Year 9 Science

Independent Learning Tasks 2024/25

Contents

Background

Within this booklet, you will find all of your Independent Learning Tasks for the year. There are a range of different activities for you to complete according to the Independent Learning Calendar, which can be found on our website.

For research tasks, you can decide on your preferred method to present your findings. Some suggestions have been provided.

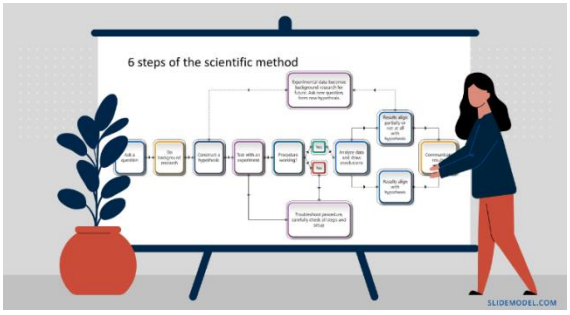
If you have any questions, please speak to your class teacher.

Instructions for Presenting Work

Option 1: Creating a Poster

1. **Title and Theme:**
    - **Title:** Ensure your poster has a clear and bold title at the top.
    - **Theme:** Stick to the theme of your research and make it visually engaging.
2. **Content:**
    - **Introduction:** Write a brief introduction to your topic.
    - **Main Points:** Break down your research into key points. Use bullet points or short paragraphs.
    - **Visuals:** Include images, diagrams, or charts to support your points.
    - **Conclusion:** Summarise your findings in a concise manner.
3. **Layout:**
    - **Sections:** Divide your poster into sections (e.g., Introduction, Methods, Results, Conclusion).
    - **Balance:** Ensure there's a good balance between text and images.
    - **Readability:** Use large fonts and clear headings to make your poster easy to read from a distance.
4. **Design:**
    - **Colours:** Use contrasting colours for background and text to make it readable.
    - **Consistency:** Keep a consistent style throughout your poster.
    - **Spacing:** Leave enough space between sections so that the poster doesn’t look cluttered.
5. **Proofreading:**
    - Check for spelling and grammar errors.
    - Make sure all information is accurate and well-presented.

Option 2: Creating a PowerPoint Presentation



1. **Title Slide:**
    - **Title:** Include the title of your presentation.
    - **Your Name:** Add your name and class.
    - **Date:** Include the date of the presentation.
2. **Content Slides:**
    - **Introduction Slide:**
        - Briefly introduce your topic.
    - **Main Points Slides:**
        - Use one slide per main point.
        - Include bullet points to list key information.
        - Add images, diagrams, or charts to support your points.
    - **Conclusion Slide:**
        - Summarize your findings.
        - Include a final image or thought-provoking question.
3. **Design:**
    - **Templates:** Use a consistent template for all slides.
    - **Fonts:** Use large, clear fonts. Avoid overly fancy fonts.
    - **Colours:** Use contrasting colours for text and background.
    - **Animations:** Use animations sparingly to keep the focus on the content.
4. **Visuals:**
    - **Images and Diagrams:** Make sure all visuals are high-quality and relevant.
    - **Charts and Graphs:** Use charts and graphs to present data clearly.
5. **Practice:**
    - **Rehearse:** Practice presenting your slides to ensure smooth delivery.
    - **Timing:** Make sure your presentation fits within the given time limit.
    - **Q&A:** Prepare for potential questions from your audience.

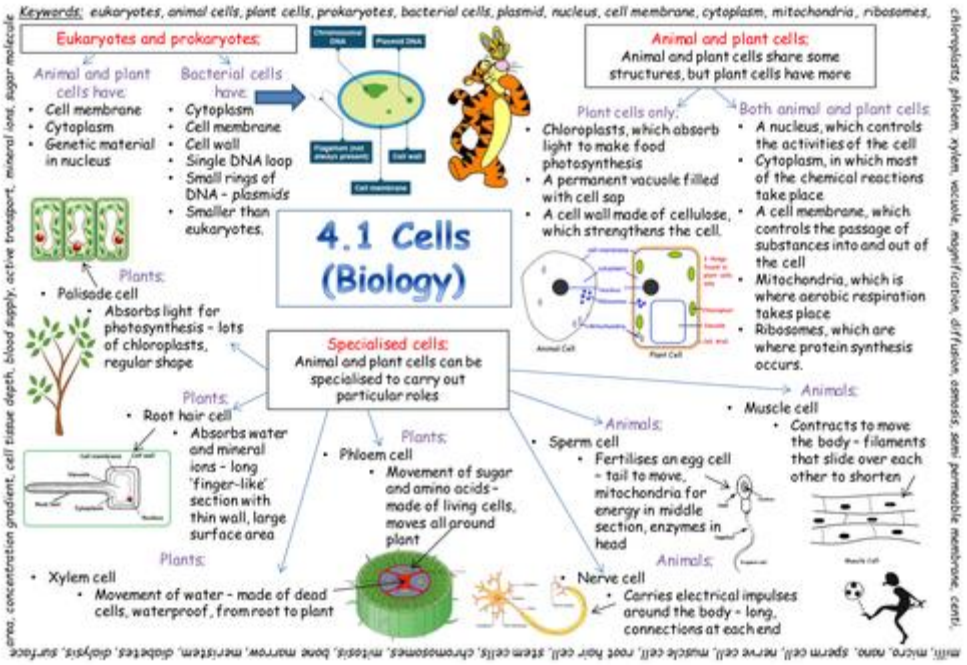
Year 9.1 Independent Learning

Cell Biology

Year 9 Science Independent Learning Task Sheet: Cell Biology

Objective:

To deepen understanding of cell biology, including cell structure, function, and processes, through independent research and practical activities.



