

2019
Higher School Certificate
Year 11 Examination

Physics

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Approved calculators may be used
- Write using black or blue pen
- A data sheet, formulae sheets and periodic table are provided
- Draw diagrams using pencil
- A protractor and ruler are required
- Write your student number and/or name at the top of every page

Total marks – 75

Section I – Pages 2–10

15 marks

- Attempt Questions 1–15
- Allow 25 minutes for this section

Section II – Pages 11–24

60 marks

- Attempt Questions 16–30
- Allow 1 hour and 35 minutes for this section

This paper MUST NOT be removed from the examination room

STUDENT NUMBER/NAME:.....

STUDENT NUMBER/NAME:.....

Section I

15 marks

Attempt Questions 1–15

Allow about 25 minutes for this section

Select the alternative A, B, C or D that best answers the question and indicate your choice with a cross (X) in the appropriate space on the grid below.

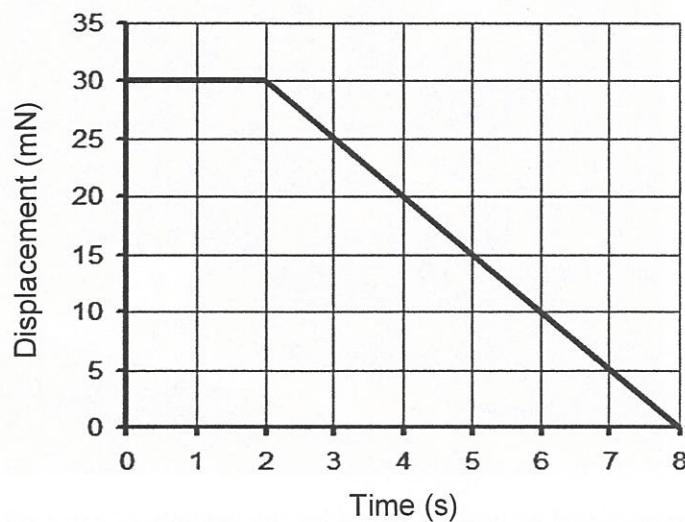
	A	B	C	D
1				
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- 1 An object travels 300 m north then turns and travels 400 m east.

What will be its final displacement?

- (A) 700 m
- (B) 700 m bearing 053°
- (C) 500 m bearing 037°
- (D) 500 m bearing 053°

- 2 Consider the following graph of the motion of an object.



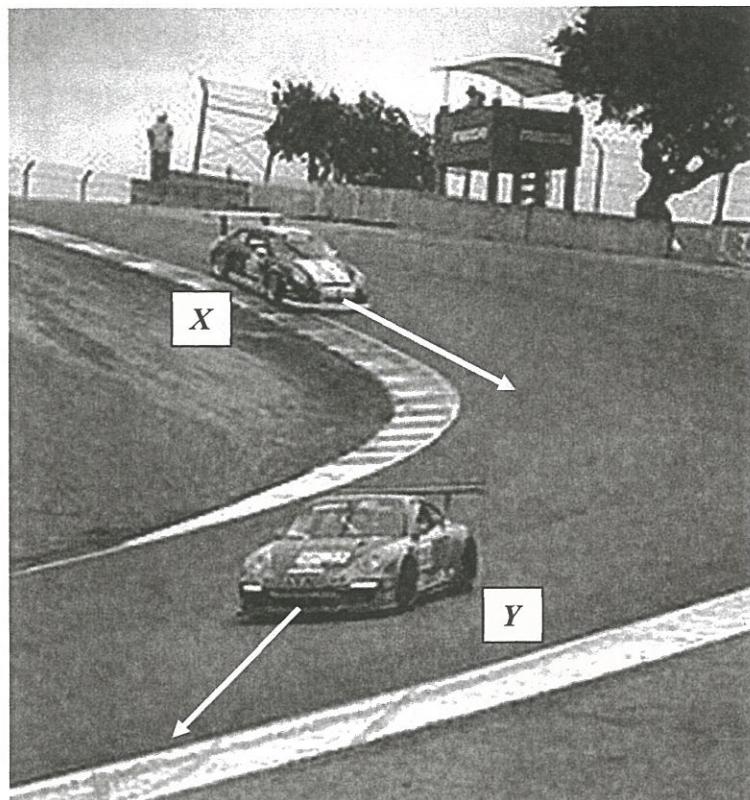
What is the instantaneous velocity of the objects at time 5 s?

- (A) 3 m s^{-1} N
- (B) 3 m s^{-1} S
- (C) 5 m s^{-1} N
- (D) 5 m s^{-1} S

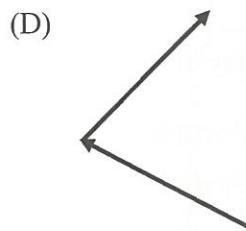
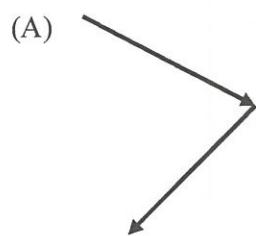
- 3 What is the best way to increase the reliability of an experiment?

