

SECTION B

The questions refer to the Case Study.
Direct quotes from the original passage will not be awarded marks.

7. (a) Explain briefly why all the Solar System planets appear on the same horizontal line on the graph below. [1]

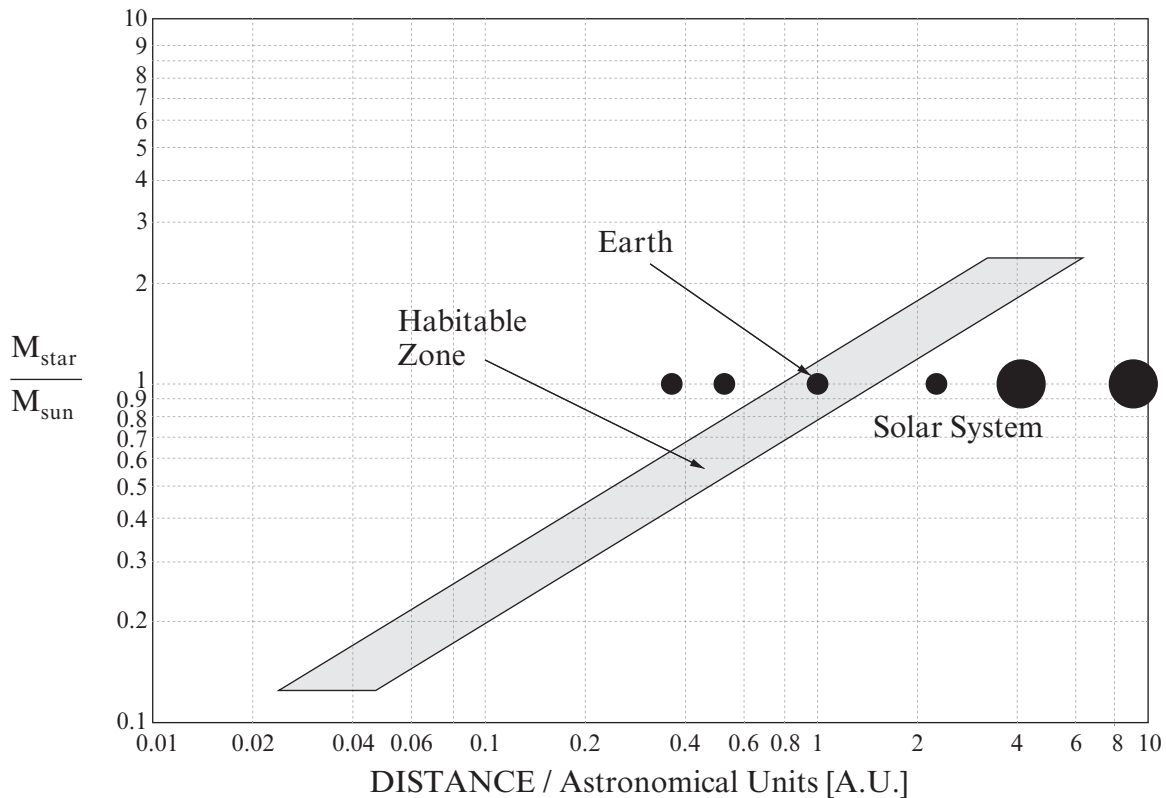
.....

.....

.....

.....

Graph of Star Mass (relative to our Sun) v Planet Distance from the Star



- (b) Place crosses on the graph to represent:

- an exoplanet orbiting a star twice the mass of the Sun and at a distance four times the Sun-Earth separation; [1]
- an exoplanet orbiting a star 0.25 times the mass of the Sun and at a distance of 0.04 times the Sun-Earth separation. [1]



- (c) Explain whether or not abundant liquid water could be found on **each** of the planets in part (b). [See also Paragraph 2.] [2]

.....

.....

.....

.....

- (d) Derive the equation $v_s = M_p \sqrt{\frac{G}{M_s d}}$ from the equations in the box in Paragraph 8. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (e) Explain how the equation $v_s = M_p \sqrt{\frac{G}{M_s d}}$ agrees with the statement “the Doppler method is most sensitive to large planets which are close to small stars”. [Paragraph 8.] [4]

.....

.....

.....

.....

.....

.....

