

YEAR 2 | MODULE 5 | PACK 01

Period, speed and circular acceleration

Official past-paper questions

2017-2023 | OCR A H556 | 5.2.1(b)-(c); 5.2.2(b)-(c)

20 marks | 6 question entries

One practice session

Use: attempt the session after learning its content. Try without notes; record any help used. Mark the session, identify the reason for lost marks, then revisit those questions after a few days.

Format: all MCQs appear first with their complete answer boxes. Written extracts retain the original paper's answer space. Only the subparts named in the source reference are assigned.

The final 6-mark frequency question also uses Year 1 LDR and potential-divider circuits. The orbital-period and kinetic-energy questions in this pack supply their required data and do not assign gravitational calculations.

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: _____ / 20

[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 CM09A12	3	3
June 2018 H556/01 Q17(a)(i)-(ii)		
Q02 CM17	2	4
November 2020 H556/03 Q4(b)(ii)		
Q03 CM10B	3	5
June 2018 H556/01 Q21(b)		
Q04 CM23B1	3	6
June 2022 H556/03 Q1(b)(i)		
Q05 CM20	3	7
November 2021 H556/03 Q3(b)(ii)		
Q06 CM11	6	8
June 2018 H556/02 Q17		

Q01 | CM09A12

3 marks

June 2018 | H556/01 | Q17(a)(i)-(ii)

- 17 (a) Phobos is one of the two moons orbiting Mars. Fig. 17.1 shows Phobos and Mars.

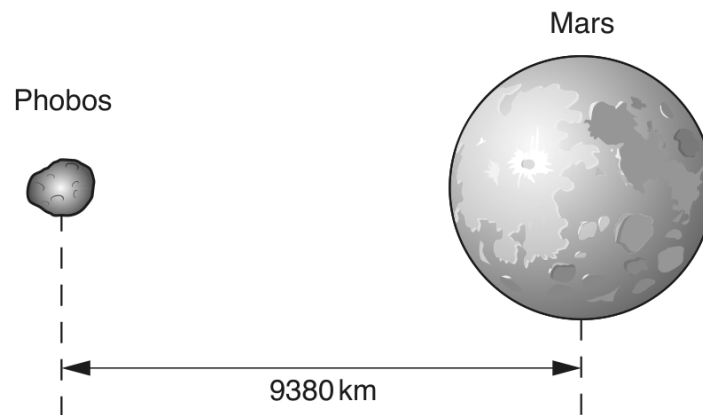


Fig. 17.1

The orbit of Phobos may be assumed to be a circle. The centre of Phobos is at a distance 9380 km from the centre of Mars and it has an orbital speed $2.14 \times 10^3 \text{ ms}^{-1}$.

- (i) On Fig. 17.1, draw an arrow to show the direction of the force which keeps Phobos in its orbit. [1]
- (ii) Calculate the orbital period T of Phobos.

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

Only (a)(i)-(ii) are assigned. The orbit diagram, radius and speed are retained; no gravitational calculation is assigned.

Q02 | CM17

2 marks

November 2020 | H556/03 | Q4(b)(ii)

- 4 The International Space Station (ISS) orbits the Earth at a height of $4.1 \times 10^5 \text{ m}$ **above** the Earth's surface.

The radius of the Earth is $6.37 \times 10^6 \text{ m}$. The gravitational field strength g_0 at the Earth's surface is 9.81 N kg^{-1} .

- (ii) The speed of the ISS in its orbit is 7.7 km s^{-1} . Show that the period of the ISS in its orbit is about 90 minutes.

[2]

Only (b)(ii) is assigned. The Earth radius, orbital height and speed are retained; no gravitational-field calculation is assigned.

Q03 | CM10B

3 marks

June 2018 | H556/01 | Q21(b)

21 Fig. 21 shows the drum of a washing machine.

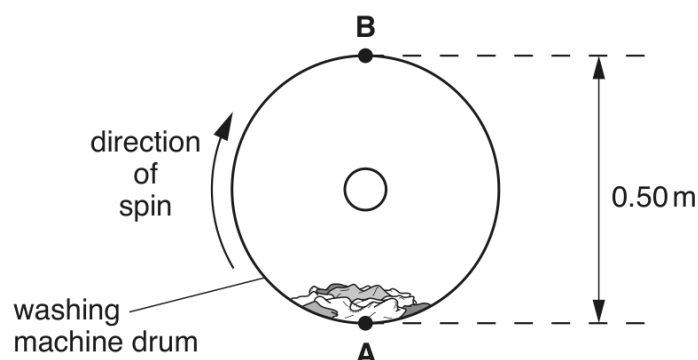


Fig. 21

The clothes inside the drum are spun in a **vertical** circular motion in a clockwise direction.

- (b) The drum has diameter 0.50 m. The manufacturer of the washing machine claims that the drum spins at 1600 ± 100 revolutions per minute.

Calculate the speed of rotation of the drum and the absolute uncertainty in this value.

speed = ... $\pm$ ms^{-1} [3]

Q04 | CM23B1

3 marks

June 2022 | H556/03 | Q1(b)(i)

- 1 The table shows some data on the planet Venus.

Mass / kg	4.87×10^{24}
Radius / km	6050
Density of atmosphere at surface / kg m^{-3}	65
Period of rotation about its axis / hours	5830

- (b) Two identical space probes, **A** and **B**, land on a flat surface on Venus.

