Contextual questions

1 **Five hundred treated in hospital after poison gas accident**

"I was inside my house and suddenly my nose and chest were intensely painful. Then the people started collapsing," said Mrs Wilma Bezuidenhout. They were part of about five hundred people that were treated through the night for serious to less serious effects of smoke poisoning. A part of the N2 highway was closed later, after motorists were overcome by the fumes.
Two people died after a strategic sulfur reserve at AECI in Somerset West caught fire last night and the wind blew a cloud of toxic sulfur dioxide into the residential area of Macasser. More than 2 500 people were removed from the neighbourhood.

Cited from *Beeld* of 18 December 1995.

When sulfur burns in oxygen, sulfur dioxide forms.

1.1 Give the formula for sulfur dioxide.
1.2 Which type of intermolecular forces exists between sulfur dioxide molecules?
1.3 Give the electron configuration of sulfur.
1.4 Why were the respiratory systems of the people in the area affected by this gas?

Sulfur can be mixed with iron filings.

1.5 What type of mixture is this? Motivate your answer.
1.6 How can this mixture be separated?

If the mixture is heated, it forms a bond.

1.7 What is the name and formula of this bond?
1.8 What type of bonds exist between the iron and sulfur?
1.9 What type of bond exists in iron?
1.10 Describe the bond that is found in Question 1.9.
1.11 Iron is a metal. Give four properties of metals.

2 **Chlorine bomb at school seriously hurts two**

Two learners at Bloemfontein High School were hurt when a homemade chlorine bomb in a plastic bottle exploded near them. The police investigated the incident on Friday at the school when a matric pupil allegedly threw the bomb in the direction of a group of learners and it exploded.
Brandon Third (16), a Grade 9 pupil, was rushed to the casualty department of the Bloemfontein Medi-Clinic after chemicals got into his eyes.

Cited from *Beeld* of 27 October 2009.

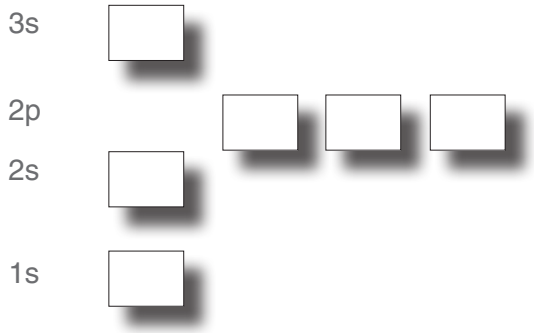
Chlorine is a very dangerous gas, because it is very reactive and toxic. Chlorine gas is a diatomic element.

2.1 What does diatomic element mean?
2.2 Give the electron configuration of chlorine.

When chlorine reacts with sodium (a very reactive metal that burns in water), table salt forms.

2.3 Name two safety measures that must be taken when working with chlorine.
2.4 What is the chemical name and formula of table salt?
2.5 Which type of bond exists between sodium and chlorine? Explain your answer.
2.6 The first ionisation energy of sodium is very low (496 $kJ \cdot mol^{-1}$) and the first ionisation energy of chlorine is very high (1 255 $kJ \cdot mol^{-1}$). Why do these differ so much?
2.7 The second ionisation energy of sodium is 4 562 $kJ \cdot mol^{-1}$. Why is it so much greater than the first ionisation energy?

2.8 Give the energy level diagram and the electron configuration of sodium.



3 **Lead content of paint may soon be regulated**

Consumers are warned not to buy toys painted with lead based paint. This is not as simple as checking for other safety aspects of toys, like age appropriateness or small parts that can be pulled off and swallowed by young children.
Only very specific laboratory tests can indicate the presence of lead in paint.
According to the MRC (Medical Research Council) lead poisoning can lower a child's IQ and lead to learning problems, shortened attention span, hyperactivity, stunted growth, hearing problems and anaemia.

Cited from *Beeld* of 29 October 2005.

Lead is classified as a heavy metal, which can cause poisoning because it cannot be removed from the body by the liver. Ludwig von Beethoven probably suffered from lead poisoning and possibly died from it.

3.1 Lead can form various ionic bonds. Give the formula of each of the following lead bonds:
- 3.1.1 Lead nitrate
- 3.1.2 Lead sulphate
- 3.1.3 Lead iodide
- 3.1.4 Lead sulphide

3.2 Give two beneficial uses of lead.
3.3 Give three effects of lead poisoning.
3.4 Which types of bonds exist between lead atoms?
3.5 The melting point of lead is 327°C and water's melting point is 0°C. What does that say about the attractive forces between lead atoms compared to the attractive forces between water molecules?
3.6 Paint must often be stirred well before one can start painting. Why is this necessary?
3.7 Which type of mixture is such paint?