N5

National Qualifications
SPECIMEN ONLY

SQ35/N5/01

Physics
Section 1—Questions

Date — Not applicable

Duration — 2 hours

Instructions for completion of Section 1 are given on Page two of the question paper SQ35/N5/02.

Record your answers on the grid on Page three of your answer booklet

Do NOT write in this booklet.

Before leaving the examination room you must give your answer booklet to the Invigilator. If you do not, you may lose at the marks for this paper.

Speed of light in materials

Material	Speed in m s^{-1}
Air	$3 \cdot 0 \times 10^8$
Carbon dioxide	$3 \cdot 0 \times 10^8$
Diamond	$1 \cdot 2 \times 10^8$
Glass	$2 \cdot 0 \times 10^8$
Glycerol	$2 \cdot 1 \times 10^8$
Water	$2 \cdot 3 \times 10^8$

Gravitational field strengths

	Gravitational field strength on the surface in N kg^{-1}
Earth	9·8
Jupiter	23
Mars	3·7
Mercury	3·7
Moon	1·6
Neptune	11
Saturn	9·0
Sun	270
Uranus	8·7
Venus	8·9

Specific latent heat of fusion of materials

Material	Specific latent heat of fusion in J kg^{-1}
Alcohol	$0 \cdot 99 \times 10^5$
Aluminium	$3 \cdot 95 \times 10^5$
Carbon Dioxide	$1 \cdot 80 \times 10^5$
Copper	$2 \cdot 05 \times 10^5$
Iron	$2 \cdot 67 \times 10^5$
Lead	$0 \cdot 25 \times 10^5$
Water	$3 \cdot 34 \times 10^5$

Specific latent heat of vaporisation of materials

Material	Specific latent heat of vaporisation in J kg^{-1}
Alcohol	$11 \cdot 2 \times 10^5$
Carbon Dioxide	$3 \cdot 77 \times 10^5$
Glycerol	$8 \cdot 30 \times 10^5$
Turpentine	$2 \cdot 90 \times 10^5$
Water	$22 \cdot 6 \times 10^5$

Speed of sound in materials

Material	Speed in m s^{-1}
Aluminium	5200
Air	340
Bone	4100
Carbon dioxide	270
Glycerol	1900
Muscle	1600
Steel	5200
Tissue	1500
Water	1500

Specific heat capacity of materials

Material	Specific heat capacity in J kg^{-1} °C^{-1}
Alcohol	2350
Aluminium	902
Copper	386
Glass	500
Ice	2100
Iron	480
Lead	128
Oil	2130
Water	4180

Melting and boiling points of materials

Material	Melting point in °C	Boiling point in °C
Alcohol	−98	65
Aluminium	660	2470
Copper	1077	2567
Glycerol	18	290
Lead	328	1737
Iron	1537	2737

Radiation weighting factors

Type of radiation	Radiation weighting factor
alpha	20
beta	1
fast neutrons	10
gamma	1
slow neutrons	3

1. 1 volt is equivalent to

   A   1 ampere per watt

   B   1 coulomb per second

   C   1 joule per coulomb

   D   1 joule per second

   E   1 watt per second.

2. A conductor carries a current of $4 \cdot 0$ mA for 250 s.

   The total charge passing a point in the conductor is

   A $1 \cdot 6 \times 10^{-5}$ C

   B $1 \cdot 0$ C

   C $62 \cdot 5$ C

   D $1 \cdot 0 \times 10^3$ C

   E $6 \cdot 25 \times 10^4$ C.

3. A ball is released from rest and allowed to roll down a curved track as shown.
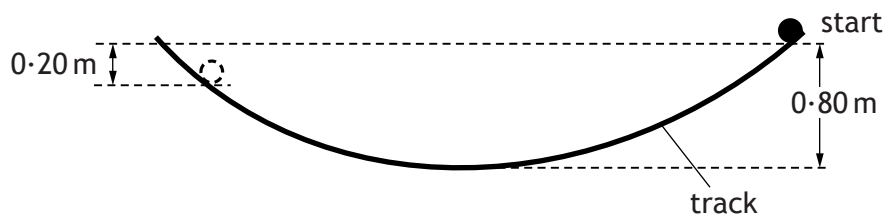
   The mass of the ball is $0 \cdot 50$ kg.

