**A Scientific Experiment**

Names \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

Date

Brine shrimp, also called *artemia*, are tiny arthropods that are often used as live food in aquariums. The shrimp begin their life cycle as metabolically inactive cysts. The cysts can remain dormant for many years if they remain dry. If these cysts come in contact with salt water, they soon rehydrate and hatch, giving rise to living embryos.

*Experiment 1*

Scientists placed dormant brine shrimp cysts into three different soda bottles containing salt water. The scientists maintained the water in each container at a constant temperature of 25º Celsius, but they kept the salt concentration (milligrams of NaCl per liter of H2O) of each bottle at different levels. The scientists then recorded the average hatching rate for the cysts in each bottle.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Temperature (˚C) | Salt Concentration (mg/L) | Average Time to Hatching (hours) |
| Bottle 1 | 25 | 0.2 | 20 |
| Bottle 2 | 25 | 0.3 | 17 |
| Bottle 3 | 25 | 0.4 | 15 |

*Experiment 2*

The scientists repeated Experiment 1, except in this experiment they kept the salt concentration constant while changing the temperature in each bottle.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Temperature (˚C) | Salt Concentration (mg/L) | Average Time to Hatching (hours) |
| Bottle 1 | 15 | 0.3 | 33 |
| Bottle 2 | 25 | 0.3 | 17 |
| Bottle 3 | 35 | 0.3 | 26 |

*Experiment 3*

The scientists repeated Experiment 1, but placed all three bottles in the dark. The chart below shows the average hatching rate (in hours) for the brine shrimp in the three bottles in Experiment 1 and Experiment 3.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Experiment 1 | Experiment 3 |
|  | Bottle 1 | 20 | 35 |
|  | Bottle 2 | 17 | 28 |
|  | Bottle 3 | 15 | 25 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | |  |  | | |  | 1. Based on the results from Experiment 1, one can conclude that: | | |  | **A.** | brine shrimp hatch less quickly as salt concentration increases. | |  | **B.** | brine shrimp hatch more quickly as salt concentration increases. | |  | **C.** | hatching is unaffected by salt concentration. | |  | **D.** | salt concentration is dependent on temperature. | |
| |  |  |  | | --- | --- | --- | |  |  | | |  | 2. Which of the following was studied in Experiment 3? | | |  | **A.** | The effect of light on the time it takes for brine shrimp to hatch. | |  | **B.** | The effect of light on salt concentration. | |  | **C.** | The effect of light on temperature. | |  | **D.** | The effect of light on the survival rate of brine shrimp. | |
| |  |  |  | | --- | --- | --- | |  |  | | |  | 3. If the standard salt concentration used in Experiment 2 were changed from 0.3 mg/L to 0.4 mg/L, what would likely happen to the time it takes for the cysts to hatch? | | |  | **A.** | The time would increase. | |  | **B.** | The time would decrease. | |  | **C.** | The time would not change. | |  | **D.** | The time would be reduced to zero. | |
| |  |  |  | | --- | --- | --- | |  |  | | |  | 4. Under which of the following conditions would you expect a brine shrimp cyst to hatch in the *least* amount of time? | | |  | **A.** | In the light, in water with 0.2 mg/L salt concentration at 25 degrees Celsius. | |  | **B.** | In the dark, in water with 0.3 mg/L salt concentration at 35 degrees Celsius. | |  | **C.** | In the light, in water with 0.4 mg/L salt concentration at 25 degrees Celsius. | |  | **D.** | In the dark, in water with 0.2 mg/L salt concentration at 25 degrees Celsius. | |
| |  |  |  | | --- | --- | --- | |  |  | | |  | 5. Which of the following graphs best represents the change in hatching time with increasing temperature as shown in Experiment 2? | | |  | **A.** | brineshrimpa **B**. brineshrimpc | |  | **C.** | brineshrimpb  **D**.brineshrimpd | |
| |  |  |  | | --- | --- | --- | |  |  | | |  | 6. What would be the best way to study the effects of changing pH (acidity) on the hatching time of brine shrimp cysts? | | |  | **A.** | Putting all three bottles in the light and keeping temperature constant while changing salt concentration and pH. | |  | **B.** | Putting all three bottles in the dark and keeping temperature constant while changing salt concentration and pH. | |  | **C.** | Putting all three bottles in the light and keeping temperature and salt concentration levels constant while varying the pH in each bottle. | |  | **D.** | Putting all three bottles in the dark and varying temperature, salt concentration, and pH in all three bottles. | |