Your notes

GCSE Engineering: revision notes

Testing and investigation

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Destructive testing

- Destructive tests break or damage samples to find material properties.
- **Tensile test**: a sample is stretched until it breaks. The load–extension graph shows the elastic region, the yield point, the ultimate tensile strength and ductility (from how far it stretches).
- Hardness tests press an indenter into the surface: Brinell uses a hard ball, Vickers uses a diamond pyramid, and Rockwell measures the depth of the dent.
- **Impact tests** (Charpy and Izod): a swinging pendulum breaks a notched sample. The energy absorbed shows toughness.
- Other tests: bend tests, fatigue tests (repeated loads) and corrosion tests.

Non-destructive testing (NDT)

- NDT checks finished parts without damaging them, such as aircraft parts, welds and pipelines.
- Visual inspection, dye penetrant (shows surface cracks), magnetic particle testing (for ferrous metals), **ultrasonic testing** (finds internal flaws using sound waves) and X-ray (radiography).

Modelling and investigation

- Engineers use models and **prototypes** to test designs, virtual testing (such as **finite element analysis**, which simulates stresses) and test rigs.
- A fair test changes one variable, measures another and keeps the rest the same. Results are recorded, repeated and analysed, often with graphs.
- Quality control checks products against specifications, using tolerances and gauges.

Key terms

Destructive testing	Tests that damage or break a sample.

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Non-destructive testing	Tests that check parts without damaging them.
Tensile test	Stretching a sample until it breaks.
Impact test	Striking a notched sample to measure toughness.
Ultrasonic testing	Using sound waves to find internal flaws.
Finite element analysis	Computer simulation of stresses in a design.
Prototype	A test version of a product.

Quick questions

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

1. What does a tensile test measure?
2. What does a Charpy impact test measure?
3. What indenter does a Vickers test use?
4. What is non-destructive testing?
5. Which NDT method finds internal flaws using sound waves?
6. What does dye penetrant testing show?
7. What is finite element analysis?
8. In a fair test, what should happen to the other variables?

Answers

1. How a material behaves when stretched
2. Toughness
3. A diamond pyramid
4. Checking parts without damaging them
5. Ultrasonic testing
6. Surface cracks
7. Computer simulation of stresses in a design
8. They are kept the same

What to do next

Practise 10 questions on this topic

Try 3 exam questions, with mark schemes

Read the lesson, one step at a time

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