

FOR OFFICIAL USE

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**3220/401**



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K&U PS

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NATIONAL  
QUALIFICATIONS  
2009

TUESDAY, 26 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.

- All questions should be answered.
- The questions may be answered in any order but all answers must be written clearly and legibly in this book.
- For questions 1–6, write down, in the space provided, the letter corresponding to the answer you think is correct. There is only **one** correct answer.
- For questions 7–20, write your answer where indicated by the question or in the space provided after the question.
- 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.
- If you use the additional space at the end of the answer book for answering any questions, you **must** write the correct question number beside each answer.
- 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.

Use **blue** or **black ink**. Pencil may be used for graphs and diagrams only.



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Marks

1. What is the frequency of a wave, if 20 crests pass a point in two seconds?

- A 0.1 hertz
- B 2 hertz
- C 10 hertz
- D 20 hertz
- E 40 hertz

Answer

1

2. How long does a geostationary satellite take to orbit the Earth?

- A 1 hour
- B 1 day
- C 1 week
- D 1 month
- E 1 year

Answer

1

3. Which of the following will **not allow** the transmission of sound waves?

- A Brick
- B Vacuum
- C Water
- D Air
- E Wood

Answer

1

4. Which of the following statements is **always** true about the structure of the atom?

- A It has more electrons than protons.
- B It has more protons than neutrons.
- C It has an equal number of protons and electrons.
- D It has more neutrons than protons.
- E It has an equal number of neutrons and electrons.

Answer

1



Marks

7. A student listens to his radio using headphones.



- (a) State the main energy transformation that takes place in the headphones.

.....

1

The table shows the frequencies for different radio stations.

<i>Radio Station</i>	<i>Frequency</i> (mega hertz)
Forth 1	97.3
Real Radio	101.0
Radio Borders	103.1
Isles	103.0
Central Scotland FM	103.1
Radio Scotland	95.0

- (b) Explain why the radio stations Radio Borders and Central Scotland FM are allowed to transmit at the same frequency.

.....

1







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Marks		
2		
1		
1		
1		

10. Party lights consist of 16 identical light bulbs connected in series. They operate from a 24 volt power supply. The current in the circuit is 1.25 amperes.

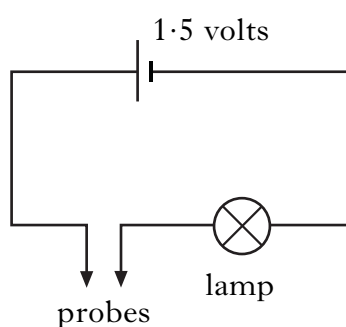
(a) Calculate the total resistance of the bulbs in the circuit.

*Space for working and answer*

(b) Calculate the voltage across each light bulb.

*Space for working and answer*

(c) A fault occurs in the circuit and a continuity tester is needed to find the fault. The circuit diagram for the continuity tester is shown.



(i) Describe how the continuity tester could be tested to make sure that it is working.

.....

(ii) The continuity tester is found to be faulty.

State one possible reason why it is not working.

.....





Marks	K&U	PS
1		
1		

**11. (continued)**

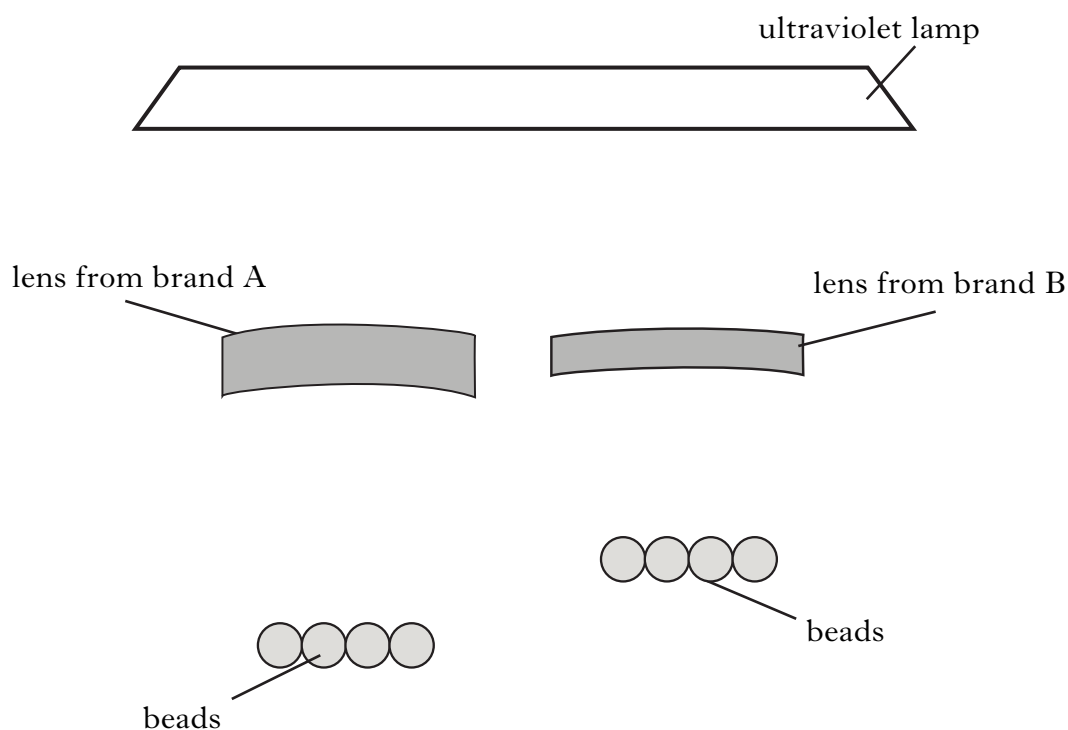
(e) A student sets up the following experiment to compare how two different brands of sunglasses protect from ultraviolet radiation.

