Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) Apparent magnitude of star is measured over a long period of time ✔

When planet passes in front of star (as seen from Earth), some of the light from star is absorbed and therefore the amount of light reaching Earth reduced ✔

This produces a light curve showing constant value with a dip periodically as the planet passes in front of the star ✔

3

(b) Dip in light curve can be caused by other effects ✔

Except for planets very close to star, periods likely to be very long and may take many years of observation using transit method alone ✔

2

[5]

Q2.

(a) Clear identification of distance from centre of sphere to right hand end of mark, or to near r.h.end of mark ✓

1

(b) 0.393 (s) ✓

Accept 0.39 (s)

1

(c) For 10 oscillations percentage uncertainty = $\frac{0.1}{15.7}$ = 0.00637 ≡ 0.64% ✓

same for the ¼ period ✓

2

(d) Identifies anomaly [0.701] ✓ and calculates mean distance = 0.759 (m)✓

Allow 1 max if anomaly included in calculation giving 0.750 (m)

2

(e) Largest to smallest variation = 0.026 (m)

Absolute uncertainty = 0.013 (m)✓

1

(f) Use of $g = \frac{2d}{t^2}$ leading to

Downloaded from www.merit-minds.com

9.83 ($m\ s^{-2}$) ✓

Allow 9.98 ($m\ s^{-2}$) if 0.39 used

Ecf if anomaly included in mean in (d)

percentage uncertainty in distance = 1.7%✓

Total percentage uncertainty =

1.7 + 2 x 0.64 = 3.0%

Absolute uncertainty = 0.30 ($m\ s^{-2}$) ✓

[g = 10.0 ± 0.3 m s^{-2}]

Expressed sf must be consistent with uncertainty calculations

3

(g) suggests one change ✓

Sensible comment about change or its impact on uncertainty ✓

eg

Use pointed mass not sphere

Because this will give better defined mark OR because the distance determination has most impact on uncertainty

OR

Time more swings / oscillations

As this reduces the percentage uncertainty in timing

OR

longer / heavier bar would take a greater time to swing to the vertical increasing t and s and reducing the percentage uncertainty in each

If data logger proposed, it must be clear what sensors are involved and how the data are used.

2

(h) $[s = \frac{g}{2}t^2]$

plot graph of s against t^2 or $\sqrt{s}$ against t ✓

calculate the gradient ✓

the gradient is g / 2 or $\sqrt{(g / 2)}$ ✓

Accept: plot s against t^2 / 2 or plot 2s against t^2:

calculate the gradient

in both cases gradient gives g

Allow 1 max for answer that evaluates g for each data point and averages

3

[15]

Downloaded from www.merit-minds.com