Class/ Index Number /	Centre Number/ 'O' Level Index Number /	Name

新加坡海星中学

MARIS STELLA HIGH SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR

PHYSICS **6091/02**

Paper 2 **25 August 2021**

1 hour 45 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number, Centre number, O level index number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

This is Section A of the paper.

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

Candidates are reminded that **all** quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper (sections A and B) is 80.

At the end of the examination, hand in the following separately:
(1) Section A
(2) Section B

For Examiner's Use	
Section A	50
Section B	30
Total	80

This document consists of 12 printed pages.

Section A

Answer **all** the questions in this section.

1 A golf ball is hit from point A on the ground and moves through the air to point B. The path of the ball is illustrated in Fig.1.1. Ignore the effects of air resistance.

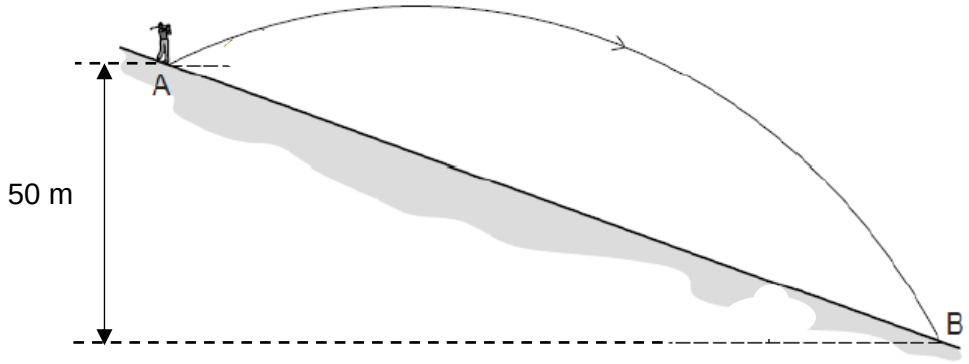

Fig. 1.1

The ground slopes downhill with constant gradient.
The ball has an initial velocity of 63 m s^{-1} at an angle to the horizontal. The ball hits the ground at B after 4.9 s.

(a) State the Principle of Conservation of Energy.

……..……..

……..……..

……..…… [2]

(b) Calculate the speed of the ball just before it lands on the ground at B.

speed = …… [3]

(c) Describe the energy changes of the ball from the instant it is hit at point A to the instant just before it lands on the ground at B.

……..……..

……..……..

……..……..

……..…… [2]

2 **(a)** State what is meant by a *field line* in

(i) a gravitational field

……..……..

……..…… [1]

(ii) an electric field

……..……..

……..…… [1]

(b) In an experiment conducted in the International Space Station (ISS), a charged metal sphere is isolated and placed in a Faraday's cage. The net gravitational field strength in the ISS can be taken to be zero.

State one similarity and one difference between the gravitational force field and the electric force field around the sphere.

Similarity ……..

……..……..

Difference ……..……

……..……..

……..…… [2]

3 Fig. 3.1 shows the flame of a Bunsen burner.

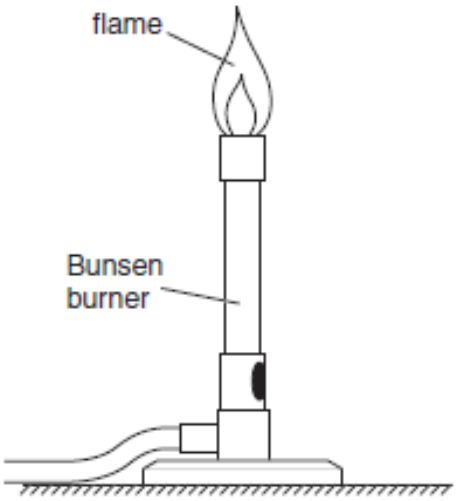

Fig. 3.1

(a) A thermocouple is used to measure the temperature of the flame because it can measure very high temperatures.

