Class:	Candidate Name:	Candidate Index Number:

EDGEFIELD SECONDARY SCHOOL
2022 PRELIMINARY EXAMINATION
Secondary 4

NA Syllabus

SCIENCE (PHYSICS) **5105/02**

Paper 2

Aug 2022

Candidates answer on the Question Paper.
No additional materials are required

Paper 1 and 2
1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the box above.
Write in dark blue or black ink.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions in Section A and any **two** questions in Section B.
The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no more than 30 minutes on Paper 1.
You may proceed to answer Paper 2 as soon as you have completed Paper 1.

At the end of the examination hand in your answers to Paper 1 and Paper 2 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

Acceleration due to gravity, g, is assumed to be 10 m/s^2 unless otherwise stated.

FOR EXAMINER'S USE	
SECTION A	**/14**
SECTION B	**/16**
TOTAL	**/ 50**

My target grade/mark: _____

_____
Parent's Signature

Section A

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

1 Fig. 1.1 shows the horizontal forces acting on a swimmer.

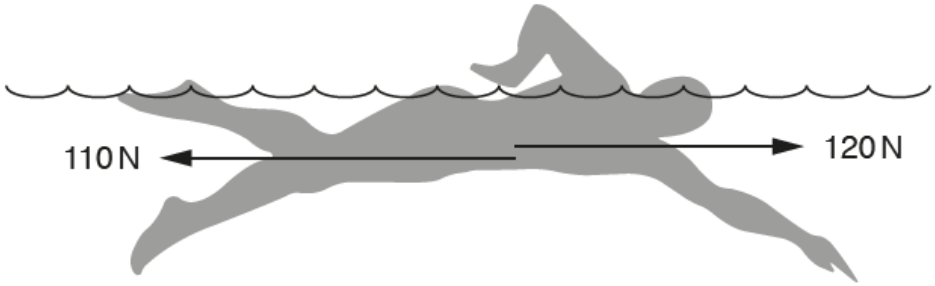


Fig. 1.1

(a) Calculate the size and direction of the resultant horizontal force on the swimmer.

size of resultant force = ……N

direction of resultant horizontal force : ……

[1]

(b) State the name of the 110 N force on the swimmer.

……[1]

(c) Fig. 1.2 shows the horizontal forces acting on the swimmer as he moves forwards a short time later.

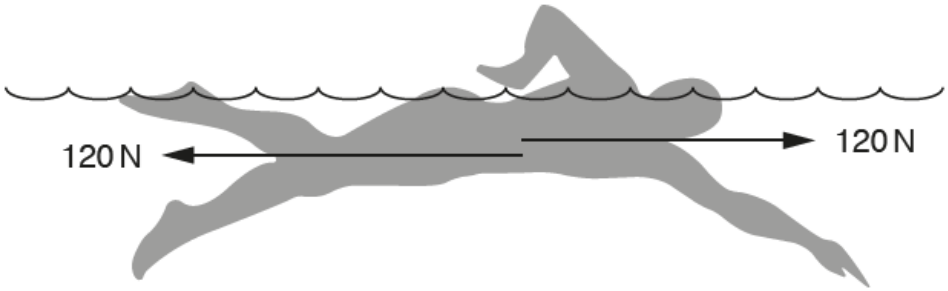


Fig. 1.2

Describe and explain the motion of the swimmer.

……

……

……[2]

2 A uniform metre rule is balanced at the 50 cm mark. Weights of 1.5 N and 3.0 N are hung from the 10 cm and 40 cm marks respectively, as shown in Fig. 2.1.

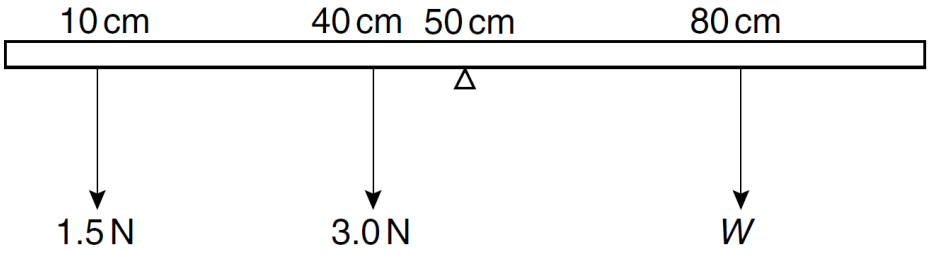


Fig. 2.1

A weight *W* hanging from the 80 cm mark balances the system.

