Your notes

GCSE Physics: revision notes

Moments, levers and pressure in fluids

Contents

1. Moments
2. Levers and gears
3. Pressure in fluids
4. Upthrust and floating (Higher)
5. Atmospheric pressure
6. Worked examples
7. Key terms
8. Quick questions
9. What to do next

Moments

- A force or a system of forces may cause an object to rotate. The turning effect of a force is called its **moment**.
- M = F d: **moment** (N m) = force (N) × perpendicular distance from the **pivot** to the line of action of the force (m).
- If an object is balanced, the total clockwise **moment** about a **pivot** equals the total anticlockwise **moment** about that pivot (the principle of moments).

Levers and gears

- **Levers** and gears transmit the rotational effects of forces.
- A **lever** increases the **moment** by increasing the distance from the **pivot**, so a small force can move a large load (for example a crowbar or a spanner).
- A small gear driving a larger gear makes the larger gear turn more slowly but with a bigger **moment**.

Pressure in fluids

- A **fluid** is a liquid or a gas. The **pressure** in a **fluid** causes a force at right angles (normal) to any surface.
- p = F ÷ A: **pressure** (Pa) = force normal to a surface (N) ÷ area of that surface (m^2).
- (Higher) The **pressure** due to a column of liquid: p = h ρ g, where h is the depth and ρ the density. **Pressure** increases with depth and with the density of the liquid.

Upthrust and floating (Higher)

- An object partly or totally submerged in a **fluid** experiences a greater **pressure** on its bottom surface than on its top surface. This creates a resultant upward force called **upthrust**.
- An object floats if its weight is equal to the **upthrust**. It sinks if its weight is greater than the **upthrust**.
- Objects less dense than the **fluid** float, because they can displace a weight of **fluid** equal to their own weight.

Atmospheric pressure

- The atmosphere is a thin layer of air around the Earth; air molecules colliding with surfaces create **atmospheric pressure**.
- **Atmospheric pressure** decreases with height, because there is less air above (and the air is less dense).

Worked examples

A 20 N force acts 0.5 m from a pivot. Find its moment.

Use moment = force × perpendicular distance from the pivot. **M = F × d**

Put the numbers in. **20 × 0.5**

Answer: 10 N m

Key terms

Moment	The turning effect of a force: force × perpendicular distance from the pivot.
Pivot	The point about which an object turns.
Principle of moments	For a balanced object, total clockwise moment = total anticlockwise moment.
Lever	A simple machine that uses a pivot to increase the turning effect of a force.
Pressure	Force per unit area: p = F ÷ A.
Fluid	A liquid or a gas.
Upthrust	The upward force on an object in a fluid, caused by the pressure difference between its top and bottom.
Atmospheric pressure	The pressure caused by air molecules colliding with surfaces.

Quick questions

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

1. What is the moment of a 10 N force acting 0.5 m from a pivot?

Your notes

2. Why is it easier to open a door by pushing far from the hinge?
3. What is the principle of moments?
4. A 400 N parent sits 2 m from a see-saw's pivot. Where must a 500 N person sit on the other side to balance?
5. What is the equation for pressure?
6. A 600 N force acts on an area of 0.02 m^2. What is the pressure?
7. Why do snowshoes stop you sinking into snow?
8. How does pressure in a liquid change with depth? (Higher)

Answers

1. 5 N m
2. The larger distance gives a bigger moment for the same force
3. For balance, clockwise moments equal anticlockwise moments
4. 1.6 m from the pivot
5. p = F ÷ A
6. 30 000 Pa
7. They spread your weight over a larger area, reducing pressure
8. It increases

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

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