- (A) Take multiple readings of the measurement and use the mode reading.
- (B) Take multiple readings of the measurement and use the average reading.
- (C) Take multiple readings of the measurement, eliminate any outliers and use the average reading.
- (D) Make sure all variables are controlled then take multiple readings of the measurement and use the average reading.

- 4 The photograph shows two cars during a race. The directions they are travelling at the instant shown in the photograph are indicated by the vector arrow. The cars are travelling at about the same speeds.

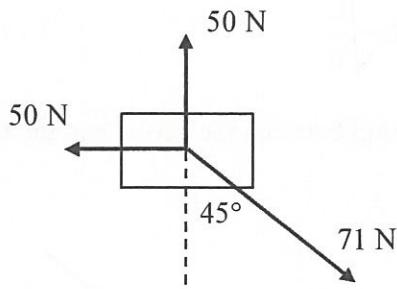


Which diagram should be used to determine the velocity of car X relative to car Y ?

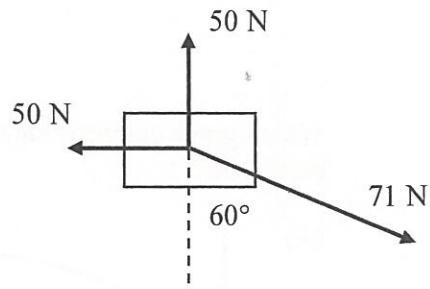


- 5 Which object shown below is in static equilibrium? All objects are on a smooth surface and are viewed from above.

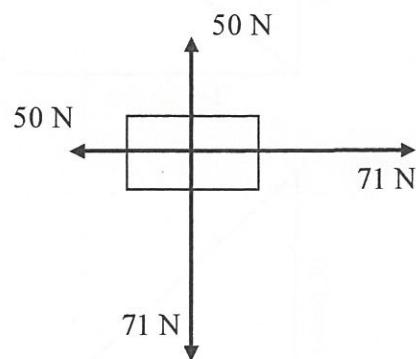
(A)



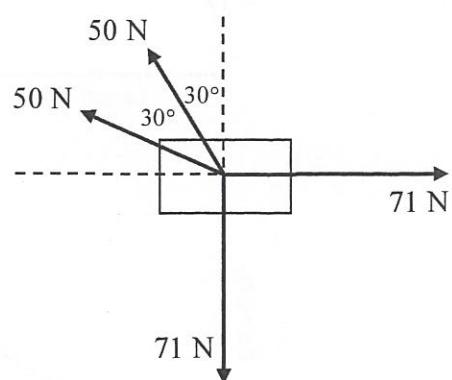
(B)



(C)



(D)



- 6 A 600 kg car is raised 2.0 m above the ground by a mechanical car hoist. This takes 30 s.

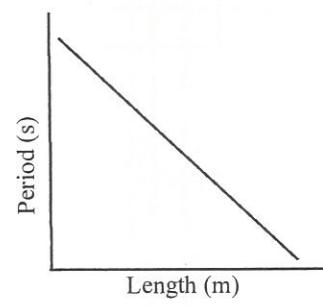
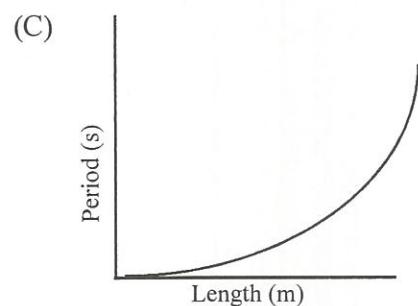
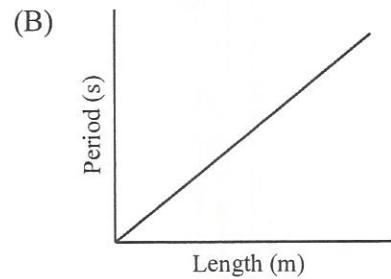
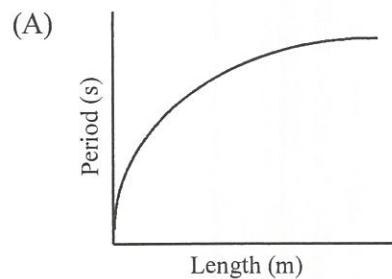
What power does the hoist generate in lifting the car?

