

**Dynamics - 2018**

1. 9702/11/M/J/18/No.8

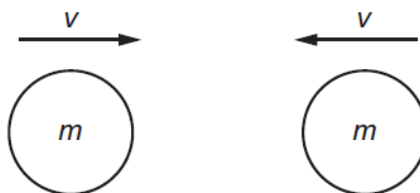
The momentum of a car of mass  $m$  increases from  $p_1$  to  $p_2$ .

What is the increase in the kinetic energy of the car?

- A  $\frac{(p_2^2 - p_1^2)}{2m}$     B  $\frac{(p_2 - p_1)^2}{2m}$     C  $\frac{p_2 - p_1}{2m}$     D  $\frac{p_1 - p_2}{2m}$

2. 9702/11/M/J/18/No.9

Two similar spheres, each of mass  $m$  and travelling with speed  $v$ , are moving towards each other.



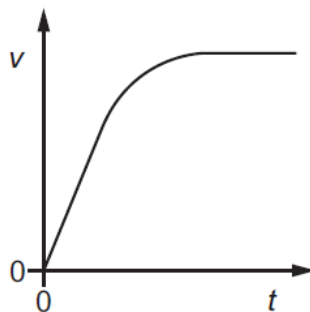
The spheres have a head-on elastic collision.

Which statement is correct?

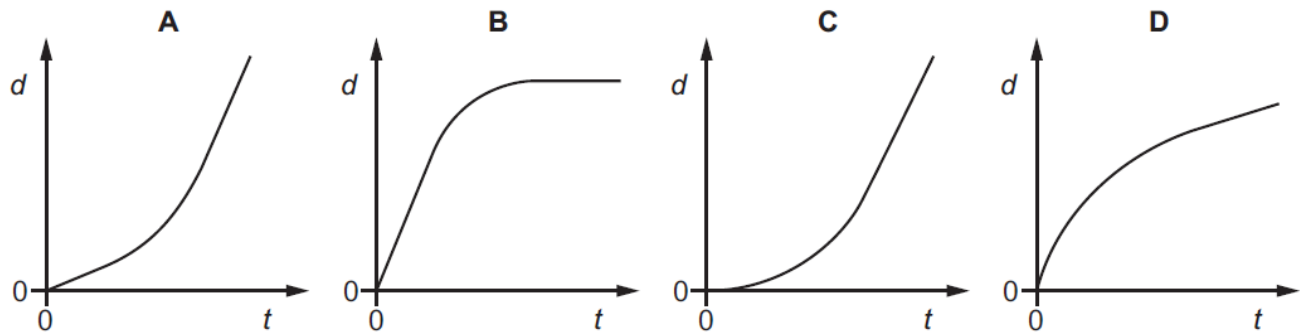
- A The spheres stick together on impact.  
 B The total kinetic energy after impact is  $mv^2$ .  
 C The total kinetic energy before impact is zero.  
 D The total momentum before impact is  $2mv$ .

3. 9702/12/M/J/18/No.7

A sky-diver falls vertically from a helicopter and reaches constant (terminal) velocity. The graph shows the variation with time  $t$  of the speed  $v$  of the sky-diver.



Which graph shows the variation with time  $t$  of the distance  $d$  fallen by the sky-diver?



4. 9702/12/M/J/18/No.8

A tennis ball of mass 55g is travelling horizontally with a speed of  $30 \text{ ms}^{-1}$ . The ball makes contact with a wall before rebounding in the horizontal direction with a speed of  $20 \text{ ms}^{-1}$ . The ball is in contact with the wall for a time of  $5.0 \times 10^{-3} \text{ s}$ .

What is the average force exerted on the wall by the ball?

- A 110 N      B 220 N      C 330 N      D 550 N

5. 9702/12/M/J/18/No.9

An elastic collision occurs between two bodies X and Y. The mass of body X is  $m$  and the mass of body Y is  $4m$ . Body X travels at speed  $v$  before the collision and speed  $\frac{3v}{5}$  in the opposite direction after the collision. Body Y is stationary before the collision.



