

# Work, Energy & Power

## TOPIC QUESTIONS

|                   |                        |
|-------------------|------------------------|
| <b>Level</b>      | <b>AS Level</b>        |
| <b>Subject</b>    | <b>Physics</b>         |
| <b>Exam Board</b> | <b>AQA</b>             |
| <b>Paper Type</b> | <b>Multiple Choice</b> |

Time Allowed : 30min

EXAM PAPERS PRACTICE

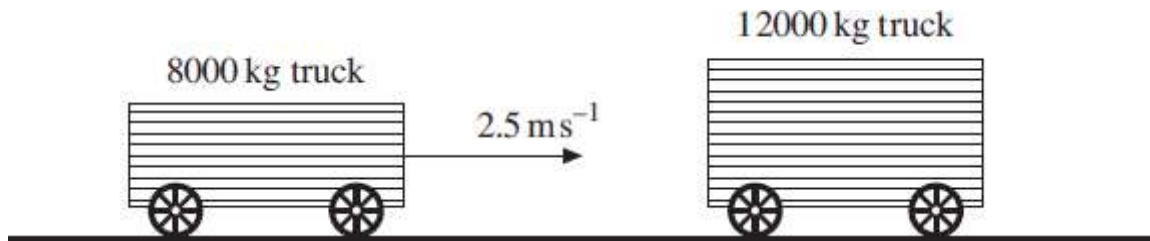
1. Which one of the following is a possible unit of impulse?

- A  $\text{Ns}^{-1}$
- B  $\text{kg ms}^{-1}$
- C  $\text{kg ms}^{-2}$
- D  $\text{sN}^{-1}$



EXAM PAPERS PRACTICE

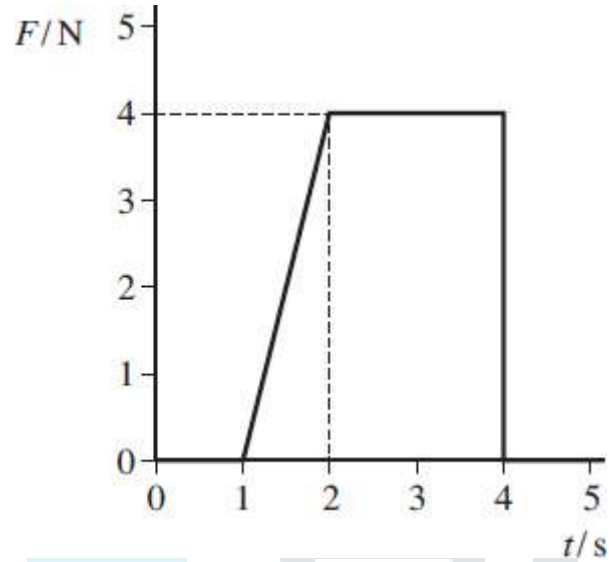
2. A railway truck of mass 8000 kg travels along a level track at a velocity of  $2.5 \text{ ms}^{-1}$  and collides with a stationary truck of mass 12000 kg. The two trucks move together at the same velocity after the collision.



What is the change in momentum of the 8000 kg truck due to the impact?

- A 8000 N s
  - B 12000 N s
  - C 20000 N s
  - D 25000 N s
3. A gas molecule of mass  $m$  moving at velocity  $u$  collides at right angles with the side of a container and rebounds elastically. Which one of the following statements concerning the motion of the molecule is **incorrect**?
- A The magnitude of the change in momentum of the molecule is zero.
  - B The magnitude of the change in momentum of the molecule is  $2mu$ .
  - C The force exerted by the molecule on the side of the container is equal to the force exerted by the container on the molecule.
  - D The change in kinetic energy of the molecule is zero.