- (A) 392 J
- (B) 392 W
- (C) 11 760 W
- (D) 11 760 J

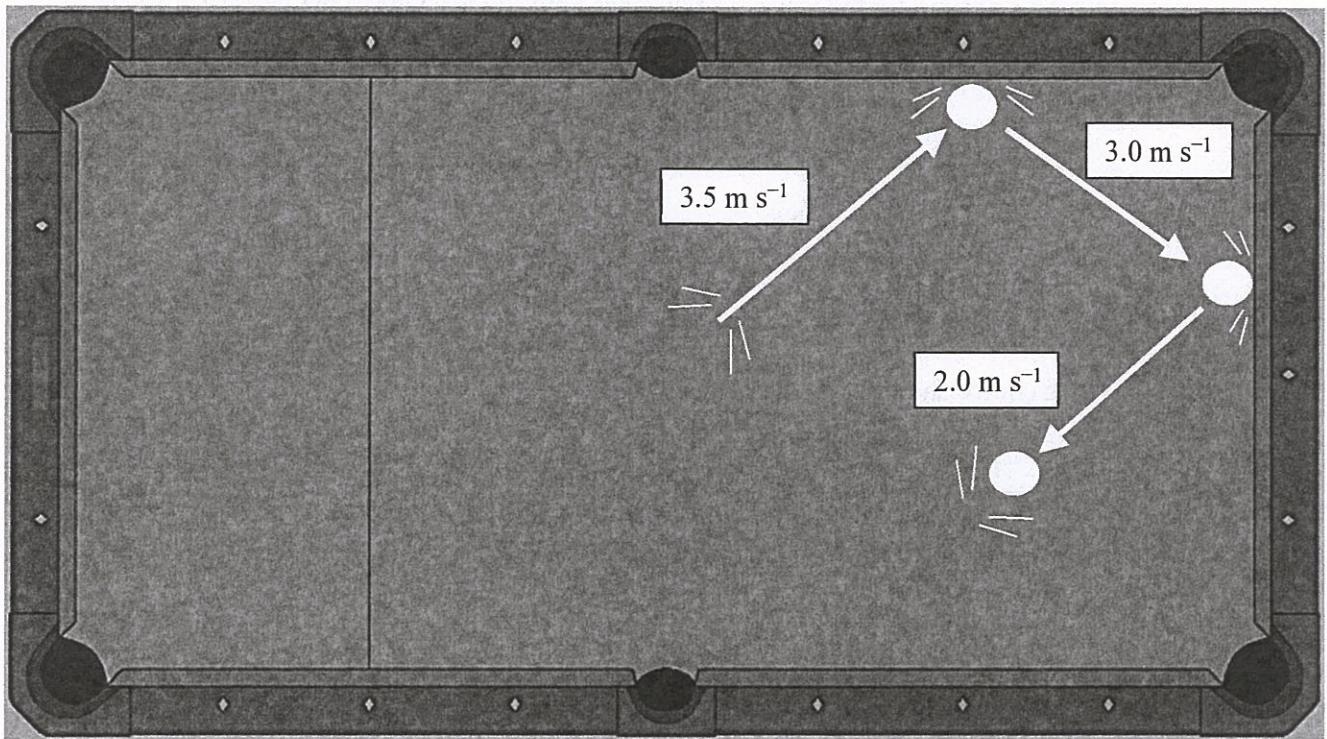
- 7 The equation for the period of a pendulum of length L is stated below:

$$T = 2\pi \sqrt{\frac{L}{g}}$$

Which graph correctly shows the relationship between the period and the length of the pendulum?



- 8 A billiard ball of mass 160 g is hit and follows the path as shown in the diagram, bouncing off two sides and returning on a path parallel to its initial direction of travel. The speeds of the ball before and after each collision with the edges are shown.

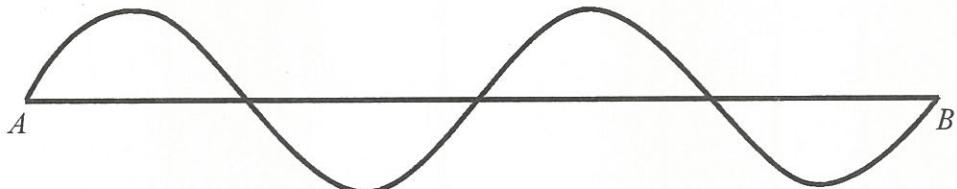


What is the magnitude of the total change in momentum of the billiard ball for this set of collisions?

- (A) 0.08 kg m s^{-1}
- (B) 0.16 kg m s^{-1}
- (C) 0.24 kg m s^{-1}
- (D) 0.88 kg m s^{-1}

Use the information below to answer Questions 9 and 10.

Consider the following diagram which shows part of a wave in a medium. The part shown represents 0.6 s of time for the wave. The distance between the ends of the line AB is 12 cm.



9 Which choice shows correct data about this wave?

	Amplitude (cm)	Wavelength (cm)
(A)	1.3	3.0
(B)	1.3	6.0
(C)	2.6	3.0
(D)	2.6	6.0

10 Which choice shows correct data about this wave?

	Period (s)	Velocity ($m s^{-1}$)
(A)	0.3	0.1
(B)	0.3	0.2
(C)	0.6	0.05
(D)	0.6	0.1

- 11 The intensity of light reaching a spaceship from a distant star is 8 units. The spaceship is 60 AU from the star.

