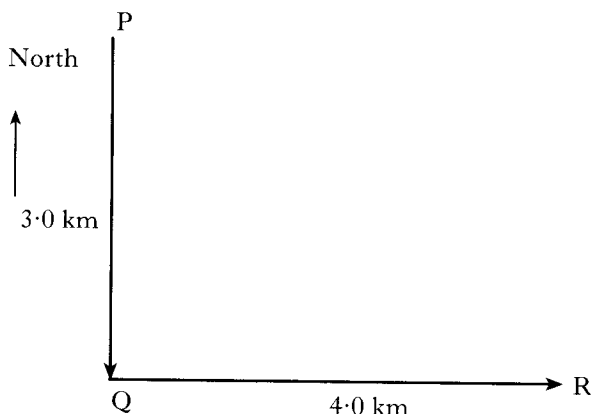


Higher
-o-O-o-
m/c
-o-O-o-

Past Paper questions
1991 - 2001

1. A long-distance athlete runs from point P to point Q and then jogs to point R.



She takes 20 minutes to run from P to Q and then a further 40 minutes to jog from Q to R.

Which row in the following table correctly gives her average speed and her average velocity for the whole journey from P to R?

	<i>Average speed</i>	<i>Average velocity</i>
A	7.0 km h^{-1}	5.0 km h^{-1} on a bearing of 143°
B	7.0 km h^{-1}	7.0 km h^{-1} on a bearing of 127°
C	7.0 km h^{-1}	5.0 km h^{-1} on a bearing of 127°
D	5.0 km h^{-1}	7.0 km h^{-1} on a bearing of 127°
E	5.0 km h^{-1}	5.0 km h^{-1} on a bearing of 143°

2. Consider the following three statements made by pupils about scalars and vectors.

I Scalars have direction only.

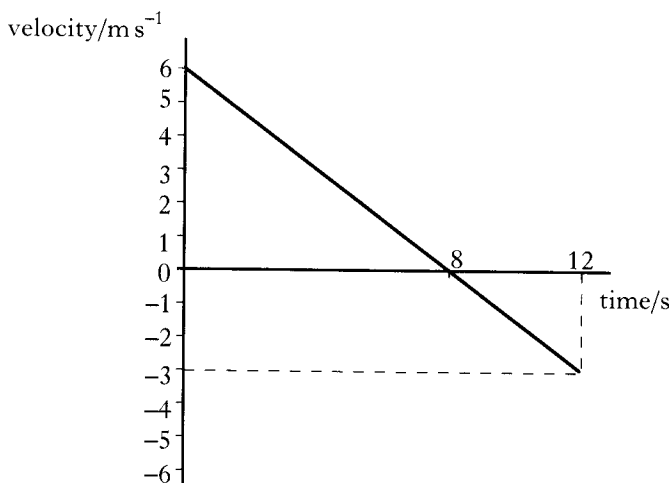
II Vectors have both size and direction.

III Speed is a scalar and velocity is a vector.

Which statement(s) is/are true?

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

3. The velocity-time graph for an object travelling along a straight line is shown below.



The displacement of the object during the first 12 seconds is

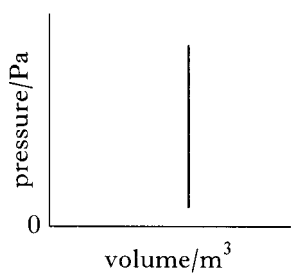
- A 18 m
 B 24 m
 C 30 m
 D 36 m
 E 54 m.

4. A balloon of mass 10 kg accelerates vertically upwards with a constant acceleration of 1 ms^{-2} . The air resistance acting on the balloon is 100 N.

Assuming that the acceleration due to gravity is 10 ms^{-2} , which row in the following table shows the size and direction of the forces acting on the balloon?

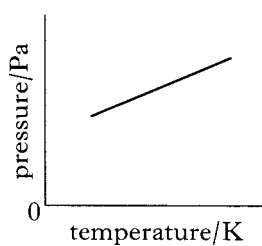
	<i>Weight</i>	<i>Air resistance</i>	<i>Uplthrust</i>
A	↓ 100 N	↓ 100 N	↑ 200 N
B	↓ 100 N	↓ 100 N	↑ 210 N
C	↓ 100 N	↑ 100 N	↑ 10 N
D	↓ 10 N	↓ 100 N	↑ 120 N
E	↓ 100 N	↑ 100 N	↑ 100 N

5. The pressure-volume graph below describes the behaviour of a constant mass of gas when it is heated.

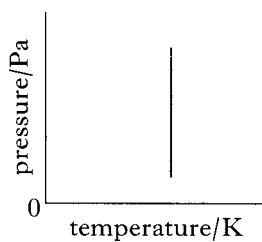


Which of the following shows the corresponding pressure-temperature graph?

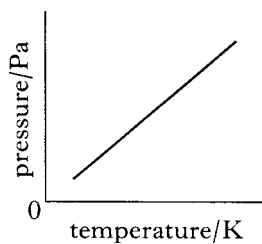
A



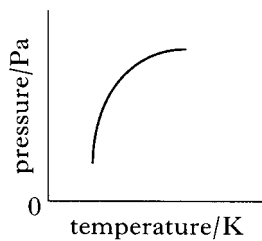
B



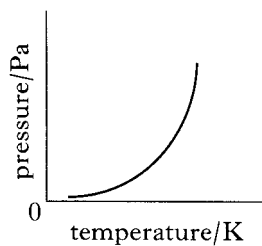
C



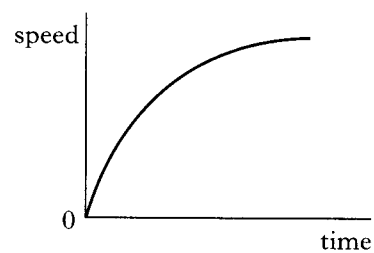
D



E

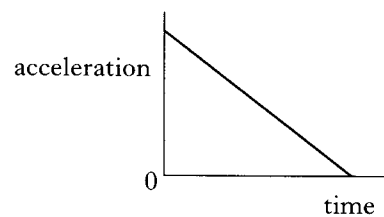


6. The following is a speed-time graph of the beginning of a cyclist's journey along a straight track.

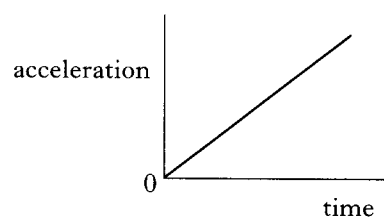


Which of the following could be the corresponding acceleration-time graph for the same period?

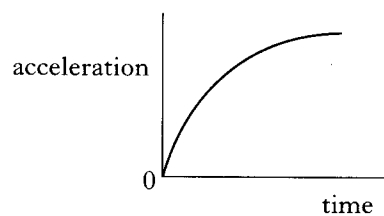
A



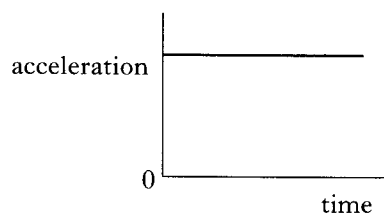
B



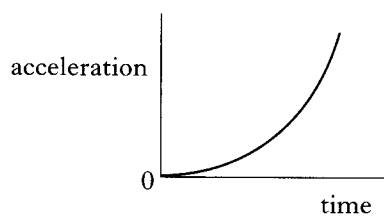
C



D

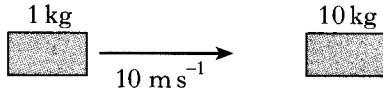


E



7. A block of mass 1 kg slides along a frictionless surface at 10 m s^{-1} and it collides with a stationary block of mass 10 kg . After the collision, the first block rebounds at 5 m s^{-1} and the other one moves off at 1.5 m s^{-1} .

before impact



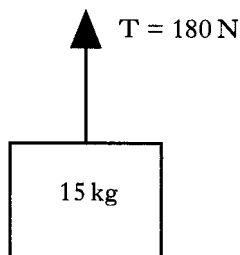
after impact



Which row in the following table is correct?

	<i>Momentum of system</i>	<i>Kinetic energy of system</i>	<i>Type of collision</i>
A	conserved	conserved	elastic
B	conserved	not conserved	inelastic
C	conserved	not conserved	elastic
D	not conserved	not conserved	inelastic
E	not conserved	not conserved	elastic

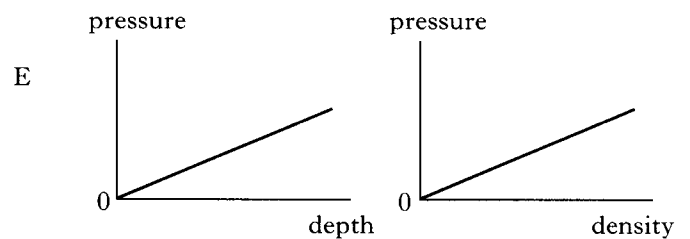
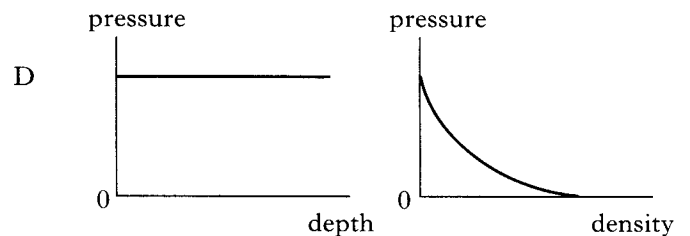
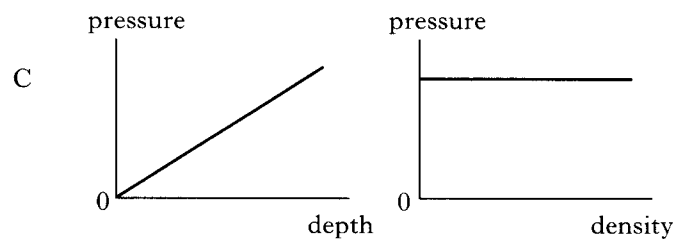
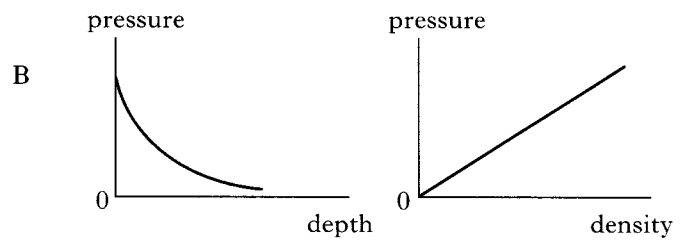
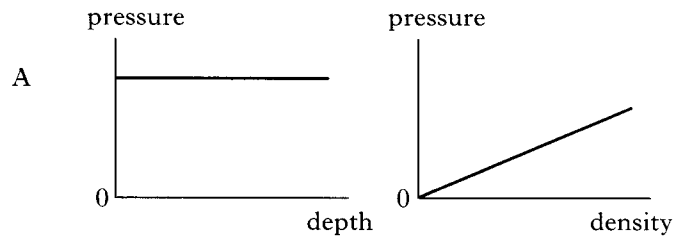
8. A tension force of 180 N is applied vertically upwards to a box of mass 15 kg .



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

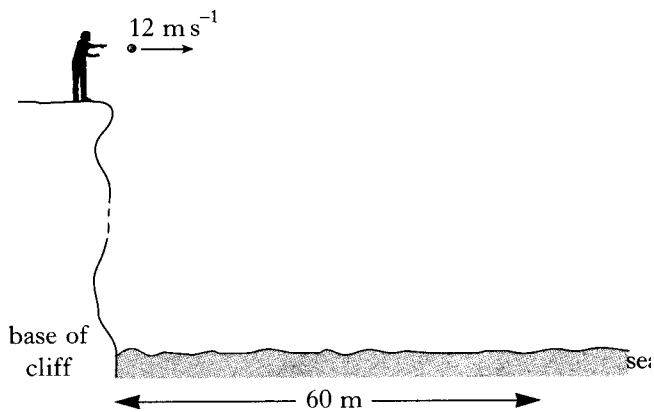
- A 2 m s^{-2}
- B 8 m s^{-2}
- C 10 m s^{-2}
- D 12 m s^{-2}
- E 20 m s^{-2}

9. Which pair of graphs correctly shows how the pressure produced by a liquid depends on the depth and the density of the liquid?



10. A cyclist is travelling along a straight, level road at 10 m s^{-1} . She applies her brakes and comes to rest after travelling a further 20 m. The braking force is constant. What is her deceleration?
- A 0.25 m s^{-2}
 B 0.50 m s^{-2}
 C 2.0 m s^{-2}
 D 2.5 m s^{-2}
 E 5.0 m s^{-2}

11. A stone is thrown horizontally with a speed of 12 m s^{-1} over the edge of a vertical cliff. It hits the sea at a horizontal distance of 60 m out from the base of the cliff.



