Cheatography

Chemistry Unit 1 Cheat Sheet

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The nature of chemistry

Nature of Chemistry

Chemistry	Study of substances that make up the world and the changes they undergo
Pseydo-science	Process inv. the collection of info that is supported by **belief** or **opinion**
Science	Process inv. the collection of info that is supported by **evidence**

Science is systematic, inv. collection of info and ideas, inv. obs. and experimentation, supp. by evidence

Science relies on process, is objective, is updated constantly	Pseudoscience lacks process, is subject, is resistant to new info (i.e. flat earters..)

Scientific inquiry is the process of using obs, investigations, and exp. to learn about natural phenomena -> any testable questions about obs., importance on creativity

Formulating Scientific Questions

Scientific question	Based on obs. and is **testable**

Formulating Scientific Questions (cont)

Most Q are based on obs.	What is that? Why? How does it work? I wonder why..
A good one	narrow focus, unknown answer, addresses gap in knowledge, leads to a hypothesis that can be tested
Non scientific question	based on supern-atural, opinion, rely on moral or social values

Scientific methods

Dependent variable	Variable that is changed by another variable
Indepe-ndent variable	The variable that you change
Qualitative	Obs/data that is not measured on numbers/precise measurements
Quanti-tative	Obs/data based on numbers/p-recise measur-ements
Sc. Inquiry	Process of using obs, inv., and exp. to learn about natural phenomena
Conclusion	Summary of the results
Controlled exp.	an exp. in which one variable is changed

Scientific methods (cont)

Control sample	Sample in a controlled exp. with variables that don't change
Exp. sample	sample in a controlled exp. in which one variable changes
Models	Simple, idea, picture, equation, method, diagram -> visualizing exp. results
Writing a lab report	Question/Hypothesis -> materials -> procedure -> result-s/data -> analysis -> conclusion

Research in Science

Skepticism	Open minded knowledge in a certain area may be uncertain
Bias	Point of view influenced by opinion
Scientific census	General agreement along scientists on an idea
How to develop sc. census?	Communication! Publications (peer-reviewed), meetings/confer-ences, discuss findings (person/o-nline)
Databases	Pubmed, NCBI, NHI, Google scholar

Hypothesis, Theory, and Law

Hypothesis	Testable expl. of a sc. problem based on research and obs. (if/then). Must be testable, supported/refuted by data
Theory	Hypothesis or a group of rel. hypothesis as true based on obs. and repetitive exp., must be testable, req. many exp. and confirmed data to overturn/-modify, can be used for predic-tions or explan-ations
Law	Statement of facts generally accepted to be true, describes relationships in nature, but does not prov. explan-ation; can be used to predict events/exp. results, support. by all obs. and data, doesn't

Hypothesis, Theory, and Law (cont)

How to work with a Hypothesis?	Attempt to explain an obs. or answer a Q -> test it -> if support, then data will agree with it -> if refute, then data will not agree, redo procedure or hypothesis -> continue evaluating data
Dalton's Atomic Theory	all matter is comp. of atoms, atoms cannot be made/destroyed during chemical reactions, all atoms of an element are identical, different elements have diff. kinds of atoms, chemical reactions occur through rearrangement of atoms
Atomic Theory	Explains law of conservation of mass

Hypothesis, Theory, and Law (cont)

Reproducibility leads to reliability	Theory must be supported by all evidence, other scientists should get similar results, all experiment must be reproducible

Safety in Science

MSDS (material safety data sheet)	Describes properties, handling, and emergency procedures of a substance
General safety practices	Avoid lose clothes/hair, wear long sleeves/close toed shoes, do not drink/eat/chew gum, no jewelry, avoid contacts if possible, avoid clutter in lab
Handling chemicals/equipment	Use tongs/mitts for hot objects, label all containers, inspect equipment before use, dispose of all substances appropriately

Safety in Science (cont)

PPE (personal protective equipment)	Eyes/face: safety goggles/shield, skin/clothing: lab coat/apron, hands: gloves
Emergency equipment	Fire extinguisher, eye wash, safety shower, first-aid kit
Chemistry glass ware	Beaker, flask, test tubes, graduated cylinder
Handling glass ware	check for breaks/chips, use tongs/holders
Heating devices	Bunsen brenner/alcohol burner, hot plate
Use of chemicals	Use clear/accurate labels, do not taste/smell/touch chemicals, use pipettes to transfer liquids, do not put liquids back into storage container, refer to MSDS for storage/disposal/handling
Accident	Stay calm, report, avoid danger, spill kit, help injured
Cuts from broken glassware	apply pressure/flush

Safety in Science (cont)

Chemical burns/irritations/heat burns	remove heat source/put out fire
Inhalation of toxic chemicals	Get fresh air/report
Chemicals in eyes	Eye wash (10-15 mins), report

Tools and Technology in chem

Balance	Measure mass
Beaker	Holds liquids
Buret	Used to deliver specific volume, i.e. titrate volumes
Degrees Celsius	Fahrenheit - 30 : 2 = ~ x C
Graduated cylinder	Measure volume of liquid
SI	International system of units, standard set of units used by all scientists
Kelvin	SI unit for temperature in science, 0 C = -273.15 K
Kilogram	SI Unit for mass
Liter	SI unit for volume
Meter	SI unit for distance

Metric system

The Metric System is Base 10

Prefix	Symbol	Multiplier	Prefix	Symbol	Multiplier
tera-	T	1,000,000,000,000	centi-	c	0.01
giga-	G	1,000,000,000	milli-	m	0.001
mega-	M	1,000,000	micro-	μ	0.000001
kilo-	k	1,000	nano-	n	0.000000001

Common SI units

Common SI Units and Units Used with SI

Prefix	Distance	Volume	Mass	Time
kilo-	kilometer (km)	*kiloliter (kL)*	kilogram (kg)	*kilosecond (ks)*
(none)	meter (m)	liter (L)	gram (g)	second (s)
centi-	centimeter (cm)	*centiliter (cL)*	*centigram (cg)*	*centisecond (cs)*
milli-	millimeter (mm)	milliliter (mL)	milligram (mg)	millisecond (ms)
micro-	micrometer (µm)	microliter (µL)	microgram (µg)	microsecond (µs)
nano-	nanometer (nm)	*nanoliter (nL)*	nanogram (ng)	nanosecond (ns)

Temperature: **degree Celsius** (°C), **kelvin** (K)
Time: minute (min)

Metric conversion example

Metric Conversions

- Convert 5.97 cm to millimeters.
  - 1 cm = 10 mm
  - 5.97 cm = (5.97)(10) = 59.7 mm
- Convert 25.0 mL to liters.
  - 1 mL = 0.001 L
  - 25.0 mL = (25.0)(0.001) = 0.025 L
- Convert 0.0453 kg to grams.
  - 1 kg = 1,000 g
  - 0.0453 kg = (0.0453)(1,000) = 45.3 g

Collecting and organizing data

inference	logical conclusion made from observation
Qualitative data	non-numerical, descriptive - describes categories or characteristics of things
Quantitative data	numerical data that can be measured, data that is easy to analyze over graph or table, has units, always numbers
Charts	Used for qualitative data
Tables	Used for numerical data set in columns and rows
Graphs	Bar/line/pie, display data for analysis
Labels	for all parts of charts, tables, and graphs