

- M1.(a)** (i) D 1
- (ii) friction 1
- (iii) any **two** from:
- the speed / velocity
  - the radius of the bend  
*the radius is insufficient*  
*accept curvature of the road*  
*size of the bend is insufficient*  
*accept distance of car from centre (of bend)*
  - the mass (of the car).  
*accept weight for mass*
- 2

- (b) the car has a wide base
- accept any description of a wide base e.g. the wheels are far apart*  
*accept wide wheel base*  
*do **not** accept long wheel base*  
*a large surface area is insufficient*  
*wide tyre(s) is insufficient*
- 1
- the car has a low centre of mass / gravity
- accept any description of low centre of mass e.g. mass is close to the ground*  
*a down force is insufficient*
- 1

[6]

- M2.(a)** gravitational attraction (between the satellite and the Earth)
- allow gravity*  
*allow weight of the satellite*
- 1
- (b) any **two** from:
- mass of satellite
  - speed / velocity (of satellite)

- radius of orbit / circle  
*allow height above the Earth*  
*radius / height alone is insufficient* 2
- (c) (i) increasing the height (above the Earth's surface) increases the time (for one orbit)  
*allow a positive correlation*  
*allow as one gets bigger, the other gets bigger, or vice versa*  
*ignore they are directly proportional* 1
- (ii) there is no relationship / correlation 1
- (d) Isaac Newton was a respected scientist who had made new discoveries before 1

[6]

- M3.**
- (a) (i) towards the centre of the circle  
*accept inwards*  
*accept a correct description*  
*'along the string' is insufficient* 1
  - (ii) tension (in the string)  
*accept pull of the string*  
*'the string' is insufficient*  
or weight (on the end of the string)  
*'the student' is insufficient*  
*'turning action' is insufficient* 1
  - (b) (i) each may (also) affect the speed  
*accept results for speed* 1

so only one independent variable  
*accept only one variable affects dependent variable*

- 'fair test' is insufficient*  
*'they are control variables' is insufficient* 1
- (ii) continuous  
*both required*  
 dependent 1
- (iii) reduces (absolute) timing error (for one rotation)  
*accept too fast to time one*  
 or increases / improves reliability / accuracy (for one rotation)  
*ignore checking for anomalous results*  
*to work out an average is insufficient* 1
- (c) speed increases with centripetal force  
*accept positive correlation*  
*do **not** accept proportional* 1
- (d) (i) gravitational pull (of the Earth)  
*accept gravity* 1
- (ii) **No**  
*both parts required – however this may have been*  
*subsumed within the reason*  
 geostationary orbits once every 24 hours  
*accept a correct comparative description* 1

[9]

- M4.** (a) (i) arrow from centre of the ball **and** at right angles to the string  
**and** in the correct direction  
*arrow should point to the student's belt*  
*accept free-hand 'straight' line*  
*do **not** accept curved line* 1
- (ii) increase  
*accept 'be stronger / bigger'* 1
- increase  
*accept 'be stronger / bigger'* 1
- increase  
*accept 'be stronger / bigger'* 1
- (b) speed  
velocity  
direction  
*all **three** correct*  
*any two correct for 1 mark*  
*otherwise 0 marks* 2
- (c) (i) centripetal  
*accept 'centripedal' and other minor misspellings*  
*do **not** accept anything which could be 'centrifugal'* 1
- (ii) gravity  
*accept 'weight'*  
*accept 'force of attraction due to mass(es) (of the Moon and the Earth)'* 1
- (iii) electron(s) 1

- (iv) electrostatic  
*accept 'electrical'*  
*do not accept just 'centripetal'*

1

[10]

- M5.** (i) towards Earth  
*for 1 mark*

1

- (ii) gravity  
*for 1 mark*

1

- (iii) changes direction  
*for 1 mark*

1

- (iv) polar orbit;  
closer  
*for 1 mark each*

2

- (v) speed constant (1)  
mass constant (1)  
*for 1 mark each*

2

[7]

