



## New Document 1

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **26 minutes**

Marks: **26 marks**

Comments:

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**Q1.**

In 1869, Dmitri Mendeleev produced his periodic table of the elements.

Mendeleev placed the alkali metals in the same group.

- (a) What evidence did Mendeleev use to decide that the alkali metals should be in the same group?

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(1)

- (b) Describe how the elements in the modern periodic table are arranged:

- (i) in terms of protons

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(1)

- (ii) in terms of electrons.

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(1)

- (c) State **two** properties of transition elements that make them more useful than alkali metals for making water pipes.

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(2)

- (d) Describe and explain the trend in reactivity of the alkali metals (Group 1).

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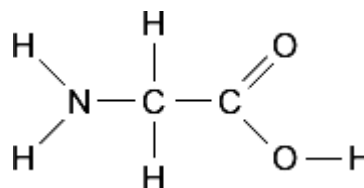
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(4)  
(Total 9 marks)

**Q2.**

Two scientists, Miller and Urey, investigated how simple gases that may have been present in the Earth's early atmosphere led to the formation of chemicals such as glycine. Glycine is found in living organisms.



(a) Name **three** simple gases that could have been present in the Earth's early atmosphere that might combine to form glycine.

1. \_\_\_\_\_  
2. \_\_\_\_\_  
3. \_\_\_\_\_

(3)

(b) Describe the main differences between the Earth's early atmosphere and the atmosphere today.

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(4)

(c) Air is a source of some gases used in industrial processes.

Name the process used to separate the gases in air.

Give the reason why this process can be used to separate the gases.

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(2)  
(Total 9 marks)

**Q3.**

There is molten rock below the Earth's solid outer crust. The rock remains molten because the radioactive decay of isotopes such as uranium, thorium and potassium releases heat energy.

- (i) Explain how this released heat energy is thought to cause the recycling of rocks.

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(4)

- (ii) Two *isotopes* of potassium are shown.



Explain what is meant by *isotopes*. You must include numbers of electrons, neutrons and protons in your explanation.

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(4)  
(Total 8 marks)

## Mark schemes

### Q1.

- (a) similar properties  
*allow same properties*  
*allow correct example of property*  
*ignore answers in terms of atomic structure* 1
- (b) (i) in order of atomic / proton number  
*allow increasing number (of protons)* 1
- (ii) elements in same group have same number (*of electrons*) in outer shell  
**or** *highest energy level*  
*allow number (of electrons) increases across a period* 1
- (c) any **two** from:  
*statements must be comparative*
- stronger / harder  
*ignore higher densities*
  - less reactive
  - higher melting points  
*ignore boiling point*
- 2
- (d) *reactivity increases down group*  
*allow converse throughout*  
*for next three marks, outer electron needs to be mentioned*  
*once otherwise max = 2* 1
- outer electron is further from nucleus*  
*allow more energy levels / shells*  
*allow larger atoms* 1
- less attraction between outer electron and nucleus*  
*allow more shielding* 1
- therefore outer electron lost more easily* 1

[9]

### Q2.

- (a) *if only formula given it must be correct*
- any **three** from:
- ammonia  
*accept NH<sub>3</sub>*

- methane  
*accept CH<sub>4</sub>*  
*allow ethane / butane / propane*
- hydrogen  
*accept H<sub>2</sub>*
- water vapour  
*accept H<sub>2</sub>O vapour / steam*
- carbon dioxide  
*accept CO<sub>2</sub>*
- carbon monoxide  
*accept CO*  
*allow oxygen / O<sub>2</sub>*  
*allow nitrogen / N<sub>2</sub>*  
*ignore nitrogen oxide*  
*ignore carbon*

3

(b) (in atmosphere today)

*ignore references to water vapour*  
*allow converse*

(much) less carbon dioxide / CO<sub>2</sub>

*allow carbon dioxide was the main gas (in Earth's early atmosphere)*

1

more nitrogen / N<sub>2</sub>

*allow nitrogen is now the main gas (in the atmosphere today)*

**or**

*nitrogen is now 78 x 80%*

1

more oxygen / O<sub>2</sub>

1

no ammonia / NH<sub>3</sub> or less methane / CH<sub>4</sub> or more argon / Ar or more noble gases

*allow less ammonia / NH<sub>3</sub>*

1

(c) (fractional) distillation

1

gases have different boiling points

*allow gases condense at different temperatures*

*ignore condensing points / levels*

*ignore evaporating points / levels*

1

[9]

### Q3.

(i) convection currents

	<i>accept a suitable description of convection currents</i>	1
	move the Earth's plates <i>accept a suitable description of 'movement' of Earth's plates</i>	1
	at plate boundary one plate or a slab of rock can be pushed down forming magma/molten rock <i>accept at subduction zones magma/molten rock is formed – deconstructive boundary</i>	1
	magma/molten rock rising and cooling at the Earth's surface reforms as part of the plate <i>accept magma/molten rock rising and cooling at the Earth's surface forms igneous rock – constructive boundary</i> <i>accept Earth's crust or lithosphere for Earth's surface</i>	1
(ii)	isotopes are atoms of the same element <i>do not accept that isotopes have the same atomic number but a different atomic mass</i>	1
	19/the same number of protons	1
	19/the same number of electrons <i>do not penalise for incorrect</i>	1
	20 and 21 neutrons/different numbers of neutrons <i>arithmetic if concept is correct</i>	1