***Are you ready for the***

***2015 Applied Science & Technology Exam?***

**So what’s this document for?**

This document is designed to help you get prepared for the Secondary 4 Applied 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](http://www.learnquebec.ca/) website to access the following resources:

* [Success Checker](http://successchecker.learnquebec.ca/) provides multiple choice questions to help check your knowledge
* VODZone contains many videos which can explain certain concepts
* [SOS LEARN](http://www.learnquebec.ca/en/services/tutorials.html) offers live on-line tutorials

If your teacher has signed you up for the [Explore Learning](http://www.explorelearning.com/) 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**

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| --- | --- | --- |
|  | **Yes** | **Not Yet** |
| **Hydrosphere: Catchment Area** |  |
| I can define a **catchment area** as ‘***a territory surrounding a waterway’*** |  |  |
| I can describe and interpret some of the impacts of human activity on the waterways in a catchment area |  |  |
| **Atmosphere:** **Cyclone and Anticyclone** |  |
| I can explain the formation of cyclones (low-pressure areas) and anticyclones (high-pressure areas) |  |  |
| **Renewable and Non-Renewable Energy Resources** |  |
| 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 |  |  |
| **Concepts related to Astronomy: Earth-Moon System** |  |
| I can describe the tides in terms of the gravitational effect of the Earth-Moon system |  |  |

**THE MATERIAL WORLD**

|  |  |  |
| --- | --- | --- |
|  | **Yes** | **Not Yet** |
| **Chemical Changes: Combustion** |  |
| I can describe the recognizable manifestations of rapid combustion  |  |  |
| I can explain a combustion reaction using the fire triangle |  |  |
| **Chemical Changes: Oxidation** |  |
| I can represent an oxidation reaction using the particle model |  |  |
| I can associate known chemical reactions with oxidation reaction  |  |  |
| **Electricity and Electromagnetism: Electrical Charge** |  |
| 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 |  |  |
| **Electricity and Electromagnetism: Static Electricity** |  |
| I can describe static electricity as the transfer of electrons from one body to another |  |  |
| **Electricity and Electromagnetism: Ohm’s Law** |  |
| I can explain the relationship between voltage, resistance and current intensity in an electrical circuit |  |  |
| I can use the equation (V=RI) to calculate voltage, resistance and current intensity in an electrical circuit (I can use Ohm’s law in calculations) |  |  |
| **Electricity and Electromagnetism: Electrical Circuits** |  |
| 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 explain the differences between alternating and direct current |  |  |
| I can represent a simple electrical circuit using a diagram and appropriate symbols |  |  |

**THE MATERIAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Electricity and Electromagnetism: Relationship between Power and Electrical Energy** |  |
| I understand the relationship between power, voltage and current intensity |  |  |
| I can use the equation P= VI to calculate 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 = PΔt to calculate the electrical energy consumed, the power of an electrical appliance and the amount of time it is in operation |  |  |
| **Electromagnetism: Forces of Attraction / Repulsion** |  |
| I understand that for magnets, different poles attract, while similar poles repel |  |  |
| I can describe and interpret the magnetic field of a magnet and behaviour of a compass in the magnetic field of a magnet |  |  |
| **Electromagnetism: Magnetic Field of a Live Wire** |  |
| 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 |  |  |
| **Electromagnetism: Magnetic Field of a Solenoid** |  |
| I can interpret the magnetic field produced by a solenoid (right-hand rule or left-hand rule) |  |  |
| I can name ways of changing the intensity of the magnetic field produced by a solenoid (nature of the core, intensity of the current, number of turns) |  |  |
| **Electromagnetism: Electromagnetic Induction** |  |
| I can describe ways of inducing electrical current in a wire  |  |  |

