

Assessment Week SL 20/05/2018 [40 marks]

1. How many significant figures are there in the number 0.0450? [1 mark]
- A. 2
 - B. 3
 - C. 4
 - D. 5

Markscheme

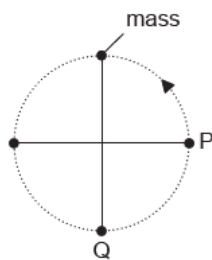
B

2. An object is positioned in a gravitational field. The measurement of gravitational force acting on the object has an uncertainty of 3% [1 mark] and the uncertainty in the mass of the object is 9%. What is the uncertainty in the gravitational field strength of the field?
- A. 3%
 - B. 6%
 - C. 12%
 - D. 27%

Markscheme

C

3. A mass attached to a string rotates in a gravitational field with a constant period in a vertical plane. [1 mark]



How do the tension in the string and the kinetic energy of the mass compare at P and Q?

	Tension in the string	Kinetic energy of mass
A.	greater at P than Q	greater at Q than P
B.	greater at Q than P	greater at Q than P
C.	greater at P than Q	same at Q and P
D.	greater at Q than P	same at Q and P

Markscheme

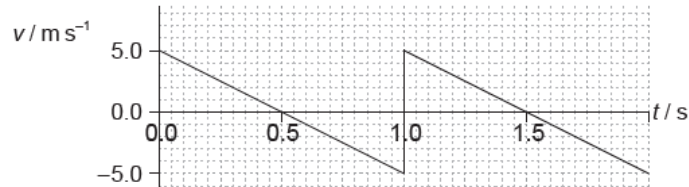
B

4. The variation of the displacement of an object with time is shown on a graph. What does the area under the graph represent? [1 mark]
- A. No physical quantity
 - B. Velocity
 - C. Acceleration
 - D. Impulse

Markscheme

A

5. An object is thrown upwards. The graph shows the variation with time t of the velocity v of the object. [1 mark]



What is the total displacement at a time of 1.5 s, measured from the point of release?

- A. 0 m
- B. 1.25 m
- C. 2.50 m
- D. 3.75 m

Markscheme

B

6. An object is released from a stationary hot air balloon at height h above the ground. [1 mark]

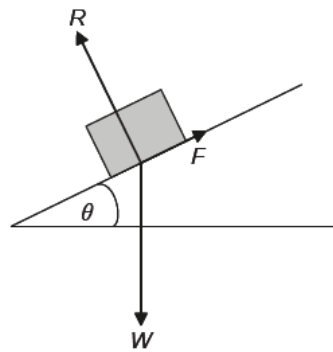
An identical object is released at height h above the ground from another balloon that is rising at constant speed. Air resistance is negligible. What does **not** increase for the object released from the rising balloon?

- A. The distance through which it falls
- B. The time taken for it to reach the ground
- C. The speed with which it reaches the ground
- D. Its acceleration

Markscheme

D

7. The diagram shows the forces acting on a block resting on an inclined plane. The angle θ is adjusted until the block is just at the point of sliding. R is the normal reaction, W the weight of the block and F the maximum frictional force. [1 mark]



not to scale

What is the maximum coefficient of static friction between the block and the plane?

- A. $\sin \theta$
- B. $\cos \theta$
- C. $\tan \theta$
- D. $\frac{1}{\tan \theta}$

Markscheme

C

8. A moving system undergoes an explosion. What is correct for the momentum of the system and the kinetic energy of the system when they are compared immediately before and after the explosion? [1 mark]

	Momentum	Kinetic energy
A.	conserved	increased
B.	conserved	conserved
C.	increased	conserved
D.	increased	increased

Markscheme

A

9. A toy car of mass 0.15 kg accelerates from a speed of 10 cm s^{-1} to a speed of 15 cm s^{-1} . What is the impulse acting on the car? [1 mark]
- A. 7.5 mN s
 - B. 37.5 mN s
 - C. 0.75 N s
 - D. 3.75 N s

Markscheme

A

10. Which of the following is a scalar quantity?

[1 mark]

- A. Velocity
- B. Momentum
- C. Kinetic energy
- D. Acceleration

Markscheme

C

11. An object is released from rest in the gravitational field of the Earth. Air resistance is negligible. How far does the object move during [1 mark] the fourth second of its motion?

