Name: ..... Register no: ..... Class: .....

NGEE ANN SECONDARY SCHOOL

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PRELIMINARY EXAMINATION

SCIENCE (PHYSICS/CHEMISTRY) **5086/02**

PAPER 2 **23 August 2024**

1 h 15 min

Additional materials: NIL

READ THESE INSTRUCTIONS FIRST

Write your name and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs, tables or rough working.

Section A
Answer **all** questions.

Section B
Answer **any one** questions out of two.
Write your answers in the spaces provided.

At the end of the examination, fasten all your papers securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use

Question	Marks
Section A	/55
Section B	/10
Total	/65

Checked by student: _____ Date: _____

This document consists of **17** printed pages and **1** blank page (Including this cover page)

Section A – 55 Marks

Answer all questions in the spaces provided.

1 Fig. 1.1 shows the speed-time graph of a car.

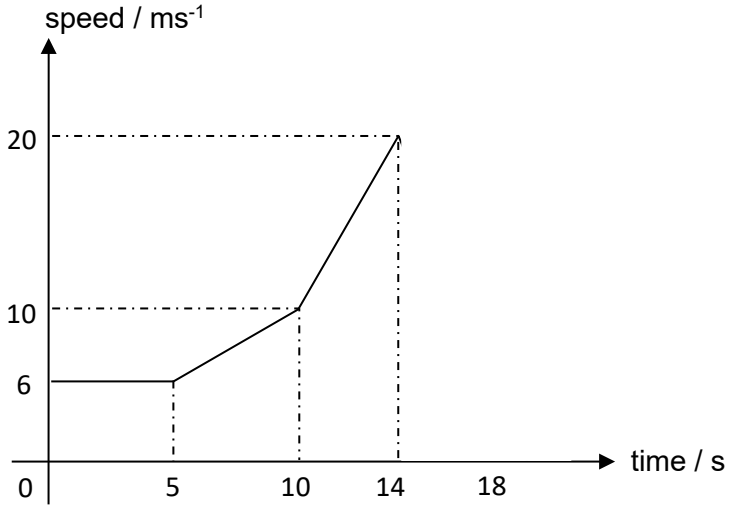


Fig. 1.1

(a) Describe the difference in the motions of the car during the time from the 10th to the 14th second and the time from the 5th to the 10th second.

……..……..…

……..…… [1]

(b) Calculate acceleration of the car from the 10th to the 14th second.

Acceleration = ……. m/s^2 [2]

(c) The car moves with uniform deceleration to rest from the 14th to the 18th second. Complete the graph on Fig. 1.1 to represent this. [1]

(d) Calculate the distance moved for the first 10 seconds.

Distance = …….. m [2]

2 Fig 2.1 shows a bus of mass 2400 kg moving along a straight road. The engine produces a forward force of 12000 N. The bus also experiences a total retarding force of 3200 N.

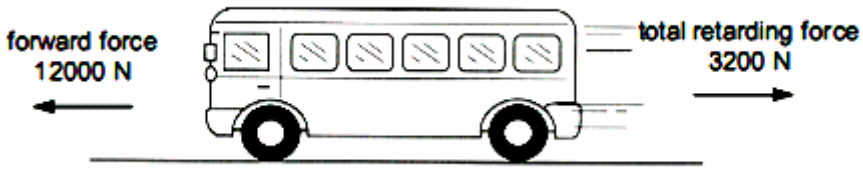


Fig 2.1

(a) Calculate the acceleration of the bus.

Acceleration = ……..m/s^2 [2]

(b) The acceleration of the bus gradually decreases until the bus comes to a uniform speed although the driving force remained constant. Explain why this happens.

……

……

……[2]

3 Fig. 3.1 shows a uniform metre rule balanced on a pivot at the 40 cm mark. The metre rule balances when a load of 5 N is suspended at the 20 cm mark.

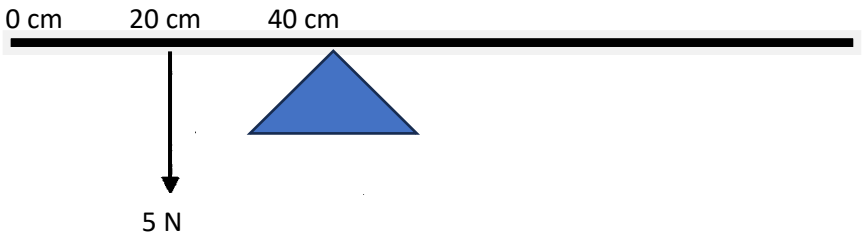


Fig. 3.1

(a) On Fig. 3.1, indicate the weight of the rule acting in the correct position. [2]

(b) Calculate the weight of the metre rule.

