



National
Qualifications
2016

X757/75/02

Physics
Section 1 — Questions

TUESDAY, 24 MAY

INSTRUCTIONS TO CANDIDATES

Candidates should enter their surname, forename(s), date of birth, Scottish candidate number and the name and Level of the subject at the top of their first answer sheet.

Record your answers by writing the letter at the end of each question.

Reference may be made to the Data Sheet and to the Relationships Sheet X757/75/11.

Before leaving the examination room you must give your question and answer sheet to the Invigilator; if you do not, you may lose all the marks for this paper.

Questions marked with an asterisk differ in some respects from those in the printed paper.

An OW in the margin indicates a new question.

SECTION 1

Attempt ALL questions

Refer to the diagram for Question 1.

- * 1. The symbol for an electronic component is shown.

This is the symbol for

- A an LDR
- B a transistor
- C an LED
- D a photovoltaic cell
- E a thermistor.

Refer to the diagram for Question 2.

- * 2. A uniform electric field exists between plates Q and R.

The diagram shows the path taken by a particle as it passes through the field.

Which row in the table identifies the charge on the particle, the charge on plate Q and the charge on plate R?

	<i>Charge on particle</i>	<i>Charge on plate Q</i>	<i>Charge on plate R</i>
A	negative	positive	negative
B	negative	negative	positive
C	no charge	negative	positive
D	no charge	positive	negative
E	positive	positive	negative

Refer to the diagram for Question 3.

- * 3. A circuit is set up as shown.

The reading on ammeter A_1 is 5.0 A.

The reading on ammeter A_2 is 2.0 A.

The reading on ammeter A_4 is 1.0 A.

Which row in the table shows the reading on ammeters A_3 and A_5 ?

	Reading on ammeter A_3 (A)	Reading on ammeter A_5 (A)
A	2.0	1.0
B	3.0	1.0
C	2.0	4.0
D	3.0	4.0
E	5.0	5.0

Refer to the diagram for Question 4.

- * 4. Two resistors are connected as shown.

The total resistance between P and Q is

A 0.17 Ω

B 3.0 Ω

C 6.0 Ω

D 16 Ω

E 32 Ω .

- * 5. A block in the shape of a cuboid has the dimensions 0.2 m by 0.05 m by 0.1 m.

The block is placed so that one of the surfaces is in contact with a smooth table top.

The weight of the block is 4.90 N.

The **minimum** pressure exerted by the block on the table top is

A 25 Pa

B 245 Pa

C 490 Pa

D 980 Pa

E 4900 Pa.

Refer to the diagram for Question 6.

- * 6. A syringe is connected to a pressure meter as shown.
The syringe contains a fixed mass of air of volume 150 mm^3 .
The reading on the pressure meter is 120 kPa .
The volume of air inside the syringe is now changed to 100 mm^3 .
The temperature of the air in the syringe remains constant.
The reading on the pressure meter is now
- A 80 kPa
 - B 125 kPa
 - C 180 kPa
 - D 80 000 kPa
 - E 180 000 kPa.

Refer to the graphs for Question 7.

- * 7. A sample of an ideal gas is enclosed in a sealed container.
Which graph shows how the pressure p of the gas varies with the temperature T of the gas?

8. A student makes the following statements about waves.
- I Waves transfer energy.
 - II A wave with a short wavelength diffracts more than a wave with a long wavelength.
 - III The amplitude of a wave depends on its wavelength.
- Which of these statements is/are correct?

- A I only
- B II only
- C III only
- D I and II only
- E I and III only

Refer to the diagram for Question 9.

- * 9. The diagram represents a wave.
The wavelength of the wave is the horizontal distance between points
- A P and Q
 - B P and S
 - C Q and R
 - D R and S
 - E S and T.

Refer to the diagram for Question 10.

- * 10. The diagram represents the position of the crests of waves 3 seconds after a stone is thrown into a pool of still water. The lines represent the crests.

Which row in the table shows the speed and the frequency of the waves?

	<i>Speed</i> (m s ⁻¹)	<i>Frequency</i> (Hz)
A	0.33	3
B	0.33	1
C	1.0	1
D	1.0	3
E	1.0	4

Refer to the diagram for Question 11.

- * 11. A ray of red light passes through a double glazed window.

Which diagram shows the path of the ray as it passes through the window?

12. Which row in the table shows how the mass and charge of an alpha particle compares to the mass and charge of a beta particle?

	<i>Mass of an alpha particle compared to mass of a beta particle</i>	<i>Charge on an alpha particle compared to charge on a beta particle</i>
A	larger	same
B	larger	opposite
C	same	same
D	smaller	opposite
E	smaller	same

13. During ionisation an atom becomes a positive ion.

Which of the following has been removed from the atom?

- A An alpha particle
- B An electron
- C A gamma ray
- D A neutron
- E A proton

14. Which of the following is a vector quantity?

- A Mass
- B Time
- C Speed
- D Kinetic energy
- E Acceleration

Refer to the diagram and graphs for Question 15.

* 15. A ball moves along a horizontal frictionless surface and down a slope as shown.
Which of the graphs shows how the speed of the ball varies with time as it travels from P to Q?

16. A cyclist is travelling at 10 m s^{-1} along a level road.
The cyclist applies the brakes and comes to rest in a time of 5 s.
The combined mass of the cycle and cyclist is 80 kg.
The maximum energy converted to heat by the brakes is

- A 160 J
- B 400 J
- C 800 J
- D 4000 J
- E 8000 J.

17. A rocket is taking off from the surface of the Earth. The rocket engines exert a force on the exhaust gases.

Which of the following is the reaction to this force?

- A The force of the Earth on the exhaust gases.
- B The force of the Earth on the rocket engines.
- C The force of the rocket engines on the Earth.
- D The force of the exhaust gases on the Earth.
- E The force of the exhaust gases on the rocket engines.

Refer to the diagram for Question 18.

- * 18. A ball is projected horizontally with a velocity of 1.5 m s^{-1} from a cliff as shown.

The ball hits the ground 1.2 s after it leaves the cliff.

The effects of air resistance are negligible.

Which row in the table shows the horizontal velocity and vertical velocity of the ball just before it hits the ground?

	<i>Horizontal velocity</i> (m s^{-1})	<i>Vertical velocity</i> (m s^{-1})
A	12	12
B	12	1.5
C	1.5	12
D	1.5	13
E	0	12

19. The minimum amount of energy required to change 0.5 kg of water at its boiling point into steam at the same temperature is

- A $2.09 \times 10^3 \text{ J}$
- B $1.67 \times 10^5 \text{ J}$
- C $3.34 \times 10^5 \text{ J}$
- D $1.13 \times 10^6 \text{ J}$
- E $2.26 \times 10^6 \text{ J}$.