Task 1: Research Cell Structure and Function

1. **Eukaryotic and Prokaryotic Cells:**
   - Research the differences between eukaryotic and prokaryotic cells.
   - Create a table comparing their structures and functions.
2. **Animal and Plant Cells:**
   - Draw and label a diagram of an animal cell and a plant cell.
   - Identify and describe the function of the following organelles:
     - Nucleus
     - Mitochondria
     - Ribosomes
     - Endoplasmic Reticulum (Smooth and Rough)
     - Golgi Apparatus
     - Chloroplasts (Plant Cell)

- Vacuole (Plant Cell)
- Cell Wall (Plant Cell)
- Cell Membrane
- Cytoplasm

Task 2: Cell Specialization and Differentiation

1. **Specialized Cells:**
   - Research different types of specialized cells (e.g., nerve cells, red blood cells, root hair cells).
   - Create a fact sheet for three specialized cells, including:
     - A labeled diagram of the cell
     - The cell's function
     - How its structure is adapted to its function
2. **Stem Cells:**
   - Research what stem cells are and their importance in medicine.
   - Write a short essay (200-300 words) on the potential uses of stem cells in treating diseases.

Task 3: Microscopy

1. **Using a Microscope:**
   - Research how to use a light microscope to view cells.
   - Write step-by-step instructions on how to prepare a slide and use a microscope.
2. **Practical Activity (Optional):**
   - If possible, use a microscope to observe and draw cells from an onion skin or cheek swab.
   - Label the cell structures you can identify.

Task 4: Cell Division

1. **Mitosis:**
   - Research the stages of mitosis.
   - Create a flowchart or storyboard that illustrates and describes each stage of mitosis.
2. **Meiosis:**
   - Research the stages of meiosis and how it differs from mitosis.
   - Write a comparison table showing the differences between mitosis and meiosis.

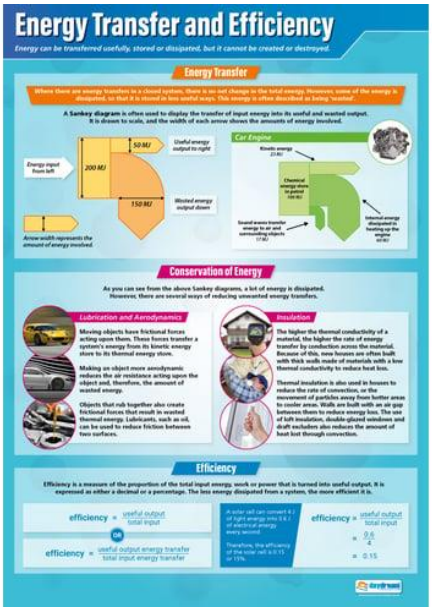
Year 9.2 Independent Learning

Energy 1

Year 9 Science Independent Learning Task Sheet: Energy

Objective:

To develop a thorough understanding of energy concepts, including energy transfers, energy resources, and efficiency, through independent learning activities.



Task 1: Energy Transfers and Efficiency

1. **Research Energy Transfers:**
   - **Objective:** Understand how energy is transferred and the concept of efficiency.
   - **Instructions:**
     - Research different types of energy transfers (e.g., kinetic, thermal, electrical, chemical).
     - Write a brief explanation of each type of energy transfer.
     - Find and describe three real-life examples of energy transfers.
2. **Calculate Efficiency:**
   - **Objective:** Learn how to calculate the efficiency of energy transfers.
   - **Instructions:**
     - Use the formula for efficiency:

- Calculate the efficiency for the following scenarios:
    1. A light bulb uses 100 joules of electrical energy and produces 20 joules of light energy.
    2. A car engine uses 5000 joules of chemical energy from fuel and produces 1200 joules of kinetic energy.
- Show all your workings and explain your calculations.

3. **Practical Activity:**
    - **Objective:** Investigate the efficiency of a simple energy transfer device.
    - **Instructions:**
        - Choose a simple device (e.g., a toy car, a light bulb, a kettle).
        - Measure the energy input and useful energy output (you may use estimations if exact measurements are not possible).
        - Calculate the efficiency of the device.
        - Write a short report on your findings, including diagrams and any assumptions made.

