

A-Level Physics

Name: _____ Score: _____

1. A 2.0 kg ball moves at $3.0 \frac{\text{m}}{\text{s}}$. What is its momentum?
_____ kg · m/s
2. Which best describes a drag (viscous) force?
 - ☐ a force that speeds an object up
 - ☐ a resistive force from a fluid on a moving object
 - ☐ a force only ever between two solids
 - ☐ another name for the weight
3. Total momentum stays constant when the resultant _____ force on the system is zero.

4. Momentum is a vector.
 - ☐ True ☐ False
5. The drag force on a falling object grows as its speed grows.
 - ☐ True ☐ False
6. In an inelastic collision, momentum is still conserved.
 - ☐ True ☐ False
7. In its general form, Newton's second law says the resultant force equals the:
 - ☐ mass times the distance
 - ☐ momentum times the time
 - ☐ rate of change of momentum
 - ☐ mass times the velocity
8. At terminal velocity, the drag force is equal to the _____.

9. Compared with collisions in general, what is special about an **elastic** collision?
 - ☐ The objects always stick together
 - ☐ No forces act during it
 - ☐ Kinetic energy is also conserved
 - ☐ Momentum is conserved

10. Catching an egg with soft hands makes the contact time longer, which makes the average force _____.

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1. **6 kg · m/s**

$$p = mv = 2.0 \times 3.0 = 6.0 \frac{\text{kg} \cdot \text{m}}{\text{s}}.$$

2. **a resistive force from a fluid on a moving object**

Drag is the resistance a fluid (liquid or gas) exerts on something moving through it. Friction is the solid-on-solid case.

3. **external**

With no resultant *external* force, the system's total momentum is conserved (internal forces come in third-law pairs and cancel).

4. **True**

Yes – $p = mv$ points the same way as the velocity, so it has a direction.

5. **True**

Yes – at rest the drag is zero, and it increases with speed. That is what eventually balances the weight.

6. **True**

Momentum is conserved in **every** collision (no external force). In an inelastic one it is the *kinetic energy* that is not conserved.

7. **rate of change of momentum**

$$F = \frac{\Delta p}{\Delta t} \text{ – the rate of change of momentum. For constant mass this is } F = ma.$$

8. **weight**

Drag = weight, so the resultant force is zero and the speed stays constant.

9. **Kinetic energy is also conserved**

All collisions conserve momentum; an elastic collision *also* conserves kinetic energy.

10. **smaller**

$$\text{Same change in momentum over a longer time means a smaller force: } F = \frac{\Delta p}{\Delta t}.$$