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| **Class Notes Ch. 4**  **Earth’s Structure & Motion** | | | Name: |
| Date: |
| Period: |
| **Section 4.1 Objectives**   * Explain how most scientists explain the formation of the solar system * Describe Earth’s size and shape and the arrangement of its layers * List three sources of Earth’s internal heat * Describe the Earth’s magnetic field   **Section 4.2 Vocabulary – Please define**  Geology –  Inner core –  Outer core –  Mantle –  Crust –  Lithosphere –  Asthenosphere –  Magnetic field – | | | |
| **Origin of the Solar System** | | | The most widely held model of the formation of our solar system is called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  It suggests that \_\_\_\_\_\_\_\_ billion years ago a great cloud of \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_ was rotating slowly in space. The dust cloud was at least \_\_\_\_\_\_\_ billion km in diameter.  As time passed, the cloud \_\_\_\_\_\_\_\_\_\_\_ under the pull of its own \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. As it shrank, its rate of rotation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Most of the material in the rotating cloud gathered around its \_\_\_\_\_\_\_\_\_\_\_\_\_\_.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of this material made its interior so \_\_\_\_\_\_\_\_ that a powerful reaction called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurred. At this time, the star we know as the \_\_\_\_\_\_\_\_\_ was born.  About \_\_\_\_\_\_\_\_\_% of the material in the cloud formed a great plane-like disk surrounding the sun and extending far into space.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces within the disk caused most of its mass to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, forming solid particles of ice and rock.  The condensed particles in the spinning cloud eventually combined into larger bodies called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .  The planetesiminals continued to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_, sometimes colliding with each other and other objects in space. Eventually, these planetesimals developed into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| **Checking for Understanding – Think. Pair. Share**  Write a paragraph summarizing how the earth formed based on the information in your text and our discussions in class. | | | |
| **Earth’s Size and Shape** | | | The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ motion resulted in Earth developing into a \_\_\_\_\_\_\_\_\_\_\_ with a bulge in the middle (oblate spheroid).  The total surface area of the Earth is about 510 million km  Approximately \_\_\_\_\_\_\_\_\_% land  Approximately \_\_\_\_\_\_\_\_\_% water (ocean)  **How did we learn that the Earth was NOT a perfect sphere?**  Scientists measured the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an object in several places on Earth’s surface, and the \_\_\_\_\_\_\_\_\_\_\_\_\_ was \_\_\_\_\_\_\_\_\_ the same.  The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ an object is located from the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the Earth, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it is. The \_\_\_\_\_\_\_\_\_\_\_\_ an object is located to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the Earth, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it is.  An object will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pole than it will at the Equator. |
| **Earth’s Interior** | | | At earth’s center is an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ core composed of \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Surrounding the inner core is an outer core composed of iron and nickel in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Around the core is the thickest of Earth’s layers the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Surrounding the mantle is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a thin, rigid layer of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rocks that includes Earth’s surface. |
|  | | | Earth’s near surface layers are classified by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The crust and the uppermost portion of the mantle make up the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  The more rigid material of the lithosphere floats upon a thin, slushlike layer of the mantle called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  **CRUST**   * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * A \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ layer of lighter rocks * Extends to a depth of 65 km * Temperature is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1000 K, however it increases by 10-30 K for every kilometer of depth * The part of the geosphere that humans have \_\_\_\_\_\_\_\_\_\_\_\_ contact with, and the only place where life has been found   **MANTLE**   * \_\_\_\_\_\_\_\_\_\_\_\_\_ with \_\_\_\_\_\_\_\_\_\_\_\_\_\_ properties * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of Earth’s layers * Composed mostly of compounds rich in \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. * \_\_\_\_\_\_\_\_\_\_\_\_ temperatures and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cause it to behave as a \_\_\_\_\_\_\_\_\_\_\_\_\_ in some ways * Extends to a depth of 2890 km (from the surface) * Temperature is between 1500-3200K, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with depth   **OUTER CORE**   * \_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Composed of \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_ * Extends to a depth of 5150 km (from the surface) * Temperature is between 3700-5500 K, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with depth   **INNER CORE**   * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ * Composed of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_ * Extends to a depth of 6371 km (from the surface) * Temperature is approximately 6000 K |
