

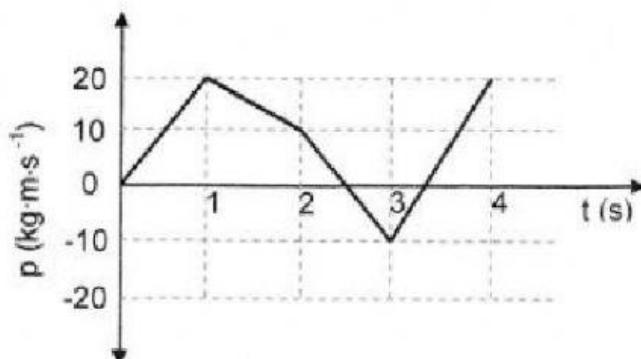
MOMENTUM, WORK, POWER, AND ENERGY MULTIPLE CHOICE QUESTIONS

1. Two balls of masses m and $2m$ are dropped simultaneously from the same height above the ground. Ignore air resistance.

When the balls strike the ground, which ONE of the following physical quantities will be the same for both balls?

- A Weight
- B Velocity
- C Momentum
- D Kinetic energy

2. The graph below shows how the momentum (p) of an object changes with time (t).



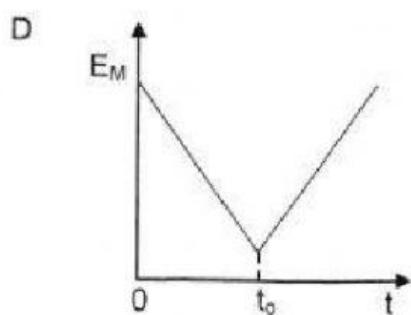
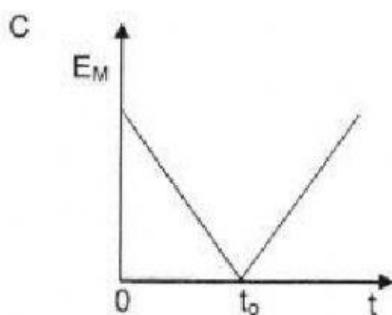
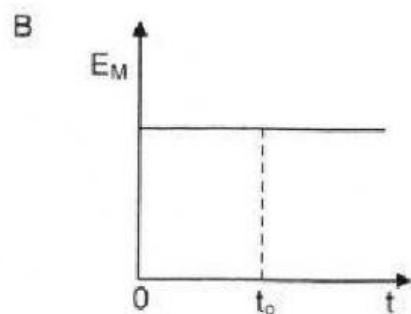
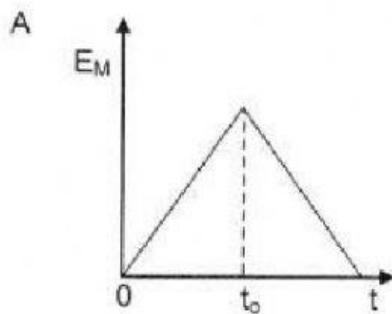
During which ONE of the following time intervals, measured in seconds, is the magnitude of the net force acting on the object the greatest?

- A 0 to 1
- B 1 to 2
- C 2 to 3
- D 3 to 4

3. A ball is dropped from a height above a floor. The ball makes an elastic collision with the floor at time t_0 and bounces vertically upwards.

Ignore air resistance.

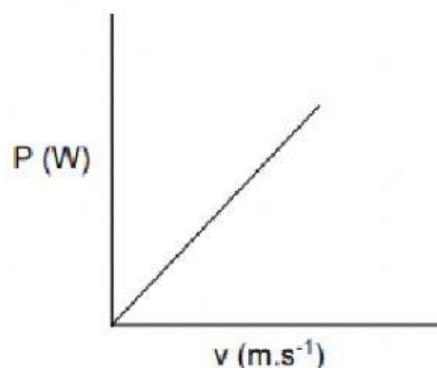
Which ONE of the following graphs shows how the total mechanical energy (E_M) of the ball changes with time?



