FREE REVISION PACK

Circular Motion

AQA A-level Physics · 7408 · Specification 3.6.1.1

Easy | Medium | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Kinetic energy from revolutions per second	AQA June 2024 · A-level Paper 1 · Q29	1 mark
2	Medium	Tension at the bottom of a vertical circle	AQA June 2017 · A-level Paper 1 · Q30	1 mark
3	Medium	Discs rotating on an axle	AQA June 2023 · A-level Paper 1 · Q28	1 mark
4	Medium	Banking angle of a turning aircraft	AQA June 2023 · A-level Paper 1 · Q30	1 mark
5	Medium	Friction on a mass on a turntable	AQA June 2024 · A-level Paper 1 · Q28	1 mark

Key ideas to have ready

- Angular speed $\omega = \theta / t = 2\pi f = 2\pi / T$ (rad s^{-1}). Linear speed $v = \omega r$.
- Centripetal acceleration $a = v^2 / r = \omega^2 r$, always towards the centre of the circle.
- Centripetal force $F = mv^2 / r = m\omega^2 r$ is the resultant force towards the centre. It is provided by a real force: tension, friction, gravity, lift...
- At the bottom of a vertical circle the tension must support the weight and provide the centripetal force: $T = mg + m\omega^2 r$.

How to use this pack

1. The questions are grouped into levels (Easy and Medium). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in AQA's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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Easy

Definitions and one-step ideas. Most students get these right.

Question 1

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2024 · A-level Paper 1 · Q29

1 A particle of mass m moves in a circle of radius r. The number of revolutions completed per second is f.

What is the kinetic energy of the particle?

[1 mark]

A $4\pi^2 mf^2 r^2$ ⬭

B $2\pi^2 mf^2 r^2$ ⬭

C $\frac{mf^2 r^2}{4\pi^2}$ ⬭

D $\frac{mf^2 r^2}{2}$ ⬭

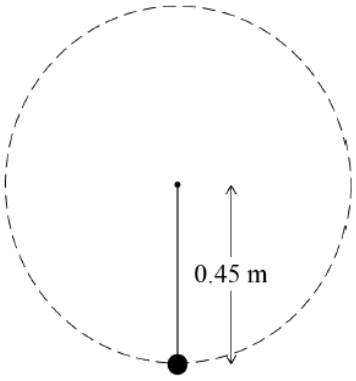
Medium

Two or three steps. Roughly a third to a half of students get these right.

Questions 2–5

AQA June 2017 · A-level Paper 1 · Q30

2 A bob of mass 0.50 kg is suspended from the end of a piece of string 0.45 m long.
The bob is rotated in a vertical circle at a constant rate of 120 revolutions per minute.



What is the tension in the string when the bob is at the bottom of the circle?

[1 mark]

A 5.8 N ○

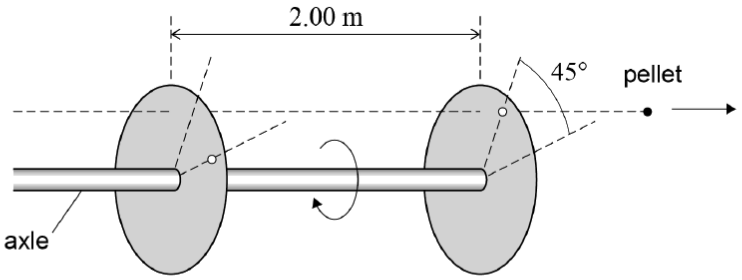
B 31 N ○

C 36 N ○

D 40 N ○

AQA June 2023 · A-level Paper 1 · Q28

3 Two circular discs made of card rotate at constant speed on a common axle.



The discs are 2.00 m apart.

An air-gun pellet is fired parallel to the axle. The pellet makes holes in the discs.
The holes are separated by an angle of 45°.
The speed of the pellet between the discs is 300 m s^{-1}.

How many revolutions does each disc complete in one second?

[1 mark]

A 19 ⬭

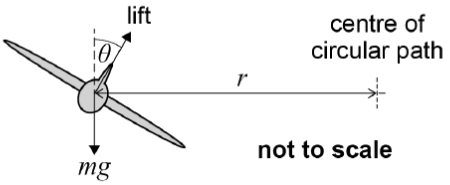
B 118 ⬭

C 740 ⬭

D 1074 ⬭

AQA June 2023 · A-level Paper 1 · Q30

4 When an aircraft turns in a horizontal circular path, it banks at an angle θ.



The aircraft has mass m and travels at constant speed v in a horizontal circular path of radius r. The lift force acts at the angle θ.

What is tan θ?

[1 mark]

A $\frac{gv^2}{r}$ ⬭

B $\frac{rv^2}{g}$ ⬭

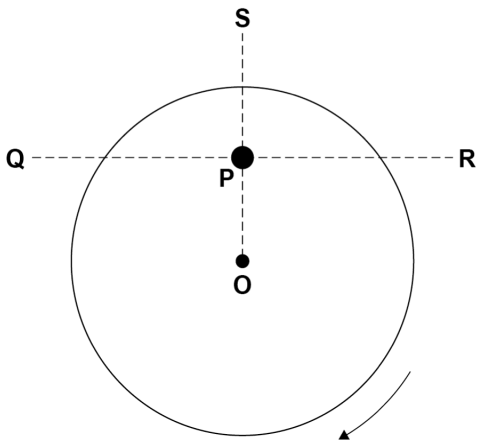
C $\frac{rg}{v^2}$ ⬭

D $\frac{v^2}{rg}$ ⬭

AQA June 2024 · A-level Paper 1 · Q28

5 A small mass is placed at **P** on a horizontal turntable. The turntable rotates clockwise with a constant angular speed about a vertical axis through its centre **O**.

view of turntable from above



The mass remains at rest relative to the turntable.

What is the direction of the frictional force on the mass at the instant shown?

[1 mark]

A from **P** to **O** ⬭

B from **P** to **Q** ⬭

C from **P** to **R** ⬭

D from **P** to **S** ⬭

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**