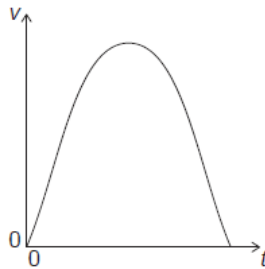
- A. 15 m
- B. 25 m
- C. 35 m
- D. 45 m

Markscheme

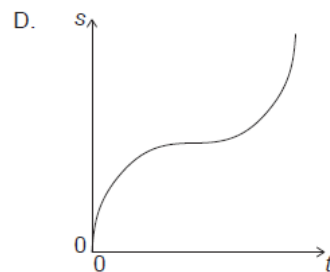
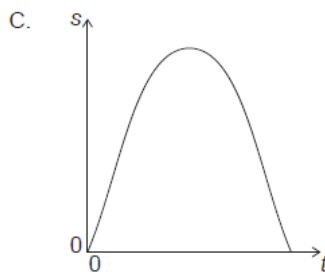
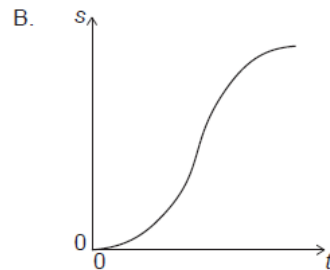
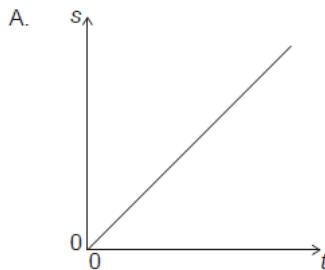
C

12. The graph shows the variation of speed v of an object with time t .

[1 mark]



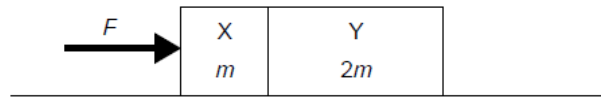
Which graph shows how the distance s travelled by the object varies with t ?



Markscheme

B

13. Two boxes in contact are pushed along a floor with a force F . The boxes move at a constant speed. Box X has a mass m and box Y [1 mark] has a mass $2m$.



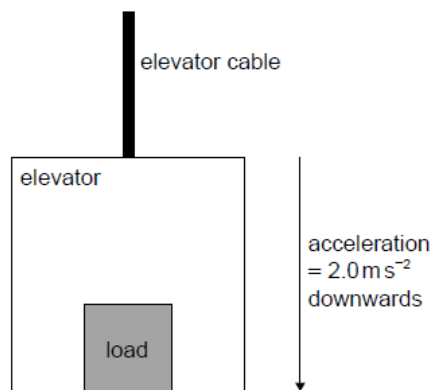
What is the resultant force acting on Y?

- A. 0
- B. $\frac{F}{2}$
- C. F
- D. $2F$

Markscheme

A

14. An elevator (lift) and its load have a total mass of 750 kg and accelerate vertically downwards at 2.0 m s^{-2} . [1 mark]



What is the tension in the elevator cable?

- A. 1.5 kN
- B. 6.0 kN
- C. 7.5 kN
- D. 9.0 kN

Markscheme

B

15. A car travelling at a constant velocity covers a distance of 100 m in 5.0 s. The thrust of the engine is 1.5 kN. What is the power of the car? [1 mark]

- A. 0.75 kW
- B. 3.0 kW
- C. 7.5 kW
- D. 30 kW

Markscheme

D

16. A stone falls from rest to the bottom of a water well of depth d . The time t taken to fall is 2.0 ± 0.2 s. The depth of the well is calculated to be 20 m using $d = \frac{1}{2}at^2$. The uncertainty in a is negligible. [1 mark]

What is the absolute uncertainty in d ?

