

## Unit 6 Free Response Questions

Your class will select three questions from the following set that you must answer. Your answer to each question is worth a maximum of ten points each. Points are earned in the following ways:

**As many as 3 pts:** English writing conventions – the student writes complete sentences with proper punctuation and grammar. The question is restated in the context of the answer.

**As many as 4 pts:** The answer addresses the question that was asked. Required examples, explanations and illustrations are provided, though they might not be correct.

**As many as 3 pts:** The answer is conceptually correct.

1. Water has the unusual property of being denser as a liquid than as a solid. Explain the role that this difference plays in the weathering of rock on the surface of the Earth.
2. A 100 gram piece of iron (specific heat  $0.449 \text{ J/g}\cdot^{\circ}\text{C}$ ) and a 100 gram piece of lead (specific heat  $0.129 \text{ J/g}\cdot^{\circ}\text{C}$ ) are placed in the sun next to each other. After 30 minutes, which metal is hotter to the touch, and why?
3. It is a well-established fact that water molecules have strong attractions for one another. Name the type of bonding that occurs between water molecules. Draw a sketch of at least four water molecules, and show these intermolecular forces using dotted lines.
4. According to your periodic table, the energy required to melt one gram of ice at  $0^{\circ}\text{C}$  (the latent heat of fusion of water) is 334 joules per gram. The energy required to boil one gram of water at  $100^{\circ}\text{C}$  (the latent heat of vaporization of water) is 2260 joules per gram. Explain in terms of intermolecular attraction AND kinetic energy why the heat of vaporization is nearly seven times the value of the heat of fusion.
5. Imagine that you are stranded in the wilderness in winter time. The only available water is snow, and you do not have a stove or fire with which to melt it. You decide to eat the snow to quench your thirst. Where is the energy coming from to melt the snow as you eat it? Why might consuming the snow actually DECREASE your long-term chances of survival?
6. The combustion of one mole of methane,  $\text{CH}_4$ , produces 800,000 joules of energy. How many grams of ice at  $0^{\circ}\text{C}$  could be melted when **4 grams** of methane is burned? The heat of fusion of water is 334 Joules/gram.