Year 9.3 Independent Learning

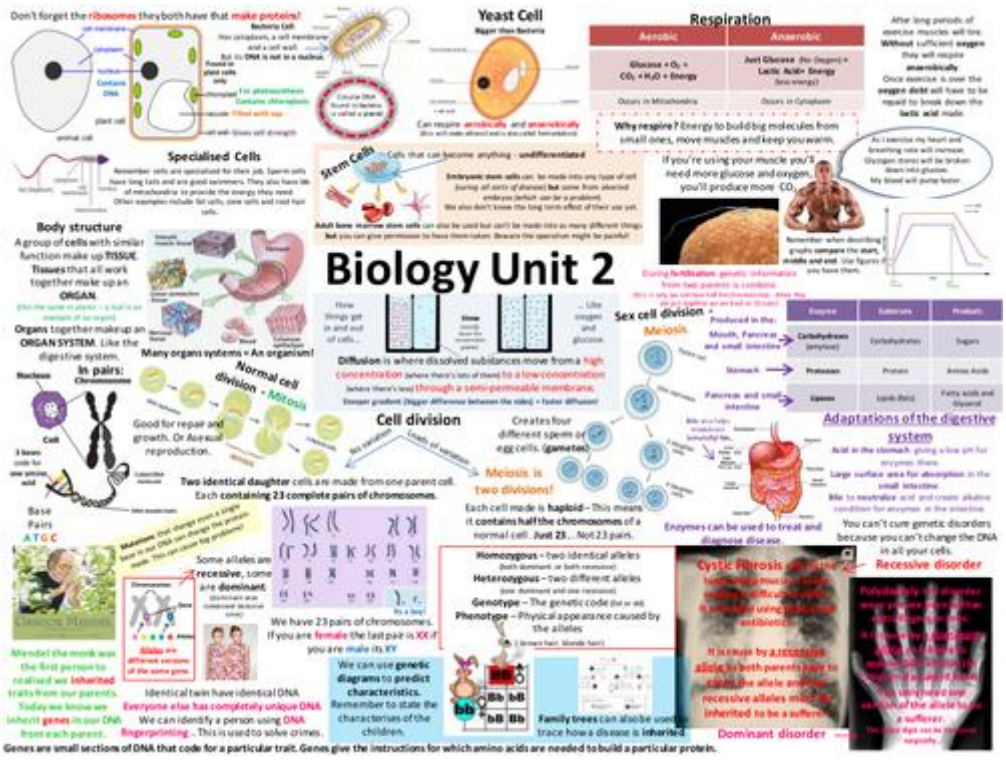
Organisation and Differentiation

Year 9 Science Independent Learning Task Sheet

Topic: Organisation and Differentiation

Objective:

To understand the principles of organisation in living organisms and the process of cell differentiation.



Task 1: Research and Define Key Terms

1. **Organisation in Biology:**
   - Define the following levels of organisation in living organisms:
     - Cells
     - Tissues
     - Organs
     - Organ Systems
     - Organism
2. **Cell Differentiation:**
   - Define cell differentiation.

- Explain why cell differentiation is important in multicellular organisms.

Task 2: Describe Examples

1. **Examples of Organ Systems:**
   - Choose two organ systems (e.g., digestive system, circulatory system).
   - Describe the main organs involved in each system and their functions.
2. **Examples of Differentiated Cells:**
   - Choose two types of differentiated cells (e.g., muscle cells, nerve cells).
   - Describe their structure and explain how it relates to their function.

Task 3: Create Diagrams

1. **Organ Systems Diagram:**
   - Draw and label a diagram of one of the chosen organ systems.
   - Include the main organs and briefly describe their functions.
2. **Differentiated Cells Diagram:**
   - Draw and label a diagram of one of the chosen differentiated cells.
   - Highlight key features that enable it to perform its function.

Task 4: Investigate Stem Cells (Optional Extension Activity)

1. **Stem Cells:**
   - Research what stem cells are and the different types (e.g., embryonic stem cells, adult stem cells).
   - Explain the potential uses of stem cells in medicine.
2. **Ethical Considerations:**
   - Discuss the ethical considerations surrounding the use of stem cells in medical research and treatment.

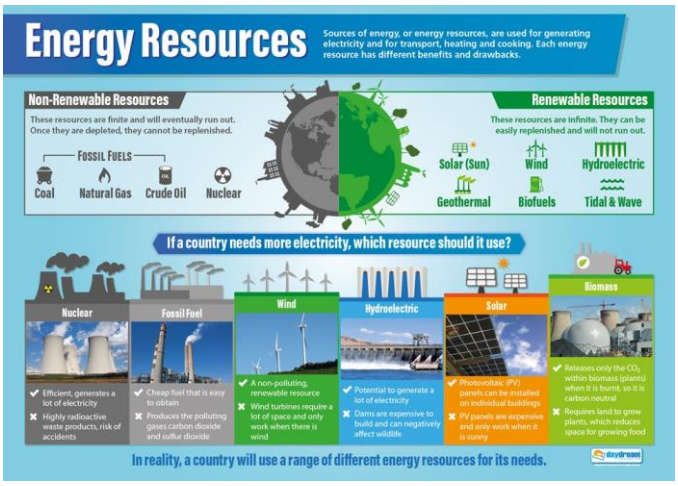
Year 9.4 Independent Learning

Energy 2

Year 9 Science Independent Learning Task Sheet: Energy

Objective:

To develop a thorough understanding of energy concepts, including energy transfers, energy resources, and efficiency, through independent learning activities.



Task 1: Energy Resources and Their Impact

1. **Research Energy Resources:**
    - **Objective:** Understand different types of energy resources and their impact on the environment.
    - **Instructions:**
        - Research the following types of energy resources: fossil fuels (coal, oil, natural gas), nuclear power, renewable resources (solar, wind, hydroelectric, geothermal, biomass).
        - Create a table summarizing the following information for each resource:
            - How the energy is generated.
            - Advantages and disadvantages.
            - Environmental impact.
2. **Energy Debate:**
    - **Objective:** Develop critical thinking skills by evaluating the pros and cons of different energy resources.
    - **Instructions:**