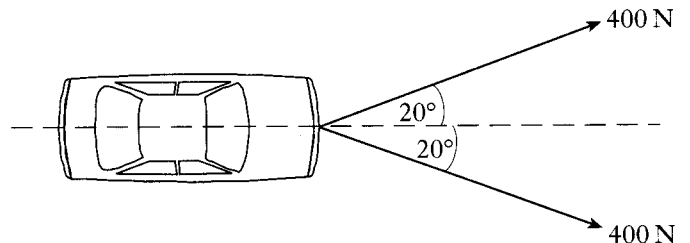
Assuming that air resistance is negligible and that the acceleration due to gravity is 10 m s^{-2} , the height from which the stone was projected above the level of the sea is

- A 5 m
 B 25 m
 C 50 m
 D 125 m
 E 250 m.
12. Which of the following groups contain vector quantities and one scalar quantity?
- A Time, distance and force
 B Acceleration, mass and momentum
 C Velocity, force and momentum
 D Displacement, velocity and acceleration
 E Speed, distance and momentum

13. A rocket of mass 200 kg accelerates vertically upwards from the surface of a planet at 2 m s^{-2} . The gravitational field strength on the planet is 4 N kg^{-1} . What is the size of the force being supplied by the rocket's engines?

- A 800 N
 B 1200 N
 C 2000 N
 D 2400 N
 E 4800 N

14. Two boys are pulling a car of mass 800 kg along a level surface with a pair of ropes attached horizontally as shown below.

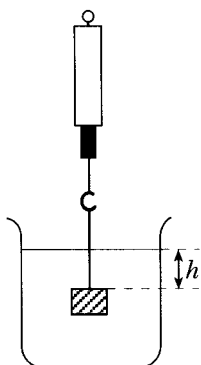


When the pull on each rope is 400 N in the directions indicated, the acceleration of the car is 0.1 m s^{-2} .

What is the size of the frictional force acting on the car in the above situation?

- A 194 N
 B 434 N
 C 533 N
 D 672 N
 E 832 N
15. 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 3 750 J
 B 28 125 J
 C 37 500 J
 D 56 250 J
 E 375 000 J.

16. A small metal block is suspended from a spring balance at a depth h below the surface of a liquid in a large beaker.



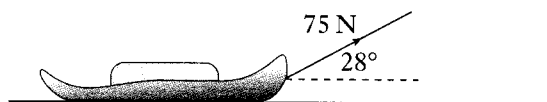
Which of the following statements is/are true?

- I The reading on the spring balance depends on the density of the liquid in the beaker.
 - II The reading on the spring balance is equal to the upthrust of the liquid on the metal block.
 - III The reading on the spring balance will increase as the depth h is increased.
- A I only
 B II only
 C III only
 D I and II only
 E I and III only

17. Which of the following gives the approximate relative spacings of molecules in ice, water and water vapour?

	<i>Molecular spacing in ice/units</i>	<i>Molecular spacing in water/units</i>	<i>Molecular spacing in water vapour/units</i>
A	1	1	10
B	1	3	1
C	1	3	3
D	1	10	10
E	3	1	10

18. A sledge is pulled a distance of 8 m in a straight line along a horizontal surface.

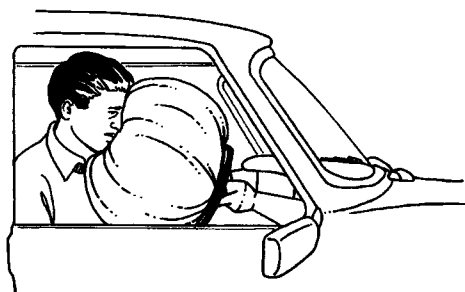


The tension in the rope is 75 N and the angle between the rope and the horizontal surface is 28° .

Which row in the following table is correct?

	<i>Horizontal component of tension/N</i>	<i>Vertical component of tension/N</i>	<i>Work done by rope/J</i>
A	$75 \sin 28^\circ$	$75 \sin 62^\circ$	600
B	$75 \cos 28^\circ$	$75 \sin 28^\circ$	530
C	$75 \sin 62^\circ$	$75 \sin 28^\circ$	600
D	$75 \cos 28^\circ$	$75 \sin 62^\circ$	600
E	$75 \sin 28^\circ$	$75 \cos 28^\circ$	35

19. Many car manufacturers are now fitting airbags which inflate automatically during an accident, as shown below.



The purpose of the airbag is to protect the driver by

- A reducing his change of momentum per second
- B increasing his change of momentum per second
- C reducing his final velocity
- D reducing his total change in momentum
- E increasing his total change in momentum.

20. A train decelerates uniformly from 12.0 m s^{-1} to 5.0 m s^{-1} while travelling a distance of 119.0 m along a straight track. The deceleration of the train is

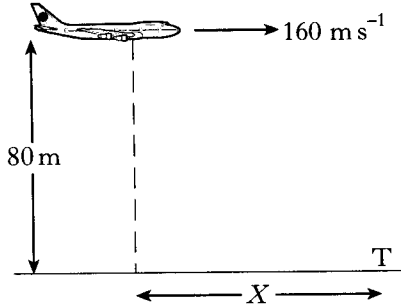
- A 0.5 m s^{-2}
- B 0.7 m s^{-2}
- C 1.2 m s^{-2}
- D 7.0 m s^{-2}
- E 14.0 m s^{-2} .

21. A ball is projected vertically upwards with an initial speed of 40 m s^{-1} . The acceleration due to gravity can be taken to be 10 m s^{-2} .

What total time will the ball take to rise to its highest point and then return to its starting point?

- A 2 s
- B 4 s
- C 6 s
- D 8 s
- E 16 s

22. An aeroplane is flying at 160 m s^{-1} in level flight 80 m above the ground. It releases a package at a horizontal distance X from the target T.

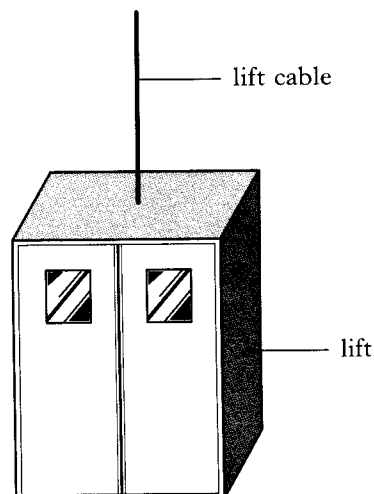


The effect of air resistance can be neglected and the acceleration due to gravity can be taken as 10 m s^{-2} .

The package will score a direct hit on the target T if X is

- A 40 m
- B 160 m
- C 320 m
- D 640 m
- E 2560 m.

23. The lift in a department store has a mass of 1100 kg .



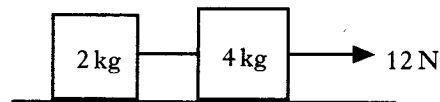
The lift is descending with a uniform downwards acceleration of 2 m s^{-2} . The acceleration due to gravity can be taken as 10 m s^{-2} .

What is the force applied to the lift by the lift cable?

- A 1100 N
- B 2200 N
- C 8800 N
- D 11 000 N
- E 13 200 N

24. 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?

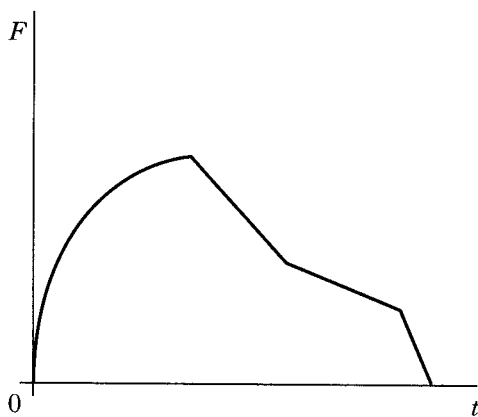
- A 2 N
- B 4 N
- C 6 N
- D 8 N
- E 12 N

25. A crane on an oil-rig is used to raise a sunken buoy from the seabed. The weight of the buoy is 4900 N and the buoyancy force (upthrust) acting on it is 1000 N. When the buoy is being raised vertically at a constant speed, a force of 800 N acts on it due to water resistance.

What is the size of the force which the vertical cable applies to the buoy?

- A 200 N
- B 1800 N
- C 3100 N
- D 4700 N
- E 6700 N

26. The graph below shows how the force, F , exerted on an object varies with time t .



The area under the graph represents the object's change of

- A acceleration
 - B velocity
 - C momentum
 - D kinetic energy
 - E potential energy.
27. A spacecraft of mass 1200 kg has landed on a planet where the gravitational field strength is 5 N kg^{-1} . The spacecraft rests on three pads, each of contact area 0.5 m^2 . The pressure exerted by these three pads on the surface of the planet is
- A $8.0 \times 10^2 \text{ Pa}$
 - B $4.0 \times 10^3 \text{ Pa}$
 - C $7.8 \times 10^3 \text{ Pa}$
 - D $9.0 \times 10^3 \text{ Pa}$
 - E $1.2 \times 10^4 \text{ Pa}$.

28. A girl wrote the following statements in her physics notebook.

- I The pressure of a fixed mass of gas varies inversely as its volume, provided the temperature of the gas remains constant.
- II The pressure of a fixed mass of gas varies directly as its kelvin temperature, provided the volume of the gas remains constant.
- III A temperature **change** of 20°C in a gas is the same as a temperature **change** of 293 K.

Which of the above statements is/are correct?

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

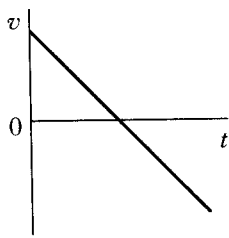
29. On a cold morning, a motorist checks the pressure of the air in one of her car tyres. It is found to be $3.0 \times 10^5 \text{ Pa}$ at a temperature of 2°C .

After a long run on a motorway, the temperature of the air in the tyre rises to 57°C . The volume of the air in the tyre remains constant and no air escapes.

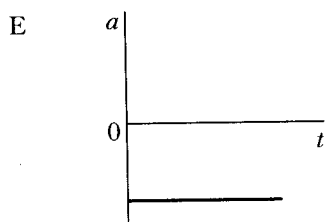
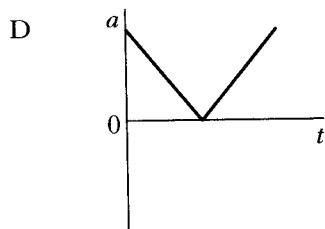
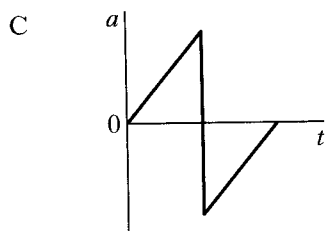
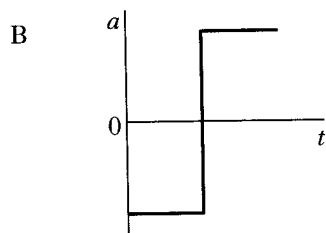
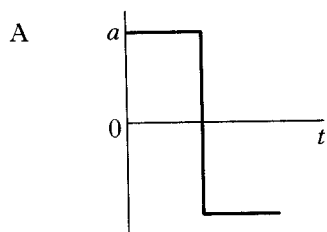
Which row in the following table gives the correct value of the final pressure of the air in the tyre and a correct statement about the final density of the air in the tyre compared to the initial density?

	<i>Final pressure of air</i>	<i>Final density of air</i>
A	$8.6 \times 10^6 \text{ Pa}$	greater
B	$8.6 \times 10^6 \text{ Pa}$	same
C	$8.6 \times 10^6 \text{ Pa}$	less
D	$3.6 \times 10^5 \text{ Pa}$	same
E	$3.6 \times 10^5 \text{ Pa}$	less

30. The velocity-time graph for an object travelling in a straight line is shown below.



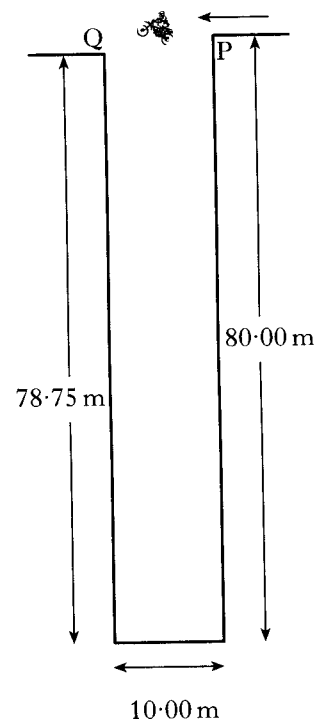
Which one of the following is the corresponding acceleration-time graph?



31. In the equation $s = ut + \frac{1}{2}at^2$ for an object moving in a straight line with a uniform acceleration "a", the term "ut" represents

- A the initial velocity of the object
- B the initial acceleration of the object
- C the velocity of the object after t seconds
- D the acceleration of the object after t seconds
- E the displacement of the object after t seconds if the acceleration is zero.

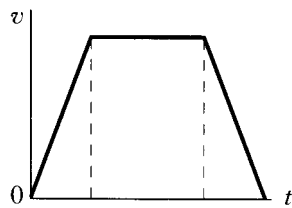
32. A motorcycle stunt involves crossing a ravine from P to Q. The motorcycle is travelling horizontally when it leaves point P.



Neglecting air resistance and taking the acceleration due to gravity to be 10 ms^{-2} , the time taken to cross the ravine from P to Q is

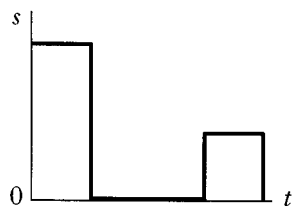
- A 0.125 s
- B 0.25 s
- C 0.5 s
- D 1.0 s
- E 4.0 s.

