

## Effective Science Teaching Design: EDTL 4480

<b>Subject &amp; Grade Band Theme (if New Ohio Science Standards):</b> Interconnections within Systems		<b>Grade Level:</b> 5
<b>Strand of Science or Domain ... highlight one (Life/Earth &amp; Space/Physical):</b> Earth and Space Science		<b># of Students/class:</b> 24
<b>Class Duration in minutes:</b> 50 minutes	<b>Day</b> <u>  1  </u> <b>of</b> <u>  10  </u>	<b>CMT's Initials:</b>

### Purpose

The Planning Instruction & Assessment task asks you to describe your plans for the learning segment and explain how they are appropriate for the students and the content you are teaching. You will demonstrate your ability to organize curriculum, instruction, and assessment to help diverse students meet the standards for the curriculum content and to develop academic language related to that content. You will provide evidence of your ability to select, adapt, or design learning tasks and materials that offer your students equitable access to science curriculum content.

### What Do I Need to Do?

- ✓ Task 1 Part A. You will write a 7 – 10 day MC Science Unit plan for this course (using the 5E Box-form template as noted in UNIT PLAN Guidelines below)
- ✓ Task 1 Part B. Within your unit plan, include a detailed plan for a 3 - 5 day lesson sequence of, referred to as a “learning segment”. Review the curriculum with your cooperating teacher and select a learning segment of 3 - 5 lessons (or, if teaching science within a large time block, about 3 - 5 hours of connected instruction) to describe, analyze, and reflect upon. The learning segment should provide opportunities for students to develop their abilities to use scientific concepts to make sense of one or more real world phenomena by using key scientific inquiry skills. (using the MC Science lesson plan format found below).
- ✓ Task 3. Design and administer a formative assessment for your unit. Analyze the data and reflect on the effectiveness of the unit on student learning.
- ✓ Task 4. Construct a 2 – 4 page reflective analysis of the above learning experiences for the entire unit.
  
- ❖ Submit copies of unit plan, lesson plan, assessment and analysis, and reflective analysis, along with all **key** instructional materials and **all** assessment tools used during the learning segment in a 3-ring binder (organized with tabs, TOC, etc.) or electronically (top of your wiki page) as a combined Word Doc or PDF File (lastname.unit.pdf). The instructional materials might include class handouts, overheads, PowerPoint or SmartBoard slides (you can add these to the wiki as well). Select materials that, together with the plans, are needed to understand what you and the students will be doing. If any materials are included from a textbook, please provide a copy of the appropriate pages. If any of these individual items are longer than **four** pages, provide a summary of relevant features in lieu of a copy. To assist scorers in matching materials to lessons, label each document or group of documents with corresponding lesson number(s).<sup>1</sup>

## MC Lesson Plan Template:

<b>Teacher Candidate's Name:</b> Kristina Rothenbuhler	<b>Date:</b> 10/20/2012
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### Lesson Rationale and/or Summary

#### Rationale:

During this lesson the students will learn about the planets. The students have showed deep interest in the subject. This will be an inquiry based lesson that allows the students to get an understanding of the planets. The students will complete activities that deepen their knowledge of the planets.

#### A summary: one paragraph

- This lesson will be taught following a 5E model. The students will complete a great deal of activities and investigations that will advance their knowledge of the planets. They will work both collaboratively and independently. At the end of the unit they will be assessed to determine the knowledge they have gained about our planets.

### Content focus: Essential Question or Enduring Understanding

- What planets make up our solar system? What are their characteristics?

<sup>1</sup> Provide citations for all sources of materials that you did not create (e.g., published texts, websites, other educators). Citations can be listed on a written e document or submitted as an additional page.

**Content, Cluster, Strand, or Standard Statement/Connection:**

The solar system includes the sun and all celestial bodies that orbit the sun. Each planet in the solar system has unique characteristics.

- Students will be able to identify the 8 planets in the solar system.
- Students will be able to describe the characteristics of each planet.
- Students will be able to compare and contrast the characteristics of the planets.

