supplemental HO 12

What is meant by the term chemistry as a science?

Science is a way of understanding our universe. Chemistry is a fascinating subject. Chemistry may be defined as the study of the structure of matter, the changes that matter will undergo, and the associated energy changes. Matter may be defined as any real substance; any such attracted by gravity and therefore has weight.

How can we begin to understand our universe?

We can begin to understand our universe through a univeral thought process. We can do this in the following way:

a. We make observations.
b. We ask questions.
c. We form imaginative pictures called a hypothesis (testable assumption) to explain our observations.
d. We predict as to what might be expected to happen in cases that have not been observed as yet.
e. We test to gain confidence in our theories.

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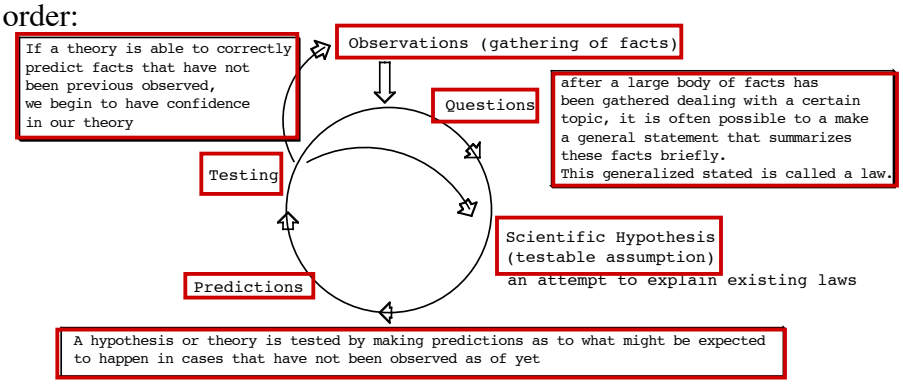
The process often—but not always—proceeds in the following order:



Law - tells us what happens; a summary of observed behavior.

Theory - a theory (model) is our attempt to explain why it happens; an explanation of behavior.

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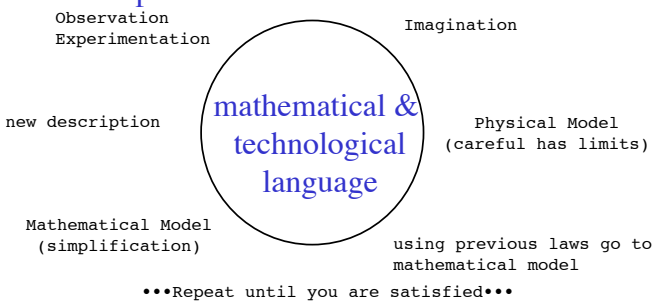
The Treadmill of the Scientific Method.

From this process a



"a linguistic instrument" will emerge so we can communicate observations and descriptions.

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Commit this to memory

Summary

1. Observations (gathering of facts and measuring)

2. Invention of theories (hypothesis). An educated guess. An attempt to explain the existence of laws by using a model which involves familiar concepts. Theory is a product of one's imagination, and are subject to change as facts are learned.

3. The testing of theories. Testing by making predictions. Theories & Hypotheses are tested by making predictions as to what might be expected to happen in cases that have not been observed as yet. If a theory is able to correctly predict facts that have not been previously observed, we begin to have confidence in our theory.

4. Statement of laws; large body of facts gathered dealing with a certain topic. A generalized statement of facts is called a law. We expect scientific laws will be the same in any part of the world or universe that we may visit in the future.

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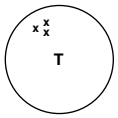
….and measurements will have to be made!!!

Measurements - a system or way of gathering numerical values—size, extent, quantity, dimension–using a measuring device.

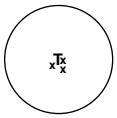
A. Accuracy: the degree to which a measured value is close to the true value.

B. Precision: the degree to which a "set" of measured values agree with each other.

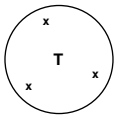
Compare the weigthed average of the "x's" to the value " **T**" which represents the true value. Decide which of the measurement is accurate, precise, both accurate and precise or neither.



precise but inaccurate



precise & accurate



inaccurate but by chance; the result of the average of the three x's will be accurate

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C. Testing (all scientific tests need to minimize the number of possible conclusions)

1. **Control test** Ideally, the two tests should differ by only one variable

2. Repeated testing: Confirm experimental results by repeated measurements

An example of a control test:

"How can we tell whether pain relief results from a placebo effect or comes for the analgesic effect of a substance, independent of a patient's faith or belief in the healing effect of the medicine?"

Ans: Create a control group by conducting a double-blind study.
1) divide a study group into two groups by random assignment.
2) the test group receives the authentic medication.
3) the control group receives placebo.

With this level of concealment, the placebo effect "the healing force of nature," operates equally with everyone involved, thus nullifying any placebo effect.

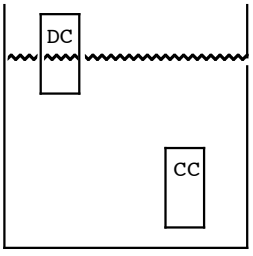
The placebo effect is "any dummy medical treatment; originally, a medicinal preparation having no specific pharmacological activity against the patient's illness. . ." (1)
This definition summarizes the attitude of modern medicine to placebo: a useless and undesired side effect of treatment.
(1) Dorland's Medical Dictionary. 27th Edition. WB Saunders Co Philadelphia, 1988.

Density Demo

- Click here to view the demo

Essay:

Analyze the situation below. Write an essay that describes the operations involved in applying the scientific method in analyzing the situation below. Propose a testable assumption (hyposthesis) to explain the experimental observation shown below.



Diet Coke (DD) floats & Coke Classic (CC) sinks in a bucket of pure water at room temperature.