33. The diagram below is the velocity-time graph for a model train moving along a straight track.

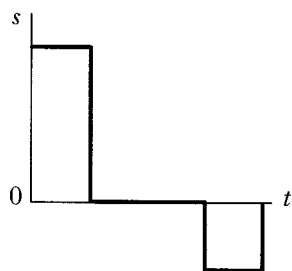


Which of the following could represent the displacement-time graph for the same motion?

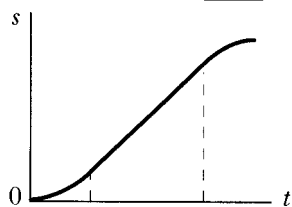
A



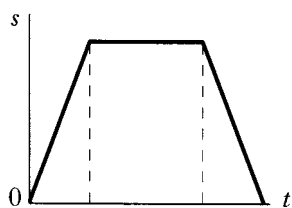
B



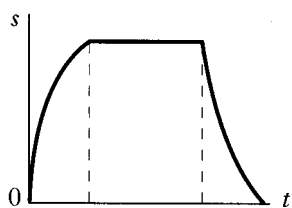
C



D

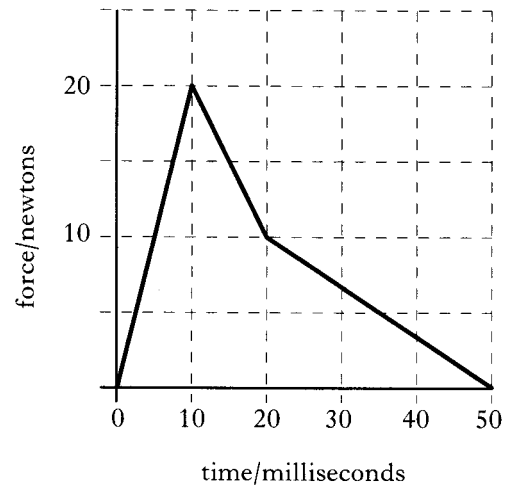


E



34. The force acting on an object is measured and the results are stored in a computer.

The force-time graph obtained from the computer is shown below.



What is the average force acting on the object during the 50 milliseconds?

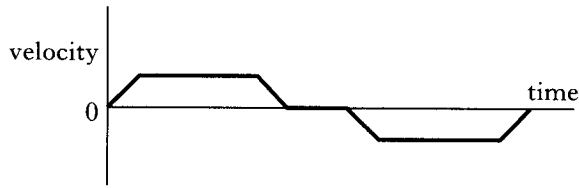
- A 15 N
- B 10 N
- C 8 N
- D 2.5 N
- E 1 N

35. 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 .

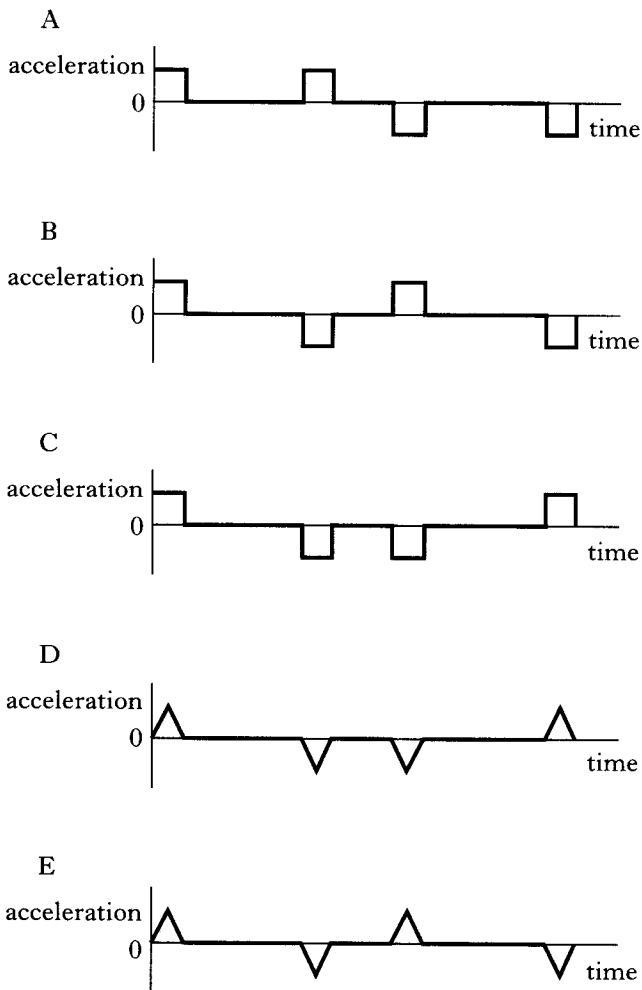
What is the outward force produced on this door by the pressures stated?

- 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

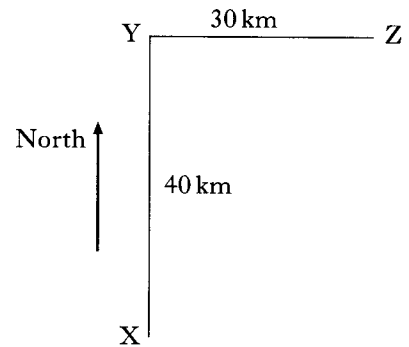
36. A lift in a hotel makes a return journey from the ground floor to the top floor and then back again. The corresponding velocity-time graph is shown below.



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



37. 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

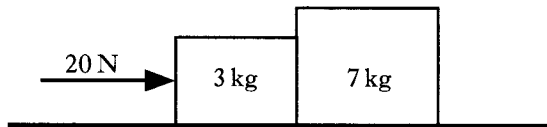
38. Consider the following three statements made by pupils about scalars and vectors.

- I Scalars have direction only.
- II Vectors have both size and direction.
- III Speed is a scalar and velocity is a vector.

Which statement(s) is/are true?

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

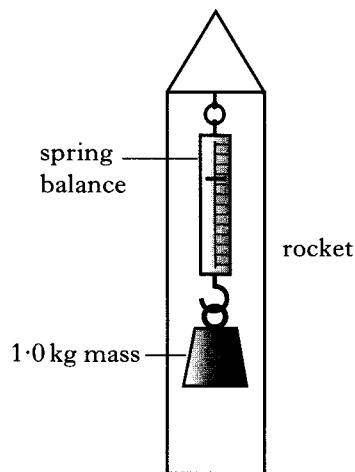
39. A horizontal force of 20 N is applied as shown to two wooden blocks of masses 3 kg and 7 kg. The blocks are in contact with each other on a frictionless horizontal surface.



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

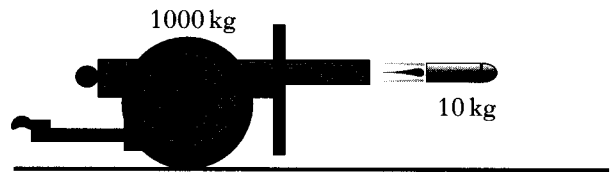
40. An object of mass 1.0 kg hangs from a spring balance which is suspended on the inside of a small rocket, as shown below.



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

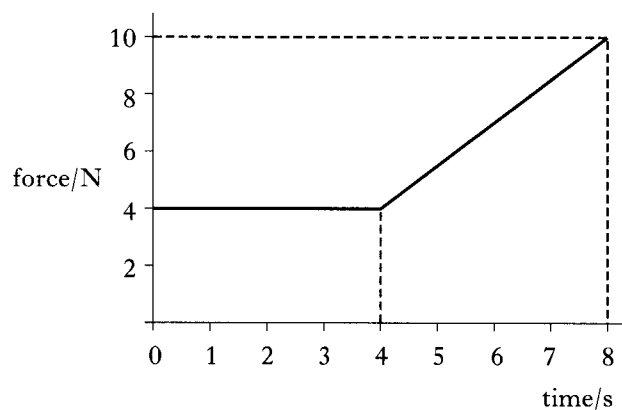
41. A field-gun of mass 1000 kg fires a shell of mass 10 kg with a velocity of 100 m s^{-1} East.



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.

42. The graph below shows the force which acts on an object over a time interval of 8 seconds.

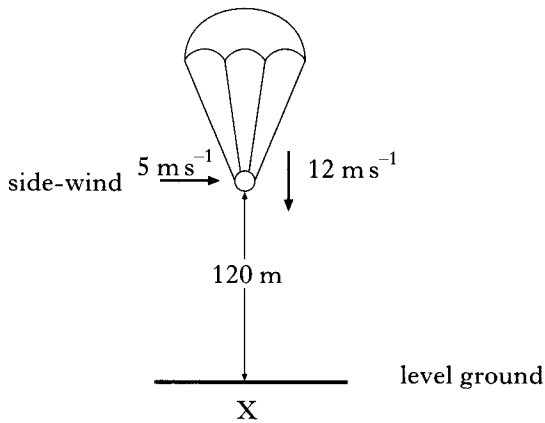


The momentum gained by the object during this 8 seconds is

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

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

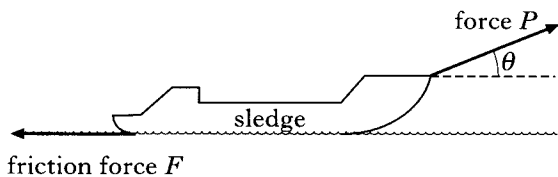
The object falls with a constant vertical component of velocity of value 12 m s^{-1} . A steady side-wind gives the object a constant horizontal component of velocity of value 5 m s^{-1} .



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

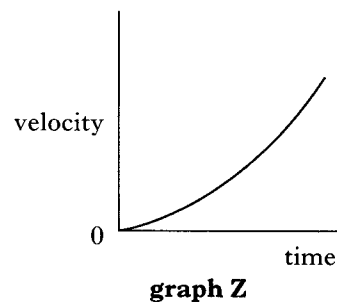
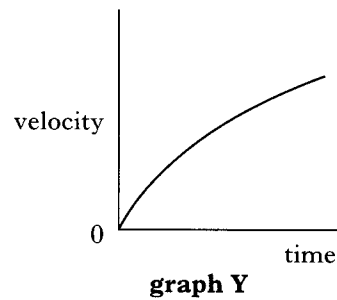
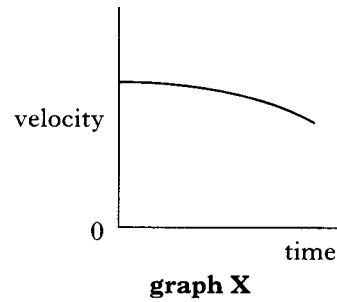
44. A sledge is dragged at a **constant velocity** along the snow against a horizontal frictional force F . The rope pulling the sledge is at an angle of θ to the horizontal, as shown.



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 $\frac{F}{\sin \theta}$

45. 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?

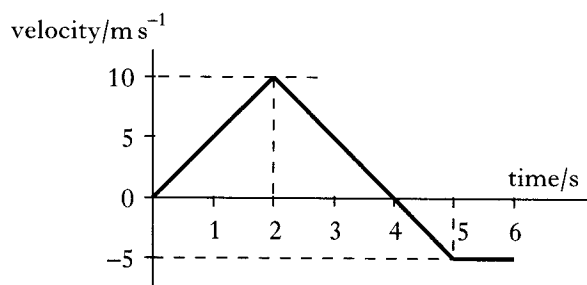


	Horizontal component of velocity	Vertical component of velocity
A	graph X	graph X
B	graph X	graph Y
C	graph Y	graph X
D	graph Y	graph Z
E	graph Z	graph Z

46. Which one of the following is a vector quantity?

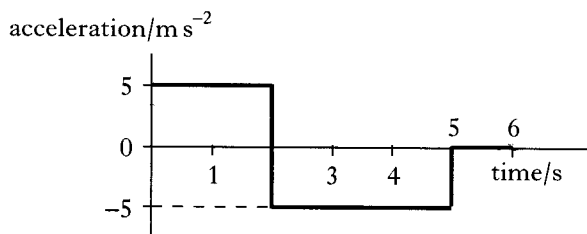
- A Distance
- B Time
- C Speed
- D Energy
- E Weight

47. 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?

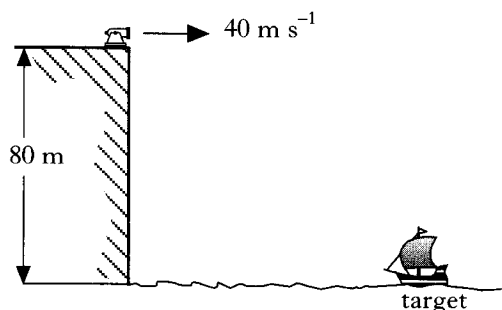
- I There is a change of direction of the object at 4 s.
- II The acceleration-time graph is of the form shown below.



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

48. 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.



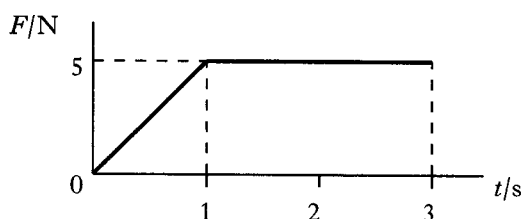
How far is the target from the foot of the cliff, if air resistance is negligible and the acceleration due to gravity is 10 m s^{-2} ?

