Redox

Question Paper

Level	O Level
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Chemical Reactions
Sub-Topic	Redox
Booklet	Question Paper

Time Allowed: **52 minutes**

Score: **/43**

Percentage: **/100**

1 Which equation does **not** represent a redox reaction?

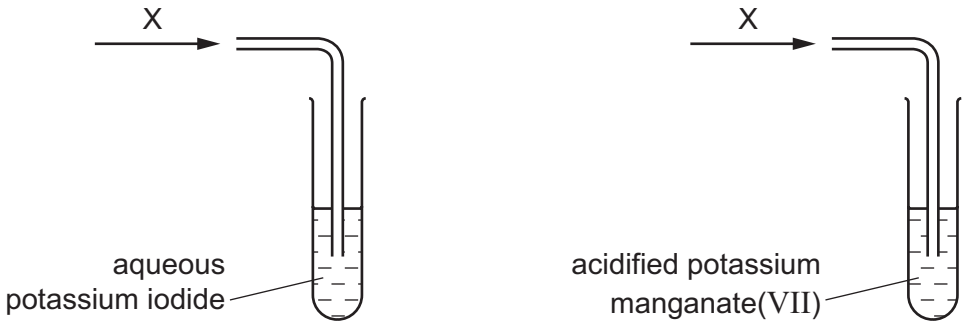
A $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$

B $2SO_2 + O_2 \rightarrow 2SO_3$

C $2KI + Cl_2 \rightarrow 2KCl + I_2$

D $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

2 Gaseous compound X is an oxidising agent. X is bubbled through separate solutions of aqueous potassium iodide and acidified potassium manganate(VII).



Which row shows the colour changes when X is bubbled through these two solutions?

	aqueous potassium iodide	acidified potassium manganate(VII)
A	brown to colourless	no change
B	brown to colourless	purple to colourless
C	colourless to brown	no change
D	colourless to brown	purple to colourless

3 The equation shows a redox reaction between iron(II) chloride and chlorine gas.

$$2FeCl_2 + Cl_2 \rightarrow 2FeCl_3$$

Which equation describes the reduction process in this reaction?

A $2Cl^- \rightarrow Cl_2 + 2e^-$

B $Cl_2 + 2e^- \rightarrow 2Cl^-$

C $Fe^{2+} \rightarrow Fe^{3+} + e^-$

D $Fe^{3+} + e^- \rightarrow Fe^{2+}$

4 How is a calcium ion, Ca^{2+}, formed from a calcium atom?

A by gaining two electrons

B by gaining two protons

C by losing two electrons

D by losing two protons

5 In which reaction is nitric acid acting as an oxidising agent?

A $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$

B $CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$

C $Na_2CO_3 + 2HNO_3 \rightarrow 2NaNO_3 + H_2O + CO_2$

D $NaOH + HNO_3 \rightarrow NaNO_3 + H_2O$

6 Aqueous potassium iodide, KI(aq), can be used as a test reagent in redox reactions.

Iodide ions are readily ……X…… . A positive result for the test is when the solution changes colour from ……Y…… to ……Z…… .

Which words correctly complete gaps X, Y and Z?

	X	Y	Z
A	oxidised	brown	colourless
B	oxidised	colourless	brown
C	reduced	brown	colourless
D	reduced	colourless	brown

7 Which ionic equation represents a redox reaction?

A $Ag^+ + Cl^- \rightarrow AgCl$

B $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$

C $H^+ + OH^- \rightarrow H_2O$

D $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

8 The equation shows the reaction for the formation of sulfur trioxide using a catalyst.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -197\,kJ/mol$$

Which change in reaction conditions would produce more sulfur trioxide?

A adding more catalyst

B decreasing the pressure

C increasing the temperature

D removing some sulfur trioxide

9 Equations for reactions of iron and iron compounds are shown.

$$Fe + 2HCl \rightarrow FeCl_2 + H_2$$

$$2FeCl_2 + Cl_2 \rightarrow 2FeCl_3$$

$$FeSO_4 + Mg \rightarrow Fe + MgSO_4$$

$$FeSO_4 + 2NaOH \rightarrow Fe(OH)_2 + Na_2SO_4$$

How many of these are redox reactions?

