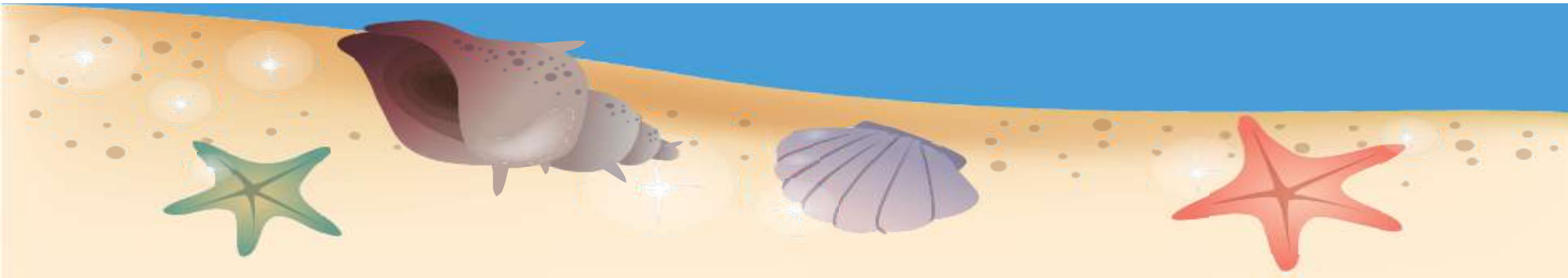
# Ocean Water Chemistry

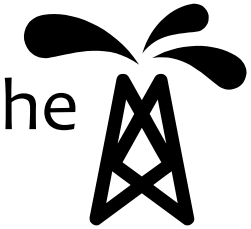
Essential Question:

How would you describe the composition of the ocean?

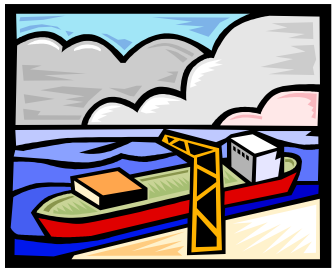


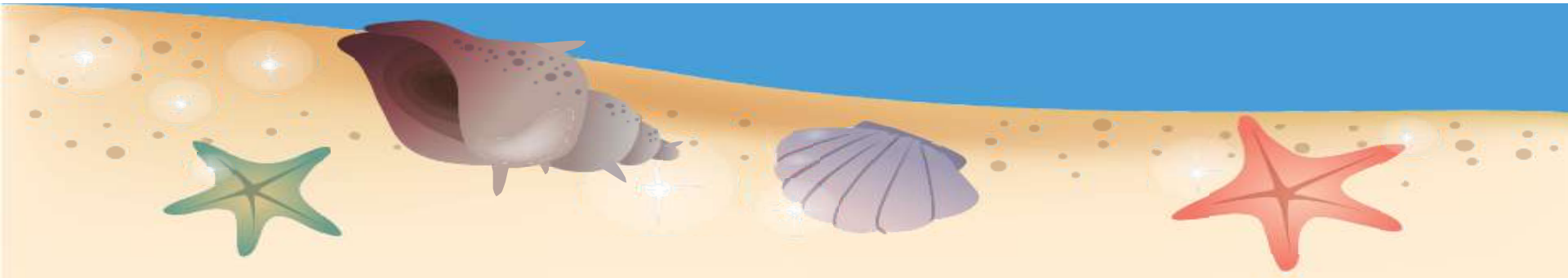
# Importance of Oceans

- Oceans provide important sources for food, energy, and minerals
  - Oil and Natural Gas are found beneath the ocean floor
  - Minerals include copper, gold, and salt



- Oceans provide transportation
- Oceans affect weather and climate





# Ocean Formation

- Oceans formed form volcanic water vapor
  - Volcanoes release many gases when they erupt including water vapor and carbon dioxide
  - Over time (millions of years) the water vapor cooled and condensed into storm clouds
  - Rains fell and filled low areas on Earth called basins
  - About 70% of the Earth is covered by ocean water

# Composition of the Ocean

- Ocean water contains dissolved gases such as oxygen, carbon dioxide, and nitrogen
- The ocean also contains dissolved salts such as chloride, sodium, sulfate, magnesium, calcium, and potassium ions
- Salinity is the measure of salts dissolved in seawater
  - About 96.5% of the ocean is water
  - About 3.5% of the ocean is salts
  - 1 kilogram of ocean water contains about 35 grams of dissolved salts

