NATURAL SCIENCES GRADE 7

LEARNER GUIDE

EARTH AND BEYOND

EARTH AND BEYOND

RELATIONSHIP OF THE SUN TO THE EARTH

New terms

Rotate – to move around the centre

Revolve – move around another object

Orbit – the path that an object takes as it moves around another object.

Tilt – When something is slanted or leaning at an angle rather than being perfectly upright or horizontal.

Axial tilting - refers to the fact that a planet's axis—the imaginary line running through its North and South Poles—is slanted and not perfectly vertical.

Equinox is the date at which the Sun crosses the celestial equator.

Celestial equator is the great circle of the celestial sphere.

On equinox, the day and night are of equal length (20 March and 22 September)

SOLAR ENERGY AND THE EARTH'S SEASONS

(a) Heat Radiation from the Sun

- **Radiation**: The Sun emits energy in the form of electromagnetic waves.
- This energy travels through space and is distributed in all directions.
- When this radiation reaches Earth, it warms the planet and it causes different weather patterns.

(b) Earth's Rotation

- **Rotation**: Earth takes **24 hours** to complete one full rotation on its axis.
- This spinning motion causes day and night, with the side of the Earth facing the Sun experiencing day, and the opposite side experiencing night.

(c) Earth's Axis Tilt

- **Axial Tilt**: The Earth's axis is tilted at an angle of **23.5°** from the vertical relative to its orbit around the Sun.
- The tilting of the Earth is leads to the different **seasons** as it affects how sunlight hits different parts of Earth throughout the year.

(d) Sunlight and Seasons

- **Sunlight Intensity**: The amount of **light intensity** (or solar radiation) that reaches the Northern and Southern Hemispheres affects the temperature and climate.
- **It** creates the **four seasons** (spring, summer, autumn, and winter).
- The different amounts of light reaching different parts of the Earth is due to Earth's axial tilt.

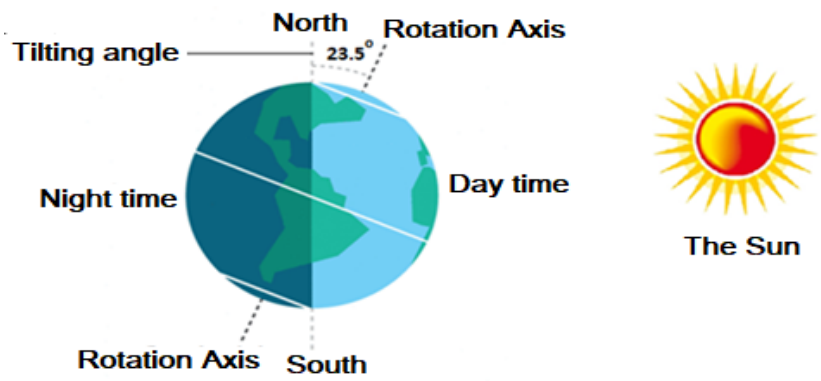
(e) Seasons in Hemispheres

- **Hemisphere Tilting**:

  During **June**, the **Northern Hemisphere** is tilted towards the Sun, resulting in summer, while the **Southern Hemisphere** is tilted away, leading to winter.
- This change in position relative to the Sun is due to Earth's orbit and axial tilt.

(f) Winter and Daylight

- **Day Length Variation**: In **winter**, the nights are **longer** and the days are **shorter** due to the Earth's axial tilting.
- The hemisphere experiencing winter is tilted away from the Sun, receiving less direct sunlight, thus shortening the length of the day.



ANSWER THE FOLLOWING QUESTIONS:

1. What form of energy does the Sun emit?

   _____

2. How does the Sun's energy travel through space?

   _____

   _____

3. What happens when the Sun's radiation reaches Earth?

   _____

4. How long does it take Earth to complete one full rotation?

   _____

5. What does Earth's rotation cause?

   _____

6. Which part of Earth experiences day?

   _____

7. What is the angle of Earth's axial tilt?

   _____

8. How does Earth's axial tilt affect sunlight?

   _____

   _____

9. Discuss what affects the temperature and climate on Earth.

   _____

   _____

10. What does the variation in sunlight cause?

    _____

11. Which hemisphere is tilted towards the Sun in June?

_____

12. What season does the Southern Hemisphere experience in June?

_____

13. Discuss why are days shorter in winter.

_____

_____

LIFE ON EARTH

(a) Plants benefit from the light coming from the Sun.

