**Chemistry Summer Work**

**Task 1 (approximately 2 hours)**

Complete these questions on file paper

1. a) What is the difference between an element and a compound? (2)

b) All substances are made up of three types of particle: atoms, molecules or ions. Explain what atoms, molecules and ions are. (3)

c) Identify each of the following particles as an atom, molecule or ion.

NH3  O2- SO4 2-

F2O O2 NO3-

H2O Cl H+

1. Write the formula of the following substances.

Classify them as ionic, atomic or molecular.

a) lithium oxide e) ammonia

b) calcium nitrate f) nitrogen

c) methane g) argon

d) ammonium sulphate h) iron (III) hydroxide

3) Balance the following equations.

a) Fe + H2O Fe3O4 + H2 (1)

b) PCl3 + H2O P(OH)3 + HCl (1)

c) ammonia + oxygen nitrogen + water (2)

d) ethane + oxygen carbon dioxide + water (2)

4) Using diagrams (e.g. dot and cross), explain ionic and covalent bonding. Use the following compounds as examples:

a) NaCl b) MgO c) CH4 d) CO2

5) Explain metallic bonding and why it is stronger in magnesium than lithium.

6) Firstly define carbon neutral fuels and then explain why the following fuels might be considered as carbon neutral fuels and whether in fact they are.

a) ethanol made from ethane

b) ethanol made from corn

c) ethanol made from **waste** sugar cane

d) coal where the released carbon dioxide is pumped and trapped underground

e) hydrogen (consider how the hydrogen is made)

**Task 2 (approximately 2 hours)**

A good chemistry student will be interested in the real world applications of the subject.

All the topics below are related to the year 12 chemistry course in some way.

Choose one topic and do some research into it. Focus on the chemistry aspect.

Present your findings as a written summary report or poster.

We are looking to see who can use scientific language, who has the determination to stick with a new topic and understand it and who has enthusiasm for the subject. Masses of copied and pasted information will be ignored completely

* You may get stopped at airport security and have your shoes and bag swabbed. The swab is put into a mass spectrometer. What is this device, what is it looking for and how does it work?
* Graphene is a substance with enormous potential to revolutionise the way we use technology. What is the structure of this substance? Why is it so good? What could it be used for?
* Why do bruises go different colours?
* A plasma screen TV uses atoms in different forms. How is it designed and how does it work?
* What are free radicals and how do they contribute to the aging process? “Superfoods” such as blueberries are supposed to reduce this effect? How do they do it?
* Robots are being sent into space to land on other planets and moons loaded with equipment to analyse the surface. What sort of equipment do they have? What data might they find and how would it help us understand the planets?
* In the 2016 Rio Olympics the pools turned a green colour that was due to algae growth. Initially the bright sunshine was blamed for breaking down the chlorine in the pool. How does this happen? Other explanations of human error were given after investigation. What chemical reactions were to blame?