(a) Calculate the sum of moment of the 1.5 N and 3.0 N weights about the 50 cm mark.

moment = …… Ncm [1]

(b) Calculate the value of the weight *W*.

weight *W* = …… N [1]

(c) Indicate with an arrow, the weight of the rule in Fig. 2.1.

Explain why the weight of the rule is not considered in the calculations in **(a)** or **(b)**.

……

……

……[1]

3 Fig. 3.1. shows a speed-time graph for the skier in a part of the race.

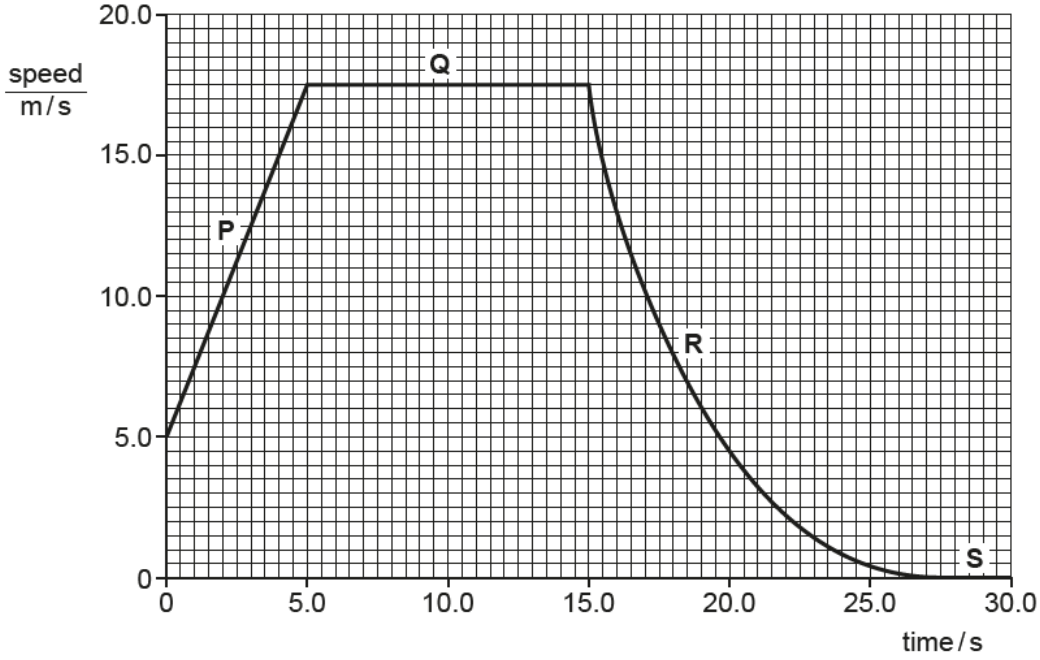


Fig. 3.1

(a) Describe the motion of the skier at each point **Q** and **R** on the graph.

Q :……

R : ……...

[1]

(b) Calculate the distance travelled by the skier for the first 5 seconds.

distance = ……. m [1]

(c) Skis are strapped to a skier's feet and are longer and wider than skier's feet.

Explain how the skis prevent the skier from sinking into soft snow.

……

……

……[1]

4 An electric hotplate is used to heat water in a saucepan as shown in Fig. 4.1. The temperature of the water is measured and recorded every minute.

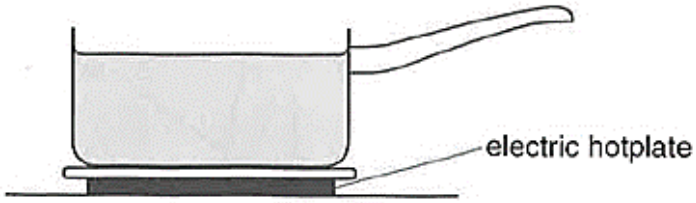


Fig. 4.1

The results obtained are shown in the table.

