Question 21 **(16 marks)**

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(a) How long, in Earth years, does light take to reach Earth from HD 189733b? (1 mark)

Answer _____ years

(b) Explain how a large planet orbiting a relatively small star makes the planet easier to discover. (1 mark)

_____

_____

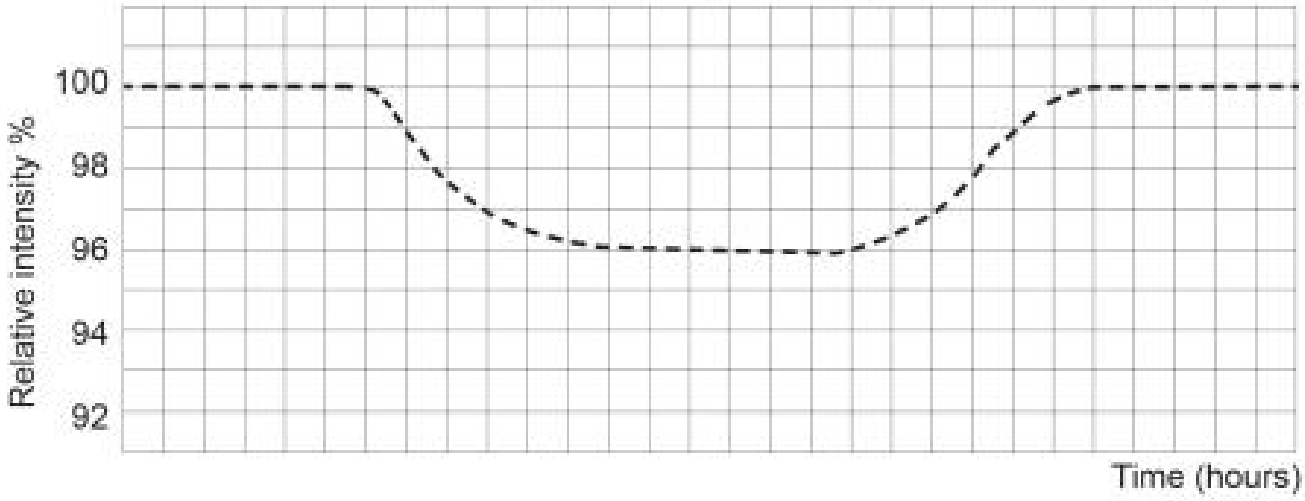
(c) Calculate the mean radius of orbit of HD 189733b. (6 marks)

(d) Particles ejected from the star are moving toward the planet's surface. At a point where the planet's magnetic field is at a right angle to the particles' motion, explain the protective effect of the magnetic field, if any, against the following:

(i) an electron arriving from the star (2 marks)

(ii) a UV photon arriving from the star. (2 marks)

(e) Below is a plot showing the dip in light intensity, due only to the planet dimensions, as the planet passes in front of its star. Modify the given plot by sketching how the light intensity drops when including the effect of a strong bow shock. (4 marks)



Light intensity variation