Teacher Key:
Pre-Assessment for *Environmental Influence on Gene Networks*
Answers in purple

1. Use the diagram at the right to answer the following questions. Circle the best answer.
   - If the circles (nodes) in the diagram are people, how many people can 1A contact?
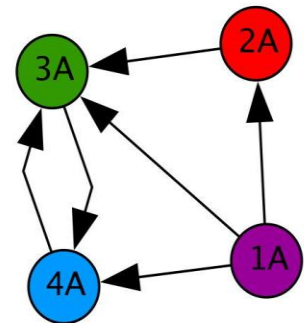
     0   1   2   **3**   4

   - How many people can contact 1A?

     0   1   2   3   4

   - How many people can contact 4A?

     0   1   **2**   3   4

   - If 2A sees a funny picture, who else will know about it? (Circle all that apply.)

     Nobody   1A   2A   **3A**   **4A**

   - Explain how/why a network diagram is a useful tool. **Look for: shows complexity, shows big picture while allowing access to details, all components can be visualized and tracked**

2. Various things are listed below. Place an X in front of the things that can be thought of as a system.

   __**X**__aquarium   __**X**__bicycle   ____pile of sand   __**X**__ocean   ____box of nails

   - Explain your thinking. How did you decide whether something is a system?

   If a part is removed, the system changes function. The sand or box of nails could lose a component and still be sand and a box of nails.

3. Explain the connection between microarrays, homology searching, and biochemical pathways. **Look for thinking. All of these things give information that can be used to compare molecules and phenotypes to better understand the inner workings of organisms. All of these parts being analyzed and measured are related and connected. DNA expression can tell us information about proteins, protein comparisons give us information about protein function and biochemical pathways tell us about the products and metabolites that organisms use. Scientists must use multiple and diverse data types, such as this, to build a usable, reliable, predictive network model (lesson 3).**

4. Students conducted an experiment to determine what causes seeds to germinate the fastest. The students used the same type of seed and water. They placed the six seeds of each test group on a paper towel in a petri dish. The data table below shows the data that they collected over several days on three groups of six seeds.

Test Group	Amount of Water	Temperature	Environmental Condition	Time of germination
1	5 ml	5°C	Dark	7 days
2	10 ml	25°C	Dark	6 days
3	15 ml	40°C	Light	4 days

What is the best conclusion based on these results? Circle the best answer.

A. The amount of water and the temperature affect the germination of the seeds.
B. The temperature and the amount of light affect the germination of the seeds.
C. The amount of water, the temperature, and the amount of light affect the germination of the seeds.
D. **No conclusion can be made from this data because too many variables were changed.**

What would your next experimental step be after these results?

Change the experimental set-up to include at least 3 trials while changing only one variable at a time or a traceable set of variables at a time.

5. Two student teams collected data as they raised the temperature in an aquarium and counted the breaths of a gold fish (per minute). Each team plans to make a line graph of their data. Which team can make a line graph AND will be more confident that their data is conclusive? Circle your answer – **Team A** or **Team B**. Also, explain your thinking in the space below Team B's table.

| Data Team A		Data Team B				
Temp (ºC)	Breath #	Temp (ºC)	Breath #	Breath #	Breath #	Breath #
18	32	18	31	32	32	31
20	38	27	43	42	43	42
22	39	36	51	52	52	51
24	40					
26	42					
28	43					
30	43					
32	50					
34	51					
36	52					

Look carefully for logical scientific thinking. Students should recognize two components: 1. A line can be made from 2 points, more is better but many is not necessary. 2. Repeatability/more than one trial increases reliability.

6. What are model organisms? What characteristics make an organism a good model organism? **Organisms that can be used in a lab setting to gain useful information for understanding more organisms other than itself. Reproduces fairly quickly, has comparable processes, allows for**

ethical use, easy living conditions, safe to use, useful data sets already exist and/or are easy to obtain, easy to manipulate, etc.

7. Give an example of HOW and WHY an organism responds to its environment.
   How – MANY options: changing phenotype, migrating, crying, etc.
   Why – to survive, evade predators, learn from mistakes, to limit energy use/loss, etc.

8. How might an environmental factor affect the phenotype (physical characteristic) of an organism? **Looking for thinking here, many options – UV rays changing skin pigment, exposure to low oxygen stimulating more red blood cells, acidic soil impacting flower color, exposure to radiation causing illness, cigarette smoking possibly leading to cancer, etc.**

9. The flow of information in a cell proceeds
   A. from RNA to DNA to protein.
   B. from protein to RNA to DNA.
   C. from DNA to protein to RNA .
   D. from DNA to RNA to protein.
   E. none of the above
   F. several are correct – it varies for different organisms

10. You are a scientist studying a pair of genes (RIP and gene RAP) which encode proteins that allow bacteria to use "Sugar Rhyme" as an energy source. You notice that the genes are only active when the bacteria are exposed to "Sugar Rhyme." Use words or a diagram to explain what may be happening.

Sugar Rhyme

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BUSTA   **P**   **RIP**   **RAP**

↓

iPod   **= RIP- RAP**
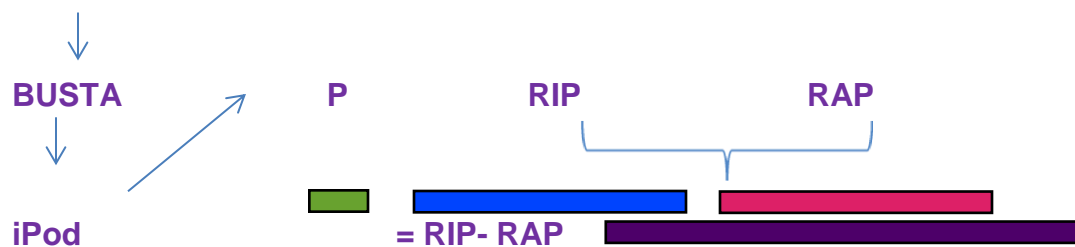
The sugar gets converted to intermediate BUSTA. When BUSTA binds the protein iPod, iPod can no longer bind DNA and repress transcription of RIP and RAP gene operon. Synthesis of RIP-RAP occurs.   (P is the promoter) An example would be the lac-operon in bacteria. For more information on gene expression, a good resource can be found at: http://www.nature.com/scitable/topicpage/gene-expression-14121669

Systems
Education Experiences
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