Probe **A** lands at the north pole. Probe **B** lands on the equator.

Each probe has mass 760 kg and volume 1.7 m^3 .

- (i) Calculate the centripetal acceleration a of probe **B** at the equator due to the rotation of Venus about its axis.

$a = \dots\dots\dots \text{ms}^{-2}$ [3]

Only (b)(i) is assigned. The original radius, rotation period and probe locations are retained.

Q05 | CM20

3 marks

November 2021 | H556/03 | Q3(b)(ii)

Given result from omitted (b)(i): the magnitude of the gravitational potential energy is $7.2 \times 10^{11} \text{ J}$ (about $7 \times 10^{11} \text{ J}$).

- (b)** The space probe has mass 810 kg. The orbital radius of the space probe is $1.5 \times 10^{11} \text{ m}$. The orbital period of the space probe around the Sun is $3.16 \times 10^7 \text{ s}$. The mass of the Sun is $2.0 \times 10^{30} \text{ kg}$.

- (ii)** Show that the kinetic energy of the space probe is half the value of your answer to **(b)(i)**.

[3]

Only (b)(ii) is assigned. The mass, orbital radius and period are retained, and the earlier energy result is supplied; no gravitational-energy calculation is assigned.

Q06 | CM11

6 marks

June 2018 | H556/02 | Q17

Requires: Year 1 LDR and potential-divider circuits.

- 17*** A metal circular plate is rotated at a constant frequency by an electric motor. The plate has a small hole close to its rim. Fig. 17.1 shows an arrangement used by a student to determine the frequency of the rotating plate.

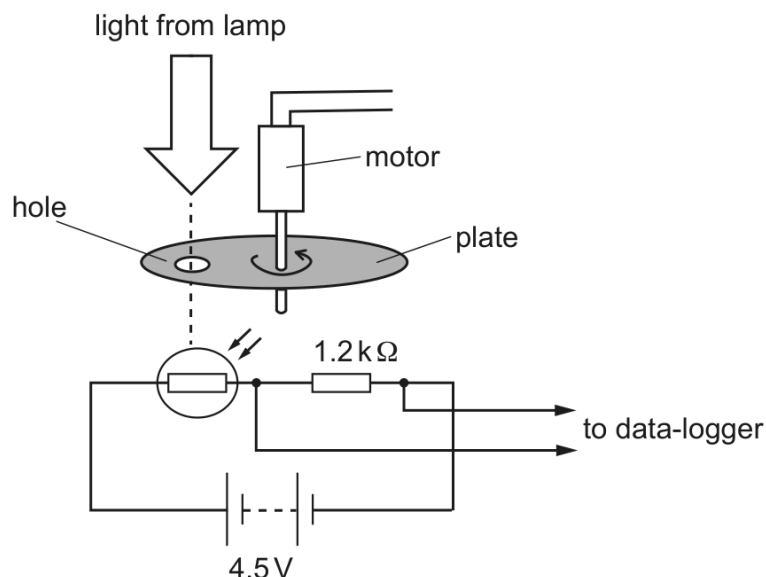


Fig. 17.1

A light-dependent resistor (LDR) and a fixed resistor of resistance $1.2\text{ k}\Omega$ are connected in series to a battery. The battery has e.m.f. 4.5 V and has negligible internal resistance. The potential difference V across the resistor is monitored using a data-logger.

Fig. 17.2 shows the variation of V with time t .

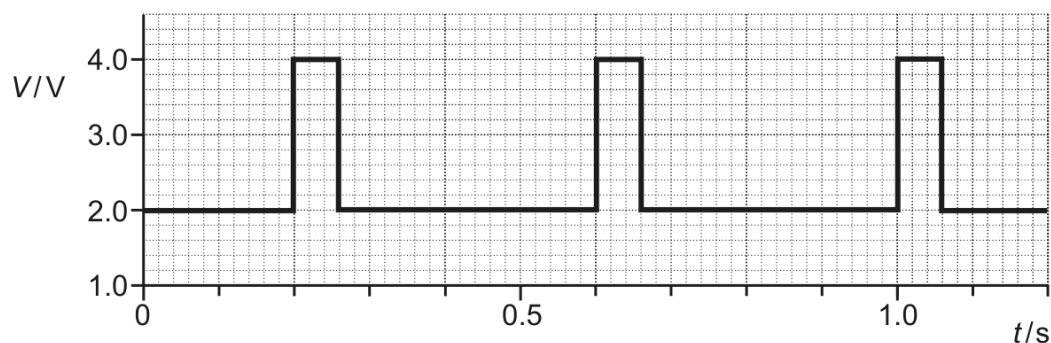


Fig. 17.2

This complete 6-mark question combines rotation frequency with Year 1 LDR and potential-divider circuits. The circuit, graph and original continuation answer space are retained.

Q06 | CM11 - continued

6 marks

June 2018 | H556/02 | Q17

Use your knowledge and understanding of potential divider circuits to explain the shape of the graph shown in Fig. 17.2. Include in your answer the maximum and minimum values of the resistance of the LDR.

Describe how the student can determine the frequency of the rotating plate.

[6]

This complete 6-mark question combines rotation frequency with Year 1 LDR and potential-divider circuits. The circuit, graph and original continuation answer space are retained.