- A. ± 0.2 m
- B. ± 1 m
- C. ± 2 m
- D. ± 4 m

Markscheme

D

17. A ball is tossed vertically upwards with a speed of 5.0 m s^{-1} . After how many seconds will the ball return to its initial position? [1 mark]

- A. 0.50 s
- B. 1.0 s
- C. 1.5 s
- D. 2.0 s

Markscheme

B

18. A projectile is fired horizontally from the top of a cliff. The projectile hits the ground 4 s later at a distance of 2 km from the base of the cliff. What is the height of the cliff? [1 mark]

- A. 40 m
- B. 80 m
- C. 120 m
- D. 160 m

Markscheme

B

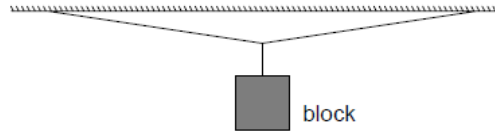
19. The initial kinetic energy of a block moving on a horizontal floor is 48 J. A constant frictional force acts on the block bringing it to rest over a distance of 2 m. What is the frictional force on the block? [1 mark]

- A. 24 N
- B. 48 N
- C. 96 N
- D. 192 N

Markscheme

A

20. A block of weight W is suspended by two strings of equal length. The strings are almost horizontal. [1 mark]



What is correct about the tension T in one string?

- A. $T < \frac{W}{2}$
B. $T = \frac{W}{2}$
C. $\frac{W}{2} < T \leq W$
D. $T > W$

Markscheme

D

21. Planet X has mass M and radius R . Planet Y has mass $2M$ and radius $3R$. The gravitational field strength at the surface of planet X is g . What is the gravitational field strength at the surface of planet Y? [1 mark]

- A. $\frac{2}{9}g$
B. $\frac{2}{3}g$
C. $\frac{3}{2}g$
D. $\frac{9}{2}g$

Markscheme

A

22. The Earth is a distance r_S from the Sun. The Moon is a distance r_M from the Earth. [1 mark]

The ratio $\frac{\text{gravitational field strength at the Earth due to the Sun}}{\text{gravitational field strength at the Earth due to the Moon}}$ is proportional to

- A. $\frac{r_M}{r_S}$
B. $\frac{r_S}{r_M}$
C. $\frac{r_S^2}{r_M^3}$
D. $\frac{r_M^2}{r_S^2}$

Markscheme

D

23. A car on a road follows a horizontal circular path at constant speed. Which of the following correctly identifies the origin and the direction of the net force on the car? [1 mark]

	Origin	Direction
A.	car engine	toward centre of circle
B.	car engine	away from centre of circle
C.	friction between car tyres and road	away from centre of circle
D.	friction between car tyres and road	toward centre of circle

Markscheme

D

24. What is the acceleration of an object rotating with constant speed v in a circle of radius r ? [1 mark]
- A. Zero
- B. $\frac{v^2}{r}$ towards the centre of the circle
- C. $\frac{v^2}{r}$ away from the centre of the circle
- D. $\frac{v^2}{r}$ along a tangent to the circle

Markscheme

B

25. A cyclist rides around a circular track at a uniform speed. Which of the following correctly gives the net horizontal force on the cyclist [1 mark] at any given instant of time?

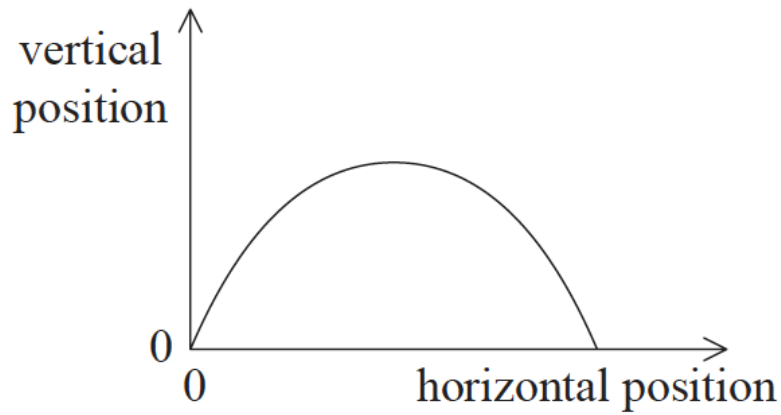
	Net horizontal force along direction of motion	Net horizontal force normal to direction of motion
A.	zero	zero
B.	zero	non zero
C.	non zero	zero
D.	non zero	non zero

