

2019

YEAR 11
YEARLY
EXAMINATION

Physics

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black pen
- Draw diagrams using pencil
- NESA approved calculators may be used
- A data sheet, formulae sheet and Periodic Table are provided at the back of this paper
- For question in Section II, show all relevant working in questions involving calculations
- Write your Student ID at the bottom of this page and at the top of page 10

Total marks:
75

Section I — 20 marks (pages 2-9)

- Attempt Questions 1–20
- Allow about 30 minutes for this part

Section II — 55 marks (pages 10-23)

- Attempt Questions 21–30
- Allow about 1 hour and 30 minutes for this part

Student ID: _____



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This paper is used with the understanding that it has a Security Period. ©Total Education Centre

Section I**20 marks****Attempt Questions 1–20****Allow about 30 minutes for this section**

Use the multiple-choice answer sheet for Questions 1–20.

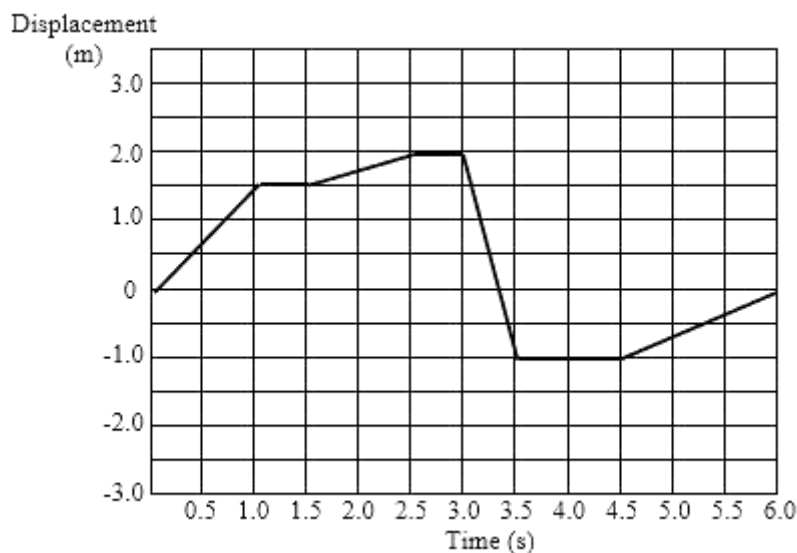
- 1** A driver passes a train travelling in the same direction, on a track parallel to the road. The driver's velocity relative to the train is 35 kmhr^{-1} north.

If the train is moving with a velocity of 60 kmhr^{-1} north, what must the velocity of the driver be relative to the road?

- A. 95 kmhr^{-1} north
- B. 60 kmhr^{-1} south
- C. 35 kmhr^{-1} north
- D. 25 kmhr^{-1} south

Use the graph below to answer Questions 2 and 3.

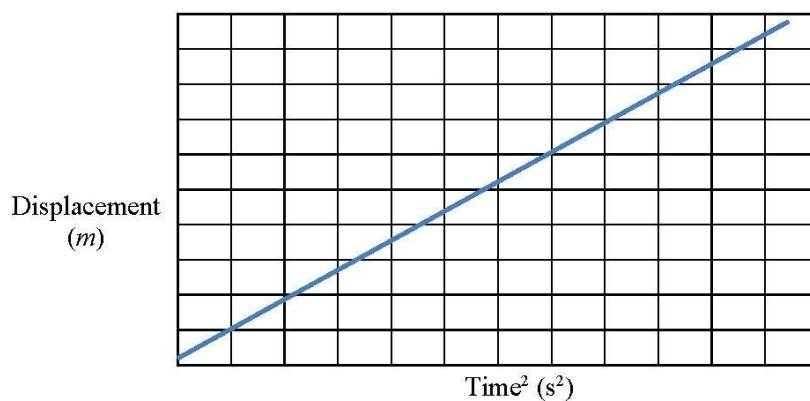
Students plotted the movement of a bee flying from flower to flower.



- 2** What was the bee's total displacement?

