**AS LEVEL CHEMISTRY**

**TRANSITION TEST**

Answer all questions

Max 32 marks

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|  | Name …………………………………………………………….. |  |
|  | Mark ……../32 ……....% Grade ……… |  |

**SECTION A**

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| 1. | In one model of atomic structure, the atom has a nucleus surrounded by electrons in levels and sub-levels. | | |  |
|  | (a) | Define the term *atomic number*.  …………………………………………………………………………………………………………… | | 1 |
|  | (b) | Explain why atoms of an element may have different mass numbers.  …………………………………………………………………………………………………………… | | 1 |
|  | (c) |  | The table below refers to a sample of krypton. |  |
|  |  | (i) | Name an instrument which is used to measure the relative abundance of isotopes.  ……………………………………………………………………………………………………… | 1 |
|  |  | (ii) | Define the term *relative atomic mass*.  ………………………………………………………………………………………………………  ……………………………………………………………………………………………………… | 2 |
|  |  | (iii) | Calculate the relative atomic mass of this sample of krypton.  ………………………………………………………………………………………………………  ……………………………………………………………………………………………………… | 2 |
|  |  | (iv) | Give the complete electronic configuration of krypton in terms of s, p and d sub-levels.  ……………………………………………………………………………………………………… | 1 |

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| 2. | (a) | Complete the electron arrangement for the Mg2+ ion.  *1s2*........................................................................................................................................................................... | 1 |
|  | (b) | Identify the block in the Periodic Table to which magnesium belongs.  …………………………………………………………………………………………………………… | 1 |
| **3.** | (a) | Complete the following table. | 2 |
|  | (b) | An atom has twice as many protons as, and four more neutrons than, an atom of 9Be. Deduce the symbol, including the mass number, of this atom.  ……………………………………………………………………………………………………………  …………………………………………………………………………………………………………… | 2 |
| **4.** | Norgessaltpeter was the first nitrogen fertiliser to be manufactured in Norway. It has the formula Ca(NO3)2. Norgessaltpeter can be made by the reaction of calcium carbonate with dilute nitric acid as shown by the following equation.  CaCO3(s)   +   2HNO3(aq)      Ca(NO3)2(aq)   +   CO2(g)   +   H2O(I)  In an experiment, an excess of powdered calcium carbonate was added to 36.2 cm3 of 0.586 mol dm–3 nitric acid. | |  |
|  | (a) | Calculate the amount, in moles, of HNO3 in 36.2 cm3 of 0.586 mol dm–3 nitric acid. Give your answer to 3 significant figures.  ……………………………………………………………………………………………………………  …………………………………………………………………………………………………………… | 1 |
|  | (b) | Calculate the amount, in moles, of CaCO3 that reacted with the nitric acid. Give your answer to 3 significant figures.  …………………………………………………………………………………………………………… | 1 |
|  | (c) | Calculate the minimum mass of powdered CaCO3 that should be added to react with all of the nitric acid. Give your answer to 3 significant figures.  …………………………………………………………………………………………………………… | 2 |

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| **5.** |  | Magnesium nitrate decomposes on heating to form magnesium oxide, nitrogen dioxide and oxygen as shown in the following equation.  2Mg(NO3)2(s) → 2MgO(s) + 4NO2(g) + O2(g) | |  |
|  | (a) | Thermal decomposition of a sample of magnesium nitrate produced 0.741 g of magnesium oxide | |  |
|  |  | (i) | Calculate the amount, in moles, of MgO in 0.741 g of magnesium oxide.  ……………………………………………………………………………………………………  …………………………………………………………………………………………………… | 2 |
|  |  | (ii) | Calculate the total amount, in moles, of gas produced from this sample of magnesium nitrate.  …………………………………………………………………………………………………… | 1 |
|  | (b) | In another experiment, a different sample of magnesium nitrate decomposed to produce 0.402 mol of gas. Calculate the volume, in dm3, that this gas would occupy at 333 K and 1.00 × 105 Pa. (The gas constant *R* = 8.31 J K–1 mol–1)  ……………………………………………………………………………………………………………  ……………………………………………………………………………………………………………  …………………………………………………………………………………………………………… | | 3 |
|  | (c) | A 0.0152 mol sample of magnesium oxide, produced from the decomposition of magnesium nitrate, was reacted with hydrochloric acid.  MgO + 2HCl → MgCl2 + H2O | |  |
|  |  | (i) | Calculate the amount, in moles, of HCl needed to react completely with the 0.0152 mol sample of magnesium oxide.  …………………………………………………………………………………………………… | 1 |
|  |  | (ii) | This 0.0152 mol sample of magnesium oxide required 32.4 cm3 of hydrochloric acid for complete reaction. Use this information and your answer to part (c)(i)to calculate the concentration, in mol dm–3, of the hydrochloric acid.  …………………………………………………………………………………………………… | 1 |

**SECTION B**

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| **6.** | An atom in which the number of protons is greater than the number of neutrons is  **A**       234U  **B**       6Li  **C**       3He  **D**       2H | 1 |
| **7.** | Which atom has an incomplete sub-shell?  **A**       Be  **B**       Ca  **C**       Ge  **D**       Zn | 1 |
| **8.** | Which one of the following does **not** have a pair of s electrons in its highest filled electron energy sub-level?  **A**       H−  **B**       Mg  **C**       P3+  **D**       Ar | 1 |
| **9.** | Which one of the following samples of gas occupies the largest volume?  **A**       1.0 g of ozone (O3) at l00 kPa and 300 K  **B**       1.0 g of oxygen (O2) at 100 kPa and 300 K  **C**       1.0 g of water vapour (H2O) at 250 kPa and 450 K  **D**       1.0 g of methane (CH4) at 333 kPa and 500 K | 1 |

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| **10.** | Which one of the following contains the greatest number of moles of methanol?  (The Avogadro number (*L*) is 6.02 × 1023, the relative molecular mass (*M*r) of methanol is 32.)  **A**       6.6 × 1022 molecules  **B**       3.3 g of methanol  **C**       2.5 × 10−3 m3 of methanol vapour at 300 K and 100 kPa  **D**       70 cm3 of 1.5 M aqueous methanol | 1 |
| **11.** | What is the volume occupied by 10.8 g of the freon CCl2F2 at 100 kPa and 273 K?  **A**       2.02 dm3  **B**       2.05 dm3  **C**       2.02 cm3  **D**       2.05 cm3 | 1 |