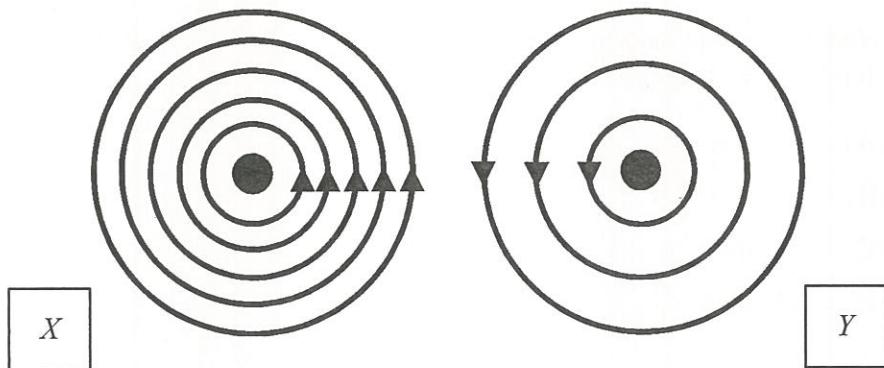
What will be the intensity reaching the ship when the distance between the star and the ship has been reduced to 15 AU?

- (A) 0.5 units
 - (B) 2 units
 - (C) 32 units
 - (D) 128 units
- 12 Which statement best defines our understanding of the temperature of a substance?
- (A) Temperature is a measure of the internal heat energy of the matter.
 - (B) Temperature is a measure of the total heat capacity of the substance.
 - (C) Temperature is a measure of the average kinetic energy of the particles of matter.
 - (D) Temperature is the sum of the kinetic energy of the particles in the substance.
- 13 A beaker containing 200 g of a liquid is heated such that the liquid absorbs 6000 J of energy. Its temperature rises 7°C .
- According to this data, what is the specific heat of the liquid?
- (A) $4.3 \text{ J g}^{-1} \text{ C}^{-1}$
 - (B) $4.3 \text{ J kg}^{-1} \text{ C}^{-1}$
 - (C) $4.3 \text{ kJ g}^{-1} \text{ C}^{-1}$
 - (D) $4285 \text{ J g}^{-1} \text{ C}^{-1}$
- 14 The force between two electrostatically charged balls placed 50 cm apart is F .

What will be the new force between the balls if the charge on each ball is doubled, and the distance between them halved?

- (A) F
- (B) $8F$
- (C) $16F$
- (D) $32F$

- 15 The diagram shows the magnetic fields around two current-carrying conductors.



Which choice correctly describes the currents in the two wires causing these fields?

- (A) The currents are in opposite directions and the current in X is larger than the current in Y .
- (B) The currents are in same directions and the current in X is larger than the current in Y .
- (C) The currents are in opposite directions and the current in X is less than the current in Y .
- (D) The currents are in same directions and the current in X is less than the current in Y .

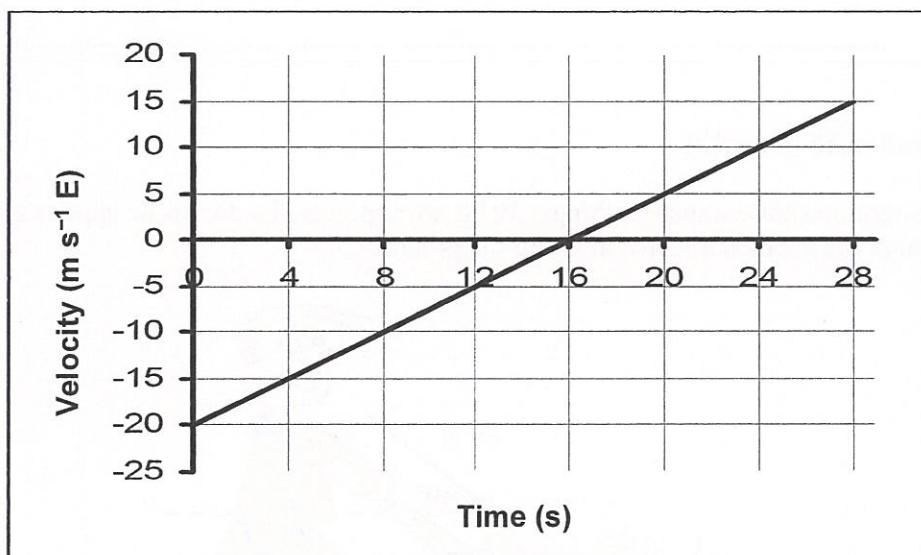
Section II**60 marks****Attempt Questions 16–30****Allow about 1 hour and 35 minutes for this section**

Answer the questions in the spaces provided.

Show all relevant working in questions involving calculations.

Question 16 (3 marks)**Marks**

Consider the velocity-time graph below for a 5 kg object.



- (a) What total distance did the object travel in 28 s?

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- (b) What was the final displacement of the object?

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- (c) What was the acceleration of the object?

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Question 17 (3 marks)**Marks**

A 600 kg car travelling at 5 m s^{-1} north accelerates until it reaches 10 m s^{-1} north. This takes 4 s.

- (a) Calculate the acceleration of the car.

