ORDERING LONGER ANSWERS -
SCIENCE EXERCISE

WHAT YOU NEED TO KNOW – ORDERING LONG ANSWERS

With longer answer questions you not only need to establish good paragraph structure, you need to work out a focus for two or three paragraphs and structure each well.

EXERCISE – LOGICAL ORDER AND CONNECTIVES

In the following exercise you have a large number of bullet points which address the question. Decide:

1 How to put the information into two or three paragraphs and then
2 Structure each of the paragraphs.

SCIENCE AREA 1 - Describe the journey of a signal in the human nervous system

- Channel proteins allow calcium ions to move into the synaptic knob from the synaptic cleft.
- There are different types of receptor to receive different types of stimulus.
- When a receptor is stimulated it depolarises, creating a generator potential.
- Receptors work to convert the stimulus into a nerve impulse.
- There are more Na+ ions on the outside of an axon before any signal is received.
- The Na+ ions are maintained on the outside of the axon membrane by a sodium-potassium pump.
- K+ ions are maintained on the inside of the axon membrane.
- There is a positive charge on the outside and a negative charge on the inside. This is polarisation.
- Na+ ions are passed across the membrane reducing the difference between the charges across the membrane.
- If there is enough generator potential an action potential in a sensory neurone will be produced.
- Na+ ions pass through the post-synaptic membrane which is then depolarised.
- The action potential moves along the neurone and reaches a synapse which has a synaptic knob at the end.

- The action potential arrives at the synaptic knob where there is a pre-synaptic membrane and after that a synaptic cleft.
- Transmitter molecules such as acetylcholine are released from the pre-synaptic membrane into the synaptic cleft.
- There is a post synaptic membrane the other side of the synaptic cleft.
- Receptor proteins in the post-synaptic membrane provide sites for the transmitter molecules to bind with and this opens up channel proteins.
- An action potential is created in the cell, the neurone has fired, and the process continues.

SCIENCE AREA 2 - Discuss the melting of an iceberg in terms of forces and bonds between molecules

- The H bond is a specific dipole interaction between an H atom in one molecule and O, N or F atoms in another molecule.
- Hydrogen bonds hold water molecules apart in an open lattice structure when it is in its solid form.
- Solids are usually denser than liquids.
- Ice is the solid form of water.
- Van der Waal's forces, or dipole forces, are present between all molecules.
- Particles in solids are usually packed closer than in liquids.
- The water molecule is H2O.
- Bigger molecules have larger van der Waals forces than smaller molecules.
- Polar molecules like H2O have permanent dipole diploe interactions.
- Water molecules have van der Waals forces and H bonds.
- Hydrogen bonds are stronger than van der Waals and so harder to break.
- The melting point of a solid requires a higher temperature if H bonds are present as well as van der Waals.
- H2O stays a solid at higher temperatures than substances with no H bonds.
- Heat from a source such as the sun, or the transfer of heat energy from surrounding water, breaks the hydrogen bonds between the water molecules.
- Ice-melt water is more dense than surrounding water because colder molecules in a liquid are closer together than in a warmer liquid.
- Hydrogen bonds are weak relative to covalent and ionic bonds
- A hydrogen bond occurs between an H atom with a slight positive charge (delta positive) on a molecule and a pair of electrons on a very electronegative atom such as O, F or N.
- When heat is applied, hydrogen bonds are broken and the lattice structure of the solid collapses and so molecules move closer together, so becomes more dense.
- Icebergs float on water because ice is less dense than water.
- As hydrogen bonds are broken, water goes from its solid form to its liquid form.
- Melt water from the iceberg sinks below the surrounding water.

SCIENCE AREA 3 - Describe how wind tunnels are used to study the flow of air around objects

- Drag force is caused by resistance between the layers of air as they slide past each other.
- With turbulent flow, when the air is more dense the drag force is greater.
- Wind tunnels help investigate drag forces around a body.
- Vehicles like cars and planes are designed so they have minimal resistive forces acting on them when they move.
- As the speed of the vehicle increases, relative to the speed of the air, the flow of air changes from laminar to turbulent flow.
- When the air flow over a vehicle is turbulent the air flow is disordered and irregular.
- The pattern of the flow of air over a vehicle is determined by the relative speed of the air and the vehicle.
- The further away from the vehicle, the faster the air flows.
- With laminar flow, the air over the vehicle moves in layers.
- In laminar flow, if the air becomes more viscous the drag force becomes greater.
- When air is more viscous, it has greater resistance to the relative motion of the vehicle.
- As the speed of the vehicle increases to the critical velocity, laminar flow changes to turbulent flow.
- In turbulent flow, the drag force is proportional to speed squared where speed is relative to the air.

