Atomic structure – 2021/20 GCSE Gateway Chemistry A

1. Nov/2020/Paper_J248/01/No.12

A potassium isotope can be shown as:

$^{39}_{19}K$

What are the numbers of protons, neutrons and electrons in this potassium isotope?

A 19 protons, 19 neutrons, 20 electrons

B 19 protons, 20 neutrons, 19 electrons

C 20 protons, 19 neutrons, 19 electrons

D 20 protons, 20 neutrons, 19 electrons

Your answer ☐ **[1]**

2. Nov/2021/Paper_J248/03/No.15

A carbon dioxide molecule is shown in the ball and stick model.

Which estimate of the distance between the oxygen atoms in a carbon dioxide molecule is correct?

A 2.0×10^{-7} m

B 2.0×10^{-10} m

C 2.0×10^{-15} m

D 2.0×10^{-20} m

Your answer ☐ **[1]**

3. Nov/2021/Paper_J248/03/No.19

This question is about elements in Group 7 of the Periodic Table.

The table shows some properties of Group 7 elements.

Element	Molecular formula	Melting point (°C)	Boiling point (°C)	Order of reactivity
Fluorine	F_2	–220	.....	most reactive ↕ least reactive
Chlorine	Cl_2	–101	–34	
Bromine	Br_2	–7	59	
Iodine	I_2	114	184	
Astatine	At_2	.....	337	

(a) Complete the table. Use ideas about trends down Group 7. **[2]**

(b) Chlorine reacts with sodium bromide, NaBr, in a displacement reaction.

Write the **balanced symbol** equation for this reaction.

..... **[2]**

(c) Explain, in terms of the arrangement of electrons, the **decrease** in reactivity from fluorine to astatine.

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..... **[3]**

(d) Iron reacts with chlorine to form iron chloride.

Look at the equation for the reaction.

$2Fe + 3Cl_2 \rightarrow 2FeCl_3$

Calculate the mass of iron chloride that can be made from 2.80 g of iron.

Give your answer to **3** significant figures.

(The relative atomic mass, A_r, of Cl is 35.5 and of Fe is 55.8).

Mass of iron chloride = ... g **[4]**

(ii) Three isotopes of neon are shown.

20 Ne 10	21 Ne 10	22 Ne 10

How many neutrons does an atom of neon-21 contain?

..... **[1]**

(iii) Calculate how many **moles** of neon there are in 101 g of neon.

(The relative atomic mass, A_r, of Ne is 20.2.)

Moles of neon = ... mol **[2]**

(c) Neon is in Group 0 of the Periodic Table. Lithium is in Group 1 of the Periodic Table.

Explain, in terms of electronic structure, why elements in Group 1 are **more** reactive than elements in Group 0.

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..... **[2]**