Exam Choice

Student Number

2019

YEAR 11
(PRELIMINARY)
EXAMINATION

Physics

General Instructions

- Reading time – 5 minutes.
- Working time – 2 hours.
- Write using black pen.
- Draw diagrams using pencil.
- For questions in Section II, show all relevant working in questions involving calculations.
- NESA approved calculators may be used.

Total marks: 75

Section I – 20 marks (pages 3 – 13)

- Attempt questions 1 – 20.
- Allow about 35 minutes for this section.

Section II – 55 marks (pages 14 – 25)

- Attempt questions 21 – 34
- Allow about 1 hour and 25 minutes for this section.

Section I – 20 marks

Attempt Questions 1-20

Allow about 35 minutes for this section

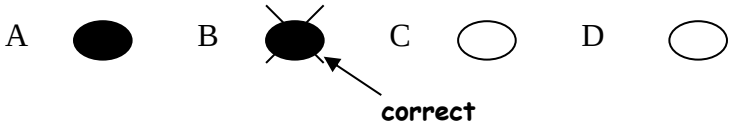
Use the multiple-choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.



1. In making a substance become electrostatically charged,

(A) electrons are removed from the substance.

(B) protons are transferred from one substance to another.

(C) an electric current flows between substances.

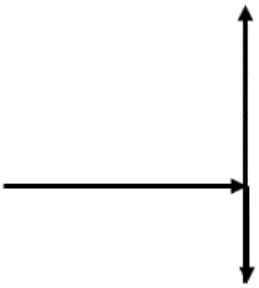
(D) electrons are removed from or are added to the substance.

2. A drone is flown 500 m to the east. It turns to the south and flies for 300 m before turning north, flying for 800 m and landing again.

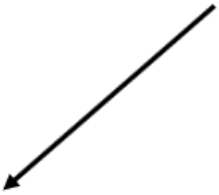
The drone's displacement vector is best represented by:

(A)

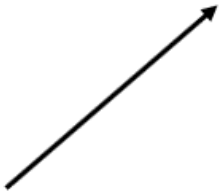
(B)



(C)



(D)



3. Which statement correctly describes the role of the medium as sound waves propagate through it?

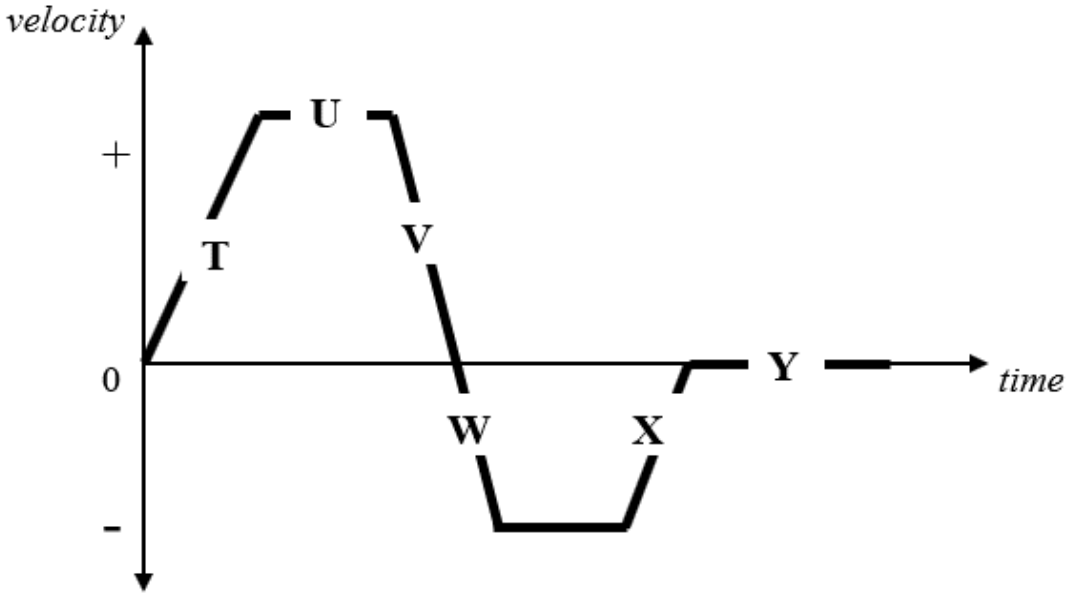
(A) Particles in the medium do not need to move as the wave passes.