Weight = …….. N [2]

4 A Bunsen burner is used to heat a beaker full of water.

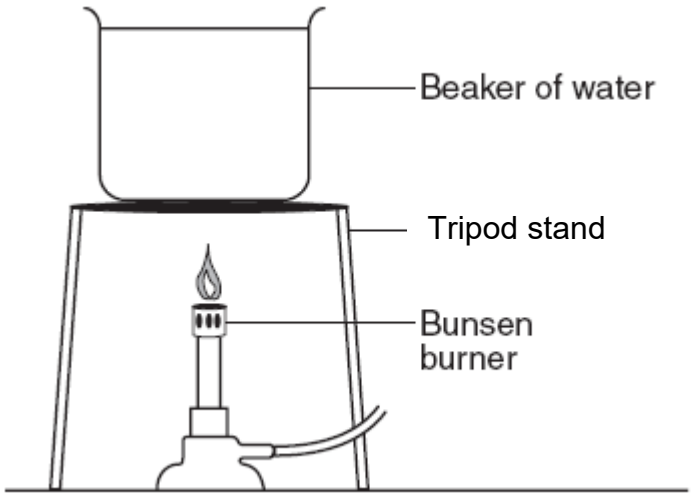


Fig 4.1

(a) State the process whereby energy is transferred from the tripod stand to the bottom of the beaker.

……[1]

(b) **(i)** Draw the direction of the convection current set up within the beaker of water [1]

(ii) Explain how energy is transferred through the water.

……

……

……

……

……[2]

(c) Compare the molecular structure of water and water vapour in terms of their intermolecular forces and distance between molecules. [2]

	Intermolecular forces	Distance between molecules
Water		
Water vapour		

5 When a vacuum flask is used, heat loss by conduction, convection and radiation are greatly reduced. Explain how the following features reduce energy transfer to the surrounding.

(a) The plastic stopper.

……...

……...[1]

(b) Vacuum between double glass.

……...

……...[1]

(c) The wall of the glass is silvered.

……...

……...[1]

6 Fig 6.1 shows sea waves approaching a beach at a speed of 1.2 m/s.

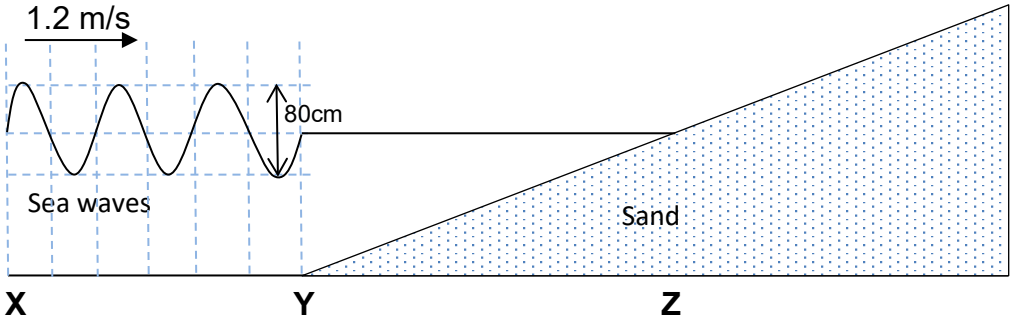


Fig 6.1

The wave takes 3.0 s to travel from **X** to **Y**.

(a) State, in metre, the size of the amplitude of the sea wave.

Amplitude = ……m [1]

(b) Calculate the distance between **X** and **Y**.