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

49. After a car has been parked in the sun for some time, it is found that the pressure in the tyres has increased. This is because

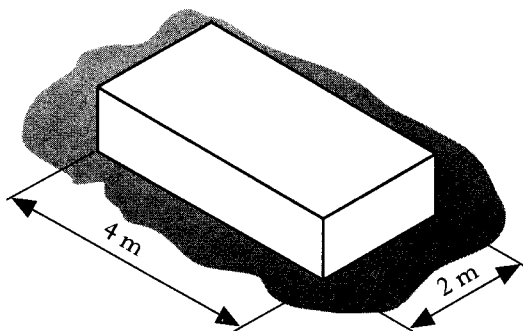
- A the volume occupied by the air molecules in the tyres has increased
- B the force produced by the air molecules in the tyres acts over a smaller area
- C the average spacing between the air molecules in the tyres has increased
- D the increased temperature has made the air molecules in the tyres expand
- E the air molecules in the tyres are moving with greater kinetic energy.

50. 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?

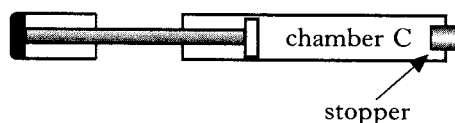
- A 0 kg m s^{-1}
 B 2.5 kg m s^{-1}
 C 5 kg m s^{-1}
 D 12.5 kg m s^{-1}
 E 15 kg m s^{-1}
51. A rectangular box of mass 10 kg is lying on a flat surface on a planet where the gravitational field strength is 4 N kg^{-1} . The base of the box measures 4 m by 2 m.



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

52. 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

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

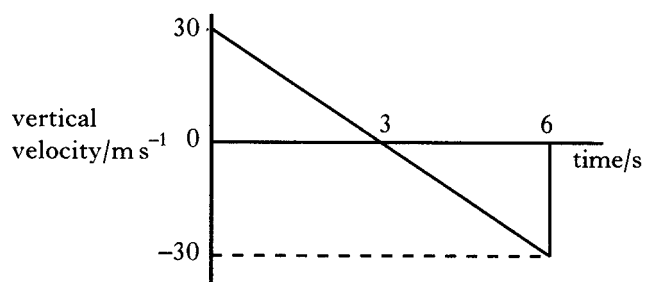
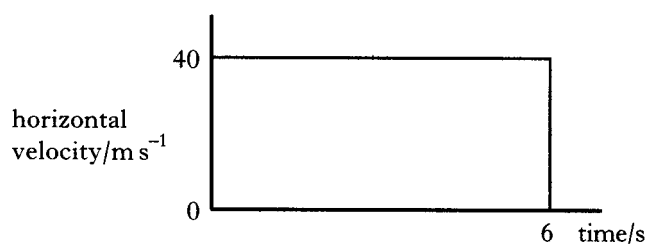
The kinetic energy gained by the electron as it goes through the electron gun is

- 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 $3.2 \times 10^{-16} \text{ J}$

54. 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} .



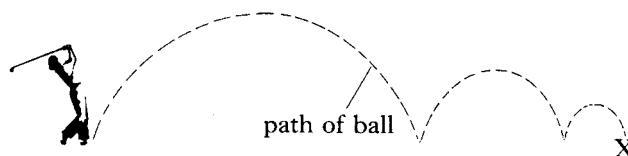
What is the speed of the ball just before it hits the ground?

- 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}

55. A diver's air cylinder has a capacity of 0.06 m^3 . 4.0 m^3 of air with a density of 1.44 kg m^{-3} is compressed into it. What is the density of the air in the cylinder?

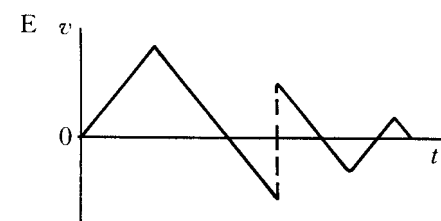
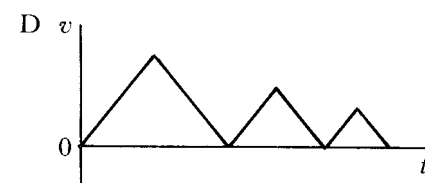
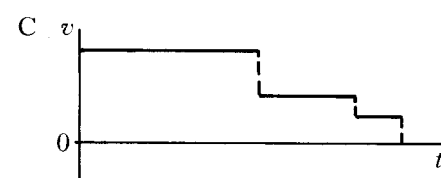
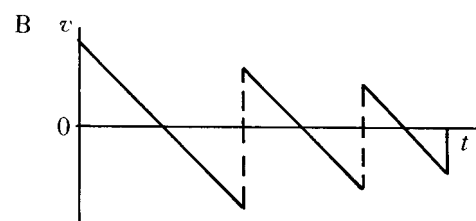
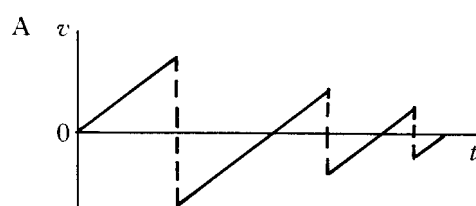
- A 0.02 kg m^{-3}
- B 0.17 kg m^{-3}
- C 5.76 kg m^{-3}
- D 6.00 kg m^{-3}
- E 96.0 kg m^{-3}

56. A golfer strikes a ball straight down the fairway.

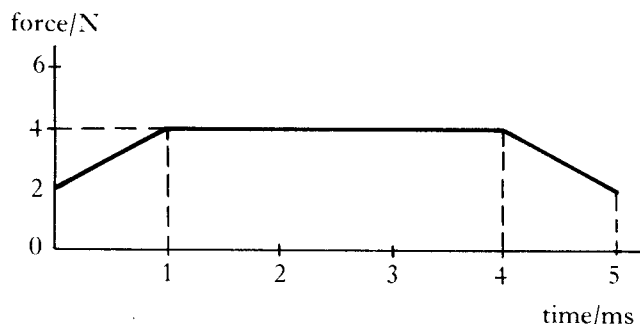


The ball bounces twice before stopping at point X.

Which of the following could be a graph of the **vertical** component of its velocity against time **after** it is struck?



57. A force, which is applied in a straight line to an object, varies with time as shown in the following graph.



What is the total impulse given to the object by the force in this 5 millisecond time interval?

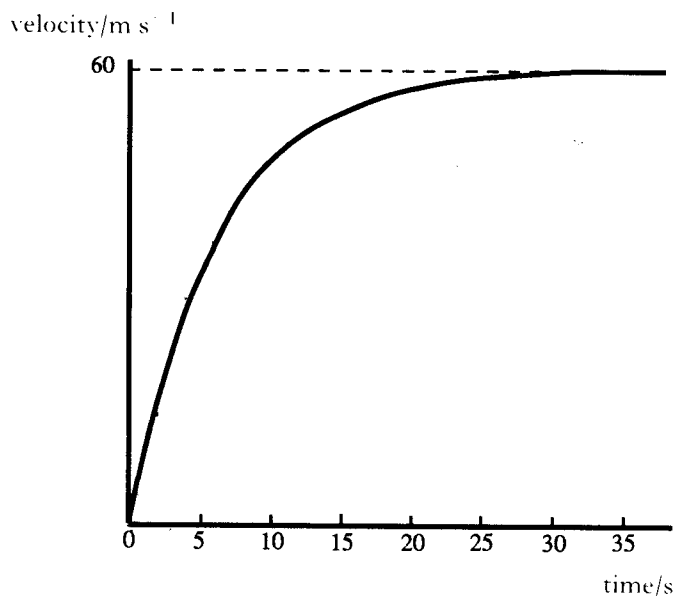
- A $8 \times 10^{-3} \text{ N s}$
 B $10 \times 10^{-3} \text{ N s}$
 C $15 \times 10^{-3} \text{ N s}$
 D $18 \times 10^{-3} \text{ N s}$
 E $20 \times 10^{-3} \text{ N s}$
58. A shell of mass 5 kg is travelling horizontally with a speed of 200 m s^{-1} when it explodes into two parts. One part of mass 3 kg continues in the original direction with a speed of 100 m s^{-1} . The other part also continues in this same direction. Its speed will be
- A 150 m s^{-1}
 B 200 m s^{-1}
 C 300 m s^{-1}
 D 350 m s^{-1}
 E 700 m s^{-1} .

59. A liquid is heated from 17°C to 50°C . The temperature **rise**, on the kelvin scale, is

- A 33 K
 B 67 K
 C 306 K
 D 340 K
 E 579 K.

60. An object of mass 4 kg falls from a considerable height in an area where the acceleration due to gravity is 10 m s^{-2} .

The velocity-time graph for the first 35 seconds of its motion is as follows.



Which row in the following table could give the frictional forces acting on the object at 4 seconds, 8 seconds and 32 seconds?

	<i>Force at 4 s</i>	<i>Force at 8 s</i>	<i>Force at 32 s</i>
A	0 N	30 N	40 N
B	40 N	30 N	0 N
C	40 N	40 N	40 N
D	20 N	30 N	40 N
E	0 N	0 N	40 N

61. A rectangular block of wood of mass 200 kg has dimensions of 2 m by 1 m by 0.1 m.

The **greatest** pressure the block can exert when lying on a level surface is

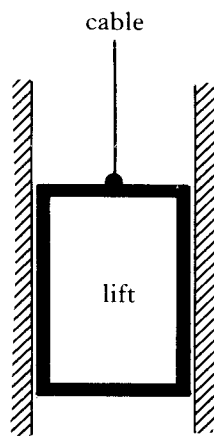
- A $1 \times 10^2 \text{ Pa}$
 B $1 \times 10^3 \text{ Pa}$
 C $2 \times 10^3 \text{ Pa}$
 D $1 \times 10^4 \text{ Pa}$
 E $2 \times 10^4 \text{ Pa}$.

62. A car travelling at 30 m s^{-1} starts to brake when it is 50 m from a stationary lorry. The car moves in a straight line and manages to stop just before reaching the lorry.

What is the deceleration of the car, in m s^{-2} ?

- A 0.6
- B 4.5
- C 9
- D 10
- E 18

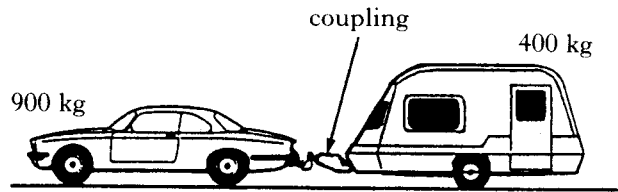
63. A lift is raised and lowered by means of a cable.



In which of the following situations is the tension in the cable greatest?

- A The lift is travelling upwards at a constant speed.
- B The lift is travelling downwards at a constant speed.
- C The lift is decelerating on the way down.
- D The lift is accelerating on the way down.
- E The lift is decelerating on the way up.

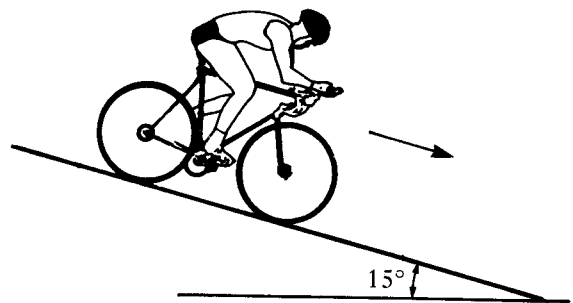
64. A car of mass 900 kg pulls a caravan of mass 400 kg along a straight, horizontal road with an acceleration of 2 m s^{-2} .



Assuming that the frictional forces are negligible, the tension in the coupling between the car and the caravan is

- A 400 N
- B 500 N
- C 800 N
- D 1800 N
- E 2600 N.

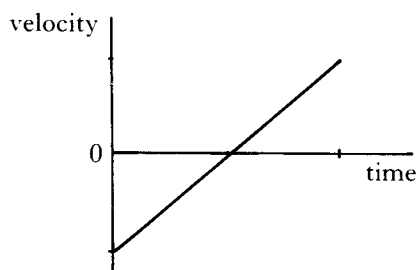
65. A cyclist free-wheels down a slope, inclined at 15° to the horizontal, at a constant velocity of 3 m s^{-1} .



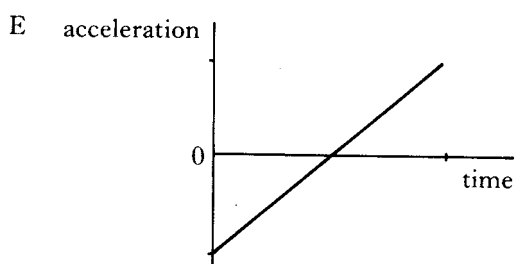
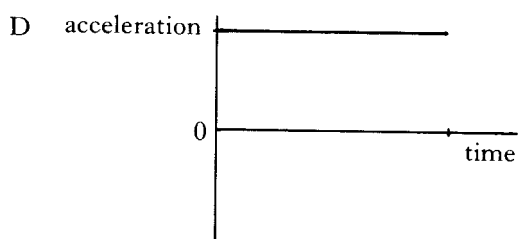
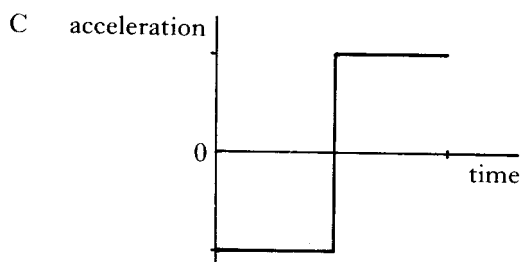
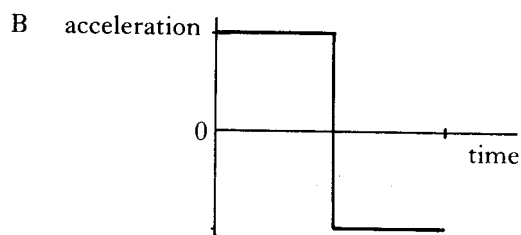
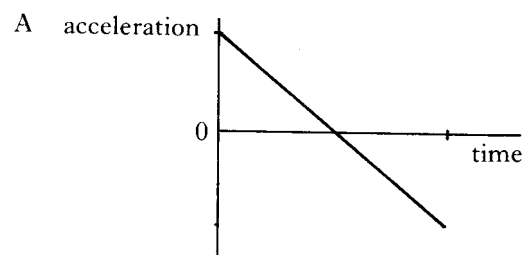
The combined mass of the rider and bicycle is 70 kg . If the value of the acceleration due to gravity is taken as 10 m s^{-2} , the total force of friction is

- A 181 N
- B 210 N
- C 362 N
- D 391 N
- E 676 N.