**THE MATERIAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Transformation of Energy: Law of Conservation of Energy** |  |
| I can explain the law of conservation of energy |  |  |
| I can apply the law of conservation of energy in different situations |  |  |
| **Transformation of Energy: Energy Efficiency** |  |
| I can define **energy efficiency** **of a device or system** as ***‘the proportion of energy consumed that is transformed into effective work’***  |  |  |
| I can determine the energy efficiency of a device by using the formula Energy Efficiency = amount of useful energy x 100 amount of energy consumed |  |  |
| I can explain how to improve the energy efficiency of an electrical appliance |  |  |
| **Fluids: Archimedes’ Principle** |  |
| I can describe the relationship between the weight of the water displaced by an immersed body and the upward acting force |  |  |
| I can explain the buoyancy of a body in terms of Archimedes' principle |  |  |
| **Fluids: Pascal’s Law** |  |
| I can recognize technical objects or technological systems whose operation is based on Pascal's principle  |  |  |
| **Fluids: Bernoulli’s Principle** |  |
| I can describe the relationship between the velocity of a fluid and its pressure |  |  |
| I can explain the concept of lift in terms of Bernoulli's principle |  |  |

**THE MATERIAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Force and Motion: Force** |  |
| I can describe the effects produced by a force (change in the state of motion of a body, distortion of a body) |  |  |
| **Force and Motion: Types of Forces** |  |
| I can recognize different types of forces in technical objects or technological systems  |  |  |
| **Force and Motion: Equilibrium of Two Forces**  |  |
| I can understand and describe conditions under which a body subjected to two forces can be in equilibrium |  |  |
| **Force and Motion: Relationship between Constant Speed, Distance and Time** |  |
| I can explain the relationship between speed, distance and time |  |  |
| I can use the equation v = d/Δt to calculate constant speed, distance and time |  |  |
| **Force and Motion: Distinction between Mass and Weight** |  |
| I can explain the relationship between mass and weight |  |  |
| I can use the equation Fg = mg to calculate mass and weight |  |  |

**THE TECHNOLOGICAL WORLD**

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| --- | --- | --- |
|  | **Yes** | **Not Yet** |
| **Graphical Language** |  |
| I can interpret an exploded view drawing of a technical object |  |  |
| I can identify and use force and motion symbols |  |  |
| **Graphical Language: Multiview Orthogonal Projection** |  |
| I can draw a multiview orthogonal projection of a simple object.  |  |  |
| I can interpret assembly drawings of technical objects consisting of a small number of parts |  |  |
| **Graphical Language: Functional Dimensioning** |  |
| I can define **functional** **dimensioning** as ***‘the set of specific tolerances related to certain parts responsible for the smooth operation of an object***’ |  |  |
| I understand that **play** is ***‘the space allowed between two parts to ensure that they can move freely’*** |  |  |
| **Graphical Language: Developments (Prism, Cylinder, Pyramid, Cone)** |  |
| I understand how three-dimensional shapes (prism, cylinder, pyramid, cone) can be created from sheet stock  |  |  |
| I can draw developments of simple solids  |  |  |
| **Graphical Language: Standards and Representations** |  |
| I can choose the appropriate type of diagram for a given representation  |  |  |
| I can represent different types of motion related to the operation of an object using the appropriate symbols (rectilinear translation, rotation, helical) |  |  |

**THE TECHNOLOGICAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Mechanical Engineering: Adhesion and Friction of Parts** |  |
| I can describe the advantages/ disadvantages of the adhesion and friction of parts in a technical object |  |  |
| **Mechanical Engineering: Linking of Mechanical Parts** |  |
| I can 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 purpose of limiting motion (degree of freedom) in a technical object  |  |  |
| I can explain the choice of a type of link in a technical object. |  |  |
| **Mechanical Engineering: Guiding Control** |  |
| I can explain the choice of a type of guiding control in a technical object  |  |  |
| **Mechanical Engineering: Motion Transmission Systems** |  |
| I understand the construction and characteristics of **friction gears** (wheels) as a motion transmission system |  |  |
| I understand the construction and characteristics of **pulleys and belt** as a motion transmission system |  |  |
| I understand the construction and characteristics of a **gear** **assembly** as a motion transmission system |  |  |
| I understand the construction and characteristics of **sprocket wheels and chain** as a motion transmission system |  |  |
| I understand the construction and characteristics of **wheel and worm gear** as a motion transmission system |  |  |
| I am familiar with the symbols for the above five (5) systems |  |  |
| I can explain the choice of a motion transmission system in a technical object  |  |  |

