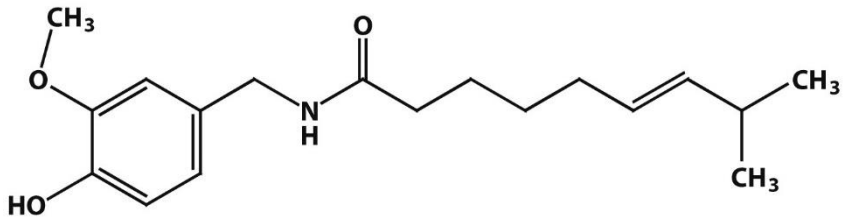
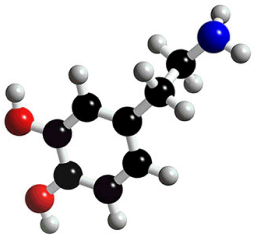
Gordano School A-level Chemistry

Year 11 → Year 12 Summer Assignment

Submit this completed work in your first lesson in Year 12



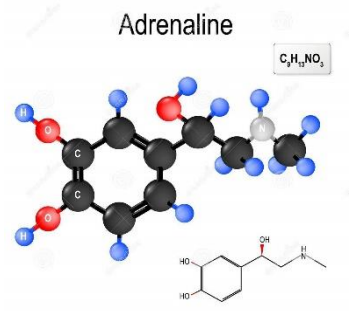
Name:_____



Gordano School A-level Chemistry Summer Assignment

The following tasks should be completed before you start your Chemistry A level studies next year. Bring the completed booklet to your first lesson in Year 12.

Task 1 - Interesting Molecule Fact File



Here is a list of interesting molecules. Do some brief searches to find **one** that looks interesting to you, then carry out some research to find answers to the criteria below. Use your research to produce a hand written fact file on the **one** you choose:

Palytoxin (the most lethal toxin?), **Luciferin** (in fireflies), **Tetrodotoxin** (the most lethal toxin?), **Capsaicin** (in chillis), **Novichok** (top secret nerve agent?), **Thalidomide** (massive drug fail that changed the way we test drugs), **Skatole** (the smell of faeces!), **Nicotine**, **Geosmin** (the smell of Earth), **Nepetalactone** (cat nip), **Morphine** (powerful pain reliever), **Penicillin** (antibiotic)

Criteria to include in your fact file

- What your molecule is and what it is used for
- An image of its Chemical structure with a key to show which element each atom is
- Its molecular formula
- Where it is found
- Any interesting properties
- How its structure or formula allows it to have these properties
- Why it might be in the news
- Anything else relevant or interesting

Task 2 – Chemistry GCSE to A level Bridging Questions

Answer the questions on the following pages

Do not write in margin

FORMULAE AND MOLECULAR EQUATIONS

a) Explain why the formula of aluminium sulfate is $Al_2(SO_4)_3$; not $AlSO_4$.

.....

.....

..... [3]

b) (i) Write down the formulae of the following compounds.

Copper(II) sulfate ..... [1]

Sodium hydroxide ..... [1]

Copper(II) hydroxide ..... [1]

Sodium sulfate ..... [1]

(ii) Write a balanced molecular equation, including state symbols, for the reaction between copper(II) sulfate and sodium hydroxide in aqueous solution to give a precipitate of copper(II)hydroxide and a solution of sodium sulfate.

..... [2]

c) (i) Equations I and II relate to the Haber process and contact process, respectively. Both are incorrect. In each case state the fault (or faults) and then write down the correct equation.

Equation I $N(g) + 3H(g) \rightleftharpoons NH_3(g)$

Fault(s) ..... [1]

Correct equation ..... [1]

Equation II $SO_2(g) + O_2(g) \rightleftharpoons SO_3(g)$

Fault(s) ..... [1]

Correct equation ..... [1]

(ii) The equations in c) (i) are each written with a $\rightleftharpoons$ sign instead of an arrow. What is the reason for this?

..... [1]

d) Iron and HCl react together according to the following basic equation: $Fe + 2HCl \rightarrow FeCl_2 + H_2$

Depending on the reaction conditions the product may be (i) solid, anhydrous iron(II) chloride, (ii) an aqueous solution of iron(II) chloride, or (iii) crystals of iron(II) chloride-4-water. Select suitable state symbols and make any other necessary modifications to the basic equation to represent the formation of each of these products.

(i) Passing dry hydrogen chloride gas over heated iron to give anhydrous iron(II) chloride.

..... [1]

(ii) Dissolving iron in hydrochloric acid to give a solution of iron(II) chloride.

..... [1]

(iii) Dissolving iron in hydrochloric acid and then crystallising the solution to give iron(II) chloride-4-water.

..... [1]

TOTAL / 17

Do not write in margin

MOLES

a) Define the chemical term *mole*.

.....

..... [3]

b) Calculate the mass of each of the following:

(i) 1 mol of atomic nitrogen.

..... [1]

(ii) 1 mol of molecular nitrogen.

..... [1]

c) How many moles are there in each of the following?

(i) 0.48 g magnesium.

..... [1]

(ii) 100 kg calcium hydroxide.

.....

..... [1]

(iii) 2 tonnes Sulfur.

.....

..... [1]

d) Calculate the percentage by mass of tin in tin(IV) chloride, $SnCl_4$.

.....

..... [2]

e) 2 mol of a compound has a mass of 117.0 g. What is its relative molecular mass?

.....

..... [2]

f) What is the *total* number of moles of particles (ions, molecules) present in 0.35 mol of copper(II) Sulfate-5-water, $CuSO_4.5H_2O$?

.....

.....

.....

..... [2]

TOTAL /14

IONIC BONDING

a) Define the term *ionic bond*.

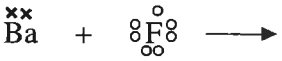
.....

.....

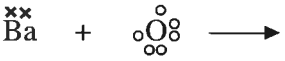
..... [3]

b) The formation of an ionic bond in sodium fluoride can be represented by:

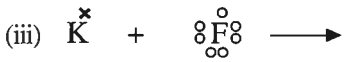
Complete each of the following equations in the same format.

(i) 

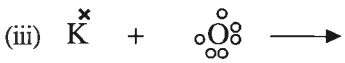
..... [2]

(ii) 

..... [2]

(iii) 

..... [2]

(iii) 

..... [2]

c) Explain why ionic compounds:

(i) are normally soluble in water, but insoluble in organic solvents.

.....

.....

.....

..... [3]

(ii) conduct an electric current when molten or in solution, but **not** in the solid.

.....

.....

.....

..... [3]

TOTAL / 17

TOPIC 4 *Questionsheet 2*

COVALENT BONDING

Do not write in margin

a) What do you understand by the following terms?

(i) Covalent bond

.....

..... [2]

(ii) Dative covalent bond

.....

..... [2]

b) Show, by means of 'dot and cross' diagrams of outer electrons, the bonding present in:

(i) silicon tetrafluoride, SiF_4

[2]

(ii) the ammonium ion, NH_4^+

[2]

(iii) the cyanide ion, CN^-

[2]

c) Give an example of a covalent compound which does not obey the 'octet rule' of valency, and state in what respect the rule is not obeyed.

.....

..... [2]

d) Aluminium chloride is used as a catalyst in the chlorination of benzene, its role being to generate the electrophile Cl^+:

$$AlCl_3 + Cl_2 \rightarrow Cl^+ + AlCl_4^-$$

What features of the $AlCl_3$ molecule make this reaction possible?

.....

..... [2]

TOTAL / 14