Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4380217321

PHYSICS **0625/43**

Paper 4 Theory (Extended) **May/June 2023**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

DC (CE/FC) 315743/3

1 Fig. 1.1 shows a balloon filled with helium gas.

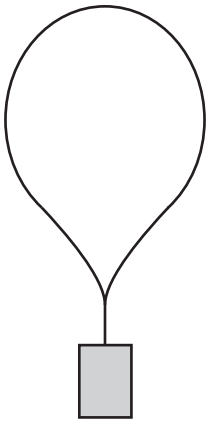

Fig. 1.1

The mass of the balloon is 120 kg.

(a) Calculate the weight of the balloon. Show your working.

weight = ... [1]

(b) The resultant force on the balloon is 54 N.

Show that the acceleration of the balloon is 0.45 m / s^2.

[2]

(c) The balloon accelerates upwards from rest at $0.45\,m/s^2$ for 8.0 s.

Calculate the velocity of the balloon after 8.0 s.

velocity = ... [2]

(d) Calculate the distance travelled by the balloon in the first 8.0 s.

distance = ... [2]

[Total: 7]

2 **(a)** **(i)** Define pressure.

.....

..... [1]

(ii) Describe how pressure in a liquid varies with its depth and with its density.

variation with depth

.....

.....

variation with density

.....

.....
[2]

(b) State **two** energy resources for which the Sun is **not** the main source.

1 .....

2 .....
[2]

(c) State and explain whether each of the following methods of electrical power generation is renewable.

(i) power generation in a nuclear power station

statement .....

explanation .....

.....
[2]

(ii) power generation from waves in the sea

statement .....

explanation .....

.....
[2]

[Total: 9]

3 (a) (i) State which state of matter, solid, liquid or gas, has the greatest thermal expansion and which has the least.

greatest expansion .....

least expansion .....

[2]

(ii) Describe, in terms of the motion and arrangement of particles, the structures of solids and gases.

solids .....

.....

gases .....

.....

[3]

(b) (i) Define specific heat capacity.

.....

..... [2]

(ii) A student carries out an experiment to determine the specific heat capacity of a metal. A cylinder of the metal is heated by a 12 W electrical heater.

State the readings that the student takes.

.....

.....

..... [3]

[Total: 10]

4 **(a)** Fig. 4.1 is an incomplete ray diagram showing an object O, a converging lens and the principal axis. The focal points of the lens are each labelled F.

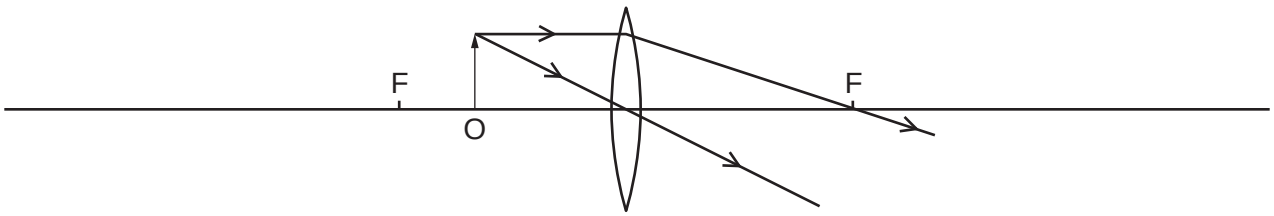

Fig. 4.1

(i) Complete the ray diagram to draw the image formed by the lens. Label your image I. [3]

(ii) Circle **three** descriptions in the list which describe the image formed in **(i)**.

diminished **enlarged** **inverted** **same size**

real **upright** **virtual**

[3]

(b) **(i)** State the name for the defect of vision that can be corrected by a converging lens.

..... [1]

(ii) Describe how a converging lens corrects the defect in **(i)**.
You may find it helpful to sketch a ray diagram.

.....

.....

..... [2]

[Total: 9]

5 **(a)** Two types of electromagnetic radiation are used in glass optical fibres for high-speed broadband.

(i) State the type of electromagnetic radiation, other than visible light, which is used in glass optical fibres.

..... [1]

(ii) Give **two** reasons why these two types of electromagnetic radiation are used in glass optical fibres for high-speed broadband.

1 .....

.....

2 .....

.....
[2]

(b) **(i)** The critical angle of the glass in an optical fibre is 45°.

Calculate the refractive index of the glass.

refractive index = ... [2]

(ii) Fig. 5.1 shows an optical fibre made of the glass described in **(i)**.

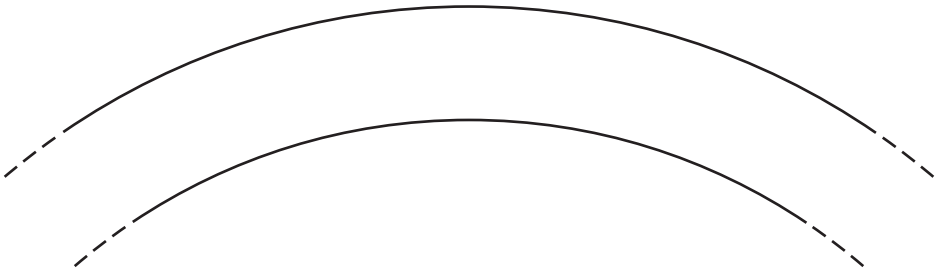

Fig. 5.1

On Fig. 5.1, draw carefully a ray of light in the fibre undergoing total internal reflection. [2]

[Total: 7]

6 An electric heater uses a resistance wire of resistance 26 Ω. The power dissipated in the resistance wire is 2500 W.

(a) Calculate the current in the resistance wire.

current = ... [3]

(b) The resistance wire of the heater has a length of 1.2 m and a cross-sectional area of $7.9 \times 10^{-7}\,m^2$.

