



**Topic Test: OxfordAQA**  
**International GCSE Physics 9203**  
Waves

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

---

Time: **35 minutes**

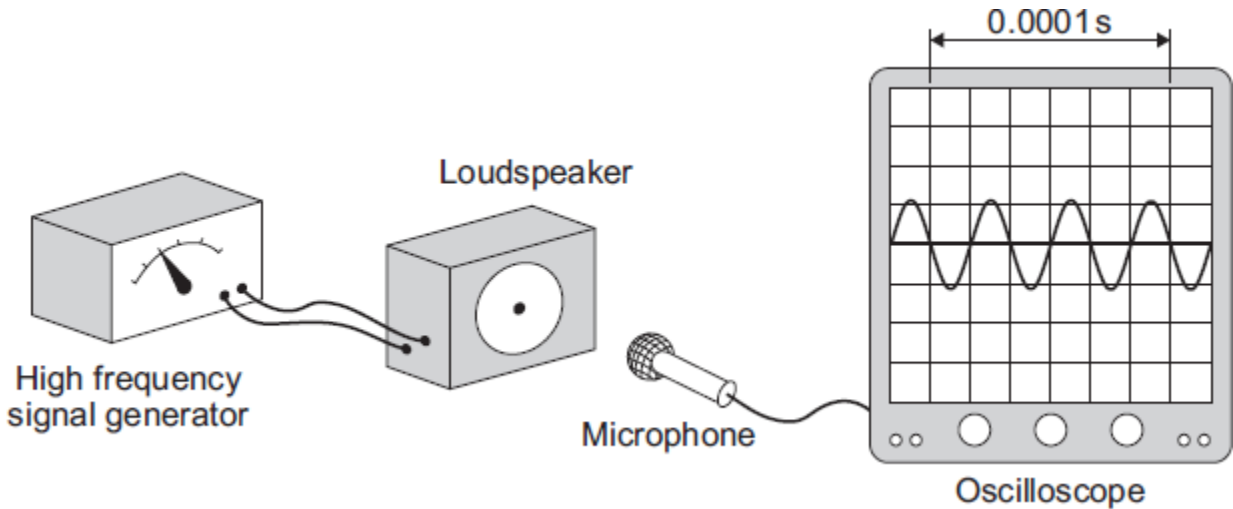
Marks: **35 marks**

Comments:

---

1

(a) The diagram shows a microphone being used to detect the output from a loudspeaker. The oscilloscope trace shows the wave pattern produced by the loudspeaker.



(i) How many waves are produced by the loudspeaker in 0.0001 seconds?

\_\_\_\_\_

(1)

(ii) How many waves are produced by the loudspeaker every second?  
Assume the input to the loudspeaker does not change.

\_\_\_\_\_  
\_\_\_\_\_

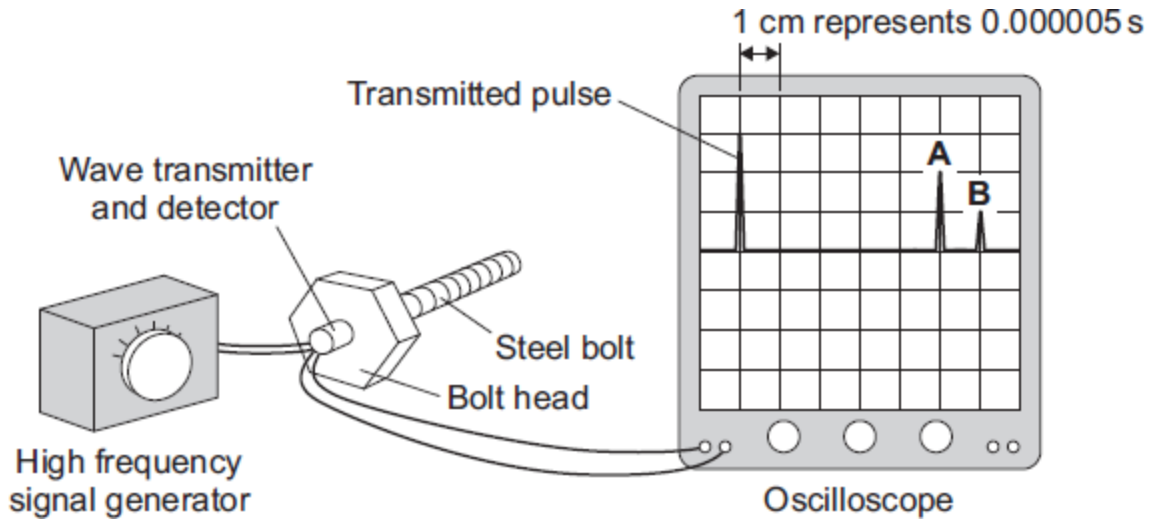
(1)

