Name : ……..

Date Due : ……..

80%	A
70%	B
60%	C
50%	D
40%	E
Below	U

1.1

Assessed Homework

Atomic Structure

%
48

1. (a) Give the relative charge and relative mass of an electron.

Relative charge .....

Relative mass .....

(2)

(b) Isotopes of chromium include ^{54}Cr and ^{52}Cr

(i) Give the number of protons present in an atom of ^{54}Cr

.....

(ii) Deduce the number of neutrons present in an atom of ^{52}Cr

.....

(iii) Apart from the relative mass of each isotope, what else would need to be known for the relative atomic mass of chromium to be calculated?

.....

(3)

(c) In order to obtain a mass spectrum of a gaseous sample of chromium, the sample must first be ionised.

(i) Give **two** reasons why it is necessary to ionise the chromium atoms in the sample.

Reason 1 .....

Reason 2 .....

(ii) State what is adjusted so that each of the isotopes of chromium can be detected in turn.

.....

(iii) Explain how the adjustment given in part (c)(ii) enables the isotopes of chromium to be separated.

.....

.....

..... [4]

(Total 9 marks)

2. (a) Complete the following table.

	Relative mass	Relative charge
Proton		
Electron		

(2)

(b) An atom of element **Q** contains the same number of neutrons as are found in an atom of ^{27}A1. An atom of **Q** also contains 14 protons.

(i) Give the number of protons in an atom of ^{27}A1.

.....

(ii) Deduce the symbol, including mass number and atomic number, for this atom of element **Q**.

.....

(3)

(c) Define the term *relative atomic mass* of an element.

.....

.....

(2)

(d) The table below gives the relative abundance of each isotope in a mass spectrum of a sample of magnesium.

m/*z*	24	25	26
Relative abundance (%)	73.5	10.1	16.4

Use the data above to calculate the relative atomic mass of this sample of magnesium.
Give your answer to one decimal place.

.....

.....

.....

(2)

(e) State how the relative molecular mass of a covalent compound is obtained from its mass spectrum.

.....

.....

(1)

(Total 10 marks)

3. (a) One isotope of sodium has a relative mass of 23.

(i) Define, in terms of the fundamental particles present, the meaning of the term *isotopes*.

.....

.....

(ii) Explain why isotopes of the same element have the same chemical properties.

.....

.....

(3)

(b) Give the electronic configuration, showing all sub-levels, for a sodium atom.

.....

(1)

(c) Explain why chromium is placed in the d block in the Periodic Table.

.....

.....

(1)

(d) An atom has half as many protons as an atom of ^{28}Si and also has six fewer neutrons than an atom of ^{28}Si. Give the symbol, including the mass number and the atomic number, of this atom.

.....

(2)

(Total 7 marks)

4. A gaseous sample of chromium can be analysed in a mass spectrometer. Before deflection, the chromium atoms are ionised and then accelerated.

(a) Describe briefly how positive ions are formed from gaseous chromium atoms in a mass spectrometer.

.....

..... (2)

(b) What is used in a mass spectrometer to accelerate the positive ions?

.....

(1)

(c) What is used in a mass spectrometer to deflect the positive ions?

.....

(1)

(d) The mass spectrum of a sample of chromium shows four peaks. Use the data below to calculate the relative atomic mass of chromium in the sample. Give your answer to two decimal places.

m/z	50	52	53	54
Relative abundance / %	4.3	83.8	9.5	2.4

.....

.....

.....

.....

(2)

(Total 6 marks)

5. (a) In terms of sub-levels, give the complete electronic configuration of the nitrogen atom, N, and of the nitride ion, N^{3-}.

N.....

N^{3-} .....

(2)

(b) Complete the electronic configurations for the metals sodium and iron.

Electronic configuration of sodium $1s^2$ .....

Electronic configuration of iron $1\ s^2$ .....

(2)

(c) Complete the following electronic configurations. [Ar] represents the electronic configuration of the argon atom.

A copper atom [Ar] .....

A copper(II) ion [Ar] .....

(2)

(d) Give the electronic configuration of the F^- ion in terms of levels and sub-levels.

.....

(1)

(e) Complete the following to show the electronic configuration of silicon.

$1s^2\ 2s^2$ .....

(1)

(Total 8 marks)

6. The values of the first ionisation energies of neon, sodium and magnesium are 2080, 494 and 736 kJ mol^{-1}, respectively.

(a) Explain the meaning of the term *first ionisation* of an atom.

.....

.....

.....

(2)

(b) Write an equation to illustrate the process occurring when the **second** ionisation energy of magnesium is measured.

.....

.....

(2)

(c) Explain why the value of the first ionisation energy of magnesium is higher than that of sodium.

.....

.....

.....

(2)

(d) Explain why the value of the first ionisation energy of neon is higher than that of sodium.

.....

.....

.....

(2)

(Total 8 marks)