

Marks
5

- Complete the following table. Give, as required, the formula, the systematic name and the principal ions present in a solution prepared by adding the substance to water. For the substances that do not form ions in solution, write N/A in this column.

FORMULA	SYSTEMATIC NAME	PRINCIPAL IONS IN WATER SOLUTION
	magnesium chloride	
	sodium chromate	
CO		
		$\text{H}^+(\text{aq}), \text{IO}^-(\text{aq})$
	iron(III) nitrate-6-water	

- Electron configurations are governed by three rules: the 'Aufbau Principle', the 'Pauli Exclusion Principle' and 'Hund's Rule of Maximum Spin Multiplicity'. The ground state electron configurations of He, N and O have been written INCORRECTLY, as shown below. For each element, name the electron configuration rule that has been broken.

Element	Electronic configuration					Name of rule that has been broken
He	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
	1s	2s	2p	2p	2p	
N	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
	1s	2s	2p	2p	2p	
O	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
	1s	2s	2p	2p	2p	

 Write the electron configuration of Fe^{2+}

What property of iron makes it useful for biological systems?

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- Complete the following table. Give, as required, the formula, the systematic name, the oxidation number of the underlined atom and, where indicated, the principal ions present in a solution prepared by adding the substance to water.

FORMULA	SYSTEMATIC NAME	OXIDATION NUMBER	PRINCIPAL IONS IN WATER SOLUTION
<u>N</u> O ₂			N/A
<u>Pb</u> (CH ₃ CO ₂) ₂			
			Mg ²⁺ (aq); <u>Cl</u> O ₄ ⁻ (aq)

Write the full electron configuration of the As³⁺ ion.

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- Draw the Lewis structures, showing all valence electrons for the following species. Indicate which of the species have contributing resonance structures.

HCO ₃ ⁻	COS	CN ⁻
Resonance: YES / NO	Resonance: YES / NO	Resonance: YES / NO

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- Complete the following table. Give, as required, the formula, the systematic name, the oxidation number of the underlined atom and, where indicated, the number of *d* electrons for the element in this oxidation state.

FORMULA	SYSTEMATIC NAME	OXIDATION NUMBER	NUMBER OF <i>d</i> ELECTRONS
$\underline{\text{S}}\text{O}_3$			
$\text{K}\underline{\text{Mn}}\text{O}_4$			
$\underline{\text{Co}}\text{Cl}_2 \cdot 6\text{H}_2\text{O}$			
	ammonium sulfate		

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- Draw the Lewis structures, showing all valence electrons for the following species. Indicate which of the species have contributing resonance structures.

NO_3^-	CO_2	N_2H_2
Resonance: YES / NO	Resonance: YES / NO	Resonance: YES / NO

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- A sample of carboxypeptidase (an enzyme) was purified and found on analysis to contain 0.191% by weight of zinc. What is the *minimum* molecular weight of the enzyme if we assume it is a monomer?

	Answer:
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- Complete the following table. Give, as required, the formula, the systematic name, the oxidation number of the underlined atom and, where indicated, the number of *d* electrons for the element in this oxidation state.

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Formula	Systematic name	Oxidation number	Number of <i>d</i> electrons
<u>C</u> O ₂			
Na ₂ <u>Cr</u> O ₄			
<u>Fe</u> Cl ₃ ·3H ₂ O			
	potassium sulfate		

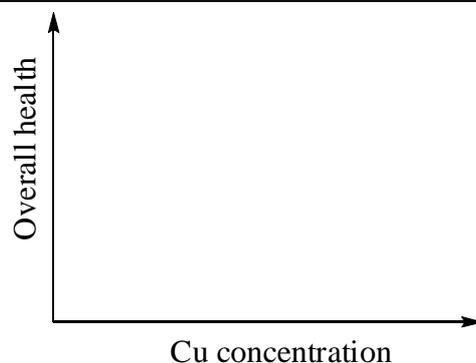
- Complete the following table, giving either the systematic name or the molecular formula as required.

Marks
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Formula	Systematic name
SO ₂	
CoCl ₂ ·6H ₂ O	
	silver chromate
	potassium hydrogencarbonate

- Copper is an essential element in human biology, deficiencies leading to blood disorders. Excess copper can occur in cases of poisoning or in Wilson's disease. Draw a graph showing the relationship between overall health and the level of copper in the body and identify the 'healthy' range.

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Describe one biological function of copper.

Suggest one approach for treating an excess level of copper.

- Complete the following table, giving either the systematic name or the molecular formula as required.

Marks
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Formula	Systematic name
NaHSO ₄	
	arsenic(III) chloride
CrCl ₃ ·6H ₂ O	
	silver dichromate

- Like most medicines, the platinum complex, cisplatin, $cis-[PtCl_2(NH_3)_2]$, is both effective and toxic. What is cisplatin used to treat?

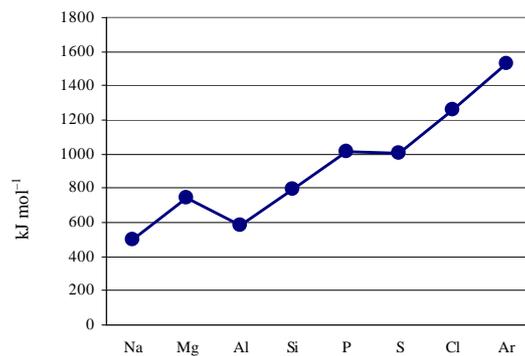
4

What does the cisplatin react with in the body to cause most of the toxicity?

Draw a graph showing the relationship between overall health and the level of platinum in the body of a healthy person.

Marks
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- The diagram below shows the general trend for the first ionisation energy for some *s* and *p* block elements.



How will the general trend differ for the second ionisation energy of these elements (*i.e.* $X^+(g) \rightarrow X^{2+}(g) + e^-$)? Explain.

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY.