17 Makemake is a dwarf planet in the solar system. Makemake has a mass of 3.1×10^{21} kg and a radius of 715 km.

(a) Calculate the gravitational field strength at the surface of Makemake.

(2)

.....

.....

.....

Gravitational field strength at surface = ...

(b) The average distance of Makemake from the Sun is similar to the average distance of the dwarf planet Pluto from the Sun.

A website states:

"The time taken by Makemake to complete one orbit of the Sun is 20% greater than the time taken by Pluto to complete one orbit of the Sun."

Assess the accuracy of the website statement.

mass of Sun = 1.99×10^{30} kg
orbit radius of Makemake = 6.80×10^{12} m
orbit time of Pluto = 248 years
1 year = 3.15×10^{7} s

(6)

(Total for Question 17 = 8 marks)