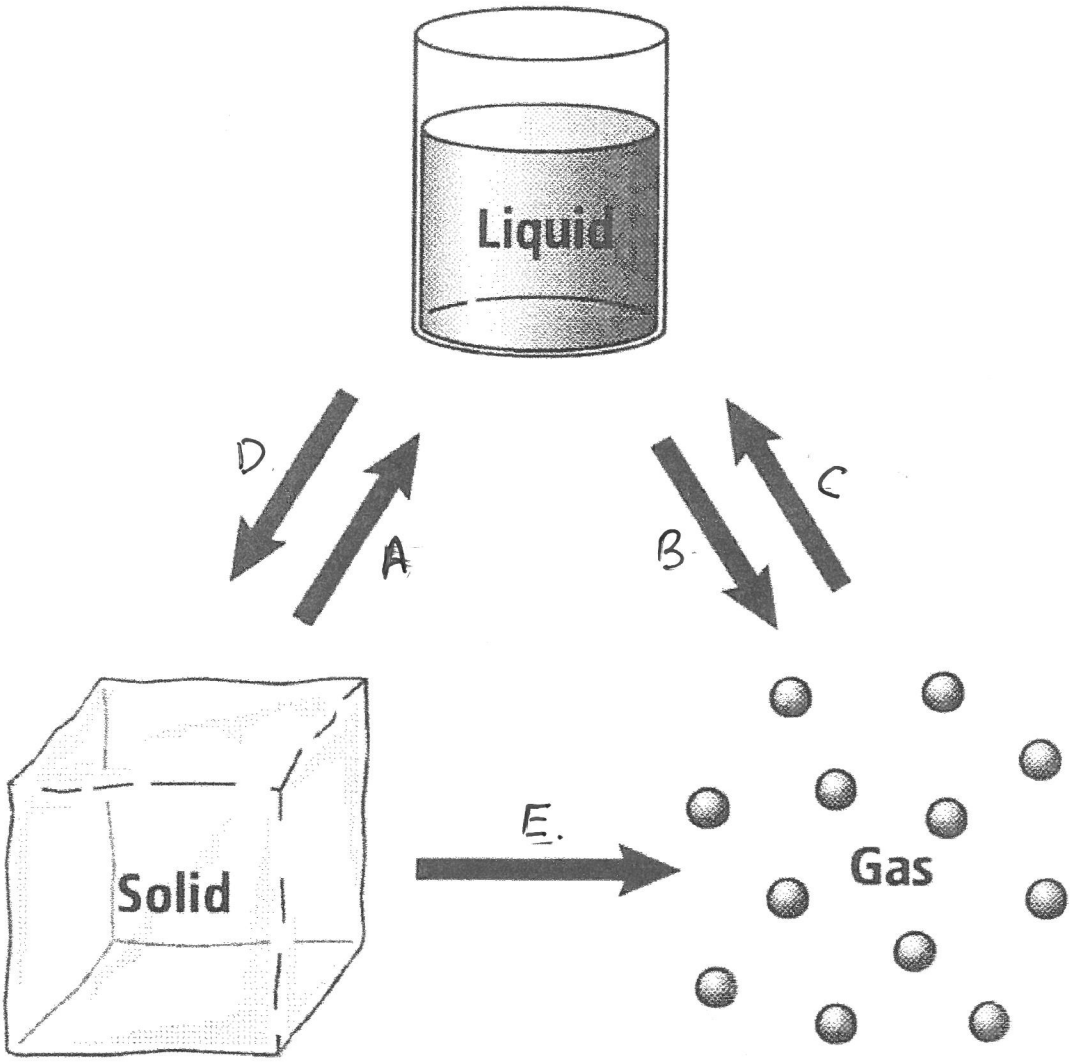
Identify the phases (Δ) of matter

STATES of MATTER



A) _____

B) _____

C) _____

D) _____

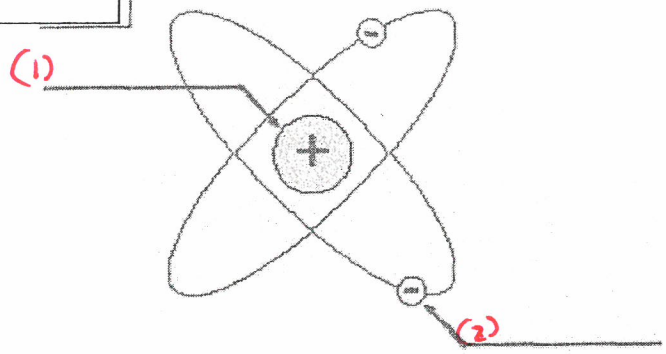
E) _____

What is Matter?

Matter *is anything that has mass.*
All objects are made of matter. Air, water, a brick, even you are made of matter. Matter is made up of smaller pieces. Over eighty years ago, scientists thought that the **atom** was the smallest piece of matter. At that time, the atom was thought to be the building blocks of matter.

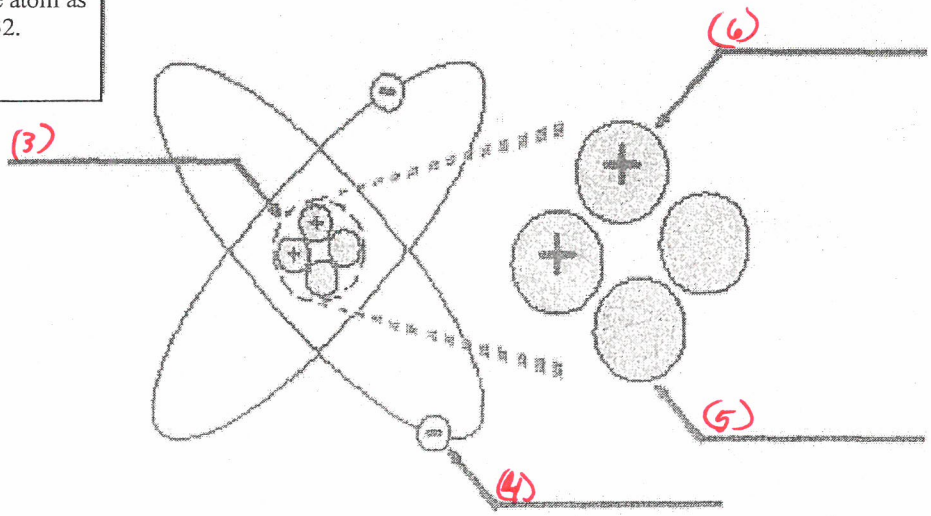
