Cambridge Assessment International Education

# Cambridge IGCSE™

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*6082508392*

**PHYSICS** **0625/32**

Paper 3 Theory (Core) **February/March 2022**

**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 10 N (acceleration of free fall = 10 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.

1 Fig. 1.1 shows some masses on a mass hanger attached to an elastic band. The elastic band is stretched by the masses.

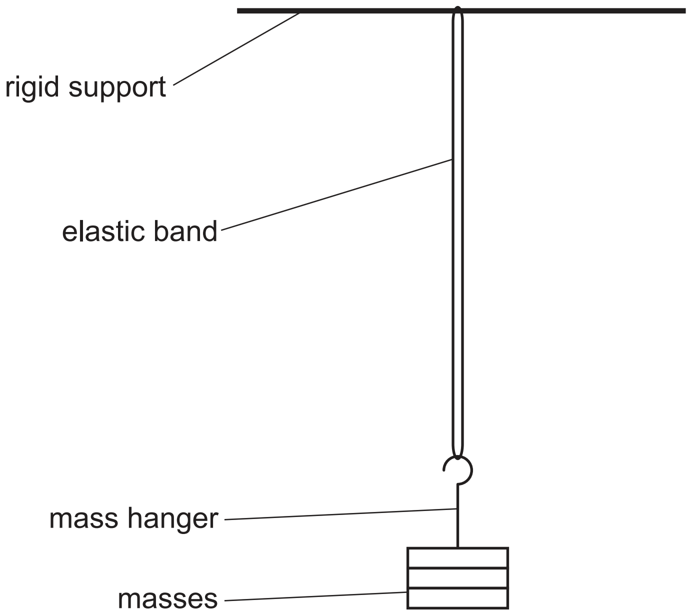


**Fig. 1.1**

**(a)** The total mass of the masses and the mass hanger is 300 g.

Calculate the total weight of the masses and the mass hanger.

total weight = ...................................................... N [3]

**(b)** A student pulls the mass hanger down and then releases it. The mass hanger and masses oscillate up and down.

The student uses a stop-watch to time 20 oscillations. Fig. 1.2 shows the time reading on the stop-watch after the 20$^{th}$ oscillation.


**Fig. 1.2**

**(i)** Determine the time **in seconds** for 20 oscillations from the time shown in Fig. 1.2.

time for 20 oscillations = ....................................................... s [1]

**(ii)** Calculate the time in seconds for **one** oscillation.

time for one oscillation = ....................................................... s [2]

**(c)** When the student pulls the mass hanger down, energy is stored in the elastic band as elastic potential energy.

Describe what happens to this energy store when the student releases the mass hanger and it moves upwards.

...................................................................................................................................

................................................................................................................................. [2]

[Total: 8]

**2** **(a)** A student is doing some physical exercise. Fig. 2.1 shows the student holding a 50 N weight.

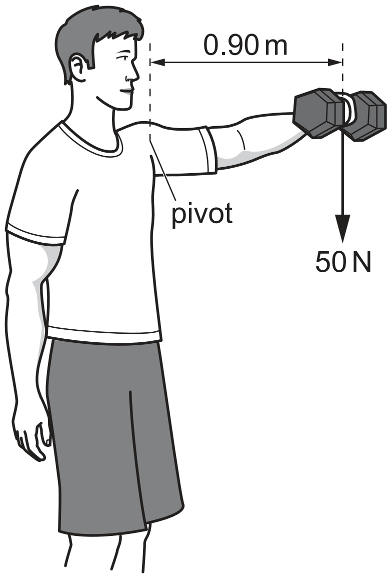


**Fig. 2.1**

The pivot in the shoulder is 0.90 m from the centre of mass of the weight.

