

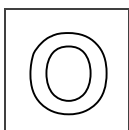
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CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination in preparation for
the General Certificate of Education Ordinary Level 2025

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

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SCIENCE (PHYSICS, CHEMISTRY)

5086/01

Paper 1 Multiple Choice

3 September 2025

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your class, register number and name on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Data Sheet is printed on page 19.

A copy of the Periodic Table is printed on page 20.

The use of an approved scientific calculator is expected, where appropriate.

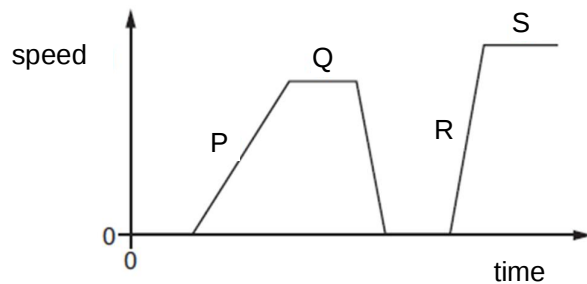
- 1 An object begins to fall close to the Earth's surface. Air resistance can be ignored. Which statement about the object's acceleration is correct?

A The acceleration is constant.
 B The acceleration decreases as the body falls.
 C The acceleration increases as the body falls.
 D The acceleration is zero

- 2 Which quantity is equal to gravitational field strength?

A weight x mass
 B gravity per unit mass
 C mass per unit weight
 D $\frac{\text{weight}}{\text{mass}}$

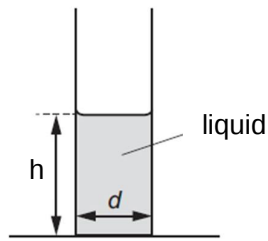
- 3 The diagram shows a speed-time graph for a bus.



Which statement about the motion of the bus is correct?

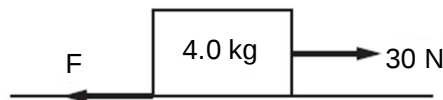
A The acceleration is greater in section P than in section R.
 B The acceleration is not constant in section P or in section R.
 C The bus is at rest in section Q and in section S.
 D The speed is constant in section Q and in section S.

- 4 A liquid is held in a cylindrical container.
The diameter of the base of the cylinder is d .
The mass of the liquid is m and its depth is h .



Using pressure = $\frac{\text{force}}{\text{area}}$, which expression gives the pressure due to the weight of the liquid on the bottom of the cylinder?

- A $\frac{mg}{\pi d^2}$
 B $\frac{mgh}{\pi d^2}$
 C $\frac{4mg}{\pi d^2}$
 D $\frac{mg}{4\pi d^2}$
- 5 A block of mass 4.0 kg is pulled across a rough horizontal surface with a force of 30 N.

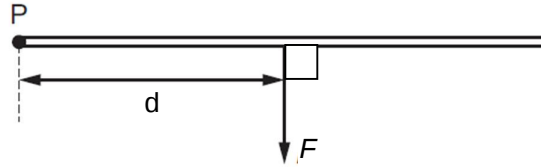


The acceleration of the block is 2.5 m/s^2 .

What is F , the force of friction between the block and the surface?

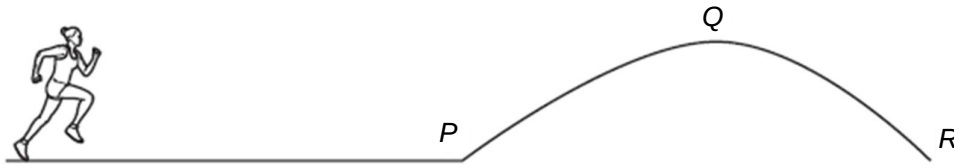
- A 10 N
 B 20 N
 C 30 N
 D 40 N

- 6 The diagram shows a force F acting at 90° to a bar at a distance d from the point P .

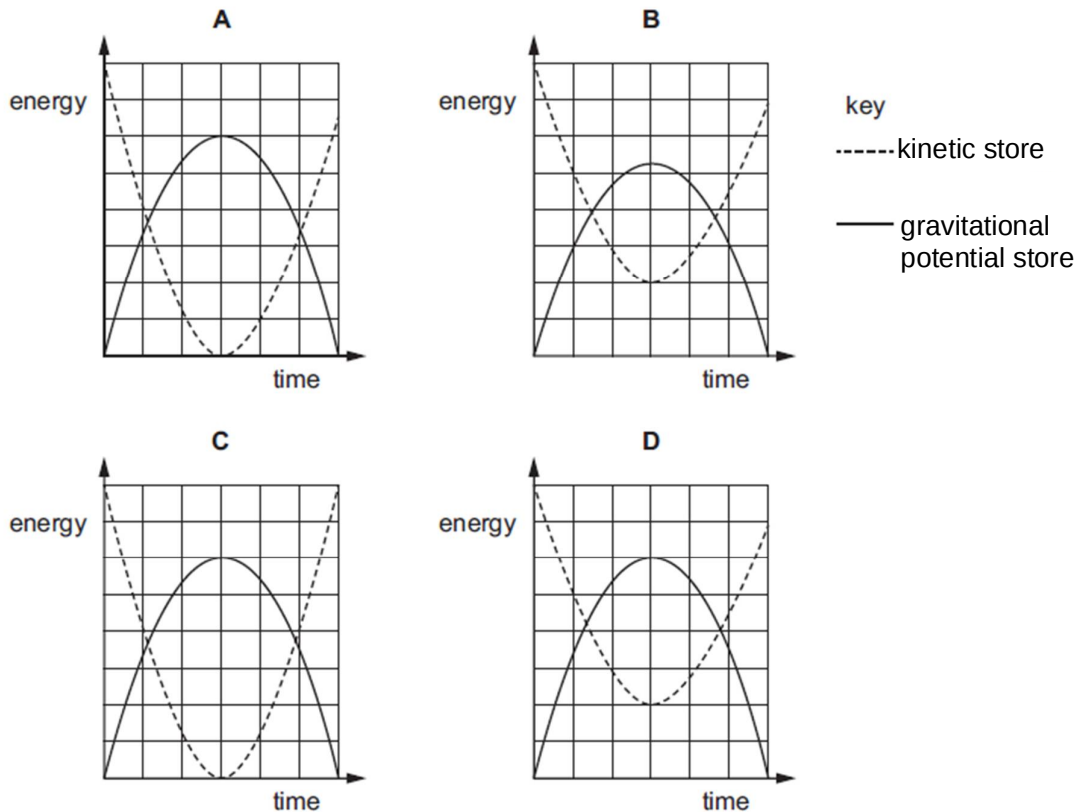


Which pair of changes causes the **greatest** increase in the moment of the force F about the point P ?

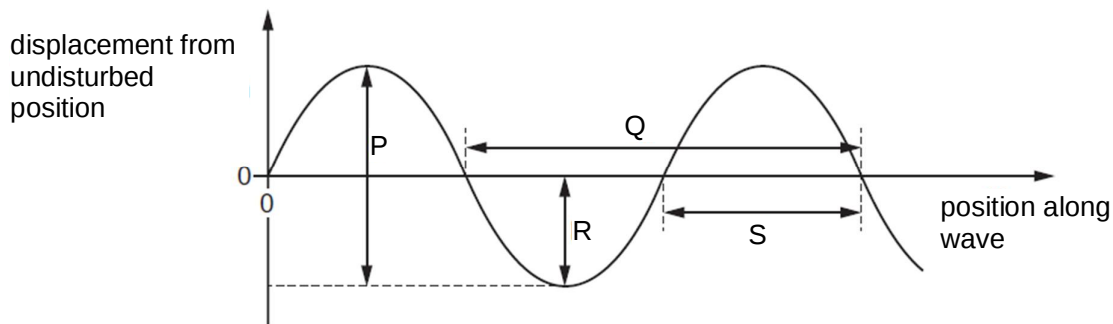
- A halving F and halving d
 B halving F and doubling d
 C doubling F and halving d
 D doubling F and doubling d
- 7 The diagram shows the path of a long jumper. Point R , where she lands, is on the same horizontal level as point P , from where she takes off. The long jumper experiences **air resistance** as she runs and jumps.



Which graph shows how the energy in the kinetic store and the energy in the gravitational potential store of the long jumper vary with time between point P and R ?