- A. 0 m
- B. 1.0 m
- C. 3.0 m
- D. 6.0 m

- 3 What was the magnitude of the bee's maximum instantaneous velocity?
- A. 1.0 ms^{-1}
 - B. 1.5 ms^{-1}
 - C. 3.0 ms^{-1}
 - D. 6.0 ms^{-1}
- 4 Students used a ball dropping experiment to determine the acceleration due to gravity. The graph below shows the line of best fit they produced. Note that the axes do not include their scales.



The students used the gradient (m) of the line of best fit to determine gravity (g).

Which equation would the students then use to determine their value for gravity from the gradient?

- A. $g = 2m$
- B. $g = m$
- C. $g = \frac{m}{2}$
- D. $g = 4m$

- 5 During a cricket game, a ball is released by the bowler with a velocity of 98 kmh^{-1} , at an angle of 35° to the horizontal.

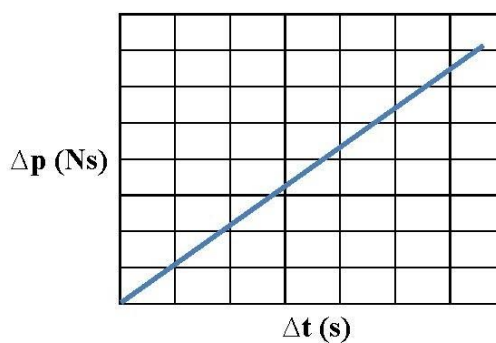
What are the vertical and horizontal components of the ball's velocity?

	<i>Horizontal component</i>	<i>Vertical component</i>
A.	56	80
B.	80	56
C.	42	89
D.	89	42

- 6 Which statement about momentum is most accurate?

- A. Moment is always conserved in any system
- B. Momentum is never conserved in any system
- C. Momentum is only conserved in open systems
- D. Momentum is only conserved in closed systems

- 7 The graph below shows the change in momentum of a car as it accelerates.



What does the gradient of this graph represent?

- A. Force
- B. Impulse
- C. Velocity
- D. Acceleration

The following information relates to Questions 8 and 9.

Ten drums, each with a mass of 50 kg, are rolled up a ramp into a truck. The top of the ramp, when placed on the edge of the truck, is 1.5 m above the ground.

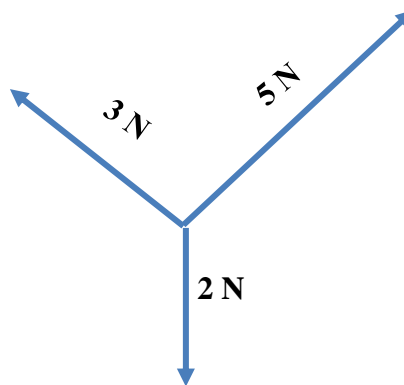


- 8 How much potential energy does each drum have at the top of the ramp?
- A. 75 J
 - B. 490 J
 - C. 735 J
 - D. 660 J
- 9 The truck had a mass of 2000 kg before being loaded with the drums. It accelerates for 5 seconds before reaching a constant velocity of 30 kmh^{-1} .

What was the net force acting on the loaded truck?

- A. $3.3 \times 10^3 \text{ N}$
- B. $4.2 \times 10^3 \text{ N}$
- C. $12.0 \times 10^3 \text{ N}$
- D. $15.0 \times 10^3 \text{ N}$

- 10 Three forces at 120° to each other, act on an object as shown below.



What is the magnitude of the resultant force?

