GET BETTER AT PHYSICS · MARK SCHEME

Gravitational Fields & Newton's Law: tiered multiple choice

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

Easy

Questions 1–4

1 **A**

Force between the Sun and the Earth · AQA June 2018 · A-level Paper 2 · Q13

$F = GMm / r^2 = 6.67 \times 10^{-11} \times 1.99 \times 10^{30} \times 5.97 \times 10^{24} \div (1.5 \times 10^{11})^2 = 3.5 \times 10^{22}$ N (masses from the data booklet).

Watch out: The Earth pulls on the Sun with exactly the same force as the Sun pulls on the Earth.

How students did: 81.4% of students got this right in June 2018.

2 **A**

Inverse-square change in force · AQA June 2017 · A-level Paper 2 · Q13

$F \propto 1 / r^2$. New force = $F \times (2.1 \div 2.5)^2 = 0.71F$.

Watch out: The force gets smaller as the distance increases, so the answer must be less than F.

3 **A**

Mean density of the Earth · AQA June 2018 · A-level Paper 2 · Q19

$g = GM / R^2$ and $M = \rho \times (4/3)\pi R^3$, so $g = (4/3)\pi G\rho R$. Rearranging: $\rho = 3g / (4\pi GR)$.

How students did: 58.5% of students got this right in June 2018.

4 **D**

Which planet has four times the field strength? · AQA June 2022 · A-level Paper 2 · Q9

$g = GM / R^2$. Row D: mass 2M and radius $R/\sqrt{2}$, so R^2 halves. $g = 2 \div ½ = 4$ times as large.

Watch out: Square the radius factor: $R/\sqrt{2}$ gives $R^2/2$, not R/2.

Medium

Question 5

5 **C**

Where the field of Pluto and Charon is zero · AQA June 2017 · A-level Paper 2 · Q12

At X the two fields are equal: $GM / x^2 = G(M/9) / (d - x)^2$. So $(d - x) / x = 1/3$, which gives $x = 3d/4$ from the centre of Pluto.

Watch out: Take the square root of the mass ratio (1/9 → 1/3), not the ratio itself.

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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