NEW TOWN SECONDARY SCHOOL
Preliminary Examination
Secondary 4 Express / 5 Normal Academic

NAME

CLASS

INDEX NUMBER

Science (Physics, Chemistry)

5076/01
5 Aug 2016
0800-0900
1 hour

Paper 1 Multiple Choice
Additional materials: OTAS

READ THESE INSTRUCTIONS FIRST

DO NOT use staples, highlighters, glue or correction fluid/tape.
Write your name, register number and class on the OTAS in the spaces provided.

There are **twenty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate OTAS.

Read the instructions on the OTAS very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
The use of an approved scientific calculator is expected, where appropriate.

You are advised not to spend more than 30 minutes on this paper.

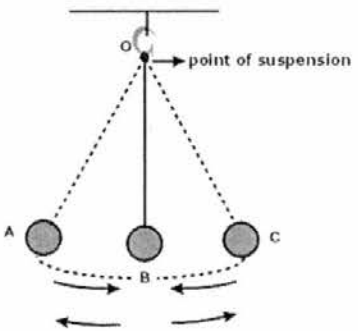
This document consists of 10 printed pages.

Setter: Mr Ronald Wee

Section A [20 marks]

Answer **all** questions in this section.

1 A pendulum swings backwards and forwards passing through B, the middle point of the oscillation.



The first time the pendulum passes through B, a stopwatch is started. The eleventh time the pendulum passes through B, the stopwatch is stopped. The total time measured is *t*.

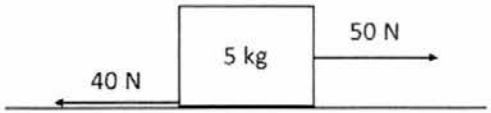
What is the period of the pendulum?

A *t*
B *t*/5
C *t*/10
D *t*/11

2 A car driver is making a journey. During the journey, he first drives at a speed of 80 km/h for 1 hour and then slows down to 50 km/h for 2 hours.
What is his average speed for the whole journey?

A 50 km/h
B 60 km/h
C 65 km/h
D 80 km/h

3 A block of mass 5 kg is pulled across a rough surface by a 50 N force, against a frictional force of 40 N.



What is the acceleration of the block across the surface?

A $0\ m/s^2$
B $2\ m/s^2$
C $8\ m/s^2$
D $10\ m/s^2$

4 A block of metal A has a mass of 200 g and a volume of 10 cm^3 while a block of metal B has a mass of 50 g and a volume of 2 cm^3.
Blocks A and B were melted down and combined to form a metal alloy of block , which has a volume of 12 cm^3.

What is the density of block C?

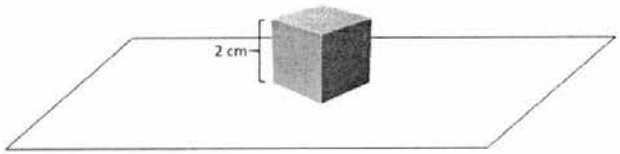
A $6.0\ g\ cm^{-3}$
B $12.0\ g\ cm^{-3}$
C $20.8\ g\ cm^{-3}$
D $22.5\ g\ cm^{-3}$

5 A man walks along a tightrope, carrying a long pole.

What is the purpose of the pole?

A To make it easier to keep his centre of gravity over the rope
B To raise his centre of gravity
C To reduce his pressure on the rope
D To spread out his weight

6 A cube of side 2 cm is place on a table. The cube weighs 4 N.



What is the amount of pressure the cube exerts on the table?

A 0.5 Pa
B 1 Pa
C 10000 Pa
D 500000 Pa

7 A ball was released from the top of a building. It falls onto the road below and bounces back up.

Which sequence, in correct order, represents the transformations of the gravitational potential energy after the ball is released?

Gravitational potential energy →

A Elastic potential energy → kinetic energy → chemical potential energy

B Elastic potential energy → kinetic energy → elastic potential energy

C Kinetic energy → elastic potential energy → kinetic energy

D Kinetic energy → gravitational potential energy → elastic potential energy

8 Some liquid in a beaker is heated.

What happens to the volume and density in the region of X?

	Volume	Density
A	Stays the same	Increases
B	Decreases	Stays the same
C	Decreases	Decreases
D	Increases	Decreases

9 Metal surfaces feel cool to the touch because metal is a

A good heat conductor and it conducts heat from the surface to your hands.

B good heat conductor and it conducts heat from your hands to the surface.

C poor heat conductor and it does not conduct heat from the surface to your hands easily.

D poor heat conductor and it does not conduct heat from your hands to the surface easily.

10 A large piece of pure ice at -10°C is left under the hot Sun. After a while, some of the ice melts away. What is the likely temperature of the remaining ice?

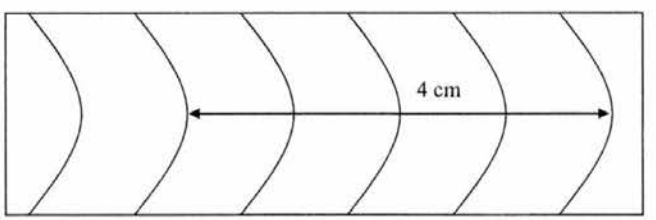
A -10°C

B 0°C

C 30°C

D 100°C

11 The diagram shows a section of the wave pattern produced by a spherical dipper in a ripple tank. The curved lines represent the wavefronts.



What is the wavelength of each wave?

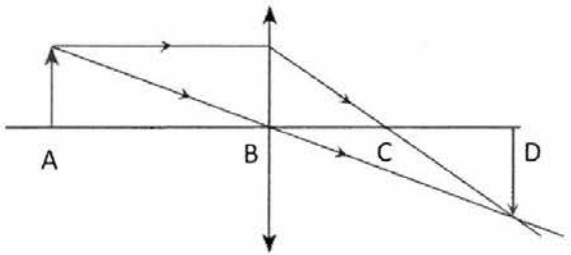
A 1 cm

B 2 cm

C 4 cm

D 8 cm

12 The diagram below shows a converging lens ray diagram. Which point is the focal point?



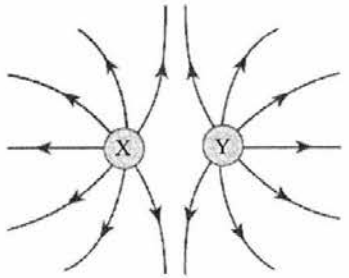
13 Which of the following is part of the electromagnetic spectrum?

