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| **A-level CHEMISTRY****Induction task 2025**Welcome to A-level Chemistry at Cheshire College South and West. Whatever your reason for choosing this subject we hope you will enjoy the challenges presented by this intriguing area of science and find it a rewarding and worthwhile experience. We follow the AQA course (specification code 7405) , which includes pure theory, applications and practical analysis. The details of the specification can be found using this QR code: You will need to know your GCSE science work well and we strongly recommend you revise this. The A-level chemistry course will be demanding and preparative work will make things much easier for you. Throughout the course it will be very important that you plan your time effectively to meet homework and internal exam deadlines and continue to develop your independent working skills. We therefore want you to attempt three tasks (A, B and C of attached homework) before starting the A-level Chemistry course. These tasks will help you to review some of the most important concepts encountered during the first part of the A-level Chemistry course and introduce some of the new areas you will study. The tasks are also designed to help us find out more about your strengths and assess what you have understood from your GCSE studies. The tasks are: **A:** Multiple choice questions **B:** Maths skills tasks**C:** A data analysis task  There is a periodic table attached at the back of the homework question sheet. You will need to bring **all** the completed tasks with you to your first A-level chemistry lecture, September 2025. Please feel free to contact us using the email address below if you need any guidance in completing this work or any additional information about preparing for the A-level Chemistry course.Lecturers: Nicola Roberts – email: Nicola.roberts@ccsw.ac.uk   Neil Hewitt – email: Neil.hewitt@ccsw.ac.ukName: .............................................................................................**Section A - Multiple Choice – 14 marks**For each question there are four possible answers; **A**, **B**, **C** or **D**. For each question, circle the answer which you think is correct. **Atoms, ions and sub-atomic particles** **Table 1** shows the sub-atomic particles in a range of atoms and ions.

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|  **Table 1**

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| --- | --- | --- | --- | --- | --- |
| **Particle** | **Symbol** | **Atomic number**  | **Mass Number**  | **Number of neutrons**  | **Number of electrons**  |
| 1 | C | 6 | **J** | 8 |  6 |
| 2 | ? | 19 | 40 | **K** | 19 |
| 3 | ? | 8 | 16 | **L** | 6 |
| 4 | ? | 83 | 209 | ? | 81 |
| 5 | Ga | 31 | ? | 39 | **M** |
| 6 | Cs+ | ? | ? | 78 | **N** |

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**1.** Which particles are ions? **A**  Particles 2, 4 and 6.**B** Particles 2, 5 and 6.**C** Particles 3, 4 and 6.**D** Particles 4, 5 and 6.**2.** Select one row from rows **A-E** from the options below that shows the correct values of **J**, **K**, **L, M** and **N** that could be used to complete **Table 1** above:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  | **Value of J** | **Value of K** | **Value of L** | **Value of M** | **Value of N** |
| **A** | 14 | 21 | 8 | 31 | 54 |
| **B** | 12 | 19 | 8 | 29 | 55 |
| **C** | 14 | 19 | 8 | 31 | 55 |
| **D** | 12 | 21 | 8 | 33 | 54 |
| **E** | None of the above |

**3.** Element alpha has an atomic number two greater than particle 6 in question 1. Element beta differs from particle 4 in question 1 by having two less neutrons. Which of the responses in the table below give the correct identity of the two unknown elements? :

|  |  |  |
| --- | --- | --- |
|  | **Element alpha** | **Element beta** |
| **A** | La | Tl |
| **B** | Cs | Tl |
| **C** | La | Bi |
| **D** | Cs | Bi |

**4.** This diagram right shows the electron arrangement in an atom of magnesium:Which of these diagrams correctly shows the electron arrangement in the magnesium ion that occurs in compounds &the correct formula for the ion? **A** Mg2- **B**Mg2+ **C**Mg2+ **D**Mg6- **5.** Look at the list of formulae below; **P** H2O **Q** C4H10 **R** I2 **S** C6H12O6 **T** HeWhich statement is true? **A** All of these substances contain covalent bonds. **B** A molecule of **S** has a bigger mass than a molecule of **R** **C** All the substances are composed of molecules**D** Two of the substances are elements **6.** The “Relative Mass” (RM) of molecules allows chemists to compare the mass of different substances. What is the Relative Mass of C6H6? **A**  42 **B**  46 **C** 78 **D**  84**7.** What is the Relative Mass of (NH4)3PO4? **A** 62 **B** 113 **C** 131 **D** 149**8.** The diagram below shows molecules in liquid water. If the water is heated it will eventually boil and turn into a gas (steam). Which of the statements on the next page are true about the formation of steam?http://t0.gstatic.com/images?q=tbn:ANd9GcTlbmMk1bSQbLIeCP1uyda-Lz4uQfwkUXeBHqp3SfVnfgwmH-b1MA |  |  |  |
| * **W** Steam consists of hydrogen and oxygen gas.
* **X** When water boils to form steam, all the covalent bonds between H and O atoms are broken.
* **Y** When water boils to form steam,forces between water molecules are broken but not the covalent bonds.
* **Z** Steam is made of H2O molecules.