(B) Particles in the medium oscillate in a direction perpendicular to the direction of propagation.

(C) Particles in the medium move back and forth parallel to the direction of propagation.

(D) Particles in the medium move randomly as the wave passes.

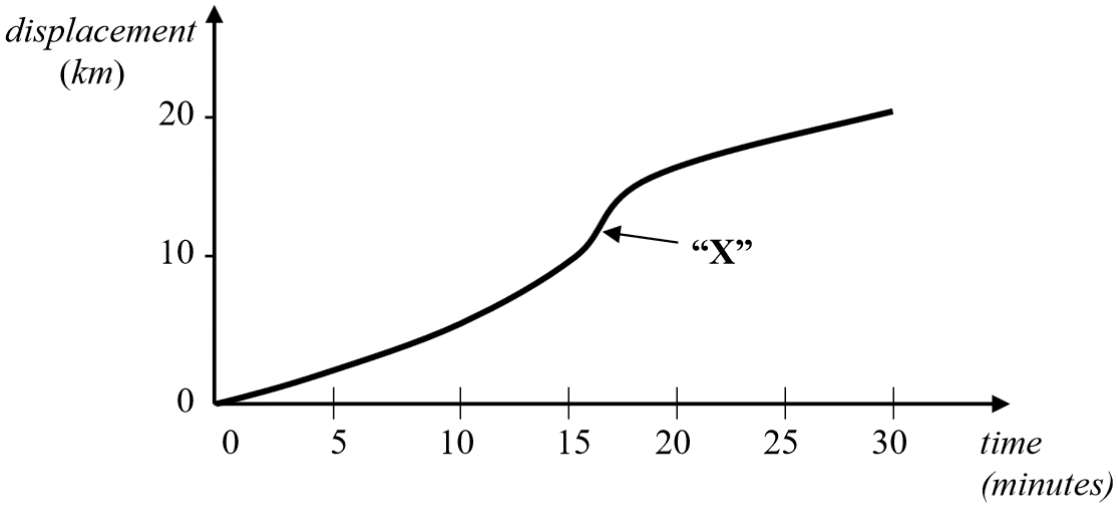
4. A car moving down a straight road has its motion analysed and plotted on a graph, shown below.



Which description most accurately describes the car's motion during the times T, U, V, W, X and Y?

	T	U	V	W	X	Y
(A)	positive acceleration	zero acceleration	negative acceleration	negative acceleration	negative velocity	stopped
(B)	positive acceleration	stopped	negative acceleration	negative velocity	negative velocity	stopped
(C)	positive velocity	stopped	negative velocity	negative velocity	positive velocity	stopped
(D)	positive velocity	zero acceleration	negative velocity	negative velocity	negative velocity	stopped

5. A train has its displacement from a station plotted against the time taken, as shown.



Which is the most accurate description of the train's motion?

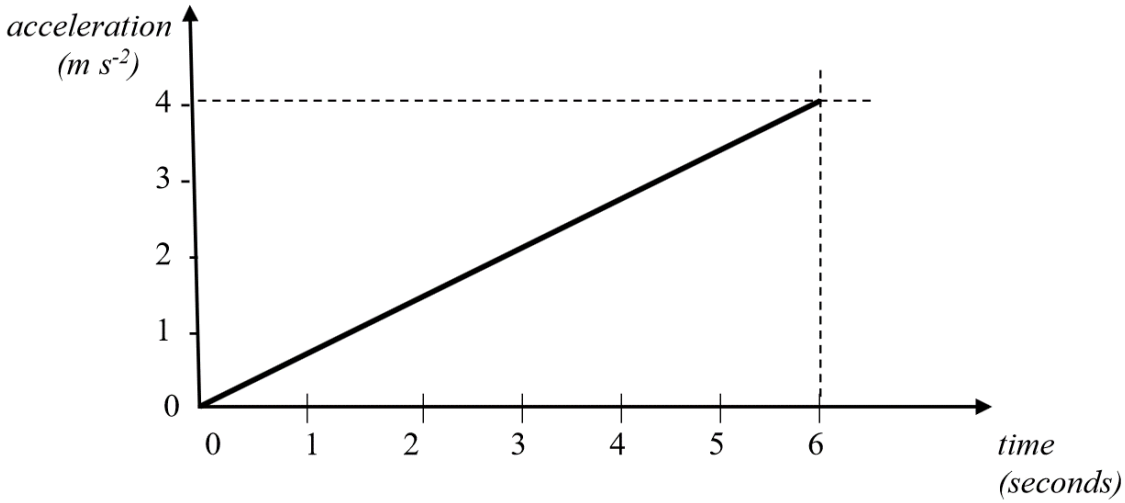
	speed at point "X" (km/h)	average velocity (km/h)
(A)	20	40
(B)	200	40
(C)	40	40
(D)	200	20

6. A current, **I**, flows through the coils of a solenoid with ***N*** turns and length ***L***.

A student wishes to double the magnetic field produced near the ends of this solenoid. Which combination of changes would achieve this result?

