Grade 10 Physical Science Guide Learners

2024 ATP: Grade 10 – Term 2: PHYSICAL SCIENCES

TERM 2 (10 days)	Week 1 3/4 – 5/4 (3 days)	Week 2 8/4 – 12/4 (5 days)	Week 3 15/4 – 19/4 (5 days)	Week 4 22/4 – 26/5 (5 days)	Week 5 29/4 – 3/5 (4 days)	Week 6 6/5 – 10/5 (5 days)	Week 7 13/5 – 17/5 (5 days)	Week 8 20/5 – 24/5 (5 days)	Week 9 27/5 – 31/5 (5 days)	Week 10 3/6 – 7/6 (4 days)	Week 11 10/6 – 14/6 (5 days)
CAPS Topics	CONTROL TEST (Transmission, and Remedial Work of Control Test) (2 hrs)	ELECTRICITY AND MAGNETISM: Electric circuits (8 hrs)	MATTER AND MATERIAL: States of matter and the kinetic molecular theory (5 hrs)	MATTER AND MATERIAL: States of matter and the kinetic molecular theory (5 hrs) The atom (1 hr)	MATTER AND MATERIAL: The atom (4 hrs)	MATTER AND MATERIAL: Periodic Table (5 hrs)	MATTER AND MATERIAL: Chemical bonding (8 hrs)	MATTER AND MATERIAL: Chemical bonding (3 hrs) CHEMICAL CHANGE: Physical and chemical change (2 hrs)	CHEMICAL CHANGE: Representing chemical change Physical and Chemical Change (8 hrs)	CHEMICAL CHANGE: Quantitative Aspects of chemical Change (5 hrs)	CONSOLIDATION (3 hrs) CONTROL TEST (2 hrs)
Topics: Concepts, Skills and Values	Discussion, and Remedial Work of Control Test	• Explain why a battery in a circuit goes flat by referring to the energy transformations in the battery and the resistors in a circuit. • Know that current is the same through each resistor in a series circuit. • Describe series circuits as potential difference dividers. • Calculate the total resistance of resistors connected in series: $R_s = R_1 + R_2 + \ldots$ • Know that potential difference is the same across resistors connected in parallel. • Describe parallel circuits as current dividers because the total current in the circuit is equal to the sum of the branch currents. • Calculate the total resistance of resistors connected in parallel: $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$ Solve problems using $R = \frac{V}{I}$ for circuits containing resistors that are connected in series and/or in parallel (maximum four resistors).	• Describe matter as being made up of particles. • State and define the properties of material: – Strength – Brittle, malleable or ductile – Density (lead / aluminium) – Melting points and boiling points • Define a mixture, a pure substance, an element and a compound and give examples. • Describe the particle nature of matter by referring to diffusion and Brownian motion. • List and characterise the three states of matter. • Define freezing point, melting point and boiling point. • Interpret/Draw heating and cooling curves and interpret data given on such curves.	• Identify the physical state of a substance at a specific temperature, given its melting point and the boiling point. • Define melting, evaporation, freezing, sublimation and condensation as changes in state. • Describe a solid, a liquid and a gas according to the Kinetic Molecular Theory in terms of particles of matter. • Describe the structure of an atom (nucleus in centre and electrons in the space around). • Define atomic number: • Determine for an atom/ion the: o atomic number o Number of protons o Number of electrons o Number of neutrons o Mass number • Determine the charge on an ion after removing/adding electrons to an atom.	• Define: isotopes, relative atomic mass. • Calculate the relative atomic mass of naturally occurring elements from the percentage of each isotope in a sample. • Represent atoms using the notation $^{A}_{Z}X$ where E = symbol of element, Z = atomic number, A = mass number. • Use Aufbau diagrams and sp notation (electron configuration) to give electronic arrangements of atoms up to Z = 20. • Describe an atomic orbital. Know that each orbital corresponds to a specific energy of electrons in it.	• Write names and formulae of elements and compounds using the cation and anion table. • Classify substances as metals, non-metals and metalloids and their positions on the periodic table. • Identify metalloids as showing increase in conductivity with increasing temperature. • Classify substances, with examples, as electrical conductors, semiconductors and insulators. • Classify substances, with examples, as thermal conductors and insulators. • Classify substances, with examples, as magnetic and non-magnetic. • Describe the PT as displaying elements in order of increasing atomic number and showing how periodicity of physical and chemical properties of elements relates to atomic structure. • Define the group number and the period number. • Relate the position of an element in the PT to its electronic structure and vice versa. • Describe periodicity from Li to Ar in terms of atomic radius, ionisation energy, electron affinity and electronegativity. • Define atomic radius, ionisation energy, electron affinity and electronegativity.	• Define a chemical bond. • Draw Lewis dot diagrams of elements. • Define: covalent bond, molecule • Draw Lewis dot diagrams of simple covalent molecules: H_2, F_2, Cl_2, O_2, N_2, HF, HCl, CH$_4$, NH$_3$, H_2O • Write names and formulae of covalent compounds. • Define: ionic bonding, formula unit, ion, anion, cation. • Draw Lewis dot diagrams of compounds (cations and anions). • Draw Lewis dot diagrams to show the formation of simple ionic compounds such as NaCl, KCl, KBr, CaCl$_2$ and MgBr$_2$. • Use the PT to predict the ions formed by atoms of metals and non-metals. • Name ionic compounds.	MATTER AND MATERIAL: Chemical bonding (3 hrs) CHEMICAL CHANGE: Physical and chemical change (2 hrs) • Define metallic bonding. • Calculate the relative atomic mass for covalent molecules e.g. $Ba(NO_3)_2$ + I_2 • Calculate relative formula masses for ionic compounds. Physical change & chemical change • Define a physical change and give examples. • Define a chemical change and give examples.	• Write word equations from chemical equations and vice-versa. • Use (s), (aq), (l) and (g) to indicate phases. • Write balanced chemical equations. • Conservation of atoms and mass. • Law of constant composition. •Interpret balanced equations in terms of conservation of atoms and mass.	• Define ion mole. • Define relative atomic mass. • Describe Avogadro's number. • Define molar mass. • Describe the relationship between molar mass and relative molecular mass and relative formula mass. • Calculate the molar mass of a substance given its formula. • Calculate mass, molar mass and number of moles using $n = \frac{m}{M}$ • State Avogadro's law. • For gases, calculate volume and moles using molar gas volume at STP. • Interpret balanced equations in terms of volume relationships for gases.	ONE PAPER (100 marks) • Electric circuits • Matter and classification • States of matter and the kinetic molecular theory • The atom • The periodic table • Chemical bonding • Energy • Physical and chemical change • Representing chemical change • Quantitative aspects of chemical change