The student uses beads which change colour when exposed to ultraviolet radiation.

The student covers one set of beads with a lens from brand A and another with a lens from brand B.

The ultraviolet lamp is switched on for 30 minutes.

The apparatus is set up as shown.



(i) Give **one** reason why this test is not a fair one.

.....

1

(ii) Why can exposure to ultraviolet radiation be harmful to humans?

.....

1

**[Turn over**





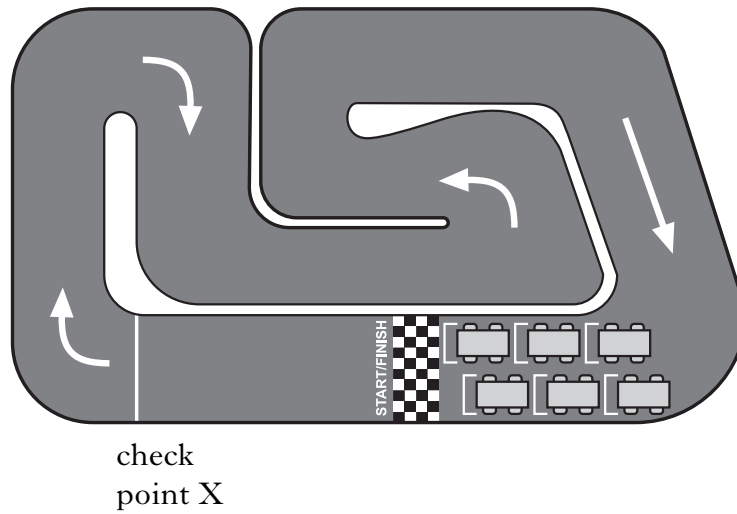




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Marks

15. An indoor kart track hosts a racing competition.



(a) Describe how to find the average speed of a kart for one complete lap of the track.

You must state the measurements that are made and how they are used.

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.....

.....

3

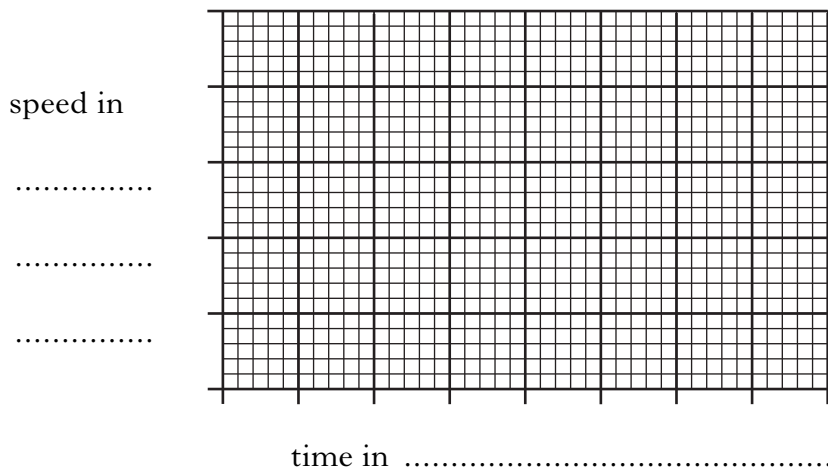
(b) The speed of a kart and driver is recorded from the start of the race.

The kart starts from rest and accelerates uniformly until it reaches check point X. Its speed at X is 12 metres per second.

The time taken to reach X is 4 seconds.

