

Astronomy Ranking Task: The Solar System

Exercise #5

Description: The table below shows some orbital and physical data for some of the largest dwarf planets in our solar system. The objects are assigned letters A through D.

		Pluto (A)	Ceres (B)	Sedna (C)	Eris (D)
Year of Discovery		1930	1801	2003	2003†
Semimajor Axis (AU)		39.4817	2.766	526	67.668
Sidereal Period	(Earth days)	90,470	1680	4.4×10^6	2.03×10^5
	(Earth years)	247.7	4.599	12,059	557
Orbital Eccentricity		0.249	0.080	0.855	0.442
Inclination to Ecliptic (°)		17.14	10.59	11.934	44.19
Equatorial Diameter	(km)	2390	941	1400	2400
	(Earths)	0.187	0.074	0.110	0.188
Mass	(kg)	1.3×10^{22}	9.5×10^{20}	4.0×10^{21}	1.7×10^{22}
	(Earths)	2.2×10^{-3}	1.6×10^{-4}	6.7×10^{-4}	2.8×10^{-3}
Mean Density (kg/m³)*		2030	2080	2000	2100
Surface Gravity (Earths)		0.06	0.028	0.04	0.07
Rotational Period	(hours)	152.7	9.04	10.0	25.8‡
	(sidereal Earth days)	6.388	0.3781	0.42	1.08‡
Axial Tilt (°)		122.5	4‡	?*	?*
Number of Moons		3	0	0	1

*The density of water at standard temperature and pressure (68° F, 1 atm) is 998.23 kg/m³.

†Eris was discovered in images from 2003 but not announced until confirmed in 2005.

‡These are rather uncertain due to the difficulty in observing the object.

*Unknown due to the difficulty in observing the object; treat as zero.

A. Ranking instructions: Rank the sizes of the objects.

Ranking Order: Largest 1 _____ 2 _____ 3 _____ 4 _____ Smallest

Or, the objects are all the same size. _____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:

B. Ranking instructions: Rank the numbers of moons of each of the objects.

Ranking Order: Most 1 _____ 2 _____ 3 _____ 4 _____ Least

Or, the objects all have the same number of moons. _____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:

C. Ranking instructions: Rank the masses of the objects.

Ranking Order: Largest 1 _____ 2 _____ 3 _____ 4 _____ Smallest

Or, the objects are all the same mass. _____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:

D. Ranking instructions: Rank the objects according to their average distance from the Sun.

Ranking Order: Closest 1 _____ 2 _____ 3 _____ 4 _____ Farthest

Or, the objects are all the same average distance from the Sun. _____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:

E. Ranking instructions: Rank the objects according to the shapes of their orbits.

Most
Ranking Order: Elliptical 1 _____ 2 _____ 3 _____ 4 _____ Least
Elliptical

Or, the objects' orbits all have the same shape. ____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:

F. Ranking instructions: Rank the tilts of the object's orbital planes.

Most
Ranking Order: Inclined 1 _____ 2 _____ 3 _____ 4 _____ Least
Inclined

Or, the orbital inclinations of the objects are all the same. ____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:

G. Ranking instructions: Rank the rotational periods of the objects.

Ranking Order: Shortest 1 _____ 2 _____ 3 _____ 4 _____ Longest

Or, the objects all rotate once in the same amount of time. ____ (indicate with a check mark)

Carefully explain your reasoning for ranking this way:
