



ANSWER BOOK

The field concept

Gravitational fields · Year 13

AQA 3.7.1 · CIE 13.1 · OCR A 5.4.1

9 questions · 25 marks

NAVY EDITION

SECTION A · Warm-up

- A1** A force field is a region in which a body experiences a (non-contact) force because of a property it has, such as its mass or its charge. [2]
- A2** Gravitational fields arise from mass; electric fields from (static) electric charge; magnetic fields from moving charge (or permanent magnets). [2]
- A3** $g = F/m = 19.6/2.0 = 9.8 \text{ N kg}^{-1}$. [2]

SECTION B · Standard

- B1** Similarity: both act at a distance and both obey an inverse-square law with separation. Difference: the gravitational force is always attractive, whereas the electric force can be either attractive or repulsive. [1]
- B2** $g = F/m = 40/5.0 = 8.0 \text{ N kg}^{-1}$. [3]
- B3** Gravitational field strength is the force per unit mass on a small test mass placed at that point, $g = F/m$. Its unit is N kg^{-1} (equivalent to m s^{-2}). [3]

SECTION C · Stretch

- C1** Around a point mass the field lines are radial, pointing inwards towards the mass, getting further apart with distance (weaker field). Near the Earth's surface, over a small region, the lines are parallel, equally spaced and vertical (a uniform field). [4]
- C2** $g = F/m = 82/10 = 8.2 \text{ N kg}^{-1}$. [3]
- C3** There is only one kind of mass, and masses always attract, so gravity is always attractive. Charge comes in two kinds (positive and negative): like charges repel and unlike charges attract, so the electric force can act in either sense. [3]