State and explain one other advantage of using a thermocouple thermometer to determine temperature.

……..……..

……..……..

……..…… [2]

(b) The thermocouple gives a reading of 5.0 mV when the cold junction is placed in melting ice and the hot junction is placed in steam.

With the cold junction kept in melting ice and the hot junction in the flame of the Bunsen burner, the thermocouple gives a reading of 40.0 mV.

Determine the temperature of the flame.

temperature = ……. [2]

4 **(a)** A student states, quite wrongly, that temperature measures the amount of thermal energy in a body.

State and explain two **observations** that show why this statement is incorrect.

……..……..……

……..……..……

……..……..……

……..……..…… [2]

(b) **(i)** Define *specific latent heat*.

……..

……..…… [1]

(ii) A beaker containing a liquid is placed on a balance as shown in Fig. 4.1.

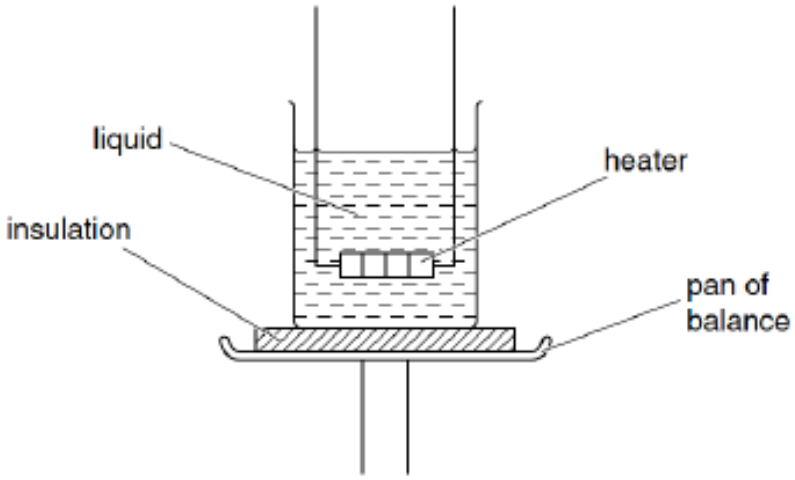

Fig. 4.1

A heater of power 110 W is immersed in the liquid. The heater is switched on and when the liquid is boiling, balance readings *m* are taken at corresponding times *t.*

Fig. 4.2 shows the variation of balance readings *m* with time *t*.

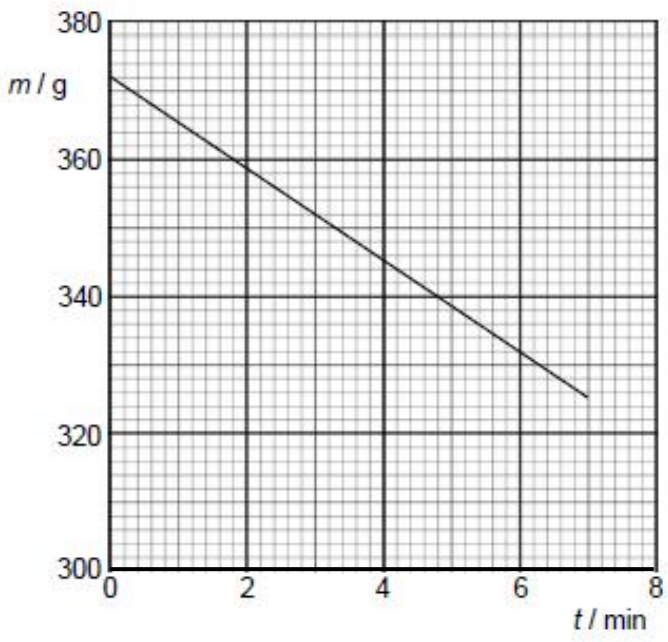

Fig. 4.2

1. From Fig. 4.2, state if the liquid is boiling at a steady rate. Explain your answer.

……..…… [1]

2. Use data from Fig. 4.2 to determine a value for the specific latent heat *L* of vaporisation of the liquid.

L = ……..…… [3]

3. State, with a reason, whether the value of *L* determined in **(b)(ii) part 2** is likely to be an overestimation or an underestimation.