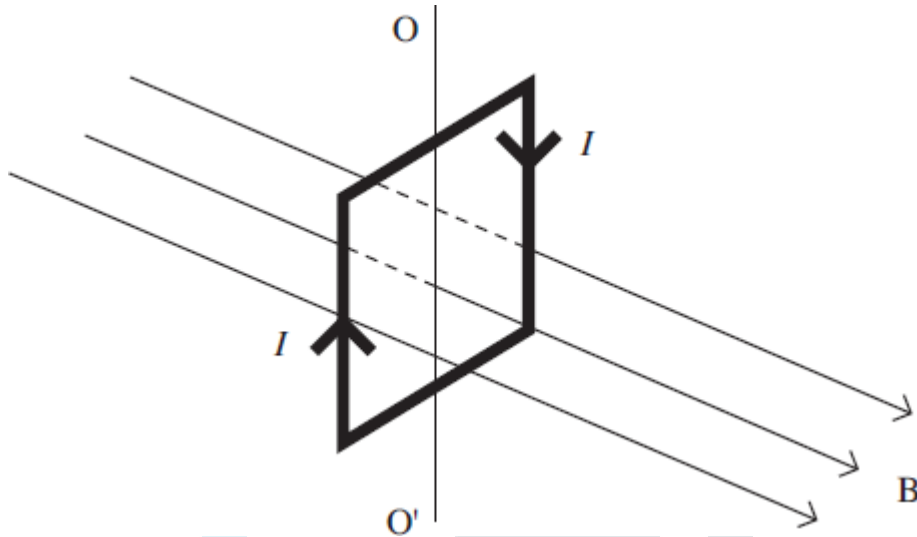
4. The graph shows how the resultant force,  $F$ , acting on a body varies with time,  $t$ .



What is the change in momentum of the body over the 5 s period?

- A 2N s
- B 8N s
- C 10N s
- D 12N s

5. The diagram shows a vertical square coil whose plane is at right angles to a horizontal uniform magnetic field  $B$ . A current,  $I$ , is passed through the coil, which is free to rotate about a vertical axis  $OO'$ .



Which one of the following statements is correct?

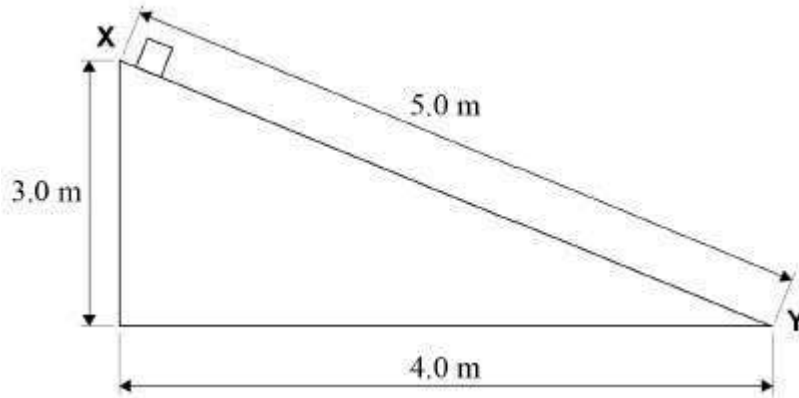
- A The forces on the two vertical sides of the coil are equal and opposite.
  - B A couple acts on the coil.
  - C No forces act on the horizontal sides of the coil.
  - D If the coil is turned through a small angle about  $OO'$  and released, it will remain in position.
6. Objects **P** and **Q** are initially at rest at time  $t = 0$

The same resultant force  $F$  is applied to **P** and **Q** for time  $T$ . The mass of **P** is 10 times greater than the mass of **Q**.

What is the ratio  $\frac{\text{kinetic energy of P}}{\text{kinetic energy of Q}}$  ?