Calculate the moment of the weight about this pivot.

moment of the weight = .................................................. N m [3]

**(b)** The student does some running exercises. Fig. 2.2 shows the speed–time graph for one exercise.

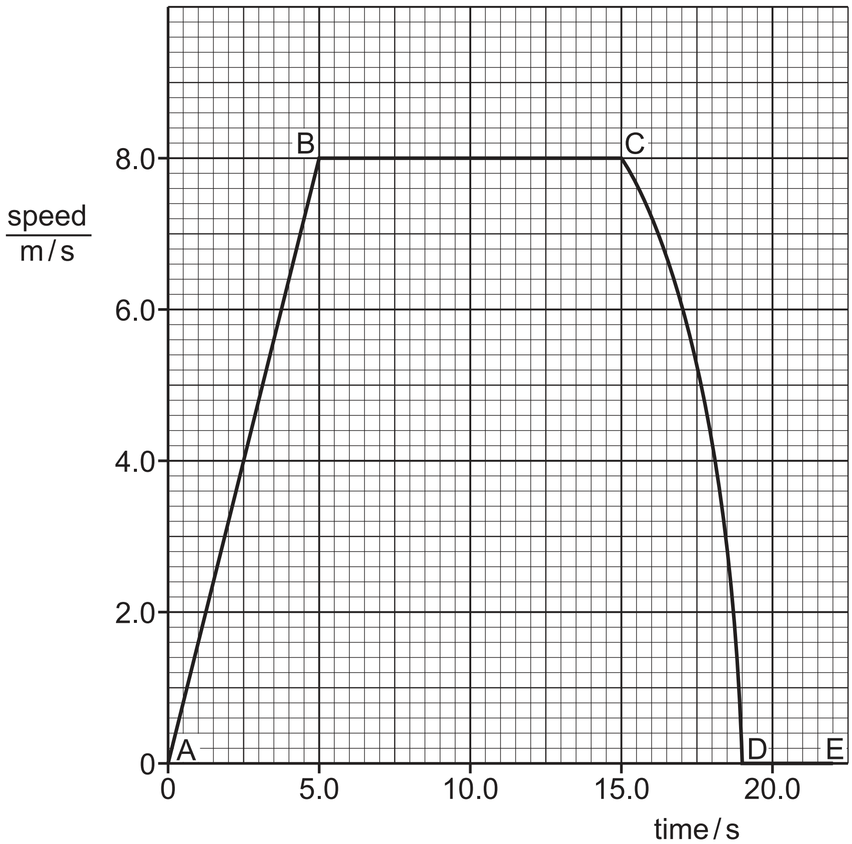


**Fig. 2.2**

**(i)** Describe the motion of the athlete in sections AB and DE.

section AB ..........................................................................................................

section DE .......................................................................................................... [2]

**(ii)** Calculate the distance moved by the athlete from time = 0 to time = 5.0 s.

distance = ...................................................... m [3]

[Total: 8]

**3 (a)** Fig. 3.1 shows a metal block and its dimensions.

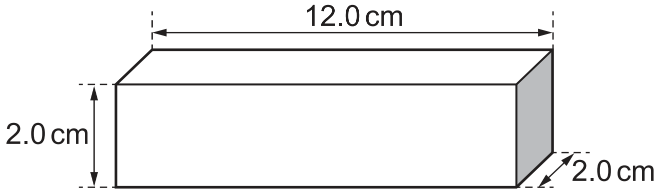


**Fig. 3.1** (not to scale)

Calculate the volume of the metal block.

volume of the block = .................................................. $cm^3$ [2]

**(b)** A different metal block has a mass of 86 g and a volume of 8.0 $cm^3$.

**(i)** Calculate the density $\rho$ of the metal using the equation

$$\rho = \frac{m}{V}.$$

density of metal = .............................................. $g/cm^3$ [2]

**(ii)** The metal block is placed in some liquid. The metal block floats on the liquid.

Suggest a value for the density of the liquid.

................................................ $g/cm^3$ [1]

**(c)** A student has a measuring cylinder, a beaker of liquid and a balance.

Describe how the student can use this equipment to determine the density of the liquid.

...................................................................................................................................

...................................................................................................................................

...................................................................................................................................

...................................................................................................................................

...................................................................................................................................

............................................................................................................................. [3]

[Total: 8]

**4** Coal-fired power stations provide electricity for homes and industry.

A government decides to replace a coal-fired power station with a hydroelectric power station.

**(a)** Describe how electrical energy may be obtained from the gravitational potential energy of the water behind a hydroelectric dam.

...........................................................................................................................................

...........................................................................................................................................

...........................................................................................................................................

...........................................................................................................................................

..................................................................................................................................... [3]

**(b)** Apart from cost, state **two advantages** of generating electricity using a hydroelectric power station compared with using a coal-fired power station.

1. .......................................................................................................................................

2. .......................................................................................................................................

[2]

**(c)** Apart from cost, state **two disadvantages** of generating electricity using a hydroelectric power station compared with using a coal-fired power station.

