

Surname					Other Names				
Centre Number					Candidate Number				
Candidate Signature									

For Examiner's Use
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General Certificate of Secondary Education  
January 2008

**PHYSICS**  
**Unit Physics P3**

**Higher Tier**

Monday 21 January 2008 1.30 pm to 2.15 pm

**PHY3H**  
**H**



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

**Instructions**

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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.

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Question	Mark	Question	Mark
1		3	
2		4	
		5	
		6	
		7	
		8	
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			



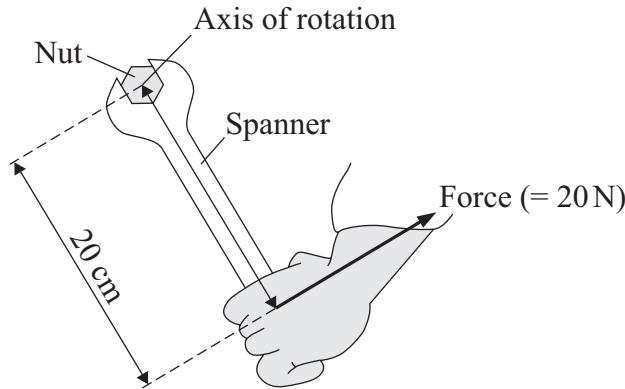
Answer **all** questions in the spaces provided.

1 A spanner gives a turning effect to undo a nut.

(a) Complete the sentence.

The turning effect of a force is called the ..... of the force.  
(1 mark)

(b) The diagram shows a spanner being used.



Use the equation in the box to calculate the spanner's turning effect in newton metres.

$\text{turning effect} = \text{force} \times \text{perpendicular distance from the line of action of the force to the axis of rotation}$
--

Show clearly how you work out your answer.

.....

.....

Turning effect = ..... Nm  
(2 marks)

(c) Give **two** ways in which you can increase the spanner's turning effect.

1 .....

2 .....

(2 marks)

5
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- 2 When sound waves reach a material, some of the energy of the sound is reflected and some is transmitted through the material.

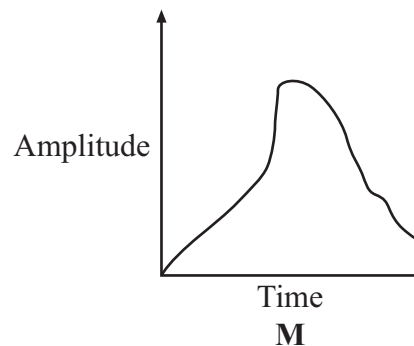
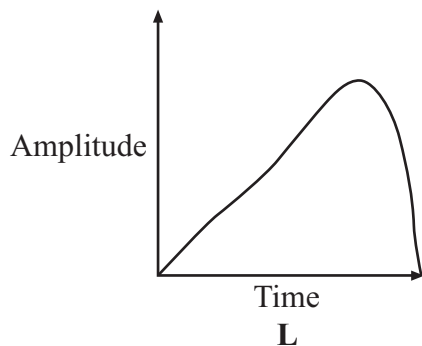
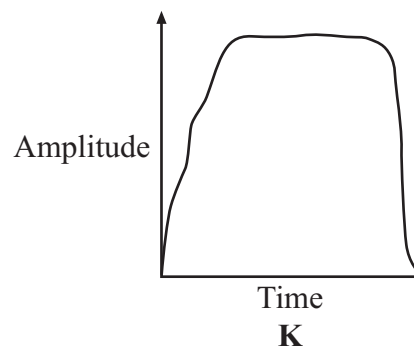
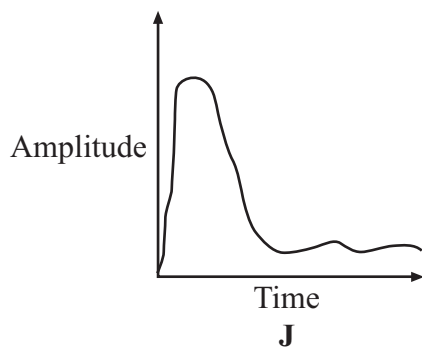
(a) Complete the sentence.

