Rule 1

Follow the directions in your course reader, of your teaching assistant and of your instructor. They are usually much more experienced doing chemistry.

Rule 2

Be prepared when entering the lab. It is for your own and everybody else's safety. This will also increase your chances to complete the experiments in a timely fashion.

Rule 3

When in doubt, ask. This will make it more likely that you isolate the product and keep your health.

Rule 4

Keep all reagent and solvent bottles closed when not in use! This will keep the reagents in better condition for everybody.

Rule 5

Always inspect your glassware before using it. Initial cracks can lead to breakage during heating or implosions upon evacuation.

Rule 6

Lubricate ground-glass joints lightly when a tight seal is needed (exclusion of moisture or vacuum).

Rule 7

When running a reaction, a stir bar or spin vane (point down) has to be added which has to be spinning, of course.

Rule 8

The O-ring is placed between the compression cap and the conical vial.

Rule 9

Never heat anything up in a closed system. It will explode eventually because the vapor pressure of every compound increases upon heating, the question is only how quickly.

Rule 10

Do not fill the vessel more than half when refluxing or distilling. There has to be room for bubbles and mixing.

Rule 11

Reflux means to boil a liquid in a container equipped with a cooled condenser so that the vapors continuously condense for re-boiling.

Rule 12

An ice-bath consists mainly of water, which has some ice added to reduce temperature.

Rule 13

The container and the heat (or cooling) source have to have good contact for heat transfer to occur.

Rule 14

Acid-base reactions are faster than nucleophilic additions. Thus, protic solvent cannot be used with strong nucleophiles, which are often also strong bases.

Rule 15

Hydrogen bonds are stronger than dipole-dipole interactions and van der Waals interactions but they are still much weaker than covalent bonds.

Rule 16

The stronger the intermolecular bonds are the higher the melting point and the boiling point of a compound.

Rule 17

Symmetric molecules have higher melting points than asymmetric molecules even if they have smaller dipole moments.

Rule 18

Intramolecular reactions will be favored if five-membered or six-membered rings are formed.

Rule 19

An increase of ten degrees Celsius causes a doubling of the rate of the reaction.

Rule 20

Never dispose of any layer, until you are sure that you will never need it again.

Rule 21

Use a short-stem funnel when pouring the solution into the separatory funnel, which should not be filled more than two-thirds.

Rule 22

The compound should exhibit a high solubility in the solvent used for extraction for the extraction to work well.

Rule 23

About 10-20% of the volume of the solution that is being extracted or washed should be used for each extraction.

Rule 24

Multiple extractions (2-3) with small amounts are more effective than one extraction with the same total volume. The first extract contains most of the product.

Rule 25

Acidic compounds are extracted with bases, basic compounds with acids. Water is extracted with saturated sodium chloride solution.

Rule 26

Vent the separatory funnel frequently, particularly when using sodium bicarbonate or low boiling solvents for the extraction.

Rule 27

When separating layers during extraction, the bottom layer is always removed first independent if this is the layer of interest or not.

Rule 28

Drying agents have to be used sparingly because the more polar a compound is the higher the affinity towards the drying agent will be.

Rule 29

The drying agent has to be removed from a solution before proceeding to the next step because the drying process is reversible at elevated temperatures.

Rule 30

In a distillation or a reflux setup the vent has to be placed after (or on top of) the condenser to ensure that the condenser works properly.

Rule 31

Excessive clamping usually leads to breakage because of strain. In most cases, two fixed points in the proper location will be sufficient to support the setup.

Rule 32

Never distill to dryness because this will not lead to any separation. It can cause an explosion because many peroxides have higher boiling points than the actual compound.

Rule 33

Compounds exhibiting a boiling point above 150 ^{o}C have to be distilled *in vacuo* to prevent decomposition.

Rule 34

Boiling stones cannot be used in recrystallization and during vacuum distillations.

Rule 35

When recrystallizing the target compound and the solvent have to have different polarities, while the impurity and the solvent should have the similar polarity.

Rule 36

The solution has to be brought to a boil during the process to maximize the solubility of the compound and minimize the amount of the solvent required to dissolve the sample.

Rule 37

The entire crude has to be dissolved during the process. Undissolved materials have to be removed by filtration or decanting.

Rule 38

A slow crystallization yields the best product in terms of purity and crystallinity because this will allow the system time to be more selective.

Rule 39

Supersaturation can be overcome by scratching on the inside of the vessel or by seeding.

Rule 40

When using a mixed solvent system, the solvents have to have different polarities but similar boiling points.

Rule 41

Silica and alumina are polar stationary phases. Thus, polar compounds adsorb stronger than non-polar compound on these stationary phases.

Rule 42

On polar stationary phases, polar solvents will cause compounds to migrate more than non-polar solvents if the compound dissolves in the solvent.

Rule 43

A capillary spotter has to be used to apply compounds to the TLC plate.

Rule 44

Samples for gas chromatography have to be much diluted because a capillary column is used.

Rule 45

When visualizing spots on the TLC plate, do not look into the UV-light. It will damage your eyes!

Rule 46

Infrared spectra that are acquired using an ATR setup have to be corrected because the penetration depth of the infrared beam is highly wavelength dependent.

Rule 47

Polar groups give rise to strong peaks in the infrared spectrum because the dipole moment changes more during the motion.

Rule 48

Samples that are submitted for NMR analysis have to be placed in a tube of appropriate length and have to be dissolved in one deuterated solvent only.

Rule 49 **The entire sample has to dissolve in the solvent in order to be visible in the NMR or UV-Vis spectrum.**	***Rule 50*** **The solvent and the cuvette have to be transparent in the range to be measured.**
Rule 51	***Rule 52***
Rule 53	***Rule 54***
Rule 55	***Rule 56***