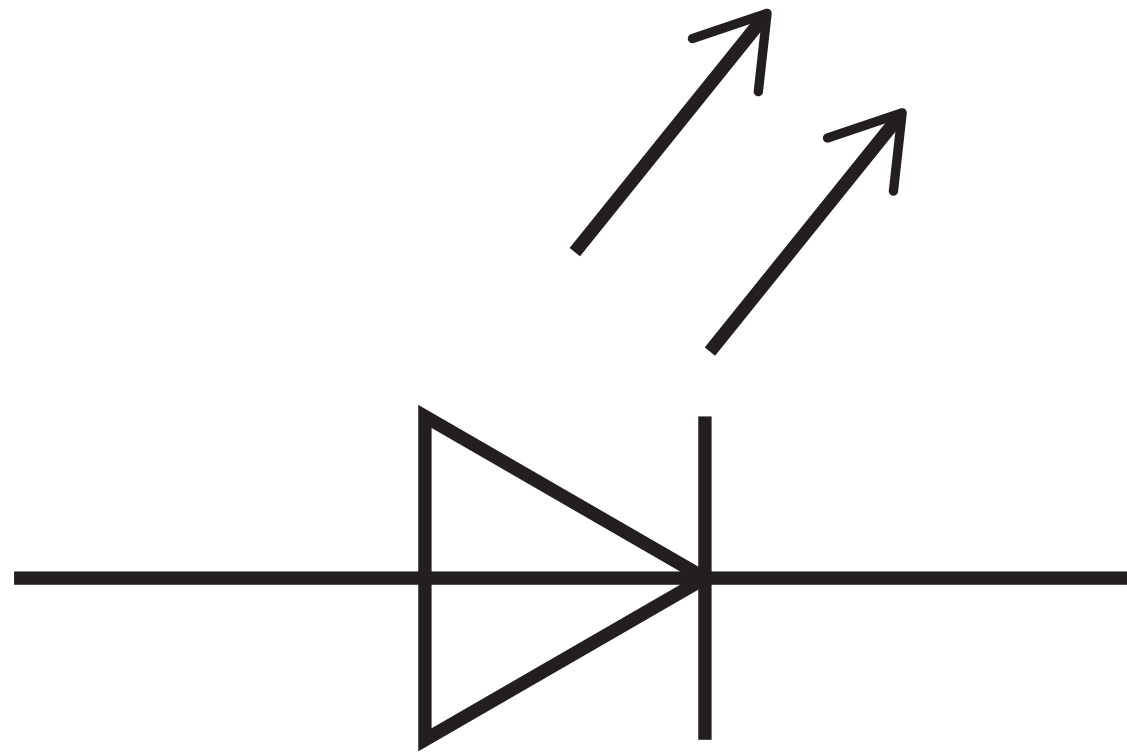
20. A student makes the following statements about the Universe.

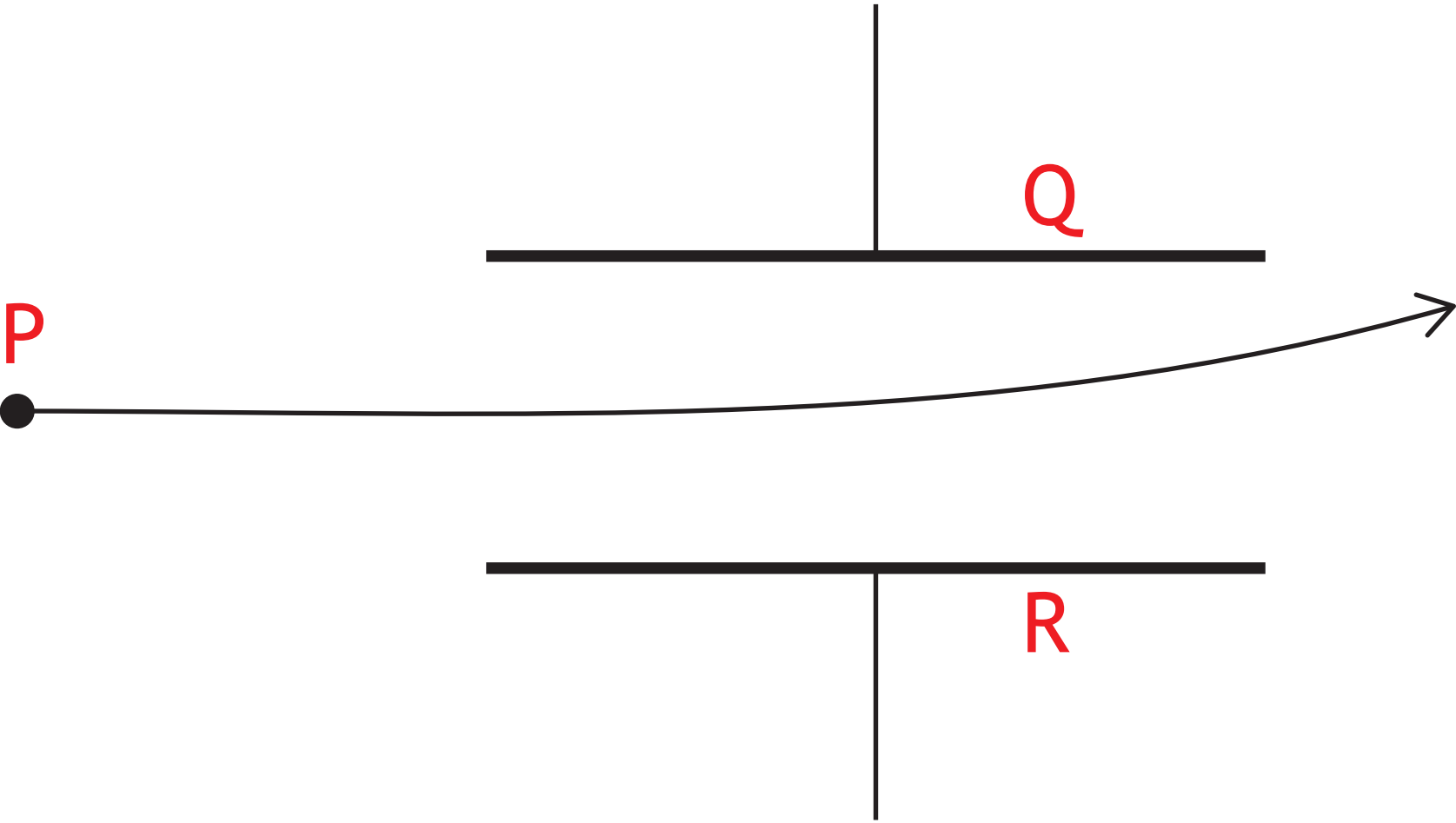
- I The Big Bang Theory is a theory about the origin of the Universe.
- II The Universe is approximately 14 million years old.
- III The Universe is expanding.