Sound waves are caused by .....  
(1 mark)

(b) The graphs **J**, **K**, **L** and **M** represent the sound energy reflected from a surface.

The graphs are all drawn to the same scale.

Which graph shows the greatest total sound energy output from the surface?



Graph .....  
(1 mark)

Question 2 continues on the next page

Turn over ►

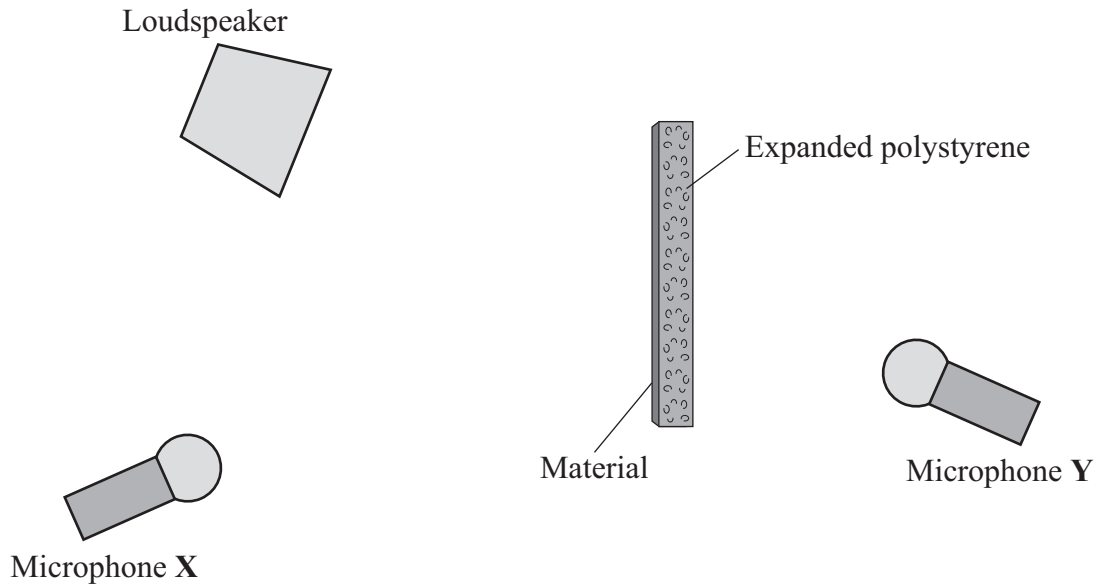


- (c) The proportion of the sound energy which is reflected or transmitted or absorbed depends on the material which receives the sound.

A student investigates different materials.

The diagram shows how a student sets up her equipment.

- (i) Using a pencil and ruler to draw on the diagram, show how microphone X receives reflected sound.



(2 marks)

- (ii) The student tests four materials. Each sheet of material is 1 mm thick. This has been glued onto a block of expanded polystyrene.

Why does the student use the same size of expanded polystyrene block and the same sound level for each test?

.....

.....

(1 mark)



- (iii) The table shows the readings for the sound level transmitted to microphone Y.

Sound level from loudspeaker in arbitrary units	Surface material	Sound level transmitted to microphone Y in arbitrary units
60	paper	39
60	plaster	18
60	cloth	31
60	wood	15

- [A] Which surface material transmits the smallest proportion of the sound?

.....  
(1 mark)

- [B] What proportion is this?

.....  
(1 mark)

- (d) People living in a flat have very noisy neighbours who are always playing loud music.

Suggest **one** practical idea to reduce the amount of noise transmitted into the flat through the walls and explain how your idea will work.