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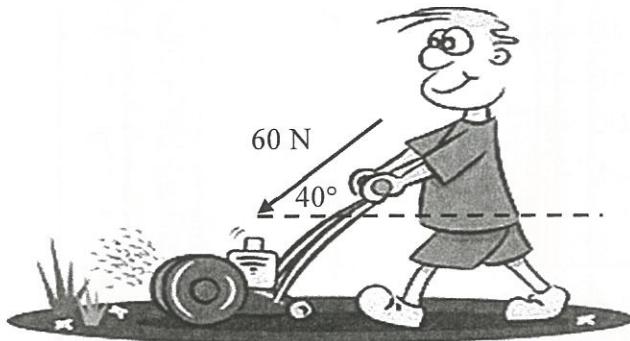
- (b) How much work is done on the car during the 4 s?

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Question 18 (3 marks)

The cartoon shows a man pushing a 30 kg lawn mower. To do this he applies a force of 60 N through the handles directed at 40° to the ground.



- (a) What is the normal reaction of the ground on the mower?

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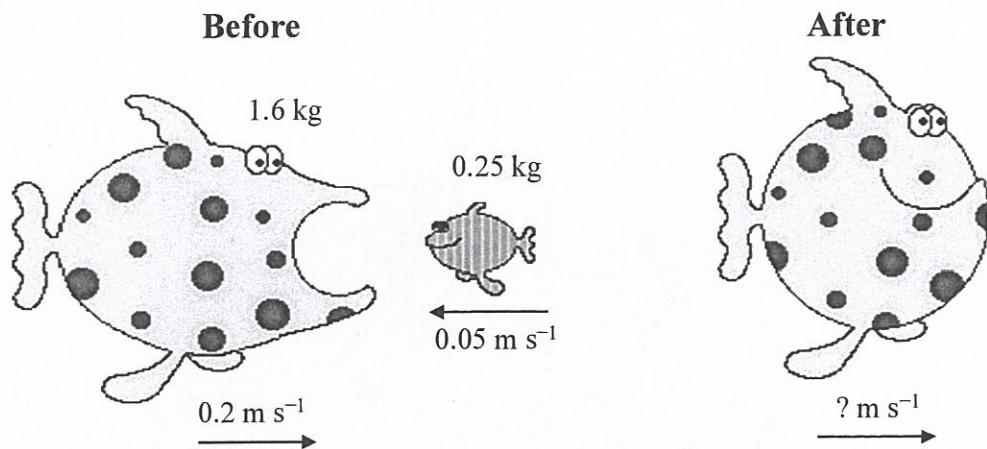
- (b) If the man is pushing the mower at a constant speed, what fictional force does the grass offer?

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Question 19 (4 marks)**Marks**

A 1.6 kg fish swimming at 0.2 m s^{-1} opens his mouth to swallow a 0.25 kg fish swimming towards him at 0.05 m s^{-1} . After swallowing the smaller fish, the larger fish coasts onwards in the same direction as he was initially going.



- (a) Calculate the speed of the large fish after swallowing the smaller fish.

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- (b) What impulse does the smaller fish apply to the larger fish?

2

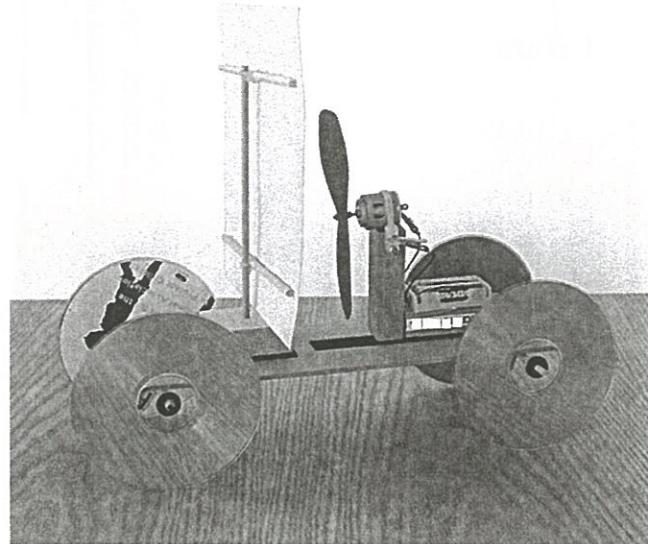
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STUDENT NUMBER/NAME:.....

Question 20 (3 marks)

Marks

A student built the cart shown below to determine whether a stranded sailboat with no wind could use a fan to move the sailboat.



Predict what will happen to the cart when the fan is switched on. Justify your answer using

3

Newton's laws.

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STUDENT NUMBER/NAME:.....

Question 21 (7 marks)

Marks

A student is to determine the acceleration due to gravity, g using the motion of an object down a smooth inclined plane.

7

Describe a procedure that is suitable for carrying out this investigation and explain how g will be calculated from the results. Include a sketch of the apparatus to be used.

