓) in the box next to your answers.

- Do not build new houses near to existing power lines.
- Move the power lines so that they take the shortest routes.
- Move each power station to the centre of the nearest city.
- Build new power lines away from where people live.
- Use more transformers in the National Grid.

(2 marks)

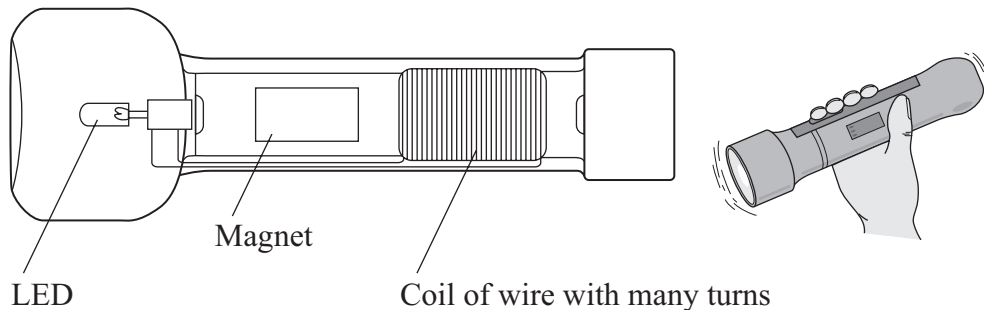
8

Turn over ►



- 2 The diagram shows some parts of a torch which works without batteries. The coil is part of a complete circuit with the LED (light-emitting diode).

You have to shake the torch for a short time and then it is ready to use.



- 2 (a) Arrange the letters, **A**, **B**, **C**, **D** and **E**, in the correct order to explain how shaking the torch produces an electric current.

- A** An electric current is induced in the circuit.
- B** The magnetic field cuts through the coil.
- C** The magnet moves in and out of the coil.
- D** A potential difference (p.d.) is induced across the ends of the coil.
- E** The torch is shaken to and fro.

The first letter has been done for you.

E				
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(2 marks)

- 2 (b) Give **two** changes which you would make to the design of the torch to increase the size of the induced potential difference.

1

.....

2

.....

(2 marks)



- 2 (c) A few minutes after shaking, the LED gets dimmer and then stops giving out light.

A student tests the torch. She shakes it for a period of time. Then she switches it on and times how long the light lasts.

These are her results.

Period of time torch is shaken measured in seconds	How long the light lasts measured in seconds
30	168
60	312
90	420
120	546
150	654

- 2 (c) (i) What conclusion can the student come to on the basis of these results?

.....

 (1 mark)

- 2 (c) (ii) The student's friend says that the results are **not** reliable. Her friend is correct.

Give **two** reasons why.

1

 2

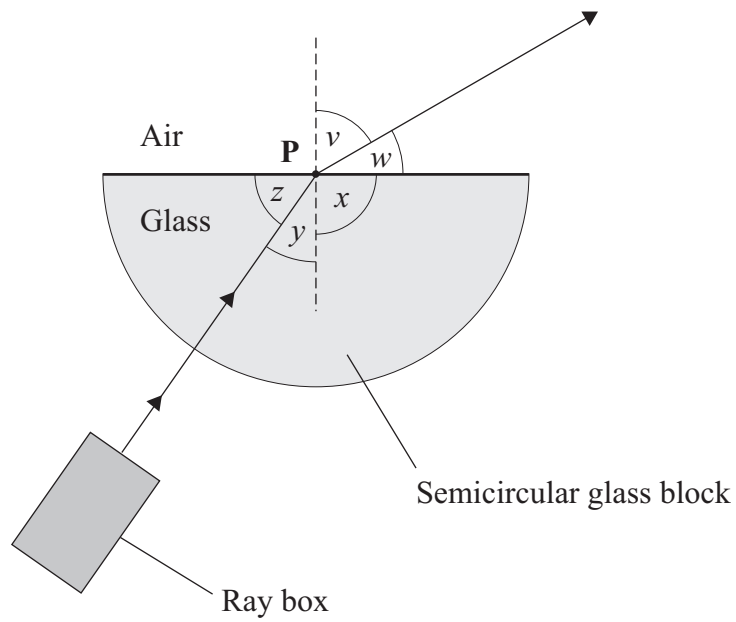
 (2 marks)

7

Turn over ►



3 A student uses a ray box and a semicircular glass block to investigate refraction.



3 (a) What is the vertical dashed line called?

