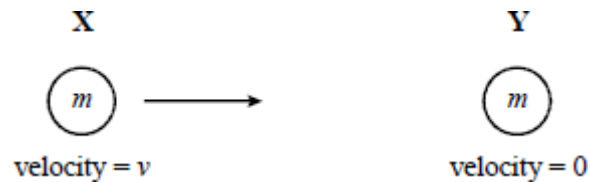


Q1. In which of the following do both quantities have the same unit?

- A** Electrical resistivity and electrical resistance.
- B** Work function Planck constant
- C** Pressure and the Young modulus.
- D** Acceleration and rate of change of momentum.

(Total 1 mark)

Q2. A body **X**, moving with a velocity v , collides elastically with a stationary body **Y** of equal mass.



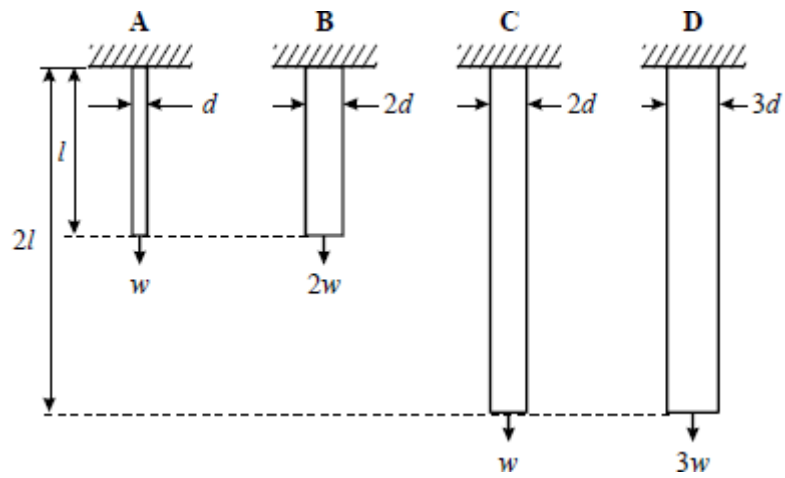
Which one of the following correctly describes the velocities of the two bodies after the collision?

	velocity of X	velocity of Y
A	$\frac{v}{2}$	$\frac{v}{2}$
B	$-\frac{v}{2}$	$\frac{v}{2}$
C	$-v$	0
D	0	v

(Total 1 mark)

Q3. The four bars **A**, **B**, **C** and **D** have diameters, lengths and loads as shown. They are all made of the same material.

Which bar has the greatest extension?



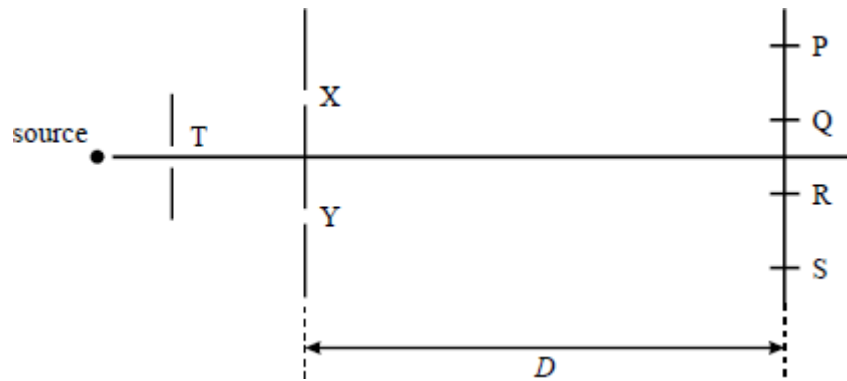
(Total 1 mark)

Q4. A narrow beam of monochromatic light falls on a diffraction grating at normal incidence. The second order diffracted beam makes an angle of 45° with the grating. What is the highest order visible with this grating at this wavelength?

- A** 2
- B** 3
- C** 4
- D** 5

(Total 1 mark)

Q5.



Coherent monochromatic light of wavelength λ emerges from the slits X and Y to form dark fringes at P, Q, R and S in a double slit apparatus. Which one of the following statements is true?

- A When the distance D is increased, the separation of the fringes increases.
- B When the distance between X and Y is increased, the separation of the fringes increases.
- C When the width of the slit T is decreased, the separation of the fringes decreases.
- D There is a dark fringe at P because $(YP - XP)$ is 2λ .

(Total 1 mark)

Q6. A wave motion has period T , frequency f , wavelength λ and speed v . Which one of the following equations is **incorrect**?

- A $1 = Tf$
- B $T = \frac{v}{\lambda}$
- C $\lambda = \frac{v}{f}$
- D $Tv = \lambda$

(Total 1 mark)

Q7. Coplanar forces of 5 N, 4 N and 3 N act on an object. Which force, in N, **could not possibly** be the resultant of these forces?

- A 0
- B 4
- C $\frac{1}{2}$
- D $\frac{1}{6}$

(Total 1 mark)

Q8. In a double slit interference arrangement the fringe spacing is w when the wavelength of the radiation is λ , the distance between the double slits is s and the distance between the slits and the plane of the observed fringes is D . In which one of the following cases would the fringe spacing also be w ?

	wave length	distance between slits	distance between slits and fringes
A	2λ	$2s$	$2D$
B	2λ	$4s$	$2D$
C	2λ	$2s$	$4D$
D	4λ	$2s$	$2D$

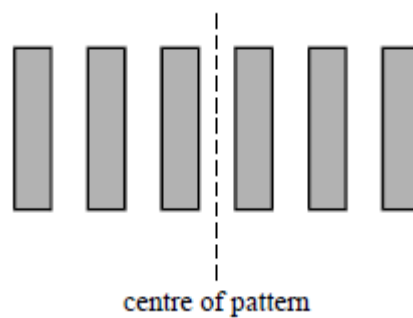
(Total 1 mark)

Q9. Monochromatic light of wavelength 590 nm is incident normally on a plane diffraction grating having 4×10^5 lines m^{-1} . An interference pattern is produced. What is the highest order visible in this interference pattern?

- A** 2
- B** 3
- C** 4
- D** 5

(Total 1 mark)

Q10.



A double slit interference experiment is performed using monochromatic light of wavelength λ . The centre of the observed pattern is a bright fringe. What is the path difference between two waves which interfere to give the third dark fringe from the centre?

- A** 0.5λ
- B** 1.5λ
- C** 2.5λ
- D** 3.5λ

(Total 1 mark)

Q11. In a Young's double slits interference arrangement the fringe separation is s when the wavelength of the radiation is λ , the slit separation w and the distance between the slits and the plane of the observed fringes D . In which one of the following cases would the fringe separation also be s ?

	wavelength	slit separation	distance between slits and fringes
A	2λ	$2w$	$2D$
B	2λ	$4w$	$2D$
C	2λ	$2w$	$4D$
D	4λ	$2w$	$2D$

(Total 1 mark)

Q12. Using a diffraction grating with monochromatic light of wavelength 500 nm incident normally, a student found the 2nd order diffracted maxima in a direction at 30° to the central bright fringe. What is the number of lines per metre on the grating?

- A** 2×10^4
- B** 2×10^5
- C** 4×10^5
- D** 5×10^5

(Total 1 mark)

Q13. Figures 1 and 2 each show a ray of light incident on a water-air boundary. **A**, **B**, **C** and **D** show ray directions at the interface.