(iii) A person with normal hearing cannot hear the sound produced by the loudspeaker.  
Explain why.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2)

- (b) The diagram shows how a very high frequency sound wave can be used to check for internal cracks in a large steel bolt. The oscilloscope trace shows that the bolt does have an internal crack.



- (i) Explain what happens to produce pulse **A** and pulse **B**.

---



---



---



---

(2)

- (ii) Use the information in the diagram and the equation in the box to calculate the distance from the head of the bolt to the internal crack.

$$\text{distance} = \text{speed} \times \text{time}$$

Speed of sound through steel = 6000 m/s

Show clearly how you work out your answer.

---



---



---



---



---



---

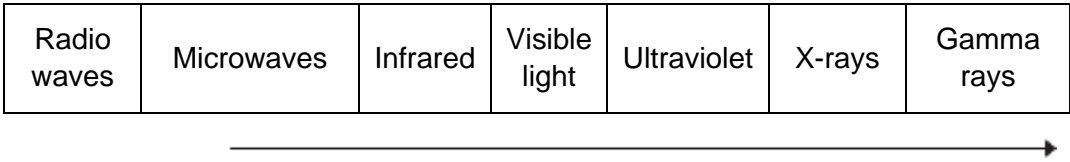
(3)

(Total 9 marks)

**2**

Different parts of the electromagnetic spectrum have different uses.

(a) The diagram shows the electromagnetic spectrum.



(i) Use the correct answers from the box to complete the sentence.

<b>amplitude</b>	<b>frequency</b>	<b>speed</b>	<b>wavelength</b>
------------------	------------------	--------------	-------------------

The arrow in the diagram is in the direction of increasing \_\_\_\_\_  
and decreasing \_\_\_\_\_ .

**(2)**

(ii) Draw a ring around the correct answer to complete the sentence.

The range of wavelengths for waves in the electromagnetic

spectrum is approximately

$10^{-15}$ to $10^4$
$10^{-4}$ to $10^4$
$10^4$ to $10^{15}$

metres.

**(1)**

(b) The wavelength of a radio wave is 1500 m.  
The speed of radio waves is  $3.0 \times 10^8$  m / s.

Calculate the frequency of the radio wave.

Use the correct equation from **Section B** of the Physics Equations Sheet.

Give the unit.

---



---



---

Frequency = \_\_\_\_\_

**(3)**

(c) (i) State **one** hazard of exposure to infrared radiation.

---

**(1)**

(ii) State **one** hazard of exposure to ultraviolet radiation.

---

(1)

(d) X-rays are used in hospitals for computed tomography (CT) scans.

(i) State **one** other medical use for X-rays.

---

---

(1)

(ii) State a property of X-rays that makes them suitable for your answer in part **(d)(i)**.

---

---

(1)

(iii) The scientific unit of measurement used to measure the dose received from radiations, such as X-rays or background radiation, is the millisievert (mSv).

The table shows the X-ray dose resulting from CT scans of various parts of the body.

The table also shows the time it would take to get the same dose from background radiation.

