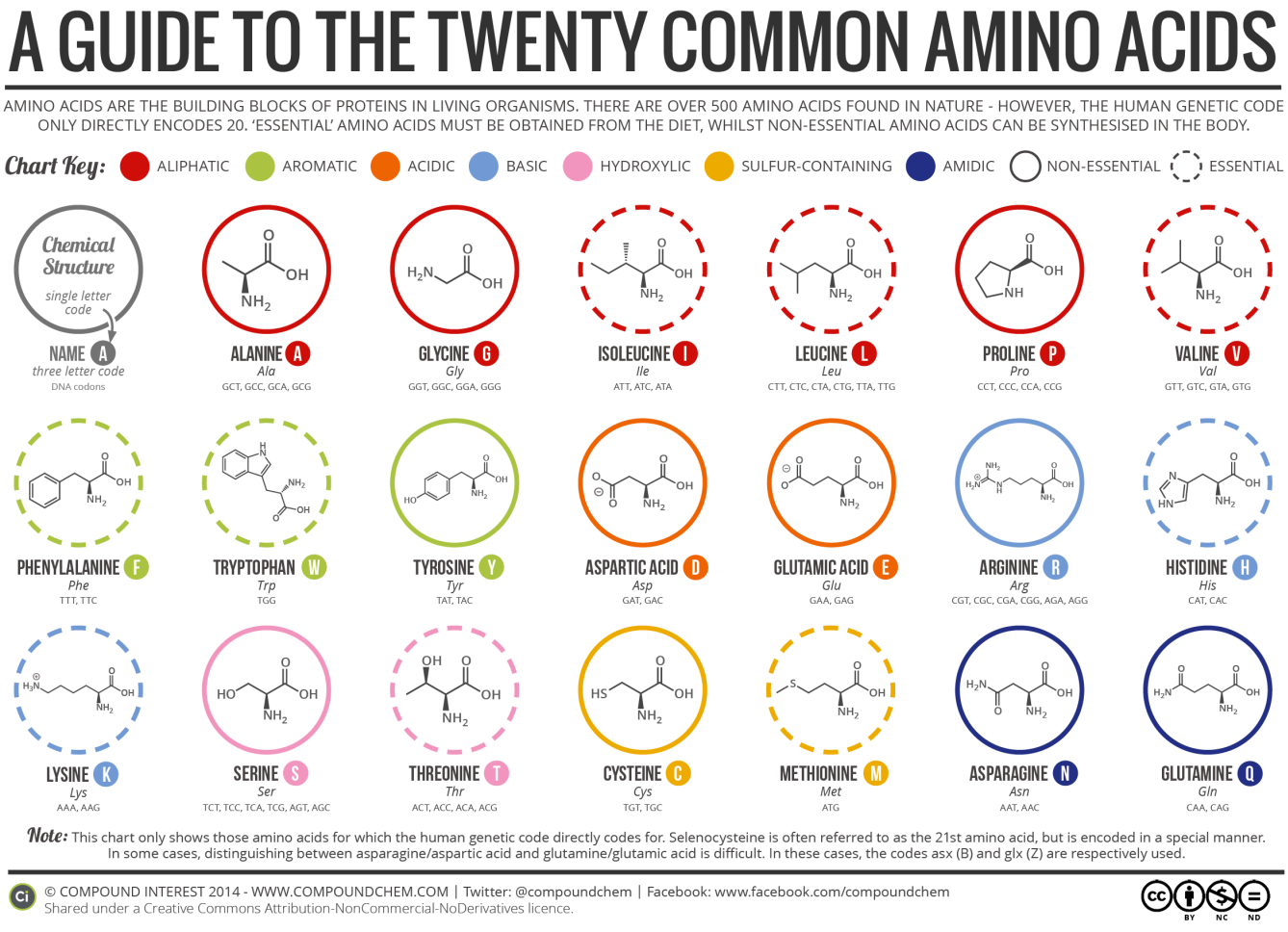
Biol213

Week One – Macromolecules and Their Building Blocks

Amino Acids:

- 20 common amino acids
- They make up proteins
- Glycine is most simple
- Each has properties well suited to carry out various biological functions
- Each has a carboxylic acid group, central alpha carbon, amino group, hydrogen group and an R group
- The R group is different in each different amino acid but the rest stays the same
- The central alpha carbon is chiral (except in glycine)
- Essential amino acids are the ones which we must consume as we do not naturally produce them, whilst non-essential ones are those that we can naturally produce



Amino Acid Classification (Varies from above table):

- Nonpolar, aliphatic: side chain hydrophobic – not soluble in water – can be isolated by extraction with organic solvents:
  - Glycine
  - Alanine
  - Proline

    - Valine
    - Leucine
    - Isoleucine
    - Methionine
- Polar, uncharged: more soluble in water – can form H bonding – weakly polar:
    - Serine
    - Threonine
    - Cysteine (stabilise structure of many proteins via cys-cys reversible disulfide bond following oxidation)
    - Asparagine
    - Glutamine
- Aromatic: absorb light in UV region – can form hydrophobic interactions:
    - Phenylalanine
    - Tyrosine
    - Tryptophan
- Positively charged, basic: strongly polar:
    - Lysine
    - Arginine
    - Histidine (least polar, often involved in catalysis by serving as a proton donor)
- Negatively charged, acidic:
    - Aspartate
    - Glutamate

Modified Amino Acids in Proteins:

- After translation, modifications can occur
- Modifications can also be made to amino acids after they are added to a protein
- Types of modification include:
    - Phosphorylation: reversible modification, important in regulation of cell function
    - Covalent modifications (in collagen)
- Bioactive amino acid derivatives are not included in proteins

Biology and pH:

- pH = power of hydrogen
- pH = -log [H+]
- Increase H+ ions = decreased pH
- Increase OH- ions = increased pH
- Strong acids and bases completely dissociate in water (HCl → H+ + Cl-)
- Weak acids and bases do not completely dissociate in water – their behaviour is best understood in terms of their pKa
- pKa = (acid dissociation constant) mid point where conc of starting and final solution is equal