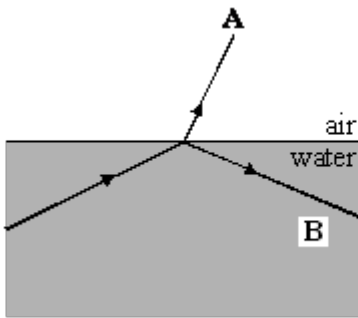


Figure 1

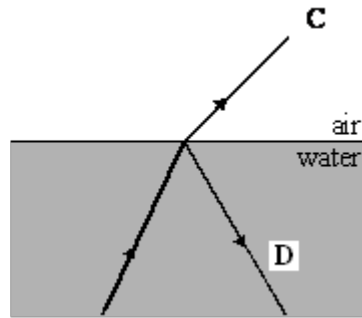


Figure 2

(a) Circle the letter below that corresponds to a direction in which a ray **cannot** occur.

- A** **B** **C** **D**

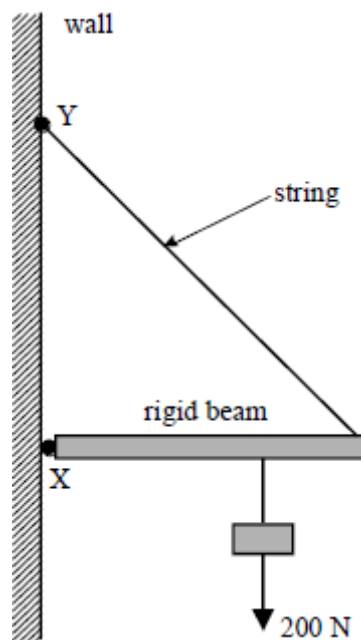
(1)

(b) Circle the letter below that corresponds to the direction of the faintest ray.

- A** **B** **C** **D**

(1)
(Total 2 marks)

Q14. In the system shown a light rigid beam, pivoted at **X**, is held in position by a string which is fixed at **Y**. The beam carries a load of 200 N. The load is moved towards **X**. Which one of the following statements is correct?



- A The tension in the string increases
- B The compression force in the beam increases
- C The moment of the load about **X** increases
- D The magnitude of the vertical component of the reaction at **X** increases

(Total 1 mark)

Q15. A lunar landing module is descending to the Moon's surface at a steady velocity of 10.0 m s^{-1} . At a height of 120 m a small object falls from its landing gear. Assuming that the Moon's gravitational acceleration is 1.60 m s^{-2} , at what speed, in m s^{-1} does the object strike the Moon?

- A 22.0
- B 19.6
- C 16.8
- D 10.0

(Total 1 mark)

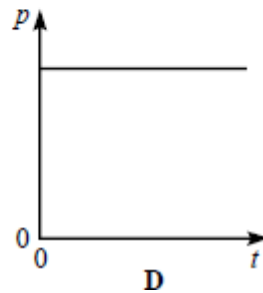
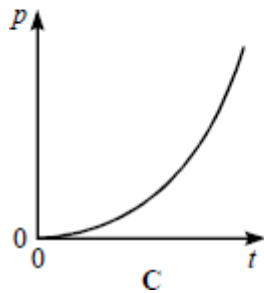
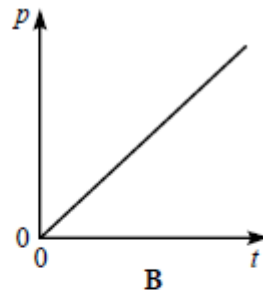
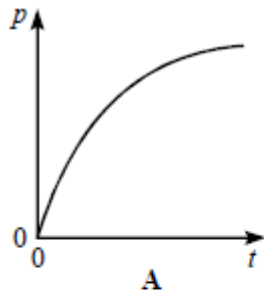
Q16. The least distance between two points of a progressive transverse wave which have a phase difference of $\frac{\pi}{3}$ rad is 0.050 m. If the frequency of the wave is 500 Hz, what is the speed of the wave?

- A** 25 m s⁻¹
- B** 75 m s⁻¹
- C** 150 m s⁻¹
- D** 1666 m s⁻¹

(Total 1 mark)

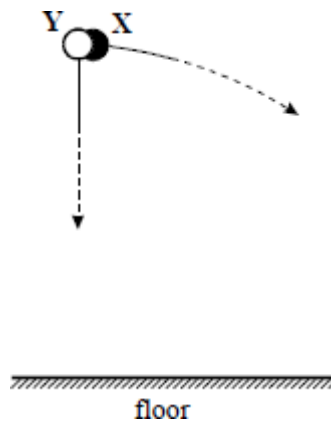
Q17. A body is accelerated from rest by a constant force.