**Academic Language**

- Planet
- Solar System
- Compare
- Contrast
- Identify
- Research
- Characteristics

**Planned Assessments:**

- Pre-assessment: Creation of mnemonic device for order of planets
- Formative Assessment: Poster and foldable with planet facts
- Summative Assessment: I have, who has activity

**Differentiated Instructional Strategies:**

- For students with lower reading levels- students will be given readings that are at a lower reading level.
- For migrant students- the students will be given readings with many pictures and will use diagrams to communicate their work.
- For students on a behavioral IEP- they will be paired with higher achieving students in the classroom that will be able to keep them on task.
- For students on an IEP for learning disabilities- directions will be spoken and written. Directions for these students will be more explicit than for others.

**Lesson Resources:**

- YouTube video about names of the planets <http://www.youtube.com/watch?v=DULoVgIW6x4>
- 12 Note cards
- Computers
- Smart Board
- White board
- Dry erase markers
- Crayons
- Colored Pencils
- White paper for students
- 8 pieces chart paper for students
- 24 Order the planets worksheet
- 24 pre-made foldables
- 12 Glue sticks
- 24 cards with I have, who has? Activity printed on them
- Books: Sciencosaur
- Night sky map
- Movie, Exploring Space DVD
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**Procedures (Four Components)**

I. Readiness/Motivation for Lesson: *Engage* Allotted Time: \_\_35 minutes\_\_

- Day 1:
- Smart Board in classroom will be turned on and cued to the YouTube video with the song to remember the names of the planets and the order.
- I will ask the students to sing the song along with the video.
- Has anyone heard of any other ways that you can remember the names of the planets and what order they are in from the sun?
- On the Smart Board the phrase “My Very Educated Mother Just Served Us Nachos” will be displayed.
- Students will be told that this is a mnemonic device that is used to help remember the names and order of the planets from the sun.
- I will explain to students that a mnemonic device is a trick to remember information where you use the first letter of each word and create a phrase that is easier to remember.
- The students will be told that all of the planets in our solar system rotate around the sun and that the sun is in the center of the solar system.
- I will remind the students that they used this concept to remember the prefixes for metric measurement.
- Students will then be asked to partner with the person that sits across from them.
- I will hand each pair of students a notecard.
- The students will then be instructed that they will create their own mnemonic device in pairs to help remember the planets in the solar system.
- The students will be asked to write their mnemonic device on the note card.
- There will be a piece of chart paper hung up in the room that says “My Very Educated Mother Just Served Us Nachos.”
- The students’ mnemonic device note cards will be taped to this chart paper.
- Students will be reminded that the phrases need to be school appropriate.
- The students will be given 15 minutes to come up with the mnemonic devices.
- I will walk around and make sure that students stay on task.
- I will also give students some hints and individual help if they need it.
- After the 15 minutes, students will be asked if everyone has finished. If needed, I will give groups more time.
- I will ask if any of the groups would like to share their phrase.
- If no one volunteers, I will pick a group. We will then go around the room clockwise and all of the groups will share their phrases.
- I will show the students where their phrases and the ones from other classes will be hanging in the classroom.
- Assessment: Students mnemonic devices will be looked at to make sure they know the order the planets are supposed to go in.

## II. Lesson Development: *Explore, Explain, Extend*

### **EXPLORE: 80 minutes**

- Students will be asked to focus on me and the front of the room.
  - Students will be placed into groups of 3.