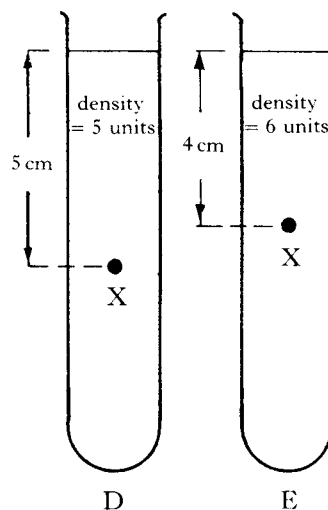
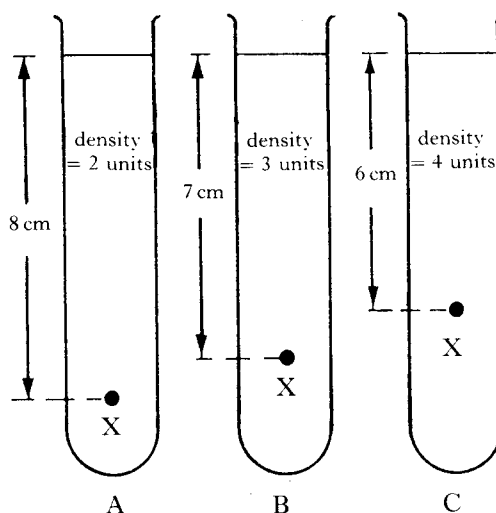
66. The following velocity-time graph represents the motion of a trolley.



Which of the graphs below is the acceleration-time graph for the motion?



67. Five liquids of different density are contained in separate, identical test tubes. The density of each liquid is given in the diagram. In which tube is the pressure greatest at point X?



Two identical metal spheres X and Y are dropped onto a horizontal surface. The distance Y falls is double the distance X falls.

Which of the following is/are true if the effects of air resistance are negligible?

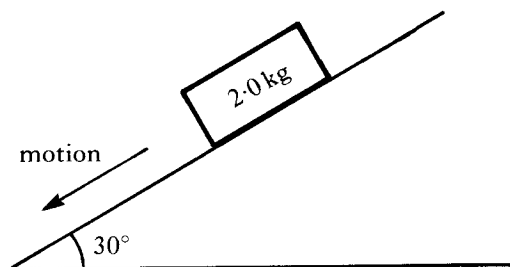
- I Y takes twice as long to fall as X.
- II The maximum speed of Y is double the maximum speed of X.
- III The maximum kinetic energy of Y is double that of X.

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

68. A car accelerates uniformly from rest and travels a distance of 60 m in 6.0 s. The acceleration of the car, in ms^{-2} , is

- A 0.83
- B 3.3
- C 5.0
- D 10
- E 20.

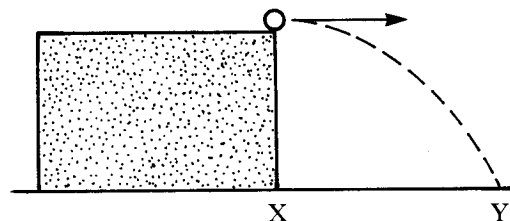
69. A block of wood, of mass 2.0 kg, slides with a constant velocity down a slope. The slope makes an angle of 30° with the horizontal as shown in the diagram.



What is the value of the force of friction acting on the block?

- A 1.0 N
- B 1.7 N
- C 9.8 N
- D 17.0 N
- E 19.6 N

70. A ball is projected with a horizontal velocity from a bench. The ball travels a horizontal distance, XY, as shown.



Which of the following is/are used to calculate the distance XY?

- I The mass of the ball
- II The height of the table
- III The horizontal velocity of the ball

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

71. The unit of momentum is

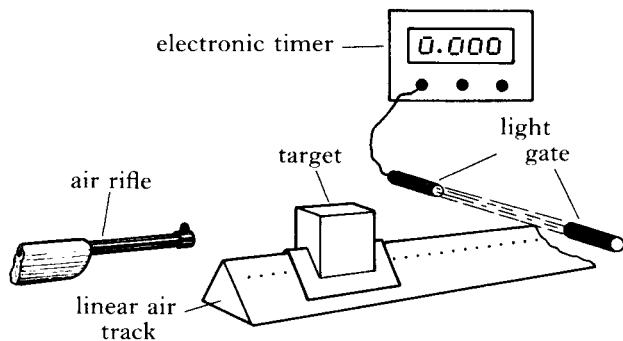
- A kg m s^{-1}
- B Nm
- C N m s^{-1}
- D kg m s^{-2}
- E N kg^{-1} .

72. A hot air balloon of mass 300 kg has people with a total mass of 250 kg on board. It floats at a steady height.

The upthrust on the balloon is

- A 0 N
- B 500 N
- C 2500 N
- D 3000 N
- E 5500 N.

73. The experimental arrangement shown below is used to measure the speed of an air rifle pellet.



The speed of the pellet is calculated from the equation

$$\text{speed of pellet} = \frac{\text{final mass of target} \times \text{speed of target}}{\text{mass of pellet}}$$

The results from one experiment are

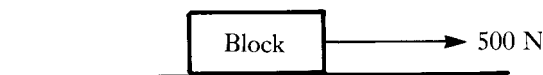
$$\text{final mass of target} = (2.00 \pm 0.02) \text{ kg}$$

$$\text{mass of pellet} = (10.0 \pm 0.5) \text{ g}$$

$$\text{speed of target} = (0.50 \pm 0.01) \text{ m s}^{-1}$$

Which of the following gives a good estimate of the percentage error in the calculated speed of the pellet?

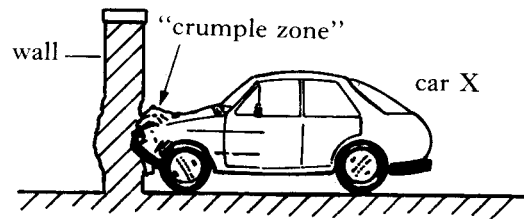
- A 1%
 B 2%
 C 3%
 D 5%
 E 8%
74. A block of weight 1500 N is dragged along a horizontal road at constant speed by a force of 500 N.



What is the force of friction between the block and the road?

- A 3 N
 B 500 N
 C 1000 N
 D 1500 N
 E 2000 N

75. Car X is designed with a "crumple zone" so that the front of the car collapses during impact as shown in the diagram below.



A similar car, Y, of equal mass is built without a crumple zone. Both cars hit a wall at the same speed.

Comparing car X with car Y, which of the following statements is/are true during the collisions?

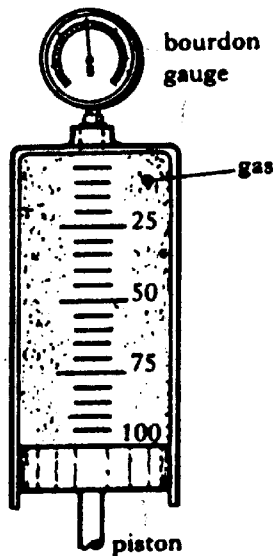
- I The average force on car X is smaller.
 II The time taken for car X to come to rest is greater.
 III The change in momentum of car X is smaller.
- A I only
 B I and II only
 C I and III only
 D II and III only
 E I, II and III

76. The pressure of a gas can be affected by factors such as its mass, its density, its volume and its temperature. Pressure is inversely proportional to volume if

- A mass alone is constant
 B density alone is constant
 C temperature alone is constant
 D mass and density are constant
 E mass and temperature are constant.

77. When a gas is compressed into a smaller volume at the same temperature, its pressure increases because the gas molecules
- are closer together
 - travel more quickly
 - strike the walls more often
 - travel in groups
 - become smaller.

78. A gas is contained in a cylinder fitted with a piston. The pressure inside is recorded by a Bourdon gauge.



The initial pressure reading is 3×10^5 Pa when the piston is at the 100 cm mark. The piston is moved from the 100 cm mark to the 75 cm mark. What is the new pressure reading if the gas temperature is unchanged?

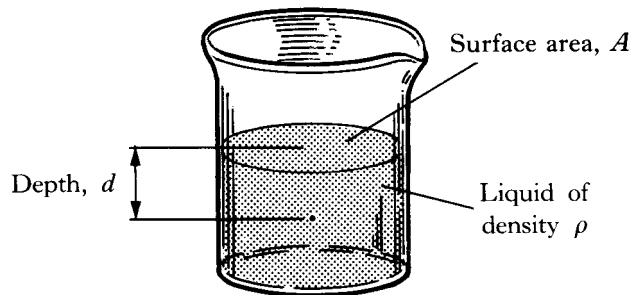
- 0.75×10^5 Pa
- 2.25×10^5 Pa
- 3.75×10^5 Pa
- 4.0×10^5 Pa
- 12.0×10^5 Pa

79. When a substance changes from liquid to gas at atmospheric pressure, its density changes by a factor of the order of
- 10^{-5}
 - 10^{-4}
 - 10^{-3}
 - 10^{-2}
 - 10^{-1} .

80. The electrons in a cathode ray tube are accelerated from cathode to anode by a potential difference of 2000 V. If this p.d. is increased to 8000 V, the electrons will arrive at the screen with

- twice the kinetic energy and four times the velocity
- four times the kinetic energy and twice the velocity
- four times the kinetic energy and four times the velocity
- twice the kinetic energy and twice the velocity
- twice the kinetic energy and $\sqrt{2}$ times the velocity.

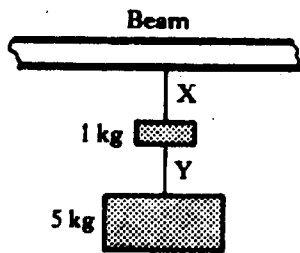
81. The glass beaker shown below contains a liquid of density ρ and surface area A .



Which of the following is/are true about the pressure, caused by the liquid, at depth d below the surface?

- The pressure varies directly as the surface area A .
 - The pressure varies directly as the liquid density ρ .
 - The pressure varies inversely as the depth d .
- I only
 - II only
 - III only
 - I and II only
 - II and III only

82. Two masses are joined together by string Y and then hung from a beam using string X.



String X is burned through using a candle. Neglecting the mass of each string, what is the tension in string Y

- I BEFORE string X is burned through, and
II AFTER string X is burned through?

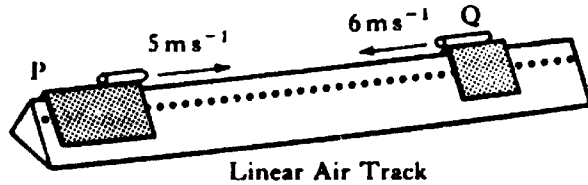
	I BEFORE string X is burned	II AFTER string X is burned
A	40 N	40 N
B	50 N	0 N
C	60 N	40 N
D	50 N	60 N
E	40 N	0 N

83. In an inelastic collision

- A some momentum is changed into kinetic energy
B some momentum is destroyed
C some momentum is changed into heat
D some kinetic energy is changed into heat
E some kinetic energy is changed into momentum.

84. Two linear air track vehicles, P and Q, are projected towards each other as shown in the diagram.

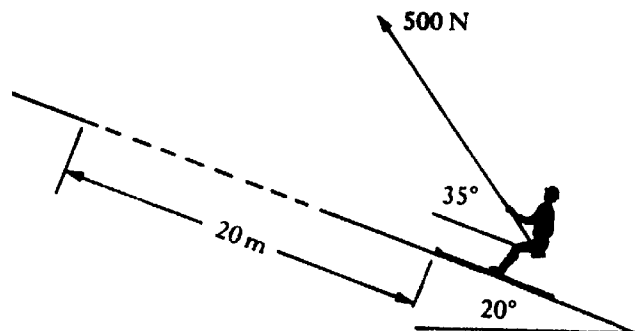
The masses of P and Q are 0.4 kg and 0.2 kg respectively and their velocities are as indicated.



If vehicle Q rebounds to the right with a velocity of 2 ms^{-1} , what happens to vehicle P?

- A It is stationary after the collision.
B It rebounds to the left with a velocity of 1 ms^{-1} .
C It continues to the right with a velocity of 1 ms^{-1} .
D It rebounds to the left with a velocity of 7 ms^{-1} .
E It continues to the right with a velocity of 7 ms^{-1} .