	Change to **I**	Change to ***N***	Change to ***L***
(A)	no change	no change	double
(B)	double	double	no change
(C)	no change	double	halve
(D)	double	double	double

7. A car is moving along a straight road at a constant 15 m s^{-1}. The car then begins to accelerate for 6.0 s. The car's acceleration versus time is recorded on the axes below.



The speed of the car after it has accelerated for 6 seconds is closest to:

(A) 19 m s^{-1}

(B) 21 m s^{-1}

(C) 27 m s^{-1}

(D) 39 m s^{-1}

8. Before starting a game, squash players must hit the small hollow rubber ball against the wall a number of times in order to heat the ball and cause the gas inside it to expand. Only then will the ball bounce properly.

Which statement best explains this?

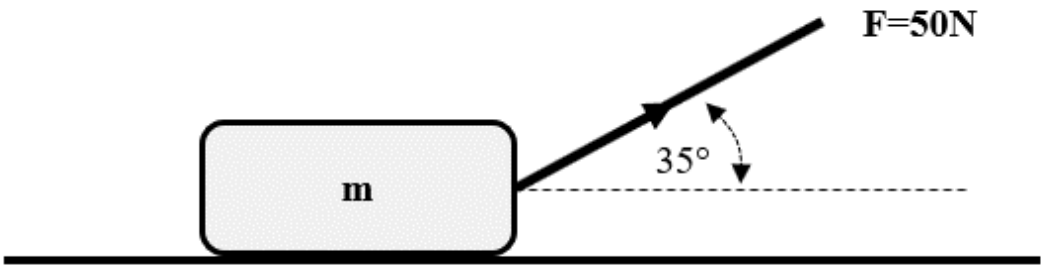
(A) When the ball rebounds off the wall, some of its momentum is transformed into heat energy.

(B) When the ball hits the wall, some of its kinetic energy is transformed into heat energy.

(C) When the ball flies through the air, the air friction causes it to gain heat energy.

(D) When the ball hits the wall, the sound it makes is transformed into heat energy.

9. A box with mass **m** is being dragged along a surface by a rope with a tension of 50N, as shown.



The acceleration of the box can be expressed as:

(A) $\frac{50\sin 35°}{m}$

(B) $\frac{50\cos 35°}{m}$

(C) $\frac{m}{50\cos 35°}$

(D) 50m x cos35°

10. A white ball with mass **m** and an initial speed **u** collides with a stationary black ball, also with mass **m**. After the collision, the black ball moves off with a speed **v**.

This collision is known to be elastic.

What is the speed of the white ball after the collision?

(A) zero

(B) **u**

(C) **v**

(D) **v**/2

11. Resonance is caused by:

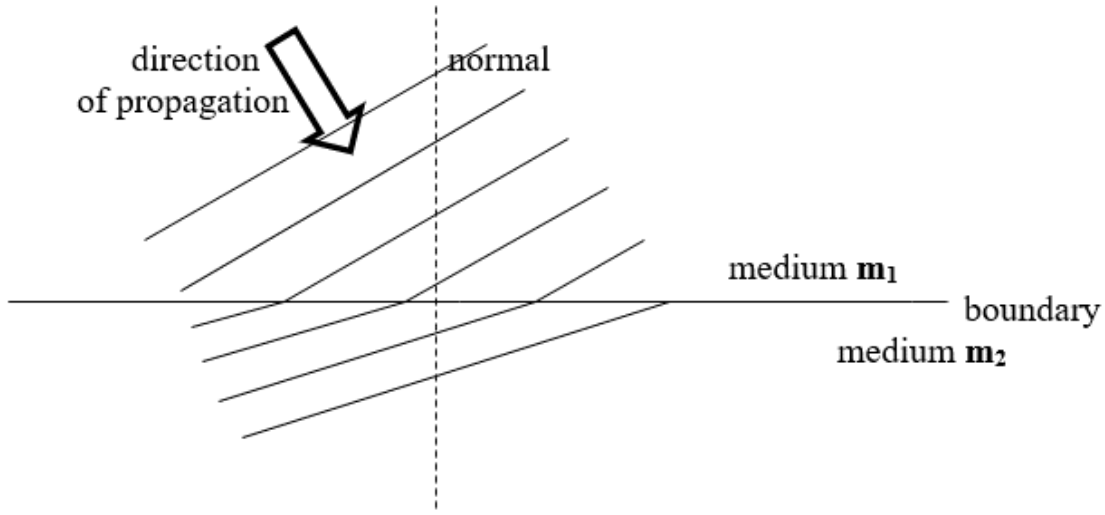
(A) an object with the same natural frequency as the sound wave.

