Answer keys to selected questions in Lab #3

5)

Moon	Period (Days)	Amplitude (Jupiter Diam.)	RMS
Io	1.77	2.95	1.55e-01
Europa	3.55	4.69	< 2e-01
Ganymede	7.15	7.49	< 2e-01
Callisto	16.7	13.2	< 2e-01

6)

Moon	P (in years)	a (in A.U.)
Io	0.00485 or 4.85e-03	0.00281 or 2.81e-03
Europa	0.00972 or 9.72e-03	0.00447 or 4.47e-03
Ganymede	0.0196 or 1.96e-02	0.00713 or 7.13e-03
Callisto	0.0457 or 4.57e-02	0.0126 or 1.26 e-02

Calculations from actual sim values; students should be close.

7) 4:2:1

8)

Moon	mass$_{Jup.}$ (in solar masses)
Io	0.000943 or 9.43e-04
Europa	0.000945 or 9.45e-04
Ganymede	0.000944 or 9.44e-04
Callisto	0.000958 or 9.58e-04

Calculations from sim values; students should be close. Rounding to 0.001 acceptable.

9) 9.48e-04; 9.00e-04<M<1.00e-03

10) ~317, or between 300 and 333. 9.5e-04 / 3e-06 = 317.

11) ~84. 8.00e-02 / 9.5e-04 = 84.

12) Larger. According to Kepler's third law, the bigger the a, the larger the P.

13) A ten percent error in **a** would cause a bigger error because a is raised to power 3 while P is only raised to power 2. For example, let a = 1 and P = 1, then m = a^3/P^2 = 1. If a is raised by 10%, m = $1.1^3/1^2$ = 1.33; if P is decreased by 10%, m = $1^3/0.9^2$= 1.24. The former is bigger.