C23 Chemical Energetics

1. Enthalpy change of atomisation, ΔH_{at} = enthalpy change when one mole of gaseous atoms formed from its element in its standard state

2. Lattice energy, ΔH_{latt} = enthalpy change when one mole of an ionic compound is formed from its gaseous ions under standard condition

3. First electron affinity, EA = enthalpy change when one mole of electrons is added to one mole of gaseous atoms, to form 1 mole of gaseous ions (each with a single negative charge) under standard condition

4. $\Delta H_f^{\ominus} = \Delta H_1^{\ominus} + \Delta H_{latt}^{\ominus}$

5. Enthalpy change of hydration, ΔH_{hyd} = enthalpy change when one mole of a (specified) gaseous ions dissolves **in water** (to form a solution of infinite dilution)

   $\rightarrow \Delta H_{hyd}^{\ominus} = \Delta H_{hyd}^{\ominus}(anions) + \Delta H_{hyd}^{\ominus}(cations)$

6. Enthalpy change of solution, ΔH_{sol} = enthalpy change when one mole of a solute dissolve **in water to form a solution of infinite dilution**

7. $\Delta H_{hyd}^{\ominus} = \Delta H_{sol}^{\ominus} + \Delta H_{latt}^{\ominus}$

8. Entropy, S = **the number of possible arrangements of the particles and their energy in a given system**

9. $\Delta S_{system}^{\ominus} = \Sigma S_{products}^{\ominus} - \Sigma S_{reactants}^{\ominus}$
10. $\Delta G^{\ominus} = \Delta H_{reaction}^{\ominus} - T\Delta S_{system}^{\ominus}$ (-ΔG = feasible , +ΔG=not feasible)

C24 Electrochemistry

11. Standard conditions:
    -ion concentration of $1.00 mol dm^{-3}$
    -temp 298 K
    -pressure 1 atm

12. Standard electrode (reduction) potential ($E^{\ominus}$) = voltage when an electrode/half-cell is connected to SHE under standard conditions: ion conc of $1.00 mol dm^{-3}$, temp 298K and pressure 1 atm

13. Standard cell potential, $E^{\ominus}_{cell}$ = voltage between two electrodes/half-cells under standard conditions: ion conc of $1.00 mol dm^{-3}$, temp 298K and pressure 1 atm

14. $E^{\ominus}_{cell} = E^{\ominus}_{reduction//cathode} - E^{\ominus}_{oxidation//anode}$ (+ $E^{\ominus}_{cell}$ = feasible)

15. $E = E^{\ominus} + \frac{RT}{zF} ln \frac{[oxidised\ species]}{[reduced\ species]} = E^{\ominus} + \frac{0.059}{z} log_{10} \frac{[oxidised\ species]}{[reduced\ species]}$ (R,T and F con.)
(z is number of electrons transferred)

16. $Q = It$
17. $F = Le\ (1e = 1.60 * 10^{-19} C\ and\ L\ = avogadro\ constant)$
18. $n = \frac{Q}{F}$ **(1F=96500$Cmol^{-1}$)**
19. ΔG = -$nE_{cell}F$ **(n=number of electrons transferred + $\Delta G\ in\ Jmol^{-1}$)**

C25 Equilibria

20. Conjugate acid-base pair = **two species that differ by one H+ ion** // (pair of reactants and products that are linked to each other by the transfer of a proton)
21. $pH = -log[H^+]$
22. $K_a = \frac{[H^+][A^-]}{[HA]}$
23. $pK_a = -logK_a$
24. $K_w = [H^+][OH^-]$
25. $pH = pK_a + log\frac{[A^-]}{[HA]}$ $(A^- = conjugate\ base, HA = acid)$
26. Buffer solution = a solution that resists a change in its pH when small amount of acid or base added
27. Partition coefficient, K_{pc} = **ratio of concentration of a solute in two different immiscible solvents at equilibrium**
28. $K_{pc} = \frac{[organic\ solvent]}{[aqueous\ solvent]}$ (it can be another way around depends on solubility - check kpc)

C26 Reaction kinetics

29. Homogeneous catalyst = same phase as reactants
30. Heterogeneous catalyst = different phase to reactants
31. Rate-determining step = **slowest step** in overall reaction
32. (Overall) Order of a reaction = (the sum) of the power/exponent to which a concentration of a reactant is raised in the **rate equation**

33. Half-life period = time taken for concentration to halve
$\rightarrow k = \frac{ln2}{t_{\frac{1}{2}}}$

C28 Chemistry of transition elements

34. **Transition element** = **a d-block element which forms one or more stable ions with incomplete d orbitals**

35. **Ligand** = **a species that contains a lone pair of electrons that forms a dative covalent bond to a central metal atom/ion**

36. **Complex** = **a molecule or ion formed by a central metal atom/ion surrounded by one or more ligands**

37. **Coordination number** = number of dative covalent bonds formed between the ligands and the central metal atom/ion

38. **Monodentate/bidentate/polydentate ligand** = a species that donates 1//2//more than 2 lone pair(s) of electrons to form 1//2///more than 2 dative covalent bond(s) to a central metal atom/ion

39. **Degenerate d-orbitals** = d-orbitals are all the same energy level
40. **Non-degenerate d-orbitals** = d-orbitals are not in the same energy level

41. **Stability constant of a complex, K_{stab}** = **the equilibrium constant for the formation of the complex ion in a solvent (from its constituent ions or molecules)**

Organic chem

42. **Enantiomers** = molecules/stereoisomers that are non-superimposable mirror images + **identical physical and identical chemical properties but rotate the plane of polarised light in opposite directions (optically active)**

43. **Optically active** = a substance that is able to rotate the plane of polarised light in opposite directions

44. **Racemic mixture** = mixture containing equal amounts of each optical isomer(enantiomers)

    → (optically inactive because enantiomers rotate plane-polarised light by equal amounts but in opposite directions, resulting in a net rotation of zero.)

45. **Isoelectric point** = pH where the species(amino acids) exists as a zwitterion // pH where the species(amino acids) is electrically neutral (no overall charge)
46. **Retention time** = time between injection and detection of substance
47. **Retardation factor**, $R_f = \frac{distance\ travelled\ by\ solute/component}{distance\ travelled\ by\ solvent}$