A 1 **B** 2 **C** 3 **D** 4

10 Which statement describes the conversion of magnesium atoms to magnesium ions?

A The change is reduction, because there has been a gain of electrons.

B The change is oxidation, because there has been a loss of electrons.

C The change is reduction, because there has been a loss of electrons.

D The change is oxidation, because there has been a gain of electrons.

11 Which colour change occurs when ethanol is added to a small quantity of warm, acidified potassium dichromate(VI)?

A orange to colourless

B orange to green

C purple to colourless

D purple to green

12 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which equation represents the reaction taking place at the anode (positive electrode) in this electrolysis?

A $Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

B $SO_4^{2-}(aq) \rightarrow SO_2(g) + O_2(g) + 2e^-$

C $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$

D $4OH^-(aq) \rightarrow 2H_2O(l) + O_2(g) + 4e^-$

13 In which equation is the underlined element reduced?

A $\underline{Cu}SO_4(aq) + Mg(s) \rightarrow Cu(s) + MgSO_4(aq)$

B $2\underline{Fe}Cl_2(s) + Cl_2(g) \rightarrow 2FeCl_3(s)$

C $2\underline{S}O_2(g) + O_2(g) \rightarrow 2SO_3(g)$

D $\underline{Zn}(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

14 An atom of which element gains three electrons when it forms an ion?

A aluminium

B iron

C nitrogen

D silicon

15 Which method of preparation of magnesium sulfate is an example of a redox reaction?

A $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

B $MgO + H_2SO_4 \rightarrow MgSO_4 + H_2O$

C $Mg(OH)_2 + H_2SO_4 \rightarrow MgSO_4 + 2H_2O$

D $MgCO_3 + H_2SO_4 \rightarrow MgSO_4 + H_2O + CO_2$

16 What is the function of silica, SiO_2, in the equation shown below?

$$CaO + SiO_2 \rightarrow CaSiO_3$$

A a basic oxide

B a reducing agent

C an acidic oxide

D an oxidising agent

17 What happens when zinc foil is placed in an aqueous solution of copper(II) sulfate?

A Copper(II) ions are oxidised.

B There is no reaction.

C Zinc atoms are oxidised.

D Zinc sulfate is precipitated.

18 Sulfur dioxide reacts with aqueous bromine according to the following equation.

$$SO_2(g) + Br_2(aq) + 2H_2O(l) \rightarrow H_2SO_4(aq) + 2HBr(aq)$$

Which element has been oxidised?

A bromine

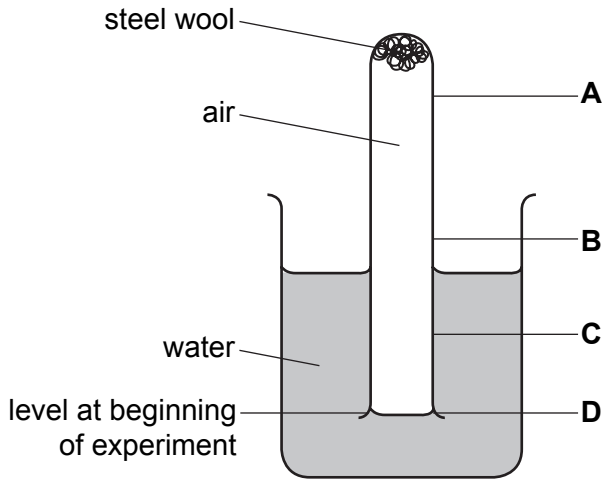
B hydrogen

C oxygen

D sulfur

19 The diagram shows steel wool inside a test-tube. The test-tube is inverted in water, trapping air inside.

What will be the water level inside the tube after several days?