1. .......................................................................................................................................

2. .......................................................................................................................................

[2]

[Total: 7]

5 A woman starts to push a trolley across the floor. Fig. 5.1 shows the horizontal forces acting on the trolley.

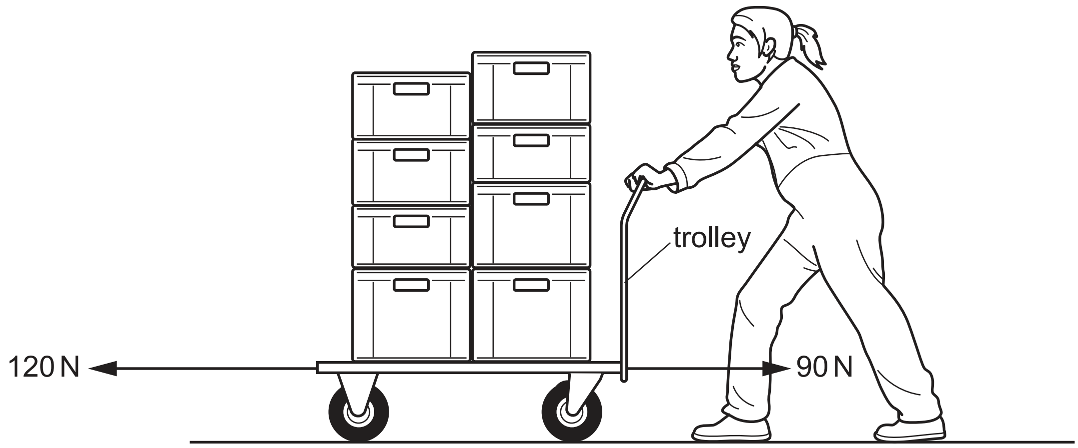


**Fig. 5.1**

**(a)** Determine the resultant horizontal force on the trolley.

resultant force = ............................................................ N

direction of resultant force = ..............................................................
[3]

**(b)** The total weight of the trolley and boxes is 900 N.

The area of **each** wheel in contact with the ground is 8.0 $cm^2$. The trolley has **four** wheels.

Calculate the pressure on the ground due to the total weight of the trolley and boxes. Include the correct unit in your answer.

pressure on the ground = .............................. unit .................. [5]

[Total: 8]

**6** Fig. 6.1 represents gas particles in a container. The container is at room temperature.

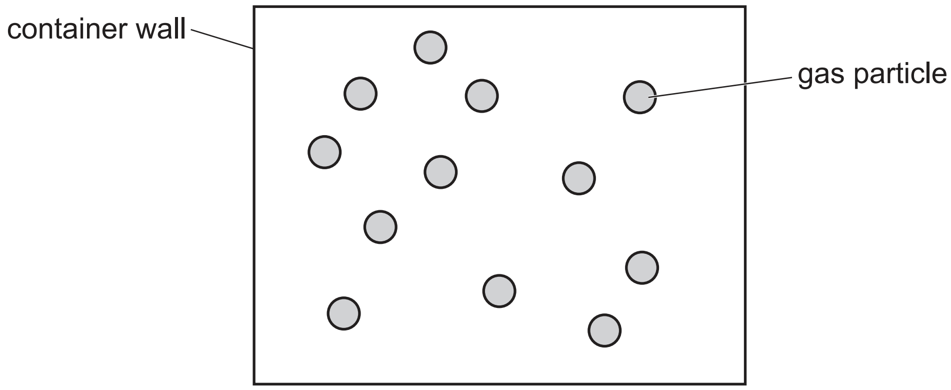


**Fig. 6.1** (not to scale)

**(a)** Describe the motion of the gas particles.

...................................................................................................................................

............................................................................................................................. [2]

**(b)** State how the motion of the gas particles changes when the gas in the container is cooled.

............................................................................................................................. [1]

**(c)** Explain how the gas particles exert a pressure on the walls of the container.

...................................................................................................................................

............................................................................................................................. [2]

[Total: 5]

7 **(a)** State the name for the transfer of thermal energy through a metal.

