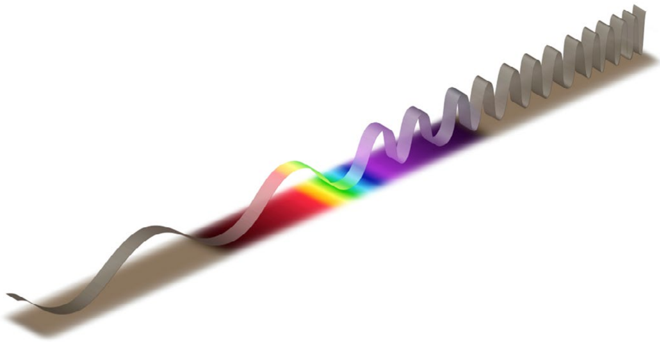
Cambridge Assessment International Education

Example Responses – Paper 3

Cambridge IGCSE™ / IGCSE (9–1)
Physics 0625 / 0972

For examination from 2023



Cambridge Pathway

Contents

Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge IGCSE / IGCSE (9-1) Physics 0625 / 0972.

This booklet contains responses to all questions from June 2023 Paper 32, which have been written by a Cambridge examiner. Responses are accompanied by a brief commentary highlighting common errors and misconceptions where they are relevant.

The question papers and mark schemes are available to download from the School Support Hub

0625 / 0972 June 2023 Question Paper 32

0625 / 0972 June 2023 Mark Scheme 32

Past exam resources and other teaching and learning resources are available from the School Support Hub

Question 1

1 A student measures the diameter of some identical steel balls. Fig. 1.1 shows the arrangement she uses.

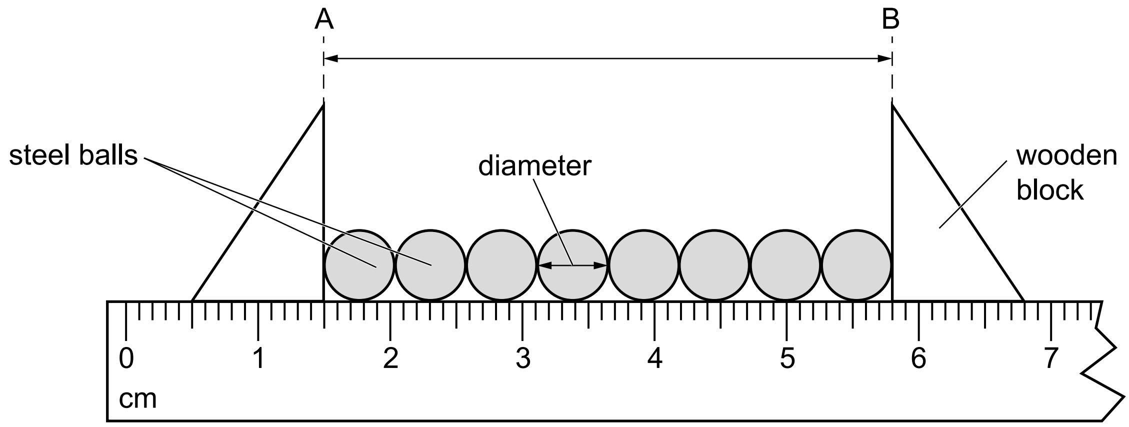


Fig. 1.1 (not to scale)

(a) **(i)** Using the ruler in Fig. 1.1, determine the distance AB on Fig. 1.1.

reading on ruler at B = 5.8 cm
reading on ruler at A = 1.5 cm
distance AB = 5.8 − 1.5

distance AB = ...4.3........ cm [2]

Examiner comment

Some candidates did not subtract 1.5 cm from the reading for B. Others did not follow the instruction to use the ruler in the question and instead measured the distance AB with their own ruler.