(B) reflection of a sound wave.

(C) reverberation of the sound wave inside an object.

(D) diffraction of a sound wave around an object.

12. As it enters a second medium, $\mathbf{m_2}$, a wave refracts as shown in the diagram.



Which statement can be made about the wave as it enters medium $\mathbf{m_2}$?

(A) Its frequency increases.

(B) Its frequency decreases.

(C) The wavelength increases.

(D) The wavelength decreases.

13. A plane can fly through still air at 300 km h^{-1}. It wishes to fly directly north over the ground but a crosswind of 100 km h^{-1} is blowing from the east.

In which direction must the pilot head the plane so that its course is directly north?

(A) N19.5°E

(B) N19.5°W

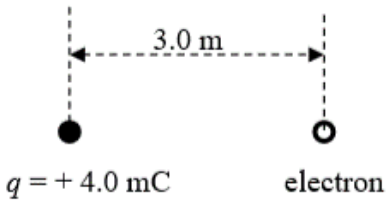
(C) N18.4°E

(D) N18.4°W

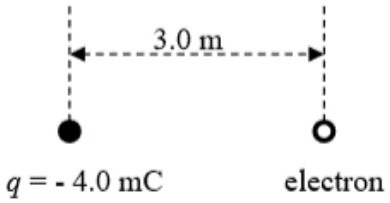
14. An electron has a force of 6.4 x 10^{-13} N acting on it in a westerly direction.

Which arrangement could produce this force?

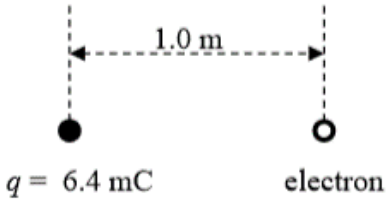
(A)



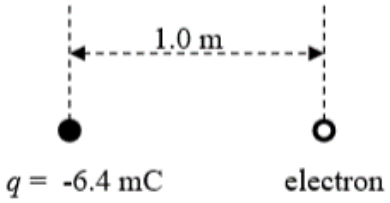
(B)



(C)



(D)



15. A crane has an electric motor with a power rating of 5.0 kW, which is 80% efficient at lifting loads vertically.

What is the maximum speed at which the crane can lift a 200 kg load?

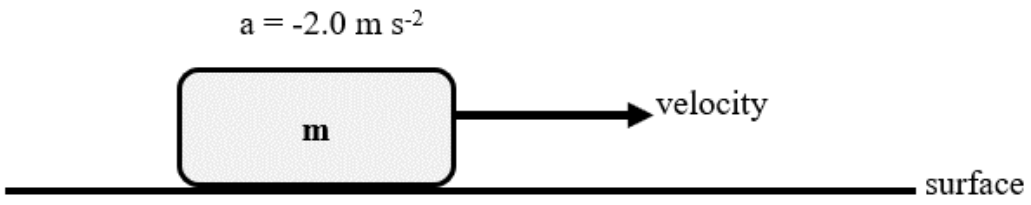
(A) 19.6 m s^{-1}

(B) 40 m s^{-1}

(C) 2.6 m s^{-1}

(D) 2.0 m s^{-1}

16. A box with mass **m** is sliding on a horizontal surface. It is decelerating at a constant 2.0 m s^{-2}, as shown.



The coefficient of kinetic friction, μ, is closest to:

