

## YEAR 12 CHEMISTRY - EQUILIBRIUM WORKSHEET 1

REACTION	CHANGE	OBSERVATIONS	POSITION OF EQUILIBRIUM	EXPLANATION
$\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2 \text{HI}_{(g)}$ colourless    violet    colourless	Remove some HI at constant volume			
$\text{Cu}(\text{H}_2\text{O})_4^{2+}(\text{aq}) + 4 \text{Cl}^-(\text{aq}) \rightleftharpoons \text{CuCl}_4^{2-}(\text{aq}) + 4 \text{H}_2\text{O}(\ell)$ blue                      colourless yellow	Remove $\text{Cl}^-(\text{aq})$			
$\text{N}_{2(g)} + 3 \text{H}_{2(g)} \rightleftharpoons 2 \text{NH}_{3(g)}$ all colourless $\Delta H$ -ve	Decrease the temperature			
$2 \text{NO}_{2(g)} \rightleftharpoons \text{N}_2\text{O}_{4(g)} \quad \Delta H \text{ -ve}$ brown    colourless	Raise the temperature			
$2 \text{CrO}_4^{2-}(\text{aq}) + 2 \text{H}^+(\text{aq}) \rightleftharpoons \text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{H}_2\text{O}(\ell)$ yellow Orange	Add $\text{OH}^-(\text{aq})$			

## YEAR 12 CHEMISTRY - EQUILIBRIUM WORKSHEET 2

REACTION	CHANGE	OBSERVATIONS	POSITION OF EQUILIBRIUM	EXPLANATION
$2 \text{NO}_{2(g)} \rightleftharpoons \text{N}_2\text{O}_{4(g)}$ $\Delta H$ -ve brown      colourless	Reduce the volume of the container			
$\text{N}_{2(g)} + 3 \text{H}_{2(g)} \rightleftharpoons 2 \text{NH}_{3(g)}$ all colourless $\Delta H$ -ve	Increase the volume of the container			
$\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$ white      white colourless $\Delta H$ +ve	Reduce the temperature			
$2 \text{CrO}_4^{2-}{}_{(aq)} + 2 \text{H}^+{}_{(aq)} \rightleftharpoons \text{Cr}_2\text{O}_7^{2-}{}_{(aq)} + \text{H}_2\text{O}_{(l)}$ yellow Orange	Increase the concentration of $\text{CrO}_4^{2-}{}_{(aq)}$			
$\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2 \text{HI}_{(g)}$ colourless violet colourless	Add more $\text{H}_2$ at constant volume			

## YEAR 12 CHEMISTRY - EQUILIBRIUM WORKSHEET 3






REACTION	CHANGE	OBSERVATIONS	POSITION OF EQUILIBRIUM	EXPLANATION
$\text{Cu}(\text{H}_2\text{O})_4^{2+}(\text{aq}) + 4 \text{Cl}^-(\text{aq}) \rightleftharpoons \text{CuCl}_4^{2-}(\text{aq}) + 4 \text{H}_2\text{O}(\ell)$ <p style="text-align: center;">                     blue                      colourless                      yellow                 </p>	Add water			
$\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2 \text{HI}(\text{g})$ <p style="text-align: center;">                     colourless   violet   colourless                 </p>	Reduce the volume of the container			
$\text{I}_2(\text{g}) \rightleftharpoons \text{I}_2(\text{s})$ <p style="text-align: center;">                     violet      black  <math>\Delta H</math> -ve                 </p>	Remove $\text{I}_2(\text{s})$			
$\text{I}_2(\text{g}) \rightleftharpoons \text{I}_2(\text{s})$ <p style="text-align: center;">                     violet      black  <math>\Delta H</math> -ve                 </p>	Increase the volume of the container			
$\text{I}_2(\text{g}) \rightleftharpoons \text{I}_2(\text{s})$ <p style="text-align: center;">                     violet      black  <math>\Delta H</math> -ve                 </p>	Increase the temperature			