.....
(1 mark)

3 (b) Which angle, v , w , x , y or z , is the angle of refraction?

.....
(1 mark)

3 (c) Why has refraction taken place?

.....
.....
(1 mark)



- 3 (d) In an investigation, a student always aims the light from the ray box at point **P**. She moves the ray box to give different values of angle v . She records angle y for each of these values. The table shows her results.

Angle v measured in degrees	Angle y measured in degrees
30	19
40	25
50	31
60	35
70	39
80	41

The student studies the data and comes to the following conclusion.

Angle y is directly proportional to angle v .

Her friend says that this conclusion is **not** correct.

- 3 (d) (i) Use data from the table to explain why the conclusion is **not** correct.

.....

 (2 marks)

- 3 (d) (ii) Write a correct conclusion for the experiment.

.....

 (1 mark)

- 3 (d) (iii) Why is your conclusion only valid when angle v is between 30° and 80° ?

.....

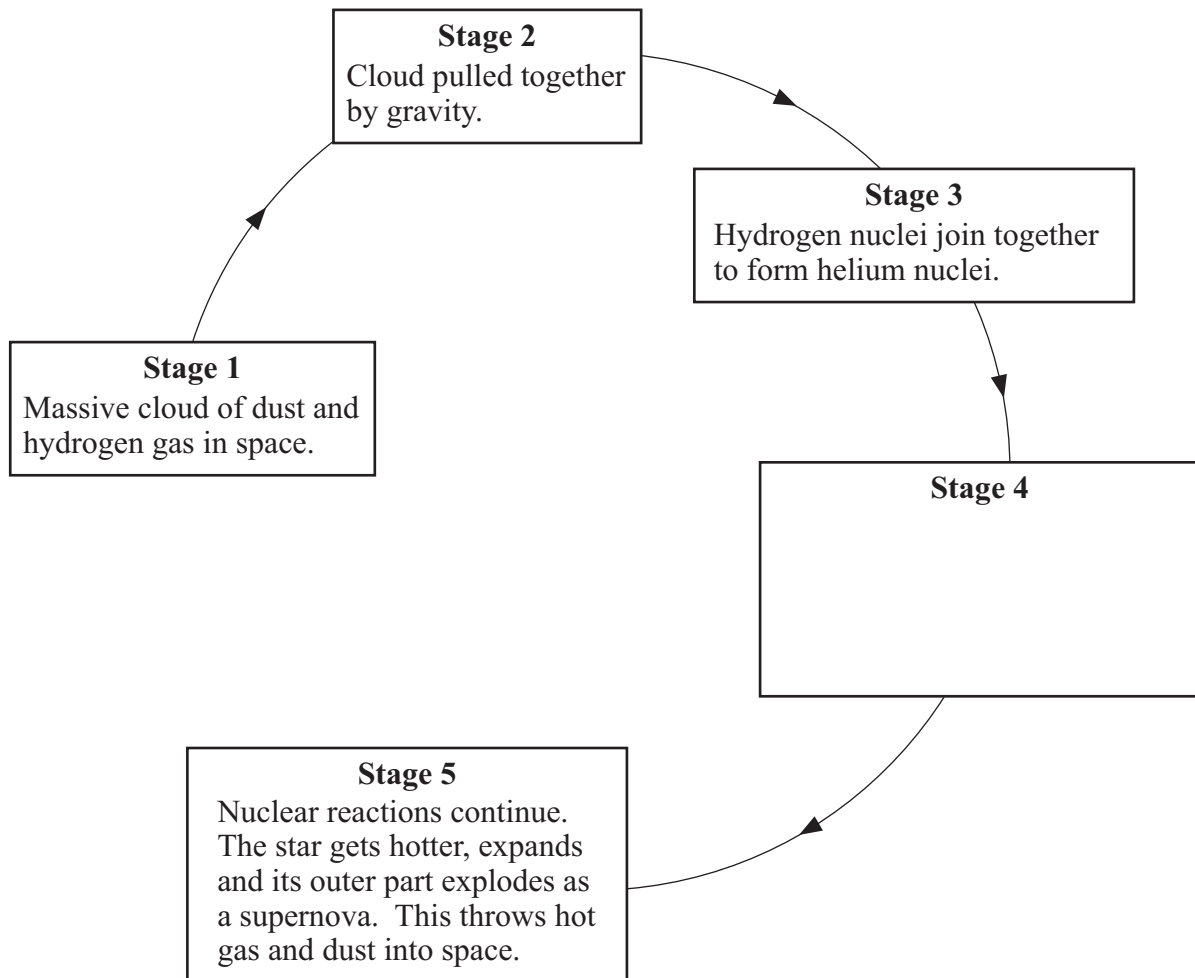
 (1 mark)

