Edexcel Formulae

Topic 1

number of neutrons = mass number – atomic number

Relative atomic mass = (mass of isotope 1 x abundance of isotope 1) + (mass of isotope 2 x abundance of isotope 2)/100

Topic 5

% atom economy = M_r of desired product/sum of M_r of all products x 100

% yield = actual mass/theoretical mass x 100

moles = mass/M_r

moles = concentration x volume/1000 (dm^3)

moles = volume/24 (dm^3) (gases)

moles = number of particles/6.02 x 10^{23} (value in data sheet)

mol dm^{-3} x M_r → g dm^{-3}

PV = nRT (gases) where v is in m^3, T is in K and P is in Pa, R (in data sheet)

percentage error = uncertainty in instrument/value x 100

Topic 8

ΔH = sum of bonds broken – sum of bonds made (mean bond enthalpies)

Q = mc ΔT where m = mass of water, c = 4.18 (in data sheet) and T is in K

Topic 9

Rate = 1/time

Rate = gradient of concentration-time curve

Topic 10

$$aA + bB \rightleftharpoons cC + dD$$

$$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

Topic 11

Example:

$$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$$

$$K_p = \frac{p(CO) \times p(H_2)^3}{p(CH_4) \times p(H_2O)}$$

Mole fraction = moles of one gas/moles of all the gases

Partial Pressure = mole fraction x total pressure

Total Pressure = sum of the partial pressures

Topic 12

$pH = -\log_{10} [H^+]$

$[H^+] = 10^{-pH}$

$K_w = [H^+][OH^-] = 1x10^{-14}$ mol^2dm^{-6} (at room temp) (value in data sheet)

$K_w = [H^+]^2$ (pure water)

Expression and use in buffer calculations:

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

Weak acid calculations:

$$K_a = \frac{[H^+]^2}{[HA]}$$

$pK_a = -\log_{10}K_a$

$K_a = 10^{-pKa}$

Half-equivalence point: $K_a = [H^+]$ or $pK_a = pH$

Topic 13

$$\Delta S_{system} = \text{(sum of the entropy of the products)} - \text{(sum of the entropy of the reactants)}$$

$$\Delta S_{surroundings} = -\Delta H/T$$

$$\Delta S_{total} = \Delta S_{system} + \Delta S_{surroundings}$$

$$\Delta G = \Delta H - T\Delta S_{system}$$

$$\Delta G = -RT\ln K$$

$$\text{min. temp.} = \Delta H/\Delta S_{system}$$

Topic 14

$$E_{cell} = E^{\ominus} \text{ of the more positive value} - E^{\ominus} \text{ of the more negative value}$$

or

$$E_{cell} = E^{\ominus} \text{ of the species being reduced} - E^{\ominus} \text{ of the species being oxidised}$$

Topic 16

For $A + B \rightarrow C + D$ **rate** $= k[A][B]$

Arrhenius: $k = Ae^{-Ea/RT}$

$$\ln k = \ln A - E_a/RT$$