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$\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2 \text{HI}_{(g)}$ colourless    violet    colourless	Remove some HI at constant volume	Solution would become lighter	$\longrightarrow$	System trying to increase the HI concentration
$\text{Cu}(\text{H}_2\text{O})_4^{2+}(\text{aq}) + 4 \text{Cl}^-(\text{aq}) \rightleftharpoons \text{CuCl}_4^{2-}(\text{aq}) + 4 \text{H}_2\text{O}(\ell)$ blue            colourless yellow	Remove $\text{Cl}^-(\text{aq})$	Solution would become bluer	$\longleftarrow$	Trying to increase the chloride ion concentration
$\text{N}_{2(g)} + 3 \text{H}_{2(g)} \rightleftharpoons 2 \text{NH}_{3(g)}$ all colourless $\Delta H -ve$	Decrease the temperature	No visual observations	$\longrightarrow$	Trying to increase the temperature so it would favour the exothermic reaction
$2 \text{NO}_{2(g)} \rightleftharpoons \text{N}_2\text{O}_{4(g)} \quad \Delta H -ve$ brown    colourless	Raise the temperature	Go Darker Brown	$\longleftarrow$	Trying to decrease the temperature to it will favour the endothermic reaction
$2 \text{CrO}_4^{2-}(\text{aq}) + 2 \text{H}^+(\text{aq}) \rightleftharpoons \text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{H}_2\text{O}(\ell)$ yellow Orange	Add $\text{OH}^-(\text{aq})$	Become yellower	$\longleftarrow$	$\text{H}^+$ ion concentration will decrease due to reaction with $\text{OH}^-$ , so system will be trying to increase the $\text{H}^+$ ions

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REACTION	CHANGE	OBSERVATIONS	POSITION OF EQUILIBRIUM	EXPLANATION
$2 \text{NO}_{2(g)} \rightleftharpoons \text{N}_2\text{O}_{4(g)} \quad \Delta H \text{ -ve}$ brown      colourless	Reduce the volume of the container	Colour will fade		Trying to decrease the pressure so it will favour the side with less molecules
$\text{N}_{2(g)} + 3 \text{H}_{2(g)} \rightleftharpoons 2 \text{NH}_{3(g)}$ all colourless $\Delta H \text{ -ve}$	Increase the volume of the container	No visual observations		Trying to increase the pressure so favour the side with more molecules
$\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$ white      white colourless $\Delta H \text{ +ve}$	Reduce the temperature	No visual observations		Trying to increase the temperature so it will favour the exothermic reaction
$2 \text{CrO}_4^{2-}(\text{aq}) + 2 \text{H}^+(\text{aq}) \rightleftharpoons \text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{H}_2\text{O}(\ell)$ yellow Orange	Increase the concentration of $\text{CrO}_4^{2-}(\text{aq})$	From yellow to orange		Trying to decrease the chromate ion concentration so it will favour the forward reaction
$\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2 \text{HI}_{(g)}$ colourless violet colourless	Add more $\text{H}_2$ at constant volume	Colour will fade		Trying to decrease the hydrogen gas concentration so favour the forward reaction .

YEAR 12 CHEMISTRY - EQUILIBRIUM WORKSHEET 3

REACTION	CHANGE	OBSERVATIONS	POSITION OF EQUILIBRIUM	EXPLANATION
$\text{Cu}(\text{H}_2\text{O})_4^{2+}(\text{aq}) + 4 \text{Cl}^-(\text{aq}) \rightleftharpoons \text{CuCl}_4^{2-}(\text{aq}) + 4 \text{H}_2\text{O}(\ell)$ blue colourless yellow	Add water	Become blue	←	
$\text{H}_{2(\text{g})} + \text{I}_{2(\text{g})} \rightleftharpoons 2 \text{HI}_{(\text{g})}$ colourless violet colourless	Reduce the volume of the container	No change- depending on the volume decrease it may look a little darker	No change	No change
$\text{I}_{2(\text{g})} \rightleftharpoons \text{I}_{2(\text{s})}$ violet black $\Delta H$ -ve	Remove $\text{I}_{2(\text{s})}$	No change	No change	No Change
$\text{I}_{2(\text{g})} \rightleftharpoons \text{I}_{2(\text{s})}$ violet black $\Delta H$ -ve	Increase the volume of the container	Become a little lighter, more purple	←	Trying to increase pressure so favour reverse reaction
$\text{I}_{2(\text{g})} \rightarrow \text{I}_{2(\text{s})}$ violet black $\Delta H$ -ve	Increase the temperature	More violet	←	Trying to decrease temperature to favour the endothermic reaction.