Question 22 (4 marks)**Marks**

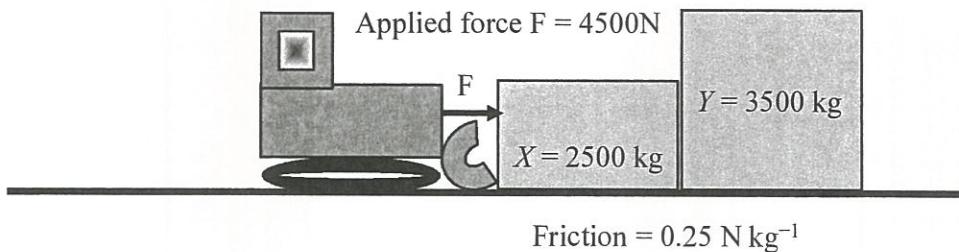
Some hammers have heads made of steel. Some have rubber heads. Steel hammers are used to hammer nails while rubber hammers are for settling paving stones into place. 4

Explain how the different construction of the hammers enhances their use.

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Question 23 (4 marks)

Consider the information in the diagram below of blocks being pushed by a bulldozer.



- (a) Calculate the acceleration of the blocks as a result of being pushed by the bulldozer. 2

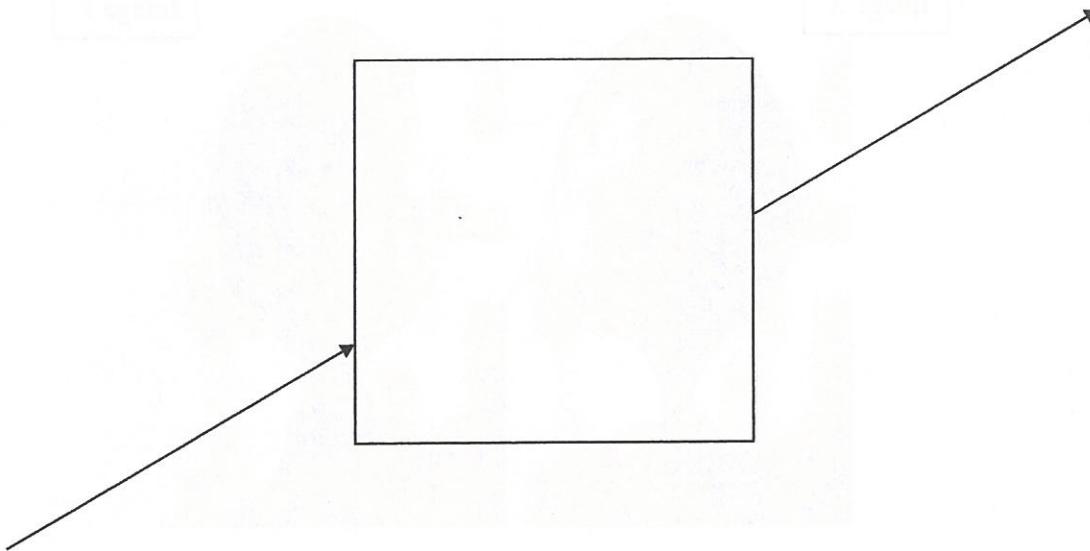
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- (b) What force does block Y apply to block X ? 2

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Question 24 (5 marks)**Marks**

Consider the incomplete diagram below which shows a beam of light entering and leaving a glass slab.

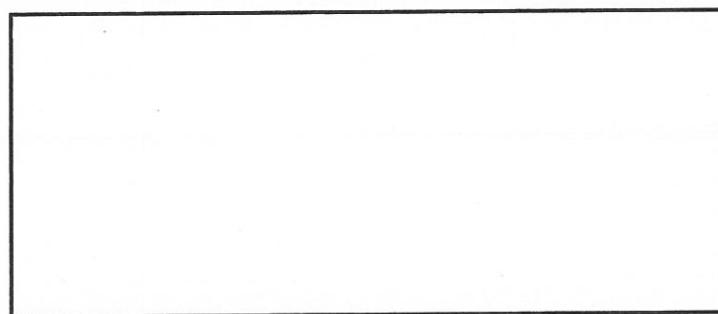
5

Use the diagram above to obtain data to calculate the critical angle for the glass.

On the diagram below accurately draw in rays to show the path of a light ray approaching point X at the critical angle and the subsequent path of the ray.

The two glass slabs drawn have the same refractive index. Show all relevant working.

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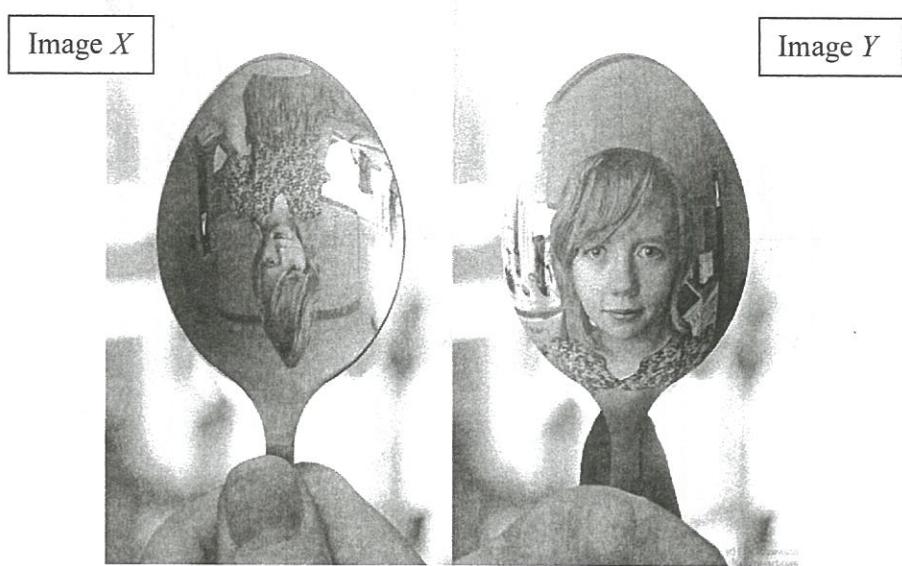
X

