Name ____________________ Class ____________________ Date ____________________

Finding a Niche in a New Environment

A species of insects has been accidentally introduced from Asia into the North American forest. The success of this organism depends on its ability to find a suitable habitat, that is, one with the proper abiotic conditions for all of its life stages. The larval stage is very sensitive to changes in temperature, humidity, and light conditions. Exposure to situations outside the tolerance limits of this species results in a high mortality (death) rate. Data showing the influence of the three physical variables on the larva are presented in Table 1. The data for each variable were obtained while the other two variables were kept constant at optimum conditions.

Table 1

Temperature (°C)	Mortality (%)	Relative Humidity (%)	Mortality (%)	Light Intensity (foot candles)	Mortality (%)
15	100	100	80	200	0
16	80	90	10	400	0
17	30	80	0	600	10
18	10	70	0	800	15
19	0	60	0	1000	20
20	0	50	50	1200	20
21	0	40	70	1400	90
22	0	30	90	1600	95
23	20	20	100	1800	100
24	80	10	100	2000	100
25	100	0	100	—	—

Questions

1. On a separate sheet of paper, plot graphs that show the effects of <u>temperature</u> and <u>humidity</u> on the mortality rates of the introduced species. Use the format illustrated in Figure 1. (Next page)
2. Mark on the graph the area that represents suitable conditions for the insect larvae to survive the combined effect of these two environmental factors.
3. How much does the suitable area for the temperature factor decrease when the humidity factor is added?

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4. Add to your graphs another to illustrate the effect of light on the mortality of the larvae. Compare the suitable area for insect survival to the area in question 2.

5. Mark the most desirable area when all three factors—temperature, light, and relative humidity—are considered. State the temperature, relative humidity, and light ranges that are optimal for the larvae.

6. One spring morning while the larvae were feeding in the open, the temperature dropped to 18°C and a strong wind lowered the relative humidity to 40 percent. The light intensity was 400 foot-candles. Which factor had the greatest influence on insect mortality?

7. What other factors determine whether terrestrial organisms can find a niche in the environment?

8. Suggest a habitat that might suit this insect. How could it react to intolerable temperatures, relative humidities, and light intensities?

Figure 1