(ii) Use the distance AB to determine the diameter of one steel ball.

total of the diameters for the steel balls ÷ number of steel balls

diameter of one steel ball = 4.3 ÷ 8

diameter of one steel ball = ...0.54........ cm [2]

Examiner comment

Some candidates rounded the answer to 1 significant figure to give an answer of 0.5 cm. Many candidates did not write their equation in words, and this led to them using an incorrect rearrangement of the equation, i.e. 8 ÷ 4.3.

(b) The mass of some steel balls is 54 g and the total volume of these steel balls is 6.9 cm^3.

Calculate the density of the steel.

density = mass ÷ volume

density = 54 ÷ 6.9

density of steel = ...7.8.......... g/cm^3 [3]

Question 2

2 Fig. 2.1 shows the speed–time graph for a cyclist.

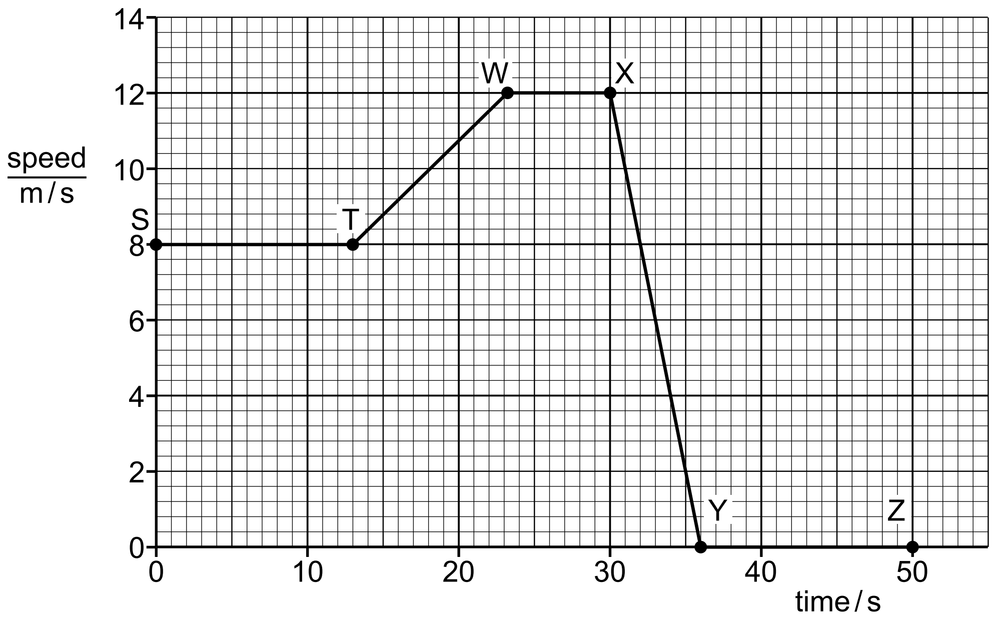


Fig. 2.1

(a) In Fig. 2.1, the sections ST, TW, WX, XY and YZ indicate stages of the cyclist's journey.

State **one** section which shows the cyclist **moving** with:

(i) constant speed

ST .... [1]

(ii) constant deceleration

XY .... [1]

(iii) constant non-zero acceleration.

TW .... [1]

Examiner comment

A common error was to confuse the speed–time graph with a distance–time graph and so to give TW as the section showing constant speed. Despite being asked for a constant speed when the cyclist was moving, a significant number of candidates chose region YZ.

(b) Calculate the distance travelled by the cyclist in section ST.

distance travelled = area below the speed–time graph in section ST

distance travelled = 8 × 13

distance travelled = ...*100*........................ m [3]

Examiner comment

- Most candidates recalled that distance travelled was equal to the area under the speed–time graph, and went on to calculate the distance travelled as 100 m.
- A common error was to calculate the area of a triangle instead of a rectangle and so give an answer of 52 m. A small number calculated the total distance travelled by the cyclist.

(c) Fig. 2.2 shows the horizontal forces on a cyclist.

