GET BETTER AT PHYSICS · MARK SCHEME

Circular Motion: tiered multiple choice

AQA A-level Physics · 7408 · Specification 3.6.1.1 · 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	D	A	D	A

Easy

Question 1

1 **B**

Kinetic energy from revolutions per second · AQA June 2024 · A-level Paper 1 · Q29

$v = 2\pi rf$, so $E_k = \frac{1}{2}mv^2 = \frac{1}{2}m(2\pi rf)^2 = \frac{1}{2} \times 4\pi^2 mf^2r^2 = 2\pi^2 mf^2r^2$.

Watch out: Square the whole of $2\pi rf$, including the 2 and the π.

How students did: Over 70% of students got this right in June 2024.

Medium

Questions 2–5

2 **D**

Tension at the bottom of a vertical circle · AQA June 2017 · A-level Paper 1 · Q30

$\omega = 120$ rev min^{-1} = 2 rev s^{-1} = 4π rad s^{-1}. Centripetal force = $m\omega^2 r = 0.50 \times (4\pi)^2 \times 0.45 = 35.5$ N. At the bottom, $T - mg = m\omega^2 r$, so $T = 35.5 + 0.50 \times 9.81 = 40$ N.

Watch out: 36 N (C) leaves out the weight. At the bottom of the circle the string must hold the bob up as well.

3 **A**

Discs rotating on an axle · AQA June 2023 · A-level Paper 1 · Q28

The pellet takes $2.00 \div 300 = 6.67 \times 10^{-3}$ s to travel between the discs. In that time the discs turn through 45° = 1/8 of a revolution. Revolutions per second = $(1/8) \div 6.67 \times 10^{-3} = 19$.

Watch out: Use the time between the discs, then convert 45° into a fraction of a revolution.

4 **D**

Banking angle of a turning aircraft · AQA June 2023 · A-level Paper 1 · Q30

Vertically, the lift balances the weight: $L \cos\theta = mg$. Horizontally, the lift provides the centripetal force: $L \sin\theta = mv^2 / r$. Dividing: $\tan\theta = v^2 / (rg)$.

Watch out: Resolve the lift into vertical and horizontal parts, then divide one equation by the other so L and m cancel.

5 **A**

Friction on a mass on a turntable · AQA June 2024 · A-level Paper 1 · Q28

The mass moves in a circle with the turntable, so the resultant force on it must point towards the centre O. The only horizontal force is friction, so friction acts from P to O.

Watch out: There is no outward 'centrifugal' force. Friction provides the centripetal force.

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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