A Sound
B Ultrasound
C Water waves
D Gamma rays

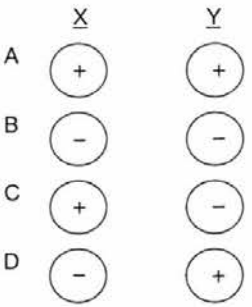
14 A note of loud volume and low pitch is played on a trumpet. Which of the following describes the amplitude and frequency of the note?

	Amplitude	Frequency
A	Large	High
B	Large	Low
C	Small	High
D	Small	Low

15 The diagram below shows the electric field pattern between two isolated point charges.



Which of the following correctly shows the identities of the two point charges?

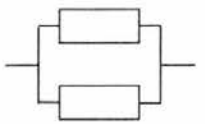


16 Which of the following resistor configurations below would result in the lowest overall resistance? You may assume that each individual resistor has the same resistance.

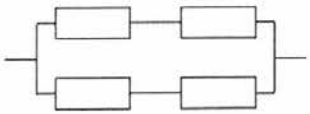
A

B

C



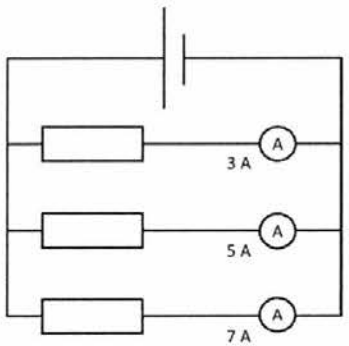
D



17 A wire has 10 C of charge pass through a point in 2 s. What is the current in the wire?

A 2 A
B 5 A
C 10 A
D 12 A

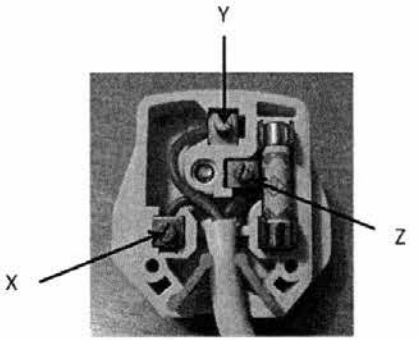
18 The diagram below shows a parallel circuit.



What is the magnitude of the current from the cell?

A 3 A
B 5 A
C 7 A
D 15 A

19 The picture below shows a standard Singapore mains plug.



Which of the following correctly states the wires connected at X, Y and Z?

	X	Y	Z
A	Earth	Live	Neutral
B	Live	Neutral	Earth
C	Live	Earth	Neutral
D	Neutral	Earth	Live

20 Which of the following processes below is most efficient in magnetising a steel bar?

A Heating up the steel bar
B Hammering the steel bar
C Connecting the steel bar in an electric circuit
D Stroking the steel bar with another magnet

End of Paper

NEW TOWN SECONDARY SCHOOL
Preliminary Examination
Secondary 4 Express / 5 Normal Academic

NAME

CLASS | | | | INDEX NUMBER | | |

Science (Physics, Chemistry)

Paper 2 Physics Section A

5076/02
1 August 2016
0900-1015
1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class in the spaces provided above.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, highlighters, glue or correction fluid/tape.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
Where necessary, you may assume the gravitational field strength of Earth to be 10 N/kg.

For Examiner's Use	
Section A	

This document consists of 10 printed pages.

Setter: Mr Ronald Wee

Section A (45 marks)

Answer **all** the questions in the spaces provided

1. (a) State one similarity and one difference between a vector and scalar quantity. [2]

(b) Give an example of
i. a vector quantity. [1]

ii. a scalar quantity. [1]

2. Fig. 2.1 shows the velocity-time graph of a car moving from rest.

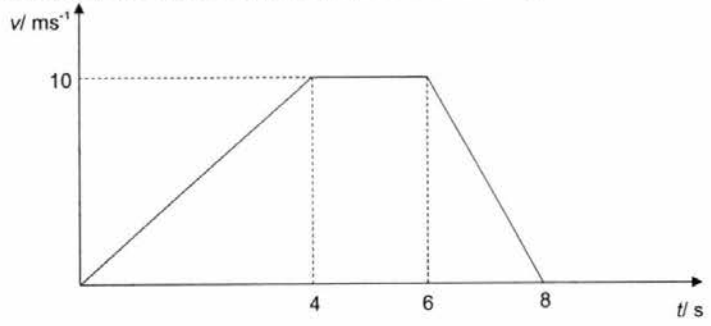


Fig 2.1

(a) Calculate the initial acceleration of the car from 0 to 4 s. [2]

Initial acceleration = _____ m/s^2

(b) Calculate the total distance travelled by the car. [2]

Total distance= _____ m

(c) Hence, calculate the average speed of the car over its whole motion. [2]

Average Speed= _____ m/s

3. A block has mass of 10 kg on Earth.

(a) Calculate the weight of the block. [2]

Weight of block = _____ N

(b) The block is teleported to Krypton, a planet with a gravitational field strength twice that of Earth. Calculate the mass and weight of the block on Krypton. [2]

Mass of block = _____ kg

Weight of block = _____ N

4. Two blocks are suspended from a metre rule, as shown in Fig 4.1 below, and placed on a pivot. The block on the left has mass 150 kg while the block on the right has mass 750 kg.

When the pivot is a distance x away from the end of the ruler, the ruler is balanced.