- I will ask the students to count off by 8's and be told that the people that have the same number as them will be the members of their group.
- I will have each group elect a person to come to the front of the room.
- The person that has been elected will come to the front of the room and will pick a piece of paper out of a bin.
- The pieces of paper in the bin will each have a planet name on them.
- The students will then be told that they are going to work in their groups to research about their planet.
- Each group will also be given a sheet of chart paper and will be told that they will research about their planet and write facts about their planet on the chart paper.
- The students will be told that the chart papers will be hung around the room.
- When the students ask what information should be put on the chart paper, I will inform them that they should put any information that they find about the planet.
- The students will also be encouraged to draw a picture of the planet and include it on their chart paper.
- I will ask the students to focus on what the planet is made of, which place it is in the order from the sun, how long the rotation of the planet lasts, if the planet has any moons, what some other distinguishing factors of the planet are.
- The students will be told that they may use the computers to research or any of the books in the classroom.
- The students will be told that they will begin to work in their groups the following day.
- Day 2:
- Students will enter the room and be told to immediately move into the groups that were established the day before.
- The students will be told that they will be able to talk while they are working, but that they need to keep their voices low.
- If the room gets too noisy, the students will be reminded that we are in a classroom and that they need to use voices appropriate for indoors.
- The students will be told that they will have the entire period to research their planet and prepare their chart paper.
- They will also be told that we will do a gallery walk the next day so that everyone can see all of the papers.
- While the students are working on their chart papers, I will walk around to every group and ask how they are doing. I will ask each group to give me a short description of the information they have found. I will help any groups that are stuck without more ideas.
- At the end of the period, I will collect all of the charts. I will ask the groups if anyone needs more time to work on their chart paper.
- If more time is needed, then the students will be given 10-15 minutes at the beginning of the following class to work on the chart.
- When all charts have been completed, they will be hung at various points around the classroom.
- Day 3:
- Students will be welcomed into the class and asked to move into the groups that they have been in for the past couple of days.
- The students will be told that they will do a gallery walk to look at the information that is on each other groups' posters.
- Each group will start at one of the posters that is not their own. The groups will be told that they will have 2 minutes at each poster.
- The students will also be told that they will rotate clockwise when they are told to move to the next poster.
- The students will be asked to remain in their groups and return to the seats they were sitting in.
- I will pair each group with another group based on which planets the groups have.
- I will make sure that each pairing of groups contains an inner planet and one of the outer planets.
- I will ask the students if they know what a Venn diagram is used for.
- I will inform the students that a Venn diagram is used to compare and contrast two things. I will draw an example on the whiteboard and show the students how to compare and contrast two things.
- I will use Summer and Fall as an example.
- I will ask the students to move into their groups of 6 quietly. When the students have moved, I will tell them that we will be using the planets that each group researched to compare and contrast.
- I will hand out blank pieces of paper to each group. I will tell the students that each original group of 3 must hand in one Venn diagram.
- I will tell the students that all of the group members' names must be on the Venn diagram.
- Students will be given 10 to 15 minutes to complete their diagram.
- The diagrams will be collected.
- I will walk around the room and monitor students' progress and make sure that they are staying on task.

- I will ask students leading questions such as, What are some things that make the planets different? Is there anything that makes them alike?
- After the Venn diagrams have been collected, the students will be asked to quietly return to their seats.
- I will ask the students to complete a worksheet that asks them to write the name of the planets in order from the sun.
- I will tell the students that they will have approximately 10 minutes to complete the worksheet.

### **EXPLAIN: 60-70 minutes**

#### • Day 4

- Each student will be given a foldable that has been pre-made by the teacher.
- The students will be asked to put the name of a planet on each flap of the foldable.
- The students will be told that they will write important information about each planet under the flap on the foldable.
- I will model to students how I would like their foldable to look.
- Students will be showed a Smart Board presentation that gives them information about each planet. The presentation will also include a definition for the students of what a planet is.
- Information will include the make-up of the planet, the rotation period of the planet, the time it takes the planet to orbit the sun, how big the planet is compared to the others, and any other information requested by the students.
- I will hand out glue sticks and ask the students to glue the foldable into their science journal.
- I will try and go at a slower pace so that everyone will be able to keep up.
- I will then ask the students to turn their attention to the television. I will inform the students that they will be watching a movie about the planets called, "Exploring Space."
- The video will last approximately 30 minutes, and if it cannot be finished that day, the students will be told that they will continue with the rest the following day.

### **EXTEND: 30 minutes**

#### **Day 5:**

- Students will be asked if they think that even though the planets are so far away, they would be able to see any of them from earth?
  - I will inform the students that many of the planets can be seen from earth depending on the time of year.
  - I will tell students that the planets may look like stars, but they are different.
  - I will ask students to get into the groups that they were in when they did their research of the planets.
  - I will ask them to quietly move into their groups.
  - I will ask the students to work on the computers and find out which planets can be seen from our area. I will ask the students to draw a picture of the night sky and indicate where the planets can be seen.
  - I will tell students to take directions (North, South, East, West) into consideration and to draw some of the other things that can be seen in the sky around the planets.
  - I will also ask the students to go outside that night and see if they can identify any of the planets.
  - I will tell the students that we will write a short journal entry about what they saw the following day.
  - I will show the students a stars and planet map that I found on the Smart Board.
  - I will then ask students to move back to their original seats quietly.