   The maximum height reached on the opposite side of the track is $0 \cdot 20$ m lower than the height of the starting point.

   The amount of energy lost is

   A $0 \cdot 080$ J

   B $0 \cdot 10$ J

   C $0 \cdot 98$ J

   D $2 \cdot 9$ J

   E $3 \cdot 9$ J.

4. In the circuit shown, the current in each resistor is different.
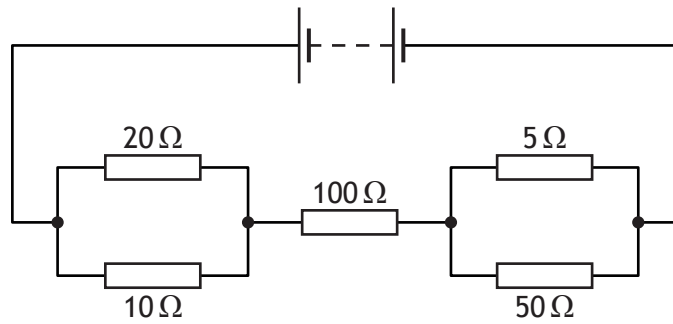
In which resistor is the current smallest?
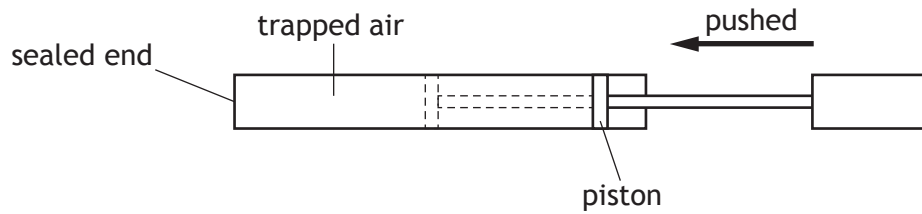
A   5 Ω

B   10 Ω

C   20 Ω

D   50 Ω

E   100 Ω

5. Three resistors are connected as shown.
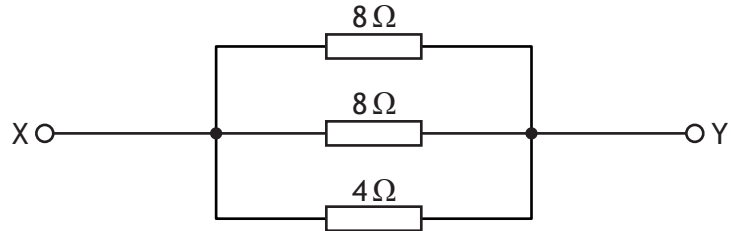
The resistance between X and Y is

A   0·08 Ω

B   0·5 Ω

C   2 Ω

D   13 Ω

E   20 Ω.

