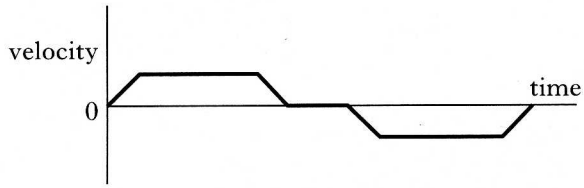


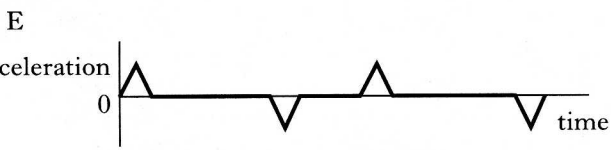
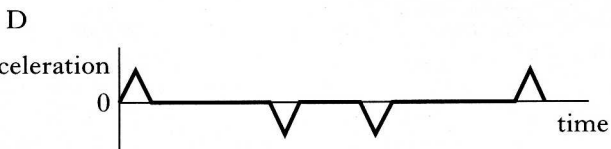
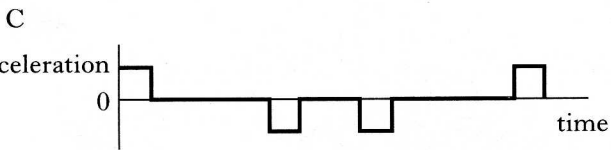
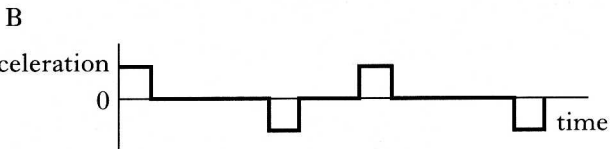
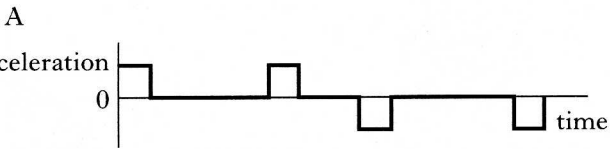
SECTION A

Answer questions 1–30 on the answer sheet.

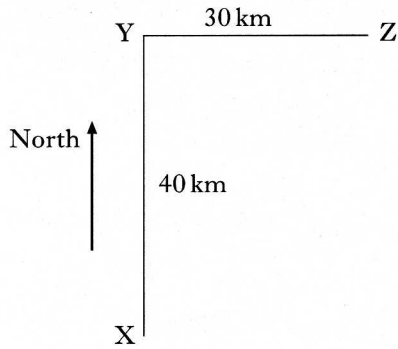
1. A lift in a hotel makes a return journey from the ground floor to the top floor and then back again. The corresponding velocity-time graph is shown below.



Which of the following shows the acceleration-time graph for the same journey?



2. A car travels from X to Y and then it travels from Y to Z, as shown in the following diagram.



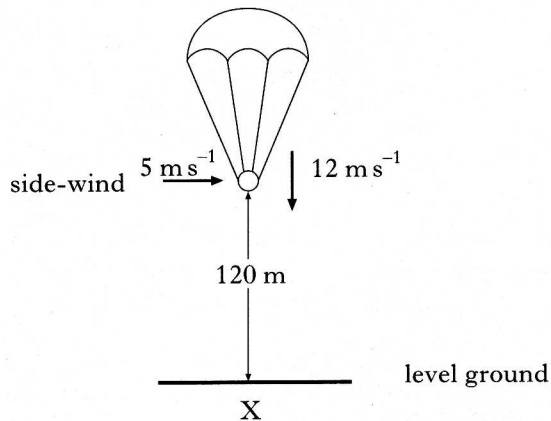
X to Y takes a time of one hour. Y to Z also takes one hour. Which of the following is a correct list of the magnitudes of the final displacement, average speed and average velocity for the complete journey?

