

FOR OFFICIAL USE

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Total Marks

**3220/401**

NATIONAL  
QUALIFICATIONS  
2007

WEDNESDAY, 16 MAY  
9.00 AM – 10.30 AM

**PHYSICS**  
**STANDARD GRADE**  
General Level

**Fill in these boxes and read what is printed below.**

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

Reference may be made to the Physics Data Booklet.

- 1 All questions should be answered.
- 2 The questions may be answered in any order but all answers must be written clearly and legibly in this book.
- 3 For questions 1–5, write down, in the space provided, the letter corresponding to the answer you think is correct. There is only **one** correct answer.
- 4 For questions 6–18, write your answer where indicated by the question or in the space provided after the question.
- 5 If you change your mind about your answer you may score it out and replace it in the space provided at the end of the answer book.
- 6 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.





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3. Which row of values would result in the greatest kinetic energy?

	<i>Mass</i> (kilograms)	<i>Speed</i> (metres per second)
A	45	8
B	45	4
C	50	10
D	50	8
E	50	4

Answer

1

4. A rocket is pushed forwards because its engine gases

- A are pushed backwards
- B spread outwards
- C are pushed forwards
- D surround the rocket
- E spread inwards.

Answer

1

5. In outer space, the engine of a space probe is switched on for a short time. When the engine is switched off, the rocket

- A changes direction
- B moves at a steady speed
- C slows down
- D speeds up
- E follows a curved path.

Answer

1

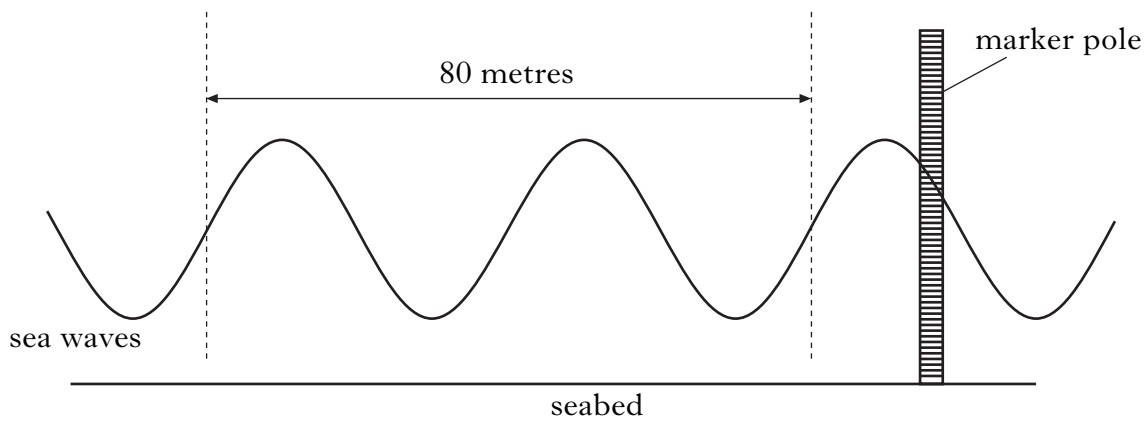
[Turn over

Marks

6. A surfer rides the waves near a beach.



(a) The diagram below shows a wave some distance from the beach.



(i) Using information from the diagram, calculate the wavelength of the wave.

*Space for working and answer*

2

(ii) The time between one crest and the next crest passing the marker pole is 5 seconds.  
Calculate the speed of the wave.

*Space for working and answer*

2











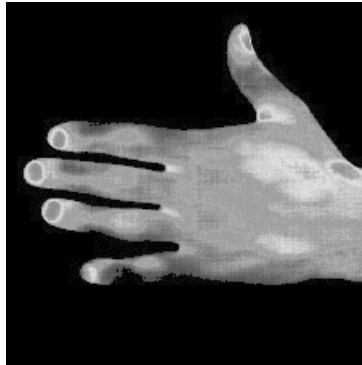




Marks

10. (continued)

(c)