| **Earth’s Heat** | | | Earth’s heat was **generated** by:   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of overlying materials causing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ heat 3. \_\_\_\_\_\_\_\_\_\_\_\_ of radioactive isotopes, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that release heat as they disintegrate into more stable forms.   Earth has slowly been **losing heat** by:   1. Some rocks \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ more quickly than others. 2. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the crustal rock \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from place to place 3. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ materials in rock varies |
| **Earth’s Magnetic Field** | | | A compass needle always points \_\_\_\_\_\_\_\_\_\_\_\_\_. In fact, the compass needle aligns itself along the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that makes up Earth’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  The magnetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pole is the equivalent of the attracting or positive end of a bar magnet, so it \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ your compass needle. The magnetic \_\_\_\_\_\_\_\_\_\_\_\_ pole is like the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or negative end of a bar magnet.  Earth’s magnetic field is actually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ about \_\_\_\_\_° away from the poles. The 11° tilt explains why the magnetic north pole and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ north pole are not in exactly the same place.  Scientists do \_\_\_\_\_\_\_\_\_ fully understand the \_\_\_\_\_\_\_\_\_\_\_ of our magnetic field. However, many support a hypothesis that credits Earth’s magnetic field to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is generated when liquid iron moves across an already existing, but weak, magnetic field. The electric current \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that, with fluid motion, produces yet another magnetic field. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, these fields \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Earth’s strong magnetic field. |
| **Review Section 4.1**   1. What evidence is there for Earth’s spheroidal shape? 2. Describe the arrangement of Earth’s layers, starting with the crust and moving inward. 3. Describe three sources of Earth’s internal heat. Which internal process is still producing heat? 4. Describe how Earth would be different today if it contained no radioactive material. What would the consequences be for the Earth’s interior layers? | | | |
| **Section 4.2 Objectives**   * Give evidence for Earth’s rotation * Relate Earth’s rotation to the day-night cycle and the time zones   **Vocabulary – Please define**  Rotation –  Standard time zones –  Time meridian –  Prime meridian –  International date line – | | | |
| **Earth’s Rotation** | | The Earth rotates \_\_\_\_\_\_\_ complete turn approximately every \_\_\_\_\_\_\_\_\_ hours.  Earth’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ shape causes the \_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to vary from point to point.  Since the Earth is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at its equator, it must rotate \_\_\_\_\_\_\_\_\_\_\_\_\_\_ at the equator to “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” with the rest of the planet. At the equator, the Earth rotates at 1670 km per hour.  As you move \_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_, the speed of rotation \_\_\_\_\_\_\_\_\_\_\_\_. At Boston, the rate of rotation drops to about 1300 km per hour. Near the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the speed of rotation is almost \_\_\_\_\_\_\_\_\_\_ per hour, because the poles are \_\_\_\_\_\_\_ the axis of rotation. | |
| **Evidence for Rotation** | | The spinning of Earth around its axis is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. He observed the direction of swing shifted 11° in a clockwise direction every hour. After 8 hours the pendulum was swinging at a right angle to its starting direction. Conclusion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. If Earth did NOT rotate, winds would blow in straight paths from areas of high pressure to low pressure. Because of Earth’s rotation, winds are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In the Northern Hemisphere winds are deflected to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and in the Southern Hemisphere winds are deflected to the \_\_\_\_\_\_\_\_\_ - i.e., the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | |
| **Axis and Rate of Rotation** | | Earth’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is an imaginary straight line that passes through the Earth between the \_\_\_\_\_\_\_\_\_\_\_Pole and the \_\_\_\_\_\_\_\_\_\_\_\_\_ Pole. When Earth rotates, it turns \_\_\_\_\_\_\_\_\_\_\_\_\_\_this axis.  The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the Earth is an imaginary flat surface around the \_\_\_\_\_\_\_\_\_\_. The axis of Earth is \_\_\_\_\_\_\_\_\_\_° from this imaginary flat surface.  At present, Earth’s axis always points toward \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (the North Star). The tilt of our axis stays the same throughout the year. The consistency in Earth’s tilt is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | |
| **Effects of Rotation** | | An effect of Earth’s rotation is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The Earth rotates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (from the standpoint of the North Pole). Thus, our sun appears to rise in the \_\_\_\_\_\_\_\_\_\_\_\_ and set in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Only half of the Earth receives sunlight at any given time. If the Earth did \_\_\_\_\_\_\_\_\_rotate, the half facing the sun would have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, while the other half would have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | |
| **Measuring Time** | | One day (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) is the approximate time it takes Earth to rotate \_\_\_\_\_\_\_\_\_\_\_ on its axis. For centuries, people figured the time of day by the sun’s position in the sky. Each day, the sun rises on the eastern horizon, seems to move in an arc across the sky, and sets below the western horizon.  Solar noon occurs when the sun is in its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the sky. This causes a problem; because of Earth’s rotation, solar noon does \_\_\_\_\_\_\_\_\_\_\_\_ occur at the same time everywhere. | |
| **Standard Time Zones** | | The problem of having different solar times in nearby communities was solved through the development of \_\_\_\_\_\_\_\_\_\_\_ zones. The Earth was divided into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, each \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ wide.  The basis for time zones is the \_\_\_\_\_\_\_\_\_\_at which the sun appears to move across the sky. Each standard time zone is roughly centered on a line of longitude exactly divisible by 15°, called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. All areas within a time zone keep the same clock time. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the average solar time at that zone’s time meridian.  The starting point for the standard time zones is the \_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, located in Greenwich, England. Travelers moving \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from Greenwich move their \_\_\_\_\_\_\_\_\_\_\_\_ to earlier times, while those moving \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ change to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ time.  In theory, each standard time zone should be exactly 15° wide. However, time zone boundaries on land are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lines, shifting east or west to meet the needs of the people living there. | |
| **U.S. Time Zones** | | Eastern Standard, Central Standard, Mountain Standard, and Pacific Standard time zones were created in the U.S. in 1883, in order to standardize train schedules. Congress made the time zones official under federal law in 1918.  Since then, Alaska Standard and Hawaii-Aleutian Standard time zones have been added. | |
| **International Date Line** | | Travelers going completely around the world gain or lose time at each time zone until they have gained or lost an entire day.  An imaginary line called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (located along the 180th meridian) represents the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at which the date changes.  Upon crossing the date line, travelers change their calendars, not their watches. For travelers moving \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the date is changed to one day \_\_\_\_\_\_\_\_\_\_\_\_\_\_; for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ travelers, the date is changed to one day \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | |
| **Review Section 4.2**   1. Describe two pieces of evidence for Earth’s rotation. 2. Why is the speed of Earth’s rotation different at the equator than it is at the poles? 3. Explain how time zones are determined. 4. In any given time zone, it gets dark a little earlier on the eastern side than on the western side. Why? | | | |
| **Section 4.3 Objectives**   * Give evidence for Earth’s revolution around the Sun * Describe Earth’s path and rate of revolution * Explain why seasons occur   **Section 4.3 Vocabulary – Please define**  Revolution –  Parallax –  Summer solstice –  Winter solstice –  Vernal equinox –  Autumnal equinox – | | | |
| **Earth’s Revolution** | **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the movement of Earth in its orbit around the sun.  **What evidence do we have that we revolve around the sun?**  Constellations change their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the sky, and some are not even visible for a period of time.  Nearby stars seem to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when compared to distant stars. This apparent shift is called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**. | | |
| **Path and Rate of Revolution** | Like our rotation, the direction of Earth’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is also \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Earth’s orbit is an ellipse with the sun located at one focus.  The average distance from the Earth to the sun is 150 million km.  At **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (Earth’s closest point to the sun in our orbit), we are about 147.6 million km from the sun. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** occurs on or about \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  At **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, (Earth’s farthest point from the sun in our orbit), we are about 152.4 million km from the sun. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** occurs on or about \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Earth makes \_\_\_\_\_\_\_\_\_\_ revolution around the sun every 365.24 days. Since one orbit represents a journey of 360°, Earth’s rate of revolution is approximately \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ per day.