Time / min	0	1	2	3	4	5	6
Temp / ^{o}C	15	36	50	61	72	80	88

(a) **(i)** Plot a graph of temperature against time, marking each point with a cross (x). [1]

(ii) Draw a curved line of best fit taking into account all the plotted points. [1]

(b) From your graph, determine the time it takes for the water to reach 45 ^{o}C. Indicate clearly on the graph how you get the answer.

time = ... m [1]

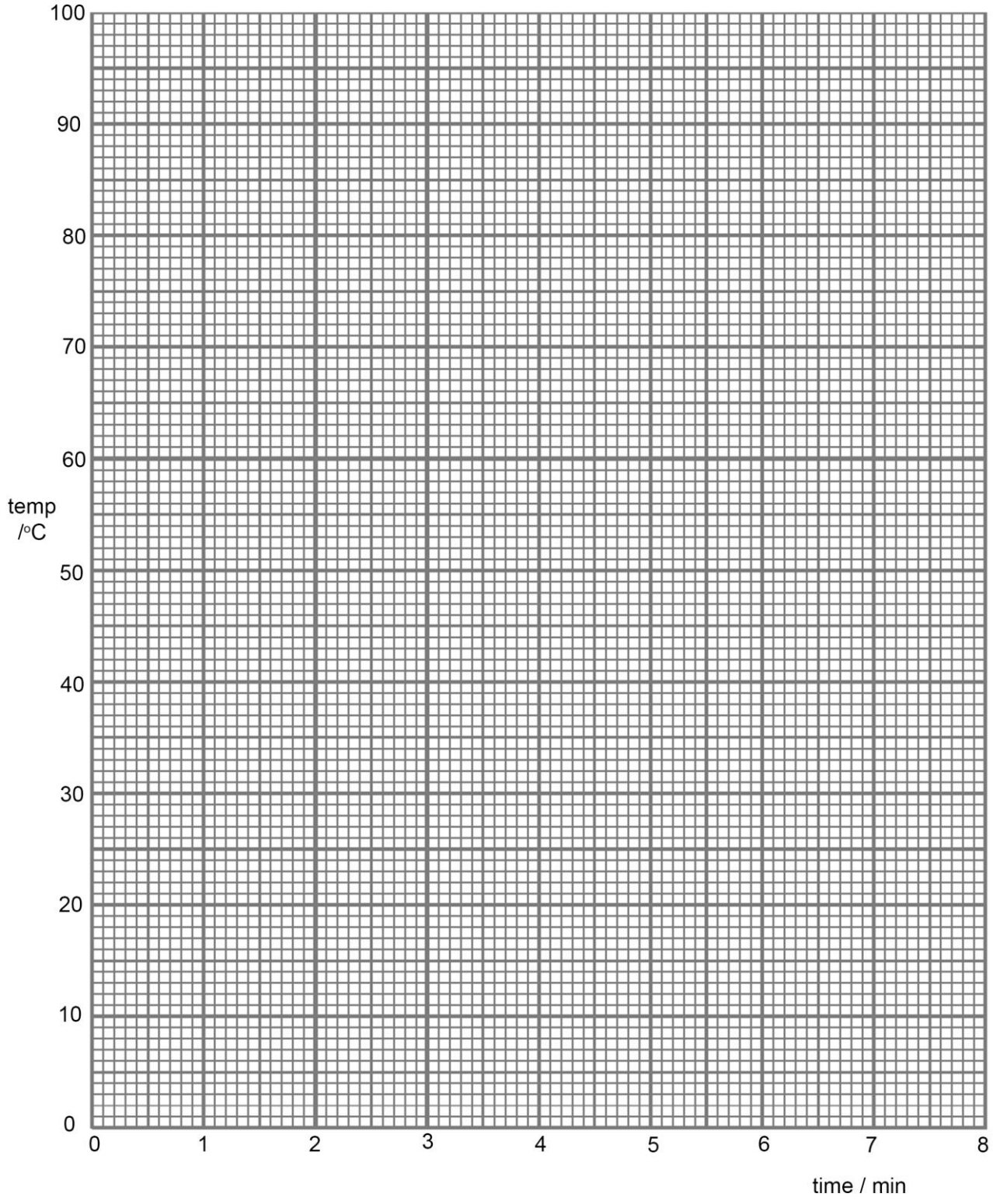
(c) During the heating process, some energy is lost from the sides of the saucepan to the surrounding air.

