



# ***Are you ready for the 2019 Science & Technology Exam?***

## **So what's this document for?**

This document is designed to help you get prepared for the Secondary 4 Science & Technology exam.

Often parents and teachers will ask you 'Are you ready for the exam?'. Normally it is quite a difficult question to answer. That's where this document can help you.

This document is made up of a list of statements that you can use to assess which area(s) require more study. Simply read and reflect on each statement and decide whether or not you can place a checkmark in the 'yes' or 'not yet' column.

## **So, what if I'm NOT ready?**

***Don't panic!*** Knowing that there are some areas that require more work is a good thing as it gives you chance to do something about it and get better prepared.

The first and best resource is always your teacher; ask him/her for some extra explanations/help/resources.

There are some additional resources, however, that you can use.

You can login to the [LEARN](#) website to access the following resources:

- \* [Success Checker](#) provides multiple choice questions to help check your knowledge
- \* [SOS LEARN](#) offers live on-line tutorials

If your teacher has signed you up for the [Explore Learning](#) web site you can use the 'Gizmo' simulations to reinforce your learning.

## **What this document isn't . . .**

This document is designed to help you prepare for the exam and give you an idea of which area(s) of the curriculum you need to focus on.

In the exam itself you will need to be able to APPLY these concepts in new situations and contexts, so simply having the knowledge isn't necessarily enough. For this reason, placing a checkmark in every 'Yes' box may NOT guarantee that you will "ace" the exam. However, your chances of success will greatly improve

## EARTH & SPACE

	Yes	Not Yet
<b>Lithosphere: Permafrost</b>		
I can define <b>permafrost</b> as <i>'a layer of permanently frozen soil'</i>		
I can explain and interpret some of the consequences of a rise in temperature in the permafrost		
<b>Biogeochemical Cycles: Carbon cycle</b>		
I can describe transformations related to the circulation of carbon in the environment		
I understand the role that photosynthesis and respiration play in the carbon cycle		
I understand the relationship between permafrost, the greenhouse effect, energy resources, combustion and the carbon cycle		
<b>Hydrosphere: Catchment Area</b>		
I can define a <b>catchment area</b> as <i>'a territory surrounding a waterway' (an area of land in which all the surface water drains into the same place)</i>		
I can describe and interpret some of the impacts of human activity on the waterways in a catchment area		
<b>Hydrosphere: Salinity</b>		
I can define <b>salinity</b> as <i>'a measure of the quantity of salt in a solution'</i>		
I can describe the influence of salinity on the density of a solution		
<b>Hydrosphere: Ocean Circulation</b>		
I can describe the factors that affect the circulation of <b>surface</b> currents and <b>deep</b> currents		
I can describe the role of <b>thermohaline circulation</b> on global <b>climate regulation</b>		
<b>Hydrosphere: Glacier and Pack Ice</b>		
I can explain the differences between <b>glaciers</b> and <b>pack ice</b>		
I can describe the impacts of the melting of glaciers and pack ice		
I understand how ocean circulation, glacier and pack ice, and salinity are interrelated.		

## EARTH & SPACE *(continued)*

	Yes	Not Yet
<b>Atmosphere: Greenhouse Effect</b>		
I can describe the greenhouse effect		
I can explain and interpret some of the consequences of a higher concentration of greenhouse gases		
<b>Renewable and Non-Renewable Energy Resources</b>		
I can describe technologies used to produce electricity using the energy resources in the lithosphere, hydrosphere and atmosphere		
I can describe the main impact of the use of energy resources in the lithosphere, hydrosphere and atmosphere		

## THE MATERIAL WORLD

	Yes	Not Yet
<b>Properties of Solutions: Concentration</b>		
I can determine the concentration of an aqueous solution (g/L, % m/m, % m/V, or ppm)		
<b>Properties of Solutions: pH Scale</b>		
I can describe the pH scale (acidity, alkalinity, neutrality, increasing and decreasing values, logarithmic nature of the scale)		
I can determine the pH of a few common substances using indicators		
I can determine whether a solution is acidic, basic or neutral based on the molecular formula of the compound involved		
<b>Properties of Solutions: Ions</b>		
I can describe the concept of <b>ion</b>		
I can relate the charge of a monatomic ion to its position in the periodic table		
<b>Properties of Solutions: Electrical Conductivity</b>		
I can describe the mechanism that allows aqueous solutions to conduct electricity (electrolytic dissolution of a solute, formation of mobile ions)		
I can predict if a solution will conduct electricity based on the molecular formula of the compounds involved		
<b>Chemical Changes: Combustion</b>		
I can describe the recognizable manifestations of rapid combustion		
I can explain a combustion reaction using the fire triangle (oxidizing agent, fuel, and ignition temperature)		
<b>Chemical Changes: Photosynthesis and Respiration</b>		
I can represent the photosynthesis reaction in a balanced equation		
I can represent the respiration reaction in a balanced equation		
<b>Chemical Changes: Acid-Base Neutralization Reaction</b>		
I can give examples of acid-base neutralization reactions		
I can name the products (salt and water) formed during acid-base neutralization reactions		
I can recognize an acid-base neutralization reaction from its equation		