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around the sun \_\_\_\_\_\_\_\_\_\_\_\_\_ the sun’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ across the sky \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  When describing the sun’s position in the sky, we refer to the point directly above an observer as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The angular distance between the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the sun’s position is called its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. When the sun is at the \_\_\_\_\_\_\_\_\_\_\_\_\_, its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is 90°. For locations in the U.S. (except Hawaii), the sun is always below the zenith.  When the sun is on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the altitude is \_\_\_\_\_\_\_\_\_\_\_. | | |
| **Effect of Revolution and Tilt** | Effects of Earth’s revolution include the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and variation in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of days and nights. In addition, the tilt of the axis has a profound effect on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  At almost any given time, \_\_\_\_\_\_\_\_\_\_\_ hemisphere is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the \_\_\_\_\_\_\_\_\_\_\_\_\_, as the other is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The hemisphere tilted \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the sun receives more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and thus has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ temperatures and longer days. The hemisphere \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the sun receives \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sunlight. This results in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ temperatures and shorter days. The changes in the hours of daylight and in temperature caused by the revolution and tilt lead to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  If the Earth had \_\_\_\_\_\_\_ tilt, then seasons would \_\_\_\_\_\_\_\_\_ occur. Every place on Earth would experience 12 hours of daylight and 12 hours of night.  If the Earth had a tilt \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than 23.5°, then each hemisphere would experience \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ summers and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ winters. | | |
| **Seasons** | The first day of summer in the Northern Hemisphere occurs on or about June 21 every year. This day has the longest daylight period and is known as the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.  At the Summer Solstice, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hemisphere is at its maximum tilt, causing the sun to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the Tropic of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (located at 23.5° North latitude).  On the Summer Solstice, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ point that is located within 23.5° of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pole (the Arctic Circle) will experience 24 hours of daylight.  The first day of winter in the Northern Hemisphere occurs on or about \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This day has the shortest daylight period and is known as the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.  At the Winter Solstice, the Northern Hemisphere is at its maximum tilt \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the sun, causing the sun to be directly above the Tropic of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (located at 23.5° South latitude).  On the Winter Solstice, \_\_\_\_\_\_\_\_\_\_\_\_\_ point that is located within 23.5° of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pole (the Antarctic Circle) will experience 24 hours of daylight.  There are two days each year, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between the solstices, when neither hemisphere tilts toward the sun. On these days, daytime and nighttime are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in length all over the world. Each of these days is known as an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** occurs on or around March 21. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs on or around September 22.  On the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the sun is overhead the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ at noon. They also mark periods of long twilight at the poles. Depending on the pole, the sun is either rising and visible for the next six months, or setting and not visible for the next six months.  Because of the tilt of the Earth, the seasons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the Northern and Southern Hemispheres.  When it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hemisphere, it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hemisphere, and vice versa.  When it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hemisphere, it is \_\_\_\_\_\_\_\_\_\_\_ in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hemisphere, and vice versa. | | |
| **Review Section 4.3**   1. What evidence is there for Earth’s revolution around the sun? 2. Describe the shape of Earth’s orbit and explain how earth’s position relative to the sun changes as Earth revolves. 3. Name the solstices and equinoxes and the dates on which they occur. 4. How would the solstices and equinoxes change if the Earth’s orbit were circular instead of elliptical? Explain how a circular orbit would affect seasonal changes. | | | |