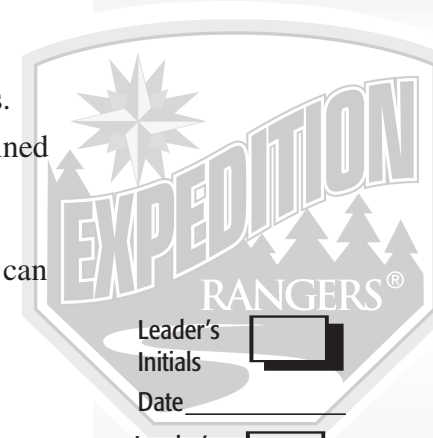
Oceanography Merit

1. Complete the following:
   a. List the four major branches of oceanography and each branch's focus.
   b. Describe how scientists use the information about the environment gained from the study of oceans.
   c. Define the following terms. Explain each term's relevance to satellite observations of the oceans, the data being collected, and how the data can be used by oceanographers.
      1. Altimetry
      2. El Niño and La Niña



Leader's Initials ☐
Date_____

2. Explain how ocean temperature affects the climate and weather.

Leader's Initials ☐
Date_____

3. Complete the following:
   a. Describe the characteristics of each type of wave:
      1. Tsunami
      2. Tidal wave
      3. Standing wave
      4. Tidal bore
      5. Seas
      6. Sea swell
      7. Surf
   b. Describe the causes of ocean waves.
   c. Define *crest, trough,* and *wavelengths*. Explain how they are used to characterize waves.
   d. Explain how breakers form.
   e. Describe the temperature, salinity, and density of ocean water.
   f. Describe circulation and currents in the ocean. Include the characteristics and causes of currents.
   g. Describe polar ice and its effects on the energy exchange on the Earth's surface.
   h. Explain what causes tides.

Leader's Initials ☐
Date_____

Leader's Initials

Date_____

4. Complete the following.
   a. Define the terms *benthos, plankton, nekton*, and *krill.*
   b. Define *phytoplankton*. Explain why it is important and how it ranks in the ocean food chain.
   c. Define *zooplankton*.
   d. Define *coccolithophores.*
   e. Describe how evaporation and precipitation affect the salinity of the oceans.

5. Do the following experiment to illustrate how salinity affects water density.
   a. Write a report of your observations for each part of the experiment.

      Objective: To observe how different water densities control the depth at which different water masses are located.

      Materials to gather:

      12 ounces tap water

      8 ounces tap water tinted with blue food coloring

      8 ounces clear, very salty water (¼ cup of salt in an 8-ounce glass of water)

      8 ounces slightly salty water tinted with red food coloring (1 teaspoon of salt in an 8-ounce glass of water)

      8 ounces very salty water tinted with green food coloring

      Large clear bowl (plastic or glass)

      4 12-ounce clear cups or glasses

      Stirring rod

      2 medicine droppers

      Activity:

      Part 1

      1. Label one cup "tap water" and fill it three-fourths full with clear tap water.
      2. Fill one medicine dropper with very salty green water.
      3. Place one drop of very salty green water into the cup with clear water.
      4. Record your observations.

      Part 2

      1. Label one cup "salty water" and fill it three-fourths full with clear salt-water.
      2. Fill the other medicine dropper with blue tap water.
      3. Place one drop of blue tap water into the cup with clear saltwater.
      4. Record your observations.

Part 3

1. Pour the remaining very salty green water into the clear bowl.
2. Pour the remaining clear tap water slowly into the bowl on top of the very salty green water.
3. Record your observations.
4. Clean the medicine dropper and fill it with slightly salty red water.
5. Place the dropper into the layer of very salty green water and squeeze out a drop of slightly salty red water.
6. Record your observations.
7. Use the same dropper of slightly salty red water. Place it into the layer of clear tap water and squeeze out a drop of slightly salty red water.
8. Record your observations.
9. Using the stirring rod, mix the layered water system together.
10. Record your observations.

b. Answer the following questions in your report.

1. What happened to the drop of very salty green water in the tap water? Why?
2. What happened to the drop of blue tap water in the salty water? Why?
3. Why did the tap and very salty green water not mix together?
4. What happened when the two drops of slightly salty red water were added to different layers? Why?
5. Based on the results of your experiment, theorize how oceanographers can measure the different densities in the open ocean.

Leader's Initials _____
Date _____

6. Make a cross-sectional drawing of an area of the seafloor (e.g., Hawaii, a continental shelf, the abyssal plains, the Tonga-Kermadec Trench). Make a topographical sketch of the same area, showing the depths of the trenches and the heights of the mountains on the seafloor. Label known landmass areas, e.g., canyon, trench, oceanic ridge, rift valley, seamount, and guyot. Use color codes or contour lines to show the elevations.

Leader's Initials _____
Date _____

7. Create a drawing of an ocean life scene with marine animals and plants placed at appropriate ocean depths. Illustrate and name the five "ocean zones"—tidal zone, neritic zone, open-ocean zone, bathyal zone, and the abyssal zone. List the types of marine life that live in each zone.

Leader's Initials _____
Date _____

8. Determine the amount of plankton a whale might eat and compare it to your own food consumption. Use the following data to do your calculations and show all of your work.

Data:

A whale swims at a speed of 1.5 meters per second while feeding.

Its mouth opening is 1.5 square meters.

Whales feed where plankton densities are 4,000 to 15,000 per cubic meters.

Calculations:

1. Determine how many cubic meters of water enter the open mouth of the whale each minute as it moves through the water at 1.5 meters per second.
2. Determine how much plankton a whale can ingest per second if the density of the plankton is 4,000 per cubic meter. Determine for 15,000 per cubic meter.
3. Determine how much plankton a whale can ingest per minute if the density of the plankton is 4,000 per cubic meter. Determine for 15,000 per cubic meter.
4. Determine how many calories a whale ingests per hour if it ingests 500,000 calories per day. Also determine how many calories it ingests per minute.
5. Calculate your own daily caloric intake by listing the following figures:
   a. Number of minutes you spend feeding per day
   b. Number of calories you ingest per day
   c. The calculated number of calories ingested per minute
6. Compare your caloric intake per minute with that of a whale. List factors that may account for the difference in caloric intake.

Leader's Initials
Date

9. Complete the following about coral:
   a. Define the following terms:
      1. Coral polyps
      2. Coral reef
      3. Symbiosis
      4. Coral algae
   b. Classify coral as animal, mineral, or vegetable. List another member of the same phylum as coral.
   c. List several reasons why coral reefs are important. Include how coral benefits people.
   d. Describe the best environment for reefs to grow.
   e. Describe the main differences between the three types of coral reefs: the fringing reef, the barrier reef, and the atoll.

Leader's Initials
Date

10. Describe the education needed to become an oceanographer. List entry-level qualifications and the preparation you can do now for a job in this field.

Leader's Initials
Date