- A 0.1
- B 1
- C 10
- D 100

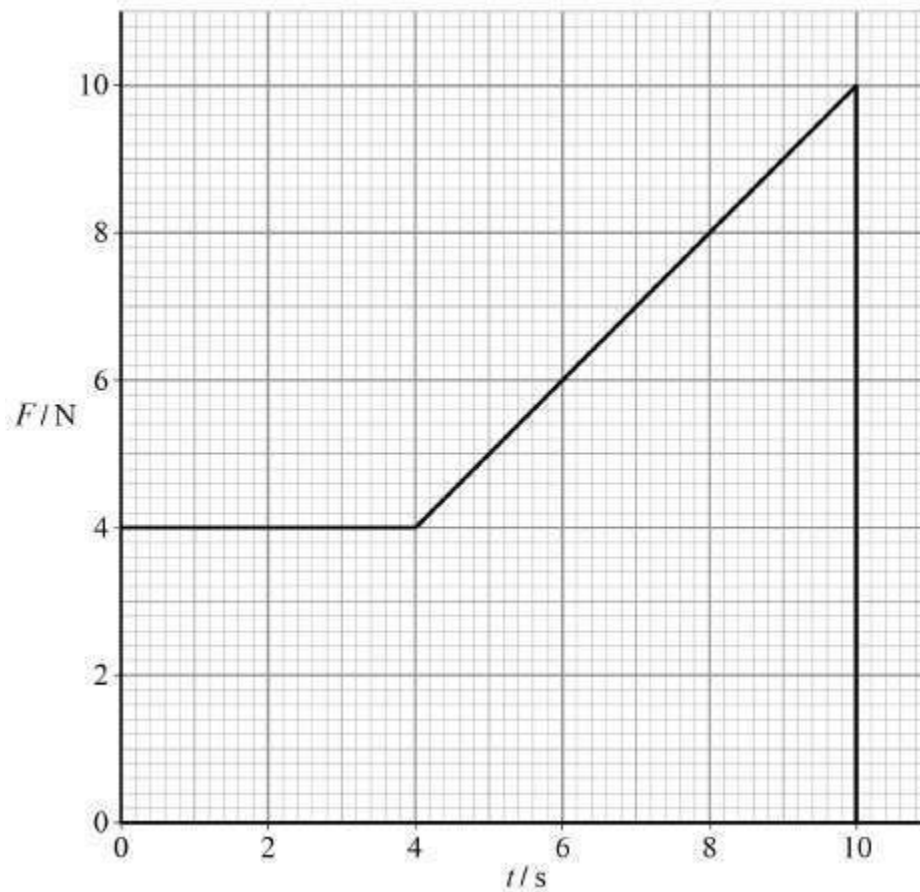
7. A mass of  $2.5\text{ kg}$  is released from rest at **X** and slides down a ramp, of height  $3.0\text{ m}$ , to point **Y** as shown.



When the mass reaches **Y** at the bottom of the ramp it has a velocity of  $5.0\text{ m s}^{-1}$ . What is the average frictional force between the mass and the ramp?

- A  $8.5\text{ N}$
- B  $10.6\text{ N}$
- C  $14.7\text{ N}$
- D  $24.5\text{ N}$

8. The graph shows how the force  $F$  applied to an object varies with time  $t$ .



What is the momentum gained by the object from  $t = 0$  to  $t = 10$  s?

- A  $18\text{kg m s}^{-1}$
- B  $32\text{kg m s}^{-1}$
- C  $40\text{kg m s}^{-1}$
- D  $58\text{kg m s}^{-1}$

9. Two identical balls, **X** and **Y**, are at the same height and a horizontal distance of 25 cm apart.

**X** is projected horizontally with a velocity of  $0.10 \text{ m s}^{-1}$  towards **Y** at the same time that **Y** is released from rest. Both **X** and **Y** move freely in the absence of air resistance.

What is the distance between the balls 1.0 s later?

