

## High-Altitude Ballooning Program: Content Knowledge Survey

Name: \_\_\_\_\_ School: \_\_\_\_\_

Date: \_\_\_\_\_ Grade: \_\_\_\_\_

### First some **facts and vocabulary**:

- *Jet airplanes can fly about 10 kilometers above the ground (about 30,000 feet)*
- *Weather balloons can rise to 30 kilometers (about 90,000 feet – call that “**near space**”)*
- *The “edge of outer space” is defined as 100 kilometers up (about 300,000 feet)*
- *Spacecraft usually orbit at least 200 kilometers up (well above the “edge of outer space”)*

1. Name three types of information you might gather with a science payload (experiment box) carried to “near space” (the upper atmosphere) using a weather balloon.
2. What kind of equipment would you need in your payload to gather the information listed above?
3. The four main layers of the atmosphere (listed alphabetically) are  
Mesosphere                  Stratosphere                  Thermosphere                  Troposphere  
  
Show the order of these layers by putting a “1” by the name of the layer closest to the surface of the earth, a “2” by the name of the layer above that, a “3” by the layer above that, and a “4” by the name of the highest layer of the atmosphere.
4. Name two gases that are commonly used to fill weather balloons.  
(a) Hydrogen and helium  
(b) Oxygen and nitrogen  
(c) Carbon dioxide and carbon monoxide
5. **Why** are the two gases that you named in the question above preferred?  
(a) They are very chemically reactive  
(b) They are very chemically un-reactive (i.e. “inert”)  
(c) They are lighter than air  
(d) Both (a) and (c)  
(e) Both (b) and (c)

6. On which of the following days would it be **hardest** to launch a weather balloon?  
(a) A rainy day (but not windy)  
(b) A windy day (but not raining)  
(c) A hot summer day (but not raining and not windy)  
(d) A cold winter day (but not snowing and not windy)
7. How can you transmit information from a weather balloon experiment to the ground while the balloon is in near space?  
(a) You cannot – you need to wait for the balloon to pop and the experiment to fall to the ground before you can possibly get any data back  
(b) Using audio signals (sound – listen from the ground to receive information)  
(c) Using flashers (visible light – watch from the ground to receive information)  
(d) Using radio waves (tune in a radio on the ground to receive information)

As you ascend into the upper atmosphere, some properties of the environment remain the same (don’t change), some properties increase (go up), and some properties decrease (go down). Describe how the following properties of the environment change as you ascend to near space (then continue upward from there, toward the edge of outer space).

8. As you **ascend** into the upper atmosphere, how does the **air pressure** change?  
(a) It does not change  
(b) It goes up and up  
(c) It goes down just a little (a few percent)  
(d) It goes down a lot (till it approaches zero)  
(e) It goes down some and up some, depending on the layer of the atmosphere you are in
9. As you **ascend** into the upper atmosphere, how does the **air temperature** change?  
*Select from the choices offered to problem 8.*  
(a)                  (b)                  (c)                  (d)                  (e)
10. As you **ascend** into the upper atmosphere, how does the **amount of sunlight you receive** change?  
*Select from the choices offered to problem 8.*  
(a)                  (b)                  (c)                  (d)                  (e)
11. As you **ascend** into the upper atmosphere, how does the **amount of cosmic radiation you receive** change?  
*Select from the choices offered to problem 8.*  
(a)                  (b)                  (c)                  (d)                  (e)
12. As you **ascend** into the upper atmosphere, how does the **gravitational force you feel** change?  
*Select from the choices offered to problem 8.*  
(a)                  (b)                  (c)                  (d)                  (e)