Your notes

GCSE Design and Technology: revision notes

Forces, stresses and reinforcement

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Forces on materials

- **Tension**: a pulling force that stretches a material, such as a rope in a tug of war.
- **Compression**: a pushing force that squashes a material, such as the legs of a chair.
- **Bending**: a force that makes a material curve, such as a shelf with books on it.
- **Torsion**: a twisting force, such as turning a screwdriver.
- **Shear**: forces acting in opposite directions that slide one part of a material past another, such as scissors cutting paper.

Reinforcing and stiffening materials

- Paper and board: folding, **laminating** (layering) and adding ribs or corrugations make card stronger, such as corrugated card.
- Timber: **laminating** thin layers (as in plywood) and adding braces or struts.
- Metals: folding, **bending**, adding ribs, or making tubes and I-beams, which are stiff for their weight.
- Polymers: ribs and webbing in moulded products, such as the ribs inside a plastic case.
- Textiles: **interfacing** (an extra fabric layer) stiffens collars and cuffs; quilting and lamination add strength.

Why it matters

- Designers must know which forces a product will face so they can choose a strong enough material and shape.
- Changing the shape (such as a tube or corrugation) can make a product stronger without using more material.

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Key terms

Tension	A pulling force that stretches a material.
Compression	A pushing force that squashes a material.
Torsion	A twisting force.
Shear	Forces that slide one part of a material past another.
Bending	A force that makes a material curve.
Laminating	Bonding layers of material together for strength.
Interfacing	An extra layer of fabric used to stiffen parts of a garment.

Quick questions

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

1. Which force acts on a rope in a tug of war?
2. Which force acts on the legs of a chair when someone sits on it?
3. Which force does turning a screwdriver create?
4. Which force do scissors use to cut paper?
5. Which force acts on a shelf holding books?
6. How does corrugation make card stronger?
7. What is interfacing used for?
8. Why are metal tubes used in bike frames?

Answers

1. Tension
2. Compression
3. Torsion
4. Shear
5. Bending
6. The ribs stop the card bending easily
7. Stiffening collars and cuffs
8. They are stiff and strong for their weight

What to do next

Practise 10 questions on this topic

Try 4 exam questions, with mark schemes

Read the lesson, one step at a time

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