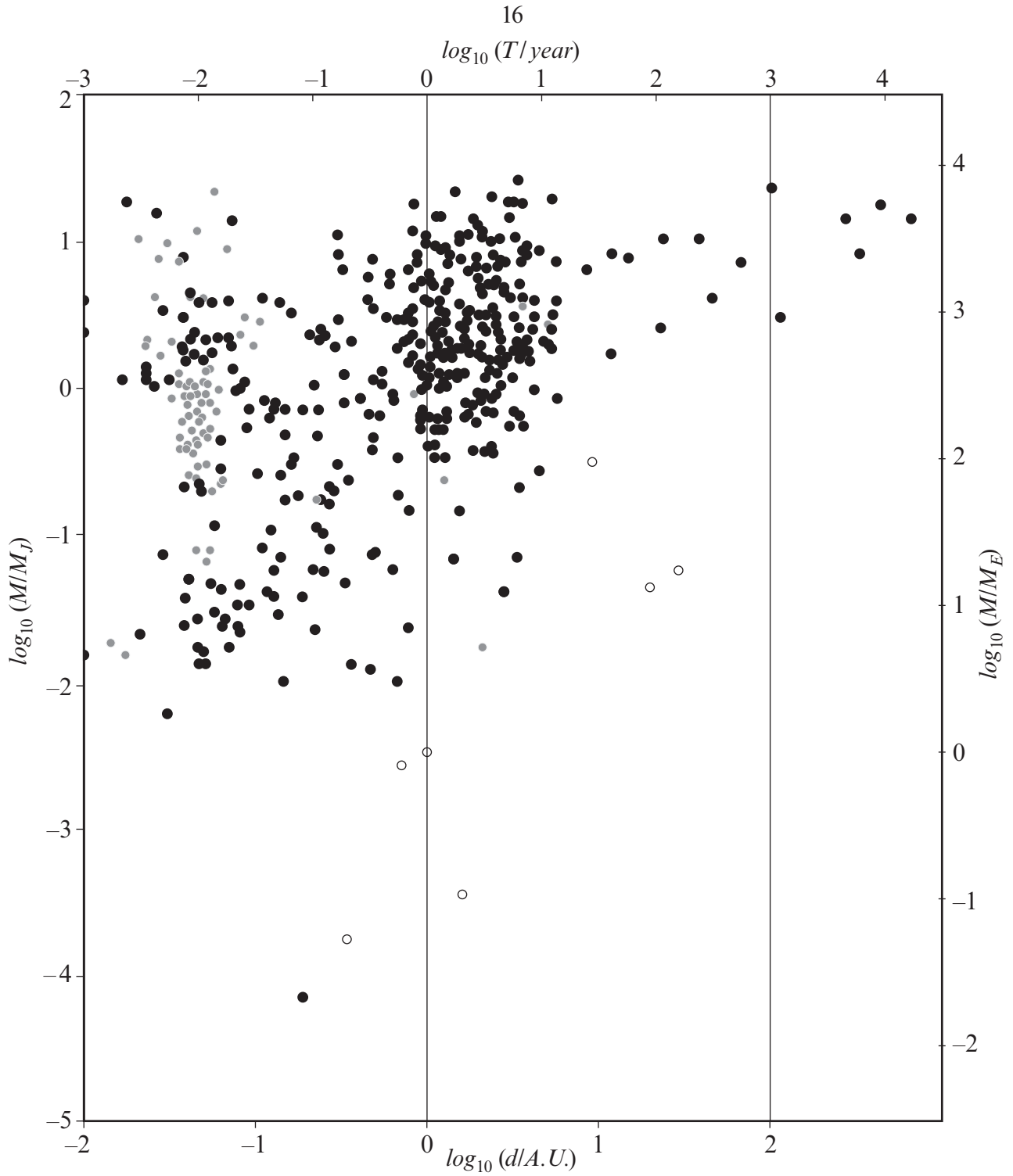
.....

.....

.....

.....





- (f) Explain whether or not the orbital parameters scatter plot (above) confirms the statement “the Doppler method is most sensitive to large planets which are close to small stars.” [2]

.....

.....

.....

.....



- (g) **Place a cross** to show the position of the planet Earth on the orbital parameters scatter plot. [2]
- (h) Jupiter's radius is $\frac{1}{20}$ that of the Sun. Calculate the fractional (or percentage) change in the Sun's apparent intensity as Jupiter transits in front of the Sun (as measured by a very distant observer). [Paragraph 9.] [2]

.....

.....

.....

.....

.....

.....

- (i) Explain briefly how radial velocity measurements combined with transit measurements lead to the mean density of an exoplanet. [Paragraph 21.] [3]

.....

.....

.....

.....

.....

.....

.....

Source

page 16 – http://en.wikipedia.org/wiki/File:Exoplanet_Period–Mass_Scatter.png