**6.** A bicycle pump is sealed at one end and the piston pushed until the pressure of the trapped air increases to $4 \cdot 00 \times 10^5$ Pa.
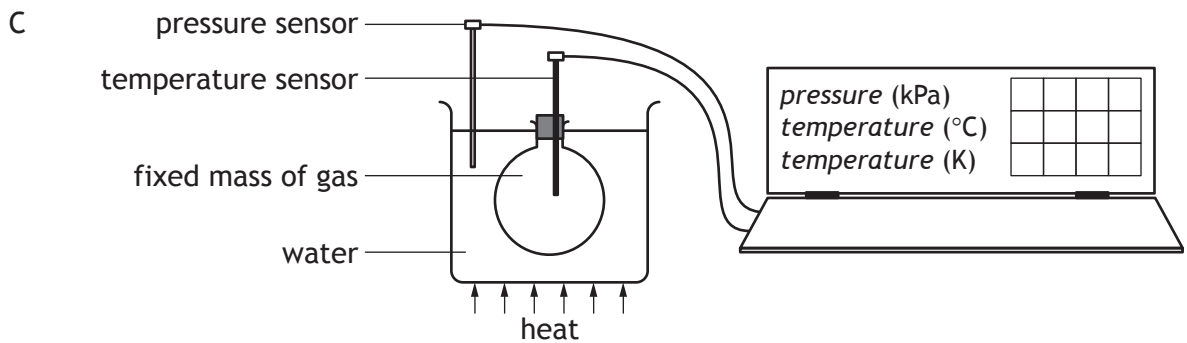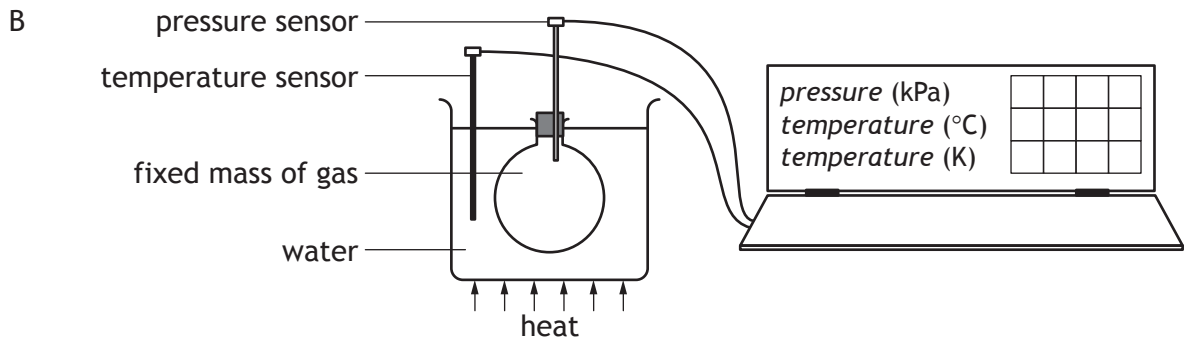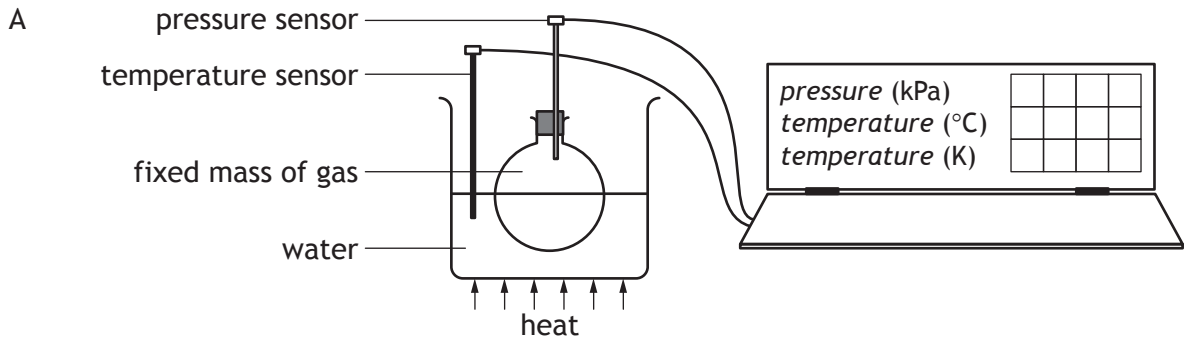

The area of the piston compressing the air is $5 \cdot 00 \times 10^{-4}\,m^2$.

The force that the trapped air exerts on the piston is

A $1 \cdot 25 \times 10^{-9}\,N$

B $8 \cdot 00 \times 10^{-1}\,N$

C $2 \cdot 00 \times 10^2\,N$

D $8 \cdot 00 \times 10^8\,N$

E $2 \cdot 00 \times 10^{10}\,N$.