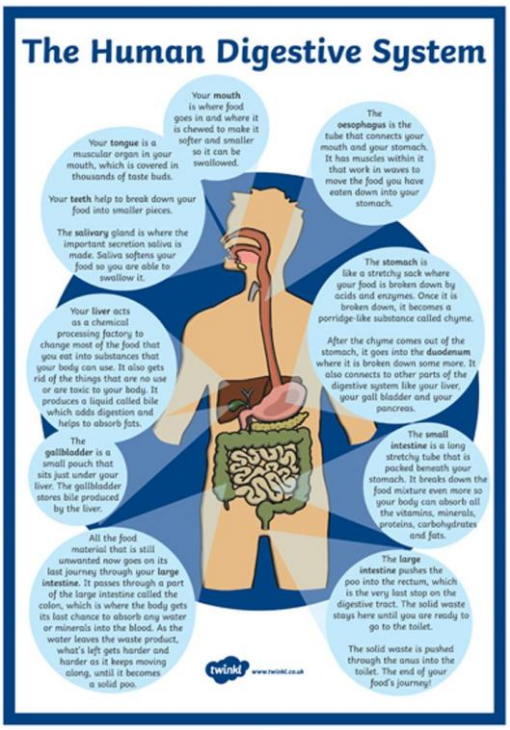
- Choose two energy resources: one non-renewable (e.g., coal) and one renewable (e.g., solar).
- Write an argumentative essay (300-500 words) discussing the benefits and drawbacks of each resource.
- Conclude with your opinion on which resource is better for long-term energy sustainability and why.

3. **Creative Project:**
    - **Objective:** Demonstrate understanding and creativity by designing an energy-efficient home.
    - **Instructions:**
        - Draw a floor plan of a home that incorporates at least three different renewable energy sources.
        - Explain how each energy source will be used in the home.
        - Include energy-saving features (e.g., insulation, energy-efficient appliances).
        - Write a short description (100-200 words) explaining how your design minimizes environmental impact and maximizes energy efficiency.

Year 9.5 Independent Learning

Digestion and Enzymes

Year 9 Science Independent Learning Task Sheet: Digestion and Enzymes
Objective:
To understand the process of digestion and the role of enzymes in the human body.



Task 1: Research the Digestive System

1. **Identify Key Organs:**
    - Research and identify the major organs involved in the digestive system. Include:
        - Mouth
        - Oesophagus
        - Stomach
        - Small intestine
        - Large intestine
        - Liver
        - Pancreas
        - Gallbladder

2. **Functions:**
    - Write a brief description of the function of each organ.

Task 2: Understand Enzymes

1. **Definition:**
    - Write a definition of enzymes and explain their role in the digestive system.
2. **Types of Enzymes:**
    - Research and describe the main types of digestive enzymes. Include:
        - Amylase
        - Protease
        - Lipase
3. **Substrates and Products:**
    - For each type of enzyme, identify the substrate (the substance it acts on) and the products (the substances produced).

Task 3: The Process of Digestion

1. **Stages of Digestion:**
    - Describe the stages of digestion from ingestion to egestion. Include what happens in each stage and the role of enzymes.
2. **Enzyme Action:**
    - Explain how enzymes work, including the concept of the active site and the lock-and-key model.

Task 4: Create Diagrams

1. **Digestive System Diagram:**
    - Draw a labelled diagram of the human digestive system, showing the major organs and their functions.
2. **Enzyme Action Diagram:**
    - Draw a diagram to illustrate how enzymes work, showing the enzyme, substrate, enzyme-substrate complex, and products.

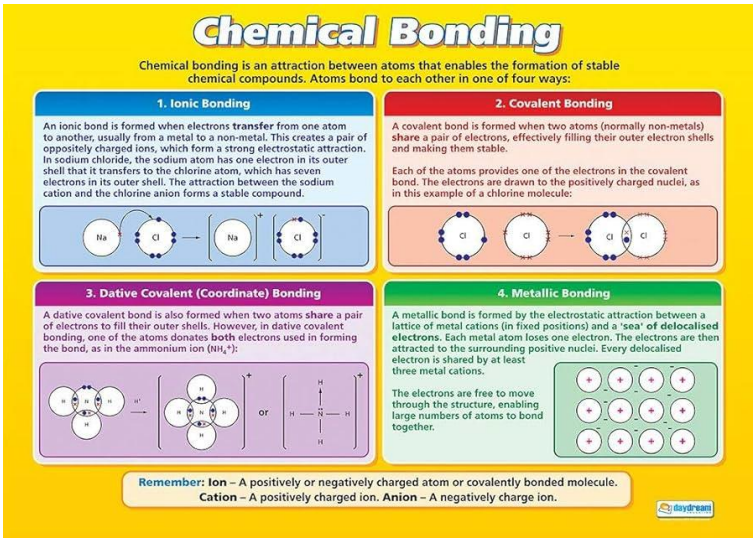
Year 9.6 Independent Learning

Bonding

Year 9 Science Independent Learning Task Sheet: Bonding

Objective:

To understand the different types of chemical bonding, their properties, and how they affect the behaviour of substances.



Task 1: Research Types of Bonding

1. **Identify Key Types of Bonding:**
    - Research and write a brief explanation of the following types of bonding:
        - Ionic Bonding
        - Covalent Bonding
        - Metallic Bonding

Task 2: Describe Each Type of Bonding

1. **Ionic Bonding:**
    - **Explanation:** Describe how ionic bonds are formed between metals and non-metals.
    - **Properties:** Explain the properties of ionic compounds (e.g., high melting points, electrical conductivity in molten/solution state).

- **Examples:** Provide examples of ionic compounds (e.g., sodium chloride).

2. **Covalent Bonding:**
   - **Explanation:** Describe how covalent bonds are formed between non-metal atoms.
   - **Properties:** Explain the properties of covalent compounds (e.g., low melting points, poor electrical conductivity).
   - **Examples:** Provide examples of covalent compounds (e.g., water, carbon dioxide).
3. **Metallic Bonding:**
   - **Explanation:** Describe how metallic bonds are formed between metal atoms.
   - **Properties:** Explain the properties of metallic compounds (e.g., high melting points, electrical conductivity, malleability).
   - **Examples:** Provide examples of metallic substances (e.g., copper, iron).