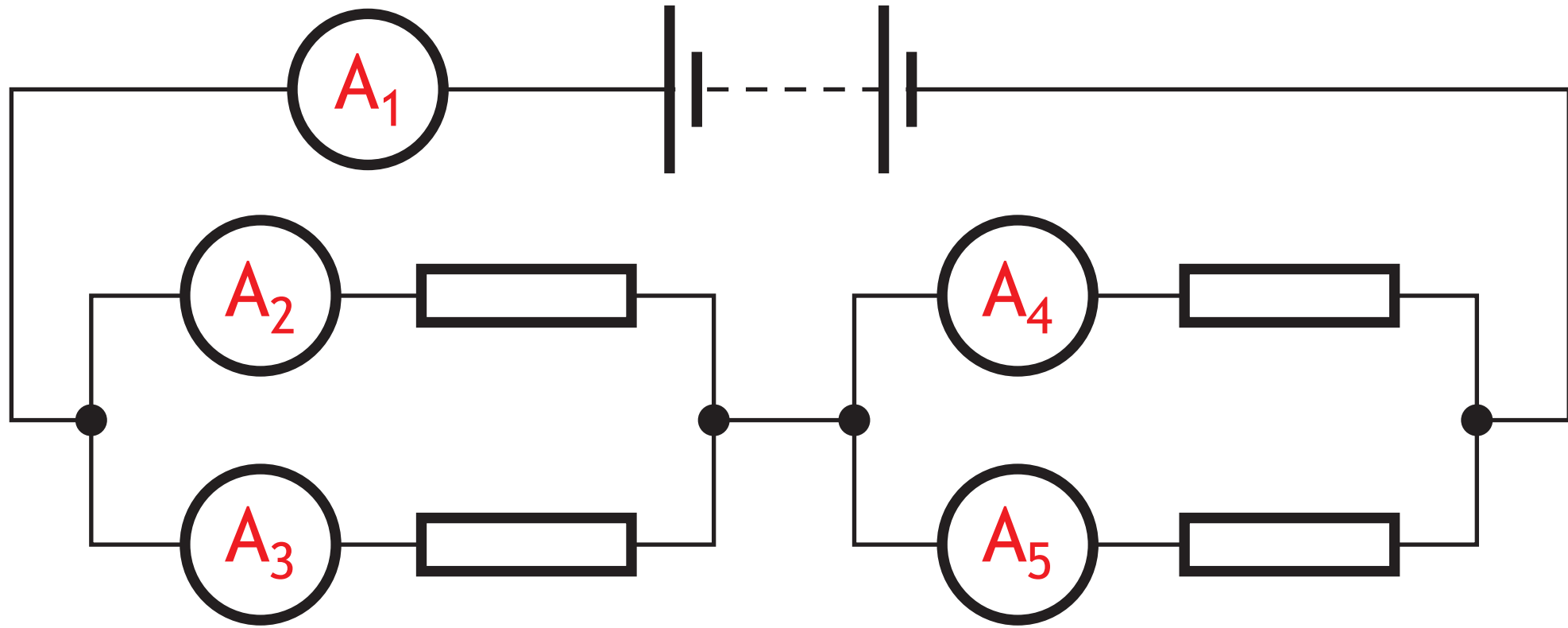
Which of these statements is/are correct?

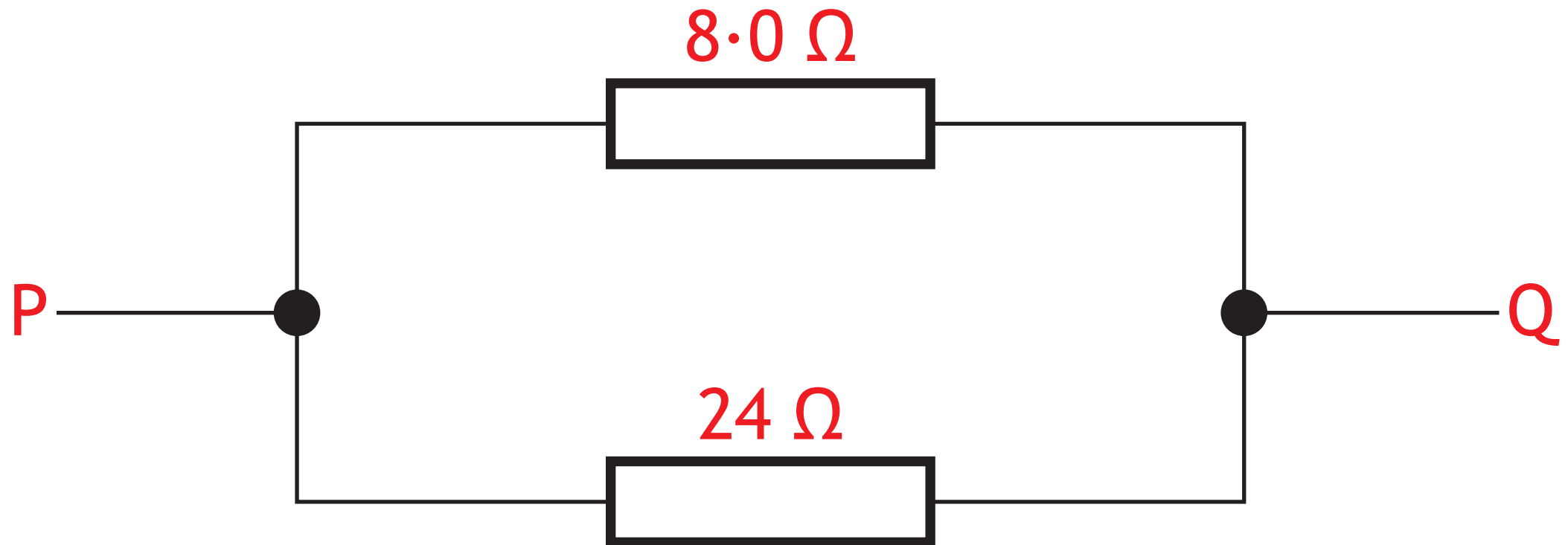
- A I only
- B II only
- C I and II only
- D I and III only
- E I, II and III.