What is the best colour and texture for the outside surface of the saucepan to keep heat loss to a minimum? Give a reason for your choice.

colour and texture : .....

reason : .....

.....[1]


100
90
80
70
60
temp
/°C
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
time / min

Section B

Answer any **two** questions from this section in the spaces provided.

5 A garden fountain uses an electric pump that propels 40 kg of water per minute to a height of 1.5 m.

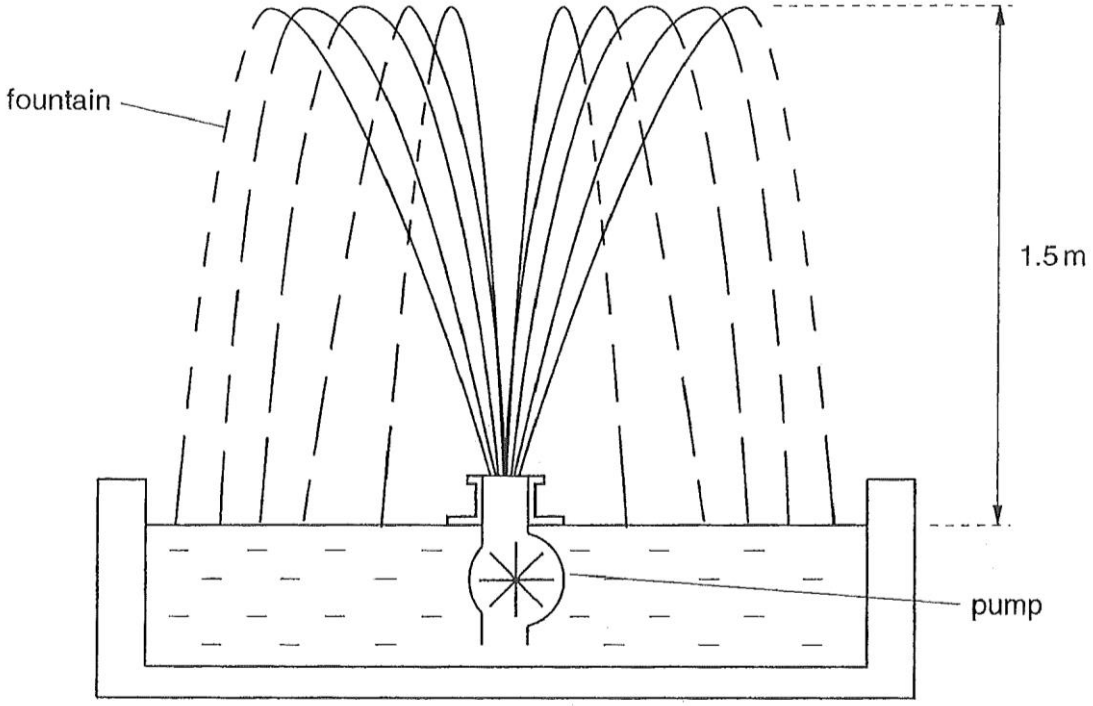


Fig. 5.1

(a) State one of the main energy gain by the water.

…….…… [1]

(b) Calculate how much energy is gained by 40 kg of water when it is raised through a vertical height of 1.5 m. The gravitational field strength is 10 N/kg.

energy = …… J [2]

(c) Calculate the power of the pump used in raising 40 kg of water to a height of 1.5 m in one minute.

power = …… W [2]

(d) The efficiency of the pump which operates the fountain is 70%.

Calculate the power supplied to the pump from the mains supply.

power = ……. W [1]

(e) Given that the cost of 1 kWh is $0.28, calculate the cost of operating the fountain for 12 hours.

cost = ……. cents [2]

6 Fig. 6.1 shows a mobile (cell) phone.

Fig. 6.1

(a) **(i)** State the type of electromagnetic wave used for the mobile phone signal.

…… [1]

(ii) The screen of the mobile phone emits visible light. State one type of electromagnetic wave with a shorter wavelength than visible light.

…… [1]

(b) The signal is transmitted at a frequency of 1800 MHz. Given that the speed of the wave 3.0×10^8 m/s, calculate the wavelength of the signal.

wavelength = …… m [2]

(c) The mobile phone produces sound waves.