In 1911, a scientist named Ernest Rutherford discovered that atoms are really made of a positively charged center called the **nucleus** orbited by negatively charged particles called **electrons.**

Label the parts of the atom as it was known at 1911.



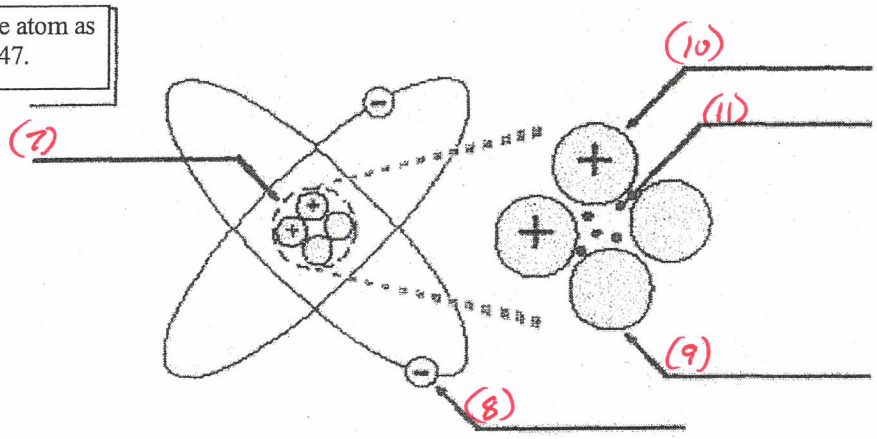
In 1932, scientists discovered that the nucleus of an atom is made of smaller particles: called **protons** and **neutrons.** **Protons** carry a *positive charge* while **neutrons** have *no charge* at all. Protons and Neutrons are each called **nucleons** since they are found in the nucleus. When they were discovered, scientists thought they were the smallest piece of matter.

