

YEAR 2 | MODULE 5 | PACK 04

Circular motion chapter test

Official past-paper questions

2017-2023 | OCR A H556 | Mixed 5.2.1-5.2.2 with Year 1 mechanics

35 marks | 3 question entries

Suggested time: 50 minutes

Use this after the first two core topic packs. Every source question in this test has been withheld from those practice packs, including its other assigned subparts.

Conditions: 50 minutes, calculator and the official formula booklet; no notes or mark scheme. Stop at the time limit and record your first-attempt score. The timing is scaled approximately to Paper 1. This test also uses Year 1 Hooke law, resolving forces and projectile motion; no magnetic-field or gravitational-energy calculation is required.

A chapter-test percentage is a progress measure, not an OCR grade prediction. Full-paper performance remains a separate check.

Reserved: all 2024 and 2025 papers are excluded. These files contain official examination questions only; no sample, specimen or practice papers.

Name: _____

First attempt: _____ Score: _____ / 35

[Official data, formulae and relationships booklet](#)

Question index

CM identifiers are stable across the question packs and mark schemes; Q numbers refer to this pack. This core pack has no selected MCQs.

Question / source	Marks	Page
Q01 CM08	12	3
June 2017 H556/03 Q6		
Q02 CM21	10	5
November 2021 H556/03 Q6		
Q03 CM24	13	7
June 2023 H556/01 Q17(a), (b)(i)-(ii)		

Q01 | CM08

12 marks

June 2017 | H556/03 | Q6

- 6 This question is about the motion of a ball suspended by an elastic string above a bench. The mass of the string is negligible compared to that of the ball. Ignore air resistance.



Fig. 6.1

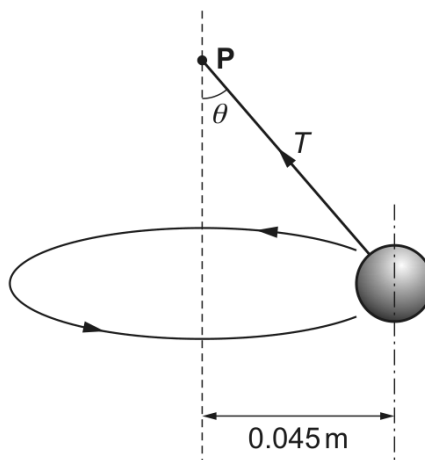


Fig. 6.2 (not to scale)

In Fig. 6.1 the ball of weight 1.2 N hangs vertically at rest from a point **P**. The extension of the string is 0.050 m. The string obeys Hooke's law.

In Fig. 6.2 the ball is moving in a horizontal circle of radius 0.045 m around a vertical axis through **P** with a period of 0.67 s. The string is at an angle θ to the vertical. The tension in the string is T .

- (a) On Fig. 6.2 draw and label one other force acting on the ball. [1]
- (b) (i) Resolve the tension T horizontally and vertically and show that the angle θ is 22° .

[2]

- (ii) Calculate the extension x of the string shown in Fig. 6.2.

$x = \dots\dots\dots$ m [3]

The complete question is assigned. Uses Year 1 Hooke law, resolving forces and projectile motion.

Q01 | CM08 - continued

12 marks

June 2017 | H556/03 | Q6

- (c) Whilst rotating in the horizontal plane the ball suddenly becomes detached from the string. The bottom of the ball is 0.18 m above the bench at this instant. The ball falls as a projectile towards the bench beneath. Fig. 6.3 shows the view from above.

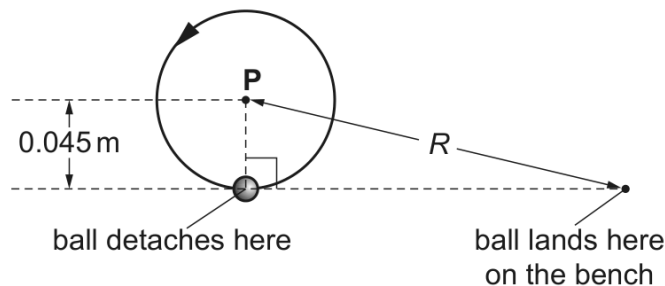


Fig. 6.3

Calculate the horizontal distance R from the point on the bench vertically below the point P to the point where the ball lands on the bench.