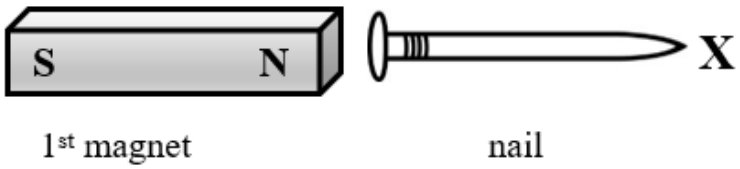
(A) 19.6

(B) 2.0

(C) 0.20

(D) 0.10

17. A bar magnet is brought close to an iron nail, as shown.



The north pole of a second magnet is brought close to the end of the iron nail labelled **X.** The force experienced by this north pole of the second magnet can be described as:

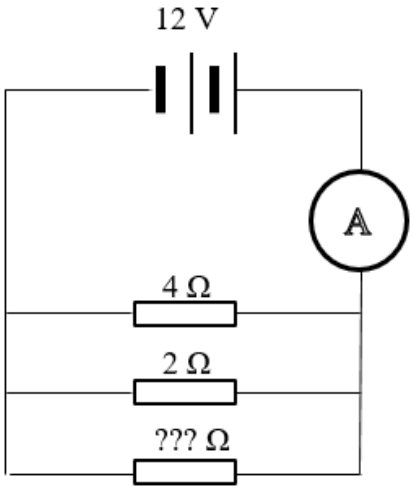
(A) no force

(B) repelling

(C) attraction

(D) cannot be determined without testing

18. A circuit was connected as shown.



The reading on the ammeter is 12.0 A.

What is the resistance of the unknown resistor?

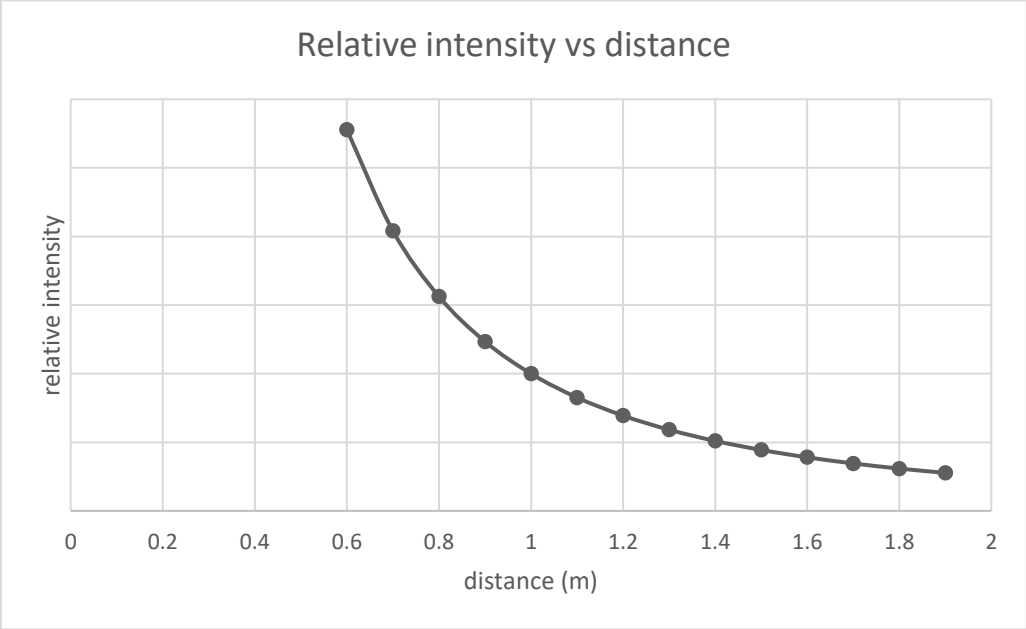
(A) 1 Ω

(B) 2 Ω

(C) 4 Ω

(D) 8 Ω

19. The intensity of light coming from a point source as the distance from the source was varied was plotted on a set of axes, as shown.



At which distance would it be expected that the intensity will be 1/200th that at a distance of 1 m?