A new heater is designed using wire of the same material with length 1.8 m and cross-sectional area $5.8 \times 10^{-7}\,m^2$.

Calculate the resistance of this wire.

resistance = ... [3]

(c) The 2500 W heater is used in a country where electricity costs 0.30 dollars per kilowatt-hour.

Calculate the cost of using the heater continuously for two days.

cost = ... dollars [2]

[Total: 8]

7 The voltage across the primary coil of a 100% efficient transformer is 220 V and the voltage across the secondary coil is 12 V.

(a) The current in the secondary coil is 2.5 A.

Calculate the current in the primary coil.

current = ... [3]

(b) Calculate the ratio of the number of turns on the primary coil to the number of turns on the secondary coil of the transformer.

ratio = ... [2]

[Total: 5]

8 **(a)** During β-decay, one of the neutrons in the nucleus changes.

(i) State what happens to this neutron.

..... [1]

(ii) Explain how charge is conserved during this change.

.....

.....

..... [2]

(b) Complete the nuclide equation for the α-decay of radon-212 to form an isotope of polonium, symbol Po.

$$^{212}_{86}\mathrm{Rn} \rightarrow$$

[3]

[Total: 6]

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[Turn over

9 Fig. 9.1 shows the Sun as the central dot and the planets Saturn, Jupiter and Earth labelled S_0, J_0 and E_0. The planets orbit the Sun anticlockwise. From the Earth's orbit, the planets appear aligned.

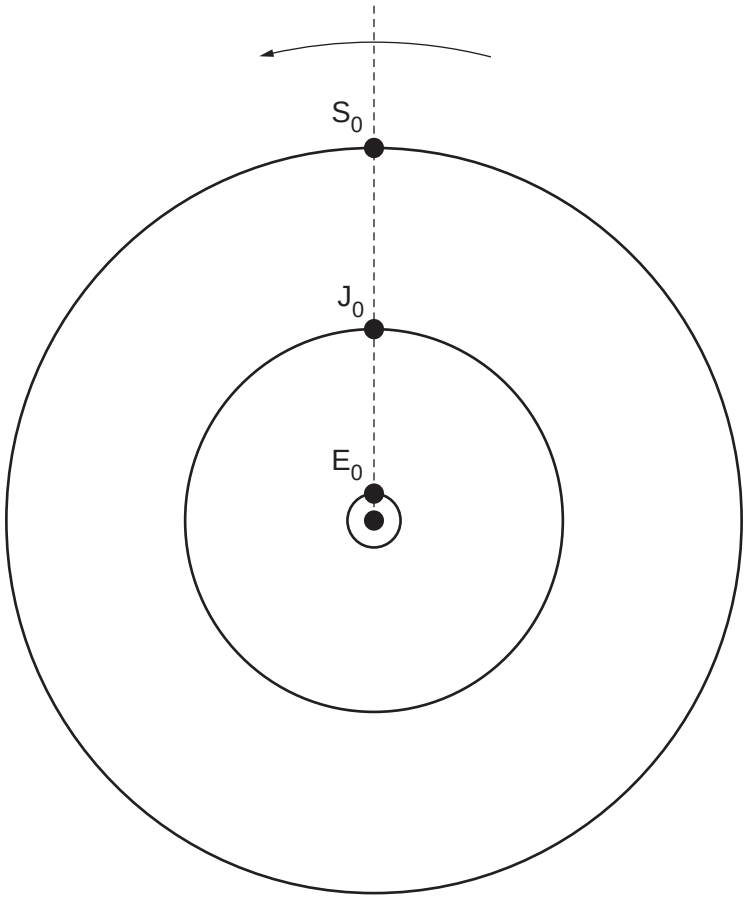

Fig. 9.1 (not to scale)

Assume that Saturn takes 30 years to orbit the Sun and that Jupiter takes 12 years to orbit the Sun.

(a) On Fig. 9.1, mark the positions of Saturn and Jupiter 5.0 years after the original positions shown.

Label these positions S_1 and J_1. Show your working.

[3]

(b) (i) On Fig. 9.1, mark the positions of Saturn and Jupiter 20 years after the original positions shown in Fig. 9.1.

Label these positions S_2 and J_2.

[1]

(ii) State what is observed from the Earth's orbit after 20 years.

.....

..... [1]

(c) (i) Choose **two** words from the list to describe **each** planet.

gaseous **large** **rocky** **small**

Jupiter .....

Earth .....

[1]

(ii) The average density of Jupiter is much less than that of the Earth.
The gravitational field strength at the surface of Jupiter is greater than that at the surface of the Earth.

Explain how these differences in density and in gravitational field strength are consistent with your answers to **(c)(i)**.

density

.....

.....

gravitational field strength

.....

.....

[3]

(d) The average density of Jupiter is 1300 kg / m^3 and its volume is 1.4×10^{15} km^3.

Calculate the mass of Jupiter.

mass = ... [3]

[Total: 12]

10 **(a)** Show that 1 light-year = 9.5×10^{15} m.

[4]

(b) **(i)** State **one** measurement that is taken when determining the speed *v* at which a galaxy is moving away from the Earth.

.....

..... [1]

(ii) Write down an equation relating *v* and the distance *d* of a far galaxy.

..... [1]

(iii) State how the distance *d* of a far galaxy can be determined other than by using the equation in **(ii)**.

.....

..... [1]

[Total: 7]

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