

## Holiday packages of chemistry S4

1. What happens when a beam of neutrons passed through the gap between the charged plates?
2. Zirconium, Zr and Hafnium, Hf, are metals. An isotope of zirconium has 40 protons and 91 nucleons.
  - a). Write the isotopic symbol for this isotope
  - b). How many neutrons are present in one atom of this isotope?
  - c). Hafnium ions,  ${}^{180}_{72}\text{Hf}^{2+}$ , are produced in mass spectrometer. How many electrons are present in one of these ion.
  - d). The subatomic particles present in zirconium and hafnium are electrons, protons and neutrons. A beam of protons is fired into an electric field produced by two charged plates.
    - i). Describe how the beam of protons behaves when it passes through the gap between the charged plates. Explain your answer.
    - ii). Describe and explain what happens when a beam of neutrons passes through the gap between the charged plates.
  - e). Different ions are deflected by the magnetic field by different amounts. Explain.
3. The two isotopes of uranium are  ${}^{235}_{92}\text{U}$  and  ${}^{238}_{92}\text{U}$ 
  - a). In what ways are these two isotopes identical?
  - b). In what ways do they differ?
  - c). In a mass spectrometer, uranium atoms can be converted into ions, ( $\text{U}^{2+}$ ). State the number of electrons present in one ( $\text{U}^{2+}$ ) ion.
4.

One of the oxides of tantalum is tantalum (V) oxide,  $\text{Ta}_2\text{O}_5$ . If the charge on the metal remained constant and then sulfur was substituted for oxygen,

  - a) How would the formula change?
  - b) Calculate the difference in the total number of protons between  $\text{Ta}_2\text{O}_5$  and its sulfur analog?

5.

The mass spectrum of a hypothetical monatomic element A contains a peak at mass number 14 and another at mass number 16.

- Sketch the mass spectrum assuming the peak at mass number 14 is three times the height of the peak at 16.
- How many isotopes are present? Why?
- Determine the relative abundances of the isotopes?

## Holiday packages of chemistry S2.

1.

The melting and boiling points of six substances are given below:

Substance	Melting point/ $^{\circ}\text{C}$	Boiling point/ $^{\circ}\text{C}$
Nitrogen	-210	-196
Carbon disulphide	-112	46
Ammonia	-78	-34
Bromine	-7	59
Phosphorus	44	280
Mercury (II) chloride	276	302

(Room temperature is taken as  $20^{\circ}\text{C}$ .)

- What do you understand by melting and boiling point?
- Which element is a solid at room temperature?
- Which compound is a liquid at room temperature?
- Which compound is a gas at room temperature?

2.

An element X belongs in the group V and period 3 of the periodic table.

(a) Draw an electron configuration of X

(b) What is the valency of X?

(c) Is X a metal or non metal element?

3.

Element M belongs to group III of the periodic table.

(a) How many electrons does M have in the outer shell?

(b) Write the formula for:

Oxide of M

Chloride of M

Nitride of M

4. Copy and complete the table.

Atoms or ions	Mass number(A)	Atomic number(z)	Neutrons(n)	Protons(p)	Electrons(e)
1. $\text{Mg}^{2+}$	24	12			
2. $\text{N}^{3-}$			7		10

5.

No	The change	Product (formula)	Product (name)
1	$K + Cl_2 \rightarrow$		
2	$N_2 + H_2 \rightarrow$		
3	$Na + O_2 \rightarrow$		
4	$C(IV) + O_2 \rightarrow$		
5	$OH^- + Mg^{2+} \rightarrow$		
6	$P + O_2 \rightarrow$		
7	$Na^+ + SO_4^{2-} \rightarrow$		
8	$K + F_2 \rightarrow$		
9	$H_2 + C \rightarrow$		
10	$Al + Cl_2 \rightarrow$		
11	$Li + O_2 \rightarrow$		
12	$CO_3^{2-} + Na^+ \rightarrow$		
13	$PO_4^{3-} + K^+ \rightarrow$		
14	$C + Br_2 \rightarrow$		
15	$Mg + O_2 \rightarrow$		
16	$P + 5O_2 \rightarrow$		
17	$N_2 + O_2 \rightarrow$		
18	$Na + H_2 \rightarrow$		
19	$ClO_3^- + Ca^{2+} \rightarrow$		
20	Magnesium ion + hydrogensulphate ion		

6. Sodium chloride is an ionic compound. It is formed when sodium reacts with chlorine.

(a) The atomic number of sodium and chlorine is 11 and 17 respectively.

(i) Draw and label dot and cross diagrams to show the arrangement of the electrons in the atoms of sodium and chlorine.

(ii) Draw and label dot and cross diagrams to show the arrangement of the electrons in the ions formed when sodium reacts with chlorine.

(iii) Give the symbols of sodium and the chloride ions formed.

(b) Draw a dot and cross diagram to show the bonding in a nitrogen molecule.