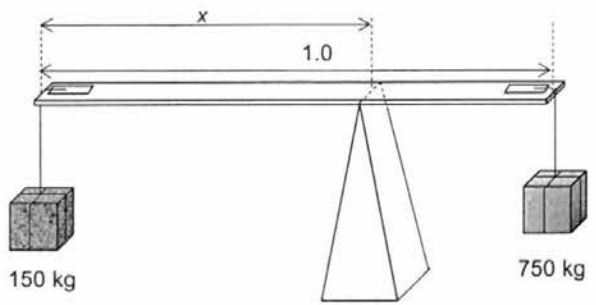


Fig 4.1

Assuming that the mass of the metre rule is negligible, calculate the value of x. [3]

x = _____ m

5. Fig 5.1 shows a parabolic mirror. A parabolic mirror is a mirror that focuses parallel rays of light into a single focal point F.

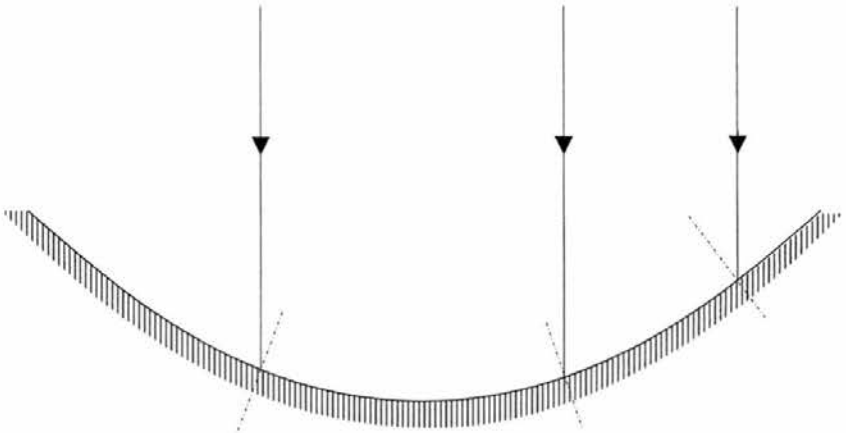


Fig 5.1

(a) In Fig 5.1, complete the ray diagrams. Ensure that you mark out and label at least one set of [3]
i. the angle of incidence and,
ii. the angle of reflection.

(b) Clearly label focal point F on Fig 5.1. [1]

6. Fig 6.1 shows a motor in a crane slowly lifting a 50 kg bucket of rubble. The bucket was initially 5 m above the ground, and the motor raises it through a vertical height of 10 m in 2 minutes before stopping.

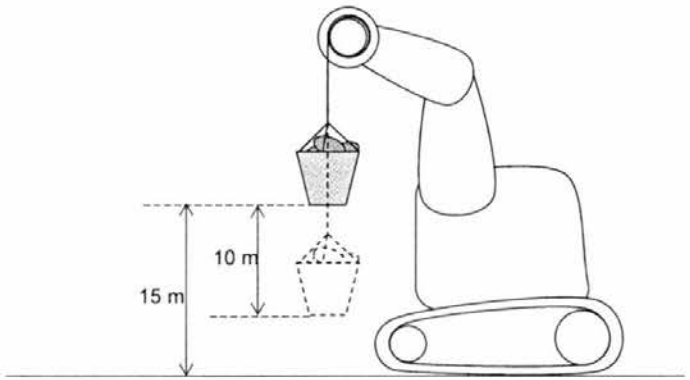


Fig 6.1

(a) i. Calculate the increase in gravitational potential energy of the bucket from its initial position. [2]

Increase = _____ J

ii. Calculate the power of the motor in the crane to lift the bucket. [2]

Power = _____ W

(b) The cable holding the bucket snaps when the bucket is at rest 15m above the ground. Using the principle of conservation of energy, calculate the velocity of the bucket just before it hits the ground. [2]

Velocity = _____ m/s

7. Fig. 7.1 shows a raft of 20 kg being pulled along by two boats in a still river.

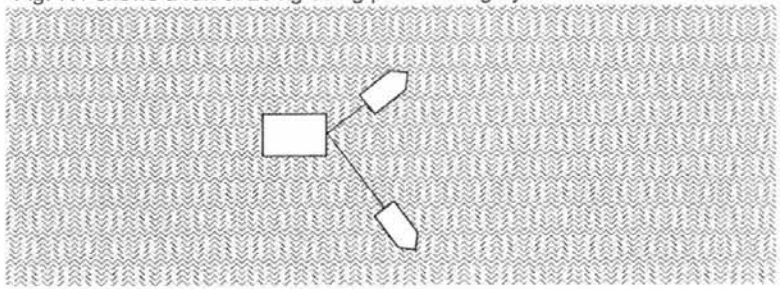


Fig 7.1

In Fig 7.2, a scaled vector diagram of the forces exerted on the raft by the two boats at one point in time are shown.

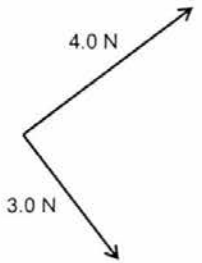


Fig 7.2

(a) i. On Fig 7.2, draw and label the resultant force due to the forces exerted by the boats. [2]

ii. Hence, state the magnitude of the resultant force acting on the raft. [1]

Resultant force = _____ N

(b) State the direction and calculate the magnitude of the acceleration of the raft at this moment. [2]

Acceleration = _____ m/s^2

Direction = _____

8. (a) State two differences between sound waves and light waves. [2]

_____

_____

_____

_____

(b) Bats use echolocation to determine their surroundings in the dark. They send out a pulse of ultrasound, which will be reflected when it hits an object. They listen for the echo of this pulse, and are able to deduce the distance of the object from where they are located.

Fig 8.1 shows a bat in a cave. It lets out a pulse of ultrasound of 5kHz towards the back of the cave.

