Chemistry
As - LEVEL

CAMBRIDGE UNIVERSITY EXAMINATIONS

General Certificate of Education Advanced Subsidiary Level
and Advanced Level (As Level and A Level)
Paper 1 Multiple Choice Questions(MCQs)

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Chapter 7

Redox

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1 Which compound contains two different elements with identical oxidation states?

A $HClO$ **B** $Mg(OH)_2$ **C** Na_2SO_4 **D** NH_4Cl

A

2 When ammonia is converted into nitric acid on a commercial scale, the following reactions can occur.

In which reaction does the greatest change in oxidation number of the nitrogen occur?

reaction	
A	$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$
B	$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$
C	$2NO + O_2 \rightarrow 2NO_2$
D	$4NH_3 + 6NO \rightarrow 5N_2 + 6H_2O$

A

3 Which element has the same oxidation number in all of its known compounds?

A beryllium

B chlorine

C nitrogen

D sulphur

A

4 In the extraction of aluminium by electrolysis, why is it necessary to dissolve aluminium oxide in molten cryolite?

A to reduce the very high melting point of the electrolyte

B cryolite provides the ions needed to carry the current

C cryolite reacts with the aluminium oxide to form ions

D molten aluminium oxide alone would not conduct electricity

A

5 A cheap carbon monoxide detector for a gas heater consists of a patch containing palladium chloride crystals. When carbon monoxide is present, the crystals turn from orange to black as the following reaction takes place.

$$CO(g) + PdCl_2(s) + H_2O(l) \rightarrow CO_2(g) + Pd(s) + 2HCl(aq)$$
$$\text{orange} \qquad\qquad\qquad\qquad \text{black}$$

Which is the element whose oxidation number **decreases** in this reaction?

A carbon

B chlorine

C hydrogen

D palladium

D

6 Concentrated sulphuric acid is added to separate solid samples of sodium chloride, sodium bromide or sodium iodide.

With which sample(s) does sulphuric acid act as an oxidising agent?

A sodium chloride only

B sodium chloride and sodium bromide

C sodium bromide and sodium iodide

D sodium iodide only

C

7 The nickel-cadmium rechargeable battery is based upon the following overall reaction.

$$Cd + 2NiOOH + 4H_2O \rightarrow Cd(OH)_2 + 2Ni(OH)_2.H_2O$$

What is the oxidation number of nickel at the beginning and at the end of the reaction?

	beginning	end
A	+1.5	+2
B	+2	+3
C	+3	+2
D	+3	+4

C

8 What happens when chlorine is bubbled through aqueous potassium iodide?

A Chlorine is oxidised to chloride ions.

B Hydrochloric acid is formed.

C Iodide ions are oxidised to iodine.

D Potassium iodide is reduced to iodine.

C

9 In the treatment of domestic water supplies, chlorine is added to the water to form chloric(I) acid, HC*l*O.

$$Cl_2(aq) + H_2O(l) \rightarrow H^+(aq) + Cl^-(aq) + HClO(aq)$$

This reacts further to give the chlorate(I) ion.

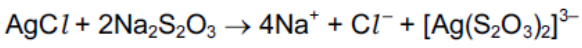
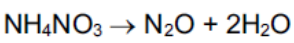
$$HClO(aq) + H_2O(l) \rightarrow H_3O^+(aq) + ClO^-(aq)$$

Both HC*l*O and C*l*O$^-$ kill bacteria by oxidation.

What is the change in oxidation number of chlorine in forming the chlorate(I) ion from the aqueous chlorine?

A –1 **B** 0 **C** +1 **D** +2

C

10	In black and white photographic film, light converts silver chloride into metallic silver. After the film has been developed, the unreacted silver chloride is removed by reaction with sodium thiosulfate to produce a 'fixed' negative.  What is the function of the thiosulfate ion? **A** to make the silver ions soluble **B** to oxidise the silver ions **C** to oxidise the silver metal **D** to reduce the silver ions	A
11	Ammonium nitrate, NH_4NO_3, can decompose explosively when heated.  What are the changes in the oxidation numbers of the two nitrogen atoms in NH_4NO_3 when this reaction proceeds? **A** –2, –4 **B** +2, +6 **C** +4, –6 **D** +4, –4	D
12	Concentrated sulfuric acid can behave **both** as a strong acid **and** as an oxidising agent. With which compound does concentrated sulfuric acid react in this way? **A** ethanol **B** magnesium carbonate **C** propanenitrile **D** sodium bromide	D
13	Which compound contains two different elements with identical oxidation states? **A** $HClO$ **B** $Mg(OH)_2$ **C** Na_2SO_4 **D** NH_4Cl	A
14	In which substance does nitrogen exhibit the highest oxidation state? **A** NO **B** N_2O **C** N_2O_4 **D** $NaNO_2$	C
15	Chlorine shows oxidation states ranging from –1 to +7 in its compounds. What are the reagent(s) and conditions necessary for the oxidation of elemental chlorine into a compound containing chlorine in the +5 oxidation state? **A** $AgNO_3$(aq) followed by NH_3(aq) at room temperature **B** concentrated H_2SO_4 at room temperature **C** cold dilute NaOH(aq) **D** hot concentrated NaOH(aq)	D

16 Solutions containing chlorate(I) ions are used as household bleaches and disinfectants. These solutions decompose on heating as shown.

$$3ClO^- \rightarrow ClO_3^- + 2Cl^-$$

Which oxidation state is shown by chlorine in each of these three ions?

	ClO^-	ClO_3^-	Cl^-
A	+1	+3	–1
B	–1	+3	+1
C	+1	+5	–1
D	–1	+5	+1

C

17 What happens when iodine solution is added to a solution of sodium bromide?

A A reaction occurs without changes in oxidation state.

B Bromide ions are oxidised, iodine atoms are reduced.

C Bromide ions are reduced, iodine atoms are oxidised.

D No reaction occurs.

D

18 Element 85, astatine, is in Group VII. Concentrated sulfuric acid is added to sodium astatide. The mixture of products includes astatine, hydrogen astatide, hydrogen sulfide, and sodium sulfate.

Which product is formed by the oxidation of one of the constituents of sodium astatide?

A astatine

B hydrogen astatide

C hydrogen sulfide

D sodium sulfate

A

19 In the redox reaction shown, how do the oxidation states of vanadium and sulfur change?

$$VO_2^+ + SO_2 \rightarrow V^{3+} + SO_4^{2-}$$

	vanadium		sulfur	
	from	to	from	to
A	+1	+3	0	–2
B	+1	+3	+4	+6
C	+5	+3	0	–2
D	+5	+3	+4	+6

D

20	In which reaction is the species in **bold** acting as an oxidising agent? **A** **2Ca** + O_2 → 2CaO **B** $Cr_2O_7^{2-}$ + $8H^+$ + **$3SO_3^{2-}$** → $2Cr^{3+}$ + $4H_2O$ + $3SO_4^{2-}$ **C** Mg + **Fe^{2+}** → Mg^{2+} + Fe **D** **SO_2** + $2H_2O$ + $2Cu^{2+}$ + $2Cl^-$ → H_2SO_4 + $2H^+$ + 2CuCl	C
21	When solid sodium iodide reacts with concentrated sulfuric acid, the products include $NaHSO_4$, H_2S, SO_2 and S. In the formation of which product has the oxidation state of sulfur changed by a value of 8? **A** H_2S **B** $NaHSO_4$ **C** S **D** SO_2	A