Linear Momentum & Conservation

TOPIC QUESTIONS

Level	A Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

1. An electric motor of input power 100 W raises a mass of 10 kg vertically at a steady speed of 0.5 ms^{-1}. What is the efficiency of the system?

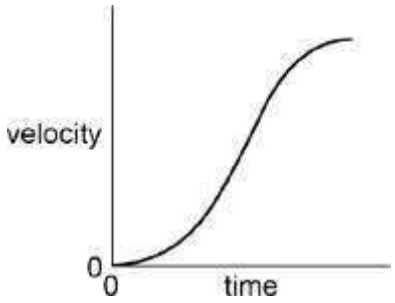
A 5%

B 12%

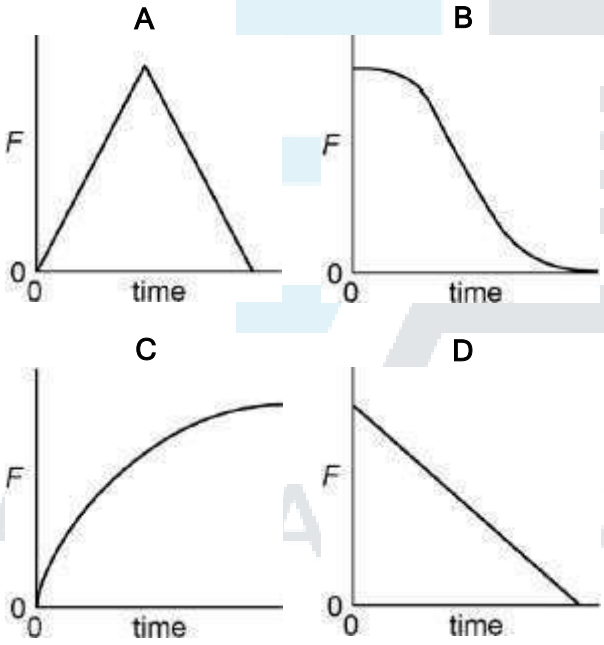
C 50%

D 100%

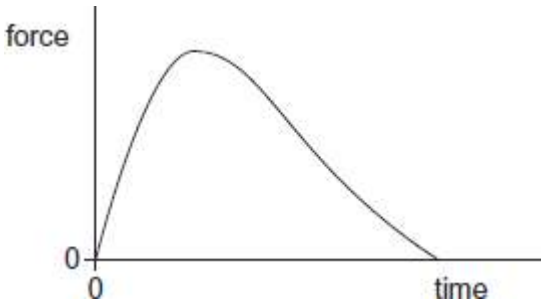
2. The velocity of a vehicle varies with time as shown by the following graph.



Which graph below represents how the resultant force F on the car varies during the same time?



3. The graph shows how the force acting on a rocket varies with time.



Which one of the following is represented by the area under the graph?

A distance travelled

B gain in kinetic energy

C change in velocity

D change in momentum

4. A golf club strikes a stationary golf ball of mass 4.8×10^{-2} kg and the ball leaves the club with a speed of 95 m s^{-1}. If the average force exerted on the ball is 7800 N, how long are the ball andclub in contact?

A 5.8×10^{-4} s

B 1.2×10^{-2} s

C 0.51 s

D 0.58s

(Total 1 mark)

5. Water of density 1000 kg m^{-3} flows out of a garden hose of cross-sectional area 7.2 × 10^{-4} m^2 at a rate of 2.0 × 10^{-4} m^3 per second. How much momentum is carried by the water leaving the hose per second?

A 5.6 ×10^{-5} N s

B 5.6 × 10^{-2} N s

C 0.20 N s

D 0.72 N s

6. Which row is true for an elastic collision between two objects in an isolated system?

	Kinetic energy	Momentum
A	conserved	conserved
B	not conserved	conserved
C	conserved	not conserved
D	not conserved	not conserved

7. The drag force on a boat is kv^2, where v is the speed and k = 64 kg m^{-1}. The boat's engine has a useful power output of 8000 W.