Fig. 2.2

(i) Calculate the size of the resultant force on the cyclist.

resultant force = 220 − 160

resultant force = ...*60*........................ N [1]

Examiner comment

The most common error was to add the two forces rather than subtract them.

(ii) State the effect, if any, of the resultant force on the motion of the cyclist.

the resultant force is in the forward direction for the cyclist and

so he will accelerate

Examiner comment

- Only the most successful candidates recognised that the resultant force would cause the cyclist to accelerate.
- A common error was simply to state that the cyclist would move forward.

Question 3

3 A student has a battery-powered torch. Fig. 3.1 shows the torch.

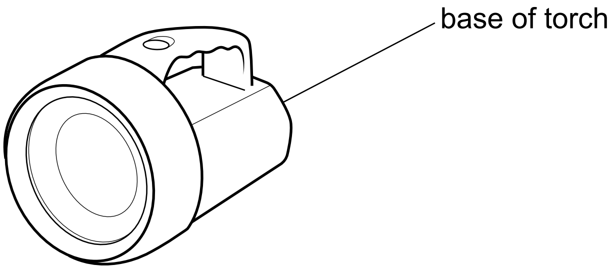


Fig. 3.1

(a) Fig. 3.2 shows the energy transfers when the torch is switched on. The diagram is incomplete.

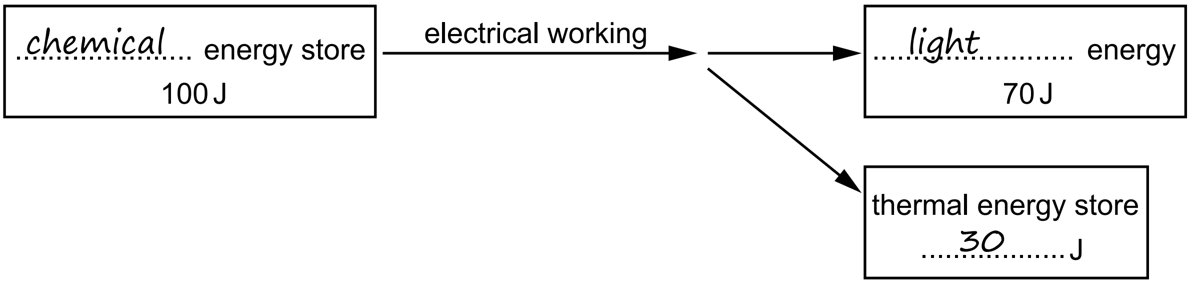


Fig. 3.2

Show the energy transfers in the torch by completing the labels on Fig. 3.2. [3]

Examiner comment

- Many candidates could not identify the energy store in the battery as chemical. The most common error was to state that it was electrical.
- Many candidates also did not identify the output energy of the torch as light and a common error was to state 'kinetic energy'.

(b) The weight of the torch is 8.5 N. The student lifts the torch a vertical distance of 0.80 m to place it on a shelf.

Calculate the work done on the torch by the student.

work done = force × distance moved

work done = 8.5 x 0.8

work done = ...6.8.......... J [3]

Examiner comment

Many candidates recalled the equation for work done and evaluated this as 6.8 J. A common error was to divide the quantities rather than multiply.

(c) The student places the torch on its base on a shelf. The area of the base of the torch is 44 cm^2. The weight of the torch is 8.5 N.

Calculate the pressure on the shelf due to the torch.

pressure = force ÷ area

P = 8.5 ÷ 44

pressure on shelf = ...*0.19*.............. N/cm^2 [3]

Examiner comment

Most candidates recalled the equation for pressure and correctly evaluated this as 0.19 N / cm^2. A common error was to invert the quantities and divide 44 by 8.5.

Question 4

4 A student has a block of solid metal at room temperature.

(a) (i) Describe the arrangement, separation and motion of the particles in the solid metal.

The particles are fixed in place in a regular or repeating pattern.

The particles are tightly packed together and closer than in liquids.

The particles vibrate about their fixed positions.

