Your notes

GCSE Physics: revision notes

Scalars, vectors and resultant forces

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Scalars and vectors

- **Scalar** quantities have magnitude (size) only, for example distance, speed, mass, energy, time and temperature.
- **Vector** quantities have magnitude and direction, for example displacement, velocity, acceleration, **force** and momentum.
- A **vector** can be shown as an arrow: its length shows the magnitude and its direction shows the direction.

Contact and non-contact forces

- A **force** is a push or a pull that acts on an object because of its interaction with another object. **Force** is a **vector**.
- **Contact forces** need the objects to touch: friction, air resistance, tension and normal **contact force**.
- **Non-contact forces** act at a distance: gravitational, electrostatic and magnetic **forces**.

Weight

- **Weight** is the **force** acting on an object due to gravity. It is measured in **newtons** (N).
- W = m g: **weight** (N) = mass (kg) × gravitational field strength (N/kg). On Earth, g is about 9.8 N/kg (Edexcel and OCR papers use 10 N/kg).
- **Weight** acts at a single point called the **centre of mass**. It can be measured with a newtonmeter (a calibrated spring balance).
- **Weight** and mass are directly proportional, but mass is the same everywhere while **weight** depends on the gravitational field strength.

Resultant forces

- The **resultant force** is the single **force** that has the same effect as all the **forces** acting on an object together.
- **Forces** in the same direction add; **forces** in opposite directions subtract.
- If the **resultant force** is zero, the **forces** are balanced.
- (Higher) A free body diagram shows all the **forces** on an object. A single **force** can be resolved into two components at right angles, and **forces** can be added using a scale drawing.

Key terms

Scalar	A quantity with magnitude only, such as speed or mass.
Vector	A quantity with magnitude and direction, such as velocity or force.
Force	A push or pull on an object caused by an interaction with another object.
Contact force	A force that acts only when objects touch, such as friction.
Non-contact force	A force that acts at a distance, such as gravity.
Weight	The force of gravity on an object: W = mg.
Centre of mass	The point where the weight of an object can be taken to act.
Resultant force	The single force that has the same effect as all the forces on an object.
Newton	The unit of force (N).

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Which of these is a vector quantity?
2. Which of these is a scalar quantity?
3. Which of these is a non-contact force?
4. What is the weight of a 50 kg person on Earth? (g = 9.8 N/kg)
5. What is weight measured in?
6. What happens to your mass on the Moon?
7. A 10 N force and a 4 N force act in opposite directions. What is the resultant force?
8. What is the resultant force when forces are balanced?

Answers

1. Velocity
2. Distance

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3. Magnetic force
4. 490 N
5. Newtons
6. It stays the same
7. 6 N
8. Zero

What to do next

Practise 10 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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