Which one of the following graphs best represents the variation of the body's momentum p with time t ?



(Total 1 mark)

Q18. A ball **X** is projected horizontally from a certain point at the same time as a ball **Y** of the same diameter but twice the mass is released from rest and allowed to fall vertically from the same level. Air resistance is negligible. Which one of the following will occur?



- A Y will hit the floor just before X
- B X will hit the floor just before Y
- C X and Y will hit the floor at the same time
- D Y hits the floor while X is half way to the floor

(Total 1 mark)

Q19. A diffraction pattern is formed by passing monochromatic light through a single slit. If the width of the single slit is reduced, which of the following is true?

	Width of central maximum	Intensity of central maximum	
A	unchanged	decreases	<input type="checkbox"/>
B	increases	increases	<input type="checkbox"/>
C	increases	decreases	<input type="checkbox"/>
D	decreases	decreases	<input type="checkbox"/>

(Total 1 mark)

Q20. Young's two slit interference pattern with red light of wavelength 7.0×10^{-7} m gives a fringe separation of 2.0 mm.

What separation, in mm, would be observed at the same place using blue light of wavelength 45×10^{-7} m?

- A 0.65
- B 1.3
- C 2.6
- D 3.1

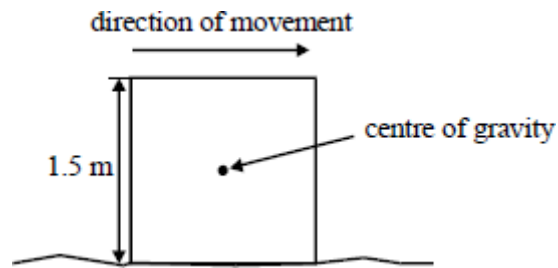
(Total 1 mark)

Q21. Which one of the following pairs contains one vector and one scalar quantity?

A	Displacement	Acceleration
B	Force	Kinetic energy
C	Power	Speed
D	Work	Potential energy

(Total 1 mark)

Q22. A uniform square block is sliding with uniform speed along a rough surface as shown in the diagram.

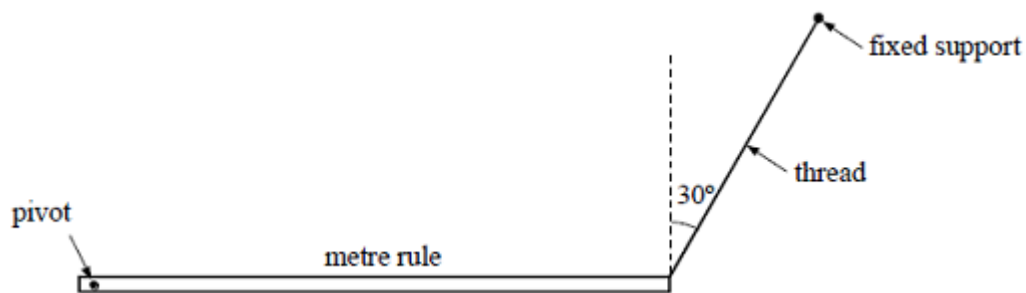


The force used to move the block is 200 N. The moment of the frictional force acting on the block about the centre of gravity of the block is

- A 150 N m, clockwise
- B 150 N m, anticlockwise
- C 300 N m, clockwise
- D 300 N m, anticlockwise

(Total 1 mark)

