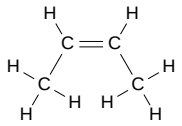
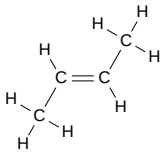
Things to remember in the last hour before the exam: Level 2 Organic Chemistry

(This is not a revision sheet – you've done that by now - it's a list of things you might want to remind yourself about …)

1. Meth-, eth-, prop-, but-, pent-, hex-
2. Naming. (1) longest C chain (2) number from end that gives lowest numbers for C=C or substituents e.g.-OH group (3) separate the numbers from numbers with comma (4) separate numbers from letters with a – (5) don't forget di- (two), tri- (three), tetra- (four). (5) list substituents alphabetically i.e. ethyl before methyl BUT remember dimethyl is "m" and not "d".
3. Alkanes C-C; alkenes C=C; alkynes C≡C; haloalkanes R-X, primary amines R-NH_2; alcohols R-OH, carboxylic acids R-COOH.
4. Isomers (same molecular formula but different structural formulas)
   - Constitutional - molecules with the same molecular formula with atoms bonded together in different orders e.g. propan-1-ol & propan-2-ol, or butane & methyl propane.
   - Geometric (cis and trans) isomers – occur as no free rotation around C=C; need to have 2 different atoms/groups attached to each C of the C=C. ∩ shape is cis.



cis but-2-ene and



trans but-2-ene

5. Classification of alcohols and haloalkanes as primary, secondary or tertiary – look how many C atoms are attached to the C atom that is C-OH or C-X.
6. Properties
   - solubility. Hydrocarbons (alkanes, -enes, -ynes) & haloalkanes insoluble in water. Form 2 layers – immiscible. Small amines, alcohols & c.acids are soluble but as C↑ solubility ↓ (since non polar H/C portion of molecule gets bigger).
   - melting & boiling points. As C↑ m.pt & b.pt ↑. Alcohols & carboxylic acids have higher m.pt & b.pt than corresponding alkanes. E.g. ethanol and ethanoic acid are both liquids @ room temperature.
7. Chemical reactions.
   - addition reactions of alkenes (small molecule adds across C=C double bond; one product only; product is saturated, has C-C).
     - H_2/Pt, Cl_2, Br_2*, H_2O/H^+, polymerisation and hydrogen halides (including major and minor products on addition to asymmetric alkenes – rich get richer: H adds to C of C=C that had most H). (*RAPID decolourisation of orange bromine water)

       n C_2H_4 → $-(C_2H_4)-_n$ (n is a large number) monomer = ethene (unsat), polymer = polyethene (sat).

- substitution reactions: (atom/group is swapped for another atom/group: 2 (or more) products made).
  - alkanes with halogens (monosubstitution). e.g. $CH_3CH_3 + Br_2 \rightarrow CH_3CH_2Br + HBr$ (Needs uv light and/or heat. SLOW decolourisation of orange bromine water).
  - alcohols with hydrogen halides. PCl_3, PCl_5, $SOCl_2$ – swaps the –OH for –Cl.
  - haloalkanes with NH_3/heat (R-Cl → R-NH_2) and aqueous KOH/heat (R-Cl → R-OH)
- oxidation of:
  - primary alcohols to form carboxylic acids with MnO_4^-/H^+, heat (colour change purple MnO_4^- to colourless Mn^{2+}) or $Cr_2O_7^{2-}/H^+$, heat (colour change orange $Cr_2O_7^{2-}$ to green Cr^{3+})
  - alkenes with MnO_4^- NO HEAT NEEDED. (colour change purple to brown MnO_2): with H^+/MnO_4^- (colour change purple to colourless). A diol is made.
- elimination of:
  (including identification of major and minor products for asymmetric reactants – the poor get poorer)
  An H is lost from C that has the least H atoms: Turns a C-C into a C=C and another small molecule made.
  - water from alcohols.(conc. H_2SO_4 .heat). R-OH → alkene + H_2O
  - hydrogen halides from haloalkanes. (alcoholic KOH/heat) R-X → alkene + H-X
- acid–base reactions of carboxylic acids and amines.
  - carboxylic acids are weak acids (pH 3-4). R-COOH + $H_2O \rightleftharpoons$ R-COO^- + H_3O^+. Turn blue litmus red & green UI orange. React with reactive metal e.g. Mg (making salt + H_2). react with carbonates or hydrogen carbonates (making salt + H_2O + CO_2). Often have "sharp vinegar" smell or unpleasant smell.
  - amines are weak bases (pH 11-12). Turn red litmus blue. Fishy smell! R-NH_2 + $H_2O \rightleftharpoons$ R-NH_3^+ + OH^-

SOME VERY IMPORTANT INTERCONVERSIONS YOU REALLY CAN'T DO WITHOUT!