Dynamics – 2021 AS

1. June/2021/Paper_11/No.8

A rocket is fired from the Earth into space.

Newton's third law of motion describes how forces act in pairs. One of the forces of a pair is the weight of the rocket.

What is the other force of this pair?

A air resistance

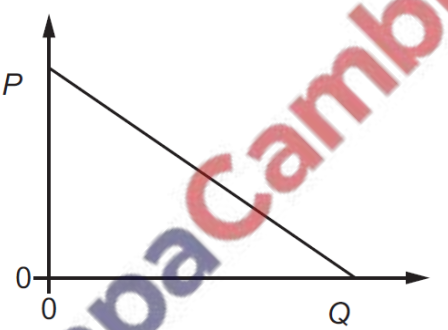
B force of the exhaust gases on the rocket

C force of the rocket on the exhaust gases

D gravitational force of the rocket on the Earth

2. June/2021/Paper_11/No.9

The graph shows how quantity *P* varies with quantity *Q* for a body falling vertically downwards in a uniform gravitational field with air resistance.



Which pair of quantities could be represented by *P* and *Q*?

	P	*Q*
A	acceleration	force of air resistance
B	acceleration	time
C	velocity	force of air resistance
D	velocity	time

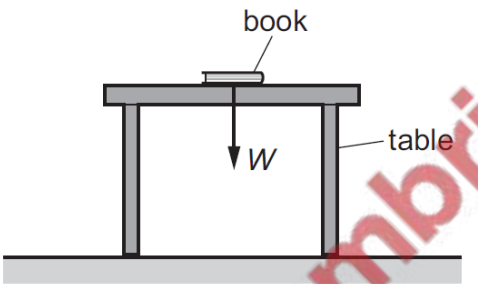
3. June/2021/Paper_11/No.10

Which quantities are conserved in an inelastic collision?

	kinetic energy	total energy	linear momentum
A	conserved	not conserved	conserved
B	conserved	not conserved	not conserved
C	not conserved	conserved	conserved
D	not conserved	conserved	not conserved

4. June/2021/Paper_12/No.8

A book of weight *W* is at rest on a table. A student attempts to state Newton's third law of motion by saying that 'action equals reaction'.



If the weight of the book is the 'action' force, what is the 'reaction' force?

A the force *W* acting downwards on the Earth from the table

B the force *W* acting upwards on the book from the table

C the force *W* acting upwards on the Earth from the book

D the force *W* acting upwards on the table from the floor

5. June/2021/Paper_12/No.9

Four balls are dropped at the same time from the top of a very tall tower. There is no wind blowing.

Which ball hits the ground first?

