

Blackbody Radiator Assessment Questions

1. When an object is in a state of thermal equilibrium, which of the following statements about energy flow is most accurate?
 - a) More energy **flows to** the object than away from it.
 - b) The flow of energy to the object is about **the same as** the flow of energy away from the object.
 - c) More energy **flows away from** the object than to it.
 - d) More information is needed to answer this question.

2. If an object receives more energy than it emits, what would you expect to happen to the average temperature of that object?
 - a) The object would become warmer.
 - b) The temperature of the object would stay about the same.
 - c) The object would become cooler.
 - d) More information is needed to answer this question.

3. If a object gives off more energy than it receives, what would you expect to happen to the average temperature of that object?
 - a) The object would become warmer.
 - b) The temperature of the object would stay about the same.
 - c) The object would become cooler.
 - d) More information is needed to answer this question.

4. Suppose you had two black, iron spheres. Sphere A has a temperature of 100°C (212°F). Sphere B has a temperature of 0°C (32°F). What can you say about the infrared heat energy being emitted by these two spheres?
 - a) Both spheres are radiating infrared heat energy. Sphere A is emitting more energy than sphere B.
 - b) Both spheres are radiating infrared heat energy. Sphere B is emitting more energy than sphere A.
 - c) Both spheres are radiating about the same amount of infrared heat energy.
 - d) Neither sphere is radiating infrared heat energy.
 - e) Only sphere A is radiating infrared heat energy.
 - f) Only sphere B is radiating infrared heat energy.

5. Suppose you had two black, iron spheres and an instrument that could measure the amount of electromagnetic radiation being emitted by each sphere. Your measurements show that sphere A is emitting less electromagnetic radiation than sphere B. What, if anything, can you conclude about the temperatures of the two spheres?

- a) These measurements would not tell me anything about the temperatures of the spheres.
- b) The spheres have the same temperature.
- c) Sphere A is warmer than sphere B.
- d) Sphere B is warmer than sphere A.

Calculations

1. Suppose you had two black, iron spheres. Sphere A has a temperature of 20°C . Sphere B has a temperature of 40°C . Calculate the relative amount of electromagnetic radiation being emitted by sphere B compared to sphere A.
2. Suppose you had two black, iron spheres. Sphere A is emitting about 5 times more electromagnetic radiation than sphere B. Calculate the relative temperatures of the two spheres.