- 8** A gas expands slowly and its temperature remains constant.
What happens to the particles of the gas?
- A** They move further apart and their average speed decreases.
 - B** They move further apart and their average speed increases.
 - C** They move further apart and their average speed remains unchanged.
 - D** They stay the same distance apart and their average speed decreases.
- 9** A hot meal is supplied in a container made of shiny metal foil.
Why does the container help to keep the food hot?
- A** The container traps air which increases convection.
 - B** The foil is a poor thermal conductor.
 - C** Shiny metal foil is a good absorber of infrared radiation.
 - D** Shiny metal foil is a poor emitter of infrared radiation.
- 10** The diagram shows a wave.



Which dimensions describe the properties of the wave?

- A** P = amplitude, S = speed
- B** P = speed, Q = wavelength
- C** R = amplitude, Q = wavelength
- D** R = amplitude, S = wavelength

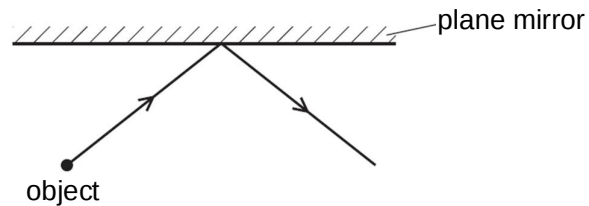
- 11** A student hits two wooden blocks together in front of a wall and calculates the speed of sound to be 340 m/s.

The time between the student hitting the blocks and hearing the echo is 0.59 s.

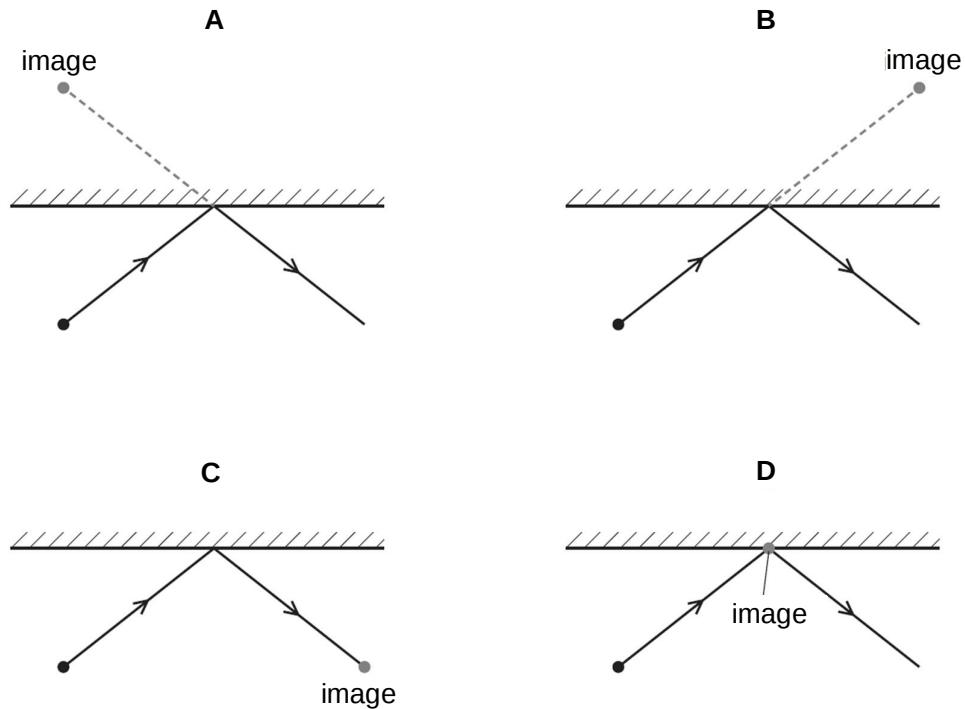


What is the distance between the student and the wall?

- A** 100 m
B 200 m
C 290 m
D 570 m
- 12** An object is placed in front of a plane mirror.
 The ray diagram shows the reflection of one ray of light from the object by the mirror.



Where does the mirror form an image of the object?

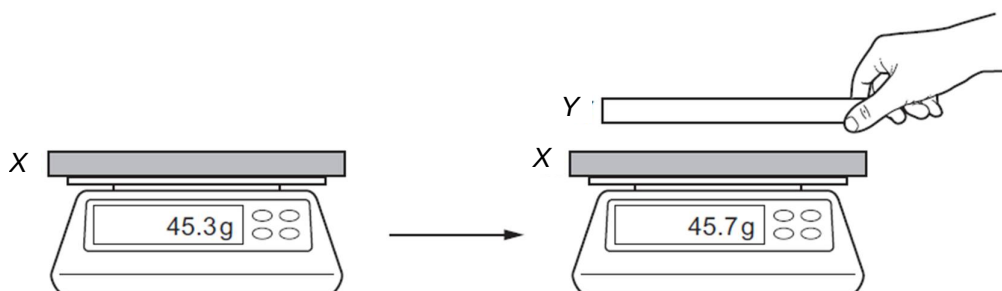


- 13** Infrared is a useful type of electromagnetic radiation. However, excessive exposure to infrared can cause harmful effects.

Which row gives a use and a harmful effect for infrared?

	use	harmful effect
A	detection of cancer	mutations
B	intruder alarms	skin burns
C	detection of fake bank notes	cell damage
D	thermal imaging	internal bleeding of body cells

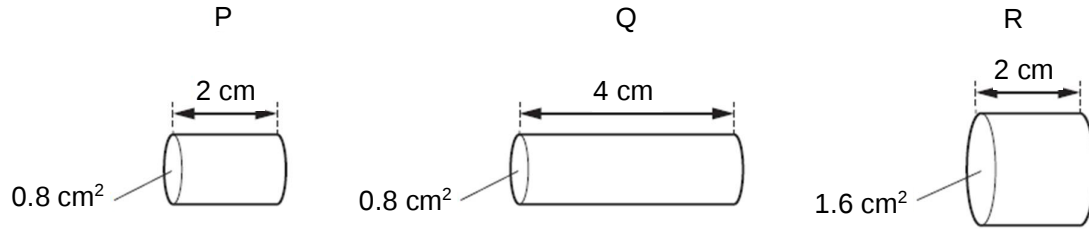
- 14** The diagram shows a charged rod X placed on a balance and another rod Y brought close to it, as shown.



Which combination of charges on the rods would cause the change in the balance reading shown?

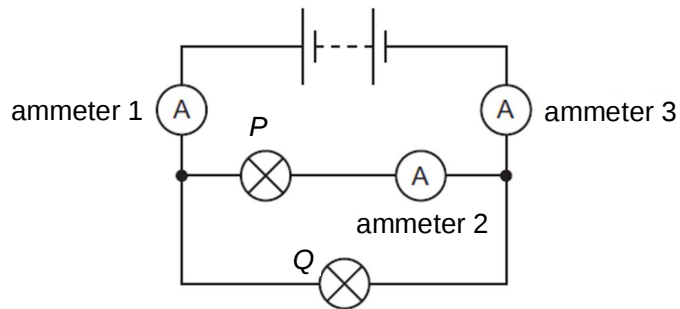
	X	Y
A	negative charge	negative charge
B	negative charge	positive charge
C	negative charge	no charge
D	positive charge	no charge

- 15** The diagram shows three wires, P, Q and R. They are all made from the same metal.



Which list gives the wires in order of resistance, from lowest to highest?

- A** $P \rightarrow Q \rightarrow R$
B $Q \rightarrow R \rightarrow P$
C $R \rightarrow P \rightarrow Q$
D $R \rightarrow Q \rightarrow P$
- 16** The diagram shows a circuit containing lamps *P*, *Q* and three ammeters. The resistance of lamp *P* is bigger than the resistance of lamp *Q*.



The current in ammeter 1 is 0.30 A.

Which row gives possible values for the currents in ammeters 2 and 3?

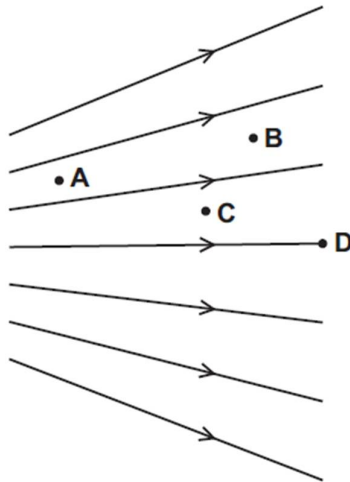
	current in ammeter 2 /A	current in ammeter 3 /A
A	0.10	0.30
B	0.15	0.30
C	0.20	0.30
D	0.30	0.00

- 17 The diagram shows the information label on an electric kettle.