Markscheme

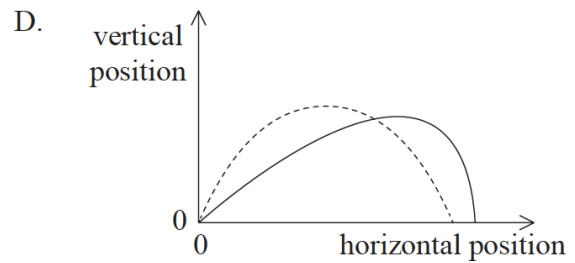
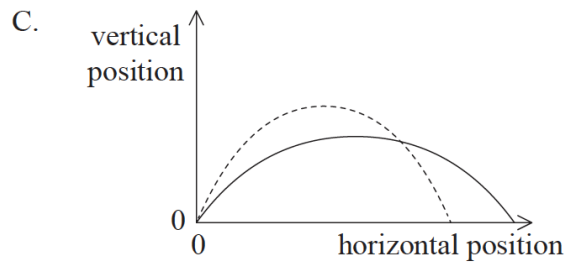
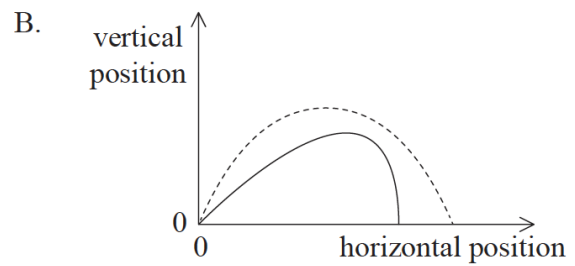
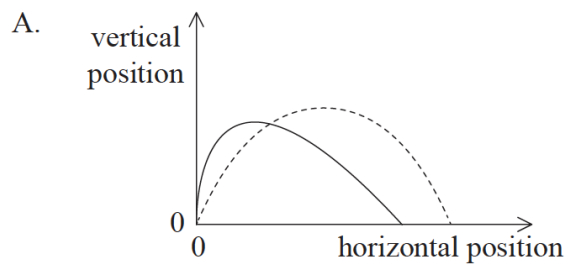
B

26. The diagram shows the trajectory of an object projected in the absence of air resistance.

[1 mark]



The object is then projected with the same initial conditions but air resistance is taken into account. Which of the following is the trajectory when air resistance is taken into account? The original trajectory is shown as a dotted line.



Markscheme

B

27. An object rotates in a horizontal circle when acted on by a centripetal force F . What is the centripetal force acting on the object when the radius of the circle doubles and the kinetic energy of the object halves? [1 mark]

- A. $\frac{F}{4}$
- B. $\frac{F}{2}$
- C. F
- D. $4F$

Markscheme

A

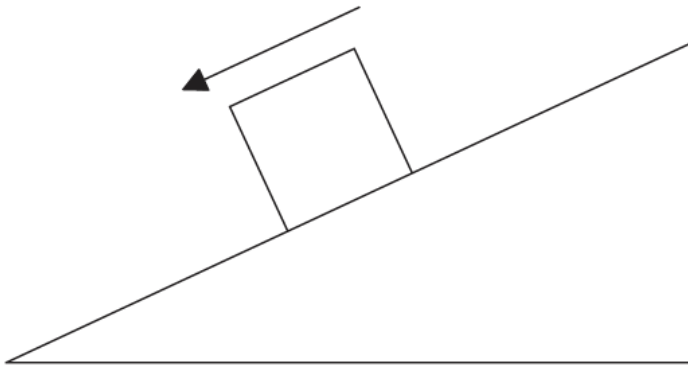
28. A constant force of 12 N is applied for 3.0 s to a body initially at rest. The final velocity of the body is 6.0 m s^{-1} . What is the mass of [1 mark] the body?
- A. 1.5 kg
 - B. 6.0 kg
 - C. 24 kg
 - D. 36 kg

Markscheme

B

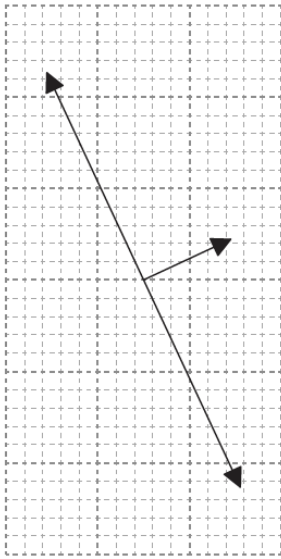
29. A block slides down an inclined plane at constant speed.