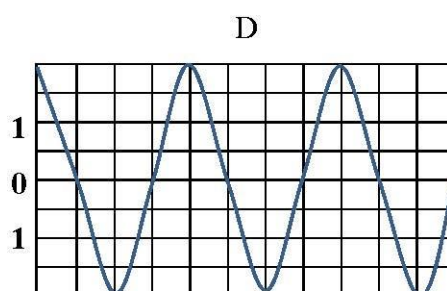
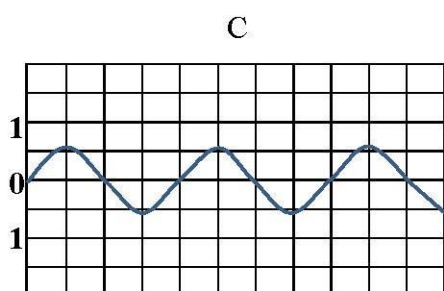
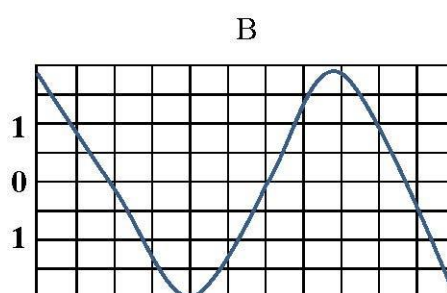
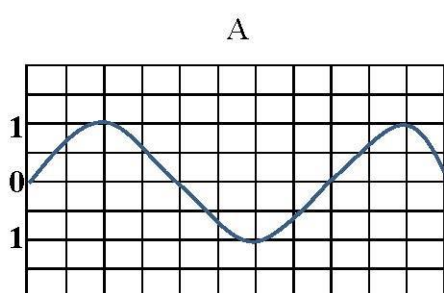
- A. 0 N
 - B. 2.7 N
 - C. 4.0 N
 - D. 10 N
- 11 What property do mechanical and electromagnetic waves have in common?
- A. They both need a specific medium to travel in
 - B. They can both travel close to the speed of light
 - C. They both transport energy from one place to another
 - D. They both propagate using transfer of particle vibrations
- 12 Which statement best describes the period of a wave?
- A. The value of the product of frequency and wavelength
 - B. A measure of the volume carried by a pure sound wave
 - C. The number of waves that pass a given point in one second
 - D. The time taken for one complete wave to pass a given point

- 13** A young bear is learning to catch salmon in a river by watching his mother and copying her movements. Each time she throws her paws in she comes out with a fish, but he is unsuccessful every time.

What property of waves does he need to learn to allow for?

- A. Reflection
- B. Diffraction
- C. Refraction
- D. Supper position

Use the information below to answer Question 14.



- 14** Which graph represents the sound wave with the lowest pitch and highest volume?

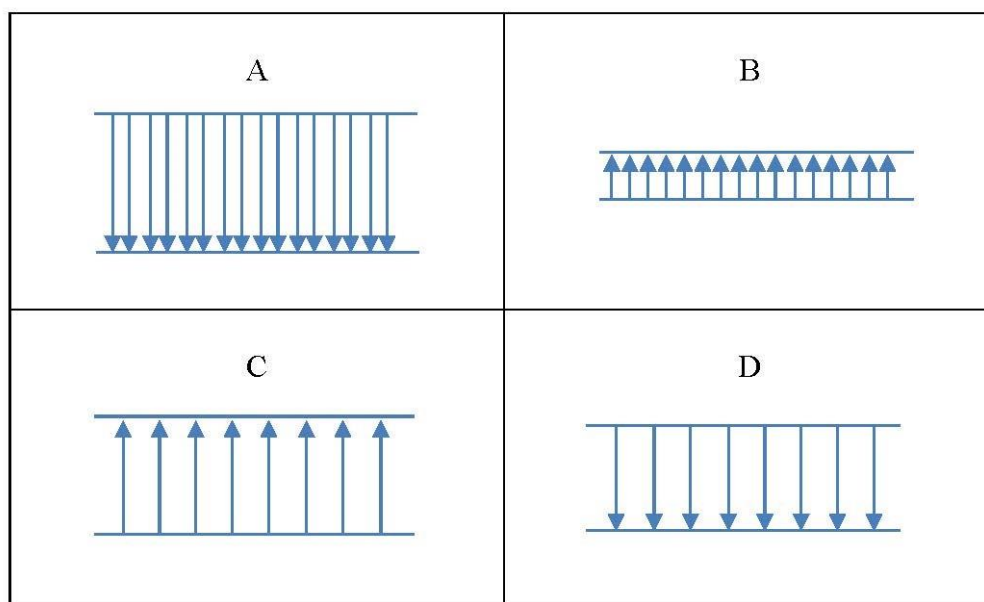
- A. A
- B. B
- C. C
- D. D

- 15** A light produces an intensity, I , at a point 6 metres from its source.

What will be its intensity at a point 2 metres from the source?

- A. $3 I$
- B. $\frac{1}{3} I$
- C. $\frac{1}{9} I$
- D. $9 I$

The diagrams of uniform electric fields relate to Questions 16 and 17.