Task 3: Create Diagrams

1. **Ionic Bonding Diagram:**
   - Draw a diagram to show the transfer of electrons between a metal and a non-metal to form an ionic bond.
   - Label the ions formed and their charges.
2. **Covalent Bonding Diagram:**
   - Draw a diagram to show the sharing of electrons between non-metal atoms to form a covalent bond.
   - Use dot-and-cross diagrams to illustrate the shared pairs of electrons.
3. **Metallic Bonding Diagram:**
   - Draw a diagram to show the 'sea of electrons' in a metallic bond.
   - Label the positive metal ions and the delocalized electrons.

Task 4: Compare and Contrast

1. **Comparison Table:**
   - Create a table comparing the three types of bonding. Include the following headings:
     - Type of Bonding
     - How it is Formed
     - Properties and Examples

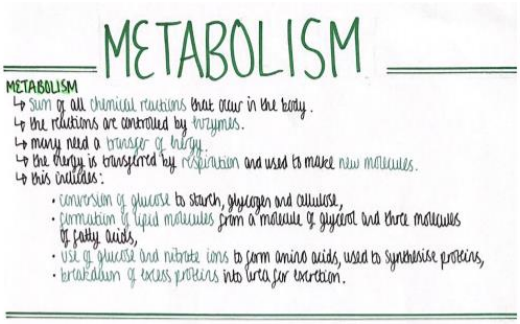
Year 9.7 Independent Learning

Bioenergetics

Year 9 Science Independent Learning Task Sheet: Bioenergetics

Objective:

To understand the processes of bioenergetics, including photosynthesis and respiration, and their importance in living organisms.



Task 1: Research and Notes

1. **Photosynthesis:**
    - Write a detailed explanation of the process of photosynthesis.
    - Include the word and symbol equations for photosynthesis:
        - **Word Equation:** Carbon dioxide + Water → Glucose + Oxygen
        - **Symbol Equation:** $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
    - Describe the role of chlorophyll and chloroplasts in photosynthesis.
2. **Respiration:**
    - Write a detailed explanation of aerobic and anaerobic respiration.
    - Include the word and symbol equations for aerobic respiration:
        - **Word Equation:** Glucose + Oxygen → Carbon dioxide + Water + Energy
        - **Symbol Equation:** $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$
    - Compare and contrast aerobic and anaerobic respiration, including their equations and energy yields.

Task 2: Diagrams and Visual Aids

1. **Photosynthesis Diagram:**

- Draw and label a diagram of a plant cell highlighting the chloroplasts.
- Show the inputs (carbon dioxide, water) and outputs (glucose, oxygen) of photosynthesis.

2. **Respiration Diagram:**
   - Draw and label a diagram of a mitochondrion.
   - Illustrate the inputs (glucose, oxygen) and outputs (carbon dioxide, water, energy) of aerobic respiration.

Task 3: Practical Experiment (Optional)

1. **Investigating Photosynthesis:**
   - Design and conduct an experiment to investigate the factors affecting the rate of photosynthesis (e.g., light intensity, carbon dioxide concentration, temperature).
   - Record your observations and results in a table.
   - Write a short paragraph explaining your findings and the significance of the experiment.

Task 4: Application and Analysis

1. **Photosynthesis and Ecosystems:**
   - Explain the importance of photosynthesis in ecosystems and its role in the carbon cycle.
2. **Respiration in Exercise:**
   - Describe how the body uses aerobic and anaerobic respiration during different types of exercise.
   - Explain the concept of oxygen debt and how it is repaid after vigorous exercise.

Task 5: Evaluation and Reflection

1. **Self-Evaluation:**
   - Reflect on what you have learned about bioenergetics.
   - Identify any areas where you need further clarification or study.
2. **Feedback:**
   - Seek feedback from your teacher or peers on your notes, diagrams, and experiment (if conducted).
   - Write down any suggestions for improvement and how you plan to address them.

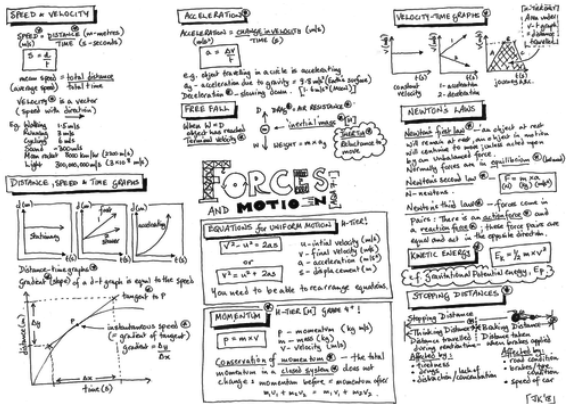
Year 9.8 Independent Learning

Forces

Year 9 Science Independent Learning Task Sheet: Forces

Objective:

To understand the fundamental concepts of forces, their effects, and how they are calculated and represented.



Task 1: Research Key Concepts

1. **Types of Forces:**
   - Research and define the following types of forces:
     - Gravity
     - Friction
     - Air resistance (drag)
     - Tension
     - Normal contact force
     - Upthrust
     - Magnetic force
     - Electrostatic force
2. **Examples:**
   - Provide real-life examples of each type of force.