(b) Plants use the light to manufacture their own food.

(c) The food manufactured by plants benefit all organisms.

SOLAR STORED ENERGY: COAL FORMATION

(a) Plants and Sunlight

- Plants use **sunlight** to grow through **photosynthesis**, but after their life cycle, they die.

(b) Large Plants and Animals Died Long Ago

- Many **giant plants and animals** that lived millions of years ago eventually **died** and began to decay.

(c) Dead Plants and Animals Buried

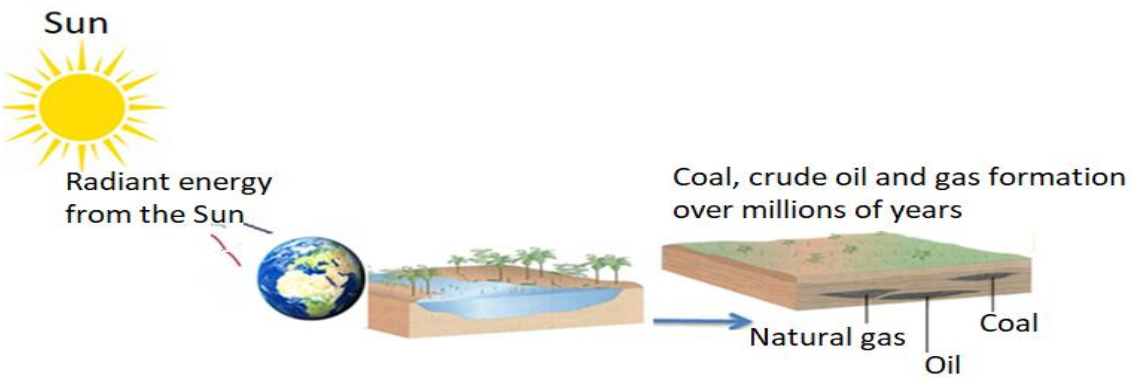
- Over time, the dead plants and animals got **buried** under layers of **water** and **dirt**.

(d) Heat and Pressure Caused Changes

- The weight of the dirt and the pressure from layers of earth above **squeezed** the dead plants and animals buried below the surface of the Earth.
- Over time, this **squeezing** caused **heat** and **changes** in the plants and animals causing physical and chemical changes.

(e) Carbon-Rich Remains Turned into Coal

- After millions of years, these changes turned the remains of plants and animals which were rich in carbon into coal.



Answer the following questions:

Knowledge (Low order)

1. What do plants use to grow?

   _____

2. What process do plants use to convert sunlight into food?

   _____

3. What happens to plants after their life cycles?

   _____

Understanding Concepts (Middle order)

4. Why do plants need sunlight to grow?

   _____

5. What happens to the remains of plants and animals that died millions of years ago?

   _____

6. How do heat and pressure affect the remains of buried plants and animals?

   _____

Application (High order)

7. What might happen to a plant if it doesn't get enough sunlight?

   _____

8. How do the remains of ancient plants and animals eventually turn into coal?

   _____

9. Can photosynthesis occur without sunlight? Why or why not?

   _____

   _____

10. What role does heat play in the formation of coal from dead plants and animals?

_____

_____

11. How is the burial of dead plants and animals under water and dirt important for coal formation?

_____

12. What is the relationship between the carbon content of dead plants and the formation of coal?

_____

13. If plants rely on sunlight to survive, what might happen to the planet's ecosystems if sunlight were blocked for an extended period?

_____

SOLAR ENERGY AND LIFE ON EARTH

Crude oil and natural gas

(a) Crude Oil and Natural Gas Formation

- Like coal, crude oil and natural gas formed millions of years ago from the remains of plants and animals.

(b) Sea Plants and Animals on the Ocean Floor

- Dead sea animals and plants sank and were deposited on the ocean floor.