……..

……..…… [2]

5 An experiment was set up in the laboratory to study the factors affecting emission and absorption of infrared radiation as shown in Fig 5.1. Flask A and Flask B are black and silver on the outer surface respectively.

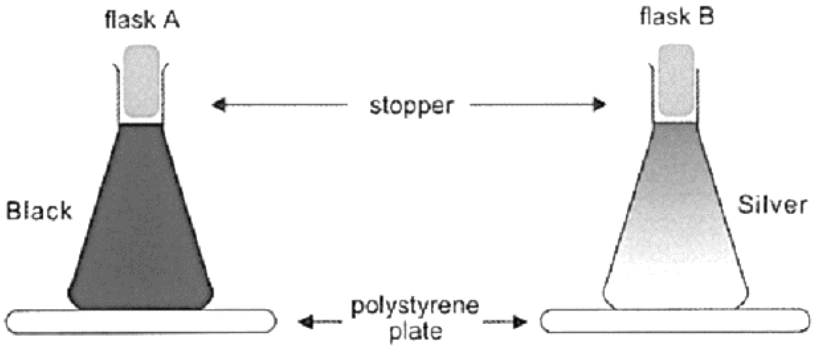

Fig. 5.1

2.0 litres of water at 98 °C was poured into each of the flasks. Both flasks were placed on polystyrene plates. The flasks did not reach the final equilibrium temperature with the surroundings.

(a) Explain the purpose of

(i) the stopper

……..

…… [1]

(ii) the polystyrene plate

……..

…… [1]

(b) After 30 minutes, name the flask that has a higher temperature. Explain your choice.

……..

……..

…… [2]

6 A photocopier is used to enlarge a picture.

(a) State two properties of the image formed by the lens of the photocopier.

……..

…….……...…… [2]

(b) Fig. 6.1 shows an object and a light ray emanating from a point on the object towards the lens. An image **twice** the size of the object is formed on the other side of the lens.

Drawing to scale, complete the diagram to show how the image was formed by the lens. Mark clearly the *principal focus* ***F*** of the lens and the *image* formed by the lens. [3]

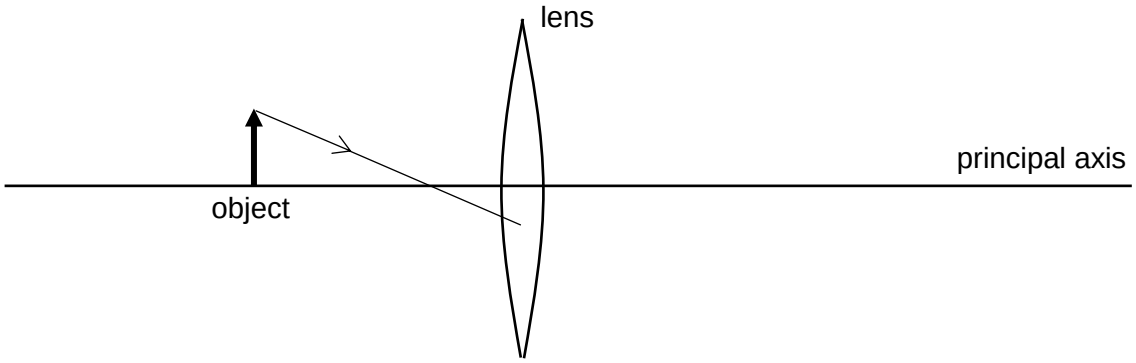

Fig. 6.1

(c) The photocopier can also be used to print pictures that are of the same size as the original picture. State, in terms of **F**, the position on the principal axis that the original picture has to be placed.

