

# Science In Action 8 - Year-End Summary - Study Guide

## Unit 1 – Mix and Flow of Matter

- 1.0 Fluids in Technological Devices
  - ❖ **WHMIS** symbols and safety procedures in the lab
  - ❖ Transporting (**slurry**), processing (glass and steel) and using materials (toothpaste) using fluids
  - ❖ Properties of fluids include: **viscosity, density, buoyancy and compressibility**
- 2.0 Properties of Mixtures and Fluids using the Particle Model
  - ❖ Matter can be classified as **pure substances** and **mixtures**
  - ❖ Solutions are made with a **solute** and a **solvent**
  - ❖ **Concentration** describes how much solute is in a particular solvent
  - ❖ **Solubility** depends on the temperature of the solution, the type of solute and the type of solvent
- 3.0 Properties of Gases and Liquids using the Particle Model
  - ❖ **Viscosity** is a fluid's resistance to flow
  - ❖ **Density** is the amount of mass in a given volume
  - ❖ An increase in temperature decreases viscosity and increases density
  - ❖ The **particle model** describes the spaces between the particles
  - ❖ Less dense objects float on more dense substances because of **buoyant force**
  - ❖ Gases are **compressible**, but liquids are nearly **incompressible**
  - ❖ **Pressure** is calculated by dividing force over area
  - ❖ **Pascal's Law** states that force applied to a fluid is transmitted equally throughout the fluid
- 4.0 Fluid Technologies
  - ❖ Fluid technologies include: **solvents, pumps, valves, hydraulics and pneumatics**

## Unit 2 – Cells and Systems

- 1.0 Characteristics of Living Things
  - ❖ They are made of cells, require energy, grow and develop, respond to their surroundings, reproduce and have adaptations to survive
  - ❖ All organisms have structures which perform specific life functions
  - ❖ Animals have **organs** and different organs that work together to perform a common function are organized into **organ systems**
- 2.0 Cells play a vital role
  - ❖ A **Microscope** is a scientific tool used to see very small structures
  - ❖ The **cell** is the basic unit of life - all organisms have at least one cell
  - ❖ Structures in cells are called **organelles** which carry out specific life functions
  - ❖ Organisms can be single celled or multi-celled
  - ❖ Substances move in and out of cells by **diffusion and osmosis**
  - ❖ All cells have a **selectively permeable membrane**
  - ❖ **Cells** form **tissue** (four types – **connective, epithelial, nervous and muscular**), tissue forms **organs** and organs work together to make **organ systems**
- 3.0 Healthy Human Body Systems
  - ❖ **Digestive System, Circulatory System, Respiratory System, Excretory System, Nervous System**
  - ❖ Interactions between systems as a result of internal and external stimuli
- 4.0 Scientific investigation and Medical Applications
  - ❖ Research to improve understanding of what causes diseases (smallpox)
  - ❖ Health is affected by a number of factors which can lead to poor health of cells, organs and organ systems

## Unit 3 – Light and Optical Systems

- 1.0 Explanations, Inventions & Investigations about Light and Vision
  - ❖ Scientific experiments to explain how light and vision work
  - ❖ Optical devices – **telescopes** and **microscopes** – have lead to **astronomy** and **microbiology**
- 2.0 Light behaves in predictable ways
  - ❖ Ray diagrams are used to describe light
  - ❖ The **Angle of Incidence** equals the **Angle of Reflection**
  - ❖ **Concave** mirrors **converge** light to a focal point (headlights)
  - ❖ **Convex** mirrors **diverge**, or spread light out
  - ❖ **Refraction** – light is bent when it passes to and from areas of different densities
  - ❖ **Concave and Convex lenses** are **optical devices** that refract light to form **images**
- 3.0 Electromagnetic Spectrum – Wave Theory
  - ❖ Light has the properties of a **wave**
  - ❖ **Visible light** has different wavelengths and forms the colors of the rainbow

- ❖ Electromagnetic spectrum also includes (**invisible** light) – radio waves, microwaves, infrared, ultraviolet, X-rays, gamma ray
- ❖ Radio waves carry the least energy – gamma rays the most energy
- ❖ Visible light can be produced naturally (**bioluminescence, sunlight**) & artificially (**phosphorescence, incandescence and florescence**)
- ❖ White light combines red light – green light – blue light
- 4.0 Eyes and Cameras capture Images using Light Properties
  - ❖ Similarities – designed to capture and focus light to form an image on a light-sensitive material
  - ❖ Insects have **compound eyes** made of many tiny lenses
  - ❖ Digital images are made by a computer, which converts the image to **pixels** (a set of numbers)

## Unit 4 – Mechanical Systems

- 1.0 Machines are tools that help us do work
  - ❖ A **machine** is a device that helps us do work
  - ❖ Energy for machines to operate is provided by people, animals, electricity, fossil fuels
  - ❖ Six simple machines: the **lever, inclined plane, wedge, screw, pulley and wheel and axle**
  - ❖ **Complex machines** are made up of two or more simple machines
  - ❖ **Gears, linkages and transmissions** connect subsystems and help to transmit the force in complex machines
- 2.0 Mechanical Advantage
  - ❖ **Mechanical Advantage** is a measure of how much a machine can increase an applied force
  - ❖ **Speed Ratio** – how speed is affected by a machine
  - ❖ **Work** is done when a force acts on an object to make it **move**
  - ❖ Machines help us do work by transferring energy
  - ❖ **Efficiency** is a measure of how well a machine uses energy and can be calculated **quantitatively** (mechanical advantage divided by speed ratio multiplied by 100)
  - ❖ **NO MACHINE can be 100% efficient** (because of friction)
  - ❖ Hydraulic systems work because of **Pascal's Law** (Unit 1 – 3.0)
- 3.0 Science, Society and The environment
  - ❖ Function (what it is supposed to do) and design (physical form that makes it useful) are two important aspects of mechanical devices
  - ❖ Evaluation criteria: efficiency, effectiveness, impact on humans and the environment
  - ❖ Efficiency described **qualitatively** – *efficiency is when a task is easier and quicker to do using a machine*
  - ❖ Technology development is influenced by scientific knowledge, trial and error and changes in society and the environment

## Unit 5 – Fresh and Saltwater Systems

- 1.0 Humans depend on Water Supply and Quality
  - ❖ Water resources: oceans, glaciers, groundwater, lakes and rivers
  - ❖ Contents of water: minerals, organisms, organic material
  - ❖ Water quality testing ensure it is safe to drink
- 2.0 Water affects Landforms and Climate on the Earth
  - ❖ **Waves and Tides** interact with landforms causing **erosion** and **sedimentation**
  - ❖ Stream and River characteristics helps us understand erosion and deposition shape the Earth's surface
  - ❖ **Plate tectonics** (ocean basins and continental drainage system in North America) and **glaciers** (further erosion of the drainage system)
  - ❖ Water interacts with Earth to produce variations in **climate**
- 3.0 Aquatic Organisms are affected by many factors
  - ❖ Organisms are affected by the quality of their aquatic environment
  - ❖ Water conditions: light, temperature and depth of the water
  - ❖ Oceans can support a much **greater diversity** of living organisms
  - ❖ A **population** - the number of a certain species living in a certain area
  - ❖ Each aquatic organism has adapted to a particular quality of water
- 4.0 Human Activities Affect Aquatic Environments
  - ❖ Water is used by humans for work, play and for survival
  - ❖ Greatest use of water – **irrigation** for agriculture (next is industry)
  - ❖ **Monitoring** helps us to determine what impact humans have on the aquatic environments they interact with
  - ❖ Science and Technology must be supported by Action and Commitment