They cannot move from place to place.

[3]

Examiner comment

Candidates had been well prepared for questions on the kinetic theory of matter. There were many responses that were awarded full marks for this question.

(ii) The student cools the block of metal in a freezer.

State the effect, if any, of cooling on the kinetic energy of the particles in the block of metal.

as the temperature decreases, the kinetic energy of the particles will decrease [1]

Examiner comment

Many candidates found this item difficult with many stating there would be no change in kinetic energy or simply stating the particles would freeze.

(b) (i) State the name of the temperature at which particles have the least kinetic energy.

absolute zero [1]

Examiner comment

Candidates found this item difficult with many stating that the temperature was ‘freezing point’ or ‘ice point’.

(ii) State the value of temperature at which particles have the least kinetic energy. Include the unit.

−273 °C [1]

Examiner comment

Most candidates thought that absolute zero was 0 °C.

(c) The metal block emits thermal radiation from its surface.

State **two** features of a surface that is a good emitter of thermal radiation.

1 a black colour

2 a dull finish

[2]

Examiner comment

Most candidates confused a surface that was a good emitter with a surface that was a good reflector, so thought that a good emitter would have a shiny white surface.

Question 5

5 An observer stands at P and looks into a rock quarry. A small explosion takes place at X in the quarry.

Fig. 5.1 shows the situation.

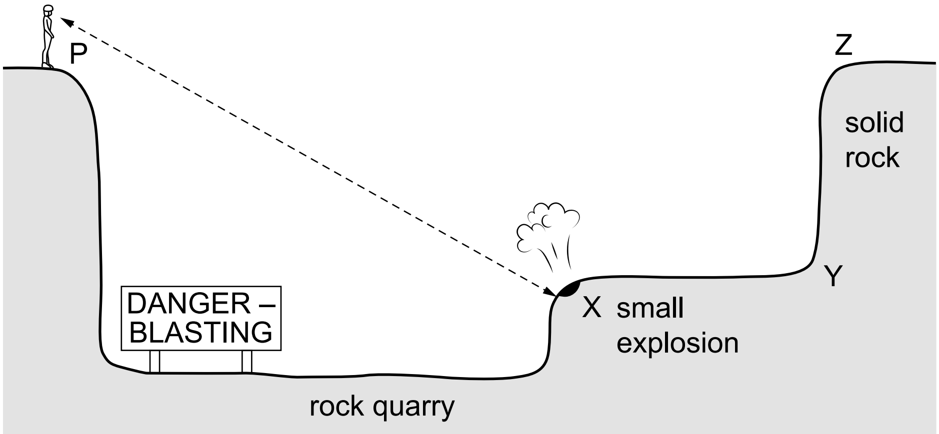


Fig. 5.1 (not to scale)

(a) The observer first hears the sound from the explosion 1.8 s after the explosion occurs. The speed of the sound is 340 m / s.

(i) Calculate the distance XP from the explosion at X to the observer at P.

speed = distance ÷ time

340 = distance ÷ 1.8

distance = 340 × 1.8

distance XP = ... *612* .... m [3]

Examiner comment

Most candidates correctly calculated the distance as 612 m. A common error was to divide 340 by 1.8 instead of multiplying.

(ii) The observer then hears a quieter sound from the explosion.

Suggest how the quieter sound waves reach the observer.

the quieter sound is an echo or sound waves reflecting from rock surfaces in the quarry [2]

Examiner comment

Most candidates recognised that the sound was caused by sound waves reflecting, but did not state that they had reflected from a rocky surface. Less successful candidates thought that sound waves reflected off each other.

(b) Before the explosion, a warning siren produces a sound. The wavelength of the sound is 0.28 m.

The speed of the sound is 340 m / s.

Calculate the frequency of the sound.

wave speed = frequency × wavelength

340 = f × 0.28

f = 340 ÷ 0.28

frequency = ...1214.......................... Hz [3]

Examiner comment

Many candidates correctly calculated the frequency as 1200 Hz. However, many candidates used an incorrect rearrangement of the equation.