85. A skier of weight 700 N is pulled up a 20° incline at a constant speed by a tow rope which is acting at 35° to the incline.



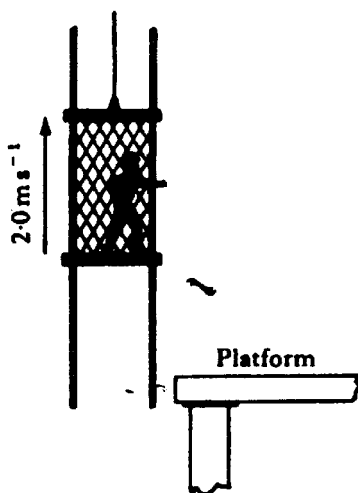
When he has moved 20 m along the incline, the gravitational potential energy (in joules) gained by the skier is given by

- A $700 \times 20 \sin 20^\circ$
B $500 \times 20 \cos 35^\circ$
C $700 \times 20 \cos 20^\circ$
D $500 \cos 35^\circ \times 20 \sin 20^\circ$
E $700 \sin 20^\circ \times \sin 55^\circ$.

86. Which of the following contains two vector quantities and one scalar quantity?

- A Displacement, speed, time
- B Momentum, force, weight
- C Heat, work, potential energy
- D Mass, distance, kinetic energy
- E Acceleration, power, velocity

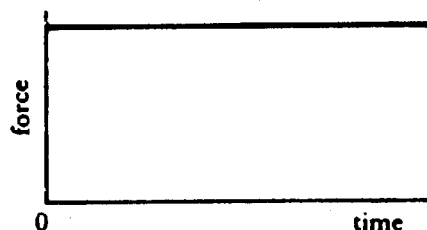
87. A lift on an oil rig rises vertically with a constant speed of 2.0 m s^{-1} . After it passes a platform, a spanner falls from the lift and hits the platform 3.0 s later.



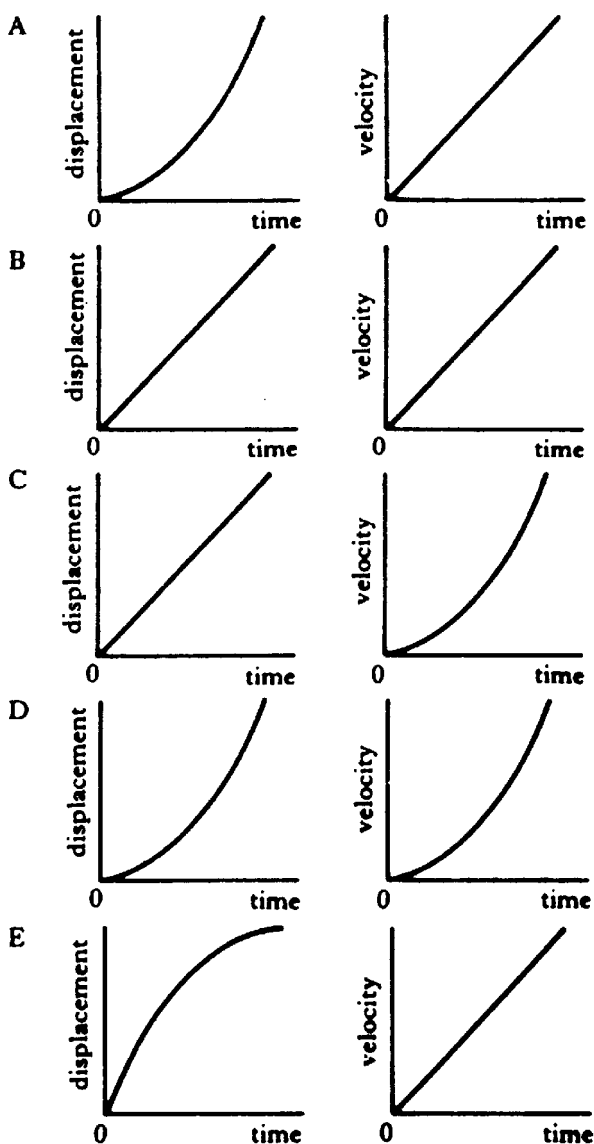
The height of the lift above the platform at the instant the spanner falls is

- A 30 m
- B 39 m
- C 45 m
- D 51 m
- E 90 m.

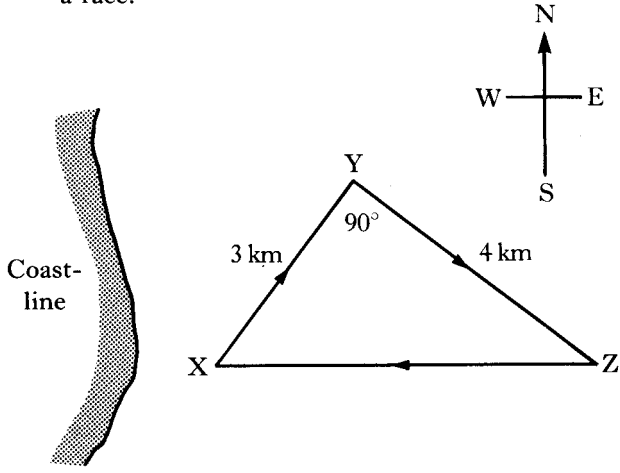
88. The following graph shows how the force applied to an object of mass 5 kg varies with time. The object is initially at rest.



The corresponding displacement-time and velocity-time graphs are shown by



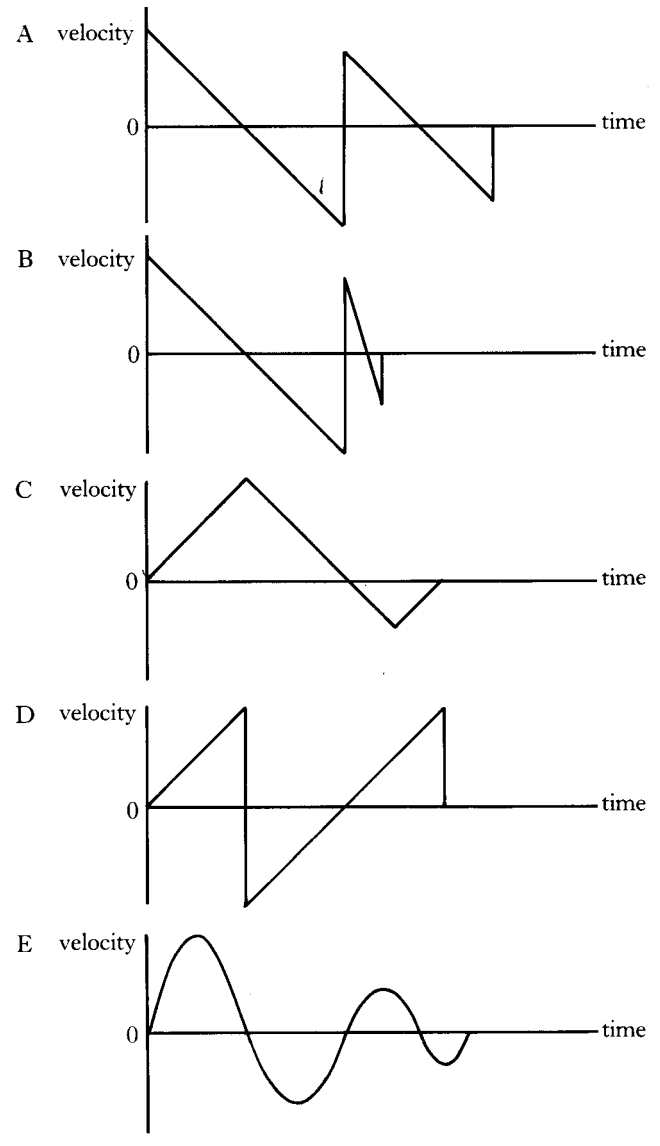
89. A yacht follows the course shown below during a race.



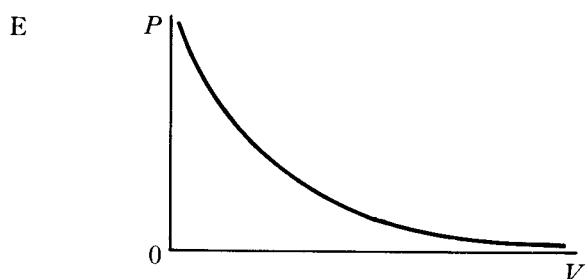
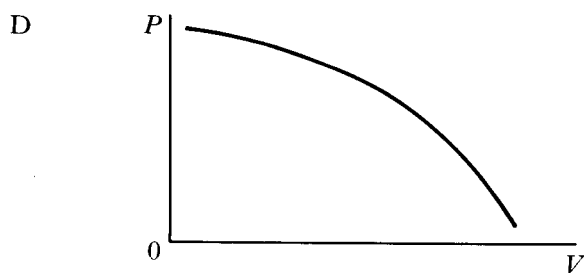
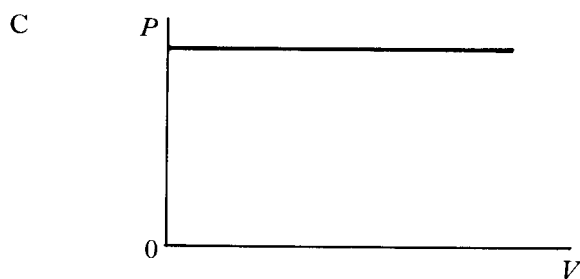
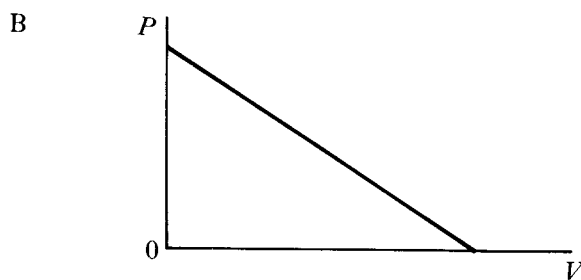
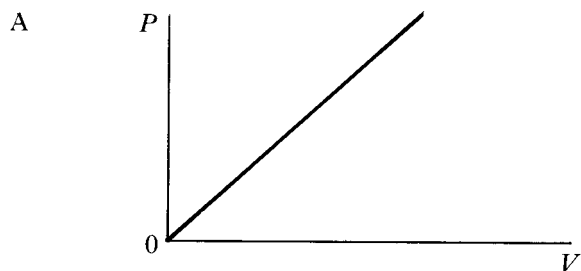
The race starts and finishes at X. Which entry in the table below gives the displacement of the yacht at position Z relative to the start; and the distance covered up to position Z?

	<i>Displacement</i>	<i>Distance</i>
A	5 km due East	5 km
B	7 km due East	5 km due East
C	5 km	7 km due East
D	7 km due East	7 km
E	5 km due East	7 km

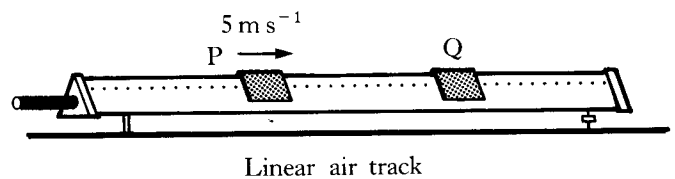
90. A ball is thrown vertically upwards from ground level. When it falls to the ground, it bounces several times before coming to rest. Which one of the following velocity–time graphs represents the motion of the ball from the instant it leaves the thrower’s hand until it hits the ground for a second time?



91. Which one of the following graphs illustrates the correct relationship between the pressure P and volume V of a fixed mass of gas at constant temperature?



92. The diagram below shows two vehicles, both of mass 0.2 kg , on a linear air track. Vehicle P is moving at 5 m s^{-1} towards vehicle Q, which is at rest before the collision.

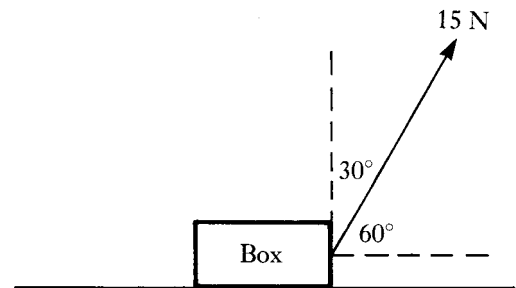


After colliding, they move off **separately** to the right. Vehicle P moves with a speed of 2 m s^{-1} and vehicle Q moves with a speed of 3 m s^{-1} .

Which one of the following correctly describes this collision?

	<i>Momentum</i>	<i>Kinetic Energy</i>	<i>Type of Collision</i>
A	lost	conserved	elastic
B	conserved	lost	elastic
C	conserved	conserved	elastic
D	lost	conserved	inelastic
E	conserved	lost	inelastic

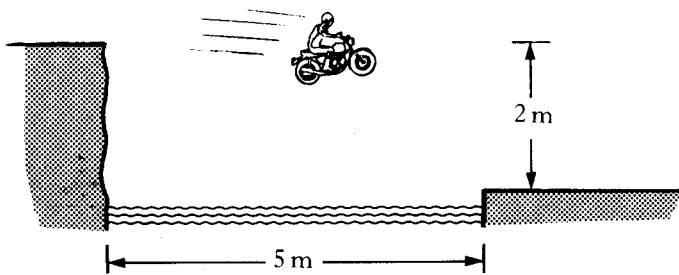
93. A force of 15 N acts on a box as shown below.



Which entry in the following table correctly shows the horizontal and vertical components of the force?