Task 2: Newton's Laws of Motion

1. **Newton's First Law:**
   - Explain Newton's First Law of Motion (Law of Inertia).
   - Provide an example to illustrate this law.

2. **Newton's Second Law:**
    - State Newton's Second Law of Motion and the formula: [F = ma]
    - Explain the relationship between force, mass, and acceleration.
    - Provide an example calculation using the formula.
3. **Newton's Third Law:**
    - Explain Newton's Third Law of Motion (Action and Reaction).
    - Provide an example to illustrate this law.

Task 3: Calculating Forces

1. **Force Calculations:**
    - Practise calculating forces using the formula [F = ma].
    - Example Problem:
        - A car of mass 1000 kg accelerates at 2 m/s^2. What is the force exerted by the engine?

2. **Weight Calculation:**
    - Calculate weight using the formula [W = mg], where (g) is the acceleration due to gravity (9.8 m/s^2).
    - Example Problem:
        - What is the weight of an object with a mass of 50 kg on Earth?

Task 4: Representing Forces

1. **Force Diagrams:**
    - Draw free-body diagrams to represent the forces acting on an object.
    - Example: Draw and label the forces acting on a book resting on a table (gravity, normal force).
2. **Vector Representation:**
    - Explain how forces are represented as vectors.
    - Practise drawing vectors to show the direction and magnitude of forces.

Task 5: Practical Activity (Optional)

1. **Investigate Friction:**
    - Conduct a simple experiment to investigate the effect of different surfaces on friction.

- Use a toy car and a ramp covered with different materials (e.g., sandpaper, cloth, plastic).
- Measure and record the distance the car travels on each surface.
- Write a short report explaining your findings.

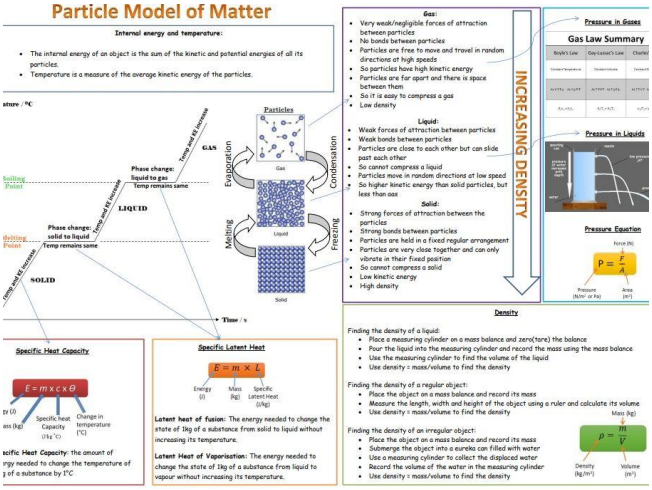
Year 9.9 Independent Learning

Particle Model of Matter

Year 9 Science Independent Learning Task Sheet: Particle Model of Matter

Objective:

To understand and explore the particle model of matter, including the states of matter, changes of state, and the properties of solids, liquids, and gases.



Task 1: Research and Notes

1. **Basic Principles:**
    - Research and write notes on the basic principles of the particle model. Include the following key points:
        - All matter is made up of particles.
        - Particles are in constant motion.
        - The arrangement and movement of particles differ in solids, liquids, and gases.
2. **States of Matter:**
    - Describe the properties of solids, liquids, and gases in terms of particle arrangement and movement.
    - Explain how the particle model accounts for the properties of each state of matter.

Task 2: Changes of State

1. **Melting and Freezing:**

- Explain what happens to the particles during melting and freezing.
- Provide examples of substances that melt and freeze.

2. **Evaporation and Condensation:**
   - Explain what happens to the particles during evaporation and condensation.
   - Provide examples of substances that evaporate and condense.
3. **Sublimation:**
   - Explain what happens to the particles during sublimation.
   - Provide an example of a substance that undergoes sublimation.

Task 3: Density Calculations

1. **Density Formula:**
   - Write down the formula for calculating density:
2. **Example Calculation:**
   - Provide an example calculation. For instance:
     - If a block of metal has a mass of 600 grammes and a volume of 200 cubic centimetres, what is its density?

Task 4: Practical Activity

1. **Density Experiment:**
   - Measure the density of different materials (e.g., a rock, a piece of wood, a metal object).
   - Record the mass and volume of each material.
   - Calculate the density using the formula.
   - Write a short report explaining your method, results, and conclusions.

Task 5: Create Diagrams

1. **Particle Diagrams:**
   - Draw diagrams to show the arrangement of particles in solids, liquids, and gases.
   - Label each diagram clearly.
2. **Changes of State Diagrams:**
   - Draw diagrams to illustrate the changes of state (e.g., melting, freezing, evaporation, condensation).
   - Label each diagram clearly.

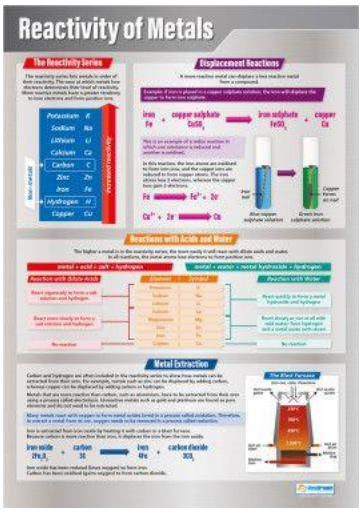
Year 9.10 Independent Learning

Reactivity of Metals

Year 9 Science Independent Learning Task Sheet: Reactivity of Metals

Objective:

To understand the reactivity series of metals and explore their reactions with water, acids, and oxygen, as well as displacement reactions.