# Source of Salt

- The primary source of the salts is from dissolved minerals brought to the oceans by rivers and streams
  - Rivers and streams deliver approximately 2.3 billion metric tons of salts every year
- A second source can be found in volcanic eruptions
  - Gases released from volcanoes provides large amounts of chlorine, sulfur, and other minerals

# Source of Salt

- Why doesn't the ocean continue to get saltier with time?
  - Oceans are considered to be in a steady state, which means that elements are added and removed at about the same rate
  - Material is removed by organisms building shells or skeletons or precipitating out as sediment



# Variations is Salinity

- The concentration of salinity levels varies through out the ocean
  - Near the ocean's surface, rain, snow, melting ice, and rivers add fresh water lowering the salinity
  - Evaporation of water increases salinity levels mainly where the climate is hot and dry or where water freezes
    - The Dead Sea between Israel and Jordan is so salty that people can easily float on its surface
    - The poles cold temperatures freeze water at the surface causing the salinity to be higher in the remaining water

# Checkpoint

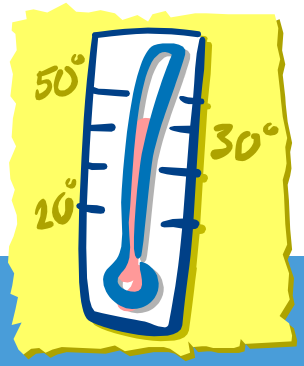
1. What gases are found in the ocean water?
   Oxygen, Carbon Dioxide, and Nitrogen
2. What is salinity?
   Amount of dissolved salts
3. Where might high amounts of ocean water evaporate?
   Where the climate is hot and dry
4. Where might high amounts of fresh water be added to ocean water?
   Where there is a lot of rain or snow, where a river enters

# Effects of Salinity

- Salinity affects several properties of water
  - Ocean water doesn't freeze until the temperature drops to about -1.9 degree Celsius
  - Salt water also has a higher density than fresh water, causing it to have a greater buoyancy
  - Buoyancy is the ability to float or rise in a liquid

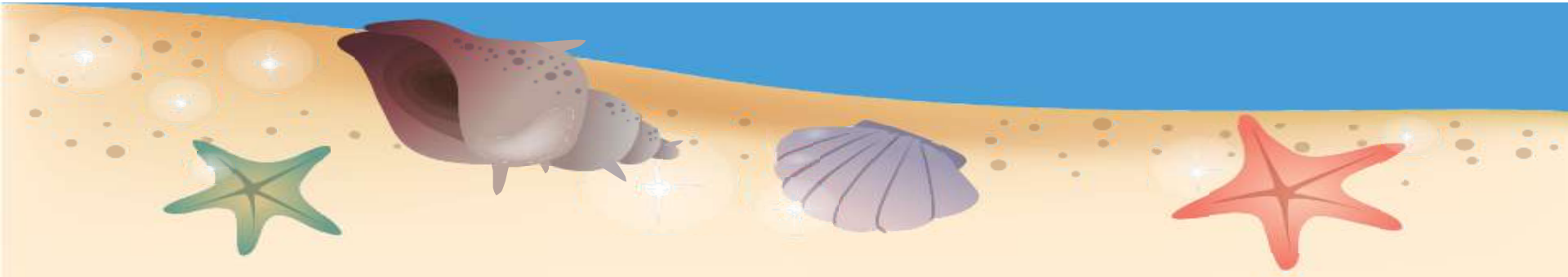
# Temperatures of Ocean Water

- Surface temperatures vary from place to place
  - The ocean absorbs energy from the sun
  - Near the equator the temperature is warmer while the farther from the equator temperatures drop
  - Warm water is usually less dense than colder water
  - The deeper you descend, the colder and denser the water becomes




# Gases in Ocean Water

- Two main gases found in the ocean are carbon dioxide and oxygen
  - Carbon dioxide is about 60 times more abundant in the ocean than the air
  - Why? Organisms such as Algae and Coral need the carbon dioxide to live
  - Oxygen is not as abundant as carbon dioxide



# Changes with Depth

- Decreasing Temperatures
  - As you descend through the ocean, water temperature decreases
- Increasing Pressure
  - Pressure increases continuously with depth in ocean