Year 13 Chemistry Worksheet 2

Day 1

Q1 Compounds of Group 1 and Group 2 elements show trends in their properties. Which **block** of the Periodic Table contains the Group 2 elements?

A. s
B. p
C. d
D. f

Q2 i) State the full **electron configuration** of a cobalt (II) ion.

(1 mark)

ii) In terms of electronic structures, explain why iodine is **less reactive** than bromine **(2 marks)**

Q3 Explain why the atomic radii of the elements **decrease** across Period 3 from sodium to chlorine. **(2 marks)**

Day 2

Q1 A radioactive compound containing the phosphide ion, $^{32}P^{3-}$, is used in the treatment of skin cancer. What is the **electronic configuration** of the phosphide ion, $^{32}P^{3-}$?

A. $1s^2\ 2s^2\ 2p^6\ 3s^2$
B. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
C. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
D. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3\ 3d^3$

Q2 Many elements in the Periodic Table have different isotopes.

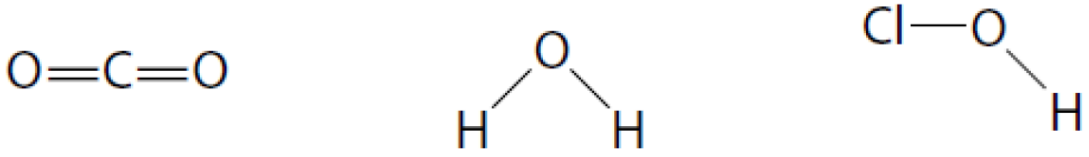
i) What is meant by the term **isotopes**, with reference to sub-atomic particles?

(1 mark)

ii) A sample of silicon contains 92.2% ^{28}Si and 4.67% ^{29}Si, the remainder being ^{30}Si.
Calculate the **relative atomic mass** of silicon in this sample.

(2 marks)

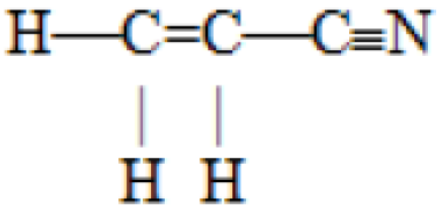
Q3 The molecules carbon dioxide, water and chloric (I) acid can b represented by these structures:



All the bonds in these molecules are polar because the elements have different electro negativities.
Explain why carbon dioxide is the only **non-polar** molecule of the three. **(2 marks)**

Day 3

Q1 The number of **pi bonds** in the molecule below is:



A. 1
B. 2
C. 3
D. 4

Q2 **Rules, Laws and Principles** are very important in the study and understanding of Chemistry.
With reference to the above statement, state the:

(i) **Dalton's Law of Partial Pressure** **(1 mark)**

(ii) **Avogadro's Principle** **(1 mark)**

(iii) Liquids, unlike gases, are incompressible.

Use the Kinetic Theory to **explain** the above statement.

(1 mark)

Q3 A student dissolved 100 g of glucose ($C_6H_{12}O_6$) in 1 kg of water. **[Mr $C_6H_{12}O_6$ = 180g/mol, Mr H_2O = 18g/mol]**
Calculate the:

(i) **Mole fraction** of glucose in this solution. **(2 marks)**

(ii) What is the **molality** of the glucose solution?

(1 mark)

(iii) If the student had dissolved the 100 g of glucose in 500cm^3 of water, then what would have been the **molarity** of the solution? **(1 mark)**

Day 4

Q1 The **geometry** of the CS_2 molecule is best described as:

A. linear
B. trigonal planar
C. trigonal pyramidal
D. bent

Q2 Nitrogen gas was produced by heating ammonium nitrite as follows:

$$NH_4NO_{2(s)} \longrightarrow 2H_2O_{(l)} + N_{2(g)}$$

When the products were collected over water at 25 ˚C and 101.3 kPa, the volume of the dry nitrogen gas observed was 1.043 L.

(i) Determine the **partial pressure** of nitrogen gas.
(Standard vapour pressure of water at 25 ˚C = 3.2 kPa)
(½ mark)

(ii) What volume would nitrogen gas occupy at **STP**?
(1½ marks)

(iii) Standard state conditions are defined by Standard Temperature and Pressure (STP). What are the **values** of temperature and pressure for standard state conditions?
(1 mark)

Q3 Define the terms:

(i) Electro negativity **(1 mark)**

(ii) First ionisation energy **(1 mark)**

(iii) Match the atoms and ions to the radii given.

Atoms and ions	Radii
Ca, Ca^{2+}, Mn	99pm, 137pm, 197pm

(3 marks)

Day 5

Q1 **Gas pressure** is caused by the:

A. weight of the gas molecules in the container.
B. repulsion between gas molecules in the container.
C. kinetic energy of the gas molecules in the container.
D. collision of the gas molecules with the walls of the container

Q2 Draw the Lewis structure for the chlorite ion, ClO_2^-

(1½ marks)

Q3 Choose the possible types of intermolecular forces of attraction given in the box for the following compounds in their liquid states.

Hydrogen bonding, van der Waals dispersion forces, dipole – dipole interactions

(i) Ethanol **(½ mark)**

(ii) Hexane **(½ mark)**

(iii) Sulphuric acid **(½ mark)**