Grade 10 Physical Science Guide Learners

Physical science is a fascinating subject that encompasses the study of matter, energy, and the interactions between them. In grade 10, learners are introduced to a variety of concepts and principles that lay the groundwork for further studies in science and technology. This guide aims to provide a comprehensive overview of key topics, study strategies, and resources to help learners excel in grade 10 physical science.

Understanding the Curriculum

The grade 10 physical science curriculum typically includes various topics, grouped into two main branches: Physics and Chemistry. Each branch has distinct learning outcomes, and a thorough understanding of these subjects is crucial for academic success.

Physics

1. Kinematics: Study of motion, including concepts of speed, velocity, acceleration, and displacement. Learners will engage with equations of motion and graphs representing different types of motion.

2. Dynamics: Focuses on the forces that cause motion, introducing Newton's Laws of Motion. Understanding the relationship between mass, force, and acceleration is critical.

3. Energy: Examines different forms of energy, including kinetic and potential energy, as well as the law of conservation of energy. Learners will also explore work, power, and energy transformations.

4. Waves and Sound: Discusses the nature of waves, types of waves (longitudinal and transverse), and the characteristics of sound waves, including frequency, wavelength, and amplitude.

5. Electricity and Magnetism: Introduces basic principles of electricity, electric circuits, Ohm’s Law, and the relationship between electricity and magnetism.

Chemistry

1. Matter and Its Properties: Explores the states of matter, properties of solids, liquids, and gases, and changes in states (melting, boiling, condensation, etc.).

2. Atoms and Molecules: Covers the structure of atoms, the periodic table, and the concept of chemical bonding (ionic and covalent bonds).

3. Chemical Reactions: Introduces different types of chemical reactions (synthesis, decomposition, single replacement, and double replacement), and the law of conservation of mass.

4. Acids and Bases: Discusses the properties of acids and bases, pH scale, and neutralization reactions.

5. Stoichiometry: Focuses on the quantitative relationships in chemical reactions, including mole calculations and balancing equations.

Effective Study Strategies

To succeed in grade 10 physical science, learners should adopt effective study strategies that promote understanding and retention of complex concepts. Here are some useful approaches:

Active Learning

1. Engage with the Material: Read textbooks and supplementary resources actively. Highlight important points, take notes, and summarize sections in your own words.

2. Practice Problem-Solving: Physical science often involves solving problems. Work through practice problems regularly to build confidence and improve your skills.

3. Group Study: Collaborate with classmates to discuss challenging topics. Teaching others is a powerful way to reinforce your understanding.