Task 1: Research the Reactivity Series

1. **Reactivity Series:**
   - Research and write down the reactivity series of metals. Include the following metals:
     - Potassium (K)
     - Sodium (Na)
     - Calcium (Ca)
     - Magnesium (Mg)
     - Aluminium (Al)
     - Zinc (Zn)
     - Iron (Fe)
     - Lead (Pb)
     - Copper (Cu)
     - Silver (Ag)
     - Gold (Au)
2. **Order of Reactivity:**
   - Explain why some metals are more reactive than others.

Task 2: Reactions with Water, Acids, and Oxygen

1. **Reactions with Water:**
    - Describe the reactions of potassium, sodium, calcium, and magnesium with water.
    - Provide word equations for each reaction.
2. **Reactions with Acids:**
    - Describe the reactions of magnesium, zinc, and iron with hydrochloric acid and sulphurc acid.
    - Provide word equations for each reaction.
3. **Reactions with Oxygen:**
    - Describe the reactions of magnesium, zinc, and iron with oxygen.
    - Provide word equations for each reaction.

Task 3: Displacement Reactions

1. **Explanation:**
    - Explain what a displacement reaction is.
    - Provide an example of a displacement reaction using the reactivity series.
2. **Practical Example:**
    - Describe a simple experiment to demonstrate a displacement reaction (e.g., zinc displacing copper from copper sulphate solution).

Task 4: Create Diagrams and Tables

1. **Reactivity Series Diagram:**
    - Draw a diagram to represent the reactivity series of metals.
    - Label each metal and indicate their relative reactivity.
2. **Reaction Tables:**
    - Create tables to summarise the reactions of metals with water, acids, and oxygen. Include the metal, reactant, product, and word equation.

Task 5: Reflection and Application

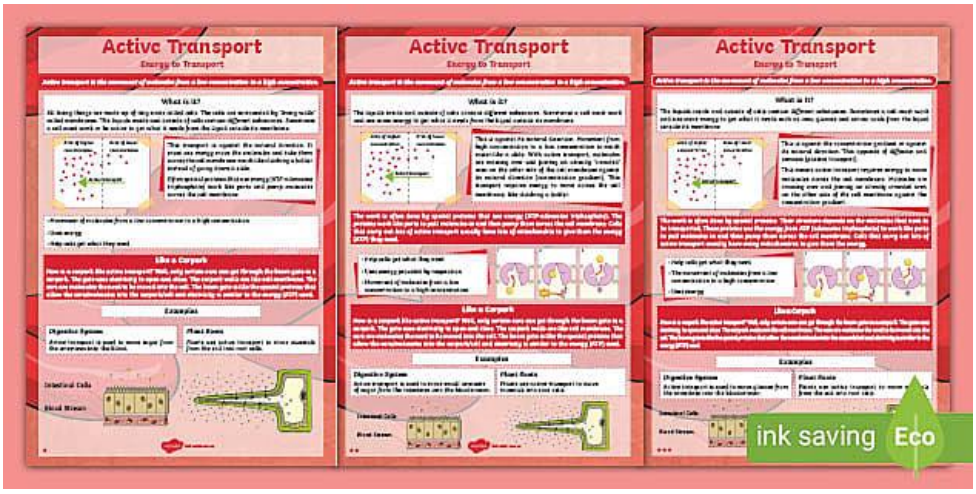
1. **Real-Life Applications:**
    - Research and write about the real-life applications of the reactivity series. Consider applications in industry, medicine, and everyday life.
    - Provide at least two specific examples.

2. **Reflection:**
    - Write a short paragraph reflecting on what you have learned about the reactivity of metals. Discuss any surprising findings or insights gained.

Year 9.11 Independent Learning

Transport in Cells

Year 9 Science Independent Learning Task Sheet: Transport in Cells
Objective:
To understand the different mechanisms of transport in cells, including diffusion, osmosis, and active transport, and their importance in biological processes.



Task 1: Research and Definitions

1. **Diffusion:**
    - **Definition:** Research and write a definition of diffusion.
    - **Key Points:**
        - Describe how diffusion occurs.
        - Explain the factors that affect the rate of diffusion (e.g., concentration gradient, temperature, surface area).
2. **Osmosis:**
    - **Definition:** Research and write a definition of osmosis.
    - **Key Points:**
        - Describe how osmosis occurs.
        - Explain the importance of osmosis in biological systems (e.g., plant cells, animal cells).
3. **Active Transport:**
    - **Definition:** Research and write a definition of active transport.
    - **Key Points:**

- Describe how active transport occurs.
- Explain the energy requirement for active transport and its role in cells.

Task 2: Create Diagrams

1. **Diffusion Diagram:**
    - Draw a diagram to illustrate the process of diffusion.
    - Label the key components and explain the movement of particles.
2. **Osmosis Diagram:**
    - Draw a diagram to illustrate the process of osmosis.
    - Label the key components and explain the movement of water molecules.
3. **Active Transport Diagram:**
    - Draw a diagram to illustrate the process of active transport.
    - Label the key components and explain the role of carrier proteins and energy (ATP).

Task 3: Practical Activity

1. **Diffusion Experiment:**
    - Conduct a simple diffusion experiment using food colouring and water.
    - **Materials Needed:** A beaker, water, food colouring.
    - **Procedure:** Add a drop of food colouring to the water and observe how it spreads.
    - **Observation:** Record your observations and explain how diffusion is occurring.
2. **Osmosis Experiment:**
    - Conduct a simple osmosis experiment using potato slices and different concentrations of salt solution.
    - **Materials Needed:** Potato, salt, water, beakers, knife, scale.
    - **Procedure:** Cut potato slices and place them in different concentrations of salt solution. Leave them for a few hours and then measure any changes in mass.
    - **Observation:** Record your observations and explain how osmosis is occurring.