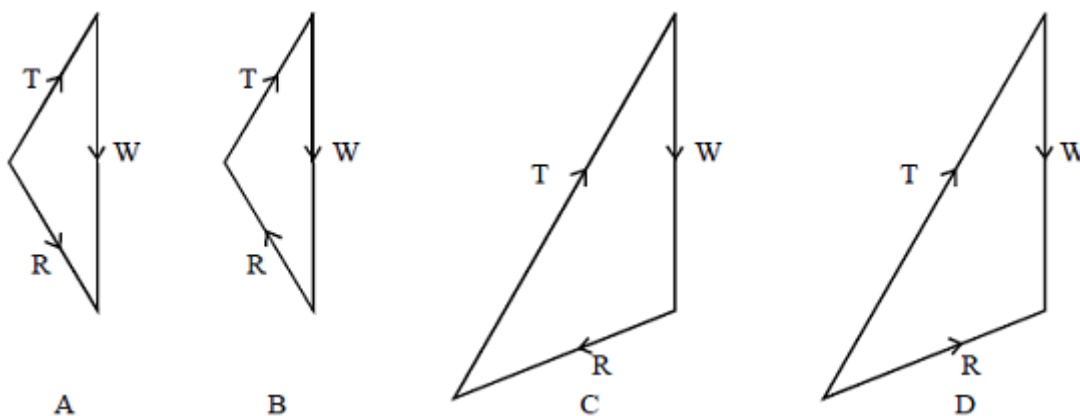
Q23. A pivoted metre rule is supported in equilibrium horizontally by a thread inclined at 30° to the vertical.



The three forces acting on the rule are:

- its weight W ;
- the tension T in the thread;
- the reaction force R at the pivot.

Which one of these diagrams, drawn to scale, represents the magnitudes and directions of these three forces?



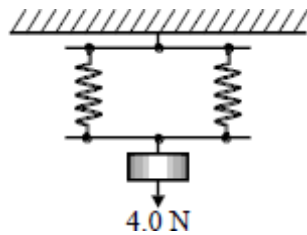
(Total 1 mark)

Q24. A steel ball of weight W falls through oil. At a time **before** the ball reaches terminal velocity, the magnitude of the viscous resistance force on the ball is

- A zero
- B between zero and W
- C equal to W
- D greater than W

(Total 1 mark)

Q25. A load of 4.0 N is suspended from a parallel two-spring system as shown in the diagram.

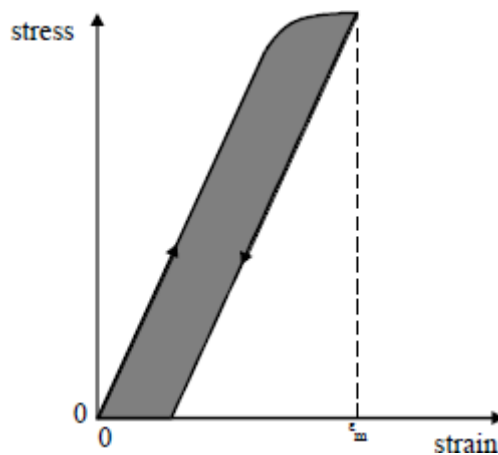


The spring constant of each spring is 20 N m^{-1} . The elastic energy, in J, stored in the system is

- A 0.1
- B 0.2
- C 0.4
- D 0.8

(Total 1 mark)

Q26. The graph shows the variation of stress with strain for a ductile alloy when a specimen is slowly stretched to a maximum strain of ϵ_m and the stress is then slowly reduced to zero.

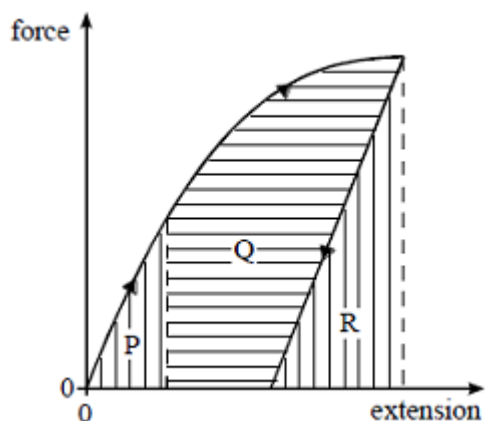


The shaded area

- A represents the work done per unit volume when stretching the specimen
- B represents the energy per unit volume recovered when the stress is removed
- C represents the energy per unit volume which cannot be recovered
- D has units of J m^{-1}

(Total 1 mark)

Q27. The force on a sample of a material is gradually increased and then decreased. The graph of force against extension is shown in the diagram.