**THE TECHNOLOGICAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Mechanical Engineering: Speed Changes** |  |
| I can explain speed changes in a technical object |  |  |
| **Mechanical Engineering: Motion Transformation Systems** |  |
| I understand the construction and characteristics of a **screw** **gear system** as a motion transformation system |  |  |
| I understand the construction and characteristics of a **cam (and follower)** as a motion transformation system |  |  |
| I understand the construction and characteristics of **connecting rods** and how they may be used in a motion transformation system |  |  |
| I understand the construction and characteristics of **slides** and how they may be used in a motion transformation system |  |  |
| I understand the construction and characteristics of **cranks** and how they may be used in a motion transformation system |  |  |
| I understand the construction and characteristics of **rotating slider crank mechanisms** as a motion transformation system |  |  |
| I understand the construction and characteristics of a **rack-and-pinion** as a motion transformation system |  |  |
| I am familiar with the symbols for the above seven (7) components/systems |  |  |
| I can explain the choice of a motion transformation system in a technical object |  |  |
| I can distinguish between cams and eccentric cams |  |  |

**THE TECHNOLOGICAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Electrical Engineering: Power Supply** |  |
| I understand that a **power supply** has ***‘the ability to provide an electrical current’*** |  |  |
| I can determine the source of current in technical objects with an electrical circuit  |  |  |
| **Electrical Engineering: Conduction, Insulation and Protection** |  |
| I can analyze the factors that affect electrical conductivity (section, length, nature, temperature of conductor) |  |  |
| I can use the colour code to determine the electrical resistance of a resistor |  |  |
| **Electrical Engineering: Control** |  |
| I can identify unipolar switches |  |  |
| I can distinguish between unidirectional and bidirectional switches |  |  |
| **Electrical Engineering: Transformation of Energy** |  |
| I can identify and explain the transformation of energy (electricity, light, heat, vibration, magnetism) in different components of a circuit  |  |  |
| I can describe the energy transformations (electricity, light, heat, vibration, magnetism) that take place in electrical or electronic appliances  |  |  |
| **Electrical Engineering: Other Functions** |  |
| I can describe the function of a **diode** |  |  |
| I can describe the function of a **condenser** |  |  |
| I can describe the function of a **relay** |  |  |

**THE TECHNOLOGICAL WORLD *(continued)***

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|  | **Yes** | **Not Yet** |
| **Materials: Constraints** |  |  |
| I can define a **constraint** as ‘***an external force (shearing, compression, deflection, torsion and tension) that is exerted on materials and that has a tendency to deform them’*** |  |
| I can explain the choice of a material based on its properties  |  |  |
| **Materials: Characteristics of Mechanical Properties** |  |
| I can explain the choice of a material based on its mechanical properties |  |  |
| **Materials: Heat Treatments** |  |
| I understand that heat treatments can be used to change the properties of materials (quenching increases hardness but fragility as well) |  |  |
| **Materials: Types and Properties** |  |
| I can relate the use of **thermoplastics** to their properties |  |  |
| I can relate the use of **thermosetting plastics** to their properties  |  |  |
| I can relate the use of **ceramics** to their properties  |  |  |
| **Materials: Modification of Properties** |  |
| I can describe different treatments to prevent degradation of materials  |  |  |
| **Manufacturing: Characteristics of Drilling, Tapping, Threading and Bending**  |  |
| I can describe the characteristics of the tools needed to shape a material  |  |  |