	<i>Displacement</i> (km)	<i>Average speed</i> (km hr ⁻¹)	<i>Average velocity</i> (km hr ⁻¹)
A	50	35	35
B	70	35	25
C	50	35	25
D	70	70	50
E	50	70	25

[Turn over

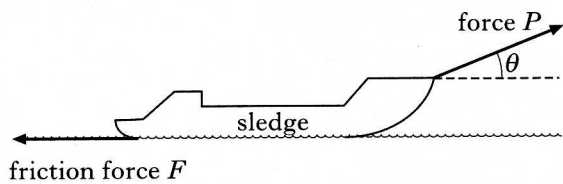
3. An object attached to a parachute falls from a helicopter which is hovering at a height of 120 m above point X.

The object falls with a constant vertical component of velocity of value 12 m s^{-1} . A steady side-wind gives the object a constant horizontal component of velocity of value 5 m s^{-1} .



How far from point X does the object hit the ground?

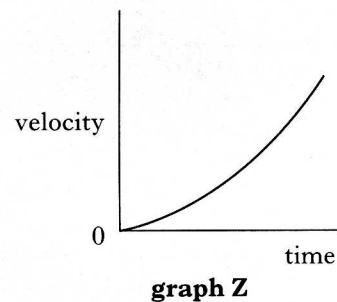
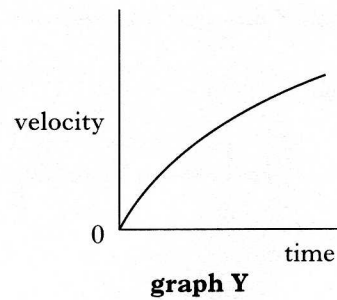
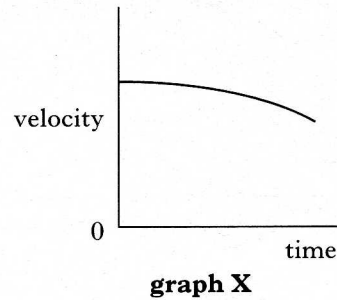
- A 24 m
 B 50 m
 C 60 m
 D 120 m
 E 150 m
4. A sledge is dragged at a **constant velocity** along the snow against a horizontal frictional force F . The rope pulling the sledge is at an angle of θ to the horizontal, as shown.



When the sledge is moving horizontally with a constant velocity, the force P pulling the rope is equal to

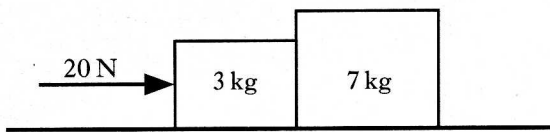
- A F
 B $F \cos \theta$
 C $F \sin \theta$
 D $\frac{F}{\cos \theta}$
 E $\frac{F}{\sin \theta}$

5. A ball is thrown horizontally over the edge of a cliff. When air resistance **is taken into account**, which graphs represent the horizontal and vertical components of the velocity of the ball during its flight?



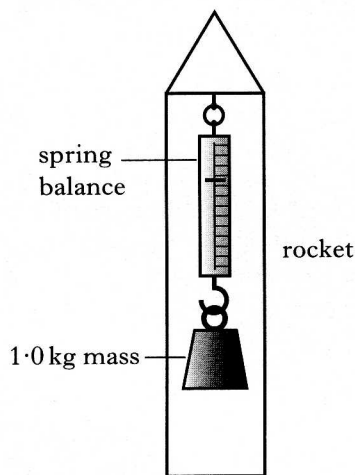
	Horizontal component of velocity	Vertical component of velocity
A	graph X	graph X
B	graph X	graph Y
C	graph Y	graph X
D	graph Y	graph Z
E	graph Z	graph Z

6. A horizontal force of 20 N is applied as shown to two wooden blocks of masses 3 kg and 7 kg. The blocks are in contact with each other on a frictionless horizontal surface.



What is the size of the horizontal force acting on the 7 kg block?

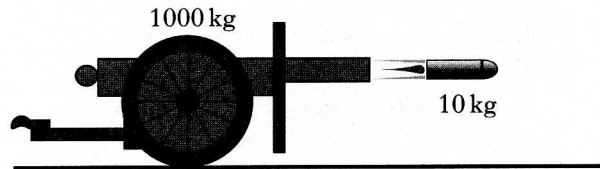
- A 20 N
 B 14 N
 C 10 N
 D 8 N
 E 6 N
7. An object of mass 1.0 kg hangs from a spring balance which is suspended on the inside of a small rocket, as shown below.