Utilizing Resources

1. Textbooks and Workbooks: Use recommended textbooks that align with your curriculum. Workbooks often provide additional practice exercises.

2. Online Resources: Websites like Khan Academy, Coursera, and educational YouTube channels offer video tutorials that can clarify difficult concepts.

3. Laboratory Experiments: Hands-on experiments help to visualize theories and concepts. Pay attention to lab procedures, safety protocols, and data collection.

4. Past Exam Papers: Review previous years' exam papers to familiarize yourself with the format of questions and the types of topics commonly tested.

Key Concepts and Formulas

Understanding key concepts and formulas is essential for problem-solving in physical science. Here are some fundamental concepts and formulas to remember:

Physics Formulas

1. Kinematics Equations:
- $v = u + at$
- $s = ut + \frac{1}{2}at^2$
- $v^2 = u^2 + 2as$

Where:
- v = final velocity
- u = initial velocity
- a = acceleration
- s = displacement
- t = time

2. Newton's Second Law:
- $F = ma$

Where:
- F = force
- m = mass
- a = acceleration

3. Energy:
- Kinetic Energy: $KE = \frac{1}{2}mv^2$
- Potential Energy: $PE = mgh$

Where:
- m = mass
- v = velocity
- g = acceleration due to gravity
- h = height

Chemistry Formulas

1. Molar Mass Calculation: The molar mass of a compound is calculated by summing the atomic masses of its constituent elements.

2. Gas Laws:
- Boyle's Law: $P_1V_1 = P_2V_2$ (at constant temperature)
- Charles's Law: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ (at constant pressure)

Where:
- P = pressure
- V = volume
- T = temperature (in Kelvin)

3. pH Calculation:
- $\text{pH} = -\log[H^+]$

Assessment and Examination Preparation

Assessment in grade 10 physical science typically includes a mix of formative and summative evaluations. Formative assessments may involve quizzes, class participation, and lab reports, while summative assessments include mid-term and final exams.

Exam Preparation Tips

1. Review Class Notes Regularly: Revisit your notes frequently to reinforce learning and identify areas that need more focus.

2. Create a Study Schedule: Allocate specific times for each topic and stick to your schedule. This will help manage your time effectively leading up to exams.

3. Mock Exams: Simulate exam conditions by timing yourself while completing practice exams. This will help build exam-taking stamina and reduce anxiety.

4. Focus on Weak Areas: Identify topics you find challenging and dedicate extra time to understanding them. Seek help from teachers or peers if needed.

Conclusion

Grade 10 physical science serves as a vital foundation for future studies in science and technology. By mastering key concepts, adopting effective study strategies, and utilizing available resources, learners can enhance their understanding and performance in this subject. Remember that curiosity and a proactive approach to learning can significantly enrich your educational experience. With dedication and hard work, you can excel in grade 10 physical science and prepare yourself for the

challenges ahead.

Frequently Asked Questions

What are the key concepts covered in Grade 10 Physical Science?

Grade 10 Physical Science typically covers topics such as motion, forces, energy, waves, electricity, and the structure of matter.

How can I effectively study for Grade 10 Physical Science exams?

To study effectively, break down topics into manageable sections, use diagrams for visual understanding, practice past papers, and form study groups to discuss concepts.

What experiments can I conduct to understand Newton's laws of motion?

You can conduct experiments using toy cars on ramps to demonstrate acceleration, or use pendulums to show inertia and force.

What resources are recommended for Grade 10 Physical Science learners?

Recommended resources include textbooks, online video tutorials, educational websites, and interactive simulations that explain physical science concepts.

How do I balance chemical equations in Grade 10 Physical Science?

To balance chemical equations, ensure that the number of atoms for each element is the same on both sides of the equation by adjusting coefficients accordingly.

What is the importance of the scientific method in Physical Science?

The scientific method is crucial as it provides a systematic approach for experimentation, observation, and analysis, helping to ensure reliable and repeatable results.

How can understanding energy transformations help in real-life applications?

Understanding energy transformations helps in optimizing energy use in devices, improving efficiency in machines, and making informed choices about renewable energy sources.

What role does mathematics play in Grade 10 Physical Science?

Mathematics is essential in Physical Science for calculations involving measurements, analyzing data, and solving equations related to physical laws.

How can I improve my practical skills in Physical Science?

Improving practical skills can be achieved through regular lab practice, following safety protocols, and gaining hands-on experience with experiments and equipment.

What types of questions are commonly found on Grade 10 Physical Science exams?

Common exam questions include multiple-choice, short answer, calculations, and application-based questions that require critical thinking and understanding of concepts.

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