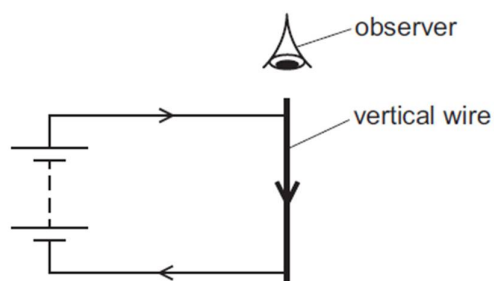
Voltage:	110 V a.c.
Power:	1.5 kW
Frequency:	50 Hz

What is the value of the current when the kettle is heating water?

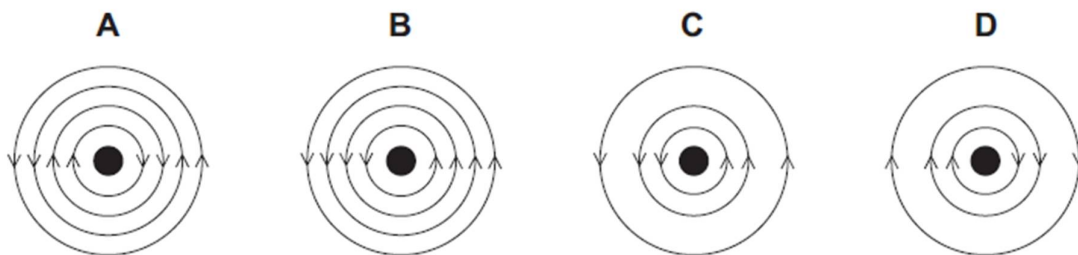
- A 0.014 A
B 2.2 A
C 3.7 A
D 14 A
- 18 A magnetic field is represented in the diagram by magnetic field lines.
At which point is the magnetic field the strongest?



- 19 A straight vertical wire carries a current in the direction shown.



What is the pattern of the magnetic field around the wire seen by an observer viewing the wire from the position shown?



- 20 A detector is placed near a radioactive material. The reading on the detector is 536 counts per second.

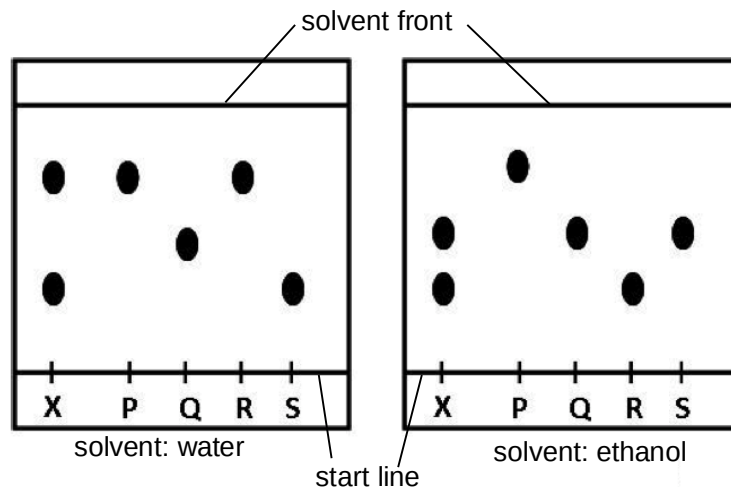
The background count rate is 44 counts per second. The half-life of the radioactive material is 34 hours.

What is the reading on the detector after 68 hours?

- A 123 counts per second
- B 134 counts per second
- C 167 counts per second
- D 178 counts per second

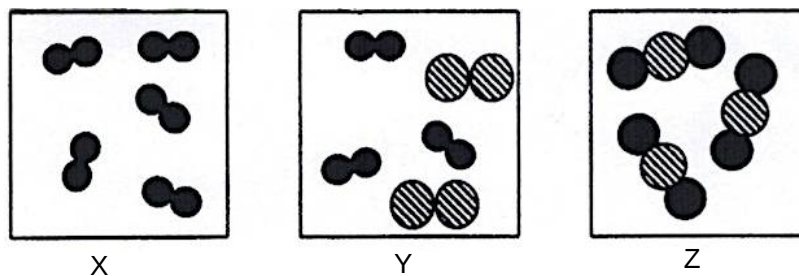
- 21** An unknown substance X and four known substances P, Q, R and S, were analysed by chromatography using two different solvents, water and ethanol.

The resulting chromatograms are shown below.



Which substances are found in X?

- A** P and R only
B R and S only
C P, R and S only
D P, Q, R and S
- 22** The diagrams show the arrangement of particles in the substances, X, Y and Z.



Which row correctly describes X, Y and Z?

	X	Y	Z
A	compound	element	mixture
B	element	compound	mixture
C	element	mixture	compound
D	mixture	compound	element

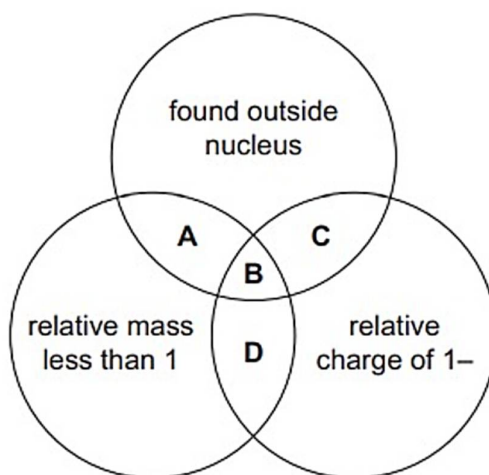
- 23** Bromine is a liquid at 20 °C.

What could be the melting point and boiling point for bromine?

	melting point / °C	boiling point / °C
A	–22	–3
B	–8	–33
C	–7	59
D	25	105

- 24** The diagram shows some properties of particles in an atom.

To which labelled part of the diagram does electron belong?



- 25** An atom forms an ion with a charge of 2+ and the electronic configuration of 2,8,8.

What is the proton number of the atom?

- A** 16
- B** 17
- C** 19
- D** 20

- 26** Element P has n protons.
Element Q has $(n - 3)$ protons and can achieve a stable electronic configuration by either sharing or accepting two electrons.

What is the compound formed when element P reacts with element Q?

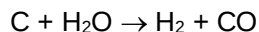
- A** a covalent compound, PQ_2
B a covalent compound, P_2Q
C an ionic compound, PQ_2
D an ionic compound, P_2Q
- 27** How many ions are there in 13.6 g of zinc chloride?

- A** 1.2×10^{23}
B 1.8×10^{23}
C 1.2×10^{24}
D 1.8×10^{24}

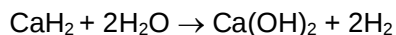
- 28** Hydrogen is produced in all reactions shown.

Which reaction produces the greatest volume of hydrogen, measured at room temperature and pressure.

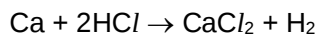
- A** 1.4 g of carbon reacts with excess steam.



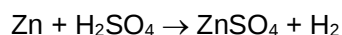
- B** 2.4g calcium hydride reacts with excess water.



- C** 4.0 g calcium reacts with excess dilute hydrochloric acid.



- D** 50.0 cm³ of 2.0 mol/dm³ of sulfuric acid reacts with excess zinc.



- 29** The table shows the observations of some reactions of an oxide, XO, where X is an unknown element.

reaction of XO with sodium hydroxide	reaction of XO with hydrochloric acid
reaction occurred	reaction occurred

What is the identity of element X?