……..……...…… [1]

7 A battery of e.m.f. 4.50 V and negligible internal resistance is connected in series with a fixed resistor of resistance 1200 Ω and a thermistor as shown in Fig. 7.1.

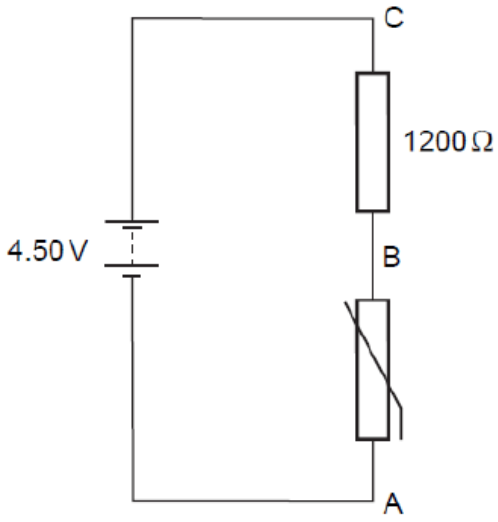

Fig. 7.1

(a) At room temperature, the thermistor has a resistance of 1800 Ω. Deduce that the potential difference across AB is 2.70 V. [1]

(b) A uniform resistance wire PQ of length 1.00 m is now connected in parallel with the resistor and the thermistor, as shown in Fig. 7.2.

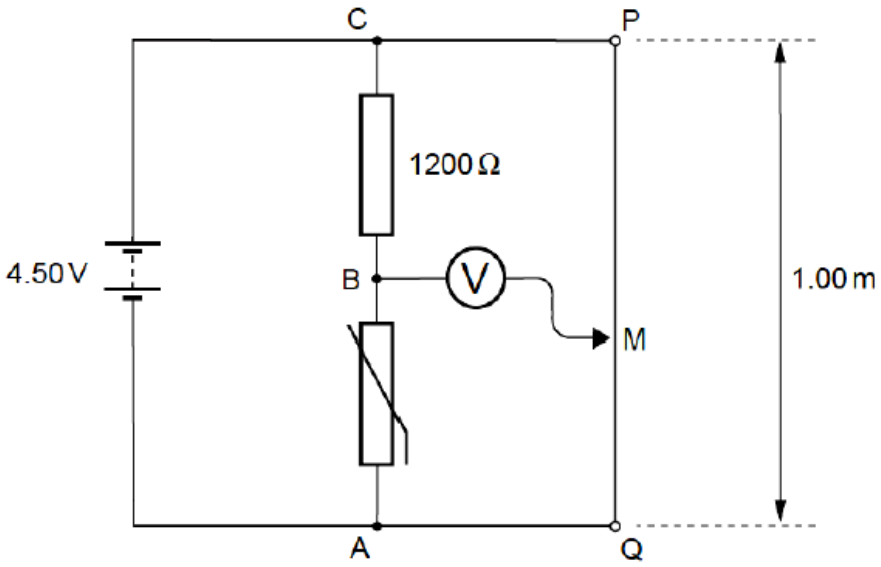

Fig. 7.2

A sensitive voltmeter is connected between point B and a moveable contact M on the wire.

(i) Explain why, for constant current in the resistance wire, the potential difference between any two points on the wire is proportional to the distance between the points.

……..

……..

……..…… [2]

(ii) The contact M is moved along PQ until the voltmeter shows zero reading.

State the potential difference between the contact at M and the point Q.

potential difference = …… [1]

(iii) The thermistor is warmed slightly. State and explain the effect on the length of wire between M and Q for the voltmeter to remain at zero deflection.

……..

……..…… [2]

8 Fig. 8.1 shows a circuit that is used to switch on an electric motor **M** automatically when the current is large enough. The L-shaped soft iron bar, pivoted about P, is able to rotate freely.