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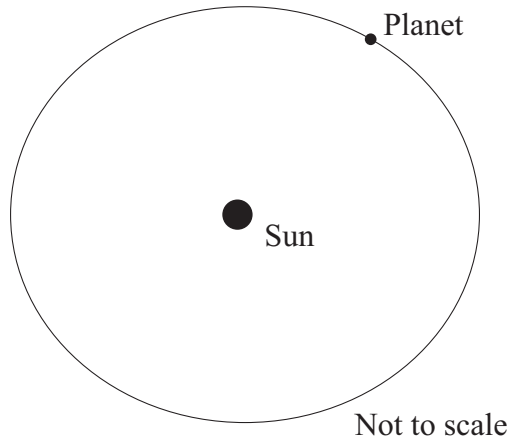
(2 marks)

9
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Turn over ►



- 3 (a) The diagram shows the orbit of a planet in the Solar System. The orbit is in the shape of a slightly squashed circle.



- (i) What is the name of this orbit shape?

.....  
(1 mark)

- (ii) Complete the sentence.

The Sun is at one .....of this shape.  
(1 mark)

- (iii) What provides the centripetal force which allows the planet to maintain its nearly circular orbit?

.....  
(1 mark)

- (iv) What is the relationship between the time it takes each planet in the Solar System to complete its orbit and the planet's average distance from the Sun?

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



- (b) Scientists have detected an object orbiting the Sun at a distance of about 17 billion kilometres. Some scientists think that the object, named Sedna, should be classified as a planet. However, some other scientists disagree.

What do you think scientists should do?

Put a tick (✓) in the box next to your answer.

Scientists should decide by voting.

Scientists should wait until they have more evidence.

Give a reason for your answer.

.....

.....

.....

(1 mark)

