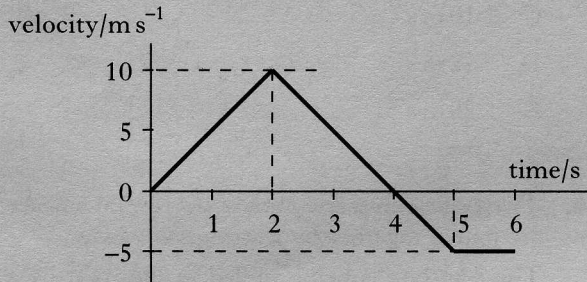


SECTION A

Answer questions 1–30 on the answer sheet.

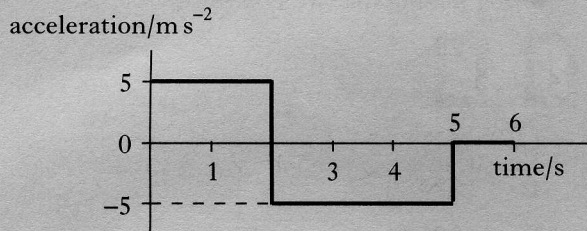
1. Which one of the following is a vector quantity?
- A Distance
 - B Time
 - C Speed
 - D Energy
 - E Weight

2. The velocity-time graph of the motion of an object starting from rest is shown below.



Which of the following statements about the motion of the object is/are true?

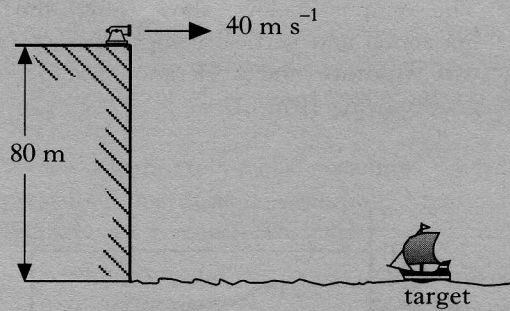
- I There is a change of direction of the object at 4 s.
- II The acceleration-time graph is of the form shown below.



- III The displacement of the object from the starting point is greatest at 6 s.

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

3. A cannonball is fired horizontally at 40 m s^{-1} from the top of a vertical cliff and it hits its target. The height of the cliff above the level of the sea is 80 m.

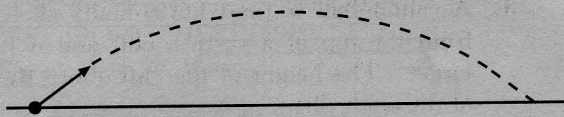


How far is the target from the foot of the cliff, if air resistance is negligible and the acceleration due to gravity is 10 m s^{-2} ?

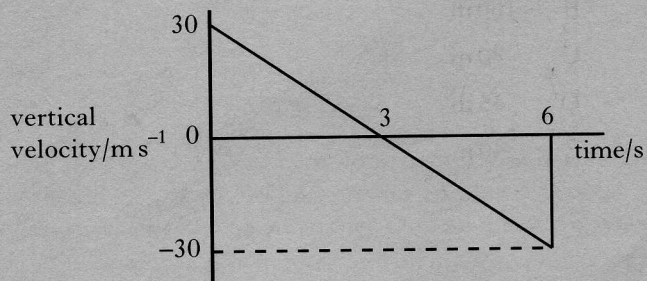
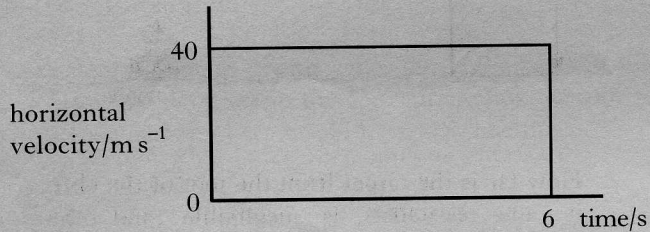
- A 320 m
- B 160 m
- C 80 m
- D 45 m
- E 40 m

[Turn over

4. A golfer strikes a golf ball which then moves off at an angle to the ground. The ball, following the path shown below, lands 6 s later.



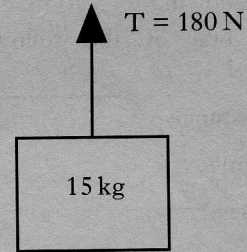
The graphs below show how the ball's horizontal and vertical components of velocity vary with time, the acceleration due to gravity being 10 m s^{-2} .