- A** carbon
B lead
C magnesium
D sulfur
- 30** The table shows information of some pH indicators.

indicators	pH					
	2	3	4	5	6	7
methyl orange	red		yellow			
methyl red	red				yellow	
bromothymol blue	yellow					blue

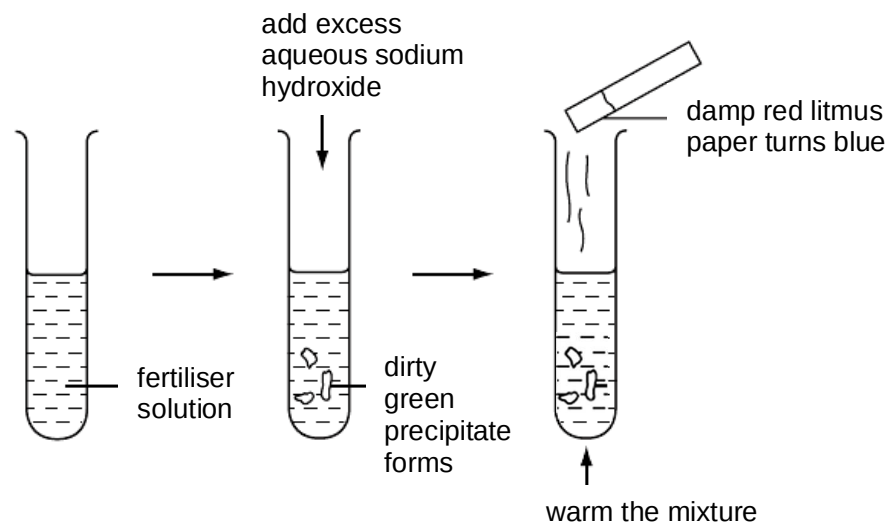
An unknown solution appears yellow when all three indicators are added to this solution.

What is the pH of the unknown solution?

- A** 4
B 5
C 6
D 7
- 31** In which reaction does the oxidation state of iron remain unchanged?

- A** $\text{C} + \text{FeO} \rightarrow \text{CO} + \text{Fe}$
B $\text{PbO} + \text{Fe} \rightarrow \text{Pb} + \text{FeO}$
C $2\text{FeCl}_2 + \text{Cl}_2 \rightarrow 2\text{FeCl}_3$
D $\text{Fe}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{FeCl}_3 + 3\text{H}_2\text{O}$

- 32 A solution of fertiliser was tested as shown.



What are the ions present in the fertiliser solution?

- A Fe^{3+} and SO_4^{2-}
B Fe^{2+} and NO_3^-
C NH_4^+ and NO_3^-
D NH_4^+ and Fe^{2+}
- 33 Period 3 of the Periodic Table contains the elements from sodium to argon.
Which statement is correct for the trend from left to right across Period 3?
- A The elements show a decrease in electrical conductivity.
B The elements have an increasing melting point.
C The elements have an increasing number of electron shells.
D The elements react more violently with water.
- 34 Which statement about the element bromine is correct?
- A It displaces chlorine from aqueous sodium chloride.
B It has a lower melting point than fluorine.
C It is a diatomic metal.
D It is lighter in colour than iodine.

- 35** A student added dilute sodium hydroxide to dilute nitric acid and recorded an increase in the temperature of the mixture.

Which row describes the reaction?

	type of reaction	energy change
A	endothermic	energy given out to surroundings
B	endothermic	energy taken in from surroundings
C	exothermic	energy given out to surroundings
D	exothermic	energy taken in from surroundings

- 36** An experiment was conducted to investigate the rate of reaction when calcium carbonate is reacted with dilute hydrochloric acid. The procedure is as shown.

- Place 50.0 cm³ of dilute hydrochloric acid in a conical flask.
- Add a known volume of water to the conical flask.
- Heat the mixture in the conical flask to the required temperature.
- Add 1.0 g of calcium carbonate to the conical flask.
- Measure the time taken for the reaction to complete.

What volume of water and temperature will allow the reaction to complete in the shortest time?

	volume of water added / cm ³	temperature / °C
A	10	30
B	10	50
C	40	30
D	40	50

- 37** A sample of petroleum is separated into three fractions, X, Y, and Z, using fractional distillation.

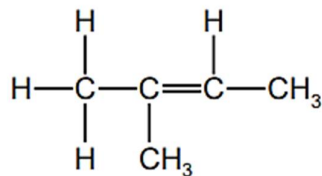
Some properties of X, Y and Z are listed.

- X is more viscous than Z.
- Y has a higher boiling point than X.

Which row correctly identifies the fraction with the longest carbon chain and highest volatility?

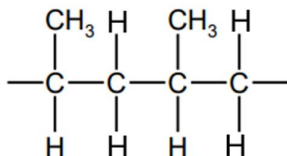
	longest carbon chain	most volatile
A	Y	X
B	Y	Z
C	Z	X
D	Z	Y

- 38 The structure of a monomer is shown.

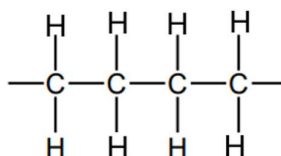


Which structure shows part of the polymer chain formed from **two** molecules of the monomer?

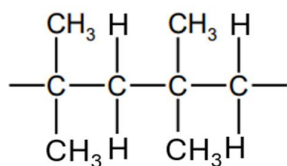
A



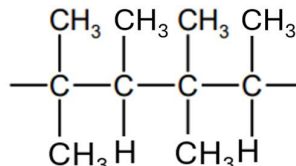
B



C



D



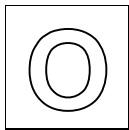
- 39 Which row describes the methods of recycling plastics correctly?

	physical method	chemical method
A	burning plastic to generate electricity	cracking plastics into fuel
B	burning plastic to generate electricity	compressing plastics into bricks
C	melting plastic into pellets for reuse	cracking plastics into fuel
D	melting plastic into pellets for reuse	compressing plastics into bricks

- 40 Which row identifies a natural source and an adverse effect of oxides of nitrogen?

	source	adverse effect
A	decay of plant and animal matters	acid rain
B	decay of plant and animal matters	global warming
C	lightning activities	acid rain
D	lightning activities	global warming

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CONVENT OF THE HOLY INFANT JESUS SECONDARY
Preliminary Examination in preparation for
the General Certificate of Education Ordinary Level 2025

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

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SCIENCE (PHYSICS)

5086/02

Paper 2 Physics

2 Sept 2025

1 hour 15 minutes

Candidates answer on the Question Paper.

No additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer **one** question.

Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

Section A

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

- 1 Fig.1.1 shows part of the speed-time graph for a rocket as it leaves the ground and travels into space.

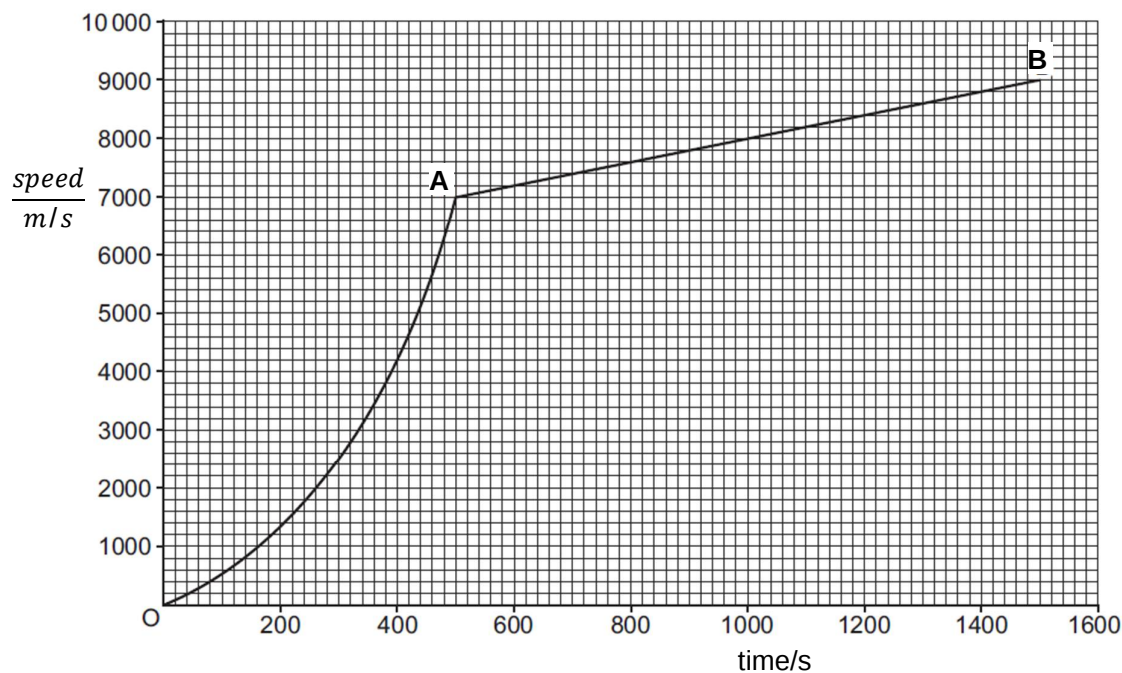


Fig. 1.1

- (a) Define acceleration.