Task 4: Application Questions

1. **Diffusion in the Human Body:**

- Explain how diffusion is important in the human body, particularly in the respiratory and circulatory systems.

2. **Osmosis in Plants:**
   - Describe the role of osmosis in maintaining turgor pressure in plant cells and its importance for plant health.
3. **Active Transport in Cells:**
   - Provide an example of active transport in cells and explain its significance (e.g., uptake of minerals in plant roots, sodium-potassium pump in animal cells).

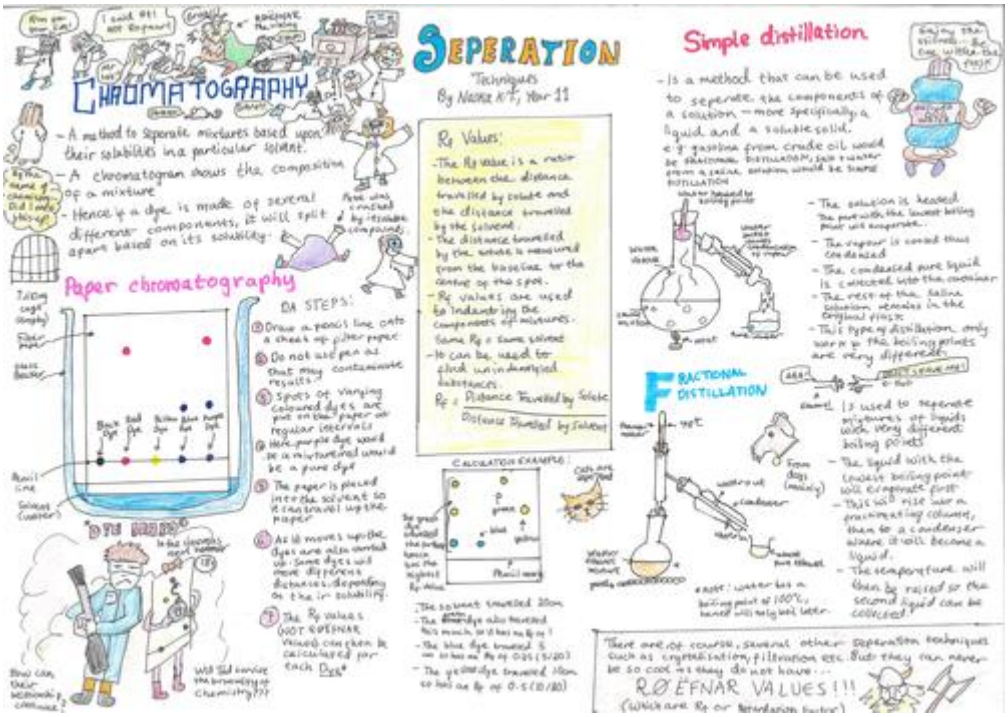
Year 9.12 Independent Learning

Separation Techniques

Year 9 Science Independent Learning Task Sheet: Separation Techniques

Objective:

To understand and apply different separation techniques to separate mixtures into their individual components, as per the AQA Trilogy Combined Science curriculum.



Task 1: Research Separation Techniques

1. **Identify Key Techniques:**
    - Research and write detailed explanations of the following separation techniques:
        - Filtration
        - Evaporation
        - Distillation (Simple and Fractional)
        - Chromatography
        - Crystallisation
        - Centrifugation
2. **Examples:**
    - Provide a real-life example of each separation technique.

Task 2: Describe Each Technique and Its Application

1. **Filtration:**
    - **Explanation:** Describe how filtration works.
    - **Example:** Separating sand from water.
    - **Application:** Explain how filtration is used in water purification.
2. **Evaporation:**
    - **Explanation:** Describe how evaporation works.
    - **Example:** Obtaining salt from saltwater.
    - **Application:** Explain how evaporation is used in the production of sea salt.
3. **Distillation:**
    - **Simple Distillation:**
        - **Explanation:** Describe how simple distillation works.
        - **Example:** Separating alcohol from water.
        - **Application:** Explain how simple distillation is used in the production of distilled water.
    - **Fractional Distillation:**
        - **Explanation:** Describe how fractional distillation works.
        - **Example:** Separating crude oil into its components.
        - **Application:** Explain how fractional distillation is used in the petroleum industry.
4. **Chromatography:**
    - **Explanation:** Describe how chromatography works.
    - **Example:** Separating different pigments in ink.
    - **Application:** Explain how chromatography is used in forensic science.
5. **Crystallisation:**
    - **Explanation:** Describe how crystallisation works.
    - **Example:** Obtaining pure sugar from sugar solution.
    - **Application:** Explain how crystallisation is used in the production of pharmaceuticals.

Task 3: Create Diagrams

1. **Draw Diagrams:**
    - Draw detailed diagrams to illustrate how each separation technique works.
    - Label each diagram clearly.

Task 4: Practical Activity (Optional)

1. **Conduct a Separation Experiment:**
    - Choose one of the separation techniques and perform a simple experiment at home (e.g., filtration with a coffee filter, evaporation by boiling saltwater).
    - Record your observations and take pictures if possible.
    - Write a short report explaining what you did, what you observed, and the results.