- 16** In which two fields will an electron experience a force towards the top of the page?

- A. A and B
- B. A and C
- C. A and D
- D. C and B

- 17** In which field would an electron experience the greatest acceleration?

- A. A
- B. B
- C. C
- D. D

- 18** If a current of 5 amps is flowing through a conductor, how many coulombs of charge flows through each hour?
- A. 5 C
 - B. 1.4×10^{-4} C
 - C. 1.8×10^4 C
 - D. 3.0×10^2 C
- 19** When two identical resistors are placed in series they have a total resistance of 10 Ohms.
- What would be their total resistance be when placed in parallel?
- A. 2.5 Ohms
 - B. 5.0 Ohms
 - C. 10 Ohms
 - D. 20 Ohms
- 20** Which Law relates to the conservation of current around a circuit?
- A. Ohm's Law
 - B. Ampere's Law
 - C. Faraday's Law
 - D. Kirchhoff's Law

2019

**YEAR 11
YEARLY EXAMINATION**

Student ID: _____

Physics

Section II Answer Booklet

55 marks

Attempt Questions 21–30

Allow about 1 hour 30 minutes for this part

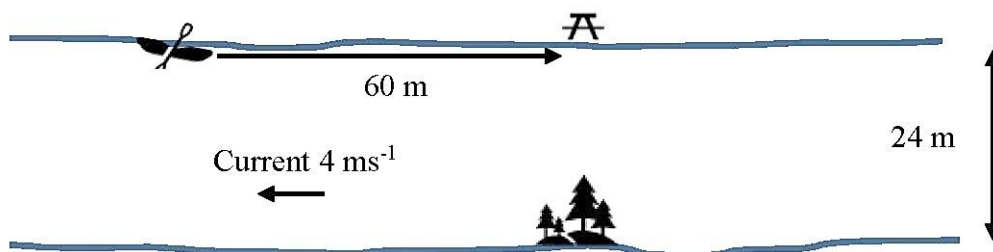
Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Show all relevant working in question involving calculations
- Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.
- Write your Student ID above

Please turn over

Question 21 (6 marks)

A river is 24 m wide with a current is 4 ms^{-1} upstream. A rowing boat is heading downstream towards a forest on the other side of the river. The rower's maximum velocity relative to the forest is 15 ms^{-1} . The forest is opposite a picnic table 60 m downstream.



- (a) How long will it take the rower to get to the forest if she travels at maximum velocity? 2

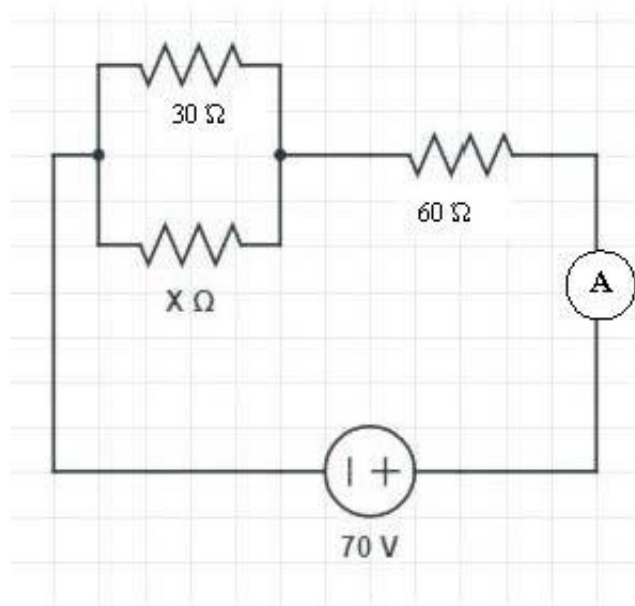
- (b) What is the rower's velocity relative to the river bank? 1

- (c) The rower after looking around in the forest wants to head over to the picnic table to have lunch. 3

Explain what the rower needs to do to take the current into account and reach the picnic table.

Question 22 (5 marks)

In the circuit modelled below, two thirds of the circuit current travels through resistor X.



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

2

- (b) Calculate the current through the ammeter.