Question 6

6 Fig. 6.1 shows light waves passing from air into a glass block.

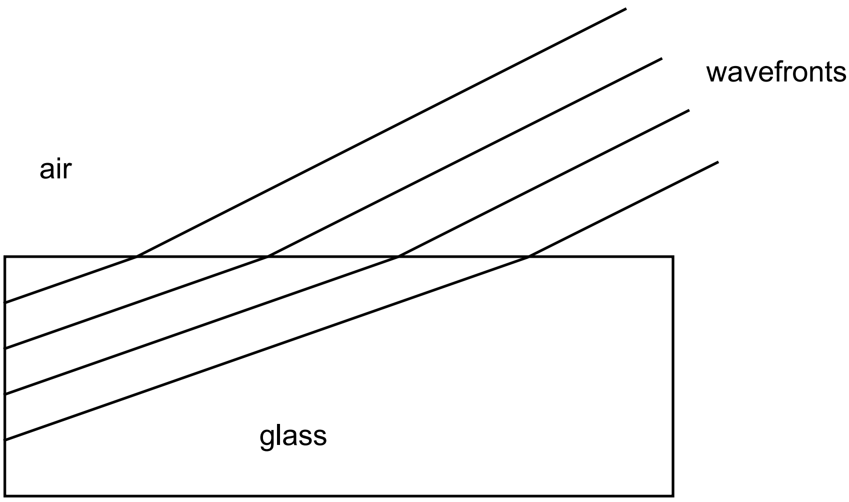


Fig. 6.1 (not to scale)

(a) (i) State the name of the process shown in Fig. 6.1 as the wavefronts enter the glass block.

the process is called refraction .... [1]

Examiner comment

Some candidates incorrectly stated that the process was diffraction or reflection.

(ii) State **two** changes in the light waves as they pass from air into glass.

1 speed ....

2 wavelength ....

[2]

Examiner comment

A common error was to describe the image rather than to state properties that changed. Answers such as they 'bend' or 'get smaller' were common.

(b) Fig. 6.2 shows a ray of red light travelling through a glass fibre. The glass fibre is made of solid glass.

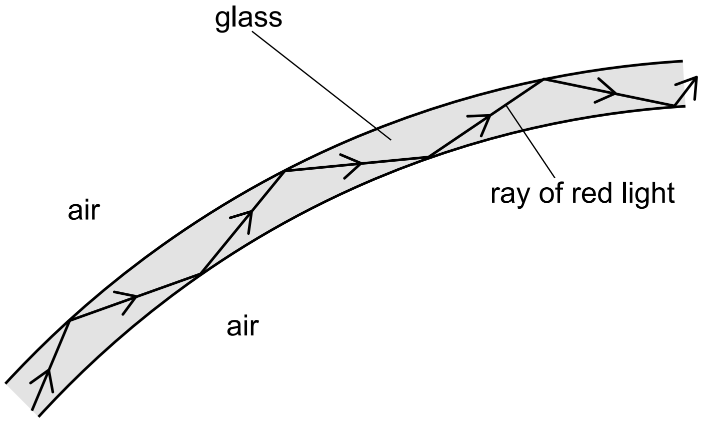


Fig. 6.2

State and explain how the ray of red light travels through the glass fibre as shown in Fig. 6.2.

The red light is travelling from a denser into a less dense medium. The red light is incident at the surface at an angle of incidence greater than the critical angle. The red light is totally internally reflected. [3]

Examiner comment

A common error was to describe the image rather than to explain the phenomena. Answers such as 'the red light bounces repeatedly against the glass surface' were common.

Question 7

7 A student uses a permanent magnet to lift some unmagnetised nails. Some of the nails are made of iron and some are made of steel. Fig. 7.1 shows the magnet lifting the nails.

