GET BETTER AT PHYSICS · MARK SCHEME

Moments: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.4.1.2 · 8 questions · 8 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	Q6	Q7	Q8
C	A	C	A	D	C	C	D

Easy

Questions 1–3

1 **C**

Definition of a couple · AQA June 2022 · AS Paper 2 · Q23

A couple is two equal and opposite forces whose lines of action don't coincide. Its moment is force × perpendicular separation, so the unit is N m. B is wrong because a couple produces rotation, not translation. A and D give N m^{-1}, which is not a unit of moment (and in A, "parallel" forces could point the same way).

How students did: This was one of the more successful questions on the June 2022 paper.

2 **A**

Is the bar in equilibrium? · AQA June 2017 · A-level Paper 1 · Q18

Check both conditions. In A, the upward forces total 4 + 4 + 2 = 10 N and the downward forces total 2 + 8 = 10 N. Each end has a net 2 N upwards at the same distance from the centre, so the moments cancel. B and D have a resultant force. C has balanced forces but a resultant moment.

3 **C**

Moment needed for equilibrium · AQA November 2020 · A-level Paper 1 · Q20

The forces balance (20 N up; 6 + 10 + 4 = 20 N down), so look at the moments about the centre. The 6 N force gives 6 × 0.30 = 1.8 N m anticlockwise and the 4 N force gives 4 × 0.20 = 0.8 N m clockwise. That leaves 1.0 N m anticlockwise, so an extra 1.0 N m clockwise is needed.

Medium

Questions 4–6

4 **A**

Hinged beam and string · AQA June 2022 · AS Paper 2 · Q22

Moments about the hinge, with beam length L. The weight gives 23.5 × L/2. The string is at 35° to the vertical, so its vertical component (perpendicular to the beam) is T cos 35°. Then T cos 35° × L = 23.5 × L/2, so T = 14 N.

How students did: This was one of the less successful questions on the June 2022 paper.

5 **D**

Moments with springs · AQA June 2018 · A-level Paper 1 · Q21

Take moments about P to remove the force in spring P: 18 × 0.65 = F_Q × 0.80, so F_Q = 14.6 N. Extension = F/k = 14.6 / 240 = 0.061 m.

How students did: 43% of students got this right in June 2018.

6 **C**

Rod on two wires · AQA June 2018 · AS Paper 2 · Q20

$T_P + T_Q = 3W$ and $T_P = \frac{1}{2}T_Q$, so $T_P = W$ and $T_Q = 2W$. Moments about P: $W \times 7.5 + 2W \times x = 2W \times 15.0$, so $x = 11.25 \approx 11.3$ cm.

> **Watch out:** The tensions split 1 : 2, but that does not mean the distances do. Take moments.

How students did: Almost 40% of students got this right in June 2018. The most common wrong answer, B, came from splitting the distance 2 : 1 like the tensions.

Hard

Questions 7–8

7 **C**

Metre-rule balance · AQA June 2017 · AS Paper 2 · Q16

Moments about the pivot (in N cm). Clockwise: 1.5 × 35 + 2.5 × 60 = 202.5. Anticlockwise: (0.5 + X) × 15. So 0.5 + X = 13.5 and X = 13.0 N. Forgetting the pan gives D. Forgetting the ruler's weight gives A.

How students did: Only 17% of students got this right in June 2017. About a third each chose A and B, mostly by leaving out the ruler's own weight.

8 **D**

Reaction at a support · AQA June 2019 · AS Paper 2 · Q24

The rod is 4 m long, so its weight W acts 2 m from the left end, which is 1 m right of F. Moments about F: 400 × 1 = 100 × 3 + W × 1, so W = 100 N. Reaction = 400 + 100 + 100 = 600 N.

> **Watch out:** The rod's weight is not drawn on the diagram, but the rod is uniform, so its weight acts at its midpoint.

How students did: Only about 11% of students got this right in June 2019. Most chose A because the rod's weight is not drawn and they left it out.

End of mark scheme

Answers from AQA's published keys; explanations written for this pack. AQA material is © AQA.
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