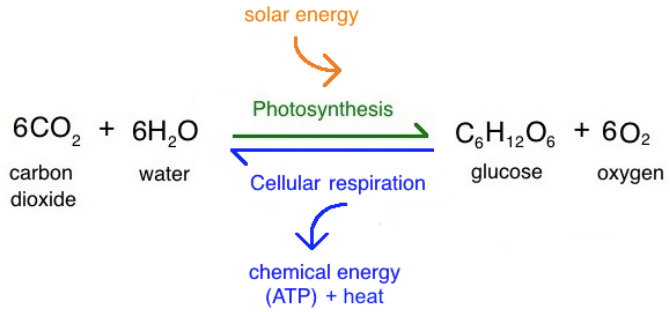
Name _____ Period _____

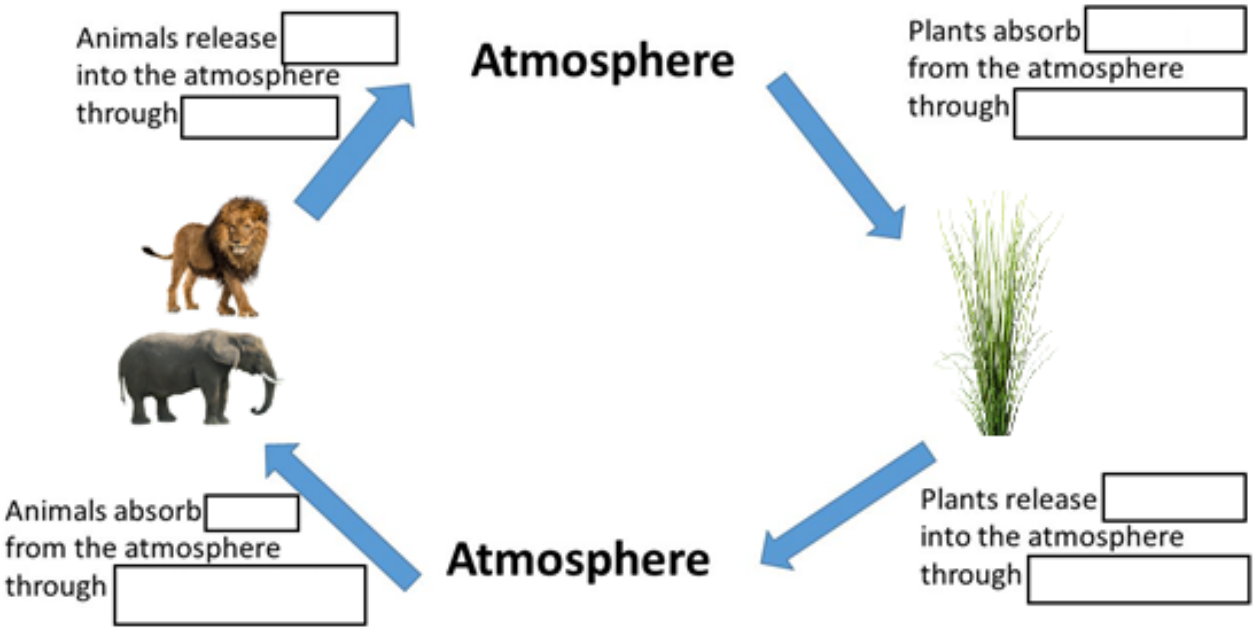
***Cellular Respiration***

Both plants and animals need to break down food molecules at the cellular level in order to obtain energy. This process is called cellular respiration. This process is dependent on photosynthesis and, since plants perform both processes, we call them autotrophs. Animals are heterotrophs as they need to consume their food from different sources. Use the chemical equations below to answer the questions once you have discussed each other's individual data. You may also want to revisit the data from the activity you did previously called "A Plant's Raw Materials."




1. Describe the relationship between photosynthesis and cellular respiration from the diagram above.

2. Fill in the boxes with the appropriate terms:




3. Using the diagram above, explain how photosynthesis and cellular respiration depend on each other.

4. Why must plants complete cellular respiration like animals?

5. How is cellular respiration dependent upon an animal's breathing rate?

6. Complete the following table.

| ***Environmental Factor*** | ***What is the relationship between photosynthesis and the concentration of each factor? (For example, what is the rate of PS with low vs. high oxygen)*** | ***What is the relationship between cellular respiration and the concentration of each factor? (For example, what is the rate of PS with low vs. high oxygen)*** |
|---|---|---|
| Oxygen levels | As oxygen concentration increases, the rate of photosynthesis increases.<br><br>As oxygen concentration decreases, the rate of photosynthesis decreases. | |
| Carbon dioxide levels | | |
| Temperature | | |
| Water | | |

