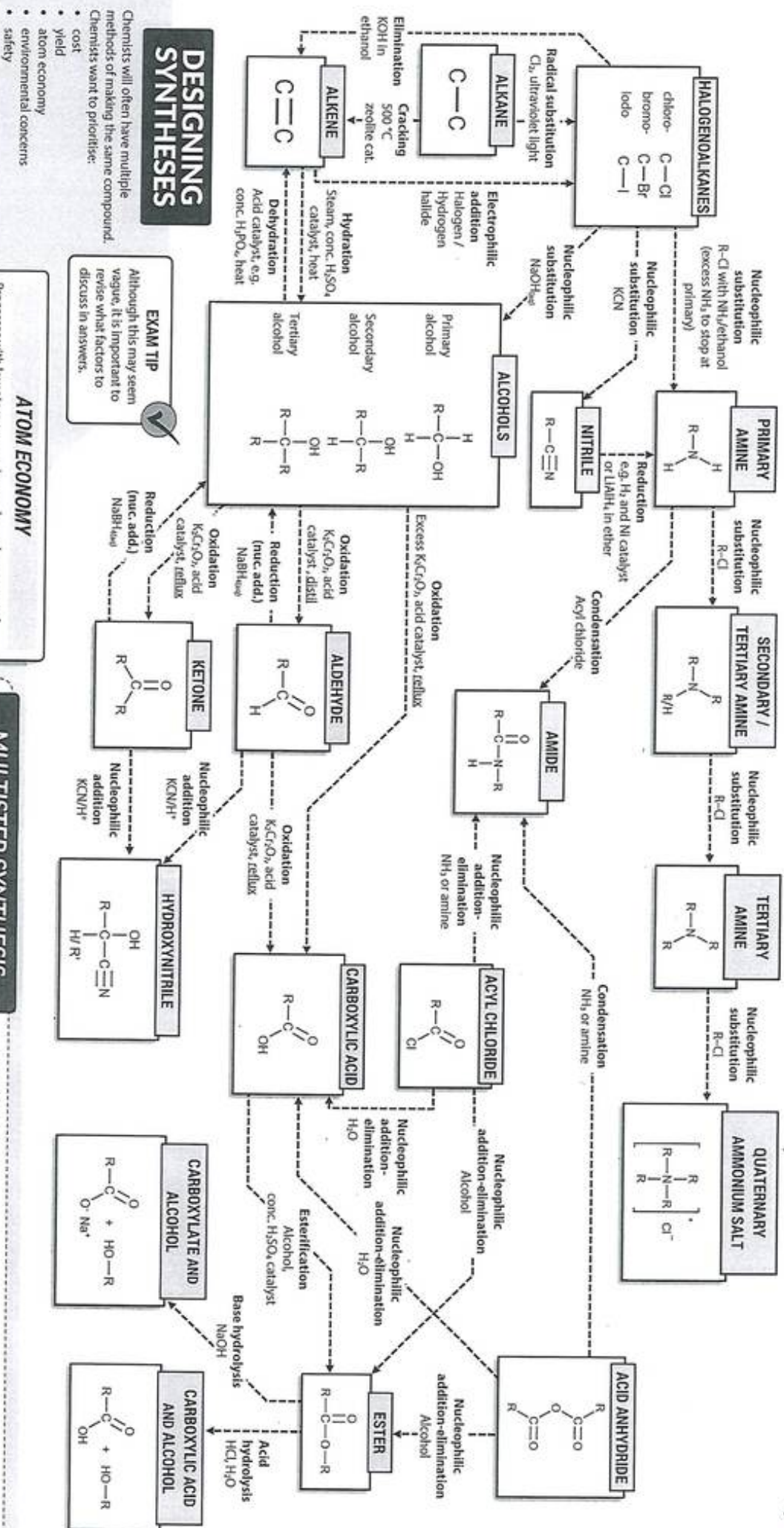


ORGANIC SYNTHESIS

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DESIGNING SYNTHESIS

Chemists will often have multiple methods of making the same compound. Chemists want to prioritise:

- cost
- yield
- atom economy
- environmental concerns
- safety

NON-HAZARDOUS STARTING MATERIALS

Chemists may choose one starting material over another if it is safer to use. For example, benzene is carcinogenic, but similar compounds such as methylbenzene are safer to use. Similarly, methods which do not use conc. acid catalysts are preferable to ones that do.

EXAM TIP

Although this may seem vague, it is important to revise what factors to discuss in answers.

ATOM ECONOMY

Processes with low atom economies produce a large mass of waste products compared to the mass of desired product. By-products may harm the environment, and can be expensive to dispose of. One method of reducing by-products and increasing yield is to reduce the number of steps in a synthesis.

SOLVENTS

Performing syntheses without a solvent can reduce the use of finite resources, as many solvents are hydrocarbons. It can also reduce pollution, and can remove the cost of separating the solvent to obtain a pure product. Some solvents are toxic.

MULTISTEP SYNTHESIS

Multistep synthesis involves finding a 'route' or set of reactions to produce one organic molecule from another.

Thinking backwards:

- We know that an amine can be formed either by reducing a nitrile or by substituting a halogenoalkane with excess ammonia in ethanol.
- The fact that the carbon chain has been extended suggests that a cyanide ion group has been used.
- The halogenoalkane can be formed by adding a hydrogen halide across the $C-C$ bond. There will be only one product as the alkene is symmetrical.

