Meden School Curriculum Planning							
Subject	Biology	**Year Group**	12	**Sequence No.**		**Topic**	3.3 Organisms Exchange Substances With Their Environment:

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
AQA GCSE Biology B2 Organisation, enzymes and digestion, the lungs, the circulatory system. Cardiovascular disease, health and disease. AQA GCSE Biology B1 Diffusion, exchange surfaces A level Biology 3.1.1-4 Biological molecules	**3.3.1 Surface Area To Volume Ratio** The relationship between the size of an organism or structure and its surface area to volume ratio. Changes to body shape and the development of systems in larger organisms as adaptations that facilitate exchange as this ratio reduces. Appreciate the relationship between surface area to volume ratio and metabolic rate. **3.3.2 Gas Exchange** Adaptations of gas exchange surfaces, shown by gas exchange: • across the body surface of a single-celled organism • in the tracheal system of an insect (tracheae, tracheoles and spiracles) • across the gills of fish (gill lamellae and filaments including the counter-current principle)	Why is smoking still a huge problem in some communities/countries? How can we help to ensure that all

A level Biology 3.2.3 Transport across membrances	• by the leaves of dicotyledonous plants (mesophyll and stomata). Structural and functional compromises between the opposing needs for efficient gas exchange and the limitation of water loss shown by terrestrial insects and xerophytic plants. The gross structure of the human gas exchange system limited to the alveoli, bronchioles, bronchi, trachea and lungs. The essential features of the alveolar epithelium as a surface over which gas exchange takes place. Ventilation and the exchange of gases in the lungs. The mechanism of breathing to include the role of the diaphragm and the antagonistic interaction between the external and internal intercostal muscles in bringing about pressure changes in the thoracic cavity. • Interpret information relating to the effects of lung disease on gas exchange and/or ventilation • Interpret data relating to the effects of pollution and smoking on the incidence of lung disease • Analyse and interpret data associated with specific risk factors and the incidence of lung disease • Evaluate the way in which experimental data led to statutory restrictions on the sources of risk factors • Recognise correlations and causal relationships. **3.3.3 Digestion and Absorption** During digestion, large biological molecules are hydrolysed to smaller molecules that can be absorbed across cell membranes. Digestion in mammals of: • carbohydrates by amylases and membrane-bound disaccharidases • lipids by lipase, including the action of bile salts • proteins by endopeptidases, exopeptidases and membrane- bound dipeptidases. Mechanisms for the absorption of the products of digestion by cells lining the ileum of mammals, to include:	communities understand the potential dangerous of smoking. The tobacco industry is a vital source of income for some countries what should the global community do to help support the reduction on economic reliance on tobacco. Air pollution in cities is a major contributor to lung disease and asthma. What should governments be doing to protect individuals?

	• co-transport mechanisms for the absorption of amino acids and of monosaccharides the role of micelles in the absorption of lipids. **3.3.4.1 Mass Transport in Animals** Over large distances, efficient movement of substance to and from exchange surfaces is provided by mass transport. The haemoglobins are a group of chemically similar molecules found in many different organisms. Haemoglobin is a protein with a quaternary structure. The role of haemoglobin and red blood cells in the transport of oxygen. The loading, transport and unloading of oxygen in relation to the oxyhaemoglobin dissociation curve. The cooperative nature of oxygen binding to show that the change in shape of haemoglobin caused by binding of the first oxygens makes the binding of further oxygens easier. The effects of carbon dioxide concentration on the dissociation of oxyhaemoglobin (the Bohr effect). Many animals are adapted to their environment by possessing different types of haemoglobin with different oxygen transport properties. The general pattern of blood circulation in a mammal. Names are required only of the coronary arteries and of the blood vessels entering and leaving the heart, lungs and kidneys. The gross structure of the human heart. Pressure and volume changes and associated valve movements during the cardiac cycle that maintain a unidirectional flow of blood. The structure of arteries, arterioles and veins in relation to their function.	

	Students could be given values of cardiac output (CO) and one other measure, requiring them to change the subject of the equation: CO = stroke volume × heart rate The structure of capillaries and the importance of capillary beds as exchange surfaces. The formation of tissue fluid and its return to the circulatory system. Analyse and interpret data relating to pressure and volume changes during the cardiac cycle Analyse and interpret data associated with specific risk factors and the incidence of cardiovascular disease Evaluate conflicting evidence associated with risk factors affecting cardiovascular disease Recognise correlations and causal relationships **Required practical 5:** Dissection of animal or plant gas exchange system or mass transport system or of organ within such a system. **3.3.4.2 Mass Transport in Plants** Xylem as the tissue that transports water in the stem and leaves of plants. The cohesion-tension theory of water transport in the xylem. Phloem as the tissue that transports organic substances in plants. The mass flow hypothesis for the mechanism of translocation in plants. The use of tracers and ringing experiments to investigate transport in plants. Recognise correlations and causal relationships Interpret evidence from tracer and ringing experiments and to evaluate the evidence for and against the mass flow hypothesis. Students could set up and use a potometer to investigate the effect of a named environmental variable on the rate of transpiration.	The obesity crisis is one of the major health risks of developed societies. Inequalities in obesity. In the United Kingdom, like other high-income countries, obesity is associated with **social and economic deprivation**, with a higher prevalence in the lowest

		income quintile. Current research suggests that this gradient is embedded, with little evidence of change over time New analysis reveals stark inequalities in obesity rates across England | The King's Fund (kingsfund.org.uk)