

# TEACHER BACKGROUND INFORMATION

*(How Objects in Space Effect Earth)*

## **A. SOLAR ENERGY:**

The light and heat released by the sun has a profound effect on life on Earth. Besides influencing climate, weather, and ocean currents, the sun provides the energy necessary for living things on Earth to survive. Once solar energy is trapped by photosynthetic organisms, it is transferred from one organism to the next, allowing a vast array of life to exist.

## **B. TIDES:**

**Lunar tides:** Lunar tides are changes in ocean water levels due to the gravitational pull of the moon. The gravity of the moon causes ocean water to bulge out on the sides of the Earth directly facing toward and away from it (see figure 4). These bulges cause high tides, and the troughs between the bulges create low tides. As the Earth rotates, the bulges move, so different areas experience high and low tides. In addition, because the moon is also in orbit around the Earth, the times of high and low times each day vary based on the location of the moon in its orbit. The difference in water levels between high and low tides primarily depends on the shapes of coastlines and beaches, ocean currents, and the Sun's gravitational force.

**Solar tides:** Solar tides are changes in ocean water levels due to the gravitational pull of the sun. Like the moon, the gravity of the sun causes bulges and troughs to form in Earth's oceans; however, the sun's gravitational force has a much weaker effect on the oceans than the moon's. The effects of solar tides on lunar tides can be observed in spring and neap tides. A **spring tide** occurs when the sun, Earth, and moon are arranged in a straight line. (This only happens during the full or new moon phases.) The effects of the

gravity of the moon and sun on the oceans combine which causes higher high tides and lower low tides (see figure 3). Conversely, a **neap tide** happens when the sun, Earth, and moon form a right angle which only occurs during the moon's quarter phases. During a neap tide, the gravitational forces of the sun and moon acting upon the Earth are in opposition to each other which results in lower high tides and higher low tides (see figure 3).

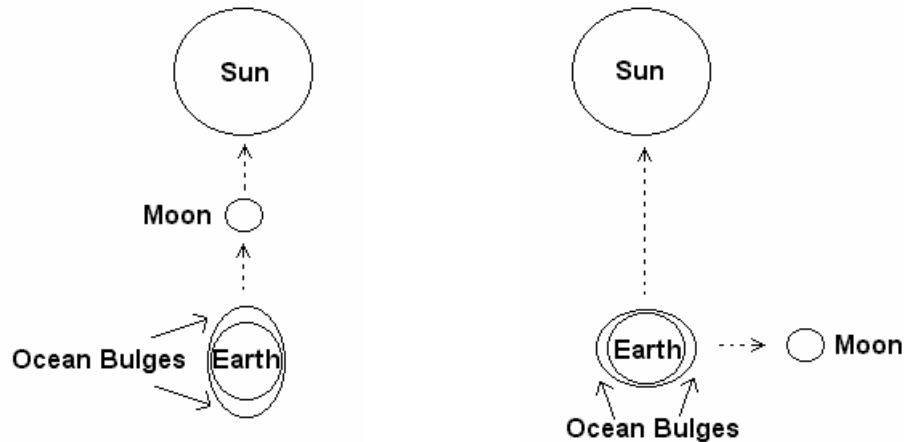


Figure 3: The diagram on the left shows the arrangement of the sun, moon, and Earth during a spring tide. The diagram on the right shows their arrangement during a neap tide. The dotted arrows represent the direction of gravitational forces. (Note: Diagram is not to scale.)

### **C. METEORITE AND ASTEROID IMPACTS:**

The Earth is frequently hit by objects in space, but only a few reach the Earth's surface due to its atmosphere. When meteoroids enter Earth's atmosphere, they begin to incandesce and burn due to the amount of friction generated by moving quickly through the atmosphere. The visible streak of light when a meteoroid burns is called a **meteor**. Most meteoroids completely burn up before they ever reach the Earth's surface. However, those which do reach the Earth's surface before vaporizing are called **meteorites**. Meteorites travel very fast through the atmosphere, so they can cause a large amount of damage when they impact the surface of the Earth. Barringer Crater, 1200 meters in diameter and 200 meters deep, is the impact

site of a 30-50 meter diameter meteorite which impacted the Earth in what is now Arizona. Craters in the Earth have also been caused by comets and asteroids. A 180 kilometer diameter crater in the Yucatan Peninsula is believed to be the impact site of a large asteroid that led to the extinction of the dinosaurs 65 million years ago.