.....
 [1]

- (b) Describe the motion of the rocket:

- (i) from **O** to **A**

..... [1]

- (ii) from **A** to **B**

..... [1]

- (c) Find the resultant force acting on the rocket from **A** to **B**. Assume the average mass of the rocket from **A** to **B** is 7.4×10^6 kg.

resultant force = N [2]

[Total: 5]

- 2 A girl is cycling along a straight horizontal road.
Fig. 2.1 shows the directions of the forces acting on the cyclist as she cycles in the direction of force **C**.

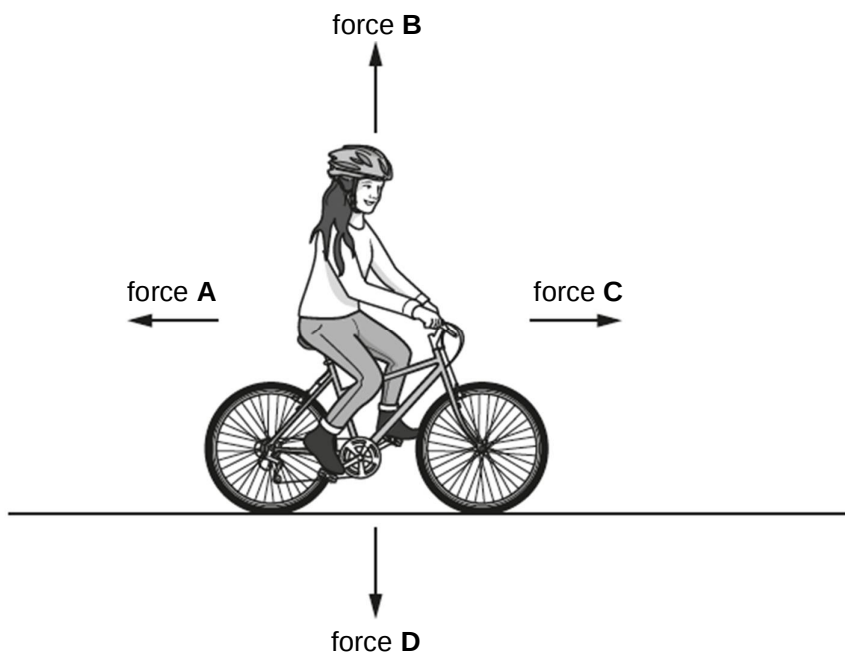


Fig. 2.1

- (a) State which force shows the direction of the force due to air resistance.
..... [1]
- (b) Force **A** changes and becomes larger than force **C**
State any effect this change has on the motion of the cyclist.
..... [1]
- (c) (i) The total mass of the girl and the bicycle is 70 kg and it is travelling with a constant speed of 11.0 m/s. The cyclist then slows down until it comes to rest. Calculate the work done to make the bicycle come to rest.

work done = [2] unit = [1]

- (ii) State the main transfer of energy that takes place between energy stores when the cyclist slows down until it comes to a rest.
..... [1]

[Total: 6]

[Turn over]

- 3 Fig. 3.1 shows the simple structure of a small hydroelectric power station.

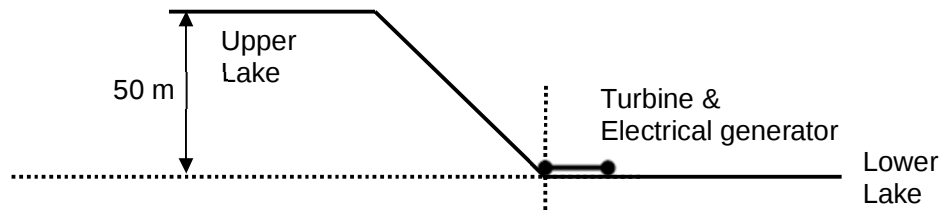
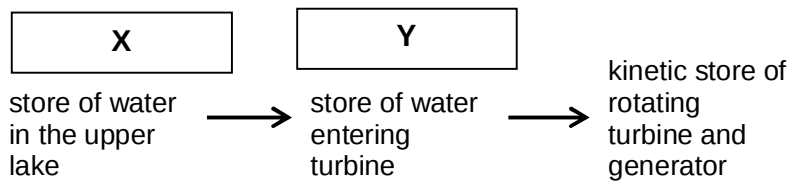


Fig. 3.1

The useful transfer of energy between energy stores occurring at each stage are as follows:



- (a) State what are X and Y.

X

Y

[2]

- (b) The hydroelectric power station is used for one hour. During the hour, the volume of water in the upper lake is $10\,000\text{ m}^3$ and it is 50 m above the turbine. No additional water enters the lake. The density of water is 1000 kg/m^3 . Calculate the loss in energy by the gravitational potential store in one hour.

potential energy loss = J [2]

[Total: 4]

- 4 Fig. 4.1 shows a wood burner in a cabin. The wood burner keeps the inside of the cabin warm when it is cold outside.

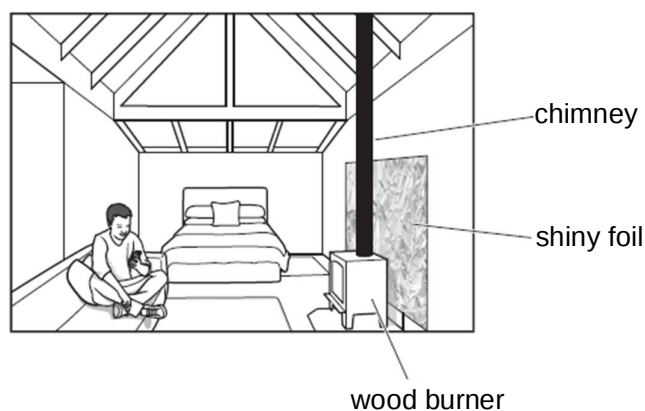


Fig. 4.1

- (a) Explain how thermal energy from the wood burner warms the cabin by convection. Use the ideas about the density of air. You may draw on Fig. 4.1 as part of your answer.

.....

.....

.....

..... [3]

- (b) The outer surface of the chimney is dull and black. Explain how the dull black surface helps to warm the cabin.

.....

.....[2]

[Total: 5]

[Turn over

- 5 (a) Describe how a longitudinal wave differs from a transverse wave.

.....

 [1]

- (b) Fig. 5.1 represents a seismic wave produced by an earthquake.



Fig. 5.1

- (i) The wave represented in Fig. 5.1 has a wavelength of 1.2×10^4 m.
 Calculate the actual distance between point J and point K.

distance = km [2]

- (ii) The wave in (i) travels through the ground at a speed of 4800 m/s.
 As the wave passes a certain point, the ground completes 5 oscillations.
 Calculate the frequency of the wave and the time it takes for the wave to complete 5 oscillations.

frequency = Hz [1]

time = s [1]

[Total: 5]

- 6 A microphone is connected to an oscilloscope as shown in Fig. 6.1 below. When three different sounds, **A**, **B** and **C** are made in front of the microphone, these are the waveforms seen on the screen of the oscilloscope are shown in Fig. 6.1.

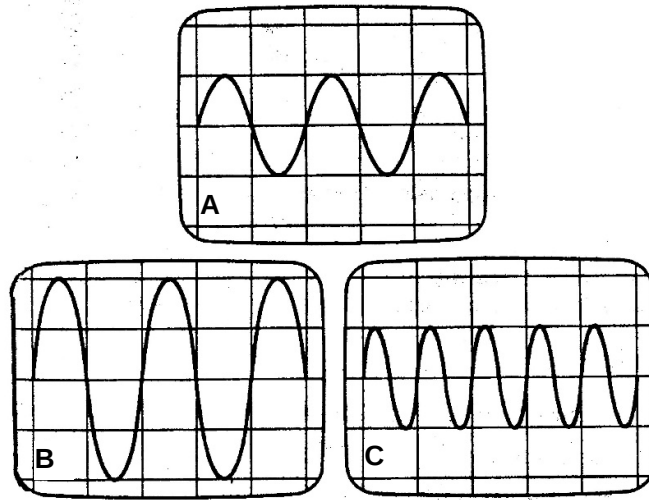


Fig. 6.1

- (a) Comparing sounds **A** and **B**, explain how the sounds are different.

