**Acids & Bases Personal Learning Plan**

**What you should already know:**

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| No | **Learning Outcome** | **Success Criteria** | ☹ | 😐 | ☺ |
|  | I can calculate the RFM of a chemical from the RAM's of the elements that make is up. | The mass of a compound can be worked out from its formula and the RAMs of the elements that make it up. This is called the RFM or the Relative Formula Mass. E.g. H2O is made up of two hydrogen atoms and an oxygen atom. The RAM of hydrogen is 1 and the RAM of oxygen is 16, therefore the RFM of H2O is 2x1 + 16 = 18 |  |  |  |
|  | I can explain the meaning of the word ‘valency’ | The valency of an atom is determined by the number of unpaired electrons in its outer shell. This describes the number of bonds that the element can make. |  |  |  |
|  | I can work out the chemical formula for a compound using valencies | Use the ‘drop and swap’ method.  e.g. Carbon fluoride   1. What elements are in this compound? Write down their symbols:   C F   1. What are their valencies? How many bonds can they make? Note this down:   C4 F1   1. Bring these numbers down to the bottom and swap them over:   C1 F4   1. Simplify these numbers and remove any ‘1s’:   **CF4** |  |  |  |
|  | I can explain the electrical conductivity of ionic substances | Ionic compounds have ions but when solid these charges can't move so they can't conduct. However, when ionic compounds melt or are dissolved the ions can move and therefore can conduct. Substances that don't conduct when solid but do when molten or dissolved in water are called **electrolytes.** |  |  |  |
|  | I know the meaning of the words: *soluble, insoluble, solute, solvent and solution* | **Soluble:** a substance that can dissolve. **Insoluble**: a substance that doesn't dissolve. **Solute**: the substance that dissolves. **Solvent**: the liquid that does the dissolving. **Solubility**: a measure of how soluble a substance is. |  |  |  |
|  | I can explain what happens when an ionic substance dissolves | Dissolving an ionic substance breaks up the ionic lattice. The ions become free to move in the solution. |  |  |  |
|  | I can explain what a ‘mole’ is | A mole is a measurement used in chemistry to show ‘how much’ of a substance you have. It helps us to compare different substances that are made up of different elements. |  |  |  |
|  | I can calculate the mass of 1 mole of a substance | One mole of a substance is its formula mass, given in grams. |  |  |  |
|  | I can calculate the mass of any number of moles of a substance | If one mole of a substance is its formula mass, then 2 moles would be double that mass etc. The formula triangle shown can be used to work out the mass:  http://www.bbc.co.uk/bitesize/intermediate2/chemistry/images/100/013_bitesize_intermediate2_chemistry_mole_calculations.png |  |  |  |
|  | I can calculate the number of moles from the mass of a substance | The formula triangle can be manipulated to give the formula:  n = m/FM |  |  |  |
|  | I can balance a chemical equation and explain what this shows about a reaction, in terms of moles | In a chemical reaction nothing is lost or gained, it is only rearranged/redistributed. So the number of each atom in the reactants must equal the number of each atom in the products.  A balanced equation shows how many moles of each substance is present:  e.g.  Na + ½Cl2 🡪 NaCl  In this reaction 1 mole of sodium reacts with 0.5 moles of chlorine to produce 1 mole of sodium chloride. |  |  |  |
|  | I can calculate the concentration of a solution. | Concentration can be calculated using the formula triangle:  http://www.bbc.co.uk/bitesize/intermediate2/chemistry/images/200/142_bitesize_intermediate2_chemistry_acids_bases_ncv_triangle.jpg  The volume is measured in litres but most of the time in practice cm3 are used and therefore to use the formula the volume must be 1000. |  |  |  |
|  | I can calculate the mass of a substance needed to prepare a specific volume and concentration of a solution | If the desired concentration and volume of the solution is known, we can calculate the number of moles of solute required using n = cv. Then using the substance’s formula mass, calculate the mass using m = n x RFM.  e.g. Calculate the mass of sodium hydroxide required to prepare 2 litres of a solution with a concentration of 0.2 moll-1.  Number of moles of solute required:  n = cv  = 0.2 x 2  = 0.4 moles  ∴Mass of NaOH required:  m = n x RFM  = 0.4 x 40  = **16 g** |  |  |  |
|  | I can state what is meant when a reaction has ‘reached equilibrium’ | An equilibrium reaction is one where the reactants react to form products but the products also react to break back down into reactants again. The reaction is at equilibrium when the rate of the forward reaction (reactants 🡪 products) is equal to the rate of the reverse reaction (reactants 🡨 products). The concentrations of reactants and products at equilibrium remain constant but not necessarily equal. This is shown by using the equilibrium sign: ⇋ |  |  |  |
|  | I know what the equilibrium constant is and what its value means for the position of equilibrium. | Image result for equilibrium constantThe equilibrium is the ratio of the conentration of products to the concentration of reactants. It has the symbol K. Mathematically it can be written as:  If K is > 1 then the equilibrium lies to the right, i.e. the concentration of products is greater than the concentration of reactants. If K is <1 then the opposite is true, there are more reactants than products. |  |  |  |

**Practice Question**

**1**

**2005**



**2**

**2006**



**3**

**2008**



**4**

**2008**

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| **Learning Intention**  We are learning about the pH Scale | | | | | |
| No. | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
| 1 | I can state what is meant by the pH of a solution |  |  |  |  |
| 2 | I can calculate the pH of an acid | e.g. What is the pH of 0.0001mol/L nitric acid? |  |  |  |
| 3 | I can calculate the concentration of an acid from its pH | e.g. What is the concentration of hydrochloric acid, pH3? |  |  |  |
| 4 | I can explain what is meant by the ionic product of water |  |  |  |  |
| 5 | I can calculate the pH of an alkali | e.g. What is the pH of 0.01mol/L sodium hydroxide |  |  |  |
| 6 | I can calculate the concentration of an alkali, from its pH | e.g. What is the concentration of potassium hydroxide, pH 13 |  |  |  |

