Question 19 **(12 marks)**

A group of students wanted to verify Kepler's laws of planetary motion. They chose to collect data on four moons of Jupiter.

(a) Complete the following table, using the data provided for the moons. (2 marks)

Moon	Orbital radius (r) ($\times 10^6$ m)	Orbital period (T) ($\times 10^3$ s)	r^3 ($\times 10^{24}$)	T^2 ($\times 10^9$)
Metis	128	25.5	2.10	0.65
Adrastea	129	25.8	2.15	0.67
Amalthea	181	43.0	5.93	1.85
Thebe	222	58.3		

(b) Plot the data from the table above onto the grid on page 31, demonstrating the relationship described by Kepler's laws of planetary motion. Draw the line of best fit. (4 marks)

(c) Using your graph, determine Kepler's constant (the ratio of r^3 to T^2). Express your answer in the appropriate significant figures. (3 marks)

$$\frac{r^3}{T^2} = \_\_\_\_\_ \text{ m}^3 \text{ s}^{-2}$$

(d) Use your graph to determine the mass of Jupiter. (3 marks)