## THE MATERIAL WORLD (*continued*)

	Yes	Not Yet
<b>Chemical Changes: Law of Conservation of Mass</b>		
I can describe the law of conservation of mass during a chemical reaction		
I can represent the conservation of mass using the particle model		
<b>Chemical Changes: Balancing Chemical Equations</b>		
I can balance chemical equations		
<b>Organization of Matter: Groups and Periods in the Periodic Table</b>		
I can locate and name the <b>groups</b> and <b>periods</b> in the periodic table		
I can describe the common characteristics of a group		
I know that the number of electron shells in an element is the same as the number of its period		
<b>Organization: Rutherford-Bohr Atomic Model</b>		
I can describe the Rutherford-Bohr atomic model		
I can represent atoms using the Rutherford-Bohr model (up until atomic number 20)		
I can recognize Rutherford-Bohr diagrams of atoms that have an atomic number greater than 20 and that belong to one of the four major groups in the periodic table (IA, IIA, VIIA and VIIIA)		
<b>Electricity and Electromagnetism: Electrical Charge</b>		
I understand that different particles have different charges i.e. that a proton has a positive charge, a neutron has neutral (no) charge and an electron has a negative charge		
I understand that two objects with similar electrical charges will repel each other and that two objects with opposite electrical charges will attract each other		



## THE MATERIAL WORLD *(continued)*

	Yes	Not Yet
<b>Electricity and Electromagnetism: Static Electricity</b>		
I can describe static electricity as the transfer of electrons from one body to another		
I can predict how electrons will transfer based on a triboelectric series or a series of actions (conduction, friction)		
I understand Induction as the displacement of negative charges within a neutral object when it is close to a charged object		
<b>Electricity and Electromagnetism: Ohm's Law</b>		
I explain the relationship between voltage, resistance and current intensity in an electrical circuit		
I can use the equation ( $V = RI$ ) or graph to determine voltage, resistance and current intensity in an electrical circuit		
<b>Electricity and Electromagnetism: Electrical Circuits</b>		
I can describe the function of different components of an electrical circuit		
I can identify the two main types of electrical circuits (series, parallel)		
I can describe the differences between alternating and direct current		
I can recognize the symbols used in circuit diagrams		
I can represent a simple electrical circuit using a diagram and appropriate symbols		
<b>Electricity and Electromagnetism: Relationship between Power and Electrical Energy</b>		
I understand the relationship between power, voltage and current intensity		
I can use the equation ( $P= VI$ ) or graph to determine power, voltage and current intensity in an electrical circuit		
I can explain the relationship between the power of an electrical appliance, the electrical energy it consumes and the amount of time it is in operation		
I can use the equation $E = P\Delta t$ to calculate the electrical energy consumed, the power of an electrical appliance and the amount of time it is in operation		



## THE MATERIAL WORLD (*continued*)

	Yes	Not Yet
<b>Electromagnetism: Forces of Attraction / Repulsion</b>		
I understand that for magnets, different poles attract, while similar poles repel		
I can describe and interpret the magnetic field of a magnet and the behaviour of a compass in the magnetic field of a magnet		
I can describe and interpret the magnetic field produced by a current-carrying wire (right-hand rule or left-hand rule)		
I can identify ways of modifying the intensity of the magnetic field produced by a current-carrying wire (type of wire, current intensity)		
I can compare the behaviour of a compass in the magnetic field of a magnet with that of a current-carrying wire		
<b>Transformation of Energy: Law of Conservation of Energy</b>		
I can explain the law of conservation of energy		
I can apply the law of conservation of energy in different situations		
<b>Transformation of Energy: Energy Efficiency</b>		
I can define <b>energy efficiency of a device or system</b> as <i>'the proportion of energy consumed that is transformed into effective work'</i>		
I can determine the energy efficiency of a device by using the formula $\text{Energy Efficiency} = \frac{\text{amount of useful energy}}{\text{amount of energy consumed}} \times 100$		
I can explain how to improve the energy efficiency of an electrical appliance		