What is the reading on the balance when the rocket is accelerating upwards from the Earth's surface at 2.0 m s^{-2} ? Use $g = 9.8 \text{ m s}^{-2}$.

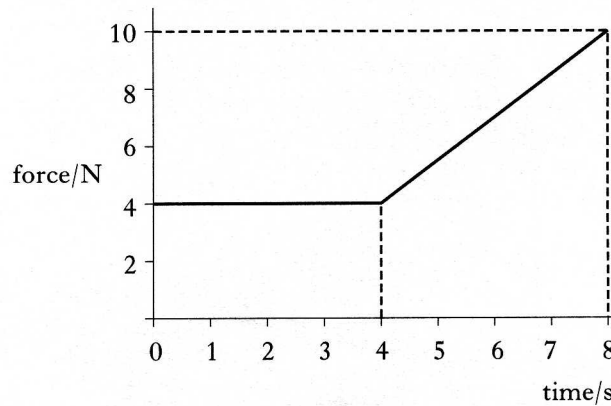
- A 0 N
 B 2.0 N
 C 7.8 N
 D 9.8 N
 E 11.8 N

8. A field-gun of mass 1000 kg fires a shell of mass 10 kg with a velocity of 100 m s^{-1} East.



The velocity of the field-gun just after firing the shell is

- A 0 m s^{-1}
 B 1 m s^{-1} East
 C 1 m s^{-1} West
 D 10 m s^{-1} East
 E 10 m s^{-1} West.
9. The graph below shows the force which acts on an object over a time interval of 8 seconds.



The momentum gained by the object during this 8 seconds is

- A 12 N s
 B 32 N s
 C 44 N s
 D 52 N s
 E 72 N s.

[Turn over

10. An aircraft cruises at an altitude at which the air pressure is 0.4×10^5 Pa. The inside of the aircraft cabin is maintained at a pressure of 1.0×10^5 Pa. The area of an external cabin door is 2 m^2 .

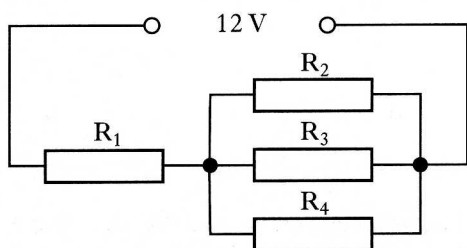
What is the outward force produced on this door by the pressures stated?

- A 0.3×10^5 N
- B 0.7×10^5 N
- C 1.2×10^5 N
- D 2.0×10^5 N
- E 2.8×10^5 N

11. The volt is equivalent to the

- A farad/coulomb
- B ampere/ohm
- C joule/ampere
- D joule/ohm
- E joule/coulomb.

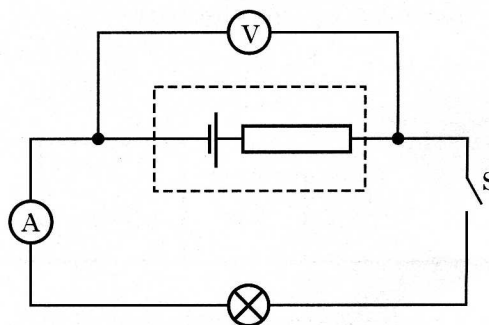
12. The diagram below illustrates a circuit in which the supply has an e.m.f. of 12 V and negligible internal resistance. Four load resistors, each of resistance $3 \text{ k}\Omega$, are connected in the circuit as shown.



Which line in the table below indicates the potential differences in volts that would exist across the resistors?