SCIENCE AREA 1 - Describe the journey of a signal in the human nervous system

The starting point of an electrical impulse in the human body is the receptor. There are different types of receptor to receive different types of stimulus. Receptors work to convert the stimulus into a nerve impulse. This process occurs in the axon. In an axon there are more Na+ ions on the outside of an axon before any signal is received. This concentration of Na+ ions is maintained on the outside of the axon membrane by a sodium-potassium pump. In a similar manner, K+ ions are maintained on the inside of the axon membrane. Therefore there is a positive charge on the outside and a negative charge on the inside; this is polarisation. When a receptor is stimulated it depolarises, creating a generator potential. Na+ ions are passed across the membrane reducing the difference between the charges across the membrane. If there is enough generator potential, an action potential in a sensory neurone will be produced.

The action potential moves along the neurone and reaches a synapse which has a synaptic knob at the end. The action potential arrives at the synaptic knob where there is a pre-synaptic membrane and after that a synaptic cleft. Channel proteins allow calcium ions to move into the synaptic knob from the synaptic cleft. Transmitter molecules such as acetylcholine are released from the pre-synaptic membrane into the synaptic cleft. There is a post synaptic membrane the other side of the synaptic cleft. Receptor proteins in the post-synaptic membrane provide sites for the transmitter molecules to bind with and this opens up channel proteins. Na+ ions pass through the post-synaptic membrane which is then depolarised. An action potential is created in the cell, the neurone has fired, and the process continues.

SCIENCE AREA 2 - Discuss the melting of an iceberg in terms of forces and bonds between molecules

The bonds between water molecules affect its properties. Van der Waal's forces, or dipole forces, are present between all molecules. However, the hydrogen bond (H bond) is a specific dipole dipole interaction between an H atom in one molecule and O, N or F atoms in another molecule. These bonds occur between an H atom with a slight positive charge (delta positive) on a molecule and a pair of electrons on a very electronegative atom such as O, F or N; bigger molecules have larger van der Waals forces than smaller molecules. H bonds are stronger than van der Waals and so harder to break, although they are weak relative to covalent and ionic bonds. The water molecule, H2O, therefore, is a polar molecule and has permanent dipole diploe interactions; they have van der Waals forces and H bonds. If H bonds are present as well as van der Waals the melting point of the solid is at a higher temperature than if only van der Waals forces were present. Therefore, H2O stays a solid at higher temperatures than substances with no H bonds.

Icebergs float on water because ice is less dense than water and yet ice is the solid form of water. Solids are usually denser than liquids because particles in solids are usually packed closer than in liquids. However, hydrogen bonds hold water molecules apart in an open lattice structure when it is in its solid form. Heat from a source such as the sun, or the transfer of heat energy from surrounding water, breaks the hydrogen bonds between the water molecules in ice. So, as heat is applied, these hydrogen bonds are broken and the lattice structure of the solid collapses and so molecules move closer together, so becoming more dense. Consequently, as the hydrogen bonds are broken, water.

SCIENCE AREA 3 - Describe how wind tunnels are used to study the flow of air around objects

Wind tunnels help investigate drag forces around a body. The pattern of the flow of air over a vehicle is determined by the relative speed of the air and the vehicle. Vehicles like cars and planes are designed so they have minimal resistive forces acting on them when they move. The further away from the vehicle, the faster the air flows. There are two types of flow: laminar and turbulent.

With laminar flow, the air over the vehicle moves in layers. Drag force is caused by resistance between the layers of air as they slide past each other. In laminar flow, if the air becomes more viscous, the drag force becomes greater, since when air is more viscous it has greater resistance to the relative motion of the vehicle. As the speed of the vehicle increases, relative to the speed of the air, the flow of air changes from laminar to turbulent flow.

In the wind tunnel, as the speed of the air past the vehicle increases to the critical velocity, laminar flow changes to turbulent flow. When the air flow over a vehicle is turbulent, the air flow is disordered and irregular. Furthermore, with turbulent flow, when the air is more dense, the drag force is greater. In addition, in turbulent flow the drag force is proportional to speed squared where speed is relative to the air.