### **EVALUATE: 20 minutes**

- Students will be told that we will now complete an activity called I have...Who has?
  - I will explain to students that they will each get a card that has a phrase on it that says "I have....." and another phrase that says "Who has.....?" I will also explain to the students that whoever has the first card, the card will say start.
  - That person will then read the statement that says, who has?
  - Whoever has the answer to that statement or question will then say, I have....., who has.....?
  - I will have a sheet of paper with every student's name on it, and I will mark if each student was able to identify the clues. If needed I will prompt students that require some help.

### **SCIENCE SAFETY PRECAUTIONS:**

**The students will be asked to keep the room clear of anything that anyone can trip over. Also the students will be reminded that they will need to behave and work together. If any student cannot conform to these rules, they will be asked to refrain from participating for 5 minutes.**

### III. Lesson Closure: Summarize, Link

Allotted Time: 2 minutes

- Students will be told that the following day they will be investigating and making some models of the planets to get a deeper understanding about the planets.
- Once the activity is complete, the students will be dismissed from the classroom.

### V. Enrichment Activities (Optional, as prescribed by instructor)

#### Task 3: FORMATIVE ASSESSMENT (from IV above).

For this assessment, I used an “I have, who has?” activity with the students. This assessment was to get an idea of what the classes had learned after completing the unit on the solar system, and was also used as a review for the students before they took a short quiz about what they had learned. I wanted to assess the entire class at once, and also make the assessment fun so the students would hopefully perform better. The assessment consisted of 40 cards with “I have, Who has?” statements on them, most were very familiar concepts, although some did reflect on concepts we did not specifically address.

I wanted to assess the students in this way because I thought it would be fun for them. I also know that these students have not had much experience with this activity, and would do well with something unfamiliar. I handed out the cards to the students, and we started the activity slowly. We went through the activity several times also so that students would have an auditory way of getting the information. As I mentioned before, I also wanted a way to complete this assessment with the students in a way that would not be threatening. I also participated and intentionally made a few mistakes during the assessment so the students would not be discouraged if they gave an incorrect answer.

The students performed very well on this assessment. All of the classes were able to complete the activity several times, and got faster each time. I told the students we would challenge the other classes to see who could perform the activity the fastest, and this certainly motivated them. Students also helped each other a great deal on this assessment. If a student was stuck on a card, students around them would help the student. Many students knew the facts, and if they did not, they were willing to ask for help. Based on the quiz that was given after this assessment also, the students learned many facts during the unit, and were able to recall them. Only 6 students, of the 81 in the classes, failed the quiz assessment. I would use this activity again with the students to review what they had learned during the unit.

**Task 4: REFLECTIVE ANALYSIS.** Your reflection should include an analysis of the entire unit (supported by details from individual lessons) including the following three parts as described below.

#### Identify & Explain:

- What did I want to accomplish? Why do I think that this topic is important?

#### Reason & Justify:

- How did I construct my lesson to teach this topic? Why did I construct it in this way?

#### Generalize & Conclude:

- What evidence will I have that enables me to judge the success of my lesson? (i.e. student's learning)

- Did I accomplish what I set out to do? How did I arrive at this conclusion?

- Was there any moment in this lesson that I suddenly realized that the group was grasping the information/skills or was there a moment when I suddenly realized that I had to change what I was doing? Explain.

- Are there other alternative teaching methods/strategies for this lesson that might improve student learning? How SPECIFICALLY would I change this lesson in the future?

- How is this lesson related to my beliefs about effective science teaching?

- What other things would I like to talk about?

#### Identify and Explain:

In this unit, I wanted students to learn the names and order of the planets in our solar system, the characteristics of the planets, and the other objects that exist in our solar system. I

think this is an important topic for students to learn because it helps to solidify the knowledge of our Earth and its place in our solar system. This unit also helped to explain the phenomena of space and the objects in it. This unit can also serve as a stepping stone to teach about other topics, such as cycles, and the concept of gravity.

### **Reason and Justify:**

I wanted to include many different ways for students to learn during this unit. I wanted every student to have an assignment in this unit to appeal to them. I also wanted to make the unit inquiry based so the students would gain a deeper understanding of the solar system concept. I tried to use the philosophy of how middle school students learn best, and offer as many choices for the students as possible.