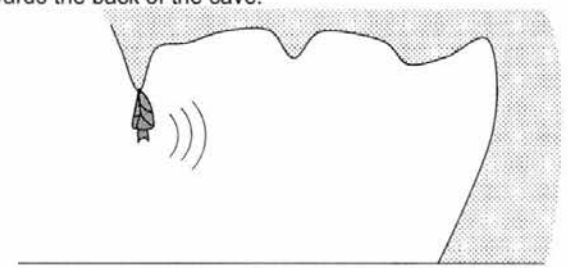


Fig 8.1

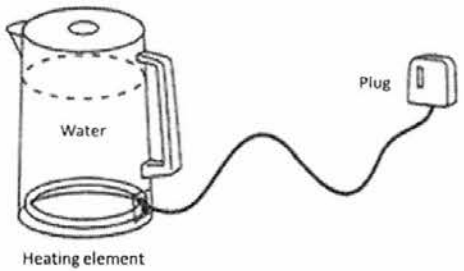
i. Calculate the wavelength of the ultrasound pulse if sound travels at 330 m/s. [2]

Wavelength = _____ m

ii. The pulse the bat sends out is reflected back 12 seconds after the pulse was sent out. Calculate the distance to the back of the cave. [3]

Distance to back of the cave = _____ m

9. An electric kettle of 2000 W is connected to the electrical mains of 220 V.



(a) Calculate the resistance of the heating element. [2]

Resistance of heating element = _____ Ω

(b) The heating element inside the electric kettle is a long nichrome wire, which has a resistivity of 1.5×10^{-6} Ωm. If the heating element has to be exactly 0.2 m long, calculate the cross-sectional area of the heating element. [2]

Cross-sectional area = _____ m^2

(c) The cost of a unit (kWh) of electricity is 24 cents a month (30 days). If the electric kettle is turned on for 1 hour each day, calculate the cost of using the electric kettle every month. [2]

Cost = $ _____

End of Paper

NEW TOWN SECONDARY SCHOOL
Preliminary Examination
Secondary 4 Express / 5 Normal Academic

NAME

CLASS

INDEX NUMBER

Science (Physics, Chemistry)

5076/02
1 August 2016
0900-1015
1 hour 15 minutes

Paper 2 Physics Section B

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class in the spaces provided above.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, highlighters, glue or correction fluid/tape.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section B
Answer any **two** questions.
Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section B	

This document consists of 7 printed pages.

Setter: Mr Ronald Wee

Section B (20 Marks)

Answer any **two** questions in this section.

Write your answers in the spaces provided.

10 Light bends when passing into a medium with a different refractive index.

(a) Define the term *refractive index*. [1]

(b) Fig. 10.1 shows a scaled diagram of a light ray travelling from a glass block of refractive index 1.5 into air of refractive index 1.0.

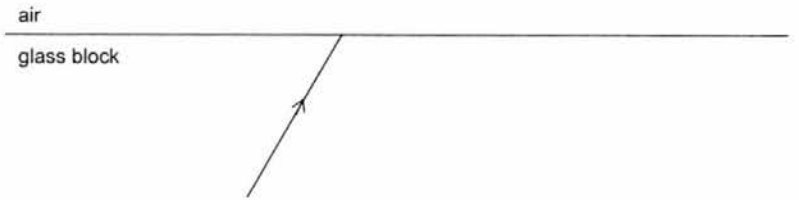


Fig 10.1

i. Measure and state the angle of incidence of the light ray in the glass block. [1]

Angle of incidence = _____ °

ii. Hence, calculate the angle of refraction of the light ray. [2]

Angle of refraction= _____ °

iii. Using your answer from part (a)(ii), complete the path of the light ray in Fig. 10.1. Label all values clearly. [1]

(c) Fig. 10.2 shows a light ray travelling from air to glass of refractive index n. The light ray is incident on the boundary at critical angle C.

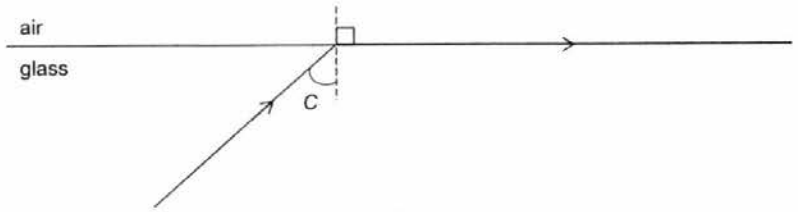


Fig 10.2

i. Calculate the critical angle for the glass block in part (b), if $n = 1.6$. [2]

C = _____ °

ii. Explain why it is **not** possible for a light ray going from air to glass to undergo total internal reflection. [2]

_____

_____

_____

_____

iv. Draw a light ray and state the angle of incidence on Fig 10.2 that will undergo total internal reflection. [1]

11 A company is testing a new model of fuse they are using. The fuse is intended to be rated as 22 A.

(a) State what a fuse is and explain how a fuse of rating 22 A works. [3]

_____

_____

_____

(b) Fig 11.1 shows a fuse connected to a test circuit consisting of a 200 V battery, a 65 Ω lamp, and a variable resistor. The fuse blows when the variable resistor is set at 30 Ω.

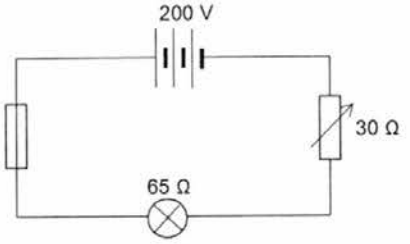


Fig 11.1

i. Calculate the current in the circuit that causes the fuse to blow. [2]

Current = _____ A

ii. Explain why it would be dangerous for such a circuit to be sold with a fuse rating of 75 A. [1]

_____

_____

(c) The blown fuse is replaced with another identical fuse of rating 22 A. An additional resistor of 20 Ω is connected to the test circuit as shown in Fig. 11.2. The variable resistor is set to a value of 15 Ω.