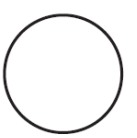
A

mass *M*
diameter *D*

B

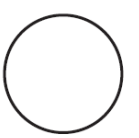
mass 4*M*
diameter *D*

C



mass *M*
diameter 2*D*

D



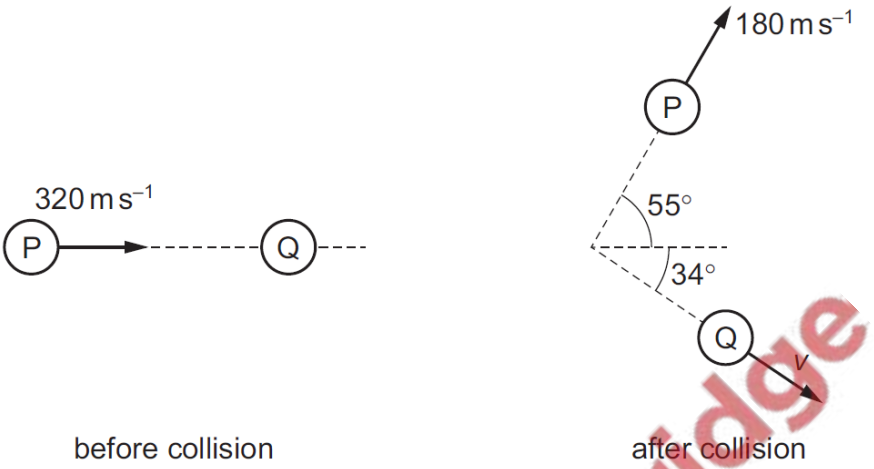
mass 4*M*
diameter 2*D*

6. June/2021/Paper_12/No.10

A nitrogen molecule P travelling at a speed of $320\,m\,s^{-1}$ in a vacuum collides with a stationary nitrogen molecule Q.

After the collision, P travels at a velocity of $180\,m\,s^{-1}$ at an angle of 55° to its original path.

Q travels in a direction at an angle of 34° to the initial path of P.



before collision after collision

Assume that there are no external forces acting on the molecules.

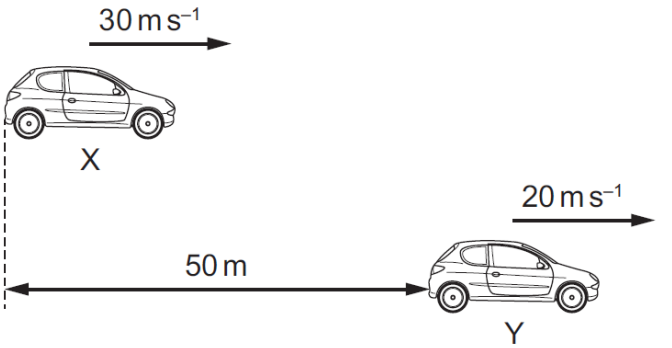
What is the magnitude v of the velocity of Q after the collision?

A $120\,m\,s^{-1}$ **B** $140\,m\,s^{-1}$ **C** $180\,m\,s^{-1}$ **D** $260\,m\,s^{-1}$

7. Nov/2021/Paper_11/No.7

They are travelling in the same direction.

X is 50 m behind Y and has a constant velocity of 30 m s^{-1}. Y has a constant velocity of 20 m s^{-1}.



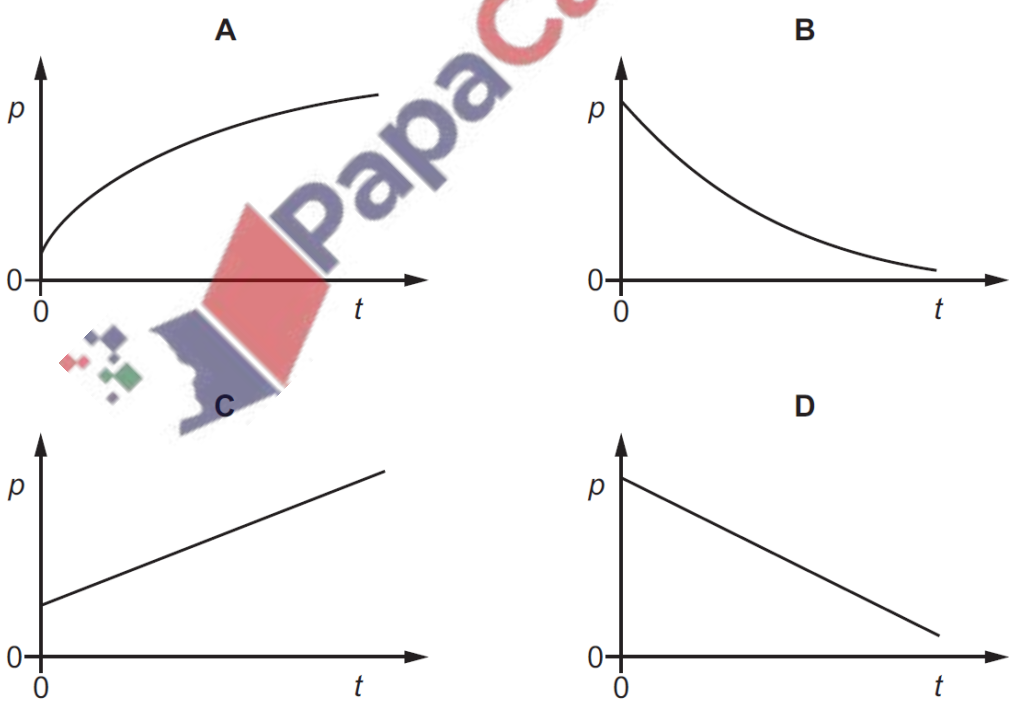
What is the value of t when X is level with Y?

