# The periodic table and periodicity – 2021/20 GCE AS Chemistry A

**1.** Nov/2021/Paper_H032/01/No.8

Which sequence has elements in order of increasing first ionisation energy?

**A** Na < Mg < A*l*

**B** Mg < A*l* < Si

**C** A*l* < Si < P

**D** Si < P < S

Your answer ☐ **[1]**

**2.** Nov/2021/Paper_H032/01/No.9

Which element has atoms with the largest number of unpaired p-electrons?

**A** aluminium

**B** oxygen

**C** chlorine

**D** phosphorus

Your answer ☐ **[1]**

**3.** Nov/2021/Paper_H032/02/No.5(d, e)

**(d)** Nickel and gallium are in period 4 of the periodic table.

**(i)** Which block in the periodic table does nickel belong to?

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

**(ii)** Complete the electron configuration of gallium.

$1s^2$ ..... **[1]**

**(e)** Element **A** is in period 3 of the periodic table (Na-Ar).

The first six ionisation energies (I.E.) of element **A** are shown below.

| 1st I.E. / kJ mol$^{-1}$ | 2nd I.E. / kJ mol$^{-1}$ | 3rd I.E. / kJ mol$^{-1}$ | 4th I.E. / kJ mol$^{-1}$ | 5th I.E. / kJ mol$^{-1}$ | 6th I.E. / kJ mol$^{-1}$ |
|---|---|---|---|---|---|
| 789 | 1577 | 3232 | 4356 | 16091 | 19785 |

Identify element **A**.

Explain your answer.

Element **A** = .....

Explanation .....

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

**4.** Nov/2020/Paper_H032/02/No.3(a, c)

This question is about some elements in Period 4 of the periodic table.

**(a)** The table shows the melting point and electrical conductivity of two elements in Period 4.

| Element | Melting Point/°C | Electrical conductivity |
|---|---|---|
| Calcium | 842 | Good |
| Bromine | –7 | Poor |

Use your knowledge of structure and bonding to explain the properties in the table.

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..... **[5]**

**(c)** The Period 4 element selenium is in the same group of the periodic table as oxygen.

Selenium and oxygen both form compounds with hydrogen with the formulae $H_2Se$ and $H_2O$ respectively.

**(i)** $H_2Se$ can be prepared by reacting aluminium selenide, $Al_2Se_3$, with water.
Aluminium hydroxide and hydrogen selenide are formed.

Write the equation for this reaction.

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

**(ii)** The boiling points of $H_2O$ and $H_2Se$ are shown below.

| Compound | Boiling point/°C |
|---|---|
| $H_2O$ | 100 |
| $H_2Se$ | –41 |

Explain why $H_2O$ has a higher boiling point than $H_2Se$.

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