20 Which reaction does **not** involve either oxidation or reduction?

A $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

B $Cu^{2+}(aq) + Zn(s) \rightarrow Cu(s) + Zn^{2+}(aq)$

C $CuO(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l)$

D $Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

21 Which equation in the blast furnace extraction of iron is **not** a redox reaction?

A $CaCO_3 \rightarrow CaO + CO_2$

B $2C + O_2 \rightarrow 2CO$

C $C + CO_2 \rightarrow 2CO$

D $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

22 What is **not** an example of oxidation?

A converting iron(III) salts into iron(II) salts

B converting magnesium atoms into magnesium ions

C dissolving of a copper anode during electrolysis

D liberating chlorine from a chloride

23 Which row in the table describes the processes occurring at the electrodes when molten sodium chloride is electrolysed?

	anode (positive)	cathode (negative)
A	oxidation	reduction
B	reduction	oxidation
C	oxidation	oxidation
D	reduction	reduction

24 The ionic equation shows the reaction between potassium iodide and iron(III) chloride.

$$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$$

Which terms describe the changes to the iron(III) ions and iodide ions?

	iron(III) ions	iodide ions
A	oxidised	reduced
B	oxidised	oxidised
C	reduced	oxidised
D	reduced	reduced

25 Which ionic equation represents the reaction taking place at the anode during the electrolysis of molten aluminium oxide?

A $Al^{3+} + 3e^{-} \rightarrow Al$

B $2Al^{3+} + 3O_2 \rightarrow Al_2O_3$

C $O^{2-} - 2e^{-} \rightarrow O_2$

D $2O^{2-} - 4e^{-} \rightarrow O_2$

26 A colourless gas is passed into each of three different solutions. The results for each solution are shown in the table.

solution	result
potassium iodide	stays colourless
acidified potassium dichromate(VI)	orange to green
acidified potassium manganate(VII)	purple to colourless

What is the colourless gas?

A an acid

B an alkali

C an oxidising agent

D a reducing agent

27 In which reaction is sulphur dioxide acting as an oxidising agent?

A $SO_2 + 2H_2O + Cl_2 \rightarrow H_2SO_4 + 2HCl$

B $SO_2 + 2NaOH \rightarrow Na_2SO_3 + H_2O$

C $2SO_2 + O_2 \rightarrow 2SO_3$

D $SO_2 + 2H_2S \rightarrow 2H_2O + 3S$

28 Which process does **not** involve either oxidation or reduction?

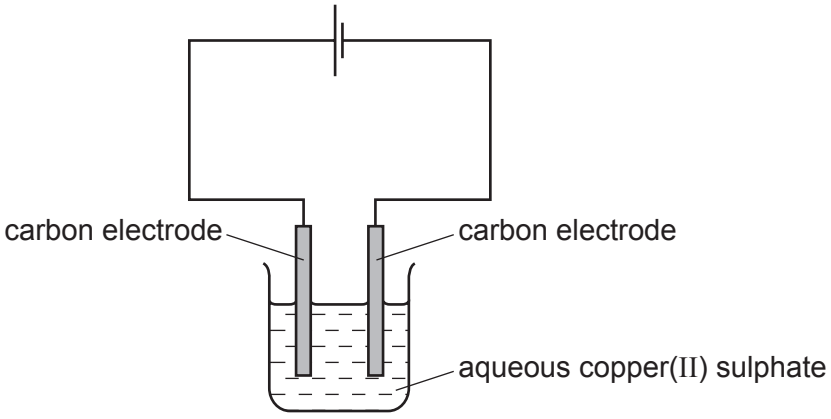
A formation of ammonium sulphate from ammonia and sulphuric acid

B formation of nitrogen monoxide from ammonia

C formation of sulphuric acid from sulphur

D formation of zinc from zinc blende (ZnS)

29 Aqueous copper(II) sulphate is electrolysed using inert electrodes as shown.



Which ionic equations show the reactions at the electrodes?

1 $Cu^{2+} + 2e^- \rightarrow Cu$

2 $Cu \rightarrow Cu^{2+} + 2e^-$

3 $2\ ^+ + 2e^- \rightarrow H_2$

4 $4O\ ^- \rightarrow 2H_2O + O_2 + 4e^-$

A 1 and 2 only **B** 1 and 4 only **C** 2 and 3 only **D