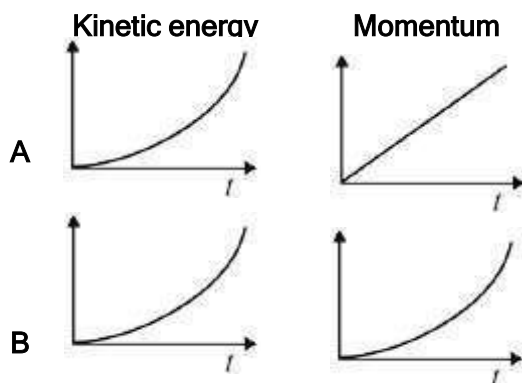
- A 0.15 m
- B 0.25 m
- C 2.4 m
- D 4.9 m

10. Two bodies of different masses undergo an elastic collision in the absence of any external force.

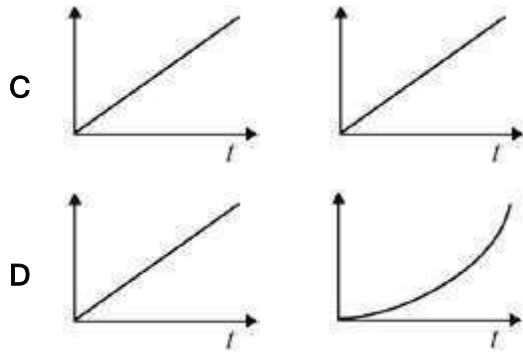
Which row gives the effect on the total kinetic energy of the masses and the magnitudes of the forces exerted on the masses during the collision?

|          | Total kinetic energy | Magnitudes of forces        |
|----------|----------------------|-----------------------------|
| <b>A</b> | remains unchanged    | same on both masses         |
| <b>B</b> | remains unchanged    | greater on the smaller mass |
| <b>C</b> | decreases            | same on both masses         |
| <b>D</b> | decreases            | greater on the smaller mass |

11. An object is accelerated from rest by a constant force  $F$  for a time  $t$ . Which graphs represent the variation of time with the change in the kinetic energy and the change in momentum of the object?







EXAM PAPERS PRACTICE

12. An object is dropped from a cliff. How far does the object fall in the third second?  
Assume that  $g = 10 \text{ m s}^{-2}$ .

- A 10 m
- B 20 m
- C 25 m
- D 45 m

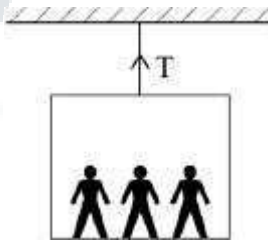
13. A body falls freely, with negligible air resistance. What quantity of the body is its rate of change of momentum?

- A mass
- B power
- C kinetic energy
- D weight

14. A firework rocket is fired vertically into the air and explodes at its highest point. What are the changes to the total kinetic energy of the rocket and the total momentum of the rocket as a result of the explosion?

|   | total kinetic energy of rocket | total momentum of rocket |
|---|--------------------------------|--------------------------|
| A | unchanged                      | unchanged                |
| B | unchanged                      | increased                |
| C | increased                      | unchanged                |
| D | increased                      | increased                |

15. A lift and its passengers with a total mass of 500 kg accelerates upwards at  $2 \text{ m s}^{-2}$  as shown.  
Assume that  $g = 10 \text{ m s}^{-2}$ .

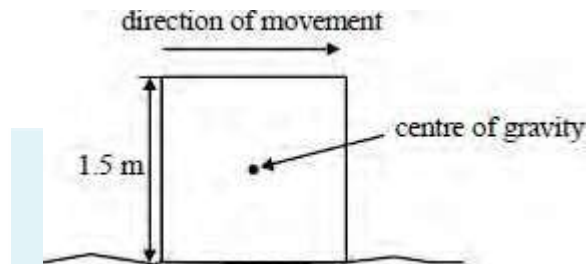


What is the tension in the cable?