.....
[1]

- (b) Comparing sounds **A** and **C**, explain how the sounds are different.

.....
[1]

[Total: 2]

[Turn over

- 7 Fig. 7.1 shows a ray of monochromatic light incident on an interface of air and corn oil at an angle of 35° . The ray is transmitted through parallel layers of corn oil and glycerol and is then reflected from the surface of a plane mirror, located below and parallel to the glycerol layer. The ray then emerges from the corn oil back into the air at point **P**. The refractive index of corn oil is 1.47.

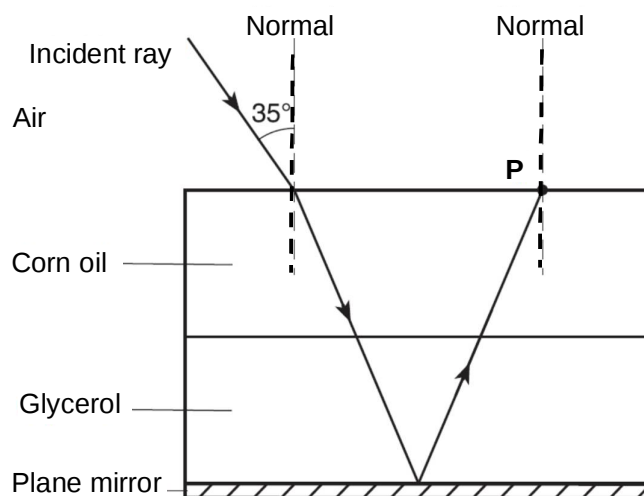


Fig. 7.1

- (a) Calculate the angle of refraction of the light ray as it enters the corn oil from air.

angle of refraction = [2]

- (b) The ray does not bend at the corn oil and glycerol interface. Explain why.

.....
[1]

- (c) Complete the ray diagram in Fig. 7.1 to show how the refracted ray leaves the interface of air and corn oil at **P**. [1]

[Total: 4]

- 8 Fig. 8.1 shows a ray diagram for a thin converging lens. The lens forms an image of the object. The object is positioned 30 cm from the optical centre of the lens.

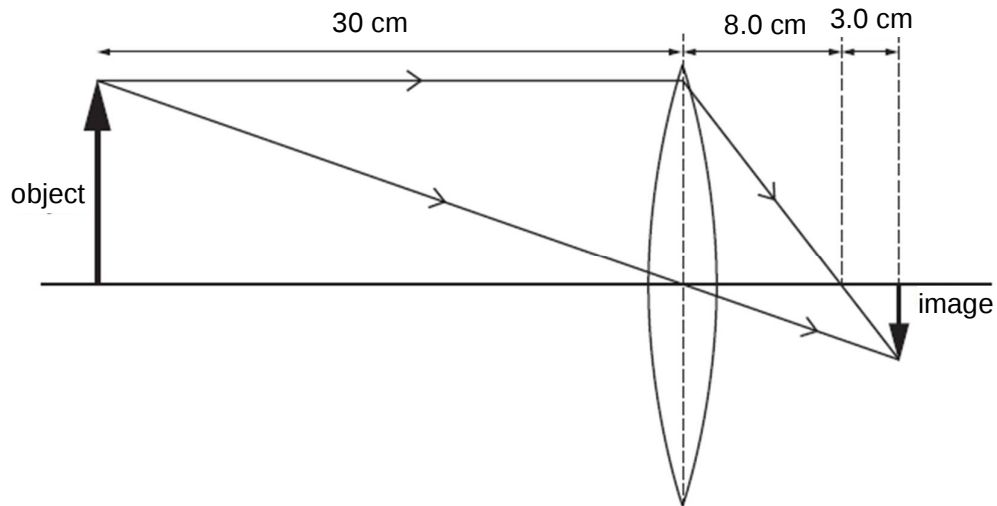


Fig. 8.1 (not to scale)

- (a) Using information from Fig. 8.1, state the focal length of the lens.

focal length = m [1]

- (b) State two characteristics of the image formed by the lens in Fig. 8.1.

.....
[2]

- (c) State one application for the placement of the object as shown in Fig. 8.1.

..... [1]

- (d) When the object is brought closer to the lens, the image can no longer be found at the right side of the lens. Explain why this happens.

.....
[1]

[Total: 5]

[Turn over]

- 9 Fig. 9.1 shows an electric with four resistors. Three switches S_1 , S_2 and S_3 are opened.

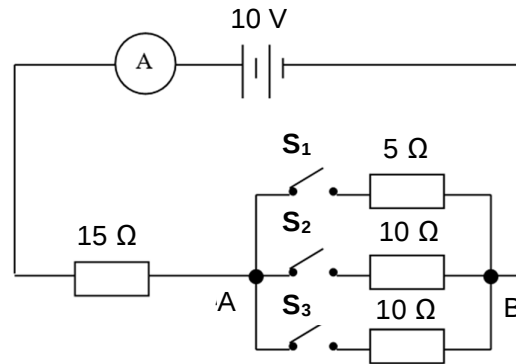


Fig. 9.1

- (a) Calculate ammeter reading when

- (i) only switch S_1 is closed.

ammeter reading = A [1]

- (ii) all switches S_1 , S_2 and S_3 are closed.

ammeter reading = A [2]

- (b) If an infinite number of resistors is added in parallel across point A and B, deduce the eventual reading of ammeter with your working shown. Explain how you arrived at this value.

.....

[2]

[Total: 5]

- 10 Fig. 10.1 shows a light bare copper wire **XY** resting on two copper rods **PQ** and **RT** placed between the North pole and South pole of a horseshoe magnet. Ends **T** and **Q** are connected to a battery.

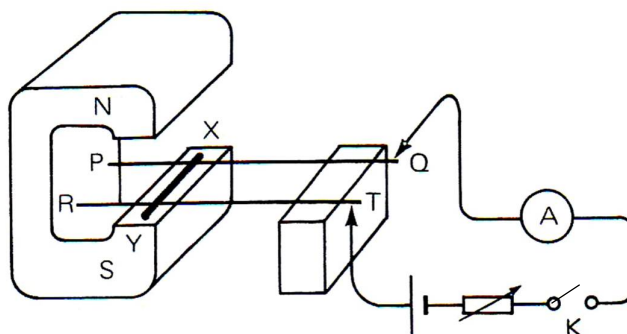


Fig. 10.1

- (a) Describe and explain what happens to wire **XY** when switch **K** is closed.

.....

 [2]

- (b) Describe and explain what happens to wire **XY** when the resistance of the variable resistor is lowered.

.....

 [2]

[Total: 4]

[Turn over

- 11 (a) Table 11.1 shows the electrical appliances, power rating and the number of hours each of them has been used in a certain week.

Electrical appliances	Power Rating	Number of hours
Refrigerator	240 V, 200 W	168
Television	240 V, 500 W	20
Bulb	240 V, 60 W	70
Air conditioner	240 V, 2 kW	50

Table 11.1

Fig. 11.1 shows how the electrical appliances are connected.

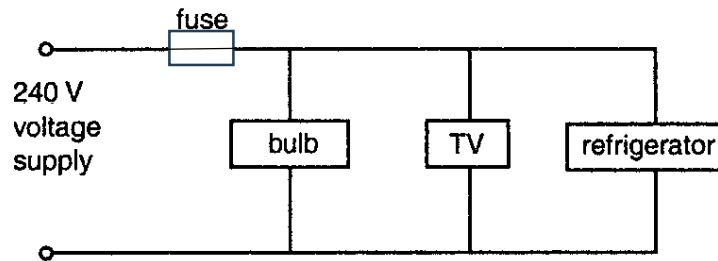


Fig. 11.1

- (i) State the type of connection in Fig. 11.1.

..... [1]

- (ii) The air conditioner is not connected together with the other appliances. It has a different circuit. Explain why.

.....
[1]

- (iii) Calculate the electricity tariff per kWh if the total cost of using all the appliances in Table 11.1 for that particular week is \$29.56

tariff = per kWh [2]

- (b) An unqualified electrician connects two electric fans A and B at home. The domestic wiring is shown in Fig. 11.2 below. The mains supply is at 240 V and **L**, **N** and **E** denote the live, neutral and earth wires respectively. Both electric fans have metal casing enclosing their motors.

