

## Cosmic Chemistry: Planetary Diversity

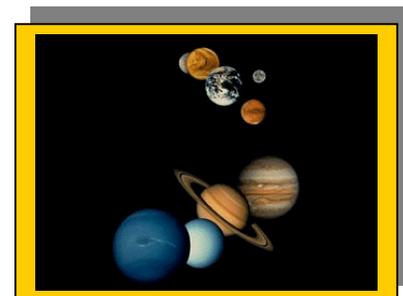
# Are We Related? Looking for Patterns In Planetary Diversity

### STUDENT ACTIVITY—PARTS 1 & 2

#### PART 1

#### BACKGROUND INFORMATION

It has been presumed that the nine planets, among other highly diverse objects of our solar system, originated from a relatively homogeneous solar nebula. Even as siblings in a given family can exhibit individual physical characteristics that arise from the same gene pool, evolutionary processes appear to have resulted in nine planets, each with their distinct attributes.



You will be working in groups, as assigned by your instructor, looking for possible patterns or methods of grouping the nine planets of the solar system. You will be selecting a team leader, a recorder, and one or two researchers. Your team will be responsible for both a poster presentation and an oral presentation of your findings. Your team leader will make sure that all members of the team have responsibilities for completing these presentations.

Keep in mind the following questions as you study the information given in this part of the activity. You will be asked to formulate answers to them later in the assignment.

1. It has been presumed that the nine planets, among other highly diverse objects of our solar system, originated from condensation of a relatively homogeneous solar nebula.
  - a) What evidence do you find that supports this theory?
  - b) Are there any specific data given in the activity that do not appear to be explained by this theory?
  - c) What other information would be helpful in making your decision?
2. There was recently another effort made to remove Pluto from the list of planets and to reduce its classification to that of a "Trans-Neptunian Object" or a minor planet. The controversy is not a new one, having been raised in 1950 and again in 1987. What evidence do you find that either supports Pluto being classified as a planet or something other than a planet?

Refer to "Are We Related? Looking for Patterns in Planetary Diversity: [Student Data Sheet](#)" for Part 1.

1. After examining the information in Data Table 1:
  - a) Describe in writing any "patterns" or relationships that you find in or between the columns of data.
  - b) Group the planets in as many ways as you can. List the planets in each group and describe in writing the basis for your grouping, for example, the common characteristic(s) of each group.
2. After examining the information in Data Table 2,
  - a) Describe in writing any "patterns" or relationships that you find in or between the columns of data.
  - b) Group the planets in as many ways as you can. List the planets in each group and describe in writing the basis for your grouping, i.e., the common characteristic(s) of each group.
  - a) Check to see if any of these groups match any groups found in question 1 above. If so, mark both groups with a distinguishing symbol, like a  $\sqrt{\quad}$ , \*, or +.
3. After examining the information in Data Table 3:
  - a) Describe in writing any "patterns" or relationships that you find in or between the columns of data.
  - b) Group the planets in as many ways as you can. List the planets in each group and describe in writing the basis for your grouping, such as, the common characteristic(s) of each group.
  - c) Check to see if any of these groups match any groups found in questions 1 and 2 above. If so, mark all matching groups with the same distinguishing symbol.

4. After examining the information in Data Table 4:
  - a) Describe in writing any patterns or relationships that you find in or between the columns of data.
  - b) Group the planets in as many ways as you can. List the planets in each group and describe in writing the basis for your grouping, i.e., the common characteristic(s) of each group.
  - c) Check to see if any of these groups match any groups found in questions 1 through 3 above. If so, mark all matching groups with the same distinguishing symbol.
5. Your student data sheet team has a section entitled "Diagrams of Internal Structures of Planets," pages 3-5. Do not read more into these diagrams than is warranted. The overall diameters of these cross-sectional diagrams are drawn to scale. Since even the constituents of some internal partitions are, in some cases, conjecture, the size of the partitions should not be considered as you look for patterns or groupings of the planets based on internal structures.

After considering the information in the "Diagrams of Internal Structures of Planets:"

- a) Group the planets in as many ways as you can. List the planets in each group and describe in writing the basis for your grouping, such as the common characteristic(s) of each group.
  - b) Check to see if any of these groups match any groups found in questions 1 through 4 above. If so, mark all matching groups with the same distinguishing symbol.
6. The detection instruments in space craft have provided us with much defining information regarding the atmospheres of the planets, especially Venus, Mars, Mercury, Jupiter, and Saturn, and some characteristics of Uranus' cloud-top atmosphere.  
After examining the constituents of the planetary atmospheres as shown in Data Tables 5, 6 and 7.
    - a) Group the planets in as many ways as you can. List the planets in each group and describe in writing the basis for your grouping, i.e., the common characteristic(s) of each group.
    - b) Check to see if any of these groups match any groups found in questions 1 through 5 above. If so, mark all matching groups with the same distinguishing symbol.
  7. Design a large chart on newsprint or poster paper so your team can display the results of your groupings in an organized way and plan your group's oral presentation of this information.

## PART 2

8. Scientists have grouped the nine planets as terrestrial or Jovian planets. The terrestrial planets include Mercury, Venus, Earth, Mars and Pluto. Jupiter, Saturn, Uranus, and Neptune are considered Jovian planets. Write a critique of this grouping on the basis of the groups and relationships that you identified in this assignment.

Your team leader should ask your instructor for copies of the Student Text "[Solar Nebula Supermarket](#)" and Appendix A "[The Solar System or Do Nine Planets a Baseball Team Make?](#)" After studying them, answer questions 9 and 10.

9. It has been presumed that the nine planets, among other highly diverse objects of our solar system, originated from condensation of a relatively homogeneous solar nebula.
  - a) What evidence do you find that supports this theory?
  - b) Are there any specific data given in the activity do *not* appear to be explained by this theory?
  - c) What other information would be helpful in making your decision?
10. There was recently another effort made to remove Pluto from the list of planets and to reduce its classification to that of a "Trans-Neptunian Object" or a minor planet. The controversy is not a new one, having been raised in 1950 and again in 1987. What evidence do you find that either supports Pluto being classified as a planet or something other than a planet?