What is the speed of the ball just before it hits the ground?

- A 10 m s^{-1}
- B 30 m s^{-1}
- C 40 m s^{-1}
- D 50 m s^{-1}
- E 70 m s^{-1}

5. A tension force of 180 N is applied vertically upwards to a box of mass 15 kg .

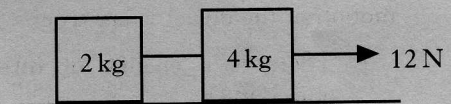


Assuming that the acceleration due to gravity is 10 m s^{-2} , the acceleration of the box is

- A 2 m s^{-2}
- B 8 m s^{-2}
- C 10 m s^{-2}
- D 12 m s^{-2}
- E 20 m s^{-2}

6. Two boxes on a frictionless horizontal surface are joined together by a string, as shown.

The 4 kg box is being pulled to the right by a constant horizontal force of 12 N .



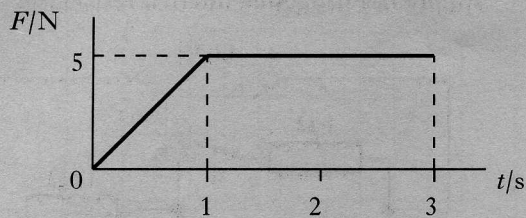
What is the value of the force of tension in the string joining the two boxes?

- A 2 N
- B 4 N
- C 6 N
- D 8 N
- E 12 N

7. The total mass of a motorcycle and rider is 250 kg . During braking, they are brought to rest from a speed of 15 m s^{-1} in a time of 10 s . The maximum energy which could be converted to heat by the brakes is

- A 3750 J
- B 28125 J
- C 37500 J
- D 56250 J
- E 375000 J

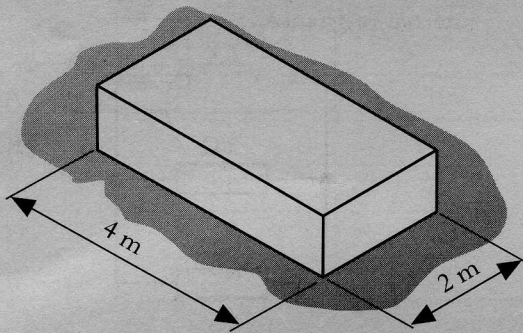
8. A model car of mass 3 kg, initially at rest, is acted upon by an unbalanced force F , as shown in the following force-time graph.



What is the momentum of the model car at time $t = 3$ s?

- A 0 kg m s^{-1}
 B 2.5 kg m s^{-1}
 C 5 kg m s^{-1}
 D 12.5 kg m s^{-1}
 E 15 kg m s^{-1}
9. A rectangular box of mass 10 kg is lying on a flat surface on a planet where the gravitational field strength is 4 N kg^{-1} .

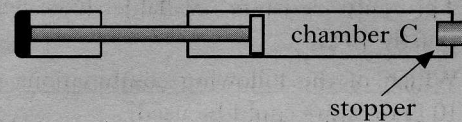
The base of the box measures 4 m by 2 m.



Which of the following statements is/are correct?

- I The weight of the box is 100 N.
 II The weight of the box is 40 N.
 III The pressure which the box exerts on the flat surface is 5 Pa.
- A I only
 B II only
 C III only
 D I and III only
 E II and III only

10. The end of a bicycle pump is sealed with a small rubber stopper. The air in chamber C is now trapped.



The plunger is then pushed in slowly, causing the air in the chamber C to be compressed. As a result of this, the pressure of the air increases.

Which of the following explain(s) why the pressure increases, assuming that the temperature remains constant?

- I The air molecules increase their average speed.
 II The air molecules are colliding more often with the walls of the chamber.
 III Each air molecule is striking the walls of the chamber with greater force.
- A II only
 B III only
 C I and II only
 D I and III only
 E I, II and III