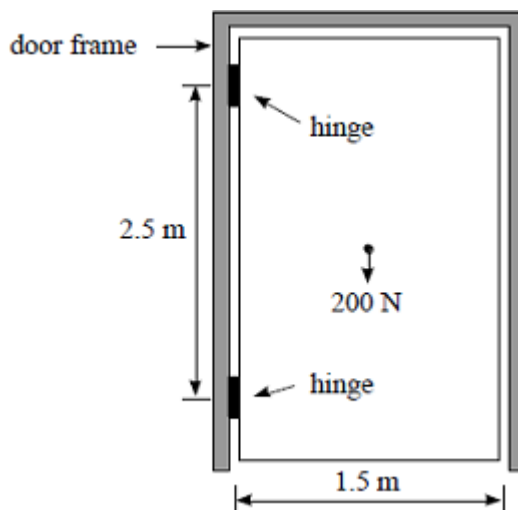


The increase in thermal energy in the sample is represented by area

- A R
- B $P + Q$
- C $P + Q + R$
- D $P + Q - R$

(Total 1 mark)

Q28. The diagram shows a uniform door hanging from two hinges 2.5 m apart.



The moment of the couple that the hinges exert on the door is

- A 150 N m
- B 200 N m
- C 250 N m
- D 500 N m

(Total 1 mark)

Q29. A light source emits light which is a mixture of two wavelengths, λ_1 and λ_2 . When the light is incident on a diffraction grating it is found that the fifth order of light of wavelength λ_1 occurs at the same angle as the fourth order for light of wavelength λ_2 . If λ_1 is 480 nm what is λ_2 ?

- A 400 nm
- B 480 nm
- C 600 nm
- D 750 nm

(Total 1 mark)

Q30. Which of the following is correct for a stationary wave?

- A Between two nodes the amplitude of the wave is constant.
- B The two waves producing the stationary wave must always be 180° out of phase.
- C The separation of the nodes for the second harmonic is double the separation of nodes for the first harmonic.
- D Between two nodes all parts of the wave vibrate in phase.

(Total 1 mark)

Q31. The diagram shows a strobe photograph of a mark on a trolley **X**, moving from right to left, in collision with another trolley **Y** which had no mark on it.

After the collision both trolleys are in motion together.



Which **one** of the following is consistent with the photograph?

- A Trolley **Y** has the same mass as trolley **X** and was initially stationary
- B Trolley **Y** had a smaller mass than **X** and was moving from right to left
- C Trolley **Y** had the same mass and was initially moving left to right at the same speed as trolley **X**
- D Trolley **Y** had the same mass and was initially moving left to right at a higher speed than trolley **X**

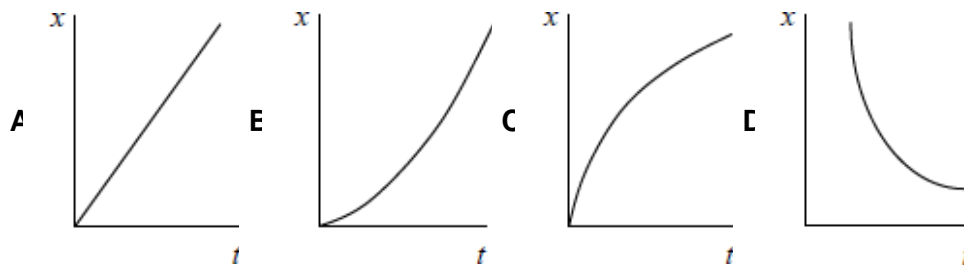
(Total 1 mark)

Q32. Which of the following is **not** a unit of power?