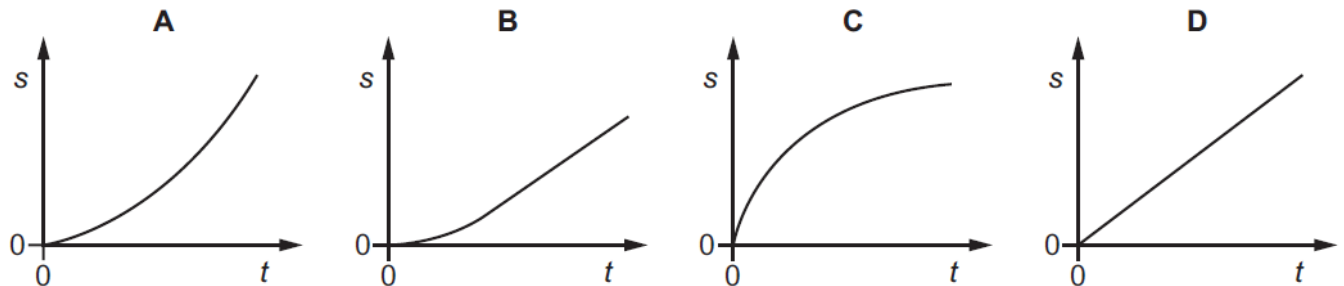
What is the kinetic energy of body Y after the collision?

- A  $\frac{8}{10}mv^2$       B  $\frac{34}{50}mv^2$       C  $\frac{16}{50}mv^2$       D  $\frac{1}{5}mv^2$

6. 9702/13/M/J/18/No.8

A sky-diver falls from a stationary balloon at time  $t = 0$ . As the sky-diver falls, her speed and the air resistance increase until the force of the air resistance is equal to her weight.

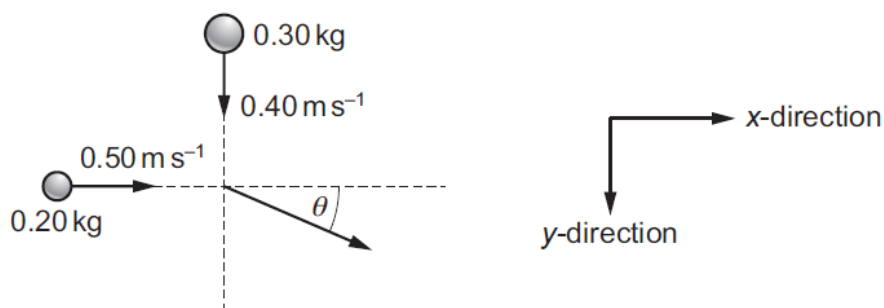
Which graph best shows the variation with time  $t$  of the displacement  $s$  for the motion of the sky-diver?



7. 9702/13/M/J/18/No.9

A ball of mass  $0.20\text{ kg}$ , travelling in the  $x$ -direction at a speed of  $0.50\text{ ms}^{-1}$ , collides with a ball of mass  $0.30\text{ kg}$  travelling in the  $y$ -direction at a speed of  $0.40\text{ ms}^{-1}$ .

The two balls stick together after the collision, travelling at an angle  $\theta$  to the  $x$ -direction.



What is the value of  $\theta$ ?

- A  $39^\circ$       B  $40^\circ$       C  $50^\circ$       D  $51^\circ$

8. 9702/12/F/M/18/No.10

Steel pellets, each with a mass of 0.60g, fall vertically onto a horizontal plate at a rate of 100 pellets per minute. They strike the plate with a velocity of  $5.0 \text{ m s}^{-1}$  and rebound with a velocity of  $4.0 \text{ m s}^{-1}$ .

What is the average force exerted on the plate by the pellets?

- A 0.0010 N      B 0.0054 N      C 0.0090 N      D 0.54 N