

FORCE AND MOTION PROBLEMS

Q1

The average force necessary to stop a hammer with 25 Ns momentum ~~force~~ expressed in 'N' is

- A) 500 ✓
- B) 50

- C) 125
- D) 25

0.65s

$$F = m \frac{\Delta v}{\Delta t}$$

$$F = \frac{mv}{t} \rightarrow p$$

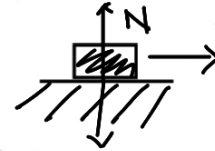
$$F = \frac{p}{t} = \frac{25 \text{ Ns}}{0.65 \text{ s}}$$

$$= 500 \text{ N}$$

Q2

Newton's third law concerns the forces of interaction between two bodies. Which of the following statements relating to the third law is not correct?

- A) Two forces must be the same types
- B) Two forces must act on different bodies
- C) Two forces always opposite in direction
- D) The two forces are equal and opposite so the bodies are in equilibrium



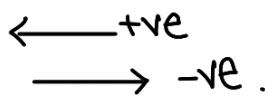
Q3

A sledge of mass 25kg is pulled across level ground with a horizontal force of 60N. The constant force of friction is 20N. What is the acceleration of the sledge?

- A) 0.5m/s²
- B) 2m/s²

- C) 1.6m/s² ✓
- D) 0.2m/s²

m = 25kg
 F_x = 60N
 f = 20N



$$\sum F = ma$$

$$F - f = m a \Rightarrow (60 - 20) \text{ N} = 25 \text{ kg} \cdot a$$

$$a = \frac{40 \text{ N}}{25 \text{ kg}} = 1.6 \frac{\text{m}}{\text{s}^2}$$

Q4

A handball is tossed vertically upward with a velocity of 19.6 meters per second. Approximately how high will it rise?

- A) 15m
- B) 25m

- C) 20m ✓
- D) 30m

0 for max height.

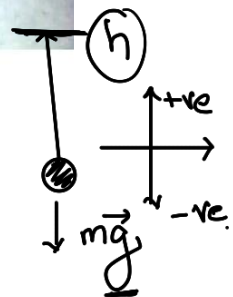
$$v_f^2 - v_i^2 = 2gs$$

$$-v_i^2 = 2gh$$

s, -ve.

$$-19.6^2 = 2 \times -9.81 \times h$$

$$h = \frac{19.6^2}{2 \times 9.81} = 20 \text{ m}$$

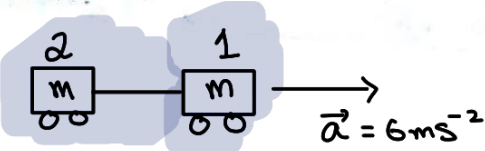


Q5

The engine of a car produces an acceleration of 6 m s^{-2} in the car. If this car pulls another car of the same mass, then the acceleration would be

- A) 6 m s^{-2}
- B) 12 m s^{-2}

- C) 3 m s^{-2}
- D) 1.5 m s^{-2}



$$F_1 = m \times 6 \text{ m/s}^2$$

$$F_2 = \frac{(m+m)}{2m} a$$

$$F_2 = F_1$$

$$2ma = 6m$$

$$a = \frac{3 \times 6}{2} \text{ m/s}^2$$

Q7

A cricket ball of mass 0.5 kg strikes a bat normally with a velocity of 30 m s^{-1} and rebounds with a velocity of 20 m s^{-1} in the opposite direction. The impulse of the force exerted by the ball on the bat is

- A) 0.5 N s
- B) 25 N s

- C) 1.0 N s
- D) 50 N s

$$\vec{I} = \Delta \vec{p}$$

$$\begin{aligned} \Delta p &= p_2 - p_1 \\ &= m(u - (-v)) \\ &= m(u + v) \end{aligned}$$

$$= 0.5 \text{ kg} (30 \frac{\text{m}}{\text{s}} + 20 \frac{\text{m}}{\text{s}})$$

$$I = 25 \text{ kg m/s} = 25 \text{ N s}$$

Q8

The Figure shows the velocity time graph of a one dimensional motion. Which of the following characteristic of the particle is represented by the shaded area?



- A) Distance covered ✓
- B) Momentum

- C) Speed
- D) Acceleration

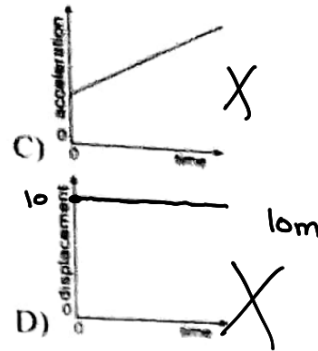
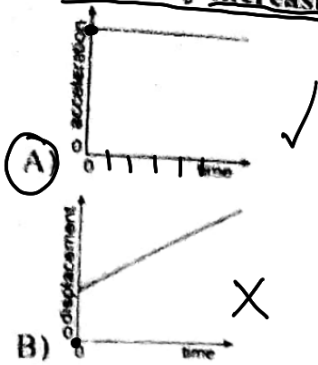
$$\frac{1}{2} \times \text{base} \times \text{ht}$$

$$\frac{1}{2} \times t \times v = \frac{1}{2} vt$$

$$\frac{m}{s} \cdot s = m$$

Q9

Which graph represents the motion of a car that is travelling along a straight road with a uniformly increasing speed?

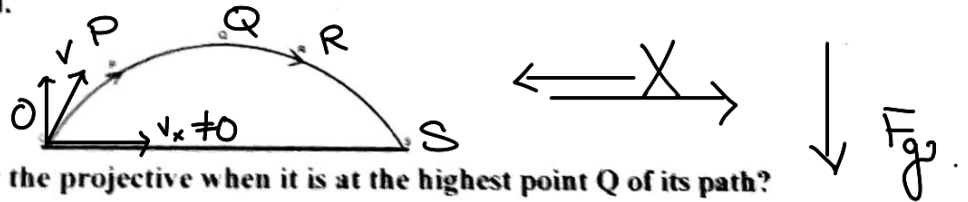


Uniform
velocity
⇓
 $a = 0$

$$a = \text{Const}$$

Q10

A projectile is launched at point O and follows the path OPQRS, as shown. Air resistance may be neglected.



Which statement is true for the projectile when it is at the highest point Q of its path?

- (A) The horizontal component of the projectile's acceleration is zero. ✓
- (B) The horizontal component of the projectile's velocity is zero. X
- (C) The kinetic energy of the projectile is zero. X
- (D) The momentum of the projectile is zero. X

$v_x = \text{Same every time.}$

$$K.E \neq 0 = \frac{1}{2} m v^2$$

$$\vec{P} = m \vec{v} \neq 0.$$