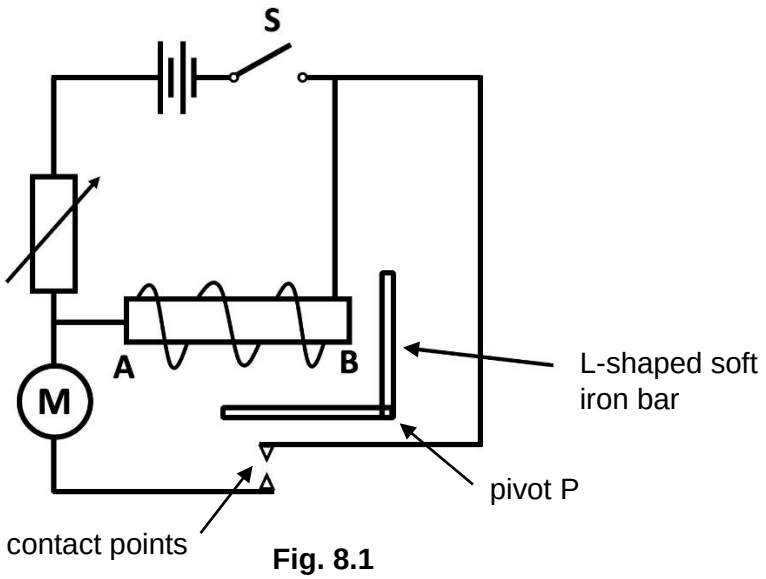

Fig. 8.1

(a) Mark on Fig. 8.1 the direction of current in the coil after the switch **S** has been closed. [1]

(b) State which end **A** or **B** of the soft-iron core will be magnetised by the current into the North pole of the electromagnet.

…… [1]

(c) The resistance of the rheostat was set to the maximum. When switch S is closed, the motor **M** did not start. Explain how the adjustment of the rheostat's resistance will cause the motor **M** to start.

……..

……..

…… [2]

9 A student uses a device for measuring wind speed as shown in Fig. 9.1.

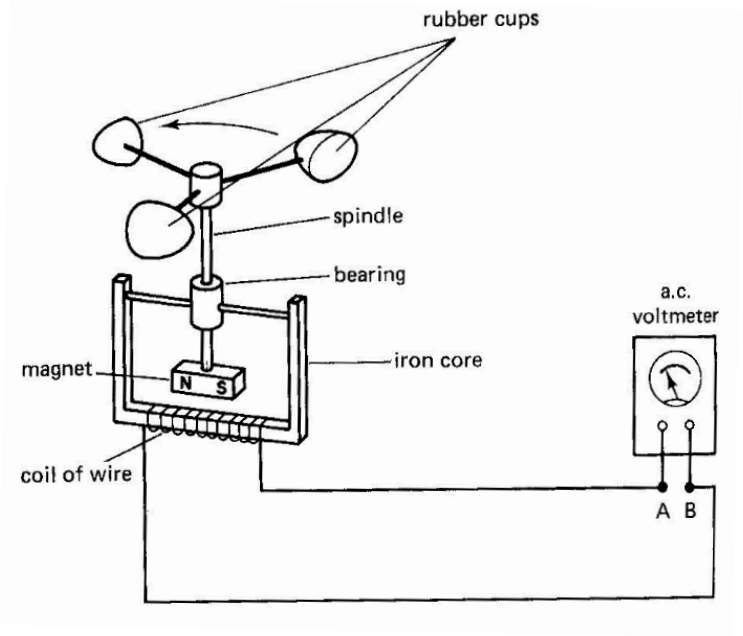

Fig. 9.1

(a) Explain clearly why the voltmeter pointer deflects when the spindle rotates.

……..

……..

……..…… [2]

(b) Give two ways in which the apparatus could be modified so as to obtain a larger deflection on the voltmeter.

……..

……..

……..…… [2]

(c) Explain the effect on the voltmeter pointer deflection when aluminium core is used instead of iron core.

……..

……..

……..…… [2]

END OF PAPER