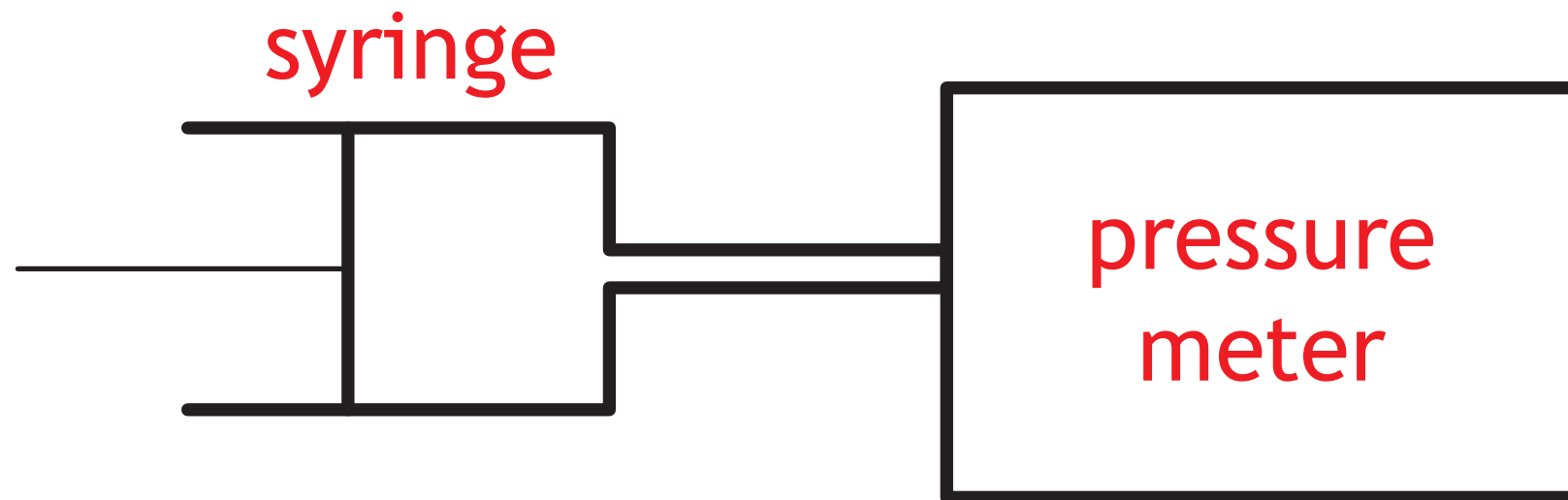
[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2]

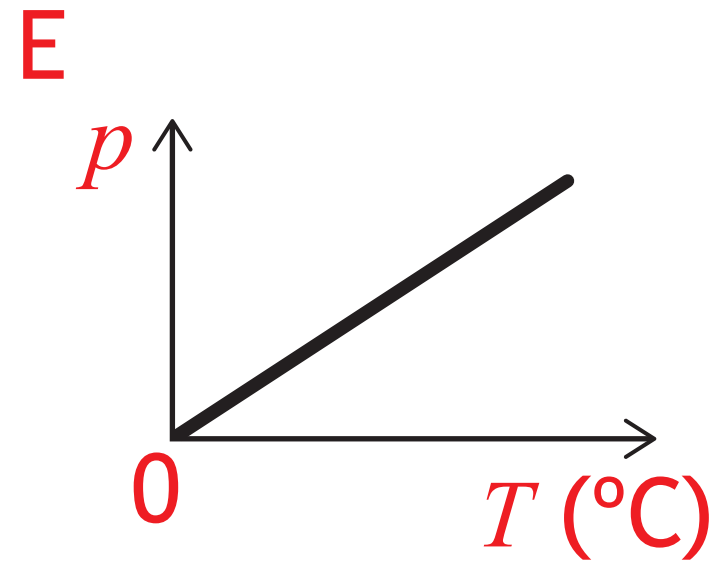
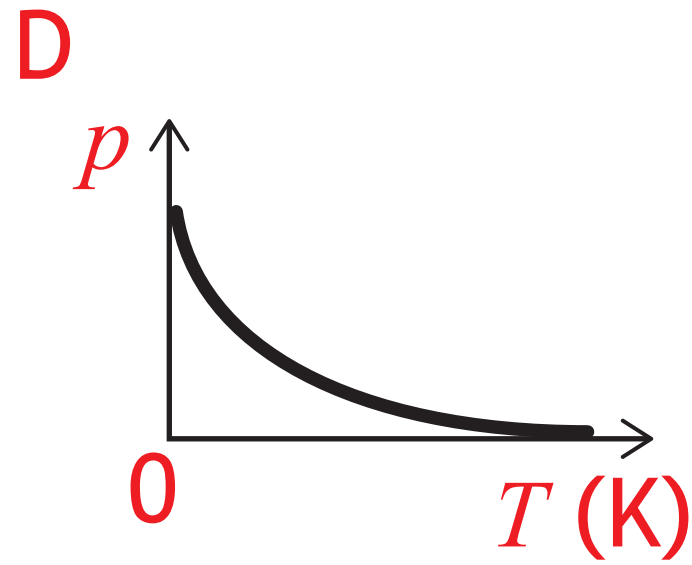
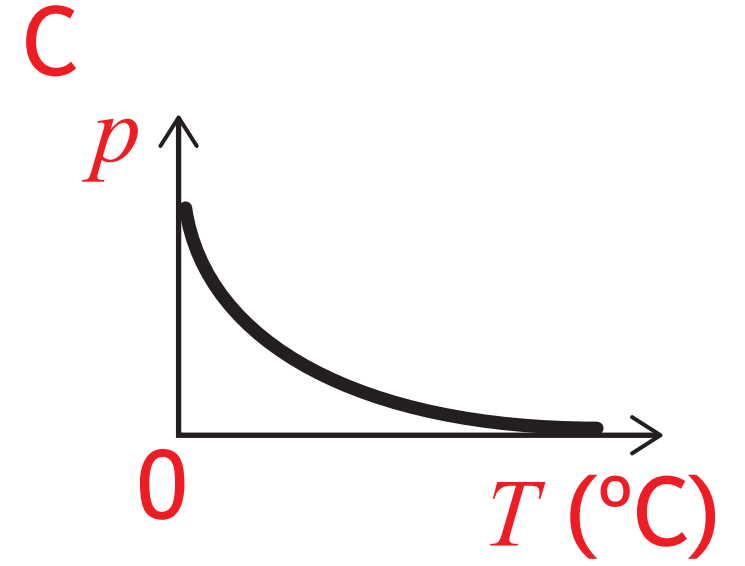
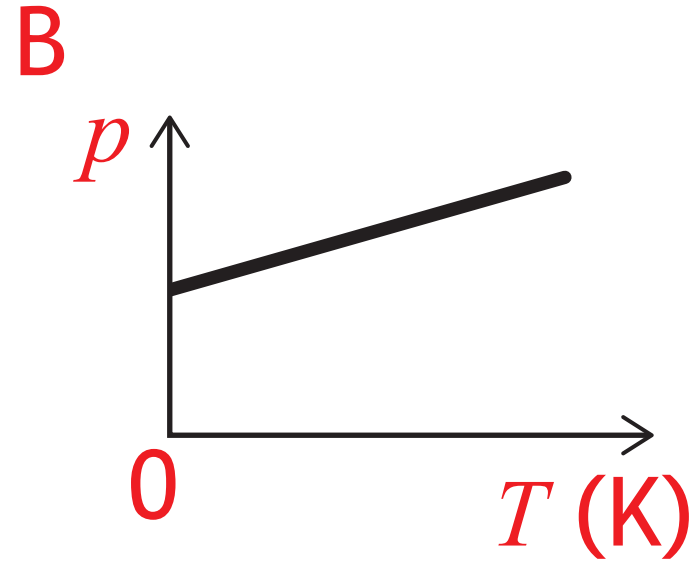
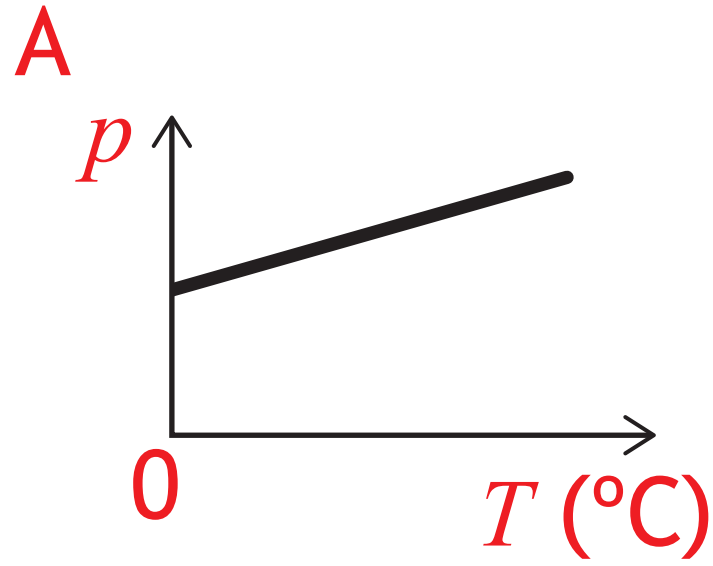