(c) Layers of Sediment Covered the Remains

- Over time, layers of sand and silt covered these remains, forming thick deposits.

(d) Heat and Pressure Made Oil and Gas

- The weight of the layers caused heat and pressure, which transformed the remains into crude oil and natural gas.

(e) Oil and Gas Trapped in Rock

- Rock layers formed above, trapping the oil and gas. These resources need to be drilled and pumped out of the Earth.

(f) Mossel Bay's Gas Fields

- Mossel Bay, in the Southern Cape, is home to some of South Africa's gas fields.

Answer the following questions:

Knowledge (Low order)

1. What natural resources are formed from the remains of plants and animals?

   _____

2. Where were the remains of dead sea plants and animals deposited?

   _____

3. What covered the remains of plants and animals on the ocean floor?

_____

4. What caused the transformation of plant and animal remains into crude oil and natural gas?

_____

5. Where is crude oil and natural gas trapped after formation?

_____

Comprehension (Middle order)

6. How are crude oil and natural gas similar to coal in their formation process?

_____

_____

7. Why did layers of sand and silt build up over the remains of sea plants and animals?

_____

8. Why is it necessary to drill and pump crude oil and natural gas out of the Earth?

_____

Application (Applying Concepts to Real Situations)

10. How could the discovery of oil in a new location impact that area's economy?

_____

11. How might the process of oil and gas formation differ in regions with different climates or geographical conditions?

_____

12. Why do certain areas like Mossel Bay have gas fields while others do not?

_____

RELATIONSHIP OF THE MOON TO THE EARTH

Relative positions

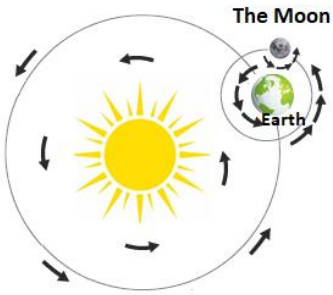
A. The Moon is a natural satellite that orbits around the Earth or a planet.

B. The Moon revolves on its orbit around the Earth and around the Sun.

C. We always see the same side of the Moon because the period of rotation of the Moon around the Earth is the same as the period it spins (27.3 days) on its axis.

D. The side of the Moon we see we call it the near side and the one we do not see the far side.

E. The effect of the gravity of the Moon's gravity results in the formation of tides.



Answer the following questions:

1. What is a Moon?

   _____

2. Discuss the movement of the Moon.

   _____

   _____

3. Explain why do we always see one side of the Moon.

   _____

   _____

4. What is the period of rotation of the Moon in days?

   _____

5. What is the effect of the Moon's gravity on the Earth?

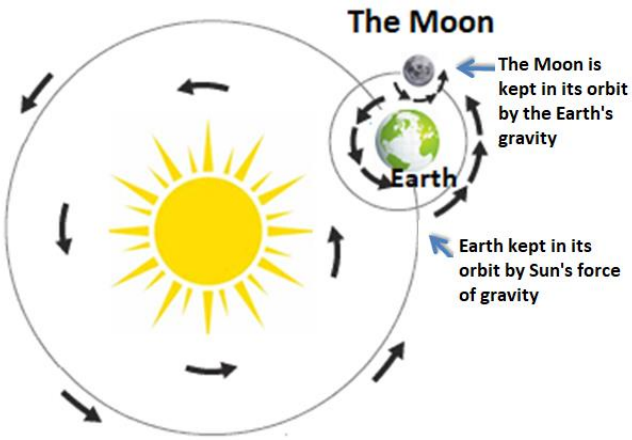
   _____

GRAVITY

(a) The force that makes objects attract each other is called gravity.

(b) All objects pull on each other with a gravitational force.

(c) The strength of gravity depends on the mass of the objects and the distance between them.



(d) The larger the objects' masses, the stronger the pull, but the force decreases as the distance increases.

(e) The Earth is held in its orbit around the Sun by the Sun's gravity.

(f) The Moon is kept in its orbit around the Earth by Earth's gravity.

(g) The Moon orbits both the Earth and the Sun.

(h) The Moon also has its own gravitational pull on the Earth.