7. Which of the following diagrams shows the best method for an experiment to investigate the relationship between pressure and temperature for a fixed mass of gas?
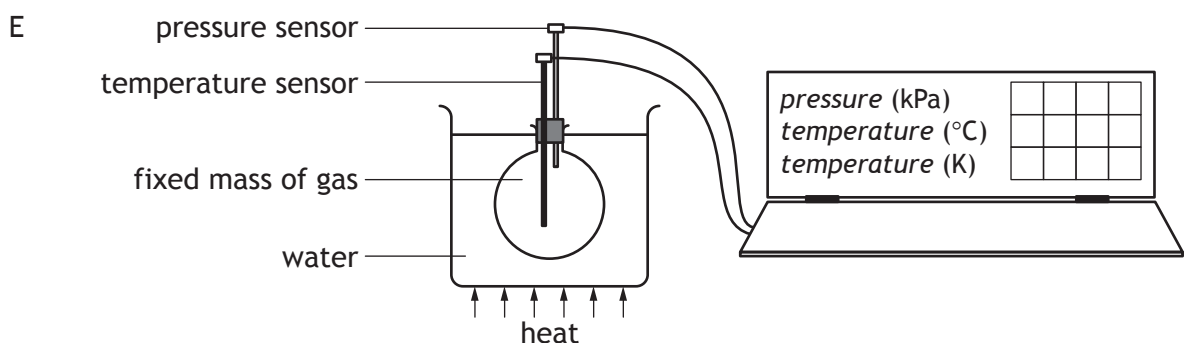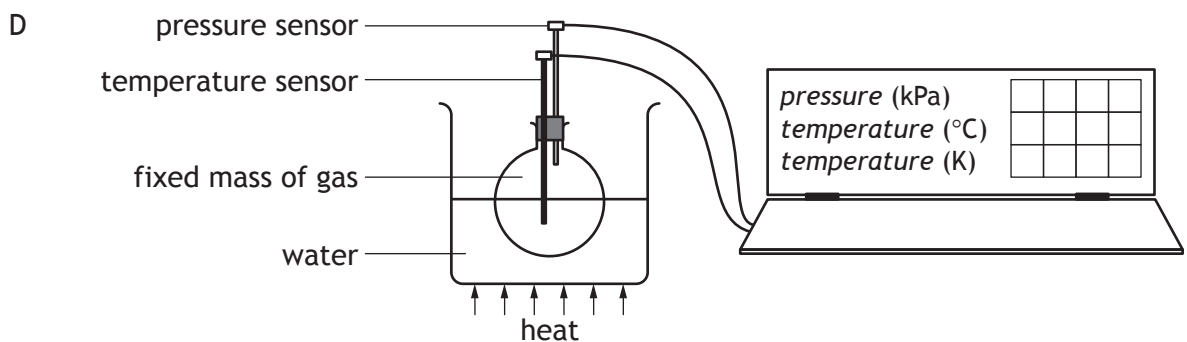
8. A fixed mass of gas is trapped inside a sealed container. The volume of the gas is slowly changed. The temperature of the gas remains constant.

Which graph shows how the pressure p of the gas varies with the volume V?

A

B

C

D

E
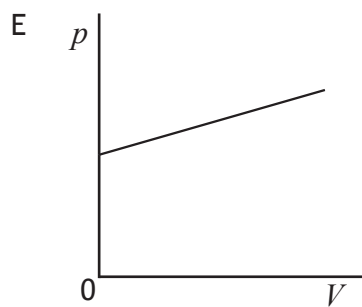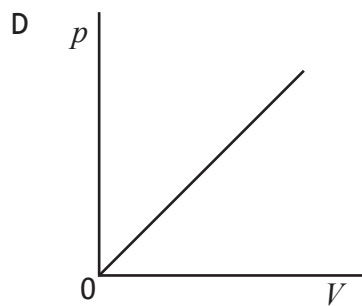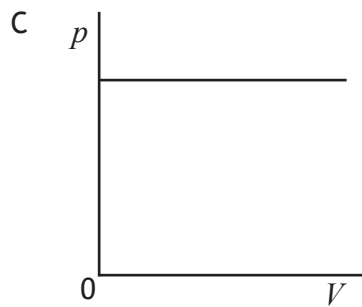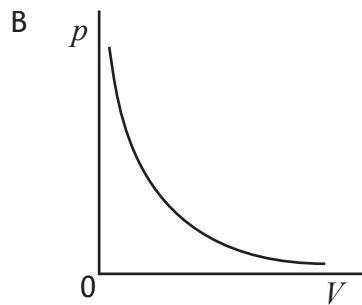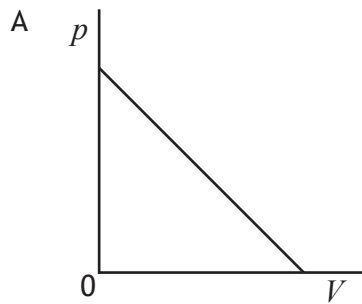
9. A student writes the following statements about electromagnetic waves.