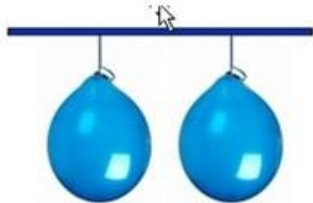
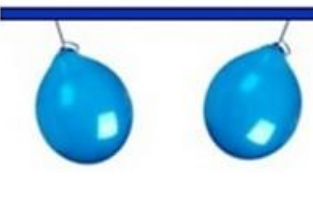
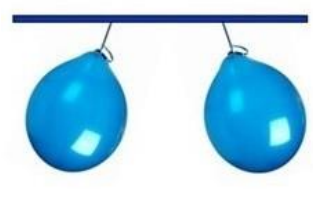
1

- (c) Calculate the energy used by the 60 Ohm resistor in one day of operation.

2

Question 23 (6 marks)

Students carried out an experiment with two balloons hung from a rod. They charged the balloons in various ways and observed their behaviour. Below is one section of their observations.

A	The two balloons prior to any charges being transferred.	
B	The two balloons after we moved them apart a little and transferred a charge to each balloon	
C	The two balloons after we allowed them to touch each other.	

- (a) Describe the type of charges the students must have given the two balloons in B, justifying your reasoning. 2

- (b) Explain why the two balloons move away from each other after they touched in C. 2

Question 23 continues on page 14

Question 23 (continued)

- (c) In another part of the experiment, they modelled two like charged points with two balloons. Each point charge was given a $+0.3\text{ C}$ charge and positioned with a radius of 20 cm between them. **2**

Calculate the force that one of these points would exert on the other.

End of Question 23

Question 24 (6 marks)

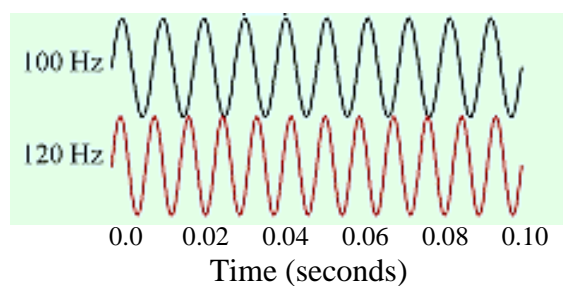
- (a) Use Snell's Law to explain the principle of total internal reflection. Include a diagram to support your answer. **4**



- (b) Account for the difference in image clarity when looking into a still pond compared to looking into it when the surface is disturbed. **2**

Question 25 (4 marks)

The graphs below represent two waves with different frequencies.



- (a) With reference to these graphs, explain the concept of beats.

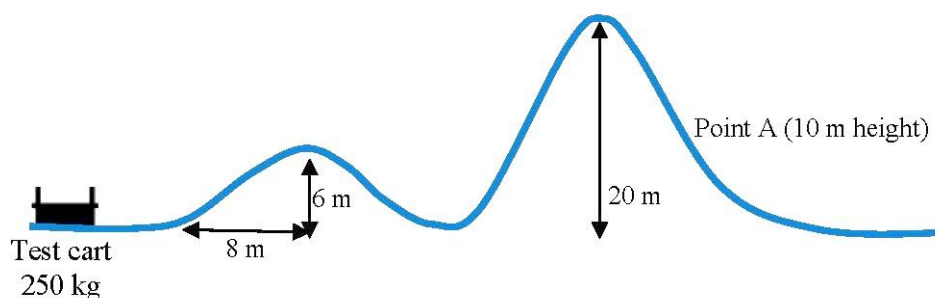
3

- (b) Calculate the value of the beat frequency for these waves.

1

Question 26 (11 marks)

The diagram below is the profile of part of a roller coaster ride at a fair.



The test cart experiences a force that accelerates it to the top of the first incline. It then travels over and down the incline before it is assisted up the next incline, 20 metres high.

The cart almost stops at the top of this incline before accelerating down the other side under the influence of gravity alone.