	<i>p.d. across</i> R_1	<i>p.d. across</i> R_2	<i>p.d. across</i> R_3	<i>p.d. across</i> R_4
A	3 V	3 V	3 V	3 V
B	6 V	6 V	6 V	6 V
C	3 V	9 V	9 V	9 V
D	9 V	3 V	3 V	3 V
E	9 V	1 V	1 V	1 V

13. The circuit below can be used to determine the e.m.f. and the internal resistance of a cell.



Ammeter and voltmeter readings are taken when switch S is open and again when it is closed. The results are as follows:

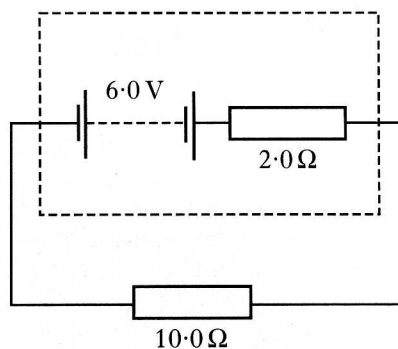
Switch S open: Current = zero : Voltage = V_1

Switch S closed: Current = I : Voltage = V_2

The e.m.f. of the cell is equal to

- A V_1
- B V_2
- C $V_1 - V_2$
- D $\frac{V_1}{I}$
- E $\frac{(V_2 - V_1)}{I}$

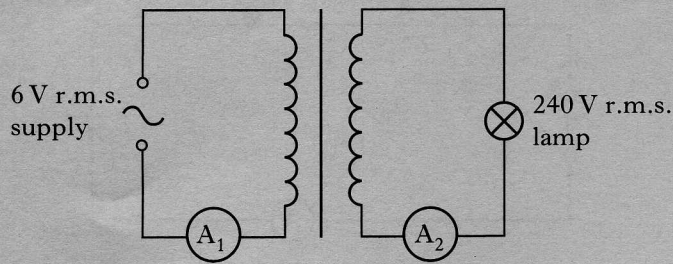
14. A battery has an e.m.f. of 6.0 V and an internal resistance of 2.0Ω . It is connected to a 10.0Ω resistor, as shown below.



The p.d. across the 10.0Ω resistor is

- A 1.0 V
- B 1.2 V
- C 4.8 V
- D 5.0 V
- E 6.0 V.

15. The step-up transformer shown below is used to light a mains lamp at its correct rating. The input voltage to the primary is 6 V r.m.s. and the voltage across the lamp is 240 V r.m.s.

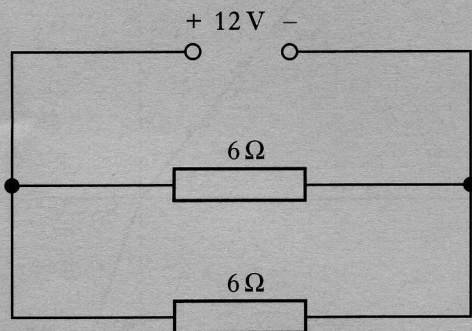


The a.c. ammeters A_1 and A_2 have negligible resistance.

The reading on A_1 is 5.0 A r.m.s. and the reading on A_2 is 0.1 A r.m.s.

The efficiency of the transformer is

- A 2.5%
 B 40%
 C 50%
 D 80%
 E 100%.
16. The circuit below shows two $6\ \Omega$ resistors connected in parallel to a 12 V d.c. supply of negligible resistance.



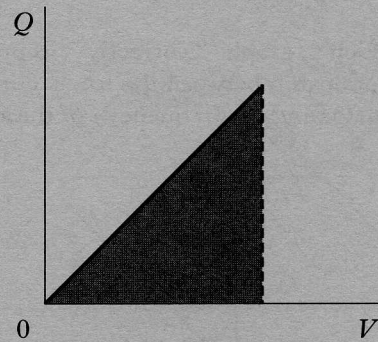
The total power developed in this circuit is

- A 12 W
 B 24 W
 C 48 W
 D 300 W
 E 1200 W.

17. An $8\ \mu\text{F}$ capacitor requires

- A $8\ \mu\text{C}$ to charge it to 1 V
 B $1\ \mu\text{C}$ to charge it to 8 V
 C $8\ \mu\text{C}$ to charge it to 8 V
 D 8 C to charge it to $8\ \mu\text{V}$
 E 1 C to charge it to $8\ \mu\text{V}$.

