

**SMS-303: Integrative marine sciences, physics.**

**Quiz Lab 1.**

- 1. The diffusion coefficient has units of:**
  - a. Length<sup>2</sup>/time.**
  - b. Length/time<sup>2</sup>.**
  - c. Length/time.**
  - d. None of the above.**
  
- 2. Diffusion of heat:**
  - a. can be described as a continuous macroscopic process.**
  - b. can be described as a discrete microscopic process.**
  - c. is linked to the kinetic energy of molecules.**
  - d. all of the above.**
  
- 3. Diffusion is a process that:**
  - a. decreases gradients (spatial differences in concentration) in the ocean.**
  - b. increases gradients (spatial differences in concentration) in the ocean.**
  - c. does not affect gradients (spatial differences in concentration) in the ocean.**
  - d. does not exist in the ocean.**
  
- 4. Increasing temperature:**
  - a. will tend to decrease the diffusion of solutes.**
  - b. will not change the diffusion of solutes.**
  - c. will tend to increase the diffusion of solutes.**
  - d. will tend to decrease the diffusion of heat.**
  
- 5. Diffusion and entropy (entropy is a measure of disorder):**
  - a. are related in that diffusion increases entropy.**
  - b. are related in that diffusion decreases entropy.**
  - c. are related in that entropy decreases diffusion.**
  - d. are not related.**

**6. Diffusion:**

- a. is the dominating nutrient transport mechanism into the upper ocean.**
- b. is the dominating nutrient transport mechanism within a breaking wave.**
- c. is the dominating nutrient transport mechanism in rivers.**
- d. is the dominating nutrient transport mechanism into a phytoplankton cell.**

**7. Double diffusion relates to:**

- a. processes arising from similar diffusion rates of heat and salt in the ocean.**
- b. processes arising from similar diffusion rates of nutrients and heat in the ocean.**
- c. processes arising from different diffusion rates of nutrients and heat in the ocean.**
- d. processes arising from different diffusion rates of heat and salt in the ocean.**

**8. The diffusion coefficients of heat and solutes:**

- a. Have the same magnitude.**
- b. Have opposite signs.**
- c. Have the same units.**
- d. Have opposite positions.**

**9. Biased random walk:**

- a. is similar to a diffusion plus a drift**
- b. is similar to a drift.**
- c. is similar to a diffusion.**
- d. none of the above.**

**10. When molecule diffuse:**

- a. all the molecule go down gradient.**
- b. some go up and some go down gradient, but the net transport is down gradient.**
- c. some go up and some go down gradient, but the net transport is up gradient.**
- d. All the molecule go up gradient.**