



QUESTION WORKBOOK

Comparing electric and gravitational fields

Electric fields · Year 13

AQA 3.7.1, 3.7.3.1 · OCR A 6.2.2

10 questions · 30 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Write down the force law for gravity and the force law for electrostatics, and state what each force depends on. [2]

A2 Write down the field-strength equation for a radial gravitational field and for a radial electric field of a point charge. [2]

A3 State the key structural difference between gravitational and electric fields. [2]

SECTION B · Standard

B1 Write down the potential equation for a radial gravitational field and for a radial electric field, and note a difference between them. [3]

- B2** Calculate the ratio of the electrostatic force to the gravitational force between a proton and an electron ($e = 1.60 \times 10^{-19} \text{ C}$, $m_p = 1.67 \times 10^{-27} \text{ kg}$, $m_e = 9.11 \times 10^{-31} \text{ kg}$).

[4]

- B3** Given that the electric force is vastly stronger than gravity, explain why gravity is the dominant force between planets and stars.

[3]

- B4** State two similarities between gravitational and electric fields.

[3]

SECTION C · Stretch

- C1** Two protons are 1.0×10^{-15} m apart (a nuclear separation). Calculate the electrostatic force and the gravitational force between them. [4]

- C2** Construct a table comparing gravitational and electric fields, covering: the source, the force law, whether attraction/repulsion occurs, and the sign of the potential. [4]

- C3** Explain why we are aware of gravity in everyday life but not of the (much stronger) electric force between everyday objects. [3]