11. An electron is accelerated from rest in an electron gun, across a potential difference of $2 \times 10^3 \text{ V}$.

The kinetic energy gained by the electron as it goes through the electron gun is

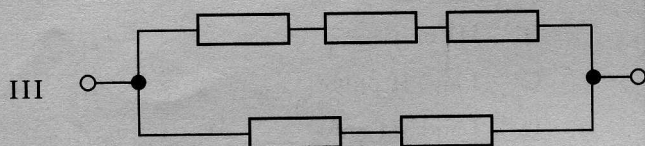
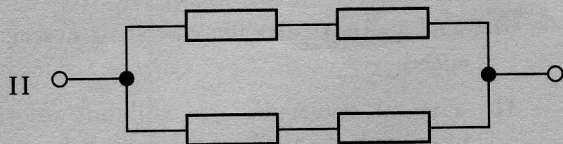
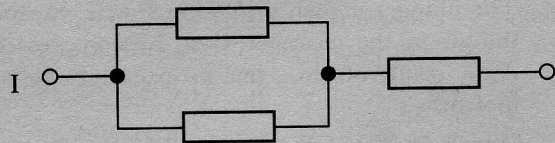
- A $8.0 \times 10^{-23} \text{ J}$
 B $8.0 \times 10^{-20} \text{ J}$
 C $3.2 \times 10^{-19} \text{ J}$
 D $1.6 \times 10^{-16} \text{ J}$
 E $3.2 \times 10^{-16} \text{ J}$.

[Turn over

12. A student requires a resistor for an electronics project and its value must lie in the range $(15 \pm 3) \Omega$.

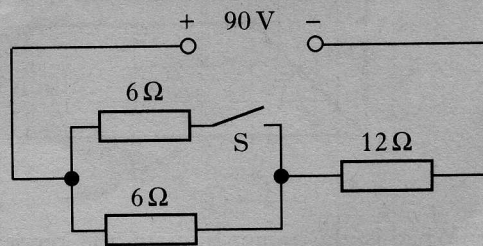
The only resistors available have values of exactly 10Ω .

Which of the following combinations of these 10Ω resistors could be used?



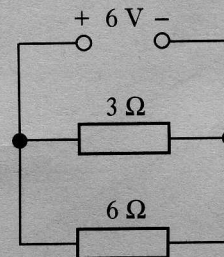
- A I only
 B I and II only
 C I and III only
 D II and III only
 E I, II and III

13. In the following circuit, what is the potential difference across the 12Ω resistor when the switch S is (i) open, and (ii) closed? The supply has negligible internal resistance.



	(i) p.d. when switch S open	(ii) p.d. when switch S closed
A	30 V	18 V
B	45 V	45 V
C	60 V	45 V
D	60 V	72 V
E	72 V	60 V

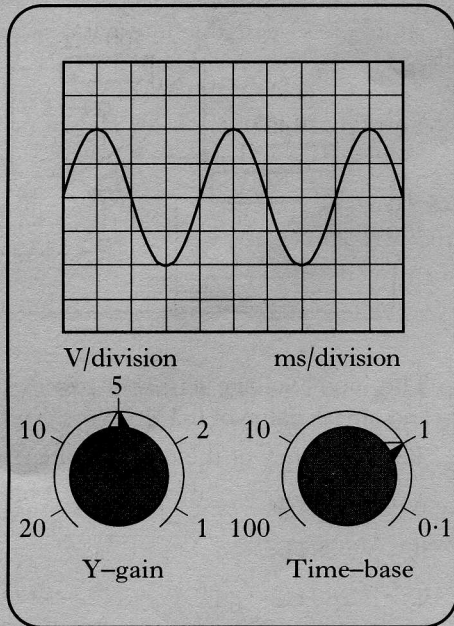
14. The circuit below shows two resistors connected to a 6 V d.c. supply of negligible internal resistance.



The power dissipated in the 3Ω resistor is

- A 3 W
 B 6 W
 C 9 W
 D 12 W
 E 18 W.

15. An alternating voltage signal is displayed on an oscilloscope, with the settings shown.



Which row in the following table gives the correct values for the peak voltage and frequency of the signal?

	<i>Peak Voltage/V</i>	<i>Frequency/Hz</i>
A	10	100
B	10	250
C	20	250
D	10	500
E	20	1000

16. The heating element in a boiler operates at 2400 W from a 120 V r.m.s. power supply.

What is the r.m.s. current, in amperes, in this element?

- A 10
 B $\frac{20}{\sqrt{2}}$
 C 20
 D $20\sqrt{2}$
 E 40

17. The “coulomb per volt” is a unit of

- A charge
 B energy
 C power
 D capacitance
 E potential difference.

18. The energy stored in a $500 \mu\text{F}$ capacitor charged to a voltage of 20 V is

- A $5 \times 10^{-3} \text{ J}$
 B $2.5 \times 10^{-2} \text{ J}$
 C $5 \times 10^{-2} \text{ J}$
 D $1 \times 10^{-1} \text{ J}$
 E $2 \times 10^{-1} \text{ J}$.

[Turn over