   I Electromagnetic waves all travel at the same speed in air.

  II Electromagnetic waves all have the same frequency.

 III Electromagnetic waves all transfer energy.

Which of these statements is/are correct?

A   I only

B   II only

C   I and III only

D   II and III only

E   I, II and III

10. A satellite orbiting the Earth transmits television signals to a receiver.
The signals take a time of 150 ms to reach the receiver.
The distance between the satellite and the receiver is

A $2{\cdot}0 \times 10^6$ m

B $2{\cdot}25 \times 10^7$ m

C $4{\cdot}5 \times 10^7$ m

D $2{\cdot}0 \times 10^9$ m

E $4{\cdot}5 \times 10^{10}$ m.

11. A wave machine in a swimming pool generates 15 waves per minute.
The wavelength of these waves is $2{\cdot}0$ m.
The frequency of the waves is

A $0{\cdot}25$ Hz

B $0{\cdot}50$ Hz

C $4{\cdot}0$ Hz

D   15 Hz

E   30 Hz.

12. For a ray of light travelling from air into glass, which of the following statements is/are correct?

   I The speed of light always changes.

  II The speed of light sometimes changes.

 III The direction of light always changes.

 IV The direction of light sometimes changes.

A   I only

B   III only

C   I and III only

D   I and IV only

E   II and IV

13. A ray of red light is incident on a glass block as shown.
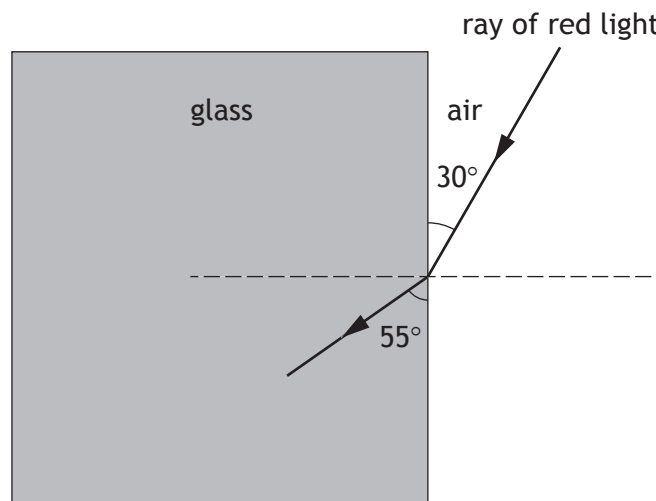
Which row in the table shows the values of the angle of incidence and angle of refraction?

	Angle of incidence	Angle of refraction
A	35°	60°
B	30°	55°
C	30°	35°
D	60°	55°
E	60°	35°

14. A student writes the following statements about the activity of a radioactive source.

    I The activity decreases with time.

    II The activity is measured in becquerels.

    III The activity is the number of decays per second.

Which of these statements is/are correct?

A   I only

B   II only

C   I and II only

D   II and III only

E   I, II and III

15. A worker in a nuclear power station is exposed to $3 \cdot 0 \, mGy$ of gamma radiation and $0 \cdot 50 \, mGy$ of fast neutrons.