Answer the following questions:

1. What is gravity?

_____

2. Which factors does gravity depend on?

_____

3. What is the relationship between the mass of an object and the force of attraction?

_____

4. How is the Earth held in its orbit?

_____

5. How is the Moon kept in its orbit as it moves around the Sun?

_____

6. Does the Moon move around the Sun?

_____

7. Explain if the Moon has a pull on the Earth.

_____

TIDES

What are tides?

(a) Tides are the regular rise and fall of large bodies of water, especially in seas and oceans.

(b) Tides are caused by the gravitational pull between the Earth, the Moon, and the Sun.

(c) All bodies of water experience gravitational forces that result in tides.

(d) Tides are more noticeable in larger bodies of water.

(e) Water moves as the Earth responds to gravitational pulls.

(f) The Moon is 360 times closer to the Earth than the Sun and has a stronger gravitational pull.

(g) Tides play an important role in maintaining shoreline ecosystems.

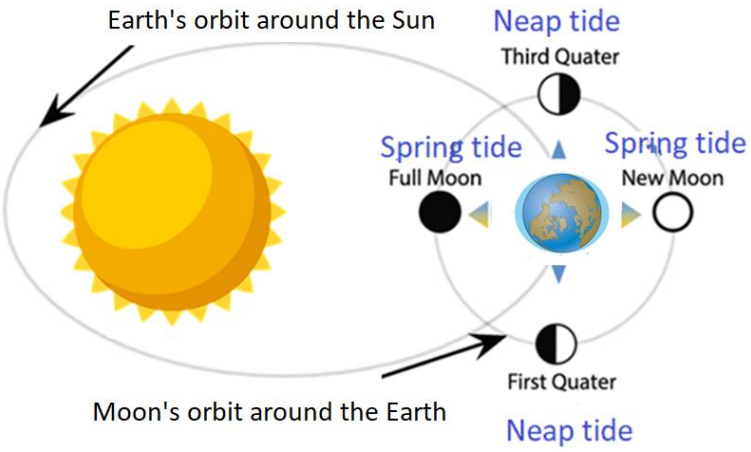
(h) Tides affect marine ecosystems by determining which organisms can survive in and out of water and endure waves.

(i) Most coastal areas experience two high tides and two low tides every lunar day (24 hours and 50 minutes), but at different times.

(j) High tides occur 12 hours and 25 minutes apart.

(k) A lunar day is the time it takes the Moon to rotate once on its axis, which is 24 hours and 50 minutes.

(l) There are two types of tides: spring tides and neap tides.



Activity:

A. Fill a large clear container with water.

B. Add a small object (golf ball size) to one end.

C. Let the learners observe what happens as the weight pulls on the water and creates a "tidal bulge."

D. Repeat the experiment with different weights to see how that impacts the size of the tidal bulge.

Answer the following questions:

1. What are tides?

   _____

2. What are the three factors that cause the formation of tides?

   _____

3. Discuss if tides occur in all bodies of water.

   _____

4. What makes the water to move?

   _____

5. Why are tides noticeable in large bodies of water?

   _____

6. How far is the Moon to the Earth when compared to the Sun?

   _____

7. Why is it expected that the Moon should have a greater pull on the Earth than the Sun?

   _____

8. How often do tides occur in coastal areas?

   _____

9. What are the two types of tides?

   _____

HIGH TIDES

(a) A high tide is the rise of a body of water to its highest level.

(b) The word “tide” comes from Latin meaning a “wave.”