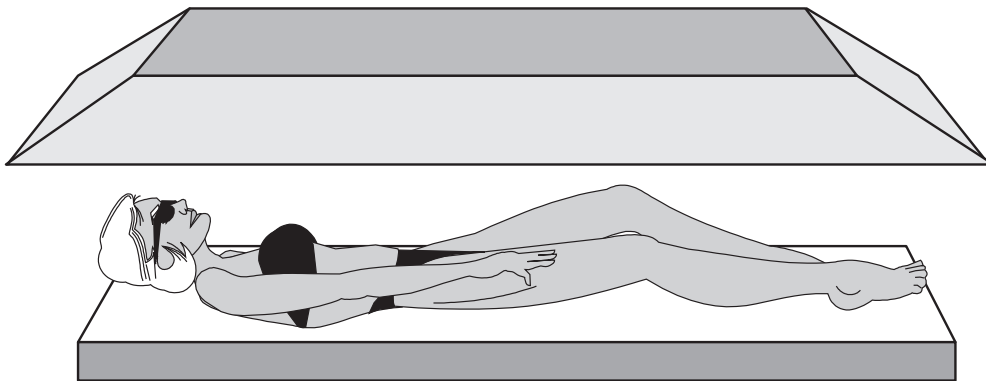
Colour photographs called thermograms are used to find the temperature variation in a patient's body.

Name the radiation used to make thermograms.

.....

1

(d)



Explain why people need to be protected from overexposure to ultraviolet radiation.

.....

1

[Turn over

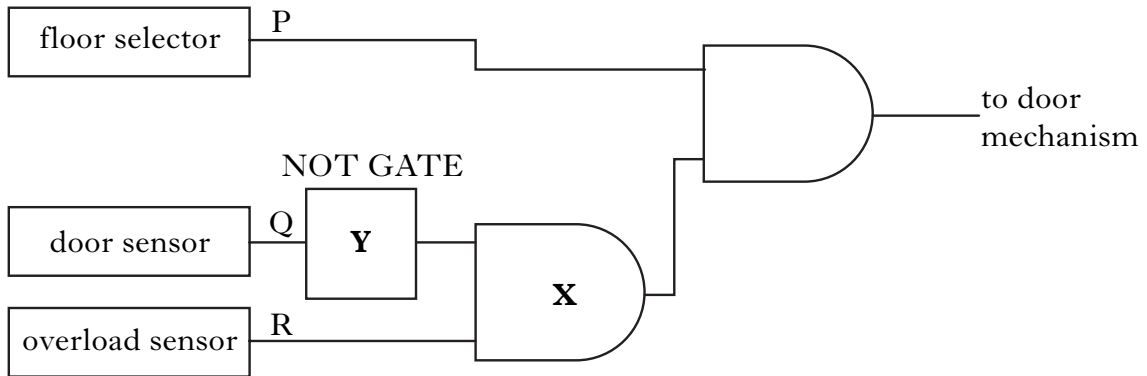




Marks

13. An electronic system is used to control a lift. When a floor has been selected, two checks are made:
- there are no obstructions to the doors;
  - the lift is not overloaded.

Part of the circuit is shown below.



The logic states are as shown for the floor selector, the sensors and the door mechanism.

		logic level
floor selector	not pressed	0
	pressed	1
door sensor	no obstruction	0
	obstruction	1
overload sensor	overloaded	0
	not overloaded	1
door mechanism	doors open	0
	doors closed	1

- (a) Name logic gate **X**.

.....

1



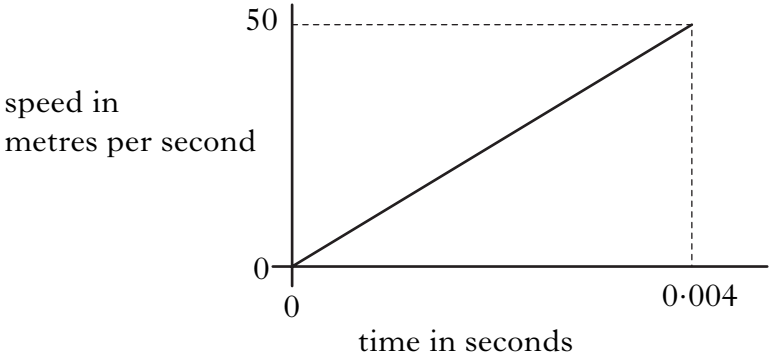




Marks

14. (continued)

(b) A graph showing how the speed of the ball changes while in contact with the racquet during the serve is shown.