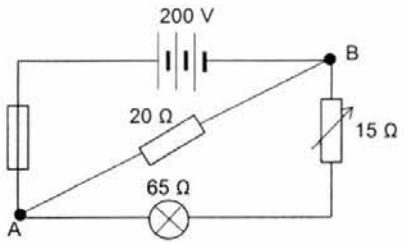


Fig 11.2

i. Calculate the new resistance across the points AB. [2]

Resistance = _____ Ω

ii. Calculate the new current through the fuse and hence determine if the fuse will blow. [2]

Current = _____ A

12 Fig 12.1 shows a current being passed through a long wire A.

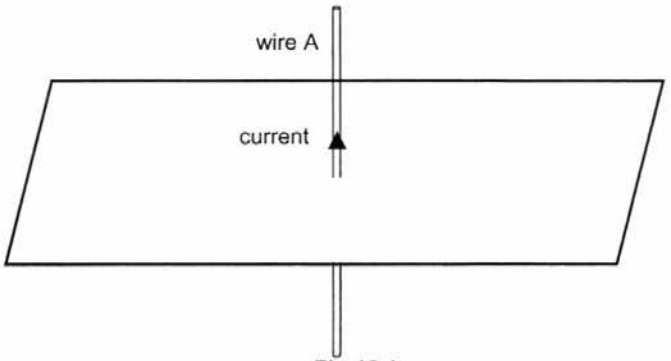


Fig 12.1

(a) Explain how the magnetic field caused by the current in wire A can be plotted using a plotting compass. [2]

(b) On Fig. 12.1, sketch the magnetic field pattern caused by the current in wire A on the sheet. [3]

(c) Suggest how the diagram showing the magnetic field will change when the current in wire A increases in magnitude. Explain your answer. [2]

(d) Fig 12.2 shows a long wire B, with the current flowing in the same direction as wire A.

(X) is the magnetic field produced by wire A.

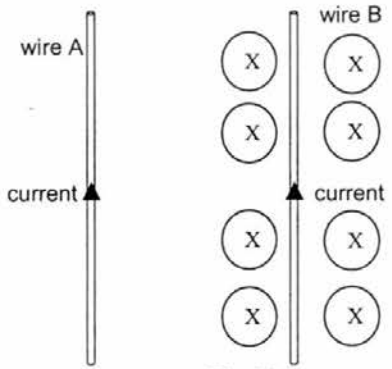


Fig 12.2

i. Determine the direction of force acting on Wire B due to the magnetic field. [1]

_____

ii. Describe and explain what happens to the direction of force acting on wire B when:

1. the direction of current in wire B is reversed. [1]

_____

_____

2. the current in wire A is increased. [1]

_____

_____

End of Paper

MCQ (20 marks)

1. B
2. B
3. B
4. C
5. A
6. C
7. C
8. D
9. B
10. B
11. A
12. C
13. D
14. B
15. A
16. C
17. B
18. D
19. D
20. D

Section A (45 marks)

Answer **all** the questions in the spaces provided

1. (a) State one similarity and one difference between a vector and scalar quantity. [2]

Both have magnitude. [1]

Vector have direction but scalar does not. [1]

(b) Give an example of
i. a vector quantity. [1]

Displacement/velocity/acceleration... (accept any reasonable answer)

ii. a scalar quantity. [1]

Length/area/volume/speed... (accept any reasonable answer)

2. Fig. 2.1 shows the velocity-time graph of a car moving from rest.

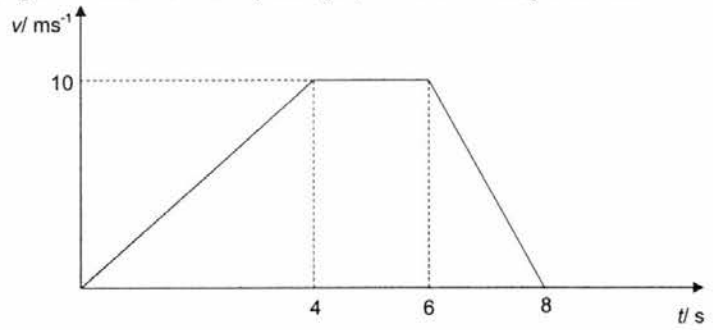


Fig 2.1

(a) Calculate the initial acceleration of the car from 0 to 4 s. [2]

Acceleration = gradient from 0 to 4s [1]
$= \frac{10-0}{4}$
$=2.5\ m/s^2$ [1]

Initial acceleration = _____ m/s^2

(b) Calculate the total distance travelled by the car. [2]

Distance = area under graph [1]
=1/2 * 10 * (2+8)
= 50 m [1]

Total distance= _____ m

(c) Hence, calculate the average speed of the car over its whole motion. [2]

Average speed = $\frac{total\ distance}{total\ time}$ [1]

$= \frac{50\ m}{8\ s}$

= 6.25 m/s [1]

Average Speed= _____ m/s

3. A block has mass of 10 kg on Earth.

(a) Calculate the weight of the block. [2]

W = m x g [1]
= 10 x 10
= 100 N [1]

Weight of block = _____ N

(b) The block is teleported to Krypton, a planet with a gravitational field strength twice that of Earth. Calculate the mass and weight of the block on Krypton. [2]

Mass = 10 kg [1]

Weight = m x (2g)
= 200 N [1]

Mass of block = _____ kg

Weight of block = _____ N

4. Two blocks are suspended from a metre rule, as shown in Fig 4.1 below, and placed on a pivot. The block on the left has mass 150 kg while the block on the right has mass 750 kg.

When the pivot is a distance x away from the end of the ruler, the ruler is balanced.