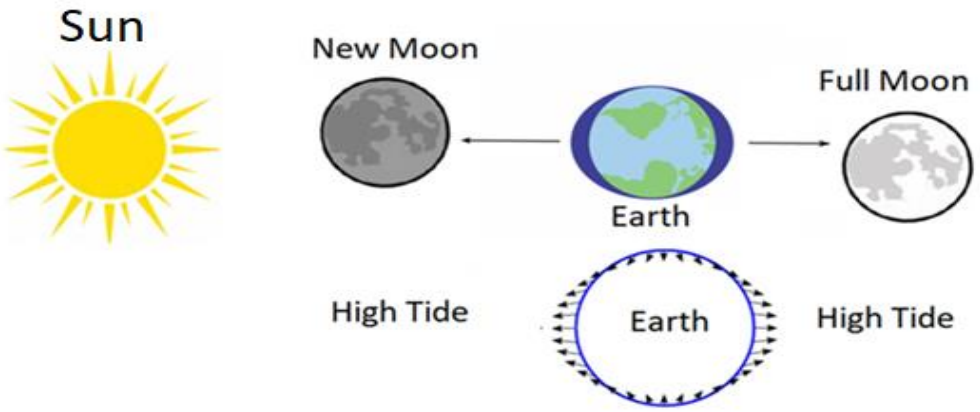
(c) When the Sun and the Moon are in a straight line spring tides (high tides) are formed.

(d) High tides are known as **spring** tides because the water springs to a higher level than normal.

(e) High tides are caused by the position of the Sun and Moon in relation to the Earth.

(f) The Moon and the Sun are in straight line during full Moon and New Moon.

(g) High tides are experienced twice a month which is during full and new Moons.



Answer the following questions:

1. What is a high tide?

   _____

2. What is the origin of the word tide?

   _____

3. What is another name for a high tide?

   _____

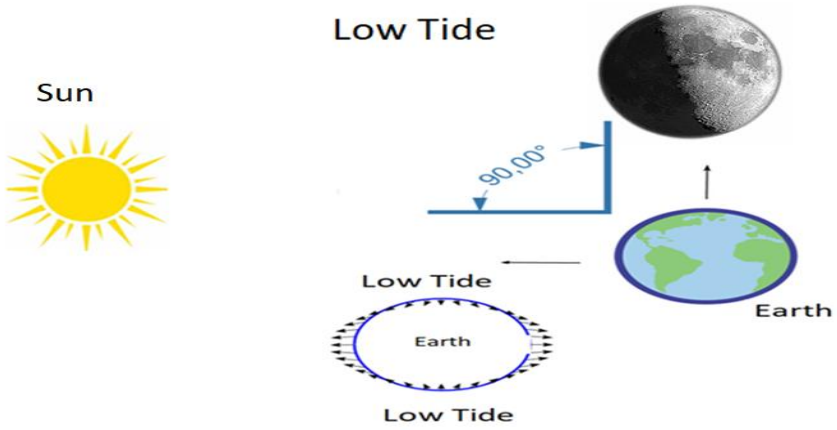
4. Discuss what leads to the formation of a high tide?

   _____

   _____

LOW TIDES

1. Low tide occurs when the ocean's water level is at its lowest.
2. During low tide, the water is lower than usual.
3. Neap tides, which are weaker low tides, happen when the Moon and the Sun are at an angle to each other.
4. Low tides occur during quarter Moon phases.
5. During quarter Moons, the Sun and Moon are positioned at an angle of 90°C relative to the Earth.
6. Low tides are good for fishing because the water is clearer, and fish swim closer to shore.
7. It's safer to swim when the currents are weakest, which is about an hour after high or low tide.
8. During this time, the water is calmer and less dangerous.
9. Rip currents, which appear darker and muddier, create dangerous swimming conditions.
10. You can spot rip currents more easily from a higher vantage point.



Answer the following questions:

Low – Order Questions

1. What is low tide?

_____

2. How does the water movement during low tide compare to high tide?

_____

3. What astronomical conditions lead to the formation of neap tides?

_____

4. When do low tides typically occur?

_____

5. Why are low tides beneficial for fishing?

_____

Middle – Order Questions

6. Explain the relationship between the positions of the Moon, Sun, and Earth during quarter Moons.

_____

7. Describe the conditions of the water during low tide and how they affect swimming safety.

_____

8. How do rip currents appear, and what do they indicate about swimming conditions?

_____

9. Analyze why low tides are safer for swimming compared to high tides.

_____

10. What visual cues can help identify rip currents from a higher position?

_____

High – Order Questions

11. Evaluate the significance of low tides for marine life and coastal ecosystems.

_____

12. Predict the potential consequences of climate change on tidal patterns and swimming safety.

_____