............................................................................................................................ [1]

**(b)** A metal can contains some water. The metal can is heated as shown in Fig. 7.1.

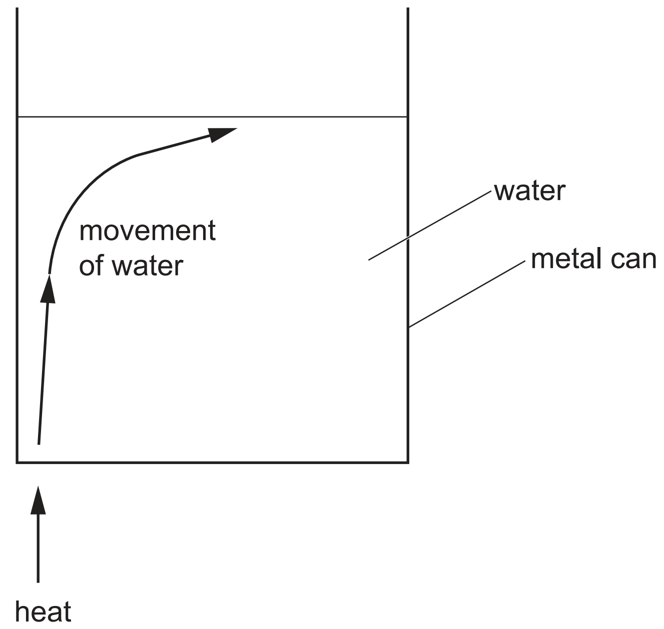


**Fig. 7.1**

Describe how thermal energy causes the movement of water shown in Fig. 7.1.

............................................................................................................................

............................................................................................................................

............................................................................................................................

............................................................................................................................ [3]

**(c)** A student places equal masses of water into two metal cans. The cans are identical apart from one having a white outer surface and the other having a black outer surface.

The student places the two cans in direct sunlight. The temperature of the water increases in both cans. After 10 minutes, the temperature increase is greater in one of the cans.

State and explain which can has the greater increase in temperature.

............................................................................................................................

............................................................................................................................ [2]

[Total: 6]