What is the maximum speed of the boat?

A 0.2 m s^{-1}

A 5 m s^{-1}

B 11 m s^{-1}

D 125 m s^{-1}

8. A railway truck of mass 2000 kg travelling horizontally at 1.5 m s^{-1} collides with a stationary truckof mass 3000 kg.
   After the collision they move together.

   Which row is correct?

	Speed of the trucks immediately after collision / m s^{-1}	Effect of collision on total kinetic energy
A	0.6	no change
B	0.6	decrease
C	1.0	no change
D	1.0	decrease

9. A body of constant mass falls freely due to gravity.

   The rate of change of momentum of the body is equal to its

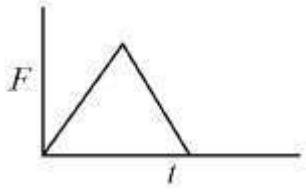
   A kinetic energy.

   B mass.

   C gravitational potential energy.

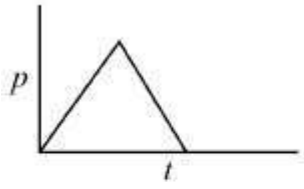
   D weight.

10. The graph shows how the resultant force F on a football, which is initially at rest, varies with time t.



Which graph shows how the momentum p of the football varies with time t?

A



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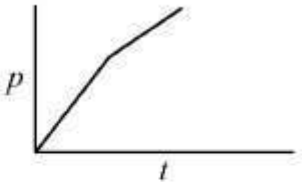

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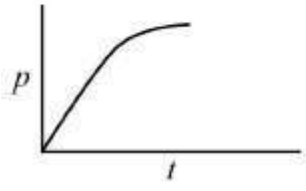
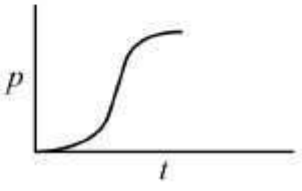


D



11. Which one of the following has the same unit as the rate of change of momentum?

A work

B energy

C acceleration

D weight

12. The nucleus of a radioactive isotope X is at rest and decays by emitting an α particle so that a newnuclide Y is formed.
Which one of the following statements about the decay is correct?

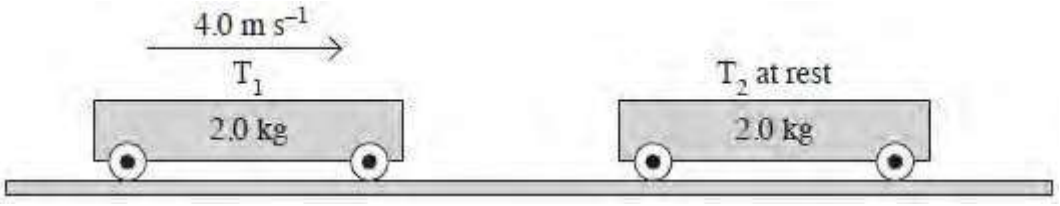
A The momentum of Y is equal and opposite to the momentum of the α particle.

B The momentum of Y is equal to the momentum of X.

C The kinetic energy of Y is equal to the kinetic energy of the α particle.

D The total kinetic energy is the same before and after the decay.

13. Trolley T_1, of mass 2.0 kg, collides on a horizontal surface with trolley T_2, which is also of mass 2.0 kg. The collision is elastic. Before the collision T_1 was moving at 4.0 m s^{-1} and T_2 was at rest.



Which one of the following statements is correct? Immediately after the collision

A T_1 is at rest and T_2 moves at 4.0 m s^{-1}.