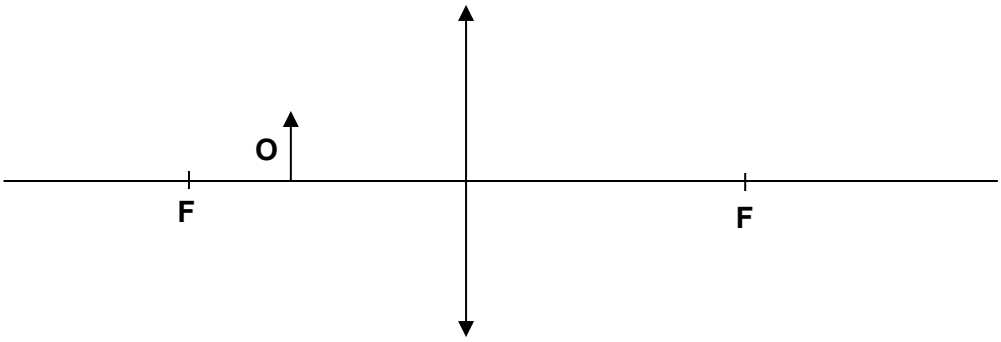
Distance = ……m [1]

(c) Calculate the wavelength of the wave.

Wavelength = ……m [1]

7 **(a)** The diagram below shows an object **O** placed in front of a converging lens. Using ray diagrams, locate and draw the image of **O**. Label it as **I**.

F is the focal points of the lens. [2]



(b) State two characteristics of the image formed.

……[1]

8 Fig. 8.1 shows a small and charged sphere S suspended by an insulating thread. It is attracted towards a large positive charged metal sphere L supported on an insulating stand.

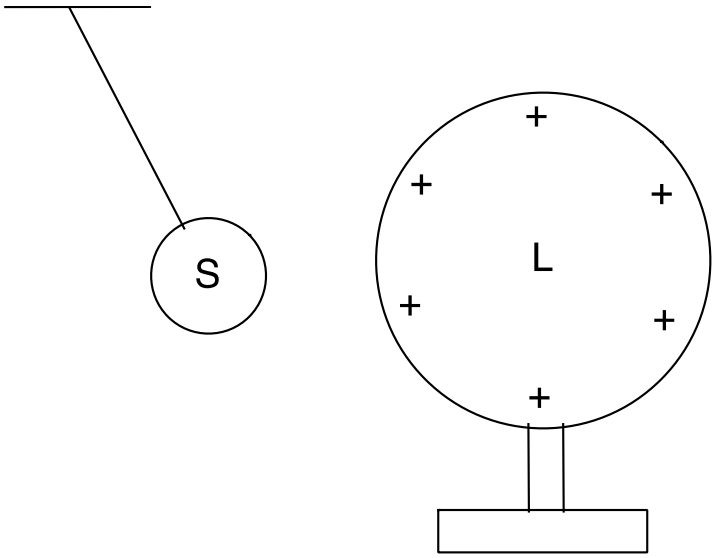


Fig. 8.1

(a) Draw and label on Fig. 8.1, all the forces acting on sphere S. [2]

(b) Explain why S is attracted towards L.

……..……..……

…….....[1]

9 Fig. 9.1 shows an ultrasound emitted downwards from a ship. The ultrasound is reflected from the seabed and is detected as it arrives back at the ship.

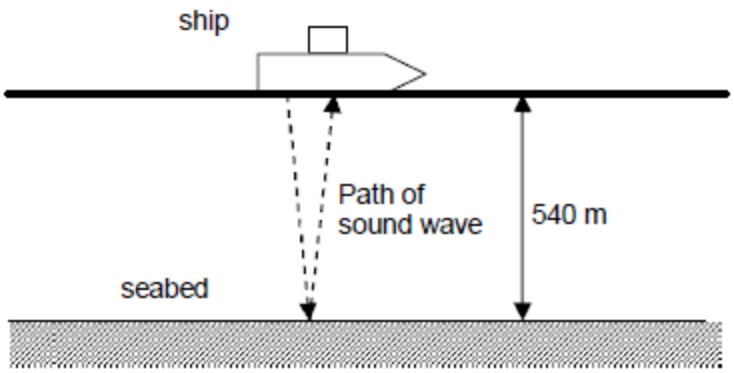


Fig. 9.1

The time between emitting the ultrasound and detecting it back at the ship is 0.58 s. The seabed is 540 m below the ship.

(a) Describe the movement of sound waves in the water.`

……

……[1]

(b) Calculate the speed of sound in seawater.

Speed of sound = ……. m/s [2]

(c) If the frequency of the sound is doubled, state the effect, if any, this has on the speed of the ultrasound.