The radiation weighting factor for gamma radiation is 1 and for fast neutrons is 10.

The total equivalent dose, in mSv, received by the worker is

A $3 \cdot 50$

B $8 \cdot 00$

C $30 \cdot 5$

D $35 \cdot 0$

E $38 \cdot 5$.

16. Which of the following contains two scalar quantities?

A   Force and mass

B   Weight and mass

C   Displacement and speed

D   Distance and speed

E   Displacement and velocity

17. A student sets up the apparatus as shown.
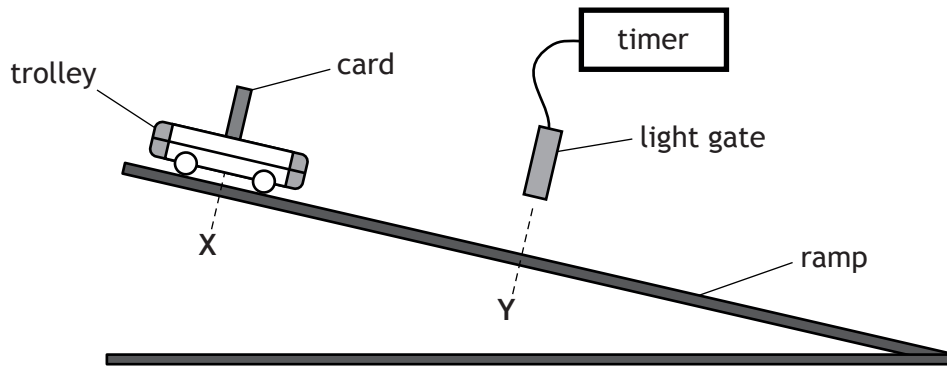
The trolley is released from X and moves down the ramp.

The following measurements are recorded.

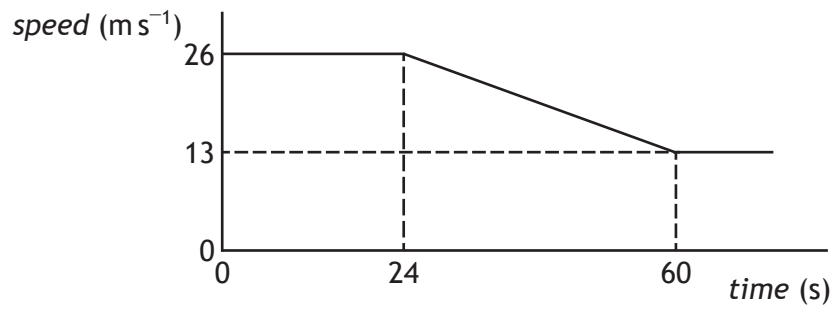time for card to pass through light gate = 0·08 s

distance from X to Y = 0·5 m

length of card = 40 mm

The instantaneous speed of the trolley at Y is

A   0·5 m s^{-1}

B   1·6 m s^{-1}

C   2·0 m s^{-1}

D   3·2 m s^{-1}

E   6·3 m s^{-1}.

18. As a car approaches a village the driver applies the brakes. The speed-time graph of the car's motion is shown.

speed (m s^{-1})

26

13

0

0

24

60

time (s)

The brakes are applied for

A   13 s

B   20 s

C   24 s

D   36 s

E   60 s.

19. The Mars Curiosity Rover has a mass of 900 kg.

Which row of the table gives the mass and weight of the Rover on Mars?

	Mass (kg)	Weight (N)
A	243	243
B	243	900
C	900	900
D	900	3330
E	900	8820

20. An aircraft engine exerts a force on the air.

Which of the following completes the "Newton pair" of forces?

A   The force of the air on the aircraft engine

B   The force of friction between the aircraft engine and the air

C   The force of friction between the aircraft and the aircraft engine

D   The force of the Earth on the aircraft engine

E   The force of the aircraft engine on the Earth

**[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2
OF YOUR QUESTION AND ANSWER BOOKLET]**