[1 mark]

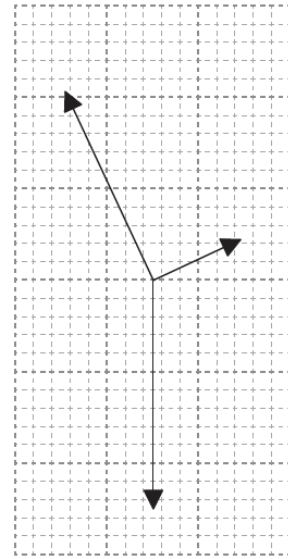


Which diagram represents the free-body diagram of the forces acting on the block?

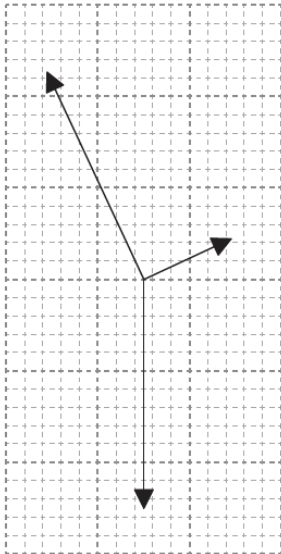
A.



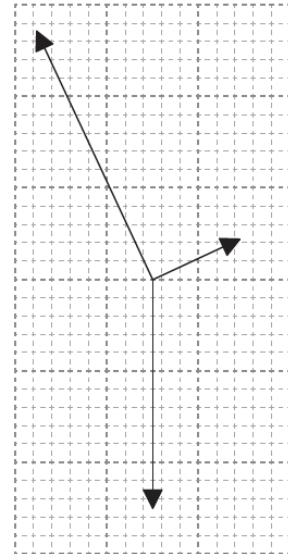
B.



C.



D.



Markscheme

B

30. A projectile is fired from level ground with speed v at an angle θ to the ground. Ignoring air resistance, which of the following is a correct expression for the maximum height reached by the projectile? [1 mark]

A. $\frac{v^2 \sin^2 \theta}{2g}$

B. $\frac{v^2 \cos^2 \theta}{2g}$

C. $\frac{v \sin \theta}{g}$

D. $\frac{v \cos \theta}{g}$

Markscheme

A

31. An object of mass m_1 has a kinetic energy E_1 . Another object has a mass m_2 and kinetic energy E_2 . The objects have the same momentum. What is the ratio $\frac{E_1}{E_2}$? [1 mark]

A. 1

B. $\sqrt{\frac{m_2}{m_1}}$

C. $\frac{m_2}{m_1}$

D. $\left(\frac{m_2}{m_1}\right)^2$

Markscheme

C

32. A metal sphere is at rest on a bench. According to Newton's third law of motion, what is a possible action-reaction pair for this situation? [1 mark]

	Action	Reaction
A.	downwards gravitational force of Earth on the sphere	upwards gravitational force of the sphere on Earth
B.	upwards gravitational force of Earth on the sphere	downwards gravitational force of the sphere on Earth
C.	upwards electrostatic force acting on the sphere due to the atoms in the bench surface	upwards gravitational force of the sphere on Earth
D.	upwards electrostatic force acting on the sphere due to the atoms in the bench surface	downwards gravitational force of the sphere on Earth

Markscheme

A

33. Which of the following is a unit of energy?

[1 mark]

