

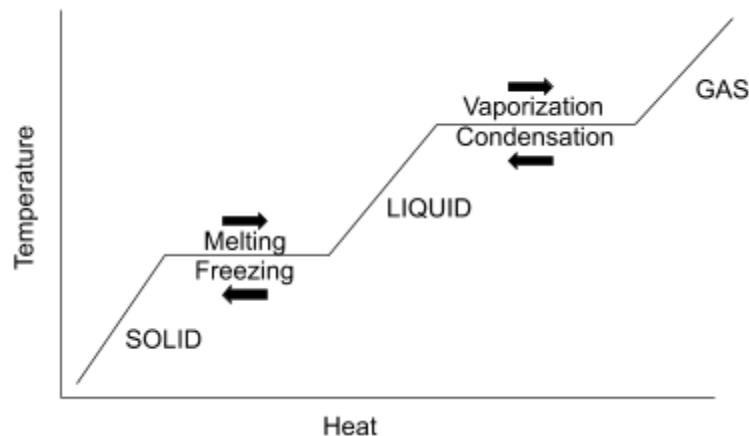
SCIENCE BASICS FOR THE ACT

Here are some of the scientific concepts you might be required to know. Don't worry too much about memorizing everything-- not many questions will require this sort of background knowledge. Of these topics, some are more commonly tested than others. The pH scale, properties of density, and prefixes are seen the most frequently.

The pH scale: The pH scale ranges from 1-14 and is used to measure the acidity/alkalinity of a solution.

- anything **under** 7 is considered **acidic**
- 7 is a neutral pH
- anything **over** 7 is **alkaline** (sometimes referred to as **basic**)

Phase changes: With an increase/decrease in temperature, matter will undergo basic phase changes (between solid, liquid, and gas).



- When in doubt, think of water. When it's really cold, it turns to ice (solid). When it warms up, it melts and turns to liquid. When you boil it, it turns to steam (gas).

Basic unit conversions and prefixes: The most commonly tested prefixes are kilo, centi and milli.

Prefix	Symbol	Meaning	Scientific Notation
Kilo-	k	1,000	10^3
Centi-	c	.01 (one hundredth)	10^{-2}
Milli-	m	.001 (one thousandth)	10^{-3}

Be sure you know how to convert from one unit to the other. You will need to move the decimal place to the:

- RIGHT when converting from larger unit to smaller unit
- LEFT when converting from smaller unit to larger unit

Ex: 5L is equivalent to 5,000 mL (moved decimal place 3 units to the right)

30L is equivalent to .03 kL (moved decimal place 3 units to the left)

How charges interact: Opposite charges (positive and negative) will attract one another. Like charges (positive and positive; negative and negative) will repel one another.

Properties and formula for density: Density is the ratio of an object's mass and volume.

$$D = \frac{m}{v}$$

- In a solution, objects that are **less** dense will **float**.
- Objects that are **more** dense will **sink**

Kinetic vs. Potential energy: **Kinetic energy** is the energy which an object contains because of a particular motion. **Potential energy** is the stored energy, when an object is in a state of rest.

Basic cell structure and functions:

- The cell **nucleus** acts as the brain of the cell and contains the cell's DNA (the genetic makeup from which proteins are made)
- The **mitochondria**, sometimes referred to as the powerhouse of the cell, creates energy-rich molecules (ATP) for the cell.
- The **cell membrane** holds all of the pieces of the cell together and serves as a barrier between the cell and adjacent cells.
- **Chloroplasts** only exist in plant cells and assist in the process of photosynthesis.
 - **Photosynthesis** is the process in which plants take carbon dioxide, water and sunlight and convert it into sugar (glucose) and oxygen.

Molecular structures:

- **Sugars:** $C_6H_{12}O_6$ is the basic glucose (sugar) molecule structure
- **Fats** (saturated, unsaturated and trans): are made up of C (Carbon), H (Hydrogen), and O (Oxygen). To differentiate fats from sugar, fats have nearly twice the number of H as C and a very small number of O. They also form long chains of repetitive molecules.
- **Proteins:** are composed of **amino acids** and are made based on the original DNA sequence. All proteins contain C, H, O and N (Nitrogen). The nitrogen in particular sets them apart, as fats and sugars will rarely if ever contain nitrogen.
- **Nucleic acids** are biomolecules like **DNA and RNA**. Nucleic acids consist of a sugar group, a P (Phosphorus) group and a base containing N in addition to C, H, and O.

Basic definitions for chemical reactions:

- **Reactant:** substances at the beginning of a reaction
- **Products:** substances at the end of a reaction
- **Solute:** substances which dissolve in solvent
- **Solvent:** the liquid in which a solute is dissolved to form a solution
- **Solution:** a homogenous mixture of two or more components

Classifications of Living things: More specifically, knowing that a species is the lowest (or most specific) form of classification and falls within the larger classifications (like genus and family)

Dominant vs. Recessive Traits When genes that code for particular traits combine, they need to decide who comes out on top. For example, you can only have one hair color, so if your mother has brown hair and your father has red hair, one of those two traits is going to manifest itself in you. The one that's more likely to win is called a **dominant trait**, and the one that's more likely to lose is called a **recessive trait**. Using the example above, let's assume brown hair is a dominant trait and red hair is recessive. We represent the "dominance" of a trait by giving it a capital letter, "B" and the recessive is lowercase "r".

The traits can combine in one of 4 possible ways according to this table:

BB	rB
Br	rr

In all of the available circumstances where a "B" is present, it will win out over the "r", and you would have brown hair with a 75% probability. However, there is a 25% chance in the 4th case where both genes combine as a recessive pair, "rr", and you would have red hair. So which trait will win is left to chance, but the dominance sets the odds in advance.