$R = \dots\dots\dots$ m [4]

- (d) Returning to the situation shown in Fig. 6.2, state and explain what happens when the rate of rotation of the ball is increased.

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..... [2]

The complete question is assigned. Uses Year 1 Hooke law, resolving forces and projectile motion.

Q02 | CM21

10 marks

November 2021 | H556/03 | Q6

- 6 The London Eye, shown rotating anticlockwise in **Fig. 6.1**, is a giant wheel which rotates slowly at a constant speed.

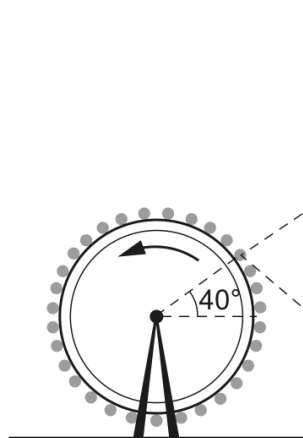


Fig. 6.1

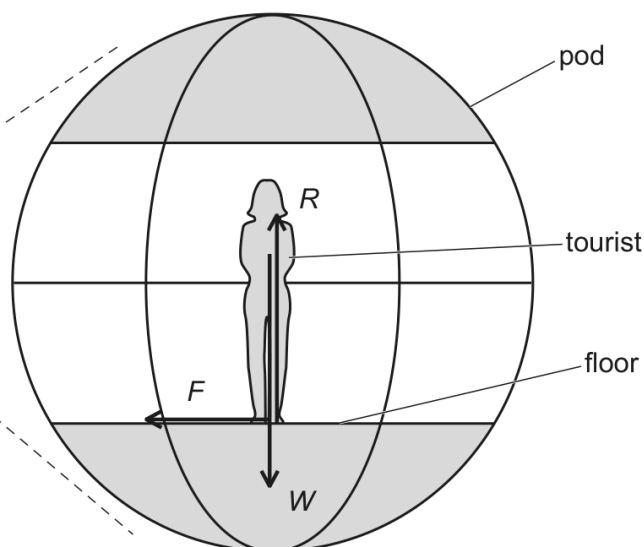


Fig. 6.2

Tourists stand in pods around the circumference of the wheel.

The floor remains horizontal at all times.

At time $t = 0$, a tourist who has a weight W of 650 N enters a pod at the bottom of the wheel.

Fig. 6.2 shows the forces acting on the tourist at a later time, when the angle between the pod's position and the centre of the wheel is 40° above the horizontal. R is the normal contact force and F is friction.

- (a) The resultant upward force $(R - W)$ on the tourist changes during the 30 minutes of the rotation of the London Eye as shown in **Fig. 6.3**.

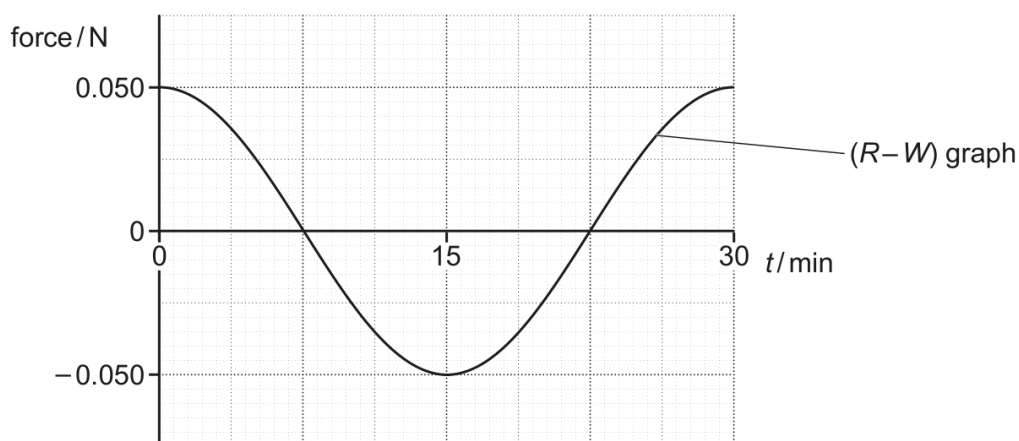


Fig. 6.3

Explain how the graph in **Fig. 6.3** shows that the magnitude of the centripetal force on the tourist during the rotation is 0.050 N.