<b>Part of the body</b>	<b>X-ray dose in mSv</b>	<b>Time it would take to get the same dose from background radiation</b>
Abdomen	9.0	3 years
Sinuses	0.5	2 months
Spine	4.0	16 months

A student suggests that the X-ray dose and the time it would take to get the same dose from background radiation are directly proportional.

Use calculations to test this suggestion and state your conclusion.

---

---

---

---

---

---

---

---

---

---

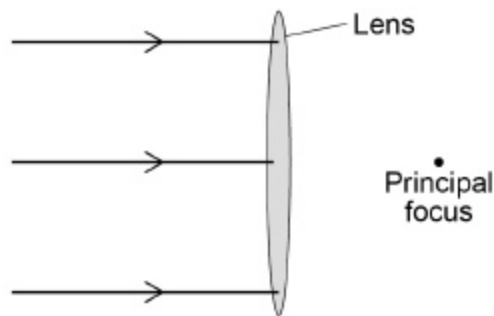
---

(3)  
(Total 13 marks)

3

Figure 1 shows three parallel rays of light entering a convex (converging) lens.

Figure 1



(a) Complete Figure 6 to show how the rays of light are brought to a focus.

(1)

(b) Complete the sentence. Choose an answer from the box.

<b>focal length</b>	<b>focal point</b>	<b>lens power</b>	<b>object distance</b>
---------------------	--------------------	-------------------	------------------------

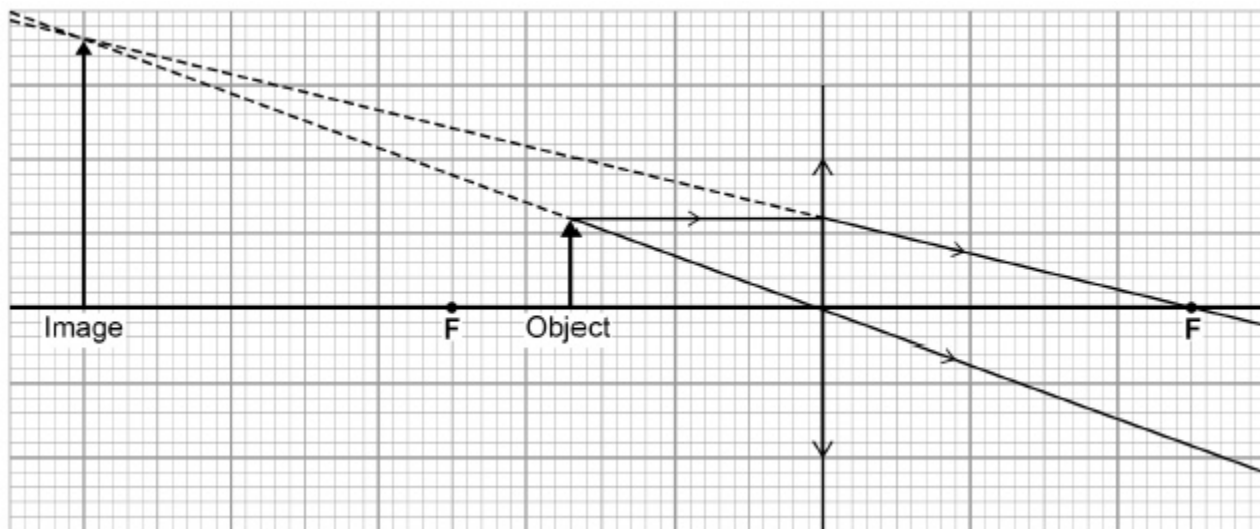
The distance from the centre of the lens to the principal focus is

called the \_\_\_\_\_.

(1)

Figure 2 shows a ray diagram for a convex lens.

Figure 2



(c) The image in **Figure 2** is magnified.

Give **two** other words that describe the nature of the image.

---

---

(2)

(d) Calculate the magnification produced by the lens in **Figure 2**.