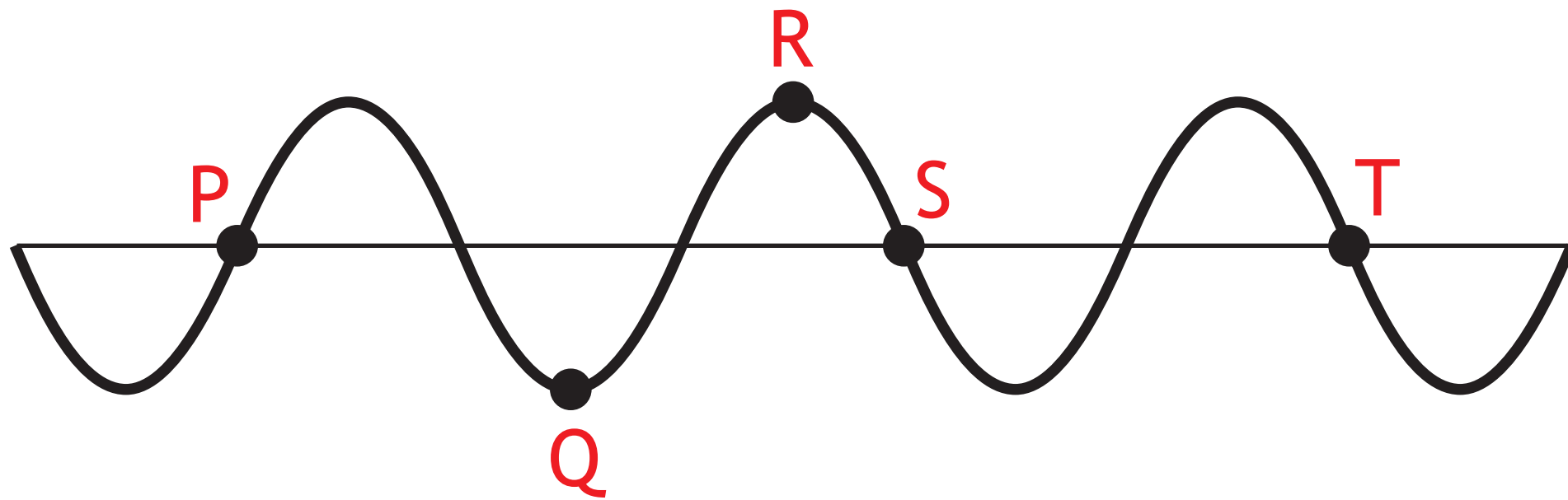


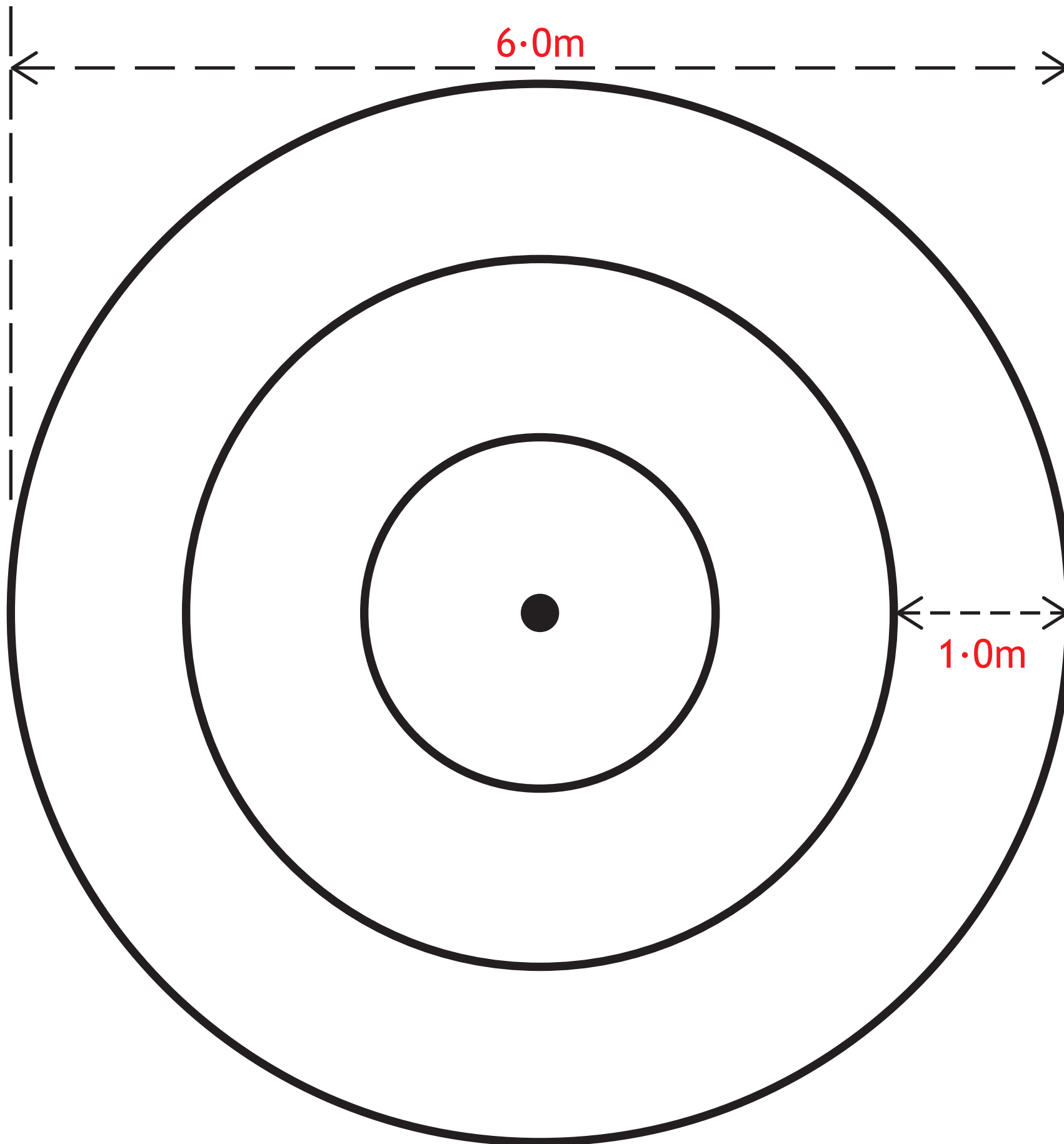