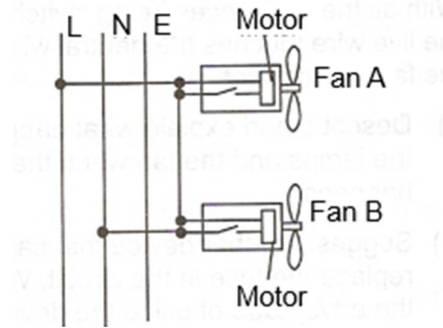


Fig. 11.2

- (i) State two mistakes made by the unqualified electrician in the wiring of the fans in Fig. 11.2.

1.

2.

[2]

- (ii) Draw on Fig. 11.3, the correct wiring for the 2 fans.

[2]

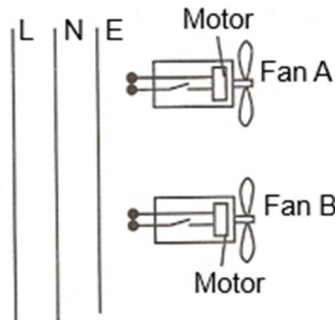


Fig. 11.3

- (iii) An electrical safety component is missing from the fan's circuit. Name the electrical safety component and explain how the safety component works.

.....

.....

.....[2]

[Total: 10]

[Turn over]

Section B

Answer **one** question in this section.

Write your answers in the spaces provided.

- 12** Fig. 12.1 shows a barrier at the entrance to a car park. The wooden barrier arm has a weight of 60 N which acts through the centre of gravity at the position shown on Fig. 12.1.

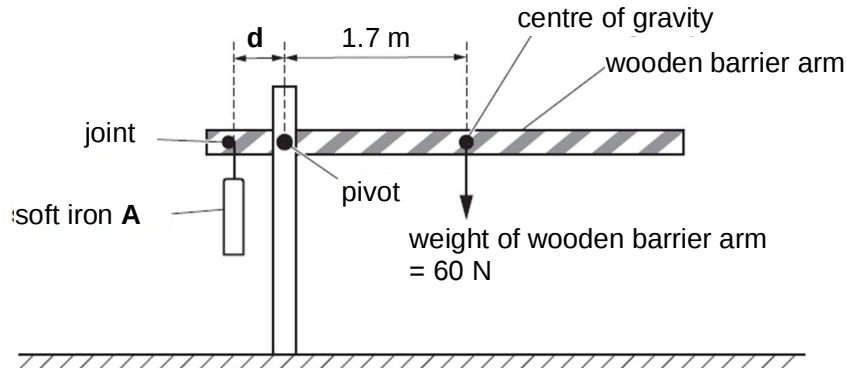


Fig. 12.1

- (a)** Define the principle of moments.

.....
 [1]

- (b)** Initially the wooden barrier arm is horizontal.

- (i)** Using Fig. 12.1, calculate the clockwise moment of the weight of the wooden arm about the pivot.

clockwise moment = Nm [2]

- (ii)** The wooden barrier arm is in equilibrium. The mass of the soft iron bar A is 23 kg.
 Using the principle of moments, calculate the distance d between the pivot and the joint holding the soft iron bar A.

distance d = m [2]

- (c) Fig. 12.2 shows a coil attached to a power supply placed below soft iron bar A.

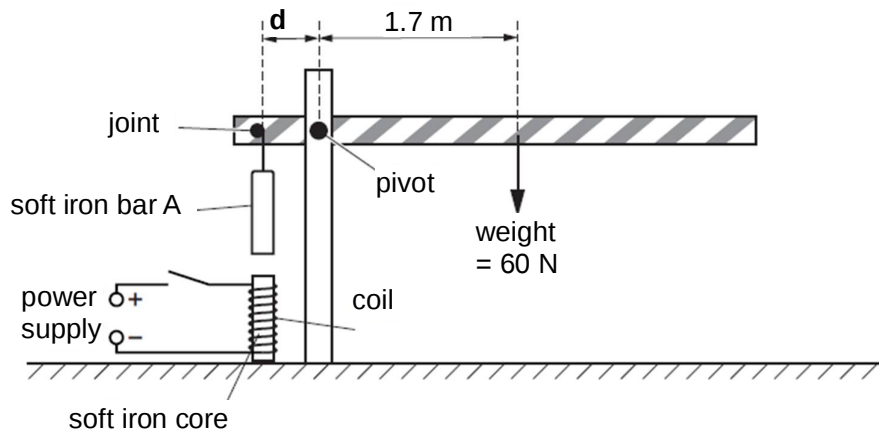


Fig. 12.2

- (i) State and explain what happens to the wooden barrier arm when the switch in the coil circuit is closed.

statement

explanation

.....

.....

.....

.....[3]

- (ii) A student suggests that the soft iron bar A is replaced by a steel bar. Explain why a steel bar is less effective than a soft iron bar in the barrier.

.....

.....

.....[2]

[Total: 10]

[Turn over]

- 13 (a) Fig. 13.1 represents how ionising radiation **P** collides and ionises an atom.

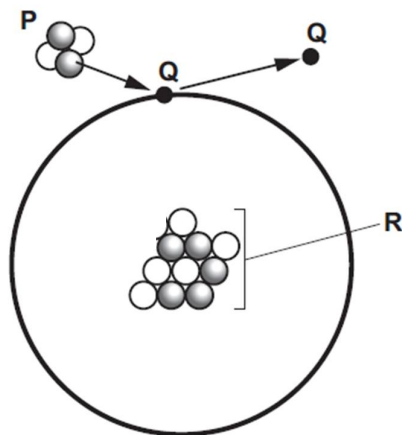


Fig. 13.1

The particle of ionising radiation **P** collides with particle **Q** which is in orbit around the central structure **R**.

- (i) Deduce the name of:

particle **P**

particle **Q** [2]

- (ii) In Fig. 13.1, all the particles in the central structure **R** are shown.
The chemical symbol for boron is ${}_{5}^{11}\text{B}$.
Explain why this atom is an isotope of boron.

.....

..... [2]

(b) A teacher demonstrates radioactive decay by using a sample.

- (i) The sample emits beta (β)-particle.
State the nature of a beta (β)-particle.

..... [1]

- (ii) The teacher places the sample in a thick lead container. Fig. 13.2 shows a narrow beam of beta particle emerging from a small hole in one side of the container.

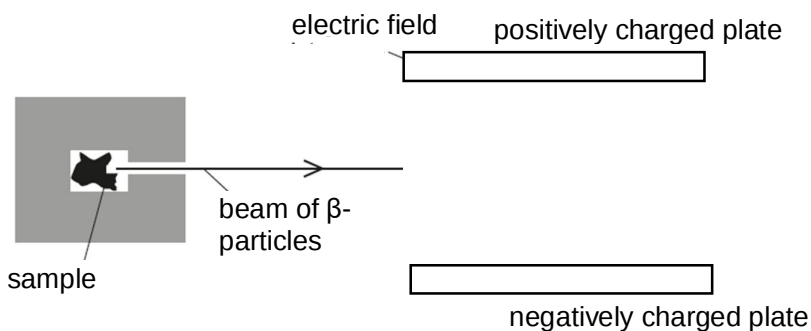


Fig. 13.2

The narrow beam enters a region where there is an electric field as shown in Fig. 13.2.

On Fig. 13.2, draw a line to indicate the path of the beta (β)-particle in the electric field. [1]

- (iii) Define half-life of a radioactive sample.

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

[Turn over

- (iv) The teacher obtains data for a decay curve. Fig. 13.3 shows the decay curve for the sample.