18. The following graph shows how the charge Q on a capacitor is related to the p.d. V applied across its plates.

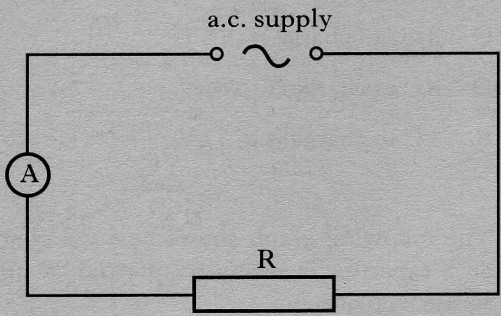


What does the shaded area under this graph represent?

- A The distance between the plates of the capacitor
 B The capacitance of the capacitor
 C The working voltage of the capacitor
 D The charge stored on the plates of the capacitor
 E The energy stored in the capacitor

[Turn over

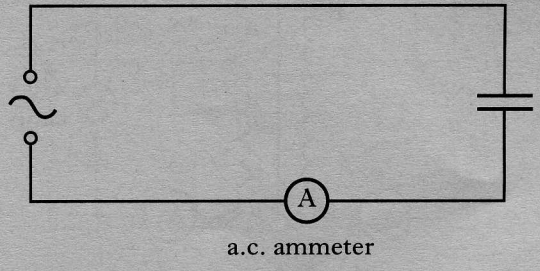
19. A resistor is connected in a circuit as shown. The output of the alternating supply can be varied in frequency but has a constant peak voltage.



Which graph correctly represents the relationship between the r.m.s. current I in the resistor and the frequency f of the supply?

- A
- B
- C
- D
- E

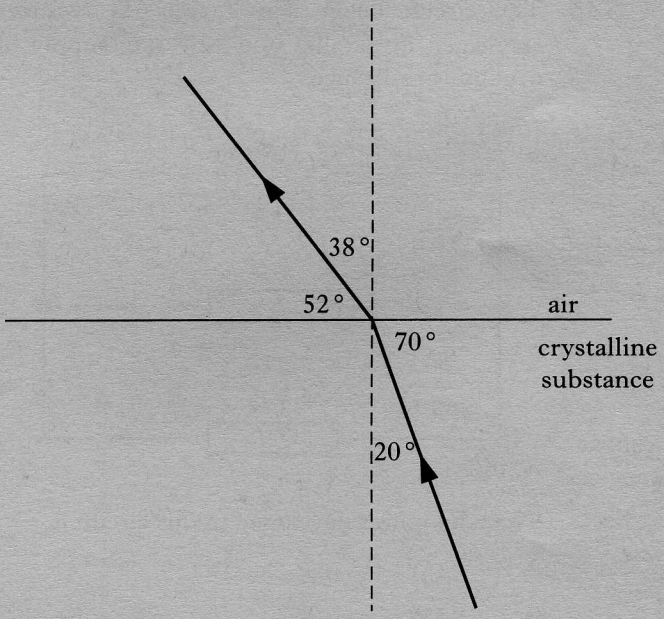
20. A capacitor is connected to a circuit as shown. The output of the alternating supply can be varied in frequency but has a constant peak voltage.



When the frequency of the output from the supply is steadily increased from 50 Hz to 5000 Hz, the reading on the a.c. ammeter will

- A remain constant
- B decrease steadily
- C increase steadily
- D increase then decrease
- E decrease then increase.

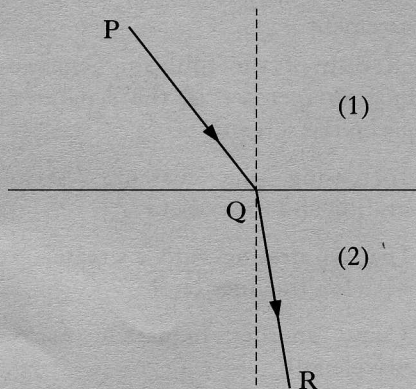
21. The diagram shows a ray of light going into air from a crystalline substance.



What is the refractive index of the crystalline substance?