I first gave the students a project to research about a planet, and to describe that planet to the class. The students were able to include the information they thought was most important, and were also able to use their creative skills to make a representation of the planet. This allowed students some choice, and also a multitude of ways for them to express themselves. I also included some videos for learners who learn best visually. Students also made foldables to organize their information, as an alternative to writing in a notebook. Students enjoyed the different ways of completing assignments, and stayed on task most of the time. I used concepts such as the Venn diagram to help make the unit more inquiry based, and give the students a deeper knowledge of the planets.

### **Generalize and Conclude:**

I gave a short quiz at the end of the unit to judge how much the students had learned about the planets. Many students performed well on this assessment, with only 6 of the 81 not passing the quiz. I also used many other formative assessments, such as “I have, who has?” that allowed me to see if the students were grasping the concepts being presented to them. Also, when I used things, such as songs, in the unit, students were able to sing along with them and to relay the song to me.

I believe I accomplished what I set out to do in this unit. I wanted the students to gain some knowledge about the solar system, and I wanted them to do it in a way that was new to them, and fit their learning needs. Many students expressed they had enjoyed the unit, and this was exciting to me as this was one of my goals. Students were also able to take pride in their work, and wanted to display it at all times. I also took the good grades received on assessments as proof the students had learned about the planets.

There was both a moment in my lesson where I knew the students were grasping the concept, and I knew I needed to change my instruction some. When the students were making and filling in their foldable with information about the planets, many of the students asked if they were able to include more information on their foldable than I had asked for. I, of course, allowed the students to do this. I also took this as a sign that the students were enjoying the lesson, and were thirsty for more knowledge about the solar system. Several students also brought samples of work they had created at home, on their own.

While I was teaching the lesson, I very quickly noticed that I would need much more time to complete the unit with all of the activities I had planned. I was very surprised at the amount of time it took for students to complete an activity. Some of this was due to me being a novice teacher, and not moving the process along quicker. Some of this was also due to students working at different paces.

If teaching this lesson again, I would try to incorporate more inquiry experiences for the students. I would like to take other approaches to the students learning the material. These experiences would include students collaborating more with their peers, and I would love to include a field trip to the BGSU planetarium. If I had more time, I would also have the students

keep a log of where the planets could be seen in the sky in the evenings. This would help the students make a better real-world connection to this lesson.

These lessons were related to my beliefs about how students should learn in a science classroom. I believe students should be offered a variety of resources and ways to learn. These lessons gave the students choice about their assignments, and allowed them to showcase not only their knowledge, but also their creativity. I also wanted to use an inquiry based approach to teaching these lessons so that students would get a deeper and richer understanding of the topic.



Candidate's Name: \_\_\_\_\_ Candidates Total Score \_\_\_\_\_ /400

Target (90 – 100%)	Acceptable (75 - 89 %)	Not Met (Below 75 %)
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**RUBRIC FOR EFFECTIVE SCIENCE TEACHING DESIGN**

The unit plan included appropriate inquiry techniques including: discovery/play, guided and/or open-ended inquiry. Students had the opportunity to investigate their own questions and/or make decisions during the inquiry.	100 85 70 55 0	Comments:
The unit plan includes a thoughtful integration of real world science learning (authentic) that pertain to the content.	100 85 70 55 0	Comments:
The unit integrated science and technology ideas as well as integrated technological resources throughout the unit plan when appropriate.	100 85 70 55 0	Comments:
The unit integrated effective cooperative/ collaborative learning strategies as well as other effective “best science teaching practices” learned throughout the semester in EDTL 4480.	100 85 70 55 0	Comments:
The unit plan was comprehensive and included all of the outlined expectations in a meaningful and valuable way.	100 85 70 55 0	Comments:

**Task 1a: SCORE FOR Unit Plan Design = \_\_\_\_\_ / 100**

5- E lesson plan was age-appropriate and aligned to state standards for 4 – 9 <sup>th</sup> grades.	100 85 70 55 0	Comments:
Each of the 5E lesson plans includes an opportunity for the students to apply their knowledge in a hands-on or minds-on (inquiry-based) manner, teacher questions are included and are diverse (including higher order questions), and closure of the content big ideas is clearly stated.	100 85 70 55 0	Comments:
Each of the 5E lesson plans includes a section that details the safety and/or differentiated learning modifications and plans of action to be carried out during the lesson	100 85 70 55 0	Comments:
The 5E lesson plan depicted a true learning cycle and each phase of the lesson depicted appropriate activities/events for that phase of the 5E model	100 85 70 55 0	Comments:
The lesson plan was comprehensive and included all of the outlined expectations in a meaningful and valuable way.	100 85 70 55 0	Comments:

