Round: 10B

1. What ocean floor feature are you near?

   You are near the mid-ocean ridge (2 pts)

2. The thermometer measuring the water temperature already reads over 300°C. Why is the water still liquid and not vapor?

   There is very high pressure at this depth (1 pt), causing the boiling point of saltwater to be greater than 300 ℃ (1 pt).

3. You lower the thermometer to measure the temperature at the interface the sediment and the crust, and, to your surprise, the temperature decreases as you approach the vent! Why is this? How can you tell?

Figure 1a: Thermal Vent

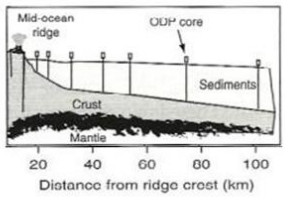
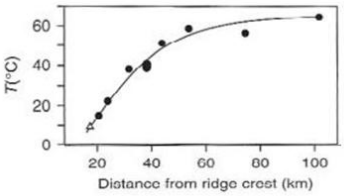


Figure 1b: Temperature Reading



The temperature at this interface is largely dictated by the thickness of the crust in this region (2 pts). From the data below, we can see that the crust thickness increases toward the ridge crest (1 pt), causing the temperature to decrease. (1 pt) (note that the closest measurement is 20 km from the vent).

4. Are hydrothermal vents sources or sinks for magnesium? For calcium? How do you know?

   Vents are sources for Mg and sinks for Ca (2 pts); this is evident from the fact that Mg concentrations increase near the ridge crest (1 pt) and Ca concentrations decrease (1 pt).

Figure 2a: Calcium Concentration

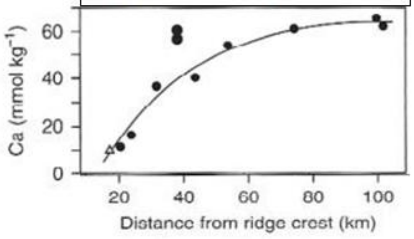


Figure 2b: Calcium Concentration

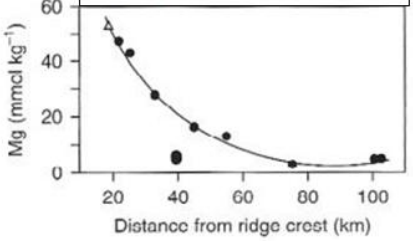
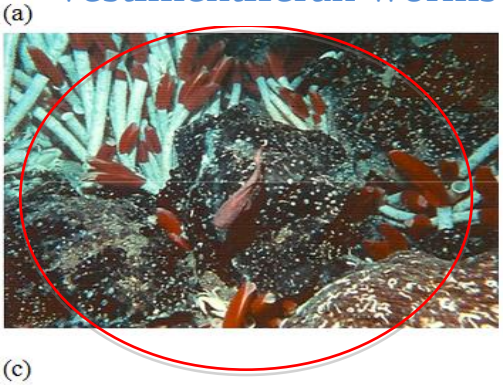


Figure 2b: Magnesium Concentration

5. You look around for signs of life. Luckily your submersible is equipped with a very powerful light. Circle and label only the images below that you would expect to see.

2 pts: Rifta pachyptila, vestimentiferan worms

(a)



(b)

(c)

(d)

2 pts: Calyptogena magnifica, vent clams

6. Name two (2) ways in which the animals in this environment differ visibly from the animals you would see in surface water.

Any two (2) of the following; (2 pts each, 4 pts total):

- Animals have less pigmentation than surface water counterparts

- Skeletons/exoskeletons are adapted to the pressure at such depths, so in general they may have thicker shells.

- Many have symbiotic relationship with chemosynthetic bacteria, or are specialized to feed on chemosynthesizers

- Cellular proteins and lipids are specially adapted to deal with temperature extremes.