……

……[1]

10 Fig 10.1 shows an electric circuit.

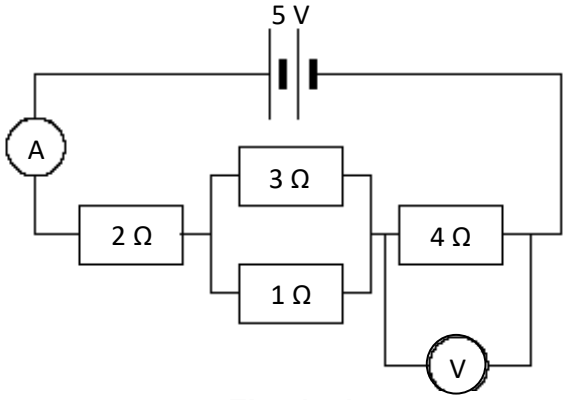


Fig. 10.1

(a) Calculate the total resistance of the circuit.

Resistance = …… Ω [2]

(b) What is the reading on the ammeter?

Ammeter = …… A [2]

(c) Calculate the charge that passes through the ammeter in 1 min.

Charge = …… C [2]

11 The activity of a radioactive source was measured at the same time each day for 5 days. The results after allowing for background radiation are shown in table 11.1.

Time / days	0	1	2	3	4	5
Activity / Bq	120	75	48	30	19	12

Table 11.1

(a) On grid of Fig. 11.1, draw a graph to show how the activity of the radioactive source varies with time.