7

Turn over ►



4 The diagram shows part of the life cycle of a star which is much bigger than the Sun.



4 (a) (i) What is the relationship between the masses of the dust and gas in the cloud in **Stage 2** and the force of gravity between them?

.....
.....
(1 mark)

4 (a) (ii) What is the relationship between the distance apart of the dust and gas in the cloud in **Stage 2** and the force of gravity between them?

.....
.....
(1 mark)

4 (b) In **Stage 3** the star remains stable for millions of years.

Explain why.

.....
.....
.....
.....
.....
(2 marks)

4 (c) What happens in **Stage 4**?

.....
.....
.....
.....
.....
(2 marks)

6

Turn over ►



- 5 (a) The diagrams show oscilloscope traces for the same musical note played on two different instruments. The oscilloscope settings are not changed.

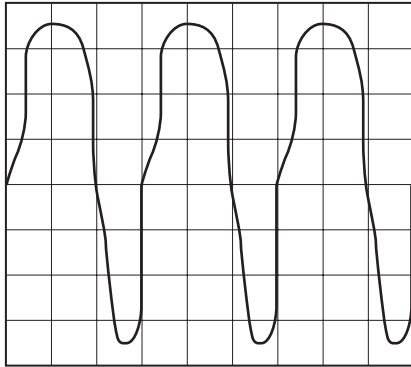


Diagram X

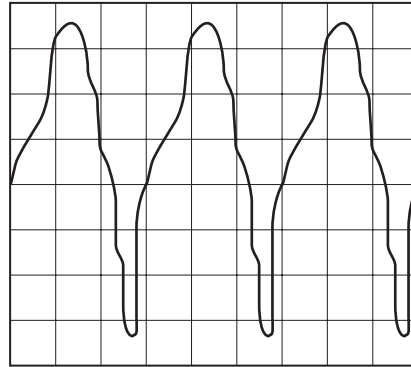


Diagram Y

- 5 (a) (i) How can you tell, from the diagrams, that it is the same musical note?

.....

(1 mark)

- 5 (a) (ii) How can you tell, from the diagrams, that the musical note has been played on different instruments?

.....

(1 mark)



5 (b) This passage is from an electronics magazine.

Electronic systems can be used to produce ultrasound waves. These waves have a higher frequency than the upper limit for hearing in humans. Ultrasound waves are partially reflected when they meet a boundary between two different media.

5 (b) (i) Approximately what is the highest frequency that humans can hear? State the number and the unit.

.....
(1 mark)

5 (b) (ii) What does the word *media* mean when it is used in this passage?

.....
.....
(1 mark)

5 (b) (iii) What happens to the ultrasound which reaches the boundary between two different media and is **not** reflected?

.....
.....
.....
.....
(2 marks)

6

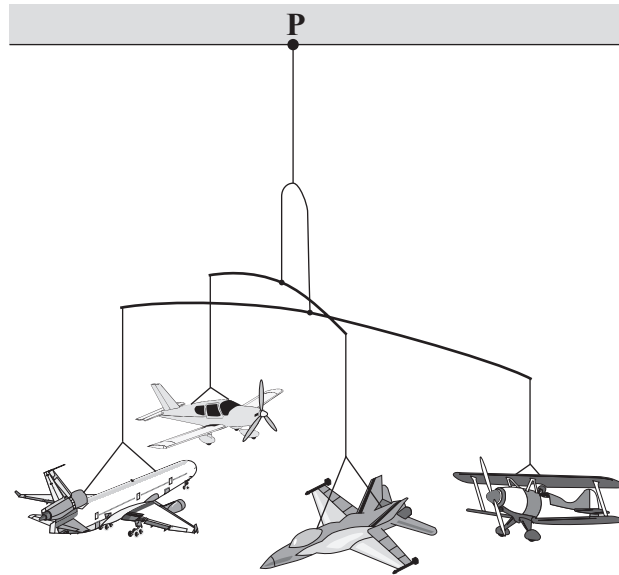
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6 (a) The diagram shows a child's mobile. The mobile hangs from point **P** on the ceiling of the child's bedroom.