A 1.0 s **B** 1.7 s **C** 2.5 s **D** 5.0 s

8. Nov/2021/Paper_11/No.8

A constant resultant force acts on an object in the direction of the object's velocity.

Which graph could show the variation with time t of the momentum p of the object?



9. Nov/2021/Paper_11/No.9

Which statement **must** be true for an object in a gravitational field?

A If the object has mass then the field causes it to accelerate.

B If the object has mass then the field causes it to have weight.

C If the object has weight then the field causes it to accelerate.

D If the object has weight then the field causes it to have mass.

10. Nov/2021/Paper_11/No.10

A ball of mass 0.16 kg is travelling horizontally at a speed of 20 $m\,s^{-1}$.

It collides with a wall and rebounds with a speed of 15 $m\,s^{-1}$ along its original path. The ball is in contact with the wall for a time of 1.0 ms.

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

A 800 N **B** 2400 N **C** 3200 N **D** 5600 N

11. Nov/2021/Paper_12/No.8

What is meant by the mass of an object?

A the property of the object that resists a change in motion

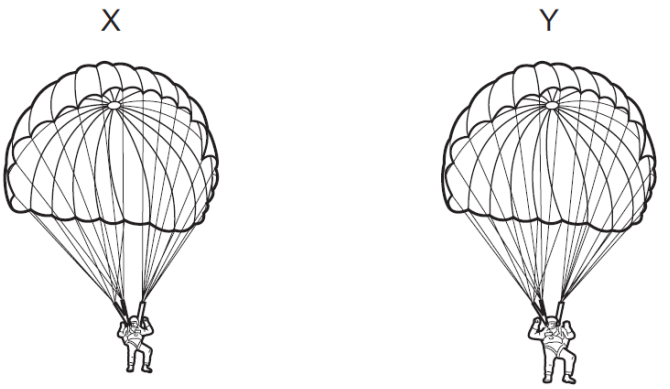
B the pull of the Earth on the object

C the total number of atoms in the object

D the weight of the object

12. Nov/2021/Paper_12/No.9

The diagram shows two parachutists, X and Y, moving vertically downwards.



The total mass of parachutist Y and his parachute is twice the total mass of parachutist X and his parachute. At this moment, the air resistance on parachute Y is twice the air resistance on parachute X. Neither parachutist has reached his constant (terminal) velocity.

Which statement describes the acceleration of Y compared with the acceleration of X?

A The acceleration of Y is half the acceleration of X.

B The acceleration of Y is the same as the acceleration of X.

C The acceleration of Y is more than the acceleration of X, but less than twice the value.

D The acceleration of Y is twice the acceleration of X.

13. Nov/2021/Paper_12/No.10

The table shows four different collisions between two blocks, each of mass 0.50 kg.