- (a) How much potential energy does the cart have at Point A, half way down the 20 metre high incline? **1**

- (b) What is the momentum of the cart at Point A? **2**

Question 26 continues on page 18

Question 26 (continued)

- (c) Calculate the cart's change in momentum from its position at the top of 20 metre incline to its position as it just reaches maximum velocity at the base of the incline. **3**

- (d) What was the magnitude of the net force needed to get the cart from the flat start to the top of the 6 m high incline? **3**

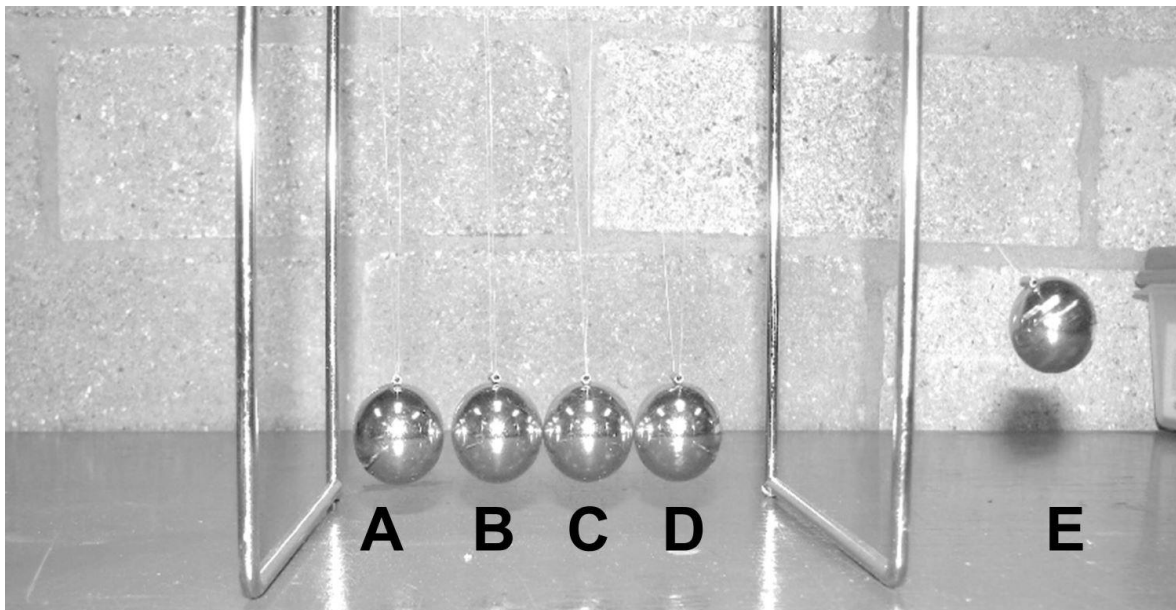
- (e) Explain why it required more applied force to get the cart started than to keep it moving along the flat, starting section of the track. **2**

End of Question 26

Question 27 (4 marks)

The picture below is of a model called Newton's Cradle. Each ball is solid steel ball that is free to interact within the cradle system. Teachers often use it to compare the conservation laws for elastic and inelastic collisions.

4



Use these laws to explain why only Ball A will move off to the left when Ball E collides elastically with Ball D.

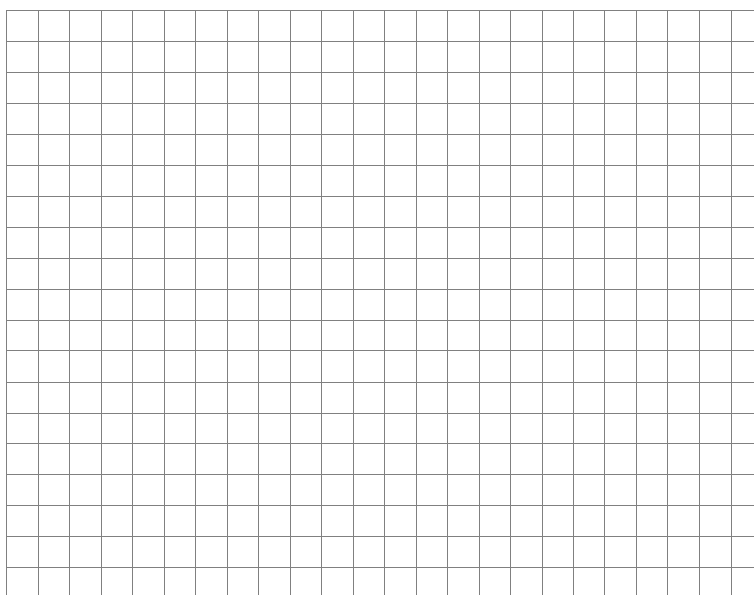
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Question 28 (6 marks)

A ball dropping under the influence of gravity is one method that can be used to compare average and instantaneous velocities.