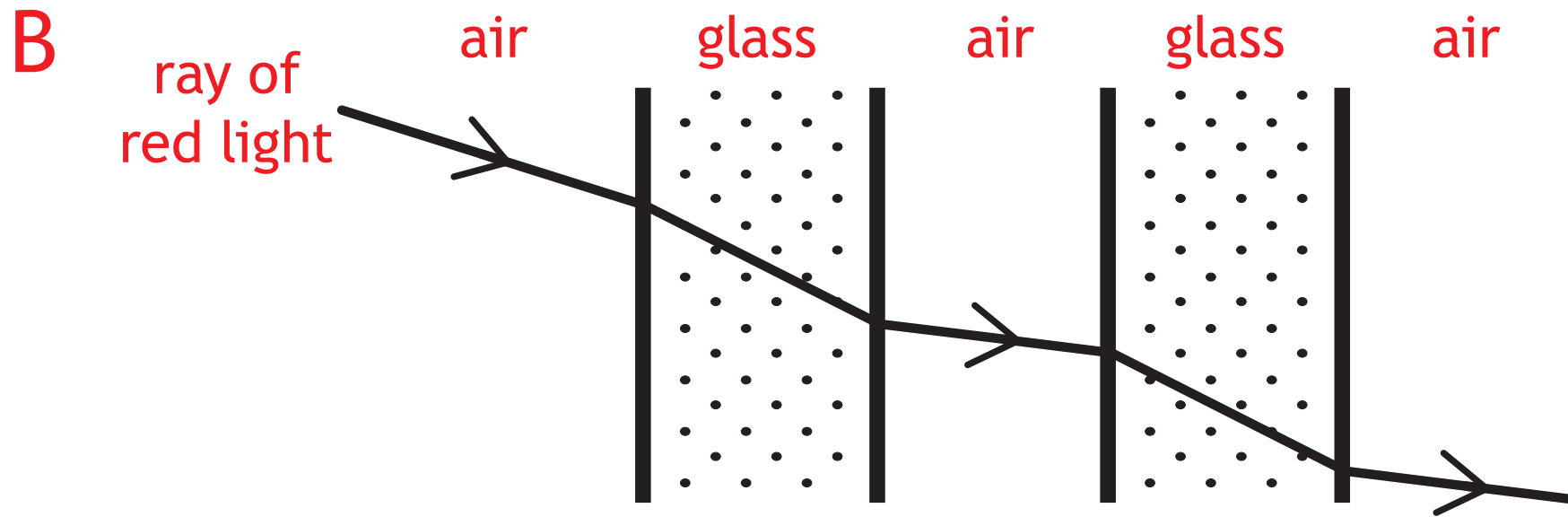
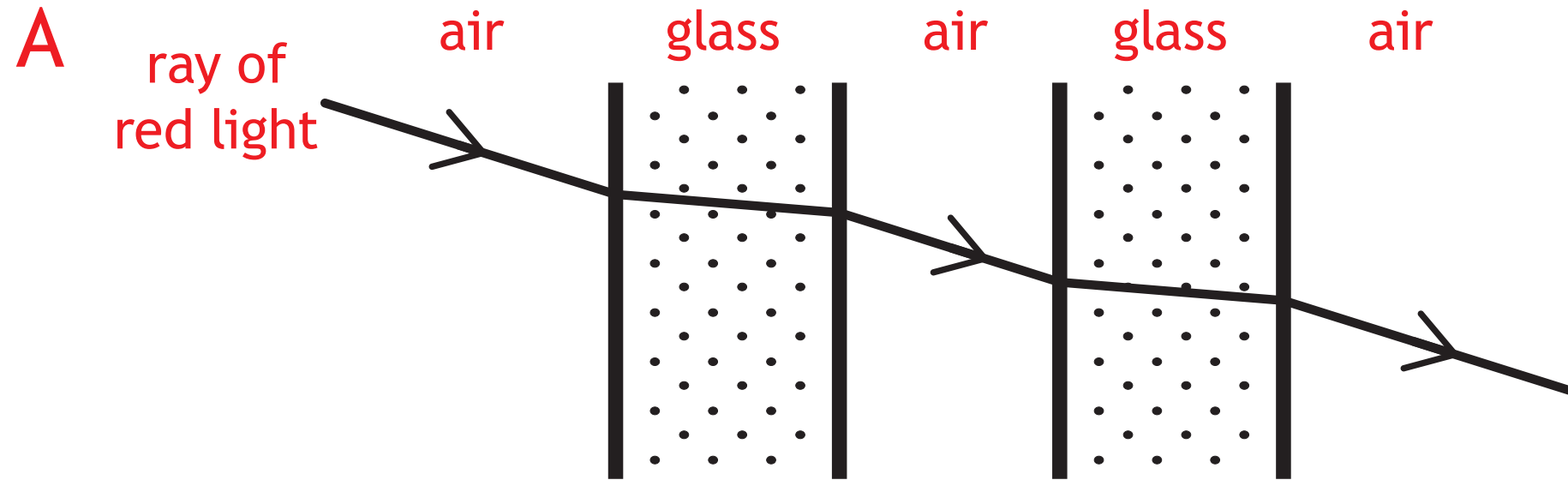


