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

orincreases / 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]