5

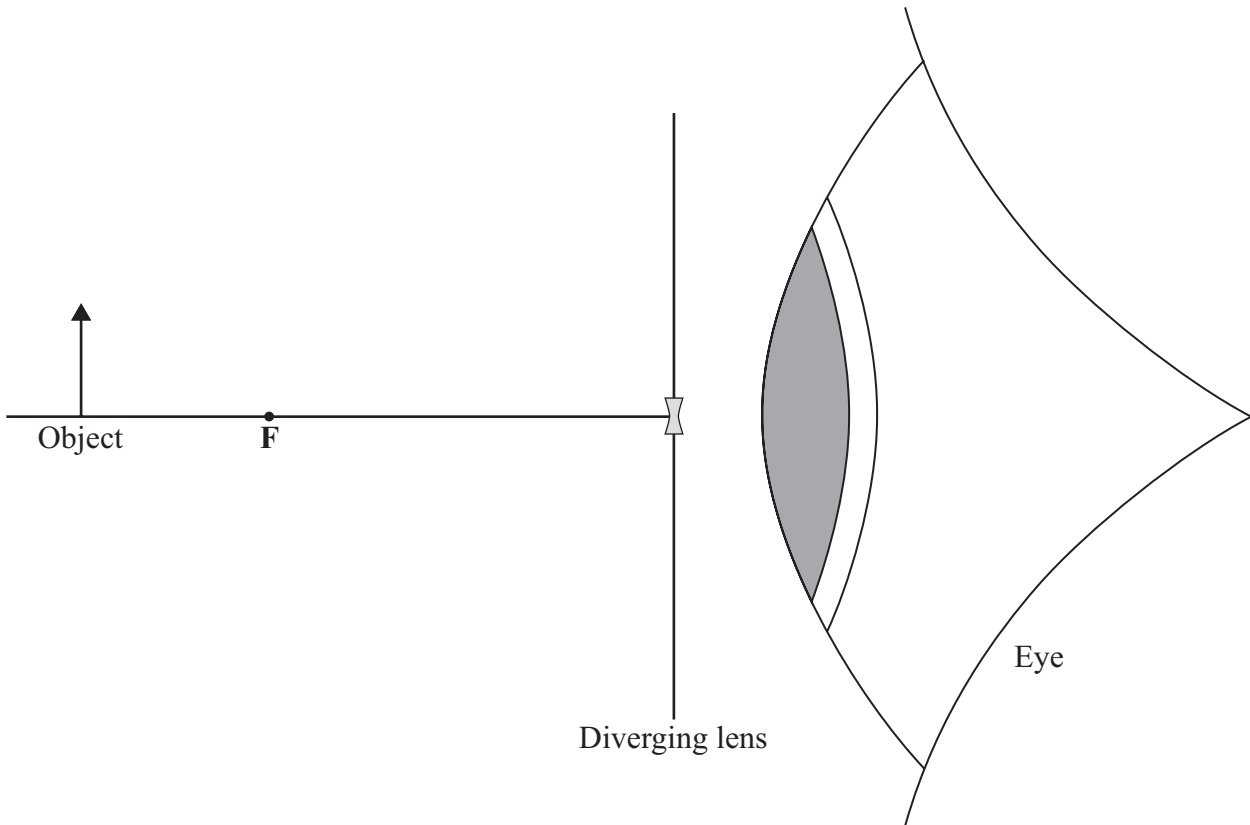
**Turn over for the next question**

**Turn over ►**



4 The diagram shows an object located vertically on the principal axis of a diverging lens. A student looks through the lens and can see an image of the object.

- (a) Using a pencil and ruler to draw construction lines on the diagram, show how light from the object enters the student's eye and the size and position of the image.



(3 marks)

- (b) Describe the nature of the image by comparing it to the object.

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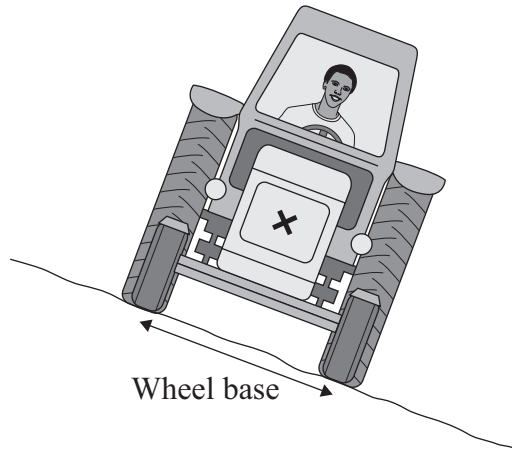
(2 marks)

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5 Tractors are often used on sloping fields, so stability is important in their design.

On the diagram, the centre of the **X** marks the centre of mass of the tractor.



(a) Explain why the tractor has **not** toppled over. You may add to the diagram to help you to explain.

.....

.....

.....

.....

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(3 marks)

(b) Give **two** features of the tractor which affect its stability and state how each feature could be changed to increase the tractor's stability.

Feature 1 .....

.....

Feature 2 .....

.....

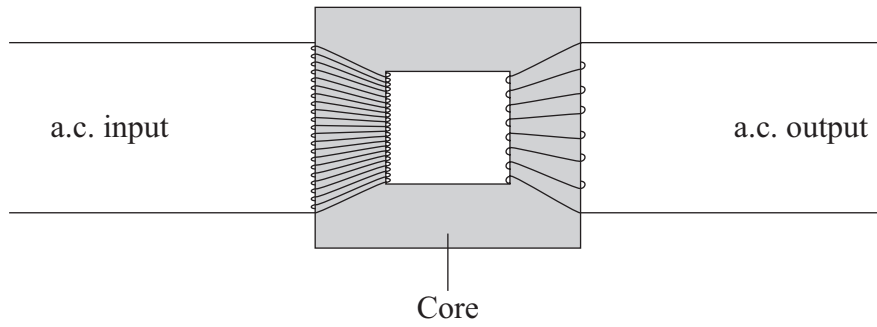
(2 marks)

5
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Turn over ►



6 (a) The diagram shows a transformer.