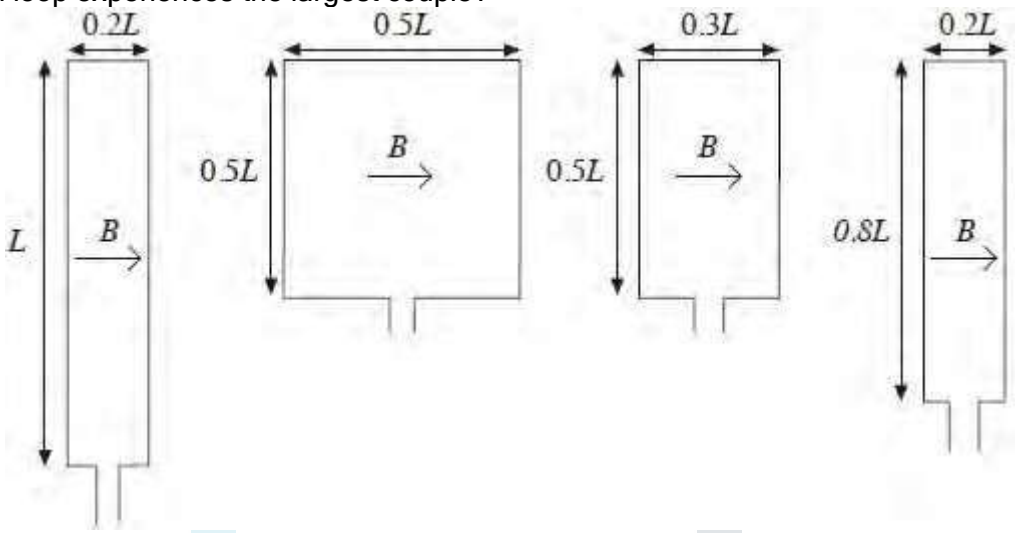
B T_1 will rebound from T_2 at 4.0 m s^{-1}.

C T_1 and T_2 will both move at 2.8 m s^{-1}.

D T_1 and T_2 will both move at 1.4 m s^{-1}.

14. Four rectangular loops of wire **A**, **B**, **C** and **D** are each placed in a uniform magnetic field of the sameflux density B. The direction of the magnetic field is parallel to the plane of the loops as shown.

When a current of 1 A is passed through each of the loops, magnetic forces act on them. Thelengths of the sides of the loops are as shown.
Which loop experiences the largest couple?



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

15. Which of the following is a scalar quantity?

A velocity

B kinetic energy

C force

D momentum

16. 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?

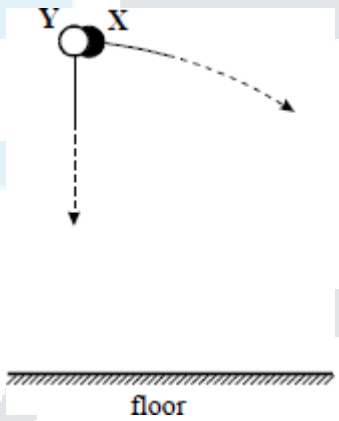
A 22.0

B 19.6

C 16.8

D 10.0

17. 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 samelevel. Air resistance is negligible. Which one of the following will occur?



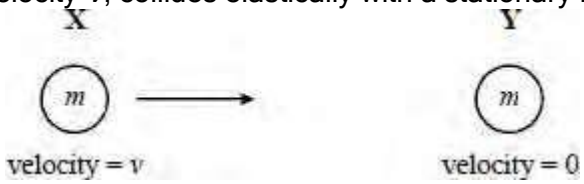
A **Y** will hit the floor just before **X**

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

18. 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

19. A car of mass M travelling at speed V comes to rest using its brakes. Energy is dissipated in the brake discs of total mass m and specific heat capacity c. The rise in temperature of the brake discs can be estimated from

A $\frac{mV^2}{2Mc}$ **B** $\frac{2MV^2}{mc}$ **C** $\frac{MV^2}{2mc}$ **D** $\frac{2mc}{MV^2}$

20. Which of the following does **not** give a value in seconds?

A capacitance × resistance

B $\frac{1}{\text{frequency}}$

C half-life

D $\frac{\text{power}}{\text{work}}$