FREE REVISION PACK

Gravitational Fields & Newton's Law

AQA A-level Physics · 7408 · Specification 3.7.1, 3.7.2.1–3.7.2.2

Easy | Medium | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Force between the Sun and the Earth	AQA June 2018 · A-level Paper 2 · Q13	1 mark
2	Easy	Inverse-square change in force	AQA June 2017 · A-level Paper 2 · Q13	1 mark
3	Easy	Mean density of the Earth	AQA June 2018 · A-level Paper 2 · Q19	1 mark
4	Easy	Which planet has four times the field strength?	AQA June 2022 · A-level Paper 2 · Q9	1 mark
5	Medium	Where the field of Pluto and Charon is zero	AQA June 2017 · A-level Paper 2 · Q12	1 mark

Key ideas to have ready

- Newton's law of gravitation: $F = GMm / r^2$, an inverse-square law. Each mass pulls the other with the same size force.
- Gravitational field strength $g = F / m$. For a point or spherical mass, $g = GM / r^2$.
- For a uniform planet of density ρ: $M = \rho \times (4/3)\pi R^3$, so g at the surface = $(4/3)\pi G\rho R$.
- Between two masses, the field is zero where $GM_1/x^2 = GM_2/(d - x)^2$, which is closer to the smaller mass.

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.

Questions 1–4

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

AQA June 2018 · A-level Paper 2 · Q13

1 The distance between the Sun and the Earth is 1.5×10^{11} m

What is the gravitational force exerted on the Sun by the Earth?

[1 mark]

A 3.5×10^{22} N ○

B 1.7×10^{26} N ○

C 5.3×10^{33} N ○

D 8.9×10^{50} N ○

AQA June 2017 · A-level Paper 2 · Q13

2 The distance between the Sun and Mars varies from 2.1×10^{11} m to 2.5×10^{11} m.
When Mars is closest to the Sun, the force of gravitational attraction between them is F.

What is the force of gravitational attraction between them when they are furthest apart?

[1 mark]

A $0.71F$ ○

B $0.84F$ ○

C $1.2F$ ○

D $1.4F$ ○

AQA June 2018 · A-level Paper 2 · Q19

3 The Earth can be assumed to be a uniform sphere of radius R.

What is the mean density of the Earth?

[1 mark]

A $\frac{3g}{4\pi RG}$ ○

B $\frac{3RG}{4\pi g}$ ○

C $\frac{3G}{4\pi Rg}$ ○

D $\frac{3Rg}{4\pi G}$ ○

AQA June 2022 · A-level Paper 2 · Q9

4 A planet of radius R and mass M has a gravitational field strength of g at its surface.

Which row describes a planet with a gravitational field strength of $4g$ at its surface?

[1 mark]

	Radius of planet	Mass of planet	
A	$2R$	$2M$	○
B	$R\sqrt{2}$	$\frac{M}{2}$	○
C	$\frac{R}{\sqrt{2}}$	$\frac{M}{2}$	○
D	$\frac{R}{\sqrt{2}}$	$2M$	○

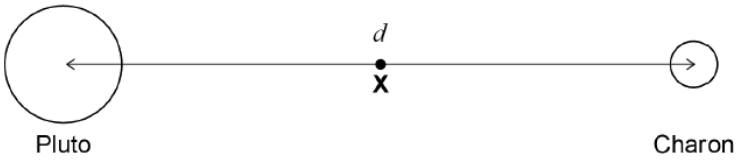
Medium Two or three steps. Roughly a third to a half of students get these right. **Question 5**

AQA June 2017 · A-level Paper 2 · Q12

5 Charon is a moon of Pluto that has a mass equal to $\frac{1}{9}$ that of Pluto.

The distance between the centre of Pluto and the centre of Charon is d.
X is the point at which the resultant gravitational field due to Pluto and Charon is zero.

not to scale



What is the distance of **X** from the centre of Pluto?

[1 mark]

A $\frac{2}{9}d$ ⬭

B $\frac{2}{3}d$ ⬭

C $\frac{3}{4}d$ ⬭

D $\frac{8}{9}d$ ⬭

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