**A** Z only **B** Y & Z **C** X, Y & Z **D** All the above  |  |  |  |  |
| **9.** The diagram below shows the structure of an amino acid (methionine) and four statements, **P-S**. Image result for methionine* **P** Methionine is made from 20 different elements.
* **Q** Each methionine molecule is made of 20 atoms.
* **R** Each methionine molecule is composed of 5 atoms.
* **S** Methionine is made from 5 different elements.

Which statement/s is/are true? **A**  P & R **B** Q & S **C** R & S **D** S only.**10.** Formulae **W-Z** are suggestions for compounds made from the ions listed below. The list below shows the formula of the ions and their charges: Potassium K+ Nitrate NO3- Aluminium Al3+ Hydroxide OH- Oxide O2- Ammonium NH4+ Calcium Ca2+ Magnesium Mg2+ Which formulae **W-Z** are correct? * **W** NH4OH
* **X** MgOH2
* **Y** NaO2
* **Z** Al(NO3)3

**A** W and X **B** W, X and Y **C** W, X and Z **D** W and Z **11.** An important equation in A level chemistry links the energy **E** of a photon of radiation to the frequency of the wave, **f**: **E = hf** In this equation **E** is the energy of the photon, **f** is the frequency of the radiation and **h** is a number called “Planck’s constant” and has a value of 6.63 x 10-34 Js. If a photon has energy of 1.31 x 10-19 J, what is the frequency of the radiation (in s-1)? **A**  8.69 x 10-53 **B** 1.97 x 1014 **C** 1.15 x 1052 **D** 1.98 x 1014**12.** Which of the following numbers are shown to three significant figures? * **F** 0.4509
* **G** 8.67
* **H** 0.47
* **I** 0.220
* **J** 3.498
* **K** 1.01 X 103
* **L** 0.00100

**A** G and K **B** G, I and K **C** G, I, K and L **D** All except F **13.** The most common unit for measuring volumes in A level chemistry is the “decimetre-cubed”, given the symbol dm3. One dm3 is equivalent to a litre and 1 dm3 = 1000 cm3. If a chemist measures out 72.6 cm3 of sodium hydroxide solution, what is this volume in dm3? **A** 0.0726 dm3 **B** 0.726 dm3 **C** 7.26 dm3 **D** 72,600 dm3 **14.** Which of the following has the greatest mass? **A** 1 mole of chlorine gas **B** 2 moles of fluorine gas **C** 3 moles of carbon as diamond **D** 1 mole of iron metal  |  |  |  |  |
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**Section B – Maths skills - 9 marks**

**15.** Given the equation PV = nRT, and the following values:

P = 4.20 x 105 V = 7.70 R = 8.31 T = 293

Calculate the value of n. Give your answer to 3 significant figures and in standard form. Show all your working.

[3 marks]

**16.** Given that time (t) is calculated by t = d/v, where d = distance measured in m and v = velocity measured in ms-1;

and kinetic energy (KE, measured in J) is calculated by:

 KE = ½ mv2

where m = mass measured in kg and v = velocity measured in ms-1;

* give an equation for calculating time (make t the subject of the equation) in terms of distance (d), mass (m) and kinetic energy (KE). [2 marks].
* Calculate the mass of a particle that travels 17.5 m in 0.2 swith a kinetic energy of 10-2 J.
* Give your answer in kg in standard form to 3 significant figures. Show all your working. [4 marks]

**Section C - Data Analysis – 8 marks**

A chemist wanted to investigate how quickly the mass of the chemical N2O5 decreased when it was heated to 50OC and decomposed. Starting with 2.33 g of N2O5 she recorded the data in the table below.

|  |  |
| --- | --- |
| **Time (s)** | **Mass of N2O5 (g)** |
| 0 | 2.33 |
| 19 | 2.08 |
| 32 | 1.91 |
| 53 | 1.67 |
| 87 | 1.60 |
| 120 | 1.11 |
| 188 | 0.72 |
| 232 | 0.55 |
| 314 | 0.34 |

**1.** Use the data in the table to plot a graph showing how the mass of N2O5 decreases over time. Add all relevant information and a line of best fit. [3 marks]

**2.** Use your graph to work out:

**a).** How long it takes for the amount of N2O5 to decrease by half – do this three times, with different initial amounts of N2O5. Show your working on the graph from part 1. What do you notice? [3 marks]

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**b).** Either use your answer to **a)** or the graph to estimate how long after the start of the experiment it would take for the mass of N2O5 to fall to a level of 0.15g. [2 marks]

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**END OF QUESTIONS**