- A 1000 N
  - B 4000 N
  - C 5000 N
  - D 6000 N
16. Which one of the following pairs contains one vector and one scalar quantity?

|          |              |                  |
|----------|--------------|------------------|
| <b>A</b> | Displacement | Acceleration     |
| <b>B</b> | Force        | Kinetic energy   |
| <b>C</b> | Power        | Speed            |
| <b>D</b> | Work         | Potential energy |

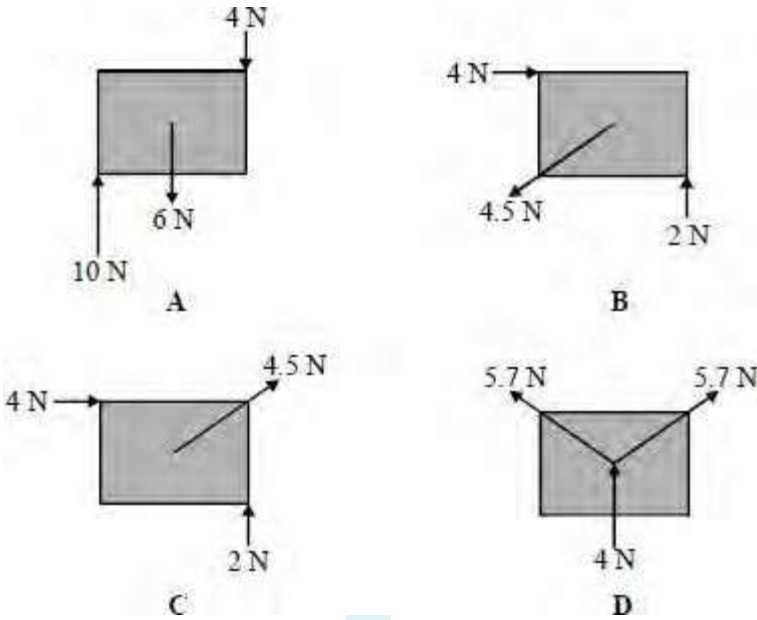
17. A uniform square block is sliding with uniform speed along a rough surface as shown in the diagram.



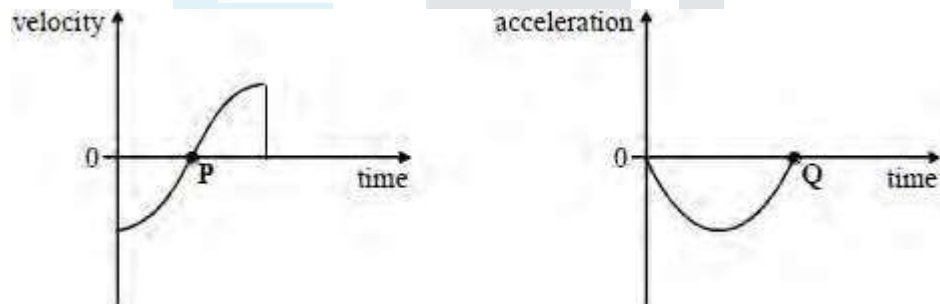
The force used to move the block is 200 N. The moment of the frictional force acting on the block about the centre of gravity of the block is

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

18. The rectangular objects, **A**, **B**, **C** and **D** are each 2 cm long and 1 cm high. Which one of the bodies is in equilibrium?



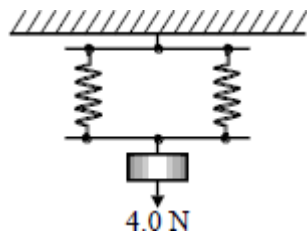
19. The diagrams show the variation of velocity and acceleration with time for a body undergoing simple harmonic motion.



Which one of the following is proportional to the change in momentum of the body during the time covered by the graphs?

- A The area enclosed by the velocity-time graph and the time axis
- B The gradient of the velocity-time graph at the point P
- C The area enclosed by the acceleration-time graph and the time axis
- D The gradient of the acceleration-time graph at the point Q

20. 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  $20 \text{ N m}^{-1}$ . The elastic energy, in J, stored in the system is

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



EXAM PAPERS PRACTICE