GET BETTER AT PHYSICS · MARK SCHEME

Work & Energy: tiered multiple choice

AQA A-level Physics · 7407 / 7408 · Specification 3.4.1.7–3.4.1.8 · 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	B	D	C	D	A	A

Easy

Questions 1–3

1 **C**

Roller coaster: maximum speed · AQA June 2016 · AS Paper 2 · Q26

The maximum speed is when all the gravitational potential energy becomes kinetic energy: $\frac{1}{2}mv^2 = mgh$, so $v = \sqrt{(2gh)} = \sqrt{(2 \times 9.81 \times 65)} = 36$ m s^{-1}.

How students did: 84% of students got this right in June 2016.

2 **A**

Prefixes: which gives 1 J of work? · AQA June 2025 · A-level Paper 1 · Q11

W = Fx. A: 1×10^{-3} N × 1×10^{3} m = 1 J. B and C each give 10 J, and D gives 10^{-6} J.

How students did: Over 90% of students got this right in June 2025.

3 **B**

Estimating a car's kinetic energy · AQA June 2022 · A-level Paper 1 · Q9

100 km h^{-1} ≈ 28 m s^{-1} and a car's mass is about 1000–1500 kg. $E_k = \frac{1}{2} \times 1000 \times 28^2 \approx 4 \times 10^5$ J. The nearest option is 10^6 J.

> **Watch out:** Convert km h^{-1} to m s^{-1} first: divide by 3.6.

Medium

Questions 4–6

4 **D**

Area under a force–distance graph · AQA June 2023 · AS Paper 2 · Q34

Area under a force–distance graph = force × distance = work done.

> **Watch out:** Impulse (B) is the area under a force–*time* graph. Check the axes before you answer.

5 **C**

Doubling the drop height · AQA June 2023 · AS Paper 2 · Q26

Energy conservation gives $v^2 = 2gh$, so v is proportional to √h. Doubling h multiplies v by √2: v√2.

> **Watch out:** B (√2v, written as the square root of 2v) is a different expression from v√2.

6 **D**

Kinetic energy of a pendulum · AQA June 2017 · A-level Paper 1 · Q31

Total energy is constant. The kinetic energy is greatest at the equilibrium position and zero at the maximum displacement. For small swings the potential energy rises with displacement², so $E_k = E_{total} - (\text{constant} \times x^2)$: an upside-down curve, graph D.

> **Watch out:** A has the right maximum and zeros but uses straight lines. B and C have the kinetic energy at a minimum in the middle.

Hard

Questions 7–8

7 **A**

Friction on a ramp · AQA June 2017 · AS Paper 2 · Q5

Potential energy lost = 2.5 × 9.81 × 3.0 = 73.6 J. Kinetic energy gained = ½ × 2.5 × 5.0² = 31.3 J. Work done against friction = 73.6 − 31.3 = 42.3 J along the 5.0 m slope, so F = 42.3 / 5.0 = 8.5 N.

> **Watch out:** Friction acts along the slope, so divide by 5.0 m, not 4.0 m (B). 24.5 N (D) is just the weight.

How students did: Only 27% of students got this right in June 2017.

8 **A**

Same force, same time, different mass · AQA June 2018 · AS Paper 2 · Q27

Same force for the same time gives the same impulse, so P and Q gain the same momentum p. $E_k = p^2 / 2m$, so the kinetic energy is inversely proportional to mass: $E_{k,P} / E_{k,Q} = m_Q / m_P = 0.1$.

> **Watch out:** It is tempting to think more mass means more kinetic energy, but P moves 10 times more slowly.

How students did: Just over 20% of students got this right in June 2018.

End of mark scheme

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