Label the parts of the atom as it was known in 1932.



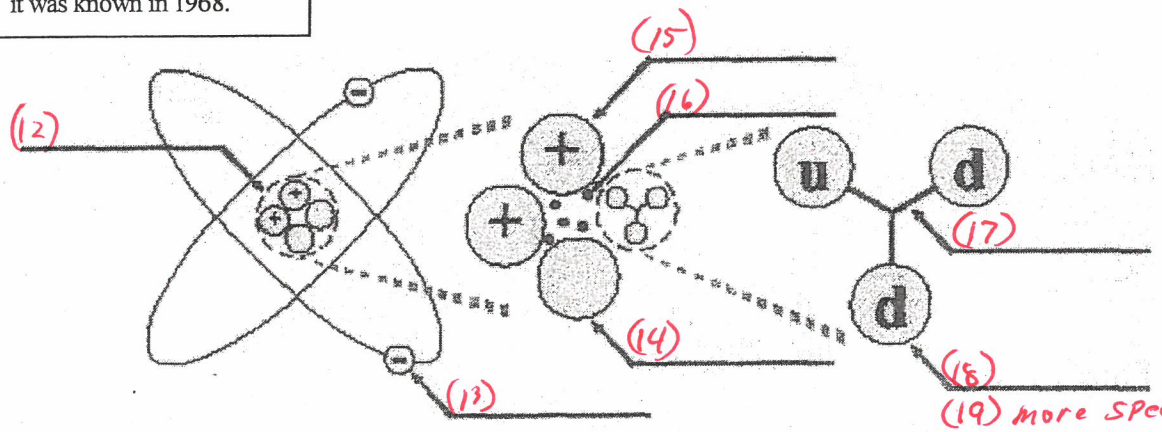
Scientists know that opposite charges attract and like charges repel, so they wondered why the protons in the nucleus didn't fly apart. They found the answer in 1947 when they discovered other particles that they named **mesons. Mesons** hold the protons and neutrons together to form the nucleus.

Label the parts of the atom as it was known in 1947.



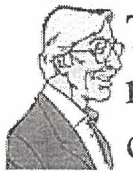
As scientists did more experiments, they began to realize that there was something funny about protons and neutrons. In 1968 they discovered that protons and neutrons are made up of smaller particles they called **quarks**. Scientists discovered six different types of quarks: **Up, Down, Strange, Charm, Top and Bottom.** *Protons* have two Up quarks and one Down quark, while *neutrons* have two Down quarks and one Up quark. Quarks are held to each other by particles: scientists called **gluons**

Label the parts of the atom as it was known in 1968.



Some scientists now think that the **quark** is the smallest piece of matter. Scientists used to think that atoms were the smallest bit of matter, but they discovered that it wasn't. Do you think that the quark is the smallest piece of matter or do you think that there might be something smaller inside the quark?

Valence Electrons



The name "valence electrons" obviously comes from the older idea of valences; the mysterious numbers Mendeleev used can now be explained via electron configurations. Look again at the applet and the valence chart below, and see if you can tell why the valence system worked and what the numbers really mean.

1st level →	1										0 →	max in outer shell!
2nd level →	1	2					3	4	3	2	1	0 →
3rd level →	1	2					3	4	3	2	1	0 →
4th Level →	1	2		transition metals			3	4	3	2	1	0 →
	...											

Electron configurations will also explain why the transition metals didn't fit the pattern, as you'll soon see.