(i) Draw a speed-time graph for the motion of the kart from the start until it reaches check point X.

Units and numerical values must be shown on both axes.



3



Marks

16. A climber of weight 550 newtons takes 40 seconds to reach the top of a 20 metre high climbing wall.



- (a) What is the minimum upward force she exerts while climbing the wall?

.....

1

- (b) Calculate the minimum work done by the climber to reach the top of the wall.

*Space for working and answer*

2

- (c) Calculate her power during this climb.

*Space for working and answer*

2

- (d) Explain why the climber uses chalk on her hands as she climbs the wall.

.....

1

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Marks

17. A house is designed to conserve as much energy as possible.



(a) Heat energy can be lost from the house by a variety of means. Insulation is used to reduce heat loss.

Match the correct type of insulation given in the word bank with each type of heat loss.

Use each answer once only.

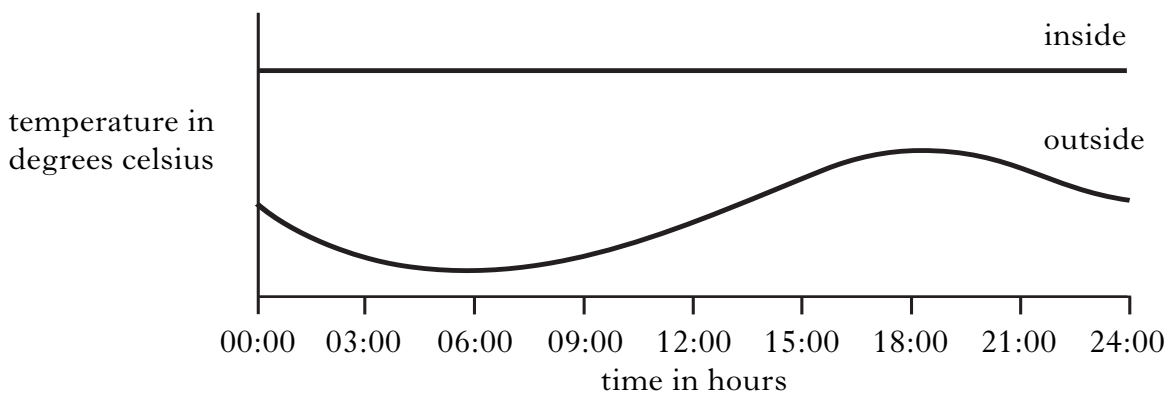
<b>foil-backed plasterboard</b>	<b>double glazing</b>	<b>loft insulation</b>
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<i>Type of heat loss</i>	<i>Correct insulation</i>
Conduction	
Convection	
Radiation	

2

The temperature in the house is kept at a constant value while the temperature outside changes.

The graph shows the temperature inside the house and the temperature outside the house over a 24 hour period.



(b) Write down the time at which heat loss from the house is greatest.

.....

1







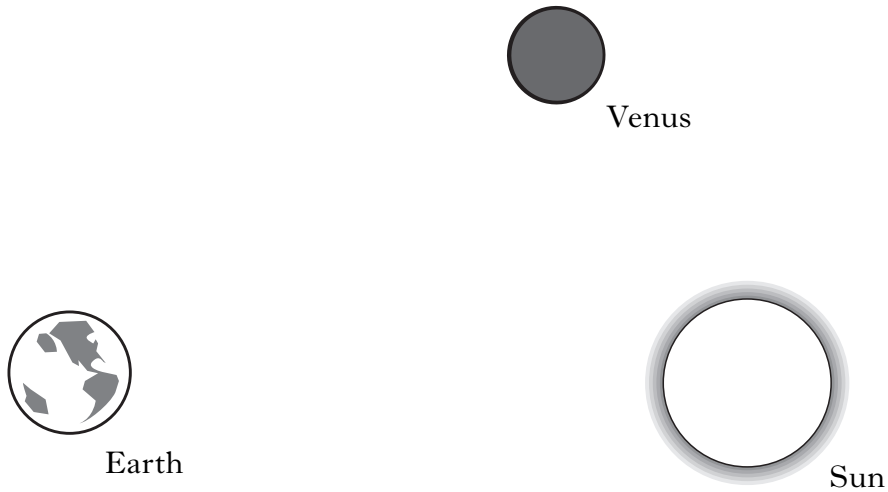
Marks

19. (continued)

(d) The planet Venus is often seen in the evening and morning close to the horizon.

Draw light rays on the diagram to show how observers on Earth are able to see Venus.

You must put arrows on the rays to show their direction.



2

[Turn over



**ADDITIONAL SPACE FOR ANSWERS**

**Make sure you write the correct question number beside each answer.**

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