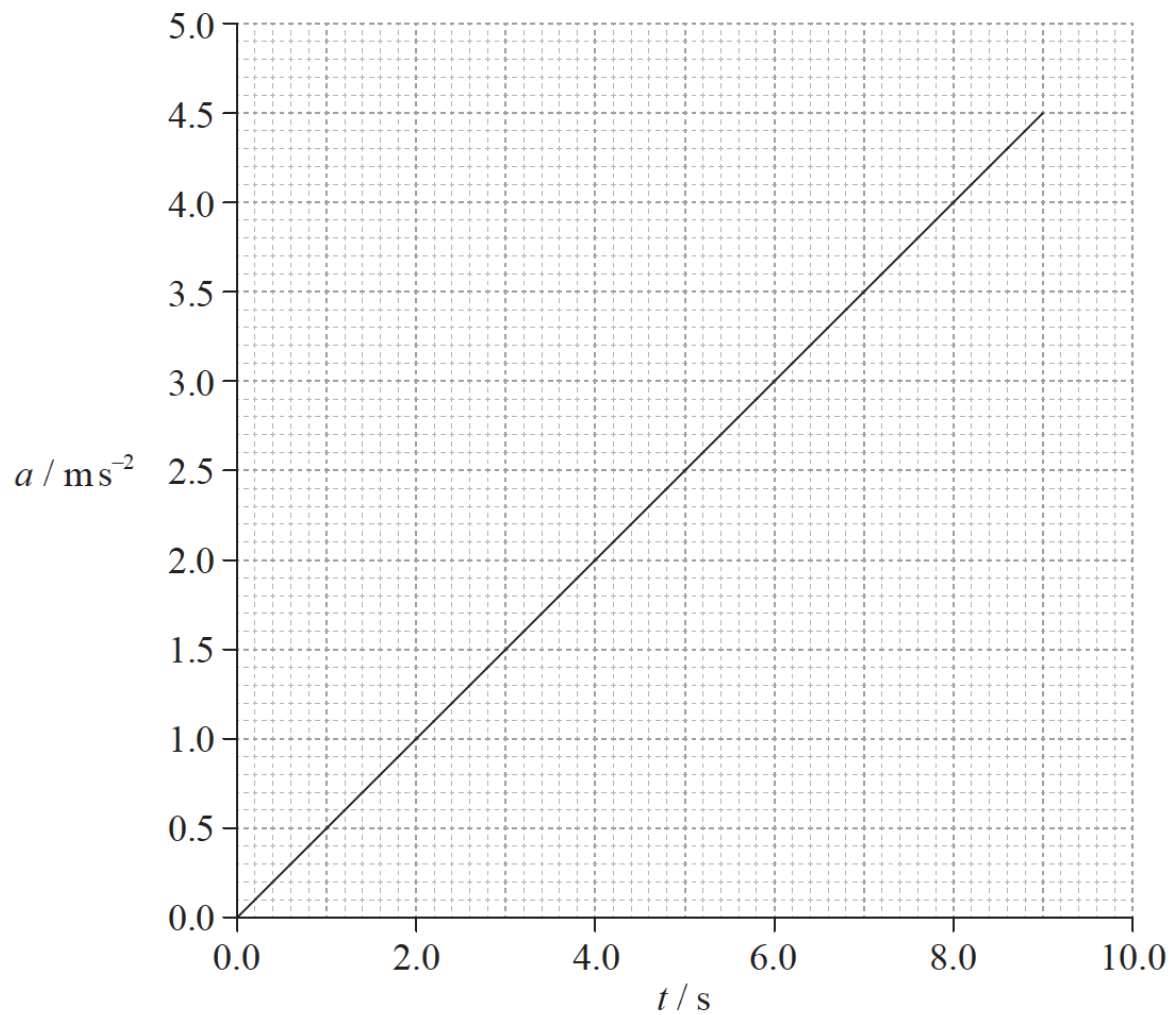
- A. $\text{kg m}^{-1} \text{s}^{-1}$
- B. $\text{kg m}^2 \text{s}^{-2}$
- C. kg m s^{-2}
- D. $\text{kg m}^2 \text{s}^{-1}$

Markscheme

B

34. A particle accelerates from rest. The graph shows how the acceleration a of the particle varies with time t .

[1 mark]