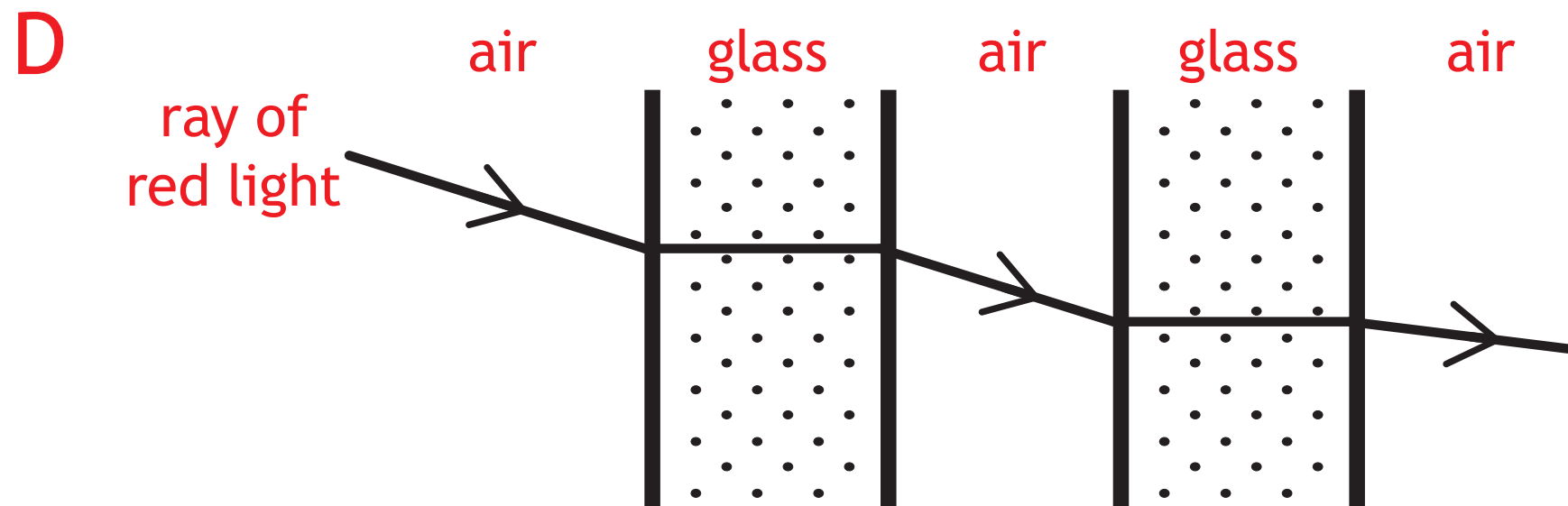
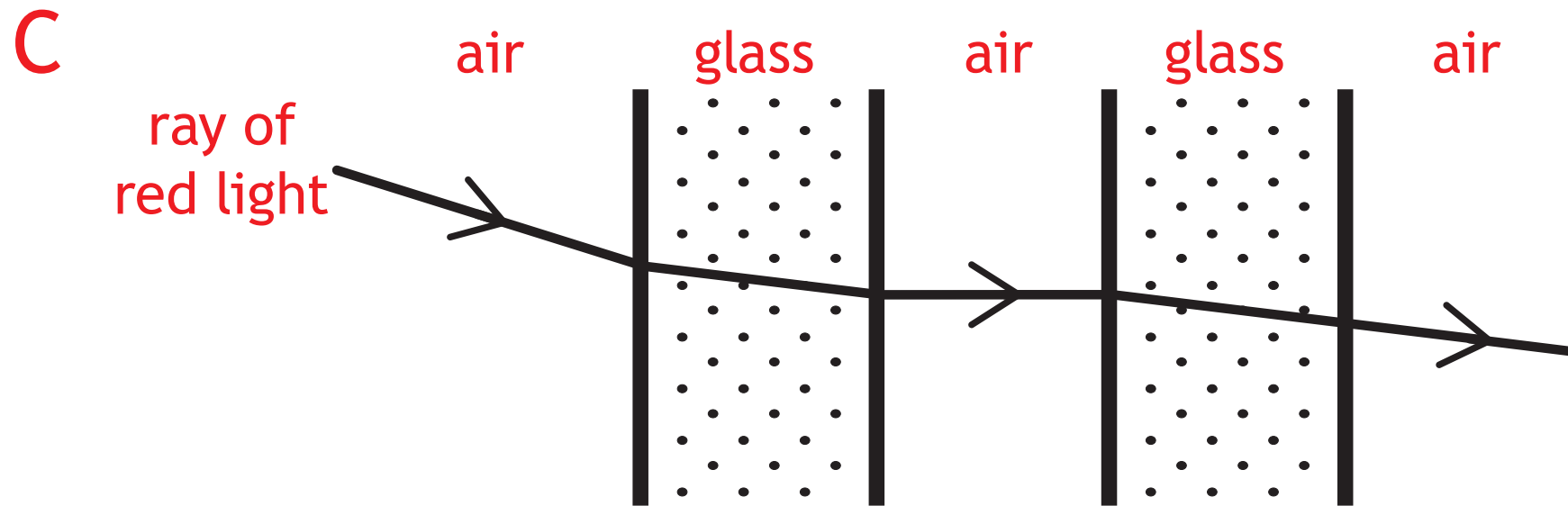


