

Homeostasis mini-PBL

Problem:

The Mars Colonist will need to have ability to work outside of the Bio-domes on the surface of Mars. Your team Biological engineering team has entered a contest to design a spacesuit that is able to meet the needs of human worker on the surface of Mars for a minimum of ten hours. As a part of this design you will need to explain the function and biological purpose for each component of your design.

Lenses:

Suit Engineer – Your job is to describe the structures and functions of the suit to help user’s body maintain homeostasis. You will be responsible for one of the four drawings/models described in the rubric.

Body systems specialist – Your job is to describe the structures and functions of the human body systems and their importance in maintaining homeostasis. You will be responsible for one of the four drawings/models described in the rubric.

Endocrinologist – Your job is to describe the feedback systems in the body and how they function to maintain homeostasis. You will be responsible for one of the four drawings/models described in the rubric.

Cellular biologist – Your job is to describe how cancer occurs in the body when exposed the radiation from space. You will be responsible for one of the four drawings/models described in the rubric.

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| Explain how the body transports oxygen and carbon dioxide and how the suit maintains levels necessary for the user | <ul style="list-style-type: none"> ● Respiratory system – structures & functions | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Circulatory system – structures & functions <ul style="list-style-type: none"> ○ Diffusion of gases between alveoli and blood stream, diffusion of gases at cellular level | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Negative feedback loop – breathing rate and heart rate | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Has a labeled diagram or model showing the functions of the suit as it relates to homeostasis of the user | 1 | 2 | 3 | 4 |
| Explain how the body maintains blood sugar levels and how the suit will provide a means to keep nutrients in and dispose of wastes from the body. | <ul style="list-style-type: none"> ● Digestive system – structure & functions | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Circulatory system – structure & functions <ul style="list-style-type: none"> ○ Transport of nutrients between intestine and blood stream (passive and active transport) ○ Regulation of water in the body and removal of wastes from the body (Osmosis – hypertonic, isotonic, and hypotonic solutions) | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Negative feedback loop – Blood sugar level | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Has labeled diagrams or model showing the functions of the suit as it relates to homeostasis of the user | 1 | 2 | 3 | 4 |
| Explain how the body maintains an internal temperature and how the suit will maintain a temperature necessary for the user. | <ul style="list-style-type: none"> ● Nervous system – structure & function | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Brief overview of integumentary system and muscular system for their connection to nervous system and body temperature | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Negative feedback loop – Body temperature | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Has a labeled diagram or model showing the functions of the suit as it relates to homeostasis of the user | 1 | 2 | 3 | 4 |
| Explain how the suit will shield the body from radiation | <ul style="list-style-type: none"> ● Describes the cell cycle, mitosis, and cancer <ul style="list-style-type: none"> ○ Discusses cell division as it relates to surface to volume ratios ○ Includes cell communication, inhibition, and differentiation | 1 | 2 | 3 | 4 |
| | <ul style="list-style-type: none"> ● Has a labeled diagram or model showing the functions of the suit as it relates to homeostasis of the user | 1 | 2 | 3 | 4 |