**8** A student uses a tank of water to observe waves on the surface of the water.

**(a)** The graph in Fig. 8.1 represents a wave on the surface of the water.

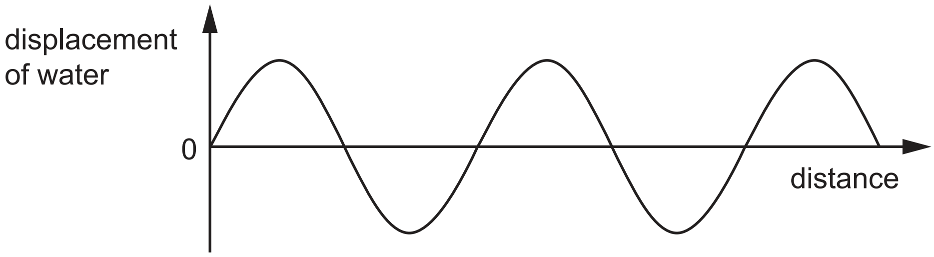


**Fig. 8.1**

**(i)** Draw on Fig. 8.1 to indicate the amplitude of the wave. Label the amplitude A. [1]

**(ii)** Draw on Fig. 8.1 to indicate **one** wavelength of the wave. Label the wavelength L. [1]

**(b)** The student creates waves in the water tank and places various barriers in their path.

**(i)** Fig. 8.2 shows the wavefronts as they approach a barrier placed at an angle of 45° to the wavefronts.

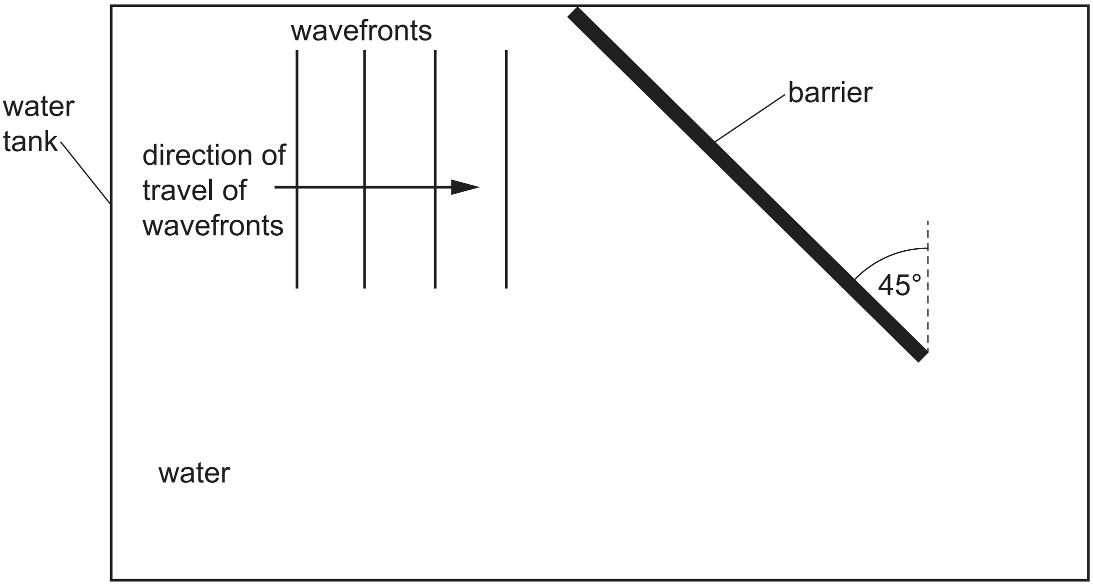


**Fig. 8.2**

On Fig. 8.2, draw **three** wavefronts after they have reflected from the barrier. Draw an arrow to show the direction of travel of these wavefronts. [2]

**(ii)** The student replaces the barrier in Fig. 8.2 with a different barrier, as shown in Fig. 8.3.

Fig. 8.3 shows the wavefronts as they reach the barrier.

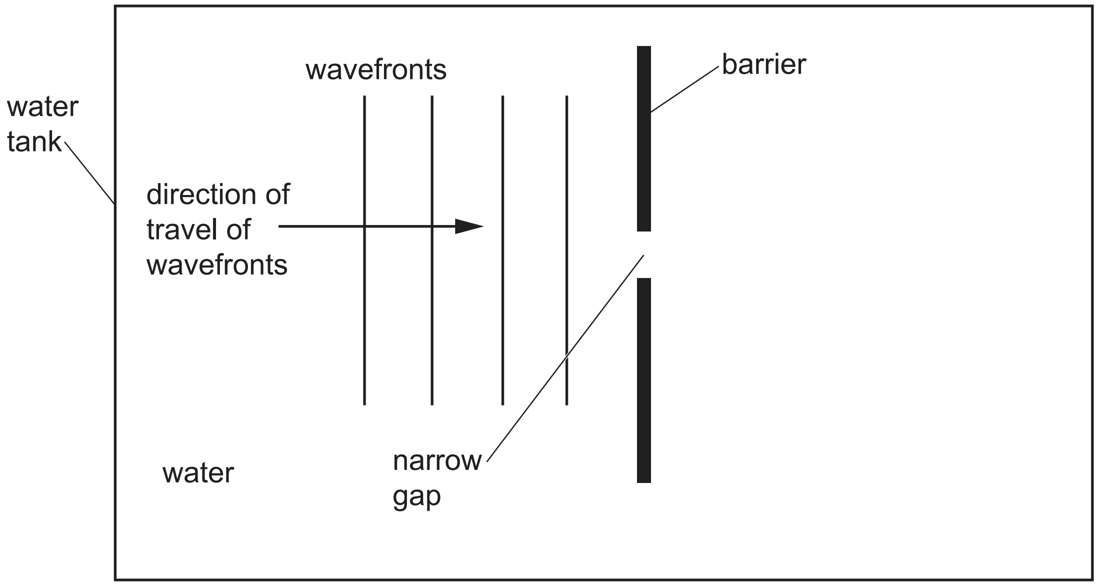


**Fig. 8.3**

On Fig. 8.3, draw **three** wavefronts after they have passed through the narrow gap. [2]

[Total: 6]

9 **(a)** Fig. 9.1 shows the regions of the electromagnetic spectrum. One region is not labelled.

| | | | | | | |
|---|---|---|---|---|---|---|
| radio waves | | infrared waves | visible light | ultraviolet waves | X-rays | gamma-rays |

**Fig. 9.1**

**(i)** In Fig. 9.1, one region is unlabelled.

State the name of the unlabelled region.

.............................................................................................................................. [1]

**(ii)** Complete the sentence.

The direction of the arrow in Fig. 9.1 shows the regions of the electromagnetic spectrum

in order of increasing ...................................................... . [1]

**(b)** State **two** uses for X-rays.

1. .......................................................................................................................................