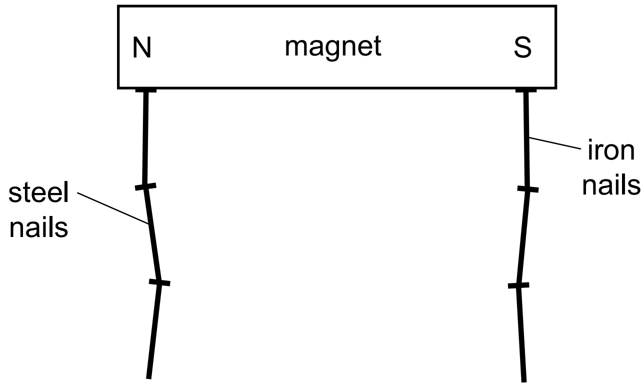


Fig. 7.1

(a) **(i)** Each nail lifts the nail below it by induced magnetism.

Describe what is meant by induced magnetism.

the nails become magnetised with the end touching the magnet having the opposite pole to the pole on the magnet [2]

Examiner comment

Only the most successful candidates stated that the magnetised nail would have the opposite pole in contact with the pole of the magnet.

(ii) The student leaves the nails attached to the magnet for several hours, then removes the magnet.

State a difference between a magnetic property of the iron nails and of the steel nails.

steel nails will retain their magnetism

.... [1]

Examiner comment

Many candidates interchanged the properties of iron and steel.

(b) A metal wire XY is connected to a voltmeter. The wire is placed between the poles of a permanent magnet. Fig. 7.2 shows the arrangement.

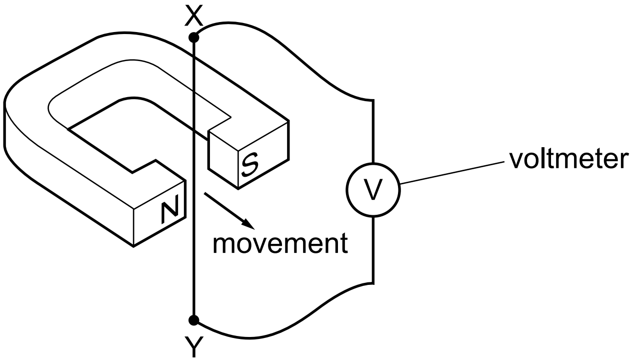


Fig. 7.2

(i) State the reading on the voltmeter when the wire is stationary between the poles.

there will be a zero reading on voltmeter [1]

Examiner comment

Some candidates thought that because the wire was in a magnetic field there would be a non-zero reading on the voltmeter. Many candidates did not link the reading to a relative movement of the wire in the magnetic field.

(ii) Give a reason for the reading on the voltmeter when the wire is moving in the direction shown in Fig. 7.2.

the wire is cutting the magnetic field of the magnet

[1]

Examiner comment

Many candidates did not link the reading to a movement of the wire cutting the magnetic field lines.