Which collision is perfectly elastic?

	before collision	after collision
A	$4.0\,m\,s^{-1}$ → 0.50 kg $0.0\,m\,s^{-1}$ 0.50 kg	$2.0\,m\,s^{-1}$ → 0.50 kg | 0.50 kg
B	$2.0\,m\,s^{-1}$ → 0.50 kg ← $2.0\,m\,s^{-1}$ 0.50 kg	$0.0\,m\,s^{-1}$ 0.50 kg | 0.50 kg
C	$2.0\,m\,s^{-1}$ → 0.50 kg ← $1.0\,m\,s^{-1}$ 0.50 kg	← $2.0\,m\,s^{-1}$ 0.50 kg $3.0\,m\,s^{-1}$ → 0.50 kg
D	$4.0\,m\,s^{-1}$ → 0.50 kg $1.0\,m\,s^{-1}$ → 0.50 kg	$1.0\,m\,s^{-1}$ → 0.50 kg $4.0\,m\,s^{-1}$ → 0.50 kg

14. Nov/2021/Paper_13/No.8

Water is pumped through a hose-pipe at a rate of 90 kg per minute. Water emerges horizontally from the hose-pipe with a speed of $20\,m\,s^{-1}$.

What is the minimum force required from a person holding the hose-pipe to prevent it moving backwards?

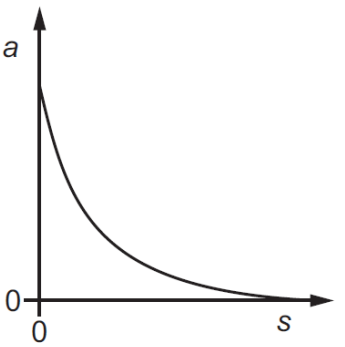
A 30 N **B** 270 N **C** 1800 N **D** 110 000 N

15. Nov/2021/Paper_13/No.9

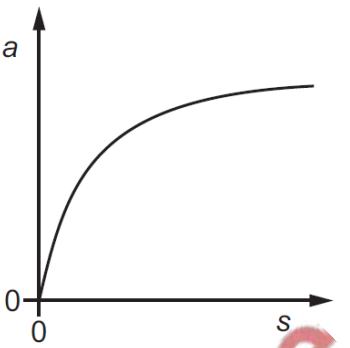
A skydiver leaves a stationary balloon and falls vertically through a long distance.

Which graph best represents the variation of the acceleration *a* of the skydiver with the distance *s* travelled as she falls through the air?

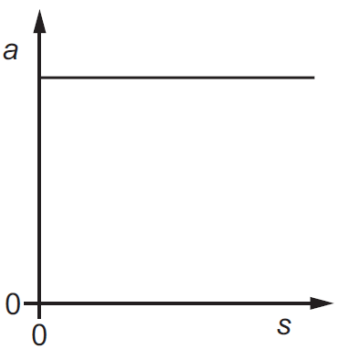
A



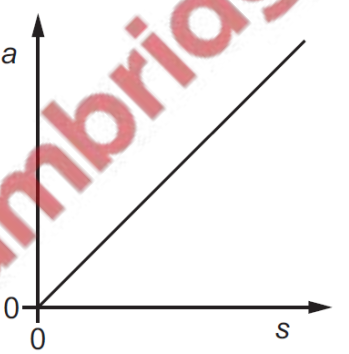
B



C



D

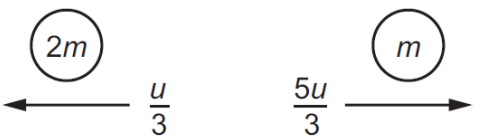


16. Nov/2021/Paper_13/No.10

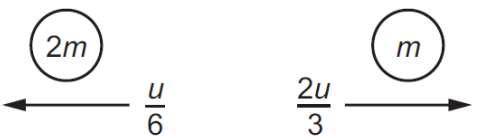
The diagram shows two spheres approaching each other head-on. Each sphere has speed u. One sphere has mass $2m$ and the other has mass m.

Which diagram shows the result of a perfectly elastic collision?

A

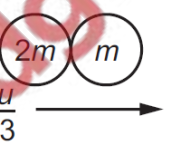


B



C

D



the spheres stick together

17. Nov/2021/Paper_13/No.11

A spherical object falls through water at a constant speed. Three forces act on the object.

Which diagram, showing these three forces to scale, is correct?