2. .......................................................................................................................................
[2]

**(c)** State why X-rays can be harmful to people.

.............................................................................................................................................

..................................................................................................................................... [2]

[Total: 6]

**10** **(a)** A student connects the circuit shown in Fig. 10.1.

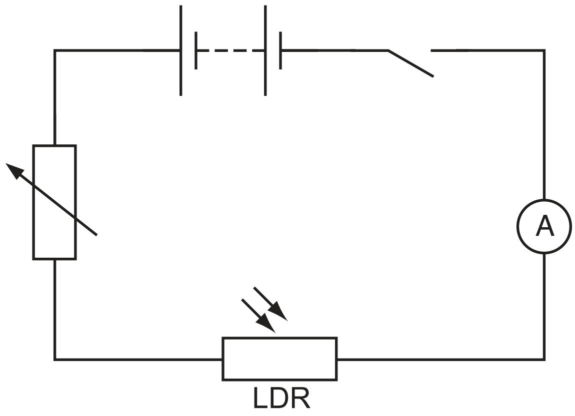


**Fig. 10.1**

**(i)** The student wants to determine the resistance of the light-dependent resistor (LDR).

Draw on Fig. 10.1 to show how the student connects a voltmeter into the circuit. Use the correct symbol for the voltmeter. [2]

**(ii)** The current in the LDR is 0.020 A when the potential difference (voltage) across the LDR is 5.4 V.

Calculate the resistance of the LDR.

resistance of LDR = ...................................................... Ω [3]

**(b)** When the student shines a light onto the LDR, its resistance is 150 Ω. The resistance of the variable resistor in the circuit is 180 Ω.

Determine the combined resistance of the LDR and the variable resistor.

combined resistance = ...................................................... Ω [1]

[Total: 6]

**11** A battery charger for a laptop computer includes a transformer.

**(a)** The primary voltage $V_p$ to the transformer is 240 V.

The number of turns on the primary coil $N_p$ is 590 turns and the number of turns on the secondary coil $N_s$ of the transformer is 48 turns.

Calculate the secondary voltage $V_s$ of the transformer.

secondary voltage $V_s$ = ...................................................... V [3]

**(b)** The plug connecting the transformer to the supply voltage contains a fuse.

Describe how a fuse works.

...................................................................................................................................

...................................................................................................................................

...................................................................................................................................

............................................................................................................................. [3]

[Total: 6]

**12** **(a)** Table 12.1 gives some properties of three different types of radiation.

**Table 12.1**

| type of radiation | nature | relative charge | ionising ability |
|---|---|---|---|
| gamma ($\gamma$) | electromagnetic wave | 0 | low |
| beta ($\beta$) | | –1 (minus one) | medium |
| alpha ($\alpha$) | helium nucleus | | |

**(i)** Complete Table 12.1 by writing the missing property in each of the empty boxes. [3]

**(ii)** State which type of radiation, alpha, beta or gamma, is the most penetrating.

............................................................................................................................ [1]

**(b)** An isotope of beryllium, Be, has the nuclide notation:

$${}^{9}_{4}\mathrm{Be}.$$

Fig. 12.1 shows a diagram of one atom of this isotope.

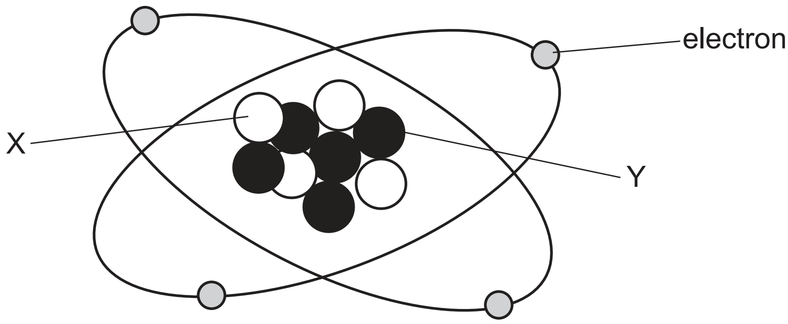


**Fig. 12.1** (not to scale)

Complete the labelling of Fig. 12.1. State the names for X and for Y.

X ..............................................................................

Y ..............................................................................

[2]

[Total: 6]