Bill Nye – Phases of Matter

1. All the stuff in the universe is made up of **matter**

2. Matter comes in 3 basic forms called **solid**, **liquid** & **gas**

3. In terms of energy, what is the difference between solid and molten (liquid) steel? In solid steel the particles have less energy and are moving slower than in liquid steel.

4. In what phase do we buy gasoline? **liquid**

5. In what phase is gasoline when it is burned in a car motor? **gas**

6. What does it take to make things change phase? **energy (heat)**

7. Describe how energy must change in order to make the following phase changes.
   - Liquid → gas **energy is added**
   - Liquid → solid **energy is taken away**

8. Where does the energy from the inside of the “stainless steel freezer of science” go? The heat must go someplace. **the energy goes outside of the freezer**

9. How do you make “fried ice”? Describe the phase changes that occur.
   - Add heat to the solid to turn it into a liquid and keep adding heat to turn it into a gas.

10. The temperature of liquid nitrogen is **-196 °C**

11. What percentage of air is nitrogen? **78%**

12. What does the heat from the room do to liquid nitrogen molecules? The heat makes the molecules move faster and turn into a gas.

13. What was the “stuff” coming out of Bill’s nose? **gas**
14. What is pressure? What causes it?
Pressure is the molecules hitting the sides of a container.

15. What is “absolute zero”? What does it mean?
-279°C. It is a theoretical temperature at which point all motion of molecules would stop.

16. Why can absolute zero never be reached?
Any device would always be attached to something else and would allow a path for heat to flow into any device that would be measuring the temperature.

17. What phase is “skipped” when solid CO₂ is warmed up? ___ liquid

18. Compare the relative speeds of the molecules of solids, liquids and gases.
   Solids ___ slowest ___ Liquids ___ medium ___ Gases ___ fastest ___

19. How does the “Clever Science Trick” with the broomstick and CO₂ gas work?
CO₂ gas can flow just like a liquid. Since it is more dense than air it will fill the bag and cause the broomstick to tip.

20. When you “see” your breath, what phase of matter is the water in? ___ gas ___

21. Describe the relationship of the states of matter to the containers they may be placed in.
   Solids ___ keep their own shape ___
   Liquids ___ take the shape of the container they are in ___
   Gases ___ take the shape of the container they are in ___