(A) 2 m

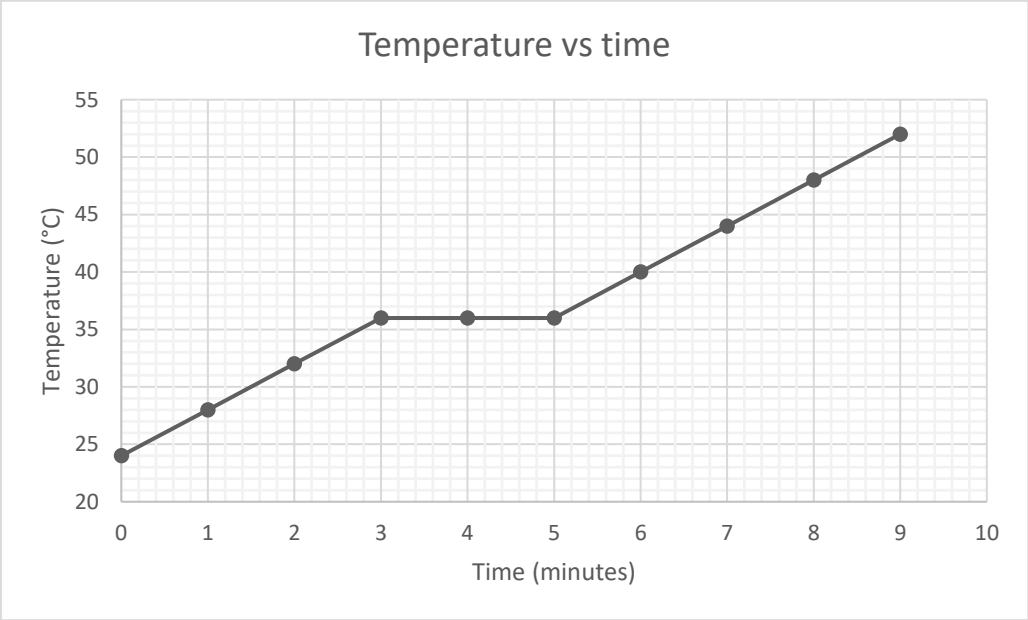
(B) 14 m

(C) 20 m

(D) 200 m

20. A 100 mL sample of a liquid substance was heated at a constant rate. The sample of this substance has a mass of 200 g. The specific heat capacity of the substance, c, is 0.40 J K^{-1} g^{-1}.

The heating curve obtained is shown below.



The latent heat absorbed by the sample when it vaporises is closest to:

(A) 24 J

(B) 320 J

(C) 640 J

(D) 1.5 kJ

2019 | **YEAR 11 (PRELIMINARY) EXAMINATION**

Physics

Section II
Answer Booklet

55 marks

Attempt Questions 21 – 34

Allow about 1 hour and 25 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 questions involving calculations.
- Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which questions you are answering.

Marks

Question 21 (6 marks)

Describe a procedure for a practical investigation that could find the acceleration of a dropped steel ball. Include all measurements that need to be recorded and what calculations would need to be performed to find the acceleration. Identify any sources of error in the investigation. **6**

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

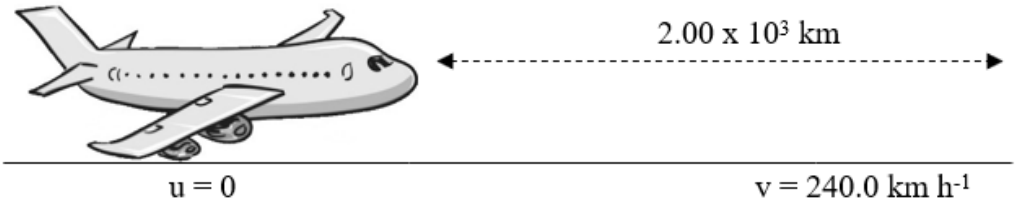
……...

……...

Marks

Question 22 (3 marks)

Boeing is designing a new aircraft which must be capable of acceleration from rest and reach a speed of 240.0 km h^{-1} within a distance of 2.00 x 10^3 m.



What is the acceleration that this aircraft must achieve? **3**

……...

……...

……...

……...

……...

……...

Marks

Question 23 (4 marks)

A car moving to the north at 14.0 m s^{-1} enters a turn which takes 10.0 s. After turning, the car is moving at 12.0 m s^{-1} to the west.

(a) Represent the car's change in velocity by using a labelled vector diagram. **2**

(b) Find the magnitude and direction of the car's change in velocity. **2**

……...

……...