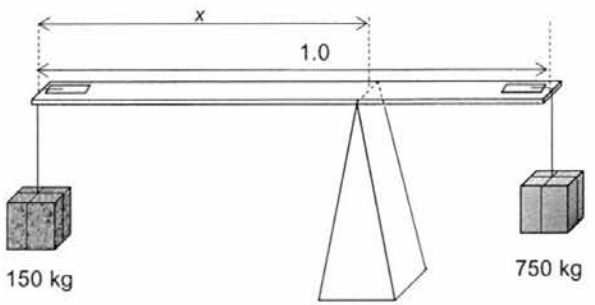


Fig 4.1

Assuming that the mass of the metre rule is negligible, calculate the value of x. [3]

By Principle of Moments,

Total anticlockwise moments = total clockwise moments [1]

(150)(x) = (750)(1-x) [1]
x = 5/6
= 0.833 m [1]

$x =$ _____ m

5. Fig 5.1 shows a parabolic mirror. A parabolic mirror is a mirror that focuses parallel rays of light into a single focal point F.

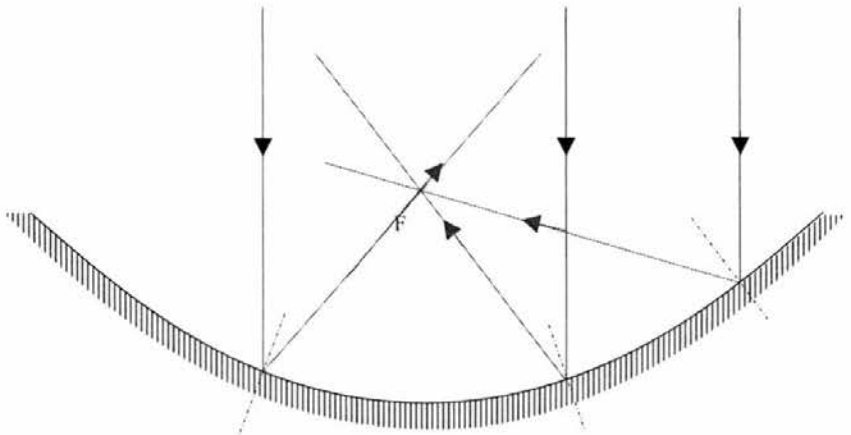


Fig 5.1

(a) In Fig 4.1, complete the ray diagrams. Ensure that you mark out and label at least one set of [3]
i. the angle of incidence and,
ii the angle of reflection.

(1 mark for correct lines
1 mark for arrow heads
1 mark for correct pair of I & r)

(b) Clearly label focal point F on Fig 5.1. [1]

6. Fig 6.1 shows a motor in a crane slowly lifting a 50 kg bucket of rubble. The bucket was initially 5 m above the ground, and the motor raises it through a vertical height of 10 m in 2 minutes before stopping.

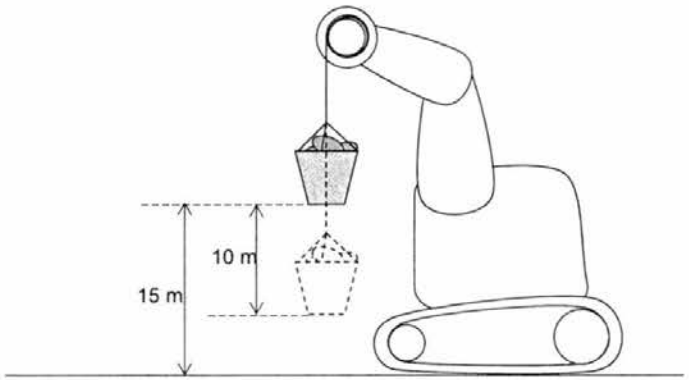


Fig 6.1

(a) i. Calculate the increase in gravitational potential energy of the bucket from its initial position. [2]

PE = mgh [1]
= (50 kg) (10 m/s^2) (10 m)
=5000 J [1]

Increase = _____ J

ii. Calculate the power of the motor in the crane to lift the bucket. [2]

Power = Work Done/time taken [1]
Work Done = increase in potential energy = 5000 J
Power = 5000 J/120 s = 41.7W [1]

Power = _____ W

(b) The cable holding the bucket snaps when the bucket is at rest 15m above the ground. Using the principle of conservation of energy, calculate the velocity of the bucket just before it hits the ground. [2]

By Principle of Conservation of Energy,
PE = KE
Mgh = ½ mv^2 [1]
$v = \sqrt{2gh}$
$= \sqrt{2 \times 10 \times 15}$
= 17.3 m/s [1]

Velocity = _____ m/s

7. Fig. 7.1 shows a raft of 20 kg being pulled along by two boats in a still river.

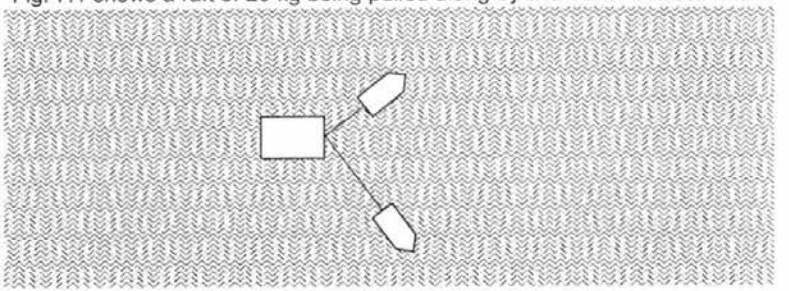


Fig 7.1

In Fig 7.2, a scaled vector diagram of the forces exerted on the raft by the two boats at one point in time are shown.

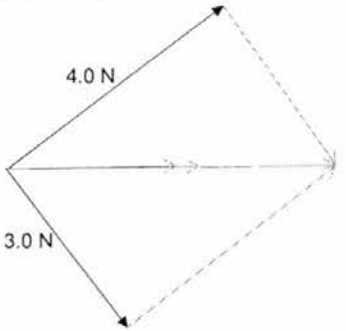


Fig 7.2

(a) i. On Fig 7.2, draw and label the resultant force due to the forces exerted by the boats. [2]
(1 for either tip-to-tail or parallelogram method used correctly)
(1 for resultant drawn correctly)

ii. Hence, state the magnitude of the resultant force acting on the raft. [1]
(if resultant force line is drawn by student, marked according to length of that line)
Resultant force = 5.0 N

(b) State the direction and calculate the magnitude of the acceleration of the raft at this moment. [2]

F = ma
$a = \frac{5}{20}$
=0.25 m/s^2 [1]
At angle of 53° north w.r.t. 3 N force [1]

Acceleration = _____ m/s^2

Direction = _____

8. (a) State two differences between sound waves and light waves. [2]

Light travels at 3 x 10^8 m/s while sound travels at 300 m/s **in air**. OR

Sound waves are longitudinal while light waves are transverse. OR

Sound needs a medium but light does not

Accept any other possible answers

Some students repeated their points by saying that sound waves are longitudinal and light waves are transverse, THEN saying that sound waves have their waves moving perpendicular to direction of motion and light waves have their waves moving parallel to direction of motion. This is just repeating the earlier point.