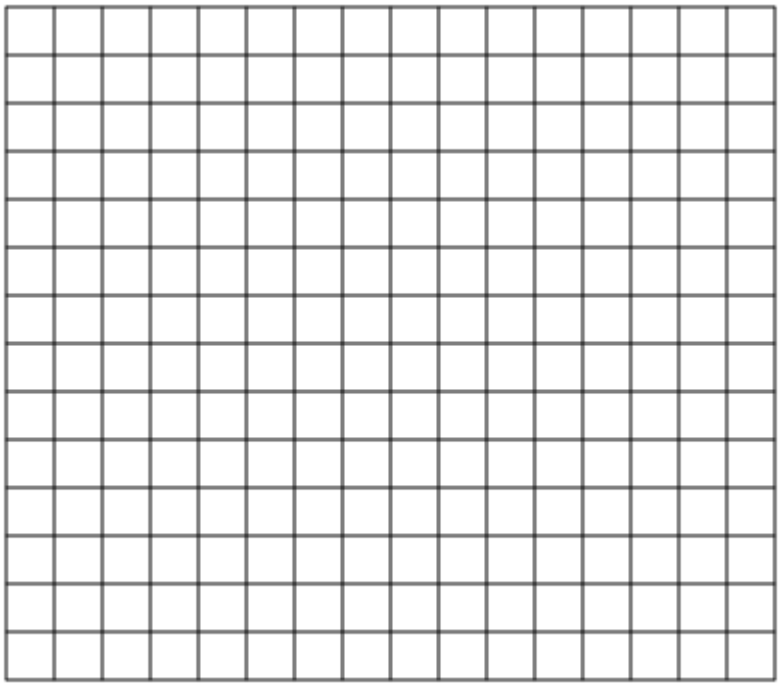
Name _____ Period _____

***Breathing Rate and Activity***

The following breathing rate data was collected while monitoring a lion on the savanna. The subject's breathing rate was measured at 2 minute intervals during each activity. The subject was a 5 year old adult female.

| **Breathing Rate over Time vs. Activity** | | | | | |
|---|---|---|---|---|---|
| Activity | *Breathing Rate (per minute)* | | | | |
| | 0 min. | 2 min. | 4 min. | 6 min. | 8 min. |
| Resting while standing | 10 | 10 | 12 | 11 | 13 |
| Resting while laying down | 10 | 8 | 10 | 10 | 10 |
| Running with other females | 10 | 33 | 35 | 37 | 40 |
| Chasing prey | 10 | 40 | 58 | 60 | 65 |
| Walking (2.5 mph) | 10 | 20 | 21 | 23 | 26 |
| Walking (4 mph) | 10 | 25 | 30 | 33 | 37 |

Directions: Graph the data from the table above.



1. What is the relationship between breathing rate and activity?

2. Explain the relationship between the breathing rate and amount of oxygen needed.

3. Explain on a cellular level why there would be a decrease in breathing rate for some activities.

4. Explain why the breathing rate for running with other females may continue to rise if it were measured at 10 and 12 minutes.