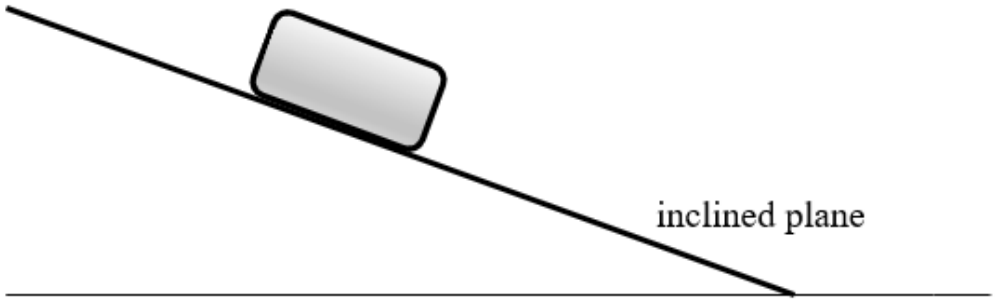
……...

……...

Marks

Question 24 (4 marks)

A box is resting motionless on an inclined plane, as shown.



(a) On the diagram, show all the forces acting on the box as labelled vectors. **2**

(b) The inclined plane is now slowly tilted more until the box just begins to slide.

Explain why the box begins to accelerate down the plane. **2**

……...

……...

……...

……...

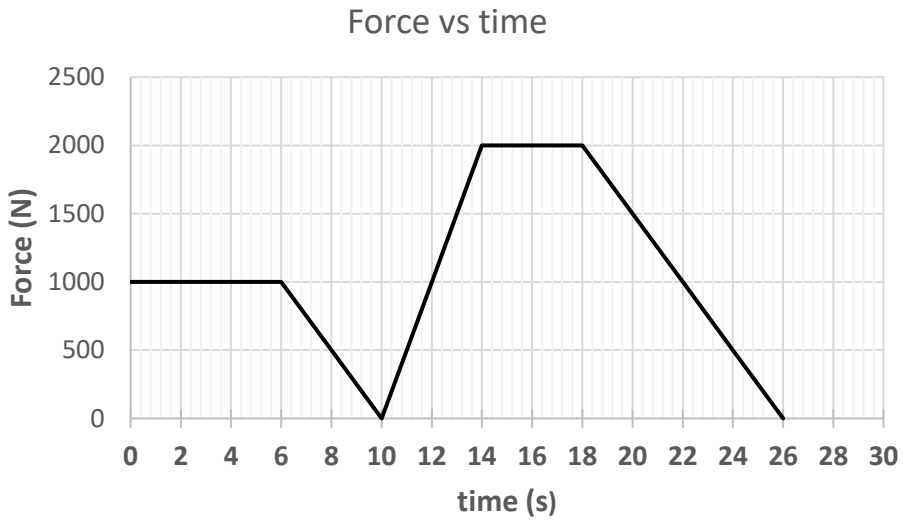
……...

……...

Marks

Question 25 (4 marks)

The net force acting on a 1400 kg vehicle is shown in the graph below.



(a) Find the total impulse acting on the vehicle during the 26 second duration. **2**

……...

……...

……...

……...

……...

(b) Assuming the vehicle started from rest, what is its final speed? **2**

……...

……...

……...

……...

Marks

Question 26 (3 marks)

A rock is falling towards the Earth. Explain the rock's motion in terms of the work done, W, the change in gravitational potential energy, ΔU, and the kinetic energy of the rock. Ignore the effects of air friction. **3**

……...

……...

……...

……...

……...

……...

Question 27 (5 marks)

(a) Describe an activity that could be performed that would clearly show the difference between transverse and longitudinal waves.

Describe how these waves would be observed to be different. **3**

……...

……...

……...

……...

……...

……...

(b) Outline the differences between electromagnetic and mechanical waves. **2**

……...

……...

……...

Marks

Question 28 (3 marks)

Outline the conditions necessary for the existence of standing waves, and give ONE example of where standing waves are produced. **3**

……...

……...

……...

……...

……...

……...

Question 29 (4 marks)

(a) When an ambulance with its siren blaring passes an observer, the Doppler effect is observed. This does not happen with the light from a car's headlight as it passes by. Explain why this is so. **2**

……...

……...

……...

……...

(b) Calculate the observed frequency when an ambulance moving at 30 m s^{-1} towards a stationary observer emits a sound with a frequency of 400 Hz. **2**

……...

……...

