A' Level Chemistry

Year 1

Unit 1: Atomic Structure & Periodicity

Summer Examination Revision Pack

The questions in this pack should be attempted **AFTER** completing all other revision.

Grade Accelerator
Recall Definitions
Drawing Diagrams
Using Equations
Drawing Graphs

Quizlet

Quizlet Classes
Flashcard Based
Games
Tests & Quizzes
Keyword Spell Checker

Condensed Notes
Keywords & Definitions
Key Concepts
Application
Key Skills

Online Forms
Take Time to Answer
Use Paper & Calculator
Work It Out
Review Missed Marks

Use the 3 Wave Process when completing these revision packs.

1. Complete the questions without assistance
(Can't answer a question? Leave it and move on)
2. Use your notes to fill any gaps after step 1
3. Use the mark scheme to fill in any remaining gaps.

1. Having gaps after step 1 is normal, that's why we are doing revision!
2. If your notes don't help during step 2, they are not good enough!
(Change your note taking method and try to understand the problem)
3. If you don't understand why the mark scheme answer is correct, **see Andy.**

If you struggle with the questions in the pack, **STOP!** and complete some more revision.

If you come to a complete dead-end, **STOP!** and speak to **Andy** asap.

Do not write outside the box

0 3 This question is about periodicity, the Period 4 elements and their compounds.

0 3 . 1 State the meaning of the term periodicity.

[1 mark]

0 3 . 2 Identify the element in Period 4 with the highest electronegativity value.

[1 mark]

0 3 . 3 Identify the element in Period 4 with the largest atomic radius.
Explain your answer.

[3 marks]

Element

Explanation

0 3 . 4 The equations for two reactions of arsenic(III) oxide are shown.

$$As_2O_3 + 6HCl \rightarrow 2AsCl_3 + 3H_2O$$

$$As_2O_3 + 6NaOH \rightarrow 2Na_3AsO_3 + 3H_2O$$

Name the property of arsenic(III) oxide that describes its ability to react in these two ways.

[1 mark]

0 3 . 5 Complete the equation for the formation of arsenic hydride.

[1 mark]

As_2O_3 + Zn + $HNO_3 \rightarrow$ AsH_3 + $Zn(NO_3)_2$ + H_2O

7

Question	Answers	Additional Comments/Guidelines	Mark
03.1	Repeating pattern/trends (of physical or chemical properties/reactions)	Allow named property Penalise groups	1
03.2	Bromine/Br	Not Br_2 Accept Kr or Krypton	1
03.3	Potassium /K Smallest number of protons/smallest nuclear charge Similar shielding / same number of shells (as other elements in period 4)	If Na or Rb lose M1 but allow access to M2 and M3 If other incorrect elements 0/3 Allow same shielding	1 1 1
03.4	Amphoteric		1
03.5	$As_2O_3 + 6Zn + 12HNO_3 \rightarrow 2AsH_3 + 6Zn(NO_3)_2 + 3H_2O$	Accept multiples	1

Do not write outside the box

0 2 This question is about atomic structure.

0 2 . 1 Define the mass number of an atom.

[1 mark]

0 2 . 2 Complete **Table 3** to show the numbers of neutrons and electrons in the species shown.

[2 marks]

Table 3

	Number of protons	Number of neutrons	Number of electrons
^{46}Ti	22		
$^{49}Ti^{2+}$	22		

0 2 . 3 A sample of titanium contains four isotopes, ^{46}Ti, ^{47}Ti, ^{48}Ti and ^{49}Ti
This sample has a relative atomic mass of 47.8
In this sample the ratio of abundance of isotopes ^{46}Ti, ^{47}Ti and ^{49}Ti is 2:2:1

Calculate the percentage abundance of ^{46}Ti in this sample.

[3 marks]

Abundance of ^{46}Ti _____ %

6

Question	Answers	Additional comments/Guidelines	Mark
02.1	<u>Number</u> of protons + neutrons (in the nucleus of the atom)	Do not allow reference to mass or average Ignore references to C-12 being 12	1

Question	Answers	Additional comments/Guidelines	Mark
02.2	<table><tr><th></th><th>Number of protons</th><th>**Number of neutrons**</th><th>**Number of electrons**</th></tr><tr><td>^{46}Ti</td><td>22</td><td>**24**</td><td>**22**</td></tr><tr><td>$^{49}Ti^{2+}$</td><td>22</td><td>**27**</td><td>**20**</td></tr></table>	Mark as rows	1 1

Question	Answers	Additional comments/Guidelines	Mark
02.3	Let ^{49}Ti be y M1 $47.8 = \frac{(46 \times 2y) + (47 \times 2y) + (48 \times (100 - 5y)) + (49 \times y)}{100}$ $47.8 = \frac{235y + 4800 - 240y}{100}$ M2 $5y = 20$ OR $y = 4$ M3 abundance of ^{46}Ti = 8%	Allow M1 $47.8 = \frac{(46 \times 2) + (47 \times 2) + (48 \times n) + 49}{(5 + n)}$ M2 $0.2n = 4$ or $n = 20$ M3 % $^{46}Ti = \frac{2}{25} \times 100 = 8\%$	1 1 1

Do not write outside the box

0 2 Rhenium has an atomic number of 75

0 2 . 1 Define the term relative atomic mass.

[2 marks]

0 2 . 2 The relative atomic mass of a sample of rhenium is 186.3

Table 2 shows information about the two isotopes of rhenium in this sample.

Table 2

Relative isotopic mass	Relative abundance
185	10
To be calculated	17

Calculate the relative isotopic mass of the other rhenium isotope.
Show your working.

[2 marks]

Relative isotopic mass _____

0 2 . 3 State why the isotopes of rhenium have the same chemical properties.

[1 mark]

Question	Answers	Additional Comments/Guidelines	Mark
02.1	<u>average/mean mass of 1 atom (of an element)</u> 1/12 mass of one atom of ^{12}C **or** <u>average/mean mass of atoms of an element</u> 1/12 mass of one atom of ^{12}C **or** <u>average/mean mass of atoms of an element ×12</u> mass of one atom of ^{12}C **or** <u>(average) mass of one mole of atoms</u> 1/12 mass of one mole of ^{12}C **or** <u>(weighted) average mass of all the isotopes</u> 1/12 mass of one atom of ^{12}C **or** average mass of an atom/isotope (compared to C−12) on a scale in which an atom of C−12 has a mass of 12	M1 = top line M2 = bottom line if moles and atoms/isotopes mixed max = 1	1 1 AO1

Question	Answers	Additional Comments/Guidelines	Mark
02.2	M1 $186.3 = \frac{\underline{(185 \times 10) + (\mathbf{X} \times 17)}}{27}$ M2 (relative isotopic mass) = <u>187</u>(.1)	correct expression	1 1 AO2

Question	Answers	Additional Comments/Guidelines	Mark
02.3	same electron configuration	allow same number of electrons allow same electron structure ignore same number of protons ignore different number of neutrons do **not** accept same number of neutrons	1 AO1