GET BETTER AT PHYSICS · MARK SCHEME

Hooke's Law & Force–Extension Graphs: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.4.2.1 · 5 questions · 5 marks

1 mark per correct letter | Worked reasoning for every question | **How students did** = from AQA examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
B	B	D	C	B

Easy

Questions 1–5

1 **B**

Naming a material that snaps without deforming · AQA June 2017 · AS Paper 2 · Q17

A brittle material, such as glass or cast iron, breaks without deforming plastically first. It behaves elastically right up to the point where it snaps.

> **Watch out:** Plastic materials do the opposite: they stretch permanently a long way before breaking. 'Stiff' describes how much force is needed per unit extension, not how a material breaks.

How students did: 91% of students got this right in June 2017.

2 **B**

What brittle fracture means · AQA June 2024 · AS Paper 2 · Q24

A brittle fracture happens after little or no **plastic** deformation: the material stretches elastically and then snaps. So B is true.

> **Watch out:** A is wrong because brittle materials do deform elastically before breaking. C and D describe Hooke's-law (elastic) behaviour: in plastic deformation stress is no longer proportional to strain.

How students did: In June 2024 the correct answer was the most popular choice.

3 **D**

Force–extension graph of a brittle material · AQA 2020 · AS Paper 2 · Q27

A brittle material obeys Hooke's law until it fractures, with no plastic region. Its graph is a straight line through the origin that ends suddenly: graph D.

> **Watch out:** A, B and C all curve after the straight section. That curved part shows plastic deformation, which a brittle material does not have.

4 **C**

Estimating the stiffness of a baby bouncer · AQA June 2022 · AS Paper 2 · Q6

Estimate: a baby has a mass of about 8–10 kg, so a weight of roughly 100 N. The spring might extend by about 0.1–0.3 m. $k = F \div \Delta L \approx 100 \div 0.2 = 500$ N m^{-1}, which is in the range 100–1000 N m^{-1}.

> **Watch out:** For estimates, choose sensible round values and check the answer sits well inside one range, not on a boundary.

5 **B**

Comparing two wires on a force–extension graph · AQA June 2017 · AS Paper 2 · Q30

X and Y have the same length and area, so the gradient $F / \Delta L = EA / L$ is proportional to the Young modulus E. X's line is steeper, so X has the **greater** Young modulus. Statement B is incorrect. A is true (more area under X's line at a given extension), C is true (both lines are straight through the origin) and D is true (X breaks at a larger force with the same area).

> **Watch out:** This asks for the **incorrect** statement. Test every option and pick the false one.

How students did: Most students got this right in June 2017.

End of mark scheme. Answers from AQA's published keys; explanations written for this pack. AQA material is © AQA. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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