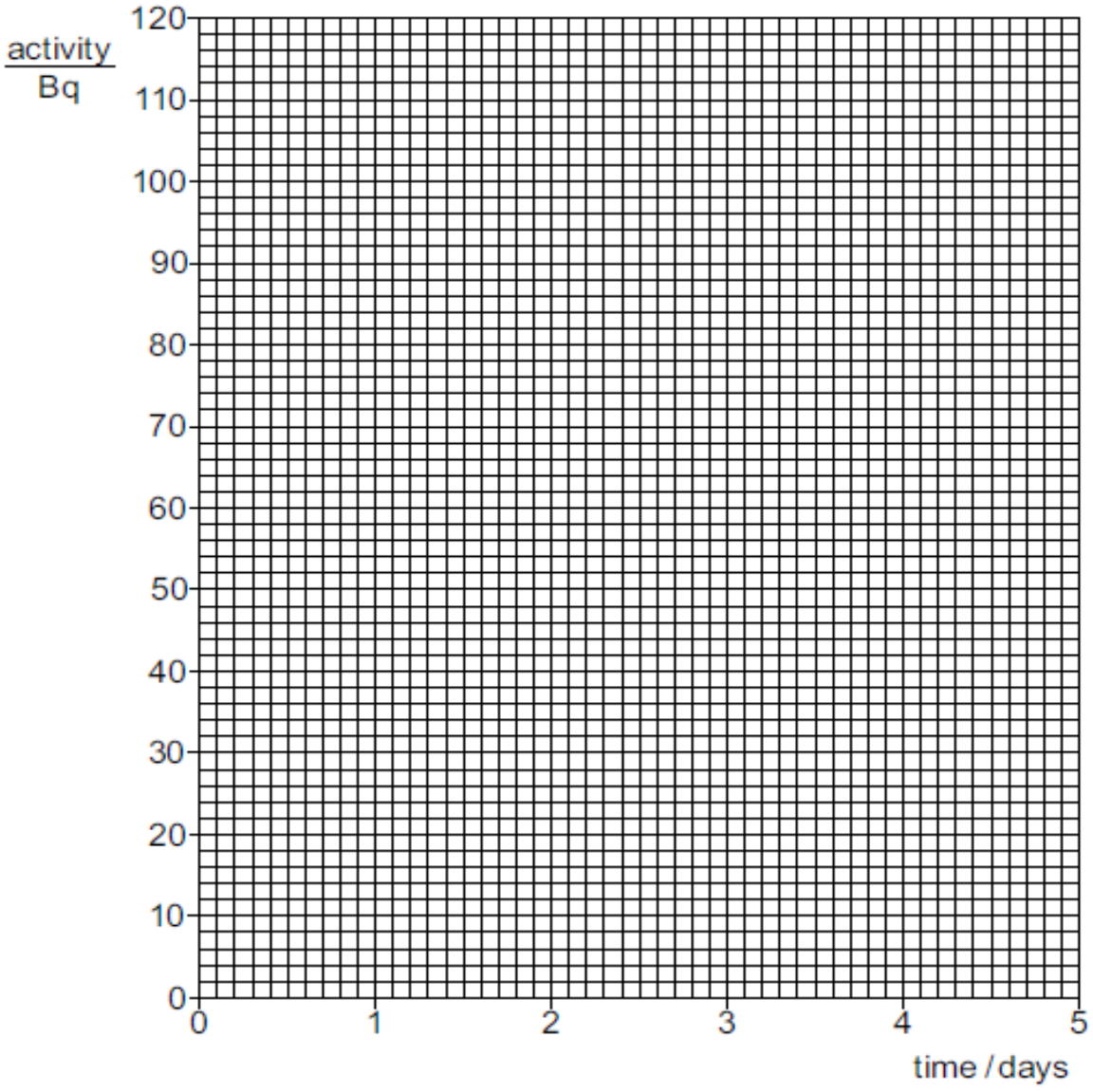


Fig. 11.1 [1]

(b) Determine the half-life of the source. Show, using at least 2 half-lives, on your graph how you arrive at your answer.

Half-life = ……days [2]

12 **(a)** Mary was scolded by her father for wasting electricity. When he went to her bedroom, no one was there but the following electrical appliances were turned on:

500 W television, 2 x 60 W bulbs, 250 W hi-fi set and 12 kW air-conditioner.

Mary was in fact in the bathroom for the past half an hour. Determine the amount of money wasted by leaving those appliances on while she was having a bath, given that 1 kWh of electricity cost $0.28.

Amount of money wasted = $…….. [3]

(b) Fig. 12.1 shows a cross-sectional view of the electric kettle and the live, neutral and earth terminals of a household electricity supply.

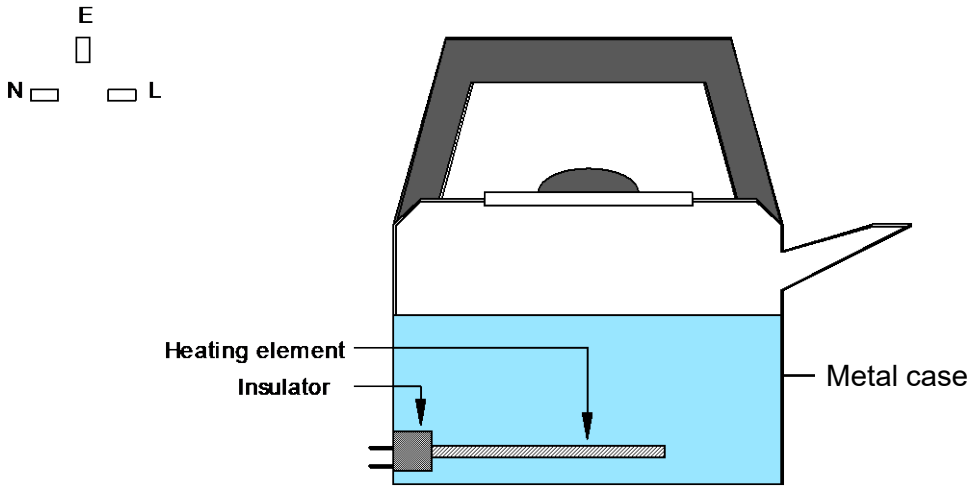


Fig. 12.1

(i) Complete Fig. 12.1 by showing how the wires are to be correctly connected from the terminals to the kettle. [2]

(ii) Include a fuse and a switch in your diagram. [1]

(iii) Explain how a fuse acts as a safety device.

....

....

....

....[1]

(iv) The 2 kW electric kettle is connected to a 240 V supply. Determine the currents flowing in the live and earth wires?

Current in live wire =……………..…….A [2]

Current in earth wire = …………..……A [1]

Section B – 10 marks

Answer any **ONE** question out of the two questions.