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..... [1]

Q02 | CM21 - continued

10 marks

November 2021 | H556/03 | Q6

- (b) (i) Explain why the horizontal force F between the floor and the tourist is necessary.

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..... [2]

- (ii) Draw on **Fig. 6.3** the variation of the horizontal force F during the 30 minutes of the anticlockwise rotation of the London Eye. Take forces to the right to be positive. [2]

- (iii) Calculate the magnitude of force F when the pod is at the position shown in **Fig. 6.2**, at 40° above the horizontal.

$F =$ N [2]

- (c) Calculate the distance d of the centre of mass of the tourist from the centre of rotation of the London Eye.

$d =$ m [3]

Q03 | CM24

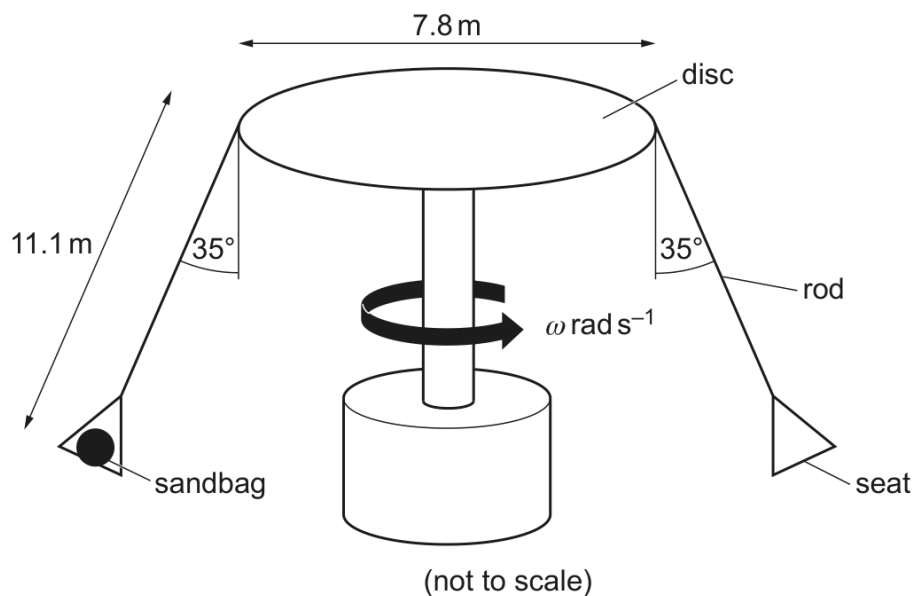
13 marks

June 2023 | H556/01 | Q17(a), (b)(i)-(ii)

17 The diagram below shows a fairground ride. Each rider is secured in a seat suspended by a rod.

The distance from the top of the rod to the base of the seat is 11.1 m.

The rod is attached to the edge of a disc of diameter 7.8 m.



To test the equipment a sandbag is attached to the seat and the ride is started.

The combined mass of the seat and the sandbag is 12 kg.

The rod makes an angle of 35° with the vertical.

- (a) (i) Draw an arrow labelled T on the diagram to represent the tension in the rod. [1]
- (ii) Show that the radius of the circular path followed by the sandbag is about 10 m.

[2]

Only (a) and (b)(i)-(ii) are assigned. All radius, tension, angular-velocity and flight-time calculations required by later assigned parts are retained. Part (b)(iii), about a released shoe, is omitted.

Q03 | CM24 - continued

13 marks

June 2023 | H556/01 | Q17(a), (b)(i)-(ii)

- (iii) Calculate the tension T in the rod.

$$T = \dots\dots\dots \text{ N [3]}$$

- (iv) Show that the angular velocity of the ride is about 0.8 radians per second.

[2]

- (b) When the seat is at its highest point the sandbag is 17 m above the ground. The sandbag is released from the seat to model an object being dropped by a rider.

- (i) Calculate t , the time taken for the sandbag to reach the ground.

$$t = \dots\dots\dots \text{ s [2]}$$

- (ii) Using your answer to (a)(iv), determine the horizontal displacement s travelled by the sandbag before hitting the ground.

$$s = \dots\dots\dots \text{ m [3]}$$

Only (a) and (b)(i)-(ii) are assigned. All radius, tension, angular-velocity and flight-time calculations required by later assigned parts are retained. Part (b)(iii), about a released shoe, is omitted.