GET BETTER AT PHYSICS · MARK SCHEME

Energy Levels & Line Spectra: tiered multiple choice

Edexcel IAL Physics · Unit 2 (WPH12) · Specification points 63 · 5 questions · 5 marks

1 mark per correct letter

Worked reasoning for every question

How students did = from Pearson examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
D	B	B	C	A

Easy

Questions 1–3

1 **D**

Lowest frequency emitted · Edexcel IAL October 2023 · Unit 2 · Q9

The lowest frequency photon comes from the smallest energy gap. The smallest gap here is between −1.36 and −2.42 (× 10^{-19} J): 1.06 × 10^{-19} J. $f = \Delta E/h = (2.42 \times 10^{-19} - 1.36 \times 10^{-19})/(6.63 \times 10^{-34})$.

How students did: 68% of students got this right in October 2023.

2 **B**

How many frequencies can be emitted · Edexcel IAL January 2025 · Unit 2 · Q9

8.74×10^{-19} J ÷ 1.6×10^{-19} = 5.46 eV, so electrons can be raised to the 5.46 eV level (or 4.91 eV). Falling back down, the possible jumps are 5.46 → 4.91, 5.46 → ground and 4.91 → ground: 3 different frequencies.

Watch out: Convert the photon energy to eV first so you can compare it with the levels.

3 **B**

Energy of the upper level from the photon emitted · Edexcel IAL January 2024 · Unit 2 · Q10

The photon carries away the energy difference: $hc/\lambda = E_2 - E_1$. So $E_2 = hc/\lambda + E_1$.

How students did: 56% of students got this right in January 2024.

Medium

Questions 4–5

4 **C**

Number of emission lines from n = 3 · Edexcel IAL January 2023 · Unit 2 · Q7

From n = 3 an electron can drop straight to n = 1, or to n = 2 and then to n = 1. The possible transitions are 3 → 2, 2 → 1 and 3 → 1, giving 3 different frequencies.

Watch out: Don't forget the second step: an electron that drops from 3 to 2 still has to drop from 2 to 1.

How students did: Examiners reported that surprisingly few students got this right in January 2023. The most common wrong answer was B: students missed the further emission from n = 2 to n = 1.

5 **A**

Transition giving the longest wavelength · Edexcel IAL October 2022 · Unit 2 · Q2

Only downward transitions emit photons, so B (an upward jump) cannot. E = hc/λ, so the longest wavelength comes from the smallest energy drop. A is the smallest downward jump.

> **Watch out:** A bigger energy jump gives a shorter wavelength, not a longer one.

How students did: Only 34% of students got this right in October 2022. Common wrong answers were B and C: many thought a bigger energy jump gives a longer wavelength.

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

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