13 A steel ball of mass 300 kg is suspended from the jib of a crane as shown in Fig. 13.1.

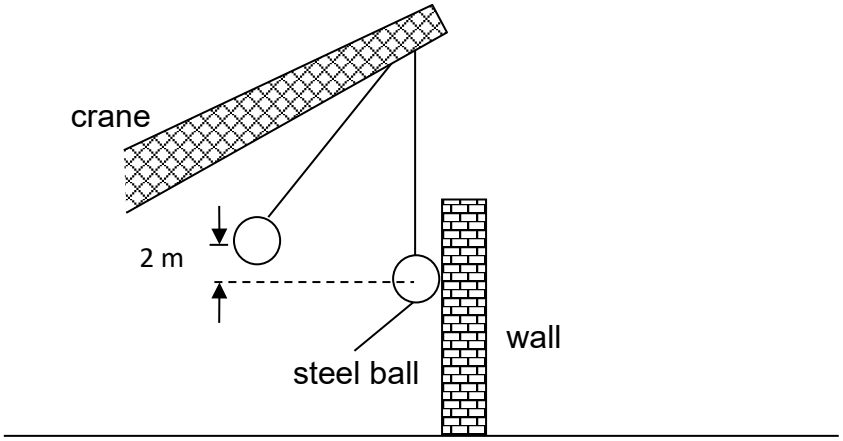


Fig. 13.1

In order to demolish the wall, the steel ball is pulled away from the wall to a height of 2 m and then released from rest.

(a) State the principle of conservation of energy.

……...…

……

……..…[2]

(b) Calculate the energy in the kinetic store that the ball has when it hits the wall. State the assumption you have made in arriving at your answer. Take g, the acceleration due to gravity as 10 m/s^2.

Assumption :……...…

……[3]

(c) On impact, the ball will transfer 30% of its energy to the wall. Calculate the rebound height at which the ball will reach after impact.

Rebound height = …… m [3]

(d) Calculate the power transfer to the wall if the impact occurs in 0.01 s.

Power = …… W [2]

14 Fig. 14.1 below shows the structure of a simple temporary electromagnet.

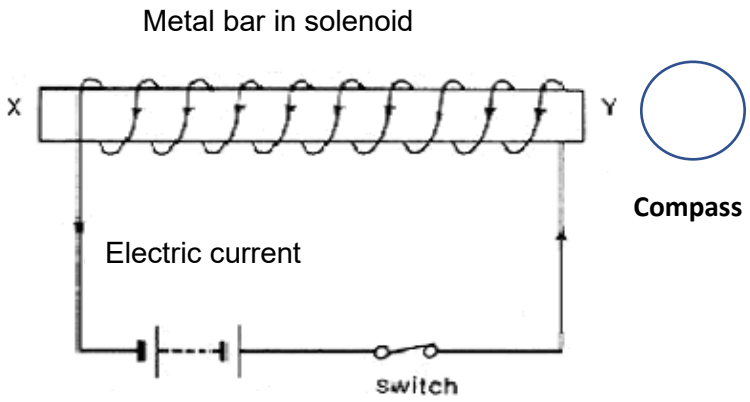


Fig. 14.1

(a) What metal could the bar be made of?

……..……[1]

(b) Suggest two ways to make the electromagnet stronger.

……

……..[2]

(c) When the switch is closed, state the polarity at **X**?

……..……[1]

(d) Sketch on the above diagram the shape of the magnetic field around the metal bar. [1]

(e) A compass is placed near to end **Y** of the metal bar as shown in the diagram. Draw an arrow to indicate the direction of the compass. [1]

(f) Fig. 14.2 shows a circuit breaker that consists of an electromagnet. Explain how the circuit breaker works when a high current surges from X to Y.

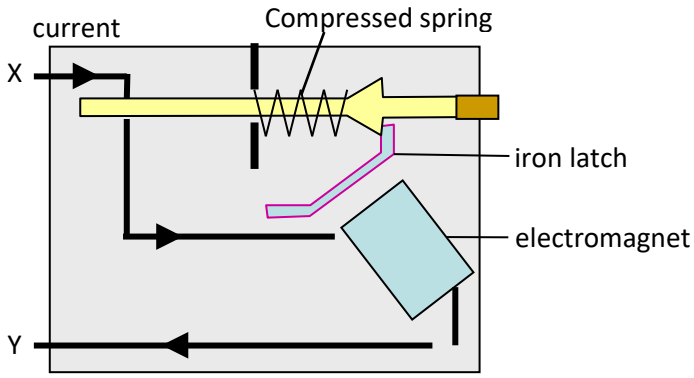


Fig. 14.2

……

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……

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……

……

……

……[3]

(g) Name another application of electromagnet.

……

……[1]

---End of Paper---

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