Question 8

8 A student uses the circuit in Fig. 8.1 to measure the resistance of the heater in the circuit.

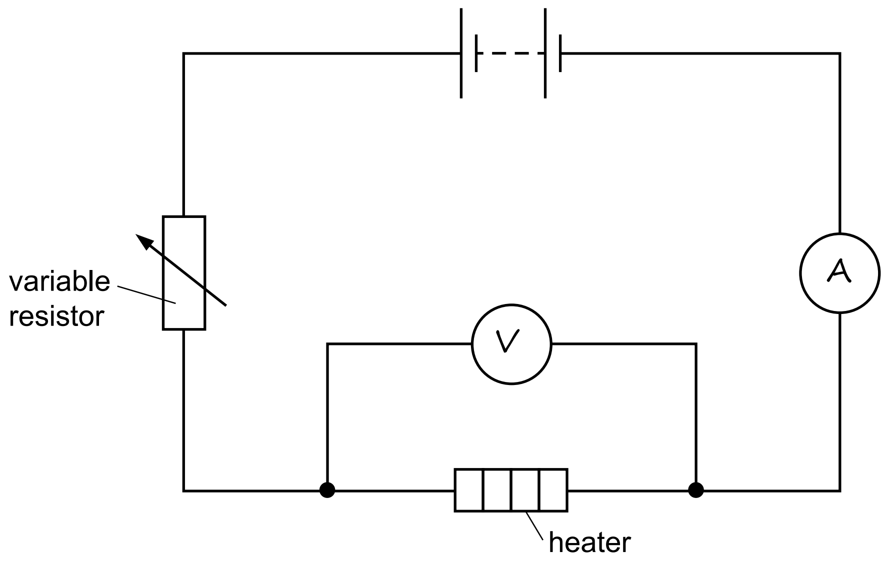


Fig. 8.1

(a) The symbols for the meters in Fig. 8.1 are incomplete.

Complete the symbols for the two meters by writing in the circles in Fig. 8.1. [2]

Examiner comment

Some candidates interchanged the symbols for the ammeter and the voltmeter.

(b) The current in the heater is 1.4 A and the potential difference (p.d.) across the heater is 8.0 V.

Calculate the resistance of the heater.

$V = IR$

$R = V \div I$

$R = 8 \div 1.4$

resistance = ...5.7.......... Ω [3]

Examiner comment

A very common error was to multiply 8 by 1.4 instead of dividing.

(c) The heater is switched on for 30 s. The current in the heater is 1.4 A and the p.d. across it is 8.0 V.

Calculate the electrical energy transferred by the heater during the 30 s.

$E = V I t$

$E = 8.0 \times 1.4 \times 30$

energy transferred = ...336.......................... J [3]

Examiner comment

This equation was new to the syllabus and a significant number of candidates did not recall it correctly.

Question 9

9 A student has a desktop computer that connects to the 240 V a.c. mains electrical supply. Fig. 9.1 shows the desktop computer.

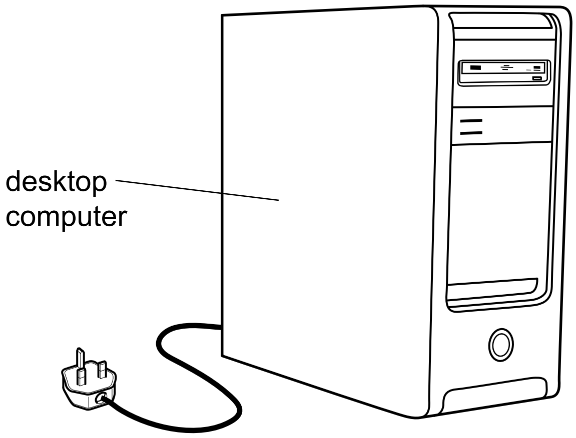


Fig. 9.1

(a) The desktop computer has an on-off switch in one of the wires that connect it to the mains supply.

State and explain which wire includes the switch.

the switch is connected into the live wire, so when the switch is off,

the computer is disconnected from mains voltage

.... [3]

Examiner comment

Many candidates found this question difficult. Very few could recall that the switch is fitted into the live wire, and an even smaller number could explain the reasons for this.

(b) The desktop computer uses a transformer to change the 240 V a.c. voltage to a 12 V a.c. voltage.

(i) State the name of this type of transformer.

the transformer is a step-down transformer [1]

Examiner comment

Many candidates did not link the decrease in voltage from 240 V to 12 V with the need to use a step-down transformer.

(ii) Describe the construction of this transformer. You may include a labelled diagram.

The transformer has a core made from soft iron. There are two coils of copper wire wrapped around the core. These are called the primary coil and the secondary coil. This transformer will have 20 times as many turns on the primary coil as there are on the secondary coil. [4]

Examiner comment

Many candidates stated that there were two coils in the transformer, but only a few gave any other detail such as the materials used for the core and the wire coils.

