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Exam Preparation and Free Resources

Name of the Student:_____

Max. **Marks : 22 Marks**

Time : 22 Minutes

Mark Schemes

Q1.

(a)   (force of) gravity causes the satellite to accelerate (towards the Earth)
      allow satellite is (constantly) accelerating

1

the acceleration causes a change in direction
      acceleration causes a change in speed negates this mark point

1

velocity changes because direction changes

1

(b)   length of orbit taken from graph = 42 100 (km)

1

42 100 = 7.73 × time
or
$$time = \frac{42100}{7.73}$$

      allow
      their distance = 7.73 × time

1

time (1 orbit) = 5446(s)
      allow a value consistent with their distance

1

$$number\ of\ orbits = \left(\frac{24 \times 3600}{5446}\right)$$

= 15.86

      $allow\ (\frac{24}{1.51}) = 15.86$

      allow a value consistent with their distance

1

number of orbits = 15
      allow a value consistent with their distance
      *an answer of 16 scores **4** marks*

1

or

length of orbit taken from graph = 42 100 (km) (1)

$$7.73 = \frac{distance}{24 \times 3600} \ (1)$$

distance = 667 872 (km) (1)

$$number\ of\ orbits = \left(\frac{667872}{42100}\right)$$

= 15.86 (1)

>*allow a value consistent with their two distances*

number of orbits = 15 (1)

>*allow a value consistent with their two distances*
>*up to full marks can be awarded for a method calculating*
>*velocity in km/h and time in hours*
>*an answer of 15 scores **5** marks*

(c) the predicted data is very close to the actual data

1

(d) supported the prediction (made by Bode)

>*allow predicted and actual values are very close*

1

so provides evidence that the equation is true / correct / works / accurate

>*allow proves for provides evidence*

1

[11]

Q2.

(a) arrow of equal size pointing vertically upwards

>*judged by eye*
>*ignore horizontal arrows if equal and opposite*
>*horizontal arrows of unequal length negates this mark*

1

labelled 'upthrust'

>*ignore buoyancy*
>*ignore 25 kN*

1

(b) weight = 25 kN

>*allow 24 to 25 kN inclusive*

1

25 000 = mass × 9.8
or
$$m = \frac{25000}{9.8}$$

>*allow their W correctly converted and substituted*

1

m = 2551 kg

>*allow correctly calculated value using their converted W*

allow a value correctly calculated with W in kN

1

m = 2600 kg

        allow a calculated answer correctly rounded to 2 significant figures

1

        *an answer of 2600 scores **4** marks*

(c)   Newton's 3rd law (of motion)

1

(d)   vertical force (50 N) drawn
and
horizontal force (150 N) drawn to the same scale

1

    resultant tension force in the correct direction
        shown by an arrowhead

1

    value of the tension force in the range 156 N−160 N
        allow a calculated value of 158

1

    value of direction in the range 18°−20° (from the horizontal)
        allow 70° to 72° (from the vertical)
        allow a bearing in the range 288 to 290

1

[11]