

MARKING SCHEME AND MODEL ANSWERS

Chapter 7: Gravitation

Maximum Marks: 40 | Suggested time: 60 minutes

Use after attempting the paper. Accept equivalent correct methods.

Suggested mark allocation:

1 mark: Correct fact, formula, unit or direction.

2 marks: Principle/formula (1); explanation, working or result (1).

3 marks: Relation (1); working/reasoning (1); final result and unit (1).

4 marks: Principle (1); setup/equation (1); working (1); result/interpretation (1).

Mark splits are a guide; award partial credit for valid steps.

Q1 - 1 mark

The radius vector sweeps equal areas in equal times.

Q2 - 1 mark

$$F = Gm_1m_2/r^2.$$

Q3 - 1 mark

$$N\ m^2\ kg^{-2}.$$

Q4 - 1 mark

$$g = GM/R^2.$$

Q5 - 1 mark

$$U = -GMm/r.$$

Q6 - 1 mark

No.

Q7 - 1 mark

Gravity.

Q8 - 1 mark

T^2 proportional to r^3 .

Q9 - 2 marks

$$4.00 \times 10^{-10}\ N.$$

Q10 - 2 marks

$$490\ N.$$

Q11 - 2 marks

$$1/\sqrt{2}.$$

Q12 - 2 marks

$$1/4.$$

Q13 - 2 marks

$$\Delta U = mgh.$$

Q14 - 2 marks

$$8.$$

Q15 - 3 marks

$$g_h/g = (2/3)^2 = 4/9.$$

Q16 - 3 marks

$$\sqrt{2gR} = 4.47 \times 10^3\ m/s.$$

Q17 - 3 marks

$$\sqrt{GM/r} \approx 7.56 \times 10^3\ m/s.$$

Q18 - 3 marks

$$150\ N.$$

Q19 - 4 marks

$$GMm/r^2 = mv^2/r \quad v = \sqrt{GM/r}; \quad T = 2\pi r/v = 2\pi \sqrt{r^3/GM}.$$

Q20 - 4 marks

$$v \approx 7.56 \times 10^3\ m/s; \quad E = -GMm/(2r) \approx -2.86 \times 10^{10}\ J.$$