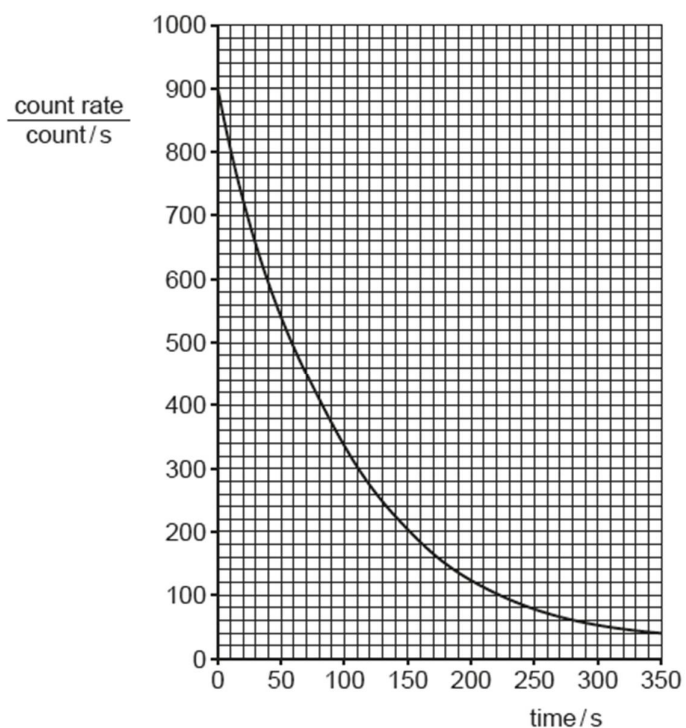


Fig. 13.3

Calculate the half-life of this sample using information in Fig. 13.3. Clearly show your working clearly on the graph or in the spaces provided.

half-life = s [2]

- (v) Suggest a reason why the half-life of this sample makes it suitable for this demonstration in a lesson.

.....

..... [1]

[Total: 10]

CONVENT OF THE HOLY INFANT JESUS SECONDARY
2025 4 EXPRESS PRELIMINARY EXAM
SCIENCE (PHYSICS) 5086 – MARKING SCHEME

Paper 1

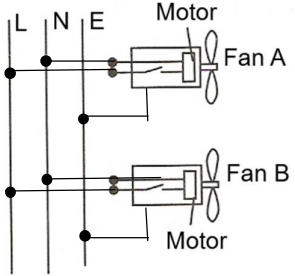
1	2	3	4	5	6	7	8	9	10
A	D	D	C	B	D	A	C	D	C
11	12	13	14	15	16	17	18	19	20
A	A	B	A	C	A	D	A	D	C

Paper 2

Section A

1	(a)	It is the rate of change of velocity.	[1] both DO NOT accept change of speed.
	(b) (i)	The acceleration increases.	[1]
	(ii)	constant/uniform acceleration.	[1]
	(c)	$\text{acc} = \frac{9000-7000}{1500-1000} = 2,$ $F = 7.4 \times 10^6 \times 2 = 1.48 \times 10^7 \text{ N}$	[1] [1] Answer in standard form is not required. Allow ecf
2	(a)	Force A	[1]
	(b)	The cyclist will decelerate.	[1]
	(c) (i)	KE of the girl = $\frac{1}{2} \times 70 \times 11^2 = 4235$ All KE has converted to internal energy, hence work done to make the bicycle come to rest = 4230 (3sf) Unit = Joule	[1] [1] accept 4235 [1] accept J
	(ii)	Kinetic store to internal store.	[1] accept heat energy
3	(a)	X: gravitational potential store Y: kinetic store	[1] [1]
	(b)	Mass = density x volume = $1000 \times (10000) =$ $1.0 \times 10^7 \text{ kg}$ GPE = $1.0 \times 10^7 \times 10 \times 50 = 5.0 \times 10^9 \text{ J}$	[1] [1] answer in standard form is not required. Allow ecf
4	(a)	Draw convection current on Fig. 4.1. When the air surrounding the burner is heated up, it expands and becomes less dense and rises.	[1] [1] [1]

		The colder air which is denser will sink to replace the heated air. A convection current is set up.	[1] do not need to give if mark is already given for the convection current drawn on Fig. 4.1
	(b)	Dull black is a good emitter of radiation. It emits heat faster from the chimney to the surrounding.	[1] [1]
5	(a)	For transverse wave, the displacement of particles is perpendicular to the wave motion whereas the displacement of particles is parallel to the wave motion for longitudinal wave. AND any relevant answers.	[1]
	(b)(i)	One wavelength = 1.2×10^4 m Distance between J and K = 1.5 wavelength Distance = $1.5 \times 1.2 \times 10^4 = 1.8 \times 10^4$ m Distance = 18 km	[1] [1]
	(b)(ii)	$V = f\lambda$, $f = 4800/12000 = 0.4$ Hz Period = $1/0.4 = 2.5$ s Time taken to make 5 oscillations = $5 \times 2.5 = 12.5$ s	[1] [1] allow ecf
6	(a)	A is softer than B since the amplitude of A is smaller than that of B.	[1] Answer needs to explain using amplitude.
	(b)	A has lower pitch than C since A has lower frequency than B.	[1] answer needs to explain using frequency.
7	(a)	$1.47 = \frac{\sin 35^\circ}{\sin r}$, $r = 23^\circ$	[2]
	(b)	Corn oil and glycerol has the same optical density. OR The speed of light does not change when it passes from corn oil to glycerol.	[1]
	(c)	A ray that is bent away from the normal is drawn.	[1]
8	(a)	0.08 m	[1]
	(b)	Diminished/real/inverted (any two)	[2]
	(c)	Camera/eyes	[1]
	(d)	A virtual image has been formed as the object distance is less than the focal length of the lens.	[1] mark awarded as long as virtual image is mentioned.

9	(a)(i)	$I = 10/20 = 0.50 \text{ A}$	[1] award mark if students writes 0.5 A
	(a)(ii)	Total resistance = $15 + \left(\frac{1}{5} + \frac{1}{10} + \frac{1}{10}\right)^{-1} = 17.5 \Omega$ $I = 10/17.5 = 0.571 \text{ A}$	[1] [1] allow ecf
	(b)	The resistor across AB $\rightarrow 0$ Hence, $I = 10/15 = 0.667 \text{ A}$	[1] [1]
10	(a)	When the current flows through XY, the interaction between the magnetic field lines of XY and permanent magnet causes a force to be produced on XY. The XY will move towards the magnet based on FLHR.	[1] [1] mark awarded without mentioning FLHR but direction of force is correct.
	(b)	Lower resistance allows bigger current flowing through the circuit. The force is larger and the XY will accelerate at a bigger value.	[1] [1] mark awarded as long as mention about smaller force.
11	(a) (i)	parallel	[1]
	(a) (ii)	Air conditioner has much greater power and hence requires a separate fuse to protect it.	[1]
	(a)(iii)	Energy = $0.2(168) + 0.5(20) + 0.06(70) + 2(50)$ = 147.8 kWh Cost = $\$29.56/147.8 = \0.20	[1] [1]
	(b)(i)	1. The casing should be connected to Earth wire. 2. The switch should be connected to live wire. 3. The fans should be connected in parallel. Any 2.	[2]
	(b)(ii)		L and N connected correctly [1] E connected to casing [1]
	(b)(iii)	Fuse. It cuts off the current supply if it exceeds fuse rating .	[1] [1] Award only if fuse rating is mentioned.

Section B

12	(a)	For a system in equilibrium , the sum of clockwise moment is equal to the sum of anticlockwise moment about the same pivot .	[1]
	(b) (i)	Clockwise moment = $60 \times 1.7 = 102 \text{ Nm}$	[2]
	(b) (ii)	CW = ACW $102 = 230 \text{ N} \times d$, $d = 0.443 \text{ m}$	[1] [1]
	(c)(i)	Statement: the joint will turn anticlockwise. OR the right side of the bar will raise etc. Explanation: when the current flows through the coil, the coil will be magnetised and induced a opposite pole at the soft iron bar A. Since unlike poles attract, a force will be exerted on bar A and causes the anticlockwise moment to be greater than the clockwise moment.	[1] any idea to indicate the moment is no longer balanced. [1] [1]
	(c)(ii)	Steel is a permanent magnet. The bar can no longer be lowered even when the current supply is switched off.	[1] [1]

13	(a)(i)	particle P : alpha radiation particle Q: electrons	[1] [1]
	(a)(ii)	It has the same number of protons as Boron. It has a different number of neutrons from Boron.	[1] [1]
	(b) (i)	A moving electron	[1]
	(b) (ii)	A line drawn towards positively-charged plate.	[1]
	(b) (iii)	It is the time taken for half the nuclei of the nuclide in any sample to decay.	[1]
	(b) (iv)	70 s ($\pm 5\text{s}$) Indicate at least 2 half-lives on the graph	[1] [1]
	(b) (v)	It has small half-life. The lesson will have enough time to collect enough data for a decay curve.	[1]