- A N m s^{-1}
- B $\text{kg m}^2 \text{s}^{-3}$
- C J s^{-1}
- D $\text{kg m}^{-1} \text{s}^{-1}$

(Total 1 mark)

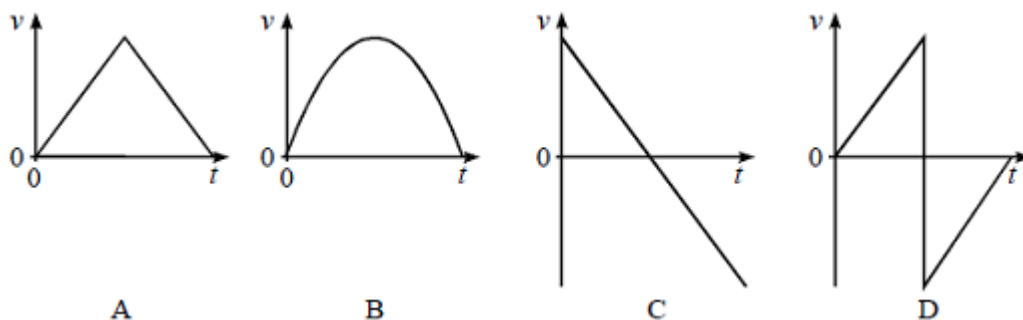
Q33. A car accelerates uniformly from rest along a straight road. Which graph shows the variation of displacement x of the car with time t ?



- A
- B
- C
- D

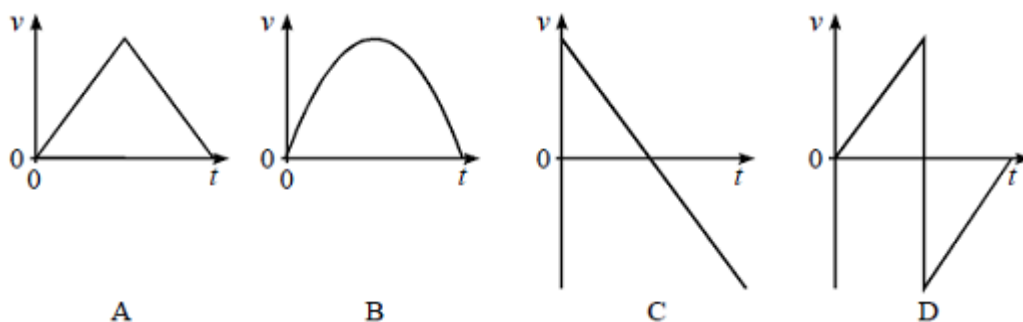
(Total 1 mark)

Q34. A perfectly elastic rubber ball falls vertically from rest and rebounds from the floor. Which one of the following velocity-time, $v-t$, graphs best represents the motion from the moment of release to the top of the first rebound?



(Total 1 mark)

Q35. A perfectly elastic rubber ball falls vertically from rest and rebounds from the floor. Which one of the following velocity-time, $v-t$, graphs best represents the motion from the moment of release to the top of the first rebound?



(Total 1 mark)

M1.C

[1]

M2.D

[1]

M3.A

[1]

M4.A

[1]

M5.A

[1]

M6.B

[1]

M7.D

[1]

M8.B

[1]

M9.C

[1]

M10.C

[1]

M11.B

[1]

M12.D

[1]

M13. (a) A

B1

(b) D

B1

[2]

M14.D

[1]

M15.A

[1]

M16.C

[1]

M17.B

[1]

M18.C

[1]

M19.C

[1]

M20.B

[1]

M21.B

[1]

M22.A

[1]

M23.B

[1]

M24.B

[1]

M25.B

[1]

M26.C

[1]

M27.B

[1]

M28.A

[1]

M29.C

[1]

M30.D

[1]

M31.A

[1]

M32.D

[1]

M33.B

[1]

M34.D

[1]

M35.D

[1]