(b) Bats use echolocation to determine their surr
They send out a pulse of ultrasound, which w
hits an object. They listen for the echo of this
deduce the distance of the object from where

Fig 8.1 shows a bat in a cave. It lets out a pu
towards the back of the cave.

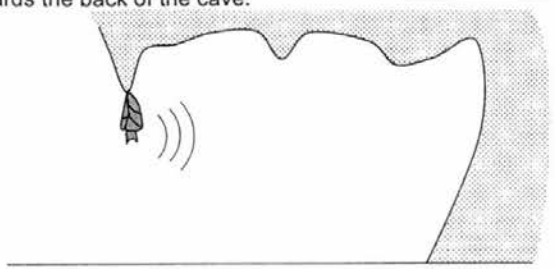


Fig 8.1

i. Calculate the wavelength of the ultrasound pulse if sound travels at 330 m/s. [2]

$v = f\lambda$[1]
$\lambda = \frac{330}{5000} = 0.066\ m$ [1]

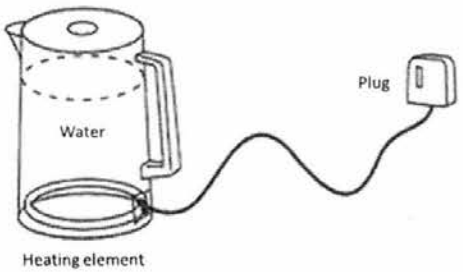
Wavelength = _____ m

ii. The pulse the bat sends out is reflected back 12 seconds after the pulse was sent out. Calculate the distance to the back of the cave. [3]

Time taken for sound to travel to back of cave = 6s [1]
$d = v \times t$[1]
= 330 x 6
= 1980 m [1]

Distance to back of the cave = _____ m

9. An electric kettle of 2000 W is connected to the electrical mains of 220 V.



(a) Calculate the resistance of the heating element. [2]

P = IV [1] & V = IR
$P = \frac{V^2}{R}$
R = 24.2 Ω [1]

(b) The heating element inside the electric kettle is a long nichrome wire, which has a resistivity of 1.5 x 10^{-6} Ωm. If the heating element has to be exactly 0.2 m long, calculate the cross-sectional area of the heating element. [2]

$R = \frac{\rho L}{A}$ [1]
A = 1.24 x 10^{-8} m^2 [1]

(c) The cost of a unit (kWh) of electricity is 24 cents a month (30 days). If the electric kettle is turned on for 1 hour each day, calculate the cost of using the electric kettle every month. [2]

Energy = Power x time [1]
= 2 kW x 1 h x 30 days
= 60 kWh x 24 cents
=$14.40 [1]

End of Paper

Section B (20 Marks)

Answer any **two** questions in this section.

Write your answers in the spaces provided.

10 Light bends when passing into a medium with a different refractive index.

(a) Define the term *refractive index*. [1]
the ratio of the velocity of light in a vacuum to its velocity in a specified medium.

(b) Fig. 10.1 shows a scaled diagram of a light ray travelling from a glass block of refractive index 1.5 into air of refractive index 1.0.

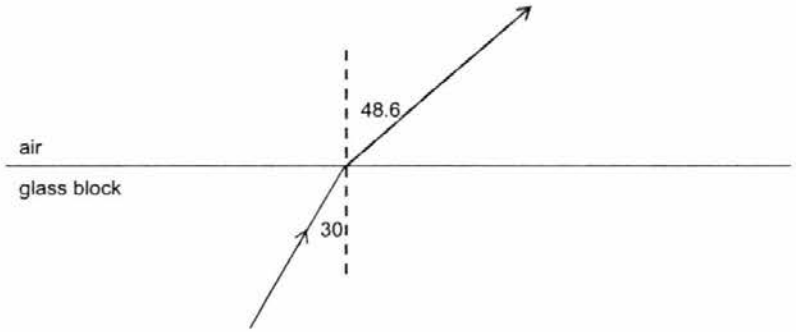


Fig 10.1

i. Measure and state the angle of incidence of the light ray in the glass block. [1]

Angle of incidence = 30 °

ii. Hence, calculate the angle of refraction of the light ray. [2]

$n = \frac{\sin i}{\sin r}$ [1]
R = 48.6 [1]

Angle of refraction= 48.6 °

iii. Using your answer from part (a)(ii), complete the path of the light ray in Fig. 9.1. Label all values clearly. [1]

(c) Fig. 10.2 shows a light ray travelling from a medium of refractive index *n* into a medium of refractive index *m*. The light ray is incident on the boundary at critical angle *C*.