**Task 1b: SCORE FOR Lesson Plan Design - \_\_\_\_\_ / 100**


The <b>Formative Assessment</b> effectively assesses one or more of the learning outcomes (clearly identified) and clearly shows what students have mastered during the lesson (a checklist /rubrics/scoring key is included)	100 85 70 55 0	Comments:
The reflective analysis of the formative assessment data is comprehensive, clearly communicated, and provides valuable information regarding what was learned in terms of effect of the effectiveness of your design on student learning.	100 85 70 55 0	Comments:

**Task 3: SCORE FOR Formative Assessment - \_\_\_\_\_ / 100**

<b>Task 4: The reflective analysis</b> of the entire unit design and implementation is <i>comprehensive, clearly communicated, and highly valuable for further professional growth.</i>	100 85 70 55 0	Comments:
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## File Details

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<b>Size</b>	13.2 KB
<b>Type</b>	HTML Document (text/html)
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I have..... Mercury

I have..... Orbit

I have..... Venus

Who has..... The objects that separate the inner planets from the outer planets?

I have..... Earth

Who has..... The only planet known to have life on it?

I have..... Mars

I have..... Jupiter

Who has..... The planet that rotates differently than the rest of the planets?

I have..... Saturn

Who has..... The planet that has the most known moons?

I have..... Uranus

I have..... Neptune

Who has..... The medium sized star at the middle of our universe?

I have..... The Asteroid Belt

I have..... Pluto

Who has..... The planet that is the least dense (they say it could float in a bathtub)?

I have..... The Sun

Who has..... The path one object takes around another?

I have..... the Tropic of Capricorn

Who has..... The planet that is now classified as a dwarf planet, but used to be part of our solar system?

I have..... The Tropic of Cancer

Who has..... The 8<sup>th</sup> planet from the sun?

I have..... the moon

I have..... an equinox

I have..... a solstice

I have..... a rotation

I have..... a revolution

I have..... tilt

Name \_\_\_\_\_

Period \_\_\_\_\_

## Solar System Quiz

1. Name the 8 planets in order from the sun. (Remember spelling counts!)

1. \_\_\_\_\_

5. \_\_\_\_\_

2. \_\_\_\_\_

6. \_\_\_\_\_

3. \_\_\_\_\_

7. \_\_\_\_\_

4. \_\_\_\_\_

8. \_\_\_\_\_

2. The first four planets are considered rocky planets. (Circle the correct answer)

TRUE

FALSE

3. The last four planets are considered gas planets. (Circle the correct answer)

TRUE

FALSE

4. One \_\_\_\_\_ of a planet is known as one day on that planet.  
(Circle an answer below)

a. Revolution

c. Rotation

b. Season

d. Gravitation

5. One \_\_\_\_\_ of a planet is known as one year on that planet.  
(Circle an answer below)

a. Revolution

c. Rotation

b. Season

d. Gravitation

6. The largest of the 8 planets in the Solar System is \_\_\_\_\_.  
(Circle an answer below)

a. Mercury

c. Uranus

b. Venus

d. Jupiter

7. The smallest of the 8 planets in the Solar System is \_\_\_\_\_.  
(Circle an answer below)

a. Mercury

c. Uranus

b. Venus

d. Jupiter

8. This planet rotates on its' side, almost like a spinning top.  
(Circle an answer below)

a. Mercury

c. Uranus

b. Venus

d. Jupiter

9. Between the Rocky planets and the Gas Giant planets is the \_\_\_\_\_.  
(Circle an answer below)

a. Belt of Orion

c. Interplanetary belt

b. Rocky Belt

d. Asteroid Belt

10. A mountain-sized chunk of dust and ice that orbits the sun is called a  
\_\_\_\_\_. (Circle an answer below)

a. Meteor

c. Shooting Star

b. Comet

d. Meteorite

11. The only planet we know has life on it is \_\_\_\_\_.  
(Fill in the blank)