4. Two cars are involved in an INELASTIC head-on collision. Which ONE of the following combinations correctly describes the kinetic energy and the momentum of the system?

	TOTAL KINETIC ENERGY	TOTAL MOMENTUM
A	Not conserved	Conserved
B	Conserved	Not conserved
C	Conserved	Conserved
D	Not conserved	Not conserved

5. The graph below shows the relationship between the power delivered by the engine of a car and the average speed of the car.



The gradient of the above graph represents the ...

- A momentum of the car.
- B work done by the engine of the car.
- C kinetic energy of the car.
- D applied force of the engine on the car.

6. A ball of mass m , falling vertically downwards, hits the floor at a speed v and bounces vertically upwards at a speed $0,75v$.

Which ONE of the following combinations regarding the change in momentum of the ball during the collision is CORRECT?

	MAGNITUDE	DIRECTION
A	$0,25mv$	Upwards
B	$0,25mv$	Downwards
C	$1,75mv$	Upwards
D	$1,75mv$	Downwards

7. The base SI unit of the physical quantity 'work' is ...

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

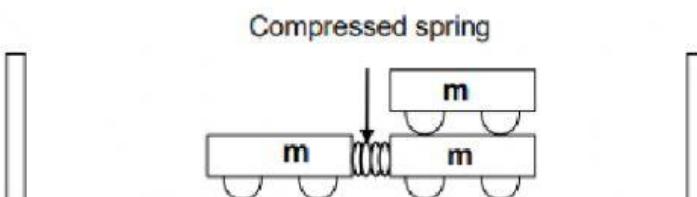
8. Which ONE of the following is the unit of measurement for the RATE OF CHANGE OF MOMENTUM?

- A watt
- B kilogram
- C ohm
- D newton

9. If the net work done on an object is negative (less than zero), then the ...

- kinetic energy of the object remains unchanged
- kinetic energy of the object is decreasing.
- kinetic energy of the object at the start is zero.
- kinetic energy of the object is increasing.

10. Learners perform an experiment using identical trolleys, each of mass m . The trolleys are arranged, as shown in the diagram below. They are initially at rest on a frictionless surface and are connected with a compressed, massless spring.

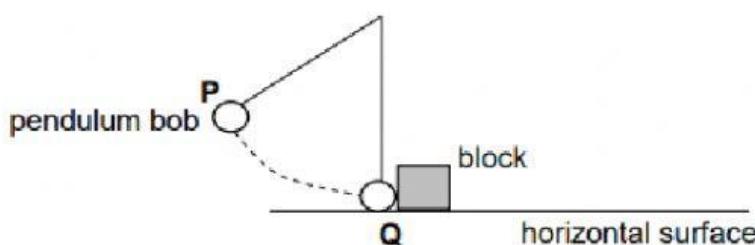


When the spring is released it falls vertically down and the single trolley moves with momentum p to the left.

The magnitude of the momentum of the two trolleys moving to the right will be:

- $2p$
- p
- $\frac{1}{2}p$
- $\frac{1}{4}p$

11. A pendulum bob is released from point P above a horizontal surface. At the lowest point, Q , of its swing, it collides with a stationary block situated on a frictionless horizontal surface, as shown below. Ignore air friction.



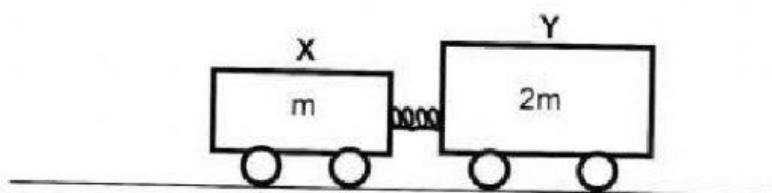
Which ONE of the following combinations of **conservation laws** can be used to calculate the speed of the bob at Q immediately before and after colliding with the block?