- A 1.2
- B 1.3
- C 1.8
- D 1.9
- E 2.3

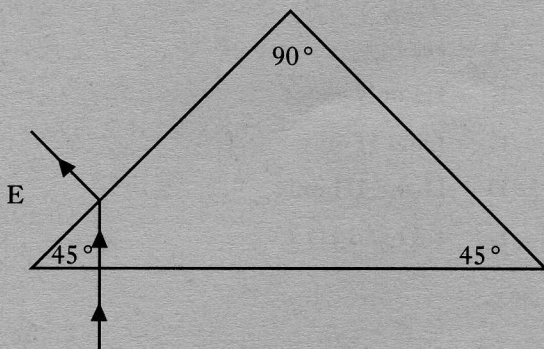
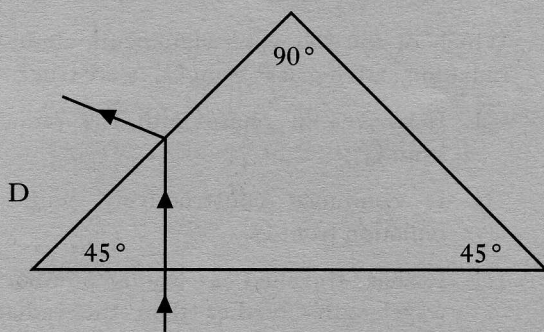
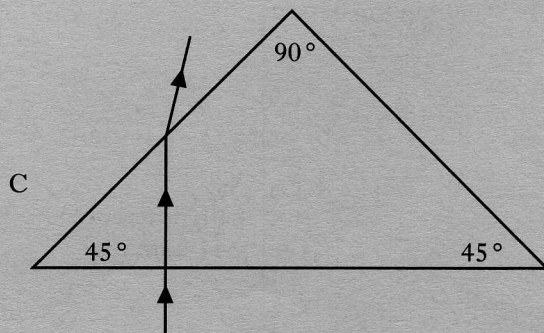
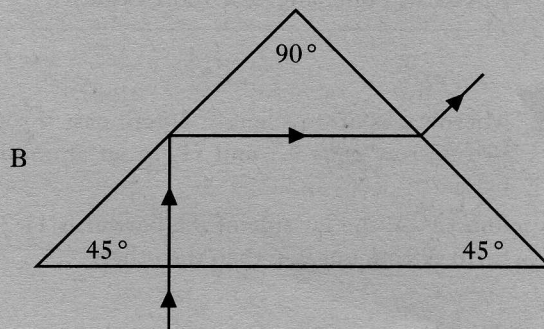
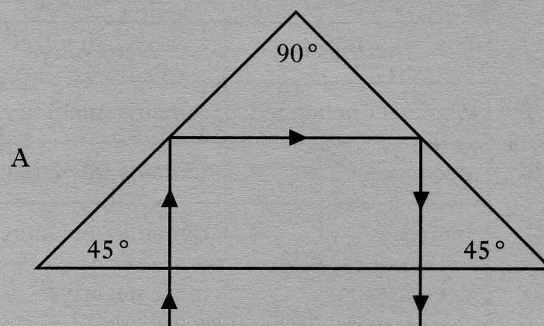
22. A ray of monochromatic light passing from medium (1) into medium (2) follows the path PQR.



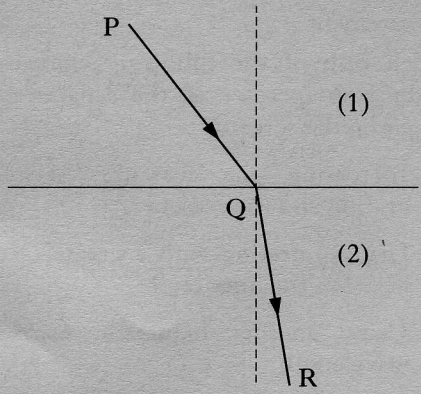
When the light passes from medium (1) to medium (2), its

- A frequency is increased
- B frequency is decreased
- C wavelength is unchanged
- D speed is increased
- E speed is decreased.

23. Which one of the following diagrams shows the correct path for a ray of light travelling from air into a glass prism whose angles are 45° , 90° and 45° ? The refractive index of the glass is 1.5.



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