6 (a) (i) Mark the position of the centre of mass of the mobile by drawing a letter **X** on the diagram. Do this so that the centre of the **X** marks the centre of mass of the mobile.



(1 mark)

6 (a) (ii) Explain why you have chosen this position for your letter **X**.

.....

.....

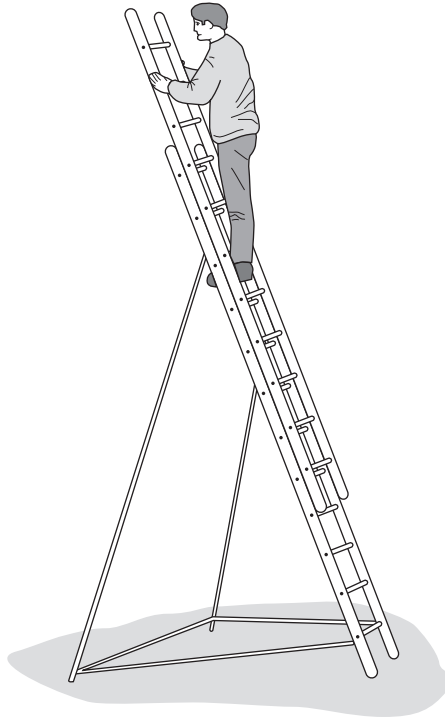
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.....

(2 marks)



- 6 (b) The diagram shows a device which helps to prevent a ladder from falling over.



Use the term *centre of mass* to explain why the ladder, in the situation shown, is unlikely to topple over.
You may add to the diagram to illustrate your explanation.

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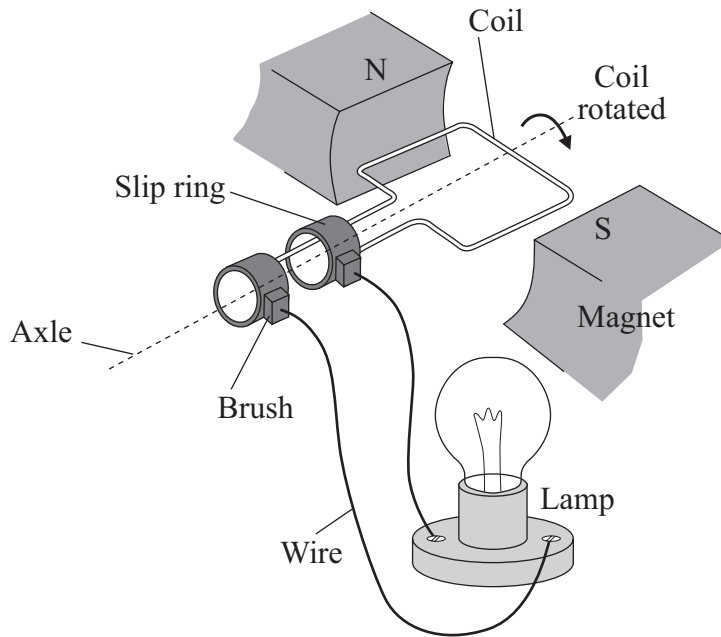
(3 marks)

6

Turn over ►



- 7 The diagram shows a generator.
When the coil is rotated around the axle, a current is produced and the lamp lights up.



- 7 (a) Explain the purpose of the slip rings and brushes.

.....

.....

.....

(2 marks)

- 7 (b) Explain how this generator gives an a.c. rather than a d.c. output.

.....

.....

.....

(2 marks)

- 7 (c) In this design, the generator effect occurs because the coil rotates in a magnetic field.

How else can a generator effect occur?

.....

.....

(1 mark)

END OF QUESTIONS



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