(i) Is the transformer in the diagram being used as a step-up transformer or as a step-down transformer?

Put a tick (✓) in the box next to your answer.

a step-up transformer

a step-down transformer

Explain your answer.

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

(ii) Why is insulated wire, and not uninsulated wire, used to make the coils?

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

(iii) Why is the core made of iron?

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



- (b) A transformer has 500 turns on its primary coil and 7500 turns on its secondary coil. The potential difference across the primary coil is 150 volts.

Use the equation in the box to calculate the potential difference across the secondary coil.

$\frac{\text{p.d. across primary}}{\text{p.d. across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$
---

Show clearly how you work out your answer.

.....

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Potential difference across the secondary coil = ..... volts  
(2 marks)

- (c) Step-down transformers are used between power lines and people's houses.

Explain why.

.....

.....

.....

(2 marks)

- (d) Before 1926, large towns had their own local power stations. After 1926, these power stations were connected to form the National Grid.

Explain the advantage of having a National Grid system.

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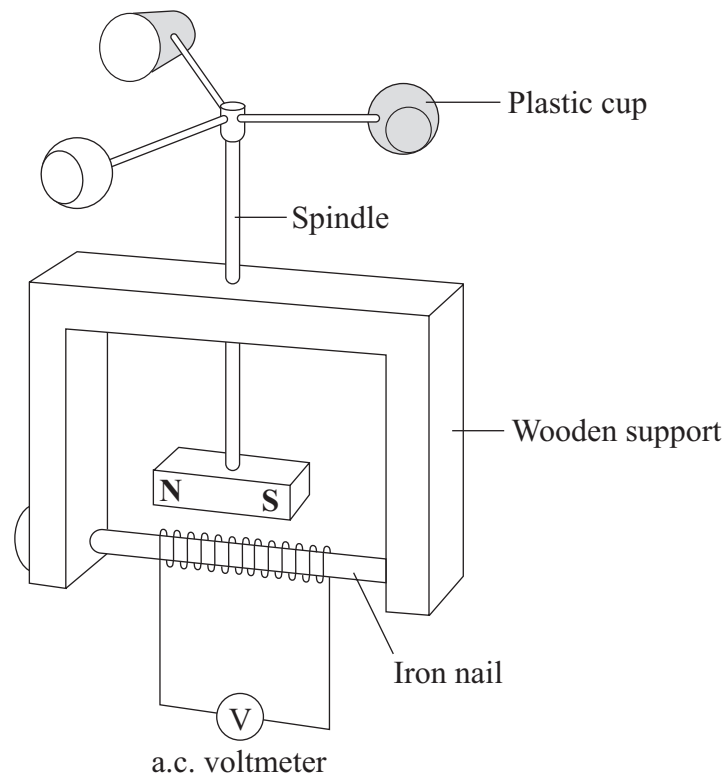
(2 marks)

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**Turn over ▶**



7 The diagram shows a student's design for a simple wind speed gauge.



- (a) Explain why the wind causes the a.c. voltmeter to give a reading. The explanation has been started for you.

*The wind causes the plastic cups to turn. This causes the spindle and magnet to turn.*

.....

.....

.....

.....

(2 marks)

- (b) The gauge is not sensitive enough to measure light winds.

Suggest **one** way that the design can be modified to make the gauge more sensitive.

.....

.....

(1 mark)

3
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8 Read the passage.

In the Solar System, the inner planets, such as the Earth, contain elements which are heavier than the elements hydrogen and helium.

Our star, the Sun, is a medium sized star.

If a star is much more massive than the Sun it will eventually swell into a red giant, start to contract, continue to contract and finally explode.

(a) What is the explosion called?

.....  
*(1 mark)*

(b) Explain why scientists believe that the Solar System was formed from the material produced when earlier stars exploded.

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.....  
*(3 marks)*

4
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**END OF QUESTIONS**



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