Question 10

10 Iodine-131 is a radioactive isotope of the element iodine. Fig. 10.1 shows the nuclide notation for a nucleus of iodine-131.

$$^{131}_{53}\mathrm{I}$$

Fig. 10.1

(a) **(i)** Determine the number of protons in one nucleus of iodine-131.

number of protons = ...53.......... [1]

(ii) Determine the number of neutrons in one nucleus of iodine-131.

number of neutrons = ...78.......... [1]

Examiner comment

One common error was to interchange the numbers of protons and neutrons. Another common error was to give the nucleon number, 131, as the number of neutrons.

(b) When a nucleus of iodine-131 decays, it emits a beta (β)-particle and a gamma (γ) ray.

State the nature of a beta-particle and a gamma ray.

A beta-particle is a fast moving negatively charged electron..........

A gamma ray is ..an electromagnetic wave..........

[2]

Examiner comment

Very few candidates could recall the nature of a beta-particle and a gamma ray.

(c) A sample contains 1.6 mg of iodine-131.
The half-life of iodine-131 is 8.0 days.

Calculate the mass of iodine-131 remaining in the sample after 24.0 days.

24 (days) ÷ 8(days) = 3 so 24 days = 3 half-lives

This means the mass of the iodine sample will halve 3 times in 24 days.

mass remaining = 1.6 × ½ × ½ × ½

mass of iodine-131 remaining = ...0.2.......... mg [3]

Examiner comment

Many candidates correctly calculated the mass of iodine-131 remaining after 24 days as 0.2 mg. However, many other were not awarded any marks. Candidates should be encouraged to state clearly the number of half-lives involved in calculations such as this, and then to clearly set out their working using this number of half-lives.

Question 11

11 Fig. 11.1 shows the Sun and the four innermost planets, A, B, C, and D, of the Solar System.

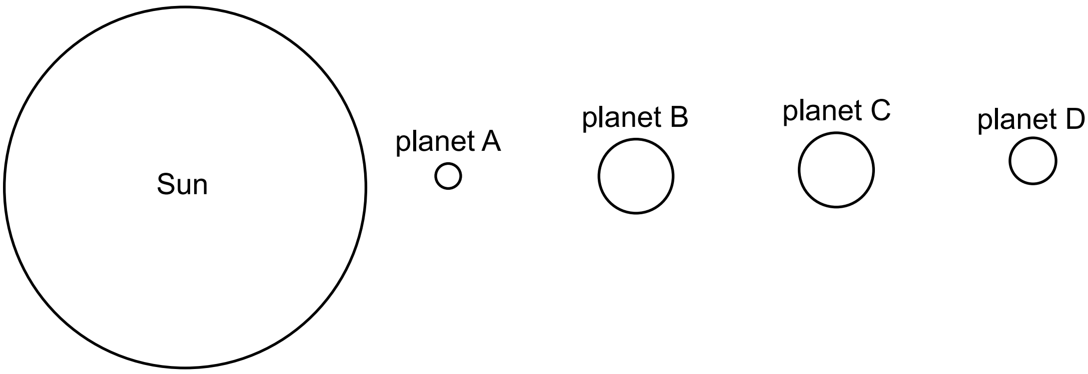


Fig. 11.1 (not to scale)

(a) In Table 11.1, write the names of the innermost planets. One is done for you.

Table 11.1

planet	name of planet
A	Mercury
B	Venus
C	Earth
D	Mars

[2]

Examiner comment

Many candidates found this question difficult, possibly because of this being a new topic on the syllabus.

(b) Describe how the four innermost planets of the Solar System were formed.

Initially, dust and gas clouds orbited the Sun. These contained many different elements. The rotation of these materials around the Sun leads to particles accreting or combining together. They subsequently form larger rocks / boulders which because of gravitational attraction combine with each other. This material joins to form a protoplanetary disk and eventually a planetary core. [4]

Examiner comment

- Very few candidates could give a detailed description of planetary formation using the accretion model.
- Many candidates described the life cycle of a star.

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