GET BETTER AT PHYSICS · MARK SCHEME

Mass Defect & Binding Energy: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.8.1.6 · 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	C	A	C	B

Easy

Questions 1–4

1 **B**

Mass difference of a lithium-7 nucleus · AQA November 2020 · A-level Paper 2 · Q30

Li-7 has 3 protons and 4 neutrons. Mass of nucleons = 3 × 1.00728 + 4 × 1.00867 = 7.05652 u. Mass difference = 7.05652 − 7.01436 = 0.04216 u.

Watch out: Use the proton number (3) for protons and A − Z (4) for neutrons.

How students did: In November 2020 this question was answered better than most of the paper.

2 **C**

Kinetic energy of an alpha particle · AQA June 2025 · A-level Paper 2 · Q28

Mass lost = 209.983 − (205.975 + 4.003) = 0.005 u. Energy released = 0.005 × 931.5 = 4.7 MeV. The lead recoils very slowly, so the alpha particle carries almost all of this energy.

How students did: Over two-thirds of students got this right in June 2025.

3 **A**

What is not true about a fission reaction · AQA June 2024 · A-level Paper 2 · Q18

Br-87 is much closer to the iron peak than La-146, so bromine (not lanthanum) has the greatest binding energy per nucleon of the three nuclides. A is not true. B, C and D are all correct.

Watch out: Compare positions on the binding-energy-per-nucleon curve, not the total binding energy.

4 **C**

Mass lost when wood burns · AQA June 2024 · A-level Paper 2 · Q19

$E = 5.6\ \text{kW h} = 5.6 \times 10^3 \times 3600 = 2.0 \times 10^7$ J. $m = E / c^2 = 2.0 \times 10^7 \div (3.0 \times 10^8)^2 = 2.2 \times 10^{-10}$ kg.

Watch out: $E = mc^2$ applies to chemical energy too; the mass change is just far too small to measure.

Medium

Question 5

5 **B**

Maximum power from the rate of mass loss · AQA November 2020 · A-level Paper 2 · Q31

Mass lost per second $= 6.0 \times 10^{-6} \div 3600 = 1.67 \times 10^{-9}$ kg s^{-1}. $P = (\Delta m/\Delta t)c^2 = 1.67 \times 10^{-9} \times 9.0 \times 10^{16} = 1.5 \times 10^8$ W = 150 MW.

Watch out: Convert per hour to per second before using $E = mc^2$.

How students did: Between 30% and 50% of students got this right in November 2020.

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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