## THE TECHNOLOGICAL WORLD

	Yes	Not Yet
<b>Mechanical Engineering: Linking of Mechanical Parts</b>		
I can recognize and describe the characteristics of the links in a technical object (direct or indirect, rigid or flexible, removable or permanent, partial or complete)		
I can determine the characteristics of links that are most suitable in the design of a technical object		
I can judge the choice of assembly solutions in a technical object		
I can explain the choice of a type of link in a technical object		
<b>Mechanical Engineering: Guiding Control</b>		
I understand that <b>guiding</b> is the function performed by a component that controls the motion of a moving component so that it follows a specific trajectory		
I can identify components that guide in a technical object		
I can explain the choice of a type of guiding control in a technical object		
<b>Mechanical Engineering: Motion Transmission Systems</b>		
I understand the construction and characteristics of <b>friction gears</b> (wheels) as a motion transmission system		
I understand the construction and characteristics of <b>pulleys and belt</b> as a motion transmission system		
I understand the construction and characteristics of <b>gear assembly</b> as a motion transmission system		
I understand the construction and characteristics of <b>sprocket wheels and chain</b> as a motion transmission system		
I understand the construction and characteristics of <b>wheel and worm gear</b> as a motion transmission system		
I am familiar with the symbols for the above five (5) systems		
I can use the terms “driver component,” “intermediate component” and “driven component” in the explanations of mechanical systems		
I can describe the reversibility of a motion transmission system		
I can explain the choice of a motion transmission system in a technical object		

## THE TECHNOLOGICAL WORLD *(continued)*

	Yes	Not Yet
<b>Mechanical Engineering: Motion Transformation Systems</b>		
I understand the construction and characteristics of <b>screw gear system</b> as a motion transformation system		
I understand the construction and characteristics of a <b>cam (and follower)</b> as a motion transformation system		
I understand the construction and characteristics of <b>connecting rods</b> and how they may be used in a motion transformation system		
I understand the construction and characteristics of <b>slides</b> and how they may be used in a motion transformation system		
I understand the construction and characteristics of <b>cranks</b> and how they may be used in a motion transformation system		
I understand the construction and characteristics of <b>rotating slider crank mechanisms</b> as a motion transformation system		
I understand the construction and characteristics of <b>rack-and-pinion drive</b> as a motion transformation system		
I am familiar with the symbols for the above seven (7) components/ systems		
I can use the terms “driver component,” “intermediate component” and “driven component” in the explanation of mechanical systems		
I can describe the reversibility of a motion transformation system		
I would be able to explain the choice of a motion transformation system in a technical object		
<b>Mechanical Engineering: Speed Changes</b>		
I understand how systems can be used to allow for speed changes in the design of technical objects		
I can perform a simple calculation of the ratio between the driver and driven components		



## THE TECHNOLOGICAL WORLD *(continued)*

	Yes	Not Yet
<b>Electrical Engineering: Power Supply</b>		
I understand that a <b>power supply</b> has ' <i>the ability to provide an electrical current</i> '		
I can determine the source of current in technical objects with an electrical circuit		
<b>Electrical Engineering: Conduction, Insulation and Protection</b>		
I can define <b>conduction</b> as the ' <i>ability to conduct electricity</i> '		
I can distinguish between electrical conductors and insulators in a technical object		
I can describe the role of a protective device in a circuit (fuse, breaker)		
I can analyze the factors that affect electrical conductivity (section, length, nature, temperature of conductor)		
<b>Electrical Engineering: Control</b>		
I can define <b>control</b> as the ' <i>ability to control the travel of electrical current</i> '		
I can describe different types of switches (lever, pushbutton, flip-flop, magnetic control)		
<b>Electrical Engineering: Transformation of Energy</b>		
I can identify and explain the transformation of energy in different components of a circuit		
I can describe the energy transformations that take place in electrical or electronic appliances (electricity and light, heat, vibration, magnetism)		

## THE TECHNOLOGICAL WORLD *(continued)*

	Yes	Not Yet
<b>Materials: Constraints</b>		
I can define a <b>constraint</b> as ' <i>an external force (shearing, compression, deflection, torsion and tension) that is exerted on materials and that has a tendency to deform them</i> '		
<b>Materials: Characteristics of Mechanical Properties</b>		
I can define certain <b>mechanical properties</b> of materials: ductility, hardness, elasticity, fragility, malleability, resilience and stiffness		
I can explain the choice of a material based on its properties		
<b>Materials: Other Properties</b>		
I can define certain <b>properties of materials</b> : chemical neutrality, corrosion resistance, electrical conductivity, heat resistance, and thermal conductivity		
<b>Materials: Types and properties</b>		
I can relate the use of <b>thermoplastics</b> to their properties		
I can relate the use of <b>thermosetting plastics</b> to their properties		
I can relate the use of <b>ceramics</b> to their properties		
<b>Materials: Modification of Properties</b>		
I can describe different treatments to prevent degradation of materials		
<b>Graphical Language</b>		
I can interpret an exploded view drawing of a technical object		
I can identify force and motion symbols		