	SPEED AT Q	SPEED AFTER COLLISION
A	Conservation of mechanical energy	Conservation of linear momentum
B	Conservation of linear momentum	Conservation of mechanical energy
C	Conservation of mechanical energy	Conservation of mechanical energy
D	Conservation of linear momentum	Conservation of linear momentum

12. Which physical quantity is equal to the rate of change of momentum?

- A Mass
- B Impulse
- C Net force
- D Acceleration

13. Two trolleys, X and Y, of masses m and $2m$ respectively, are held together by a compressed spring between them. Initially they are stationary on a horizontal floor, as shown below. Ignore the effects of friction.



The spring is now released and falls to the floor while the trolleys move apart.

The magnitude of the MOMENTUM of trolley X while it moves away is ...

- A zero.
- B half the magnitude of the momentum of trolley Y.
- C twice the magnitude of the momentum of trolley Y.
- D the same as the magnitude of the momentum of trolley Y.

14. An object is dropped from rest and after falling a distance x , its momentum is p . Ignore the effects of air friction.

The momentum of the object, after it has fallen a distance $2x$, is ...

A p
 B $\sqrt{2}p$
 C $\frac{p}{2}$
 D $2p$

15. A block slides across a rough, horizontal surface. The work done by friction changes only the:
 A Internal energy
 B Potential energy
 C Kinetic and internal energies
 D Potential and kinetic energies

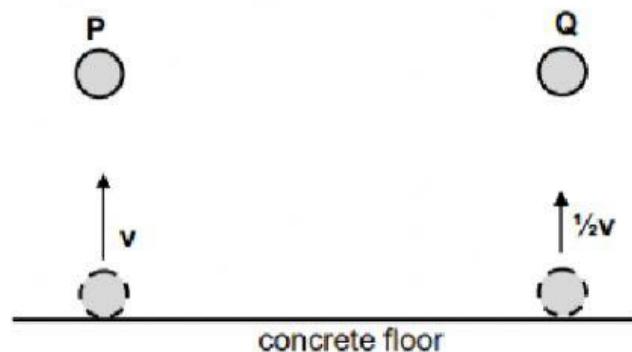
16. An object of mass m travelling at speed v along a straight line, collides head-on with a wall. Assume that the collision is elastic and the object rebounds in the opposite direction.
 What are the changes in the momentum and in the kinetic energy of the object, as a result of the collision?

	Change in momentum	Change in kinetic energy
A	0	0
B	0	mv^2
C	$2mv$	0
D	mv^2	0

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17. Ball **P** and ball **Q**, of the same mass, are dropped onto a concrete floor. Both balls hit the concrete floor at the same speed, v . Ball **P** rebounds with the same vertical speed, v , but ball **Q** rebounds with speed $\frac{1}{2}v$.

Refer to the diagram below. Ignore air resistance.



Which ONE of the following statements regarding the collision of EACH ball with the concrete floor is CORRECT?

- A Kinetic energy is conserved for both balls **P** and **Q**.
- B The change in momentum of ball **P** is greater than that of ball **Q**.
- C The contact time with the floor is the same for both balls **P** and **Q**.
- D Momentum is conserved for the collision of ball **P**, but not for that of ball **Q**.

18. If the net work done on a moving object is POSITIVE, then we can conclude that the kinetic energy of the object ...

- A is zero.
- B has increased.
- C has decreased.
- D has not changed.

19. An airbag can protect a driver from serious injury during a collision. Which ONE of the following best explains why this is possible?

	TIME OF IMPACT	NET FORCE
A	Increases	Increases
B	Decreases	Decreases
C	Increases	Decreases
D	Remain the same	Decreases

20. A vehicle with mass m is moving horizontally at a constant velocity on a frictionless path. The kinetic energy of the vehicle is K and the momentum is p . The velocity of the vehicle can be given as:

- A** $\frac{K}{p}$
- B** $\frac{2K}{p}$
- C** $\frac{K}{p}$
- D** $\frac{p}{K}$