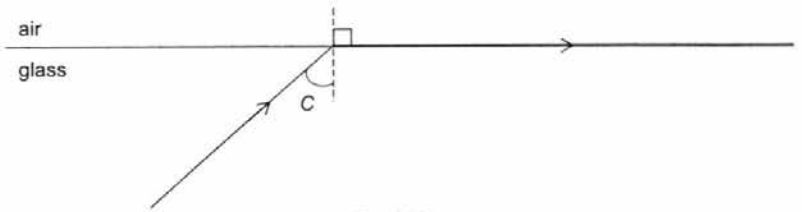


Fig 10.2

i. Calculate the critical angle for the glass block in part (b), where *n* = 1.6. [2]

$n = \frac{1}{sinC}$ [1]
$1.6 = \frac{1}{\sin C}$
C = 38.7 [1]

C = 38.7 °

ii. Explain why it is not possible for a light ray going from air to glass to undergo total internal reflection. [2]

As light goes from air to glass, it will always bend towards normal [1]
as it slows down. Because optical density of glass higher than air [1]
Hence will always be refracted.

iv. Draw a light ray and state the angle of incidence on Fig 10.2 that will undergo total internal reflection. [1]
(any angle greater than C)

11 A company is testing a new model of fuse they are using. The fuse is intended to be rated as 22 A.

(a) State what a fuse of rating 22 A is and explain how it works. [3]

Long thin metal wire in the circuit [1]

Will melt and break [1]

When current passing through exceeds 22 A [1]

(b) Fig 11.1 shows a fuse connected to a test circuit consisting of a 200 V battery, a 65 Ω lamp, and a variable resistor. The fuse blows when the variable resistor is set at 30 Ω.

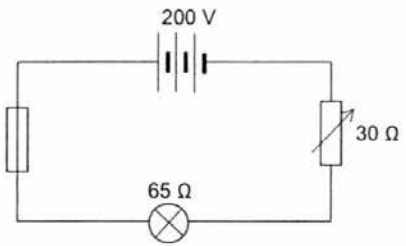


Fig 11.1

i. Calculate the current in the circuit that causes the fuse to blow. [2]

$$R = (30 + 65)\Omega = 95\Omega$$
$$V = IR \text{ [1]}$$
$$I = \frac{V}{R}$$
$$I = \frac{200}{95}$$
$$I = 2.105A \approx 2.11A \text{ [1]}$$

Current = _____ A

ii. Explain why it would be dangerous for such a circuit to be sold with a fuse rating of 75 A. [1]

If this fuse was sold with a rating of 75A, a much higher current than desired would be able to pass through the electrical circuit it is installed in, and might cause overheating and fires.

(c) The blown fuse is replaced with another identical fuse of rating 22 A. An additional resistor of 20 Ω is connected to the test circuit as shown in Fig. 11.2. The variable resistor is set to a value of 15 Ω.

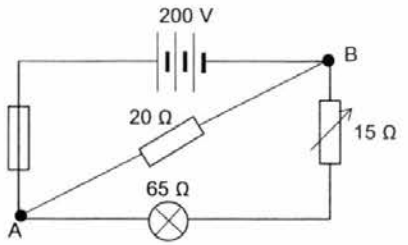


Fig 11.2

i. Calculate the new resistance across the points AB. [2]

$$R\ (series) = (65 + 15)\Omega = 80\Omega$$
$$\frac{1}{R\ (AB)} = \frac{1}{80} + \frac{1}{20} \text{ [1]}$$
$$R(AB)\Omega = 16\ \Omega \text{ [1]}$$

Resistance = _____ Ω

ii. Calculate the new current through the fuse and hence determine if the fuse will blow. [2]

$$I = \frac{V}{R}$$
$$= \frac{200}{16}$$
$$= 12.5\ A \text{ [1]}$$

No, the fuse will not blow. [1]

Current = _____ A

12 Fig 12.1 shows a current being passed through a long wire A.

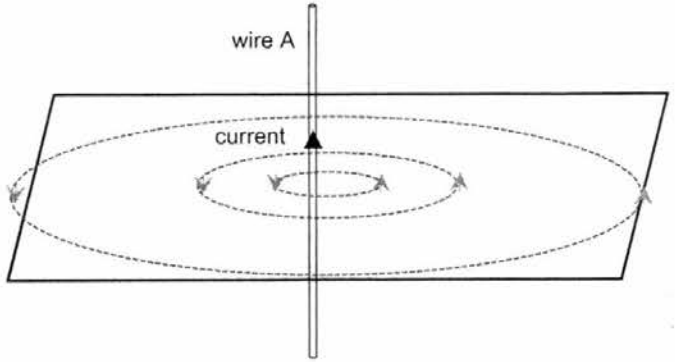


Fig 12.1

(a) Explain how the magnetic field caused by the current in wire A can be plotted using a plotting compass. [2]

Place compass on the sheet.

Mark the positions of the S and N ends of the compass needle

Move the compass so that the S end of the need is at the previous N

Repeat until a circle is formed. [1] Repeat for different distances from wire. [1]

(b) On Fig. 12.1, sketch the magnetic field pattern caused by the current in wire A. [3]
(1 for direction) (1 for circle) (1 for near circles closer together)

(c) Suggest how the diagram showing the magnetic field will change when the current in wire A increases in magnitude. Explain your answer. [2]

Circles become closer together. [1] As the current in wire A increases

in magnitude, the magnetic field becomes stronger. [1]

(d) Fig 12.2 shows a long wire B, with the current flowing in the same direction as wire A.

(X) is the magnetic field produced by wire A.

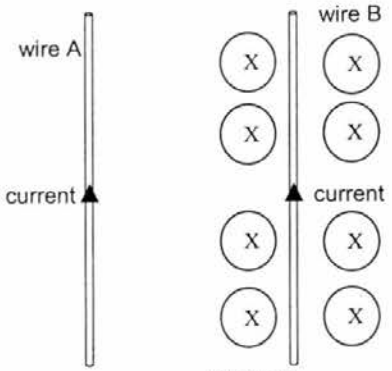


Fig 12.2

i. Using Fleming's Left Hand Rule and your answer in b(ii), determine the direction of force acting on Wire B due to the magnetic field. [1]

the force points towards wire A/ to the left

ii. Describe and explain what happens to the direction of force acting on wire B when:

1. the direction of current in wire B is reversed. [1]

The force changes direction and points away from A by FLHR.

2. the current in wire A is increased. [1]
Force does NOT change direction, still points towards wire A. [1]
Force increases as the strength of magnetic field by A increases.

End of Paper