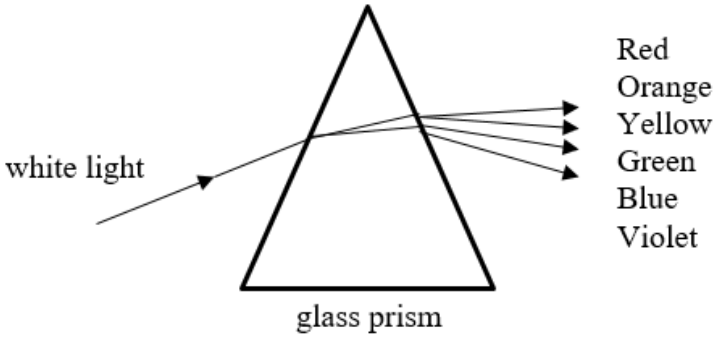
……...

……...

Marks

Question 30 (3 marks)

A student set up the apparatus below and made the following observations.



Name this observed phenomenon and explain why it occurs. **3**

……...

……...

……...

……...

……...

……...

Question 31 (3 marks)

Explain how Kirchoff's voltage law relates to the conservation of energy. **3**

……...

……...

……...

……...

……...

……...

Marks

Question 32 (5 marks)

An electric heating coil is connected to a 12 V power source and draws a constant current of 3.0 A. It is immersed into an insulated container with 250 mL water, originally at 15.0 °C.

(a) Calculate how many joules of heat energy are being added to the water every second. Assume all energy transformations are 100% efficient. **3**

……...

……...

……...

……...

……...

……...

(b) Find the time it takes to heat the water to 30.0 °C **2**

……...

……...

……...

……...

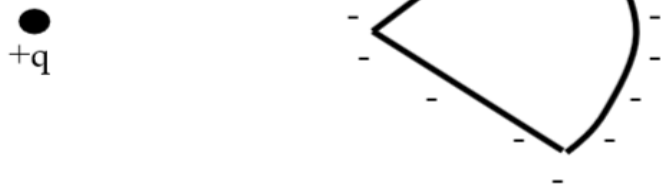
……...

Marks

Question 33 (4 marks)

Equipotential lines can be drawn around charged objects.

(a) Draw lines of equipotential around the objects shown below. **2**



(b) When a charge is moved through a potential difference of 4.50 kV, its potential energy increases by 1.35×10^{-4} J.

What is the magnitude of this charge? **2**

……...

……...

……...

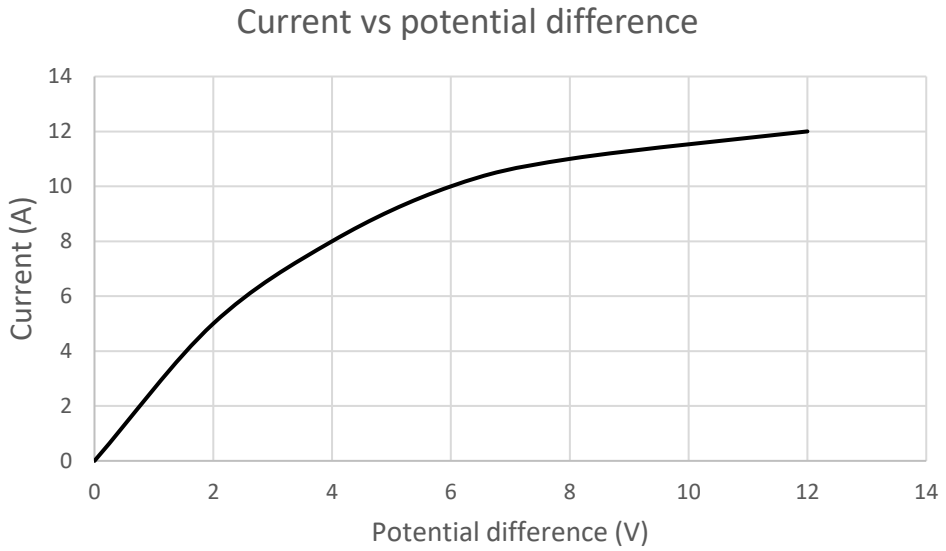
……...

Marks

Question 34 (4 marks)

A small light globe has the potential difference across it and the current flowing through it measured as the voltage of the power source is varied.

The results are plotted on the axes shown below.



(a) State whether this globe is an ohmic or a non-ohmic resistance and give your reasons. **2**

……...

……...

……...

……...

(b) What is the value of the globe's resistance when a potential difference of 4.0 V is applied? **2**

……...

……...

……...

……...

Section II extra writing space.

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

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……