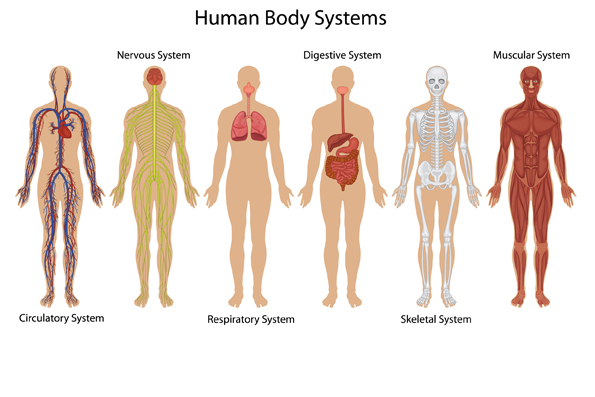
**Unit Essential Question:** *How do our bodies produce and use the energy needed to move objects?*

**Engage**

In Task 2, you learned how the nervous system plays a key role in the body’s ability to make objects move. But what other subsystems of the body are involved in various actions?

The picture below shows the main subsystems of the human body that we will be exploring in this task.



Your teacher will show pictures of different real-life activities. For each activity,

* + - 1. Discuss with your group which body systems you think are involved and record on a blank piece of paper.

1. Show your group’s paper to the rest of the class at the same time as other groups.
2. Compare with other groups and discuss any differences as a class.

As a group, discuss:

1. Which body systems did the class think were involved in *most* of the activities?
2. Which body systems did the class think were involved in only a *few* of the activities?

**Unit Essential Question:** *How do our bodies produce and use the energy needed to move objects?*

**Explore**

Based on our prior knowledge, we have ideas about the subsystems of the body that are utilized in different activities, but how can we know? Let’s gather evidence of different body systems working together by conducting an experiment. With your group, follow the procedure below:

1. Assign roles within your group.
   1. Exerciser/Heart Rate Monitor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Respiratory Rate Monitor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Timer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Data Calculator/Recorder: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Measure the *Exerciser’s* heart rate and respiratory rate while they are sitting at rest.
   1. *Exerciser*: To measure heart rate, press 2 fingers on your neck right underneath your chin to feel the number of heartbeats.
   2. *Respiratory Rate Monitor*: To measure respiratory rate, observe the number of breaths as shown by the *Exerciser’s* chest rising.
   3. *Timer*: Use a phone, watch, or timer to measure time (10 seconds for each round). Tell the *Exerciser* and *Respiratory Rate Monitor* when to start counting and when to stop counting.
   4. *Recorder*: Record number of heartbeats and number of breaths. Then calculate heart rate (beats per minute) and respiratory rate (breaths per minute) by multiplying these numbers by 6. Record.
3. *Exerciser*: Do jumping jacks for 2 minutes (The *Timer* will tell you when to start and stop). *All Other Group Members*: Immediately after *Exerciser* finishes the jumping jacks, repeat the steps above to measure heart rate and respiratory rate after exercise.
4. Make sure all team members have recorded the data. Discuss and record any other observations your team noticed about the *Exerciser* before and after exercise.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **At Rest** | | **After Exercise** | |
| **Heart Rate**  **(Beats Per Minute)** | \_\_\_\_\_ in 10 secs | x6 = \_\_\_\_\_ bpm | \_\_\_\_\_ in 10 secs | x6 = \_\_\_\_\_ bpm |
| **Respiratory Rate**  **(Breaths Per Minute)** | \_\_\_\_\_ in 10 secs | x6 = \_\_\_\_\_ bpm | \_\_\_\_\_ in 10 secs | x6 = \_\_\_\_\_ bpm |
| **Other Observations** |  | |  | |

**Unit Essential Question:** *How do our bodies produce and use the energy needed to move objects?*

**Explain**

**Engaging in Argument From Evidence**: A student from another class is arguing that doing exercise requires only the respiratory system and circulatory system to work together. Individually, write an argument supporting or refuting this student’s claim. Use evidence from the experiment as well as the article provided by your teacher to support your argument.

|  |  |
| --- | --- |
| **Claim**:  Do you agree or disagree with the student from the other class? Why? |  |
| **Evidence and Reasoning**:  What experimental data supports your claim?  What other scientific information can you use to support your claim? |  |

**Unit Essential Question:** *How do our bodies produce and use the energy needed to move objects?*

**Elaborate**

**Systems and System Models:** In your argument, you wrote about the different body systems involved in doing exercise. With your group, make a poster model that shows all the subsystems at work during exercise and exactly how they interact to make exercise possible. Your poster should show a diagram or flowchart that includes:

* A labeled image of each subsystem that is used during exercise
* Key organs and tissues of each subsystem that is used during exercise (This will require research!)
* Arrows and captions between the subsystems to describe how they interact

You may use the space below to plan your poster:

**Unit Essential Question:** *How do our bodies produce and use the energy needed to move objects?*

**Evaluate: Connecting to the Culminating Project**

You have been asked to teach people how their bodies make the movement of objects possible in a specific activity. In this task, you learned that there are other subsystems of the body at work, besides just the nervous system.

* In a paragraph, flowchart, or diagram, explain how different subsystems of the body work together to do your chosen activity.

This should be individually in your Project Organizer.

**Unit Essential Question:** *How do our bodies produce and use the energy needed to move objects?*

**Reflection**

Individually reflect on Task 3, using the questions provided:

1. At the beginning of this task, you were asked to identify which body systems you thought were involved in different activities. Look back at your responses to the questions in the *Engage*. How has your understanding of the body systems involved in various activities changed over the course of this task?
2. In this task, we focused on the crosscutting concept of:

* **Systems and System Models**:Systems may interact with other systems and may have sub-systems.

Where do you see examples of **Systems and System Models** in this task?

1. Now that you have learned more about other subsystems of the body that are needed to do activities, what questions do you still have?