(i) State the range of audible frequency for a healthy human ear. Include the unit.

…… [1]

(ii) The ring tone of the mobile phone consists of two musical notes, **A** and **B**.

Note **A** is *louder* and has *same pitch* as note **B**.

Fig. 6.2 shows note **A** displayed on an oscilloscope screen.

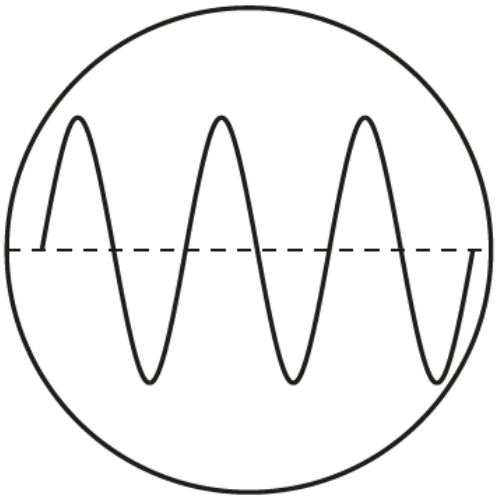


Fig. 6.2

Note **B** is now displayed on the same oscilloscope screen as note **A**.

(1) Draw on Fig. 6.2, how note **B** will appear on the screen. [1]

(2) Describe the differences between the wave for note **B** and the wave for note **A**.

……

.....[1]

(d) State a difference between the electromagnetic waves and the sound wave mentioned above.

……

……[1]

7 A circuit contains two resistors $\mathbf{R_1}$ and $\mathbf{R_2}$ connected in parallel to a battery. Ammeters $\mathbf{A_1}$ and $\mathbf{A_2}$ and a voltmeter **V** are placed at different points in the circuits as shown in Fig. 7.1.

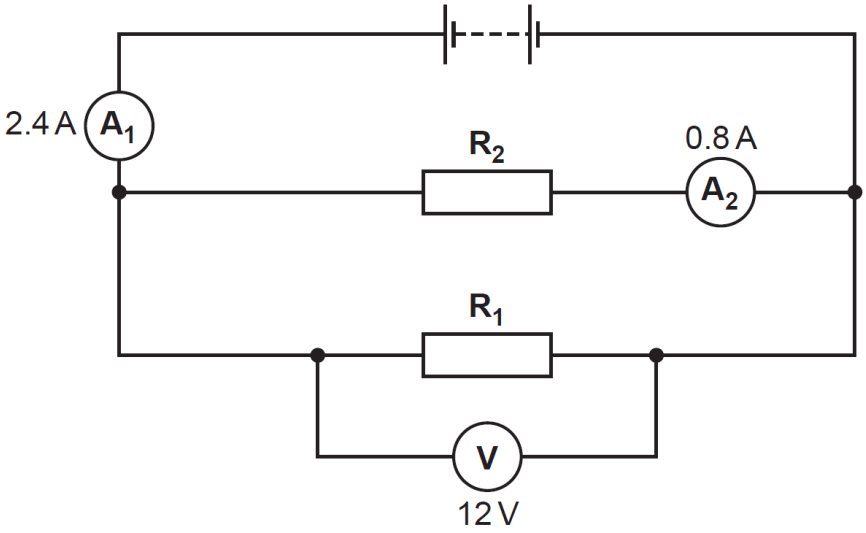


Fig. 7.1

The following readings are taken from the meters.

Reading on the voltmeter **V** = 12 V
Reading on the ammeter $\mathbf{A_1}$ = 2.4 A
Reading on the ammeter $\mathbf{A_2}$ = 0.8 A

(a) State the potential difference across $\mathbf{R_2}$.

potential difference = ... V [1]

(b) Calculate the resistance of resistor $\mathbf{R_2}$.

resistance = ... Ω [1]

(c) Calculate the power dissipated in resistor $\mathbf{R_2}$.

power = ... W [2]

(d) Calculate the resistance of resistor $\mathbf{R_1}$.

resistance = …… Ω [2]

(e) An additional resistor $\mathbf{R_3}$ is added and is connected parallel to $\mathbf{R_1}$.

State and explain what happens to the reading of $\mathbf{A_1}$.

……

……

……[2]

End of paper