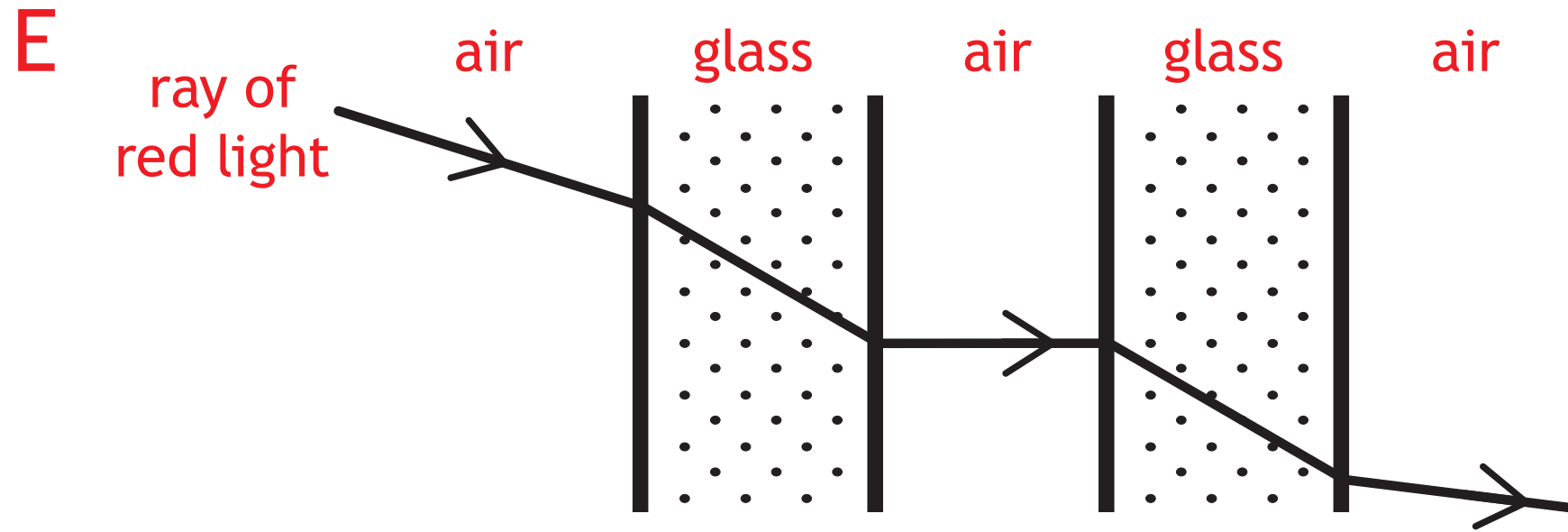


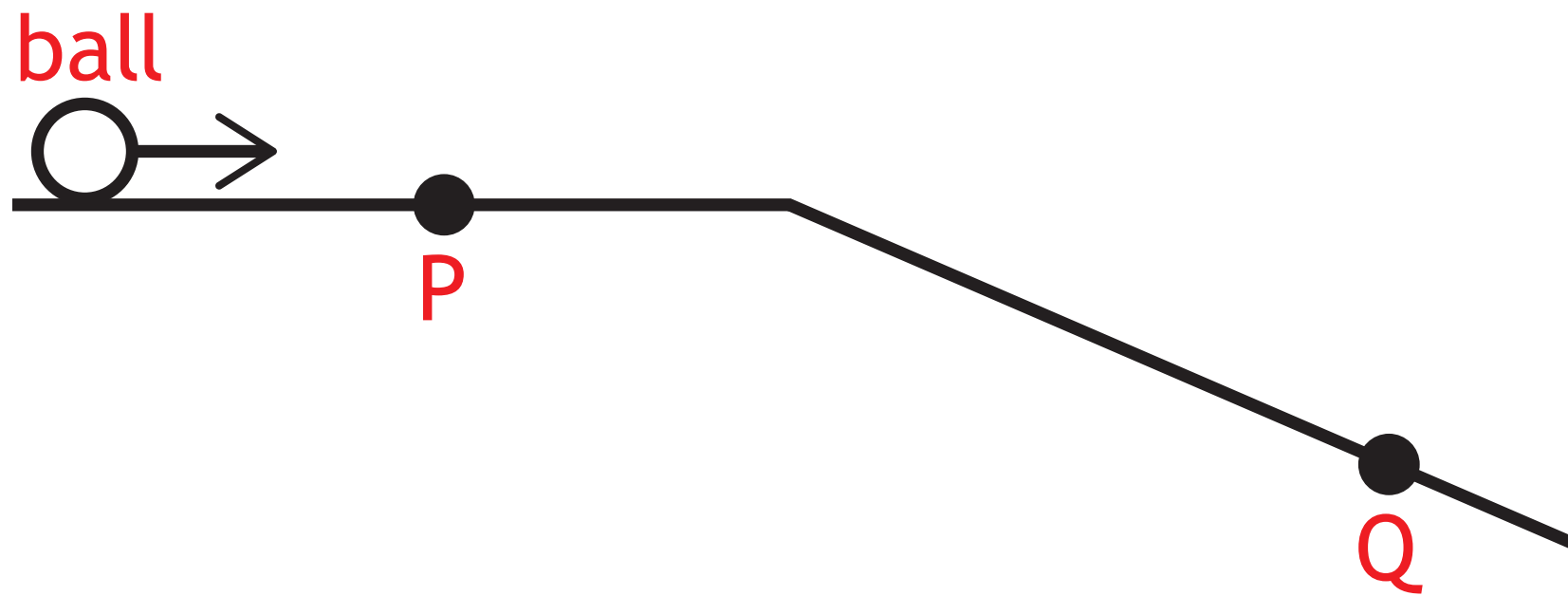












Q15 (Graphs A - E)