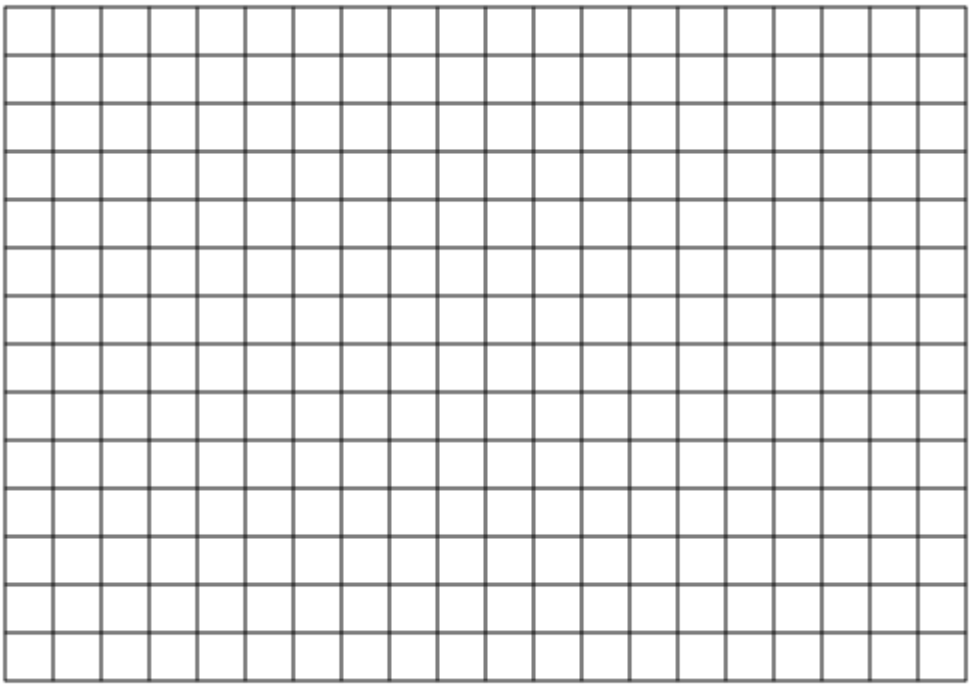
Name: _____ Period: _____

***Breathing rate and oxygen levels***

In 1771, Priestley noticed that a mouse in a sealed jar would eventually collapse. He then tried slipping a sprig of mint inside and realized the plant revived the mouse. The data below shows how the mouse's breathing rate changed during Priestley's experiment.

| Time (min.) | Breathing Rate/min. | Amount of $O_2$ in the jar | Amount of $CO_2$ in the jar |
|---|---|---|---|
| 0 | 160 | 90% | 10% |
| 10 | 165 | 80% | 20% |
| 20 | 175 | 70% | 30% |
| 30 | 190 | 60% | 40% |
| 40 | 250 | 50% | 50% |
| 50 | 280 | 40% | 60% |
| 60 | 320 | 30% | 70% |
| **The sprig of mint was added to the jar.** | | | |
| 70 | 310 | 35% | 65% |
| 80 | 290 | 40% | 60% |
| 90 | 280 | 45% | 55% |
| 100 | 265 | 50% | 50% |

**Directions: Graph the breathing rate vs. time.**



1. What is the relationship between the mouse and mint plant (What does the plant give off that the mouse takes in)?

2. Explain the **trend** of the breathing rate from 0-60 minutes.

3. Give a reasonable explanation as to what happened between 30-60 minutes.

4. Explain why the breathing rate of the mouse would increase as less and less oxygen is available. (See 0-60 min.)

5. Why does the rate of breathing change after the sprig of mint was added?

6. **Highlight on the graph** the points after the mint sprig was added. How does the addition of the mint sprig affect the mouse?

7. At which percentage of oxygen would Priestley have noticed a large change in the mouse's breathing rate?

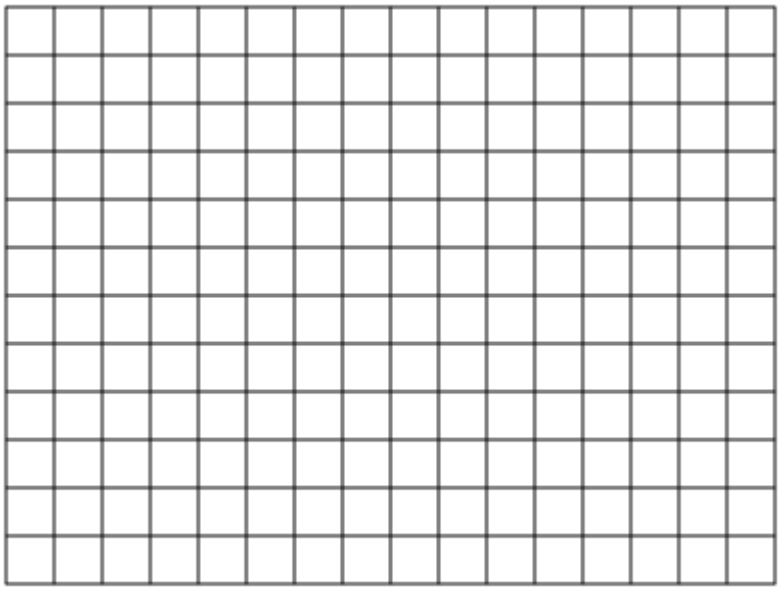
Name _____ Period_____

***Breathing rate and temperature***

Data was collected by researchers where the breathing rate of a lion was measured at different temperatures. The results of that experiment are in the data table below. The average temperature is highlighted in the table.

| Temperature (°C) | Breathing Rate (Breaths per Minute) |
|---|---|
| 6 | 15 |
| 13 | 25 |
| 18 | 30 |
| 20 | 38 |
| **23** | **45** |
| 25 | 52 |
| 27 | 58 |
| 32 | 60 |

**Directions**: Graph the data from the table above.



1. What is the relationship between the temperature and breathing rate?

2. What trend is seen in breathing rate as the temperature increases? Use data to support your answer.

3. Give a reasonable explanation for the breathing rate trend you see in your graph.

4. At the average temperature of 23°C, the lion's $O_2$ level in each body cell is 90%. At 27°C, the lion's $O_2$ level is 80% and at 32°C, the lion's $O_2$ level is 70%. Give a reasonable explanation for these percentages including breathing rate data.