6

Describe how to get useful results using this method. Tabulate an appropriate set of results and produce a graph for analysis. Analyse your graph to compare instantaneous velocity and average velocity.



Question 28 continues on page 21

Question 28 (continued)

End of Question 28

Question 29 (4 marks)

The heat capacities of soil and water are set out below.

4

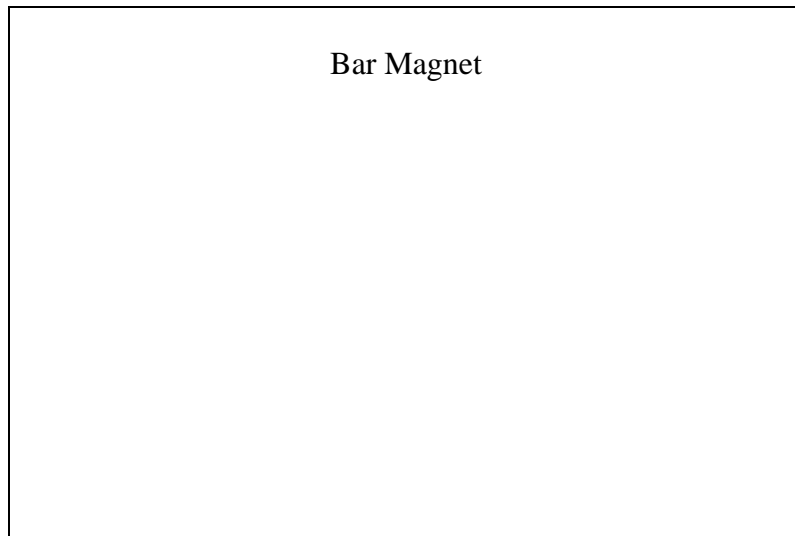
<i>Material</i>	<i>Heat capacity</i> (JKg ⁻¹ K ⁻¹)
Soil	800
Water	4182

Use the principles of physics to explain how these differences impact upon the air temperature in a dry inland environment, compared to an environment next to the ocean.

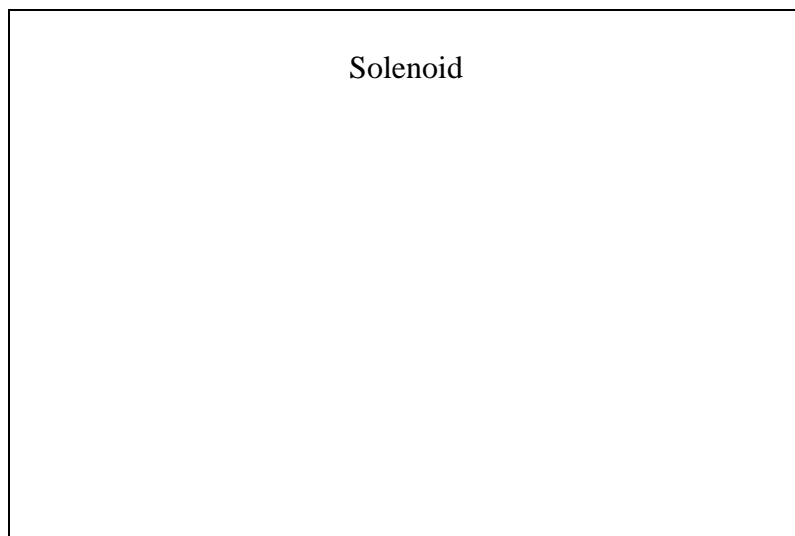
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Question 30 (3 marks)

- (a) Draw a diagram of a bar magnet, correctly labelling its poles and surrounding magnetic field. **1**



- (b) Draw a diagram of a solenoid showing the circuit required to achieve identical field directions and poles drawn in (a) above. **2**



End of paper

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

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