STUDENT NUMBER/NAME:.....

Question 25 (5 marks)

Marks

The picture shows the image of a person in the same spoons where the highly polished surface of the spoon is acting as a mirror.



- (a) Compare the 2 reflecting surfaces and the properties of the 2 images. 2

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- (b) In the space below, draw an appropriate diagram to show the formation of image X. 3

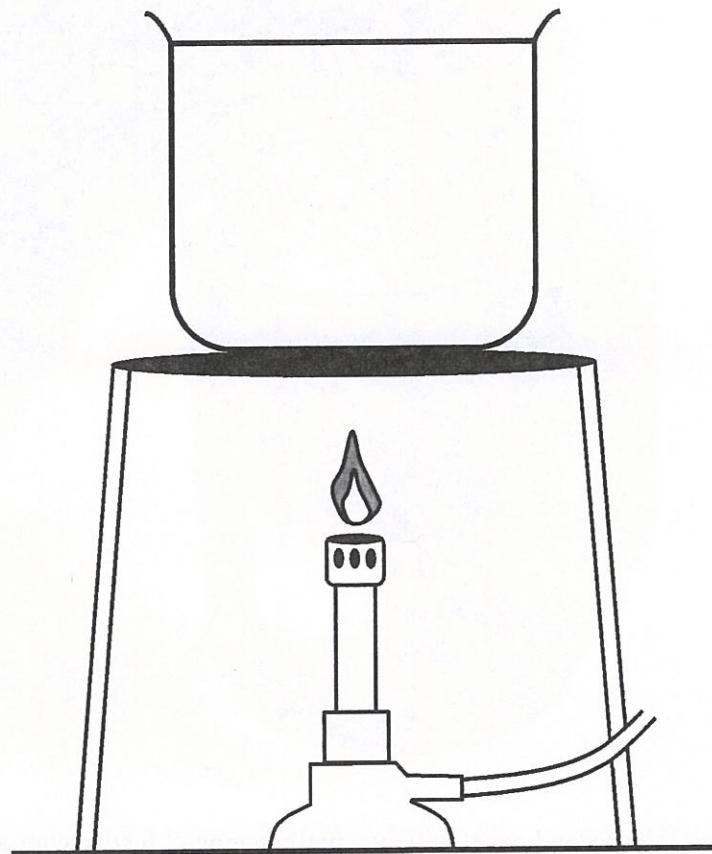
STUDENT NUMBER/NAME:.....

Question 26 (3 marks)

Marks

The diagram shows a Bunsen burner heating a beaker of water.

3



Place appropriate labels and arrows on the diagram above to explain how heat is transferred from the base of the beaker to heat the water.

STUDENT NUMBER/NAME:.....

Question 27 (3 marks)

Marks

A beaker of hot water is placed inside a larger beaker of cold water as shown in the photo.

3



If the beakers are left to stand, what will eventually happen? Justify your answer.

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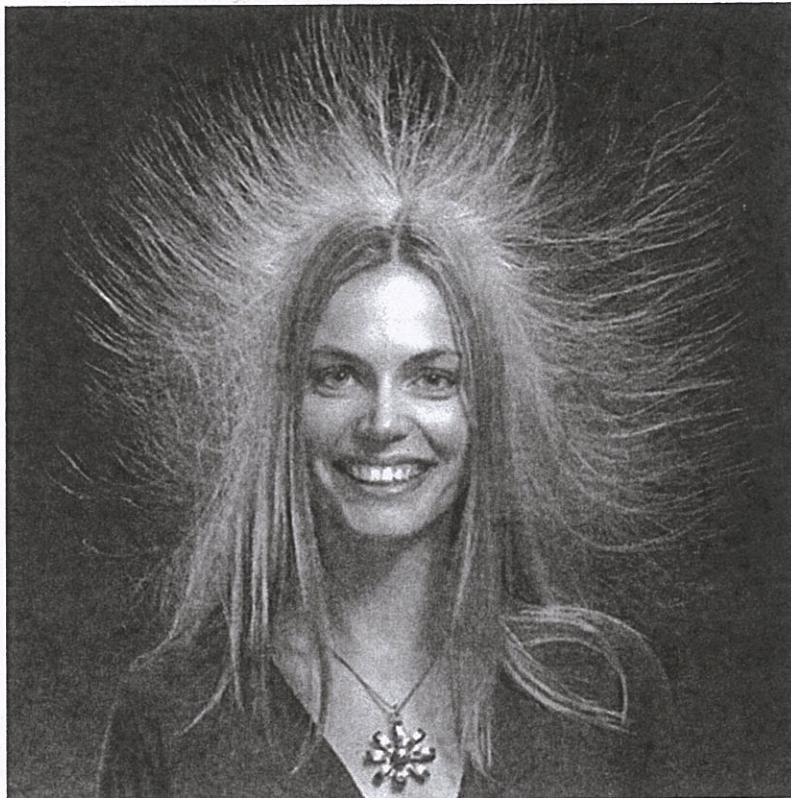
STUDENT NUMBER/NAME:.....

