

Velocity

6.5.4.1.3 · Physics · revision notes

Velocity is speed in a given direction, so it is a vector. You need to explain the difference between speed and velocity.

Key facts

- Velocity = speed in a given direction
- Unit of velocity: m/s, with a direction
- Along a line: + for one direction, – for the opposite direction
- Velocity is a vector; speed is a scalar
- Velocity changes if the speed OR the direction changes

Notes

Speed and velocity

- The **velocity** of an object is its speed in a given direction.
- Velocity is a **vector** quantity; speed is a **scalar** quantity.
- Velocity has the same unit as speed, m/s, but you also give a direction, e.g. 25 m/s north.
- Along a straight line, you can show direction with a sign: +3 m/s forwards, –3 m/s backwards.

When does velocity change?

- Velocity changes if the speed changes, if the direction changes, or if both change.
- A car going round a bend at a steady 15 m/s has a constant speed but a changing velocity.
- Two objects with the same speed moving in different directions have different velocities.
- A change in velocity is an acceleration, and it needs a resultant force.

How to answer each type of question

Explain the difference between speed and velocity

2 marks

Grade 4

1. Say that speed is a scalar: magnitude only.
2. Say that velocity is a vector: speed in a given direction.

Example. Explain the difference between speed and velocity.

Model answer. Speed is a scalar: it has magnitude only (1).

Velocity is a vector: it is speed in a given direction (1).

Don't lose marks

- ✗ Saying velocity is 'the same as speed'.
- ✗ Giving a velocity without a direction or a sign.
- ✗ After a bounce, subtracting the speeds ($5 - 4 = 1$ m/s) instead of the velocities ($-4 - 5 = -9$ m/s).

More tips

Memory tricks

- Velocity = speed + direction.
- Steering wheel test: turning the wheel changes your velocity, even if the speedometer reading stays the same.

Exam technique

- Whenever a question says 'velocity', think about direction as well as speed.
- Use the word 'vector' when you explain what velocity is.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3

Define velocity

The velocity of an object is its speed in a given direction.

Grade 4

Explain the difference between speed and velocity

Speed is a scalar (magnitude only); velocity is a vector (magnitude and direction).

Grade 5

Use + and – signs for velocity

Along a line, e.g. +4 m/s to the right and –4 m/s to the left.

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