Calculate the acceleration of the ball during the serve.

*Space for working and answer*

2

(c) For a second serve, the server hits the ball with a smaller force.  
What effect does this have on the speed of the ball when it leaves the racquet?

.....

1

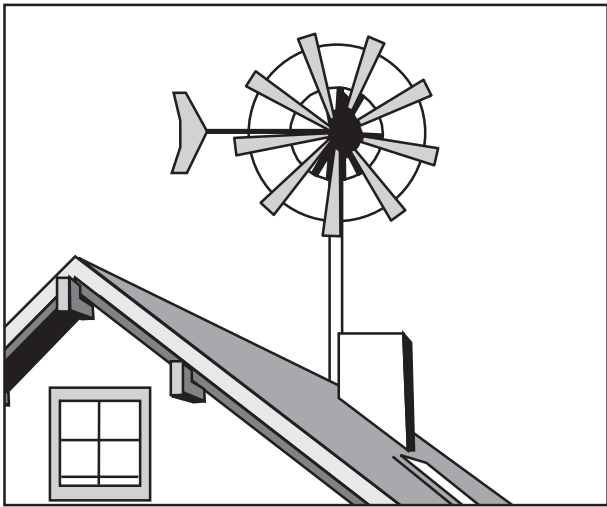
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Marks

17. A householder installs a wind turbine electricity generator.



The table gives information about the wind turbine.

Rated power output	1.5 kilowatts
Product life	20 years
Installation cost	£1600

(a) In the year 2006, the wind turbine generated electricity for 2000 hours.  
Calculate the energy generated in kilowatt-hours during 2006.

*Space for working and answer*

2

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Marks

**17. (continued)**

- (b) An electricity supplier charges 8 pence per kilowatt-hour.  
Calculate the cost of buying the same amount of electricity as generated by the wind turbine in 2006.

*Space for working and answer*

2

- (c) The wind turbine costs £1600 to install. It is used to generate energy for 20 years. Each year it generates the same amount of energy as it did in 2006.  
Calculate how much money the householder will save if the turbine is used to generate electricity over this time.

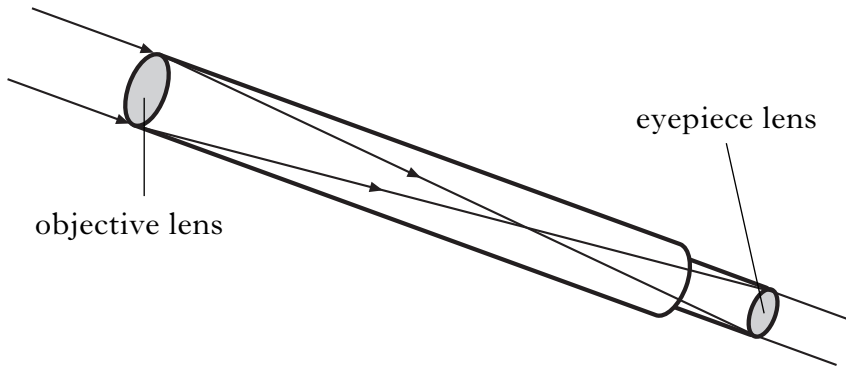
*Space for working and answer*

2

**[Turn over**

Marks	
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18. The diagram below shows a refracting telescope, which is used by astronomers to view distant stars, planets and galaxies.



(a) (i) Which lens, the objective or the eyepiece, has the longer focal length?

..... 1

(ii) What is the purpose of the eyepiece lens?

..... 1



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**YOU MAY USE THE SPACE ON THIS PAGE TO REWRITE ANY ANSWER YOU HAVE DECIDED TO CHANGE IN THE MAIN PART OF THE ANSWER BOOKLET. TAKE CARE TO WRITE IN CAREFULLY THE APPROPRIATE QUESTION NUMBER.**



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