GES Year 9 Chemistry: Half Termly 2 Topic Sheet for January – March 2020

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| TOPIC: STATES OF MATTER |

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| Theme: The particulate nature of matter | Level: Year 9 |
| Objectives: To develop an understanding of the states of matter. How the states are changed with the concept of the particle matter and diffusion. | |

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| Focussing Statements | Key Words Practical | | |
| 1. **State the distinguishing properties of solids, liquids and gases?**  * examples of solids, liquids and gases * emphasise their properties.  1. **Describe the structure of solids, liquids and gases in terms of particle separation, arrangement and types of motion**  * Use ‘particles in boxes’ diagrams to represent the three states of matter. * An excellent collection of animations and video clips can be found at: www.nationalstemcentre.org.uk/elibrary/reso urce/3988/particles-in-motion  1. **Describe changes of state in terms of melting, boiling, evaporation, freezing, condensation and sublimation.**  * The heating of solid octadecanoic acid (stearic acid) until it is liquid, and then allowing it to freeze again * rate of evaporation of propanone, * Sublimation can be demonstrated by heating ammonium chloride in an evaporating dish and collecting the solid on the sides of an inverted filter funnel above the dish  1. **Explain changes of state in terms of the kinetic theory**  * Relate the conversions to the motion and arrangement of particles. This may be done as a research activity using textbooks or the internet * Emphasise the change in the arrangement and movement of the particles when a substance changes state. * Relate the conversions to the motion and arrangement of particles. Relate this to the energy input/output.  1. **Describe qualitatively the pressure and temperature of a gas in terms of the motion of its particles**  * Pressure is due to particles in a gas hitting the walls of a container. The faster the speed of the particles the higher the pressure. The higher the temperature of a gas the faster the particles are moving**.**  1. **Describe and explain Brownian motion in terms of random molecular bombardment State evidence for Brownian motion**  * One effective way to view Brownian motion is to view a slide of colloidal graphite through a microscope.  1. **Describe and explain diffusion**  * Simple examples of diffusion include: • air freshener, perfume, ether, camphor smells in the lab • movement of nitrogen dioxide gas or bromine vapour in air • coloured inks/CuSO4/KMnO4 in water and Pb(NO3)2 in KI. * Extension – what would influence diffusion rate, for example temperature using tea bags held by a glass rod in beakers of hot and cold water. Learners should be able to link their observations to the particle model.  1. **Describe and explain dependence of rate of diffusion on molecular mass**  * Demonstration: Two cotton wool pads, one soaked with conc. hydrochloric acid and the other with conc. ammonia can be placed at opposite ends of a long glass tube sealed with bungs. A white ‘smoke’ of the precipitated ammonium chloride is seen where the two gases meet. | | Solids  Liquids  Gases  Particles  Motion  Melting point  Boiling point  Evaporation  Freezing  Condensation  Sublimation  Kinetic theory  Pressure  Brownian motion  Molecular mass  Diffusion  Rate of diffusion  Colloid | Melting and freezing of stearic acid: [www.nuffieldfoundation.org/practicalchemistry/melting-and-freezing-stearic-acid](http://www.nuffieldfoundation.org/practicalchemistry/melting-and-freezing-stearic-acid)  Rate of evaporation of propanone: www.nuffieldfoundation.org/practicalchemistry/rate-evaporation Sublimation of ammonium chloride: [www.tes.co.uk/teachingresource/Sublimation-of-AmmoniumChloride-Experiment-6132591/](http://www.tes.co.uk/teachingresource/Sublimation-of-AmmoniumChloride-Experiment-6132591/)  Diffusion of ammonia and hydrogen chloride: [www.nuffieldfoundation.org/practicalchemistry/diffusion-gases-ammonia-andhydrogen-chloride](http://www.nuffieldfoundation.org/practicalchemistry/diffusion-gases-ammonia-andhydrogen-chloride)  Details of how to perform a diffusion in liquids experiment: [www.nuffieldfoundation.org/practicalchemistry/diffusion-liquids](http://www.nuffieldfoundation.org/practicalchemistry/diffusion-liquids) | |

**Textbooks and worksheets**