Use the Physics Equations Sheet.

---

---

---

---

Magnification = \_\_\_\_\_

(2)

Convex lenses are used to correct long sight.

(e) Explain what is meant by long sight.

---

---

---

---

(2)

(f) Complete the sentence. Choose an answer from the box.

<b>25 mm</b>	<b>25 cm</b>	<b>250 cm</b>	<b>25 m</b>
--------------	--------------	---------------	-------------

For a normal eye, the near point is approximately \_\_\_\_\_ from the eye.

(1)

(g) A student is outside looking up at the dark night sky.

He then looks down to read a text message on a brightly lit phone.

Explain the changes that take place in the student's eye so he can see the text message clearly.

---

---

---

---

---

---

(4)

**(Total 13 marks)**

## Mark schemes

<b>1</b>	(a) (i) 3	1	
	(ii) 30 000 <b>or</b> 10 000 × their (a)(i) correctly calculated	1	
	(iii) any <b>two</b> from:		
	<ul style="list-style-type: none"> <li>• frequency is above 20 000 (Hz) <i>accept the frequency is 30 000</i></li> <li>• frequency is above the upper limit of audible range</li> <li>• upper limit of audible range equals <u>20 000</u> (Hz) <i>ignore reference to lower limit</i></li> <li>• it is ultrasound/ultrasonic</li> </ul>	2	
	(b) (i) wave (partially) <u>reflected</u>	1	
	at crack to produce <b>A</b> and end of bolt to produce <b>B</b> <i>accept at both ends of the crack</i>	1	
	(ii) 0.075 (m) allow <b>2</b> marks for time = 0.0000125 <i>allow 1 mark for time = 0.000025</i> <i>answers 0.15 <b>or</b> 0.015 <b>or</b> 0.09 gain 2 marks</i> <i>answers 0.18 <b>or</b> 0.03 gain 1 mark</i> <i>the unit is not required but if given must be consistent with numerical answer for the available marks</i>	3	
			<b>[9]</b>
<b>2</b>	(a) (i) frequency	1	
	wavelength	1	
	(ii) $10^{-15}$ to $10^4$	1	
	(b) $2.0 \times 10^5$ <i>correct substitution of</i> <i><math>3.0 \times 10^8 / 1500</math> gains 1 mark</i>	2	
	Hz	1	

- (c) (i) (skin) burns 1
- (ii) skin cancer / blindness 1
- (d) (i) any **one** from:
- (detecting) bone fractures
  - (detecting) dental problems
  - treating cancer
- 1
- (ii) any **one** from:
- affect photographic film
  - absorbed by bone
  - transmitted by soft tissue
  - kill (cancer) cells
- answer must link to answer given in (d)(i)*
- 1
- (iii)  $9 / 36 = 0.25$   
 $0.5 / 2 = 0.25$   
 $4 / 16 = 0.25$   
*accept:*  
 $36 / 9 = 4$   
 $2 / 0.5 = 4$   
 $16 / 4 = 4$
- 2
- conclusion based on calculation  
*two calculations correct with a valid conclusion scores 2 marks*  
*one correct calculation of k scores 1 mark*
- 1

[13]

- 3** (a) three correct rays including arrows in the correct direction 1
- (b) focal length 1
- (c) upright 1
- virtual 2

(d) magnification =  $18 / 6$  1  
magnification = 3 1  
*allow 1 mark for correct calculation using one correct value*  
*an answer of 3 scores 2 marks*

(e) the image is formed behind the retina 1  
because eyeball too short 1

**or**

lens not powerful enough

**OR**

distant objects can be seen clearly (1)

close objects cannot be seen clearly (1)

(f) 25 cm 1

(g) pupil constricts  
*allow pupil gets smaller*

to allow less light to enter eye 1

lens gets thicker  
*allow lens becomes more powerful* 1

to focus light from nearby object on retina 1

**[13]**