Question 28 (3 marks)

Marks

Consider the diagram which shows a girl whose hair appears to be floating, or standing on end, after having just finished brushing her hair.

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Explain how this occurs, in terms of the principles of physics involved.

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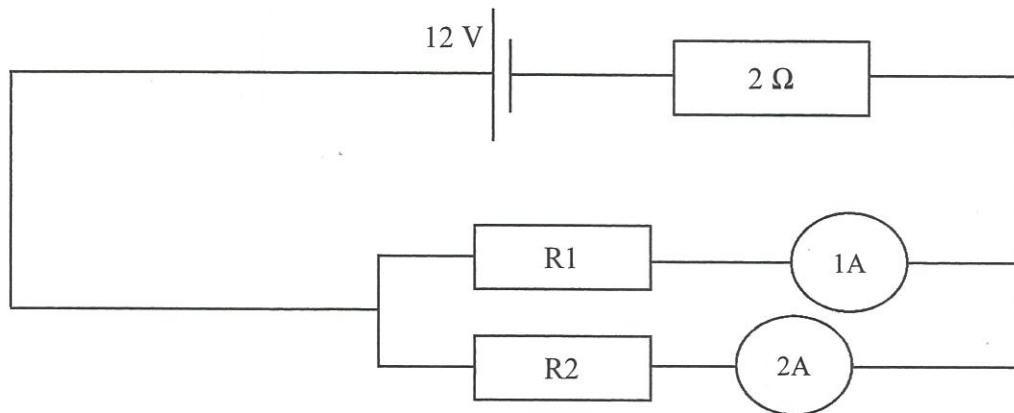
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Question 29 (4 marks)**Marks**

Consider the following electrical circuit.



- (a) Calculate the total resistance of the circuit.

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- (b) What is the energy dissipated in the R2 resistor each minute?

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STUDENT NUMBER/NAME:.....

Question 30 (6 marks)

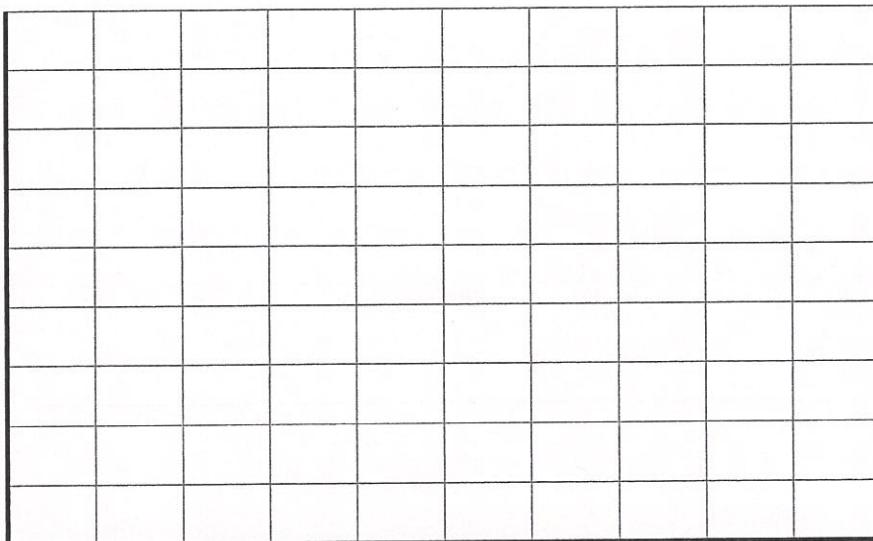
Marks

The table shows the results of an investigation on the electrical conductivity of a piece of resistance wire.

<i>Applied potential difference (V)</i>	<i>Current in wire (A)</i>
0	0
4	0.6
8	1.2
12	1.8
16	2.3
20	2.7
24	3.1
28	3.4
32	3.7
36	3.9

- (a) Graph the results on the axes below, placing the independent variable on the x -axis.

3



Question 30 continues on the next page

STUDENT NUMBER/NAME:.....

Question 30 (continued)

Marks

- (b) Explain the shape of the graph.

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- (c) Use the graph to determine the resistance of the wire when 24 V is applied across its ends.

1

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End of paper