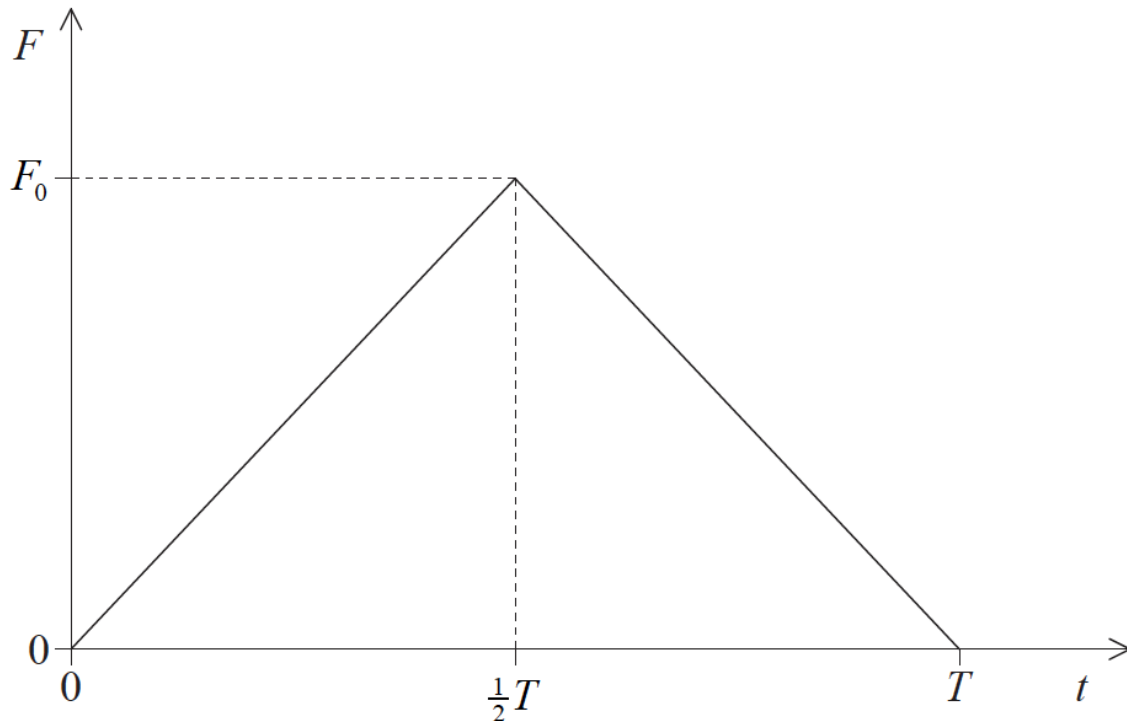
What is the speed of the particle at $t=6.0\text{s}$?

- A. 0.5 ms^{-1}
- B. 2.0 ms^{-1}
- C. 9.0 ms^{-1}
- D. 18 ms^{-1}

Markscheme

C

35. A ball is moving horizontally and strikes a vertical wall from which it rebounds horizontally. The sketch graph shows how the contact force F between ball and wall varies with time of contact t . [1 mark]



The maximum value of F is F_0 and the total time of contact between ball and wall is T .

What is the change in momentum of the ball?

- A. $\frac{F_0 T}{2}$
- B. $F_0 T$
- C. $\frac{F_0}{2T}$
- D. $\frac{F_0}{T}$

Markscheme

A

36. A truck is pulled up an inclined plane at constant speed by an electric motor. The gain in potential energy of the truck is 48 kJ. The efficiency of the electric motor is $\frac{2}{3}$. [1 mark]

How much energy is dissipated in pulling the truck up the plane?

- A. 16 kJ
- B. 24 kJ
- C. 32 kJ
- D. 64 kJ

Markscheme

B

37. The sides of a square are measured to be 5.0 ± 0.2 cm. Which of the following gives the area of the square and its uncertainty? [1 mark]
- A. 25.0 ± 0.2 cm²
 - B. 25.0 ± 0.4 cm²
 - C. 25 ± 2 cm²
 - D. 25 ± 4 cm²

Markscheme

C

38. In an inelastic collision [1 mark]
- A. momentum and kinetic energy are both conserved.
 - B. momentum is conserved but kinetic energy is not.
 - C. kinetic energy is conserved but momentum is not.
 - D. neither momentum nor kinetic energy are conserved.

Markscheme

B

39. The length of the side of a cube is $10.0 \pm 0.3 \text{ cm}$. What is the uncertainty in the volume of the cube? [1 mark]
- A. $\pm 0.027 \text{ cm}^3$
 - B. $\pm 2.7 \text{ cm}^3$
 - C. $\pm 9.0 \text{ cm}^3$
 - D. $\pm 90 \text{ cm}^3$

Markscheme

D

40. Which of the following is always true for an object moving in a straight line at constant speed? [1 mark]
- A. No forces act on the object.
 - B. No resultant force acts on the object.
 - C. The momentum of the object is zero.
 - D. No work is being done on the object.

Markscheme

B