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|  | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
| 7 | I can explain the advantages and disadvantages of indicators |  |  |  |  |
| 8 | I know the names and formulae of common laboratory acids. |  |  |  |  |
| 9 | I know the names and formulae of common laboratory bases |  |  |  |  |
| 10 | I know what every acidic solution has in common |  |  |  |  |
| 11 | I know what every basic solution has in common |  |  |  |  |
| 12 | I know what every neutral substance has in common. |  |  |  |  |
| 13 | I can explain why water is neutral and also weakly conducts electricity. |  |  |  |  |
| 14 | I know the Bronsted-Lowry definitions for an acid and a base. |  |  |  |  |
| 15 | I can identify conjugate acids and bases in an equation |  |  |  |  |
| 16 | I know what a hydronium ion is. |  |  |  |  |
| 17 | I can explain why water is amphiprotic |  |  |  |  |

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| **Learning Intention**  We are learning how to make acids and alkalis | | | | | |
| No. | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
| 18 | I can identify simple chemicals that will make acidic solutions when dissolved in water |  |  |  |  |
| 19 | I can explain why dissolving some substances produces an acidic solution |  |  |  |  |
| 20 | I can explain how these chemicals can have a negative effect on the environment and how they can become present in the environment | e.g. oxides of nitrogen and sulfur |  |  |  |
| 21 | I can explain what acid rain is and how it can be tackled. |  |  |  |  |
| 22 | I can identify simple chemicals that will make alkali solutions when dissolved in water |  |  |  |  |
| 23 | I can explain why dissolving some substances produces an alkali solution |  |  |  |  |
| 24 | I can explain how insoluble chemicals affect the pH of water |  |  |  |  |
| 25 | I can describe and give an example of an amphoteric oxide |  |  |  |  |

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| **Learning Intention**  We are learning about concentrations of solutions | | | | | |
| No. | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
| 26 | I can describe the effect of adding water to the pH of acids and alkalis |  |  |  |  |

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| **Learning Intention**  We are learning about reactions of acids | | | | | |
| No. | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
| 27 | I know what happens to the pH when acids and bases are mixed. |  |  |  |  |
| 28 | I can name the reaction when an acid and base are mixed |  |  |  |  |
| 29 | I can give the definition for a ‘base’ |  |  |  |  |
| 30 | I can explain the difference between a ‘base’ and an ‘alkali’ |  |  |  |  |
| 31 | I can write an equation to show the reaction between an acid and a metal hydroxide |  |  |  |  |
| 32 | I know what a salt is and can name it given the acid and the base. |  |  |  |  |
| 33 | I can write an ionic equation to show the reaction of an acid with a metal hydroxide |  |  |  |  |
| 34 | I can explain what a ‘rough titre’ is and why it is not included when calculating the average volume used |  |  |  |  |
| 35 | I can explain why titrations are repeated |  |  |  |  |
| 36 | I can calculate the volume or concentration of a solution required to completely react with another solution | e.g. NaOH + H2SO4 🡪 Na2SO4 + H2O  25 cm3 of 0.2 moldm-3 NaOH solution is neutralized by 21.7 cm3 of sulfuric acid. What is the concentration of the acid? |  |  |  |
| 37 | I can write an equation to show the reaction between an acid and a metal oxide |  |  |  |  |
| 38 | I can write an equation to show the reaction between an acid and a metal carbonate (or hydrogencarbonate) |  |  |  |  |
| 39 | I can explain what a spectator ion is and can identify them in an equation. | e.g. KOH + HNO3 🡪 KNO3 + H2O |  |  |  |
| 40 | I can write the equation for a neutralisation without the spectator ions and use this to explain the change in pH. |  |  |  |  |

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| L**earning Intention**  We are learning about types of Acids and Bases | | | | | |
| No. | **Outcome** | **What you know and understand** | ☹ | 😐 | ☺ |
| 41 | I can explain what is meant by a ‘strong acid/alkali’ and give examples |  |  |  |  |
| 42 | I can explain what is meant by a ‘weak acid/alkali’ and give examples |  |  |  |  |
| 43 | I can compare the properties of strong and weak acids |  |  |  |  |
| 44 | I can explain why the same volume of alkali is needed to neutralise a strong or weak acid. |  |  |  |  |

**Key Words from Acids and Bases**

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| **Key Word or Phrase** | **Meaning** |
| Acid |  |
| Base |  |
| Alkali |  |
| Neutral |  |
| Titration |  |
| Concentration |  |
| Burette |  |
| Pipette |  |
| Indicator |  |
| pH |  |
| Neutralisation |  |
| Standard Solution |  |
| Salt |  |
| Precipitation |  |
| Spectator Ion |  |
| Bronsted Acid |  |
| Bronsted Base |  |
| Conjugate Acid |  |
| Conjugate base |  |
| Hydronium ion |  |
| Weak Acid/base |  |
| Strong Acid/base |  |
| Dissociate |  |
| Equimolar |  |
| Amphiprotic |  |
| Amphoteric |  |

**Practice Past Paper Questions**

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**1**

**2**



**3**

**2005**

**4**



**2006**



**5**

**2005**

**6**



**2006**



**7**

**2007**



**8**

**2007**



**9**

**2007**



**10**

**2008**