	<i>Horizontal component/N</i>	<i>Vertical component/N</i>
A	$15 \sin 60^\circ$	$15 \sin 30^\circ$
B	$15 \cos 60^\circ$	$15 \sin 30^\circ$
C	$15 \sin 60^\circ$	$15 \cos 60^\circ$
D	$15 \cos 30^\circ$	$15 \sin 30^\circ$
E	$15 \cos 60^\circ$	$15 \sin 60^\circ$

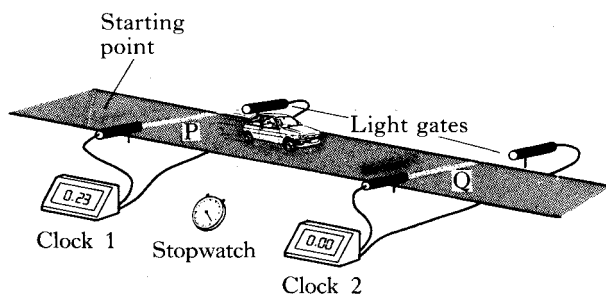
94. A unt motorcyclist attempts to jump a river which is 5 m wide. The bank from which he will take off is 2 m higher than the bank on which he will land as shown below.



What is the minimum horizontal speed he must achieve just before take-off to avoid landing in the river?

- A 2.0 m s^{-1}
 B 3.2 m s^{-1}
 C 7.9 m s^{-1}
 D 10.0 m s^{-1}
 E 12.5 m s^{-1}

95. A student sets up the apparatus in the diagram to measure the average acceleration of a model car as it travels between P and Q.



For one run, the following measurements were recorded along with their estimated errors:

- clock 1 reading = $0.23 \text{ s} \pm 0.01 \text{ s}$
 clock 2 reading = $0.12 \text{ s} \pm 0.01 \text{ s}$
 stopwatch reading = $0.95 \text{ s} \pm 0.20 \text{ s}$
 length of car = $0.050 \text{ m} \pm 0.002 \text{ m}$
 distance PQ = $0.30 \text{ m} \pm 0.01 \text{ m}$

The measurement which gives the largest percentage error is the

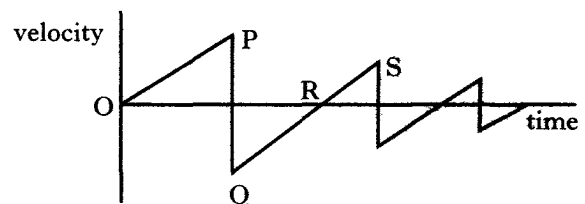
- A reading on clock 1
 B reading on clock 2
 C reading on the stopwatch
 D length of car
 E distance PQ.

96. A woman walks 12 km due North. She then turns round immediately and walks 4 km due South. The total journey takes 4 hours.

Which row in the following table gives the correct values for her average velocity and average speed?

	<i>Average velocity</i>	<i>Average speed</i>
A	4 km h ⁻¹ due N	4 km h ⁻¹
B	4 km h ⁻¹ due N	2 km h ⁻¹
C	3 km h ⁻¹ due N	4 km h ⁻¹
D	2 km h ⁻¹ due N	4 km h ⁻¹
E	2 km h ⁻¹ due N	3 km h ⁻¹

97. The following, velocity-time graph describes the motion of a ball, dropped from rest and bouncing several times.



Which of the following statements is/are true?

- I The ball hits the ground at P.
 II The ball is moving upwards between Q and R.
 III The ball is moving upwards between R and S.

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

98. The momentum of a rock of mass 4 kg is 12 kgms^{-1}

The kinetic energy of the rock is

- A 6 J
- B 18 J
- C 36 J
- D 144 J
- E 288 J.

99. Density is measured in

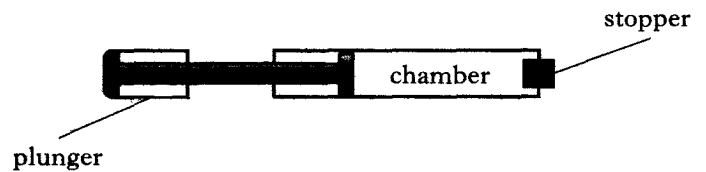
- A N m^{-2}
- B N m^{-3}
- C kgm^3
- D kgm^{-2}
- E kgm^{-3}

100. The pressure of a fixed mass of gas is 100 kPa at a temperature of -52°C .
The volume of the gas remains constant.

At what temperature would the pressure of the gas be 200 kPa?

- A -26°C
- B $+52^\circ\text{C}$
- C $+147^\circ\text{C}$
- D $+169^\circ\text{C}$
- E $+442^\circ\text{C}$

101. The end of a bicycle pump is sealed with a stopper so that the air in the chamber is trapped.



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

Assuming that the temperature remains constant, which of the following explain/s why the pressure increases?

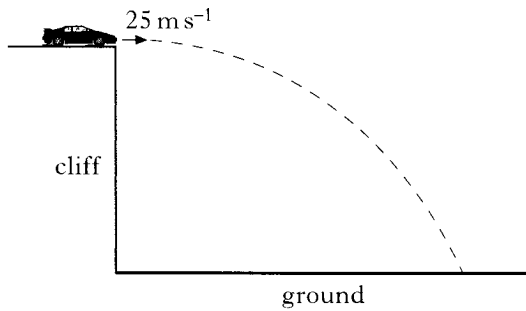
- I The air molecules increase their average speed.
 - II The air molecules are colliding more often with the walls of the chamber.
 - III Each air molecule is striking the walls of the chamber with greater force.
- A II only
 - B III only
 - C I and II only
 - D I and III only
 - E I, II and III

102. A speed skier crosses the **start-line** of a straight 200 metre downhill course with a speed of 30 m s^{-1} . She accelerates uniformly all the way down and takes 5 s to cover the course.

What is her speed as she crosses the **finish-line**?

- A 30 m s^{-1}
- B 35 m s^{-1}
- C 40 m s^{-1}
- D 45 m s^{-1}
- E 50 m s^{-1}

103. For the purpose of a car advertising campaign, a car with a dummy driver is driven over a cliff, as shown.

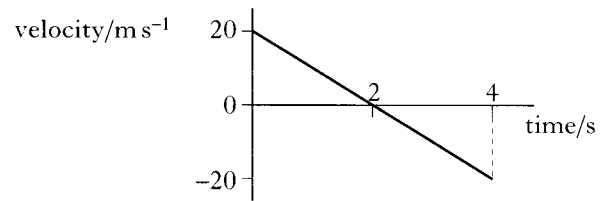


The car leaves the top of the cliff horizontally at a speed of 25 m s^{-1} and hits the ground below 3 s later.

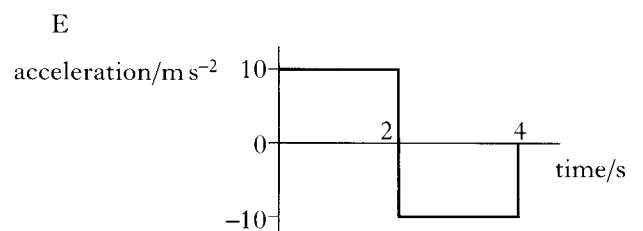
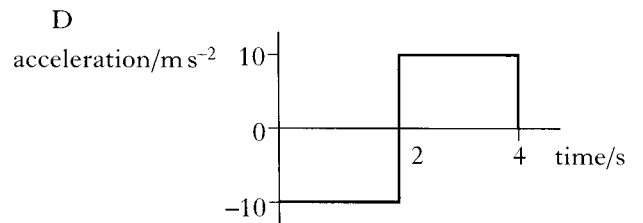
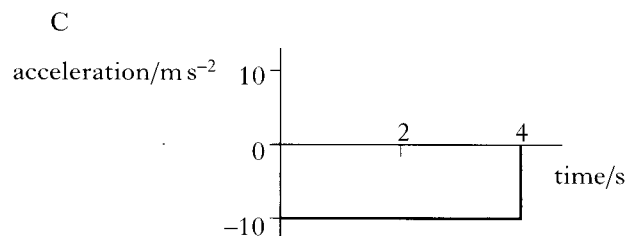
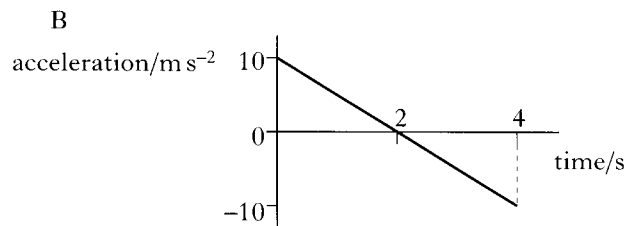
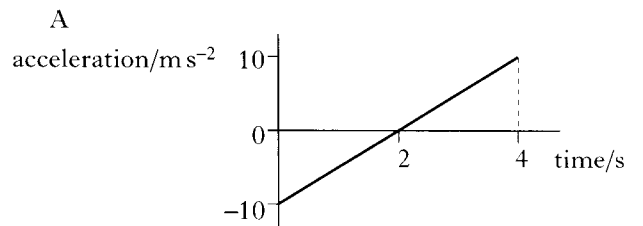
Assuming that air resistance is negligible and that the acceleration due to gravity is 10 m s^{-2} , what is the height of the cliff?

- A 30 m
- B 45 m
- C 75 m
- D 90 m
- E 120 m

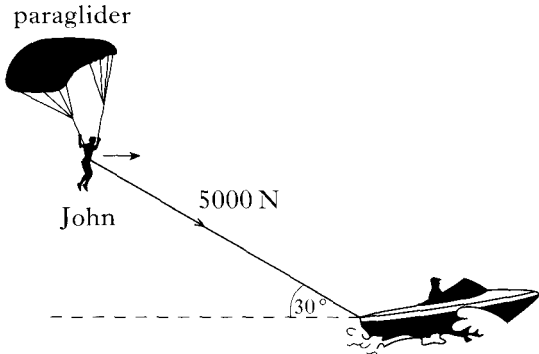
104. The following velocity-time graph represents the vertical motion of a ball.



Which of the following acceleration-time graphs represents the same motion?



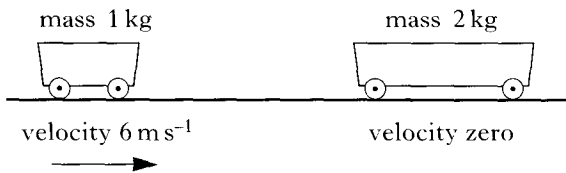
105. While being towed behind a speedboat, John and his paraglider are moving horizontally with a constant velocity, as shown below.



The towing cable exerts a force of 5000 N on John and his paraglider. What is the horizontal resistive force acting on John and his paraglider?

- A 2500 N
- B 4330 N
- C 5774 N
- D 7500 N
- E 10000 N

106. The diagram below shows the masses and velocities of two trolleys just before they collide on a level bench.

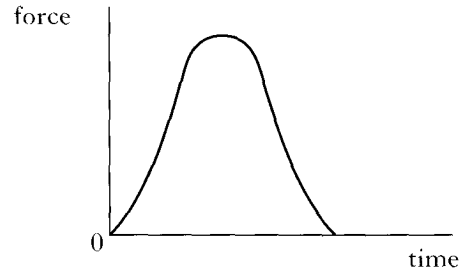


After the collision, the two trolleys move along the bench joined together.

How much kinetic energy is lost as a result of this collision?

- A 0 J
- B 6 J
- C 12 J
- D 18 J
- E 24 J

107. A golfer hits a golf ball with a club. The graph below shows how the force between the club and the ball varies during the time of contact.



The area under the curve on the graph is equal to

- A the distance travelled by the ball
- B the average force on the ball
- C the change in the speed of the ball
- D the change in the momentum of the ball
- E the acceleration of the ball.

108. Water flows over a waterfall, which is 120 m high, at a rate of $1 \times 10^6 \text{ kg s}^{-1}$.

Assuming that the acceleration due to gravity is 10 m s^{-2} , which of the following gives the power delivered by the water in falling?

- A $1200 \times 10^6 \text{ W}$
- B $120 \times 10^6 \text{ W}$
- C $12 \times 10^6 \text{ W}$
- D $(1 \times 10^6) / 120 \text{ W}$
- E $(1 \times 10^6) / 1200 \text{ W}$

109. Which of the following statements about the absolute zero of temperature is/are true?

- I The absolute zero of temperature is -273 K .
- II At absolute zero, movement of molecules ceases in an ideal gas.
- III At absolute zero, the mass of an ideal gas is zero.

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

110. The weight of a solid object is 100 N and its volume is $1 \times 10^{-3}\text{ m}^3$. Assuming that the gravitational field strength is 10 Nkg^{-1} the density of this object is

- A $1 \times 10^6\text{ kg m}^{-3}$
- B $1 \times 10^5\text{ kg m}^{-3}$
- C $1 \times 10^4\text{ kg m}^{-3}$
- D $1 \times 10^{-1}\text{ kg m}^{-3}$
- E $1 \times 10^{-2}\text{ kg m}^{-3}$

111. Which of the following is a scalar quantity?

- A Velocity
- B Acceleration
- C Mass
- D Force
- E Momentum

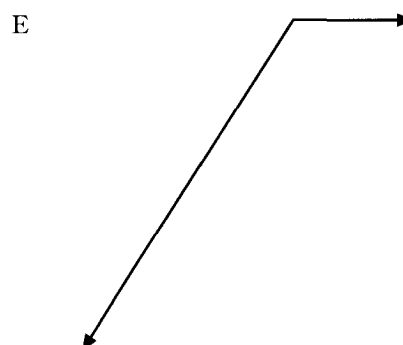
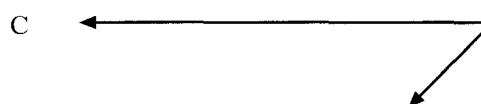
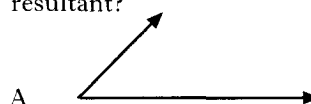
112. Which one of the following pairs contains one vector quantity and one scalar quantity?

- A Force, kinetic energy
- B Power, speed
- C Displacement, acceleration
- D Work, potential energy
- E Momentum, velocity

113. The diagram below shows the resultant of two vectors.



Which of the diagrams below shows the vectors which could produce the above resultant?



114. A woman walks 12 km due North. She then turns round immediately and walks 4 km due South. The total journey takes 4 hours.

Which row in the following table gives the correct values for her average velocity and average speed?

	<i>Average velocity</i>	<i>Average speed</i>
A	4 km h ⁻¹ due N	4 km h ⁻¹
B	4 km h ⁻¹ due N	2 km h ⁻¹
C	3 km h ⁻¹ due N	4 km h ⁻¹
D	2 km h ⁻¹ due N	4 km h ⁻¹
E	2 km h ⁻¹ due N	3 km h ⁻¹

115. The air in a car tyre is at a pressure of 2.8×10^5 Pa when its temperature is 20 °C.

The temperature of the air rises to 30 °C. The volume of the air in the tyre is unchanged.

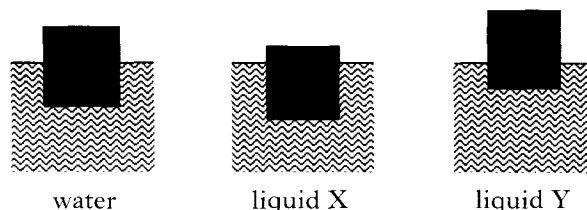
The pressure of the air in the tyre is now

- A 1.9×10^5 Pa
- B 2.7×10^5 Pa
- C 2.8×10^5 Pa
- D 2.9×10^5 Pa
- E 4.2×10^5 Pa.

116. Which of the following gives the correct relationship between the pressure and temperature of a fixed mass of an ideal gas at constant volume?

- A The pressure is directly proportional to the temperature in °C.
- B The pressure is inversely proportional to the temperature in °C.
- C The pressure is directly proportional to the temperature in K.
- D The pressure is inversely proportional to the temperature in K.
- E The expression (pressure X temperature in K) is constant.

117. A block floats in water and two other liquids X and Y at the levels shown.



Which of the following statements is/are correct?

- I The density of the material of the block is less than the density of water.
 - II The density of liquid X is less than the density of water.
 - III The density of liquid X is greater than the density of liquid Y.
- A I only
 - B II only
 - C I and II only
 - D I and III only
 - E II and III only

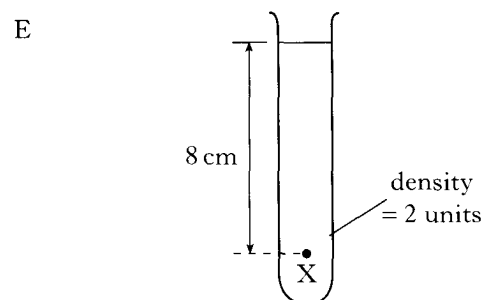
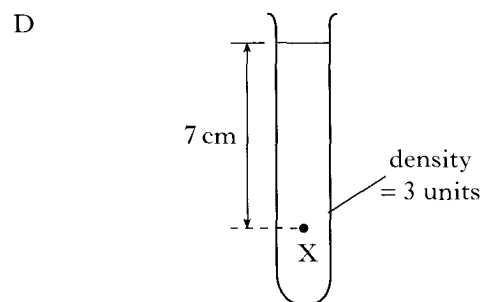
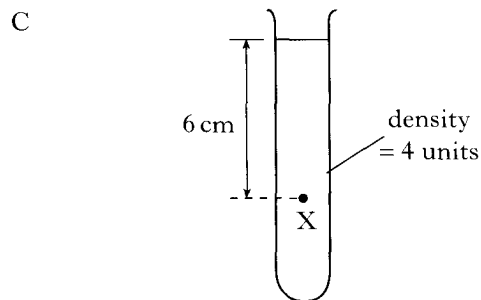
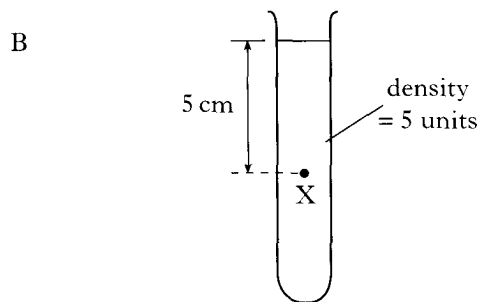
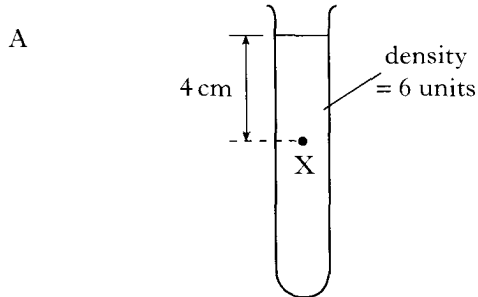
118. Ice at -10 °C is heated until it becomes water at 80 °C.

The temperature change on the kelvin scale is

- A 70 K
- B 90 K
- C 343 K
- D 363 K
- E 636 K.

119. Five liquids of different density are contained in separate, identical test tubes. The density of each liquid is given in the diagram.

In which test tube is the pressure greatest at point X?

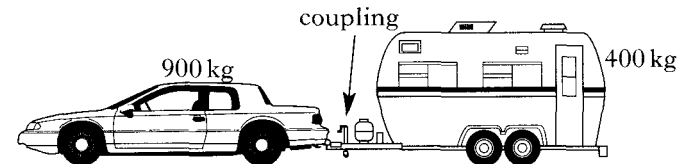


120. A helicopter is **descending** vertically at a constant speed of 3.0 ms^{-1} . A sandbag is released from the helicopter. The sandbag hits the ground 5.0 s later.

What was the height of the helicopter above the ground at the time the sandbag was released?

- A 15.0 m
 B 49.0 m
 C 107.5 m
 D 122.5 m
 E 137.5 m

121. A car of mass 900 kg pulls a caravan of mass 400 kg along a straight, horizontal road with an acceleration of 2.0 ms^{-2} .



Assuming that the frictional forces on the caravan are negligible, the tension in the coupling between the car and the caravan is

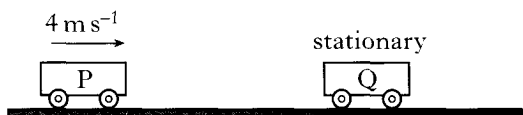
- A 400 N
 B 500 N
 C 800 N
 D 1800 N
 E 2600 N

122. A rocket of mass 5.0 kg is travelling horizontally with a speed of 200 ms^{-1} when it explodes into two parts. One part of mass 3.0 kg continues in the original direction with a speed of 100 ms^{-1} . The other part also continues in this same direction. Its speed is

- A 150 ms^{-1}
 B 200 ms^{-1}
 C 300 ms^{-1}
 D 350 ms^{-1}
 E 700 ms^{-1}

123. In the diagram below, the trucks are of equal mass and the horizontal surface can be considered frictionless.

Truck P is initially moving at 4 m s^{-1} towards truck Q. Truck Q is initially stationary.



When truck P collides with truck Q, they join together.

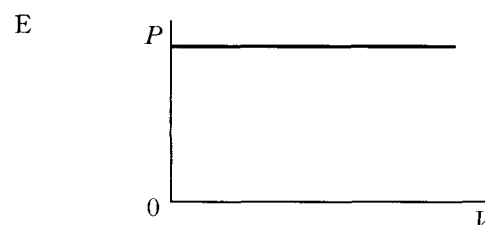
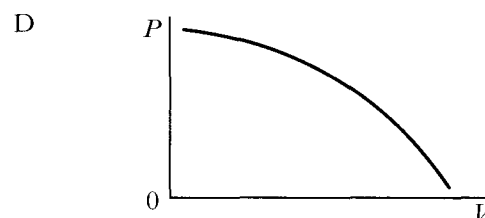
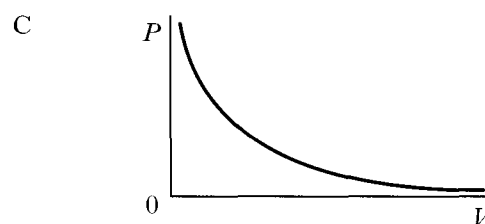
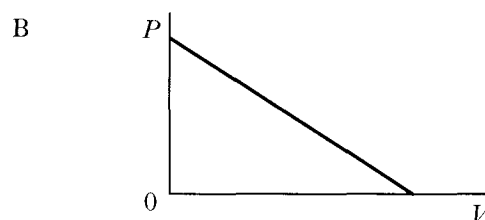
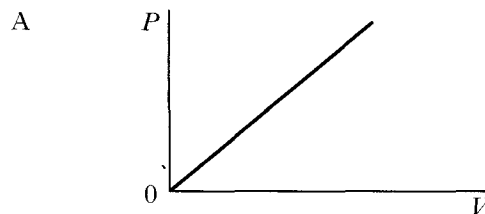
How are the total momentum and the total kinetic energy of the trucks affected by this collision?

	<i>Total Momentum of trucks</i>	<i>Total Kinetic Energy of trucks</i>
A	unchanged	doubled
B	unchanged	unchanged
C	unchanged	halved
D	halved	unchanged
E	halved	doubled

124. A pressure of one pascal is produced by

- A a force of 1 newton acting on 1 square centimetre
- B a force of 1 newton acting on 1 square metre
- C a mass of 1 kilogram acting on 1 square centimetre
- D a mass of 1 kilogram acting on 1 square metre
- E a mass of 10 kilograms acting on 1 square metre.

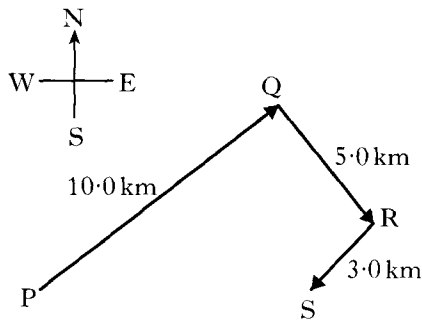
125. Which one of the following graphs illustrates the correct relationship between the pressure P and the volume V of a fixed mass of ideal gas at constant temperature?



126. Which of the following is a vector quantity?

- A Distance
- B Time
- C Speed
- D Energy
- E Weight

127. A soldier on a training exercise completes the route labelled PQRS.



The resultant displacement of the soldier is 9.0 km due East.

What is the average speed of the soldier if he takes 2 hours to complete the route PQRS?

- A 4.5 km h^{-1}
- B 4.5 km h^{-1} due East
- C 4.5 km h^{-1} due West
- D 9.0 km h^{-1}
- E 9.0 km h^{-1} due East

128. A helicopter is descending vertically at a constant speed of 3.0 m s^{-1} .

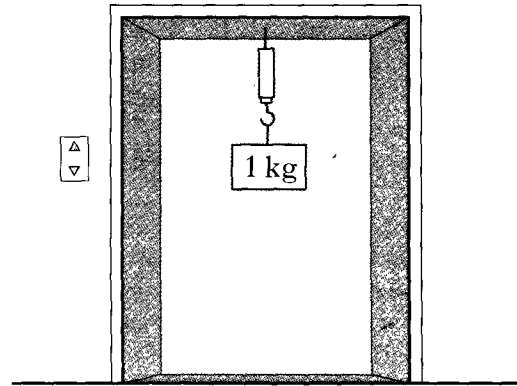
A sandbag is released from the helicopter and it hits the ground 5.0 s later.

What was the height of the helicopter above the ground at the time the sandbag was released?

You should assume that the acceleration due to gravity is 9.8 m s^{-2} and that air resistance is negligible.

- A 15.0 m
- B 49.0 m
- C 107.5 m
- D 122.5 m
- E 137.5 m

129. An object of mass 1 kg hangs from a spring which is attached to the roof of a lift.

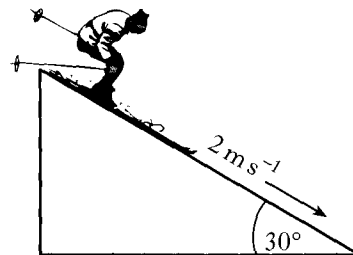


What is the reading on the spring balance when the lift accelerates upwards at 2 m s^{-2} ?

You should assume that the gravitational field strength is 10 N kg^{-1} .

- A 2 N
- B 8 N
- C 10 N
- D 12 N
- E 30 N

130. A skier travels at a constant velocity of 2 m s^{-1} down a slope.



The mass of the skier is 70 kg.

What is the total frictional force opposing the motion of the skier?

You should assume that the gravitational field strength is 10 N kg^{-1} .

- A 0 N
- B 140 N
- C 350 N
- D 606 N
- E 1400 N