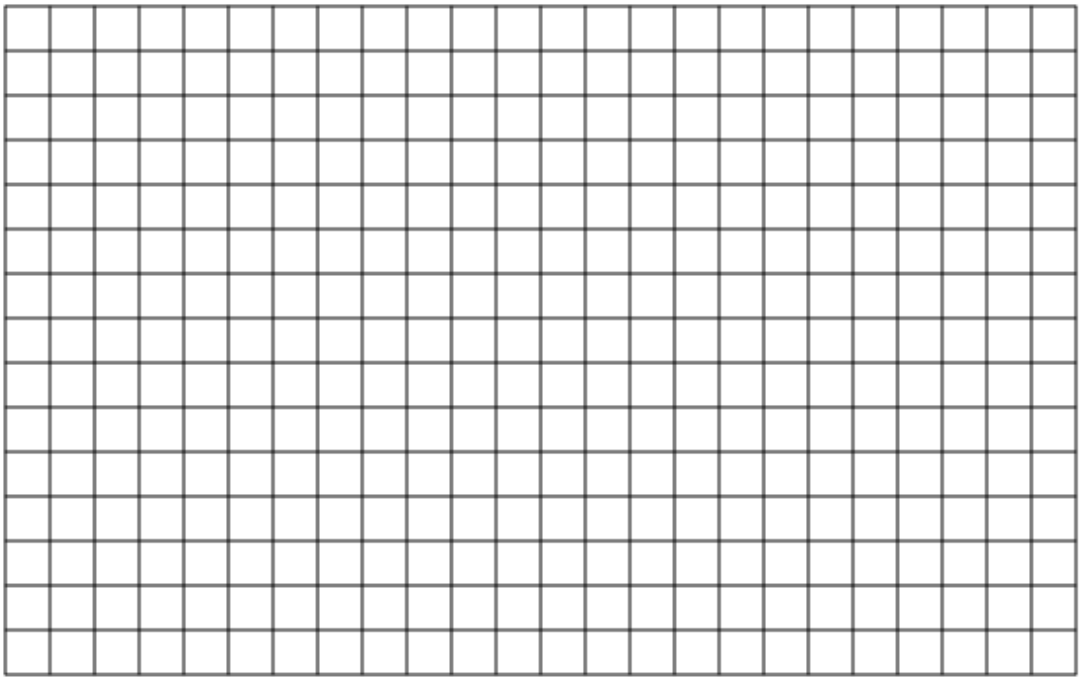
Name _____ Period _____

***Breathing Rate and Time of day***

Data was collected by researchers where the breathing rate of an elephant was measured at different times of day. The results of that experiment are in the data table below. Use the following data from this elephant, complete the graph and answer the questions that follow.

| Time of Day | Breathing Rate/min. | | Time of Day | Breathing Rate/min. |
|---|---|---|---|---|
| 12 am | 12 | | 12 pm | 22 |
| 1 | 10 | | 1 | 16 |
| 2 | 10 | | 2 | 20 |
| 3 | 10 | | 3 | 25 |
| 4 | 10 | | 4 | 22 |
| 5 | 11 | | 5 | 20 |
| 6 | 20 | | 6 | 26 |
| 7 | 18 | | 7 | 18 |
| 8 | 15 | | 8 | 18 |
| 9 | 16 | | 9 | 15 |
| 10 | 20 | | 10 | 15 |
| 11 | 24 | | 11 | 14 |

**Directions:** Graph the above data table.



1. What is the relationship between the time of day and breathing rate?

2. What trend is seen in breathing rate as the day goes on? Use data to support your answer.

3. Explain the relationship between the breathing rate and amount of oxygen needed.

4. During what time frame(s) did the breathing rate remain constant?

5. Give a reasonable explanation as to why this occurs.

6. Explain on a cellular level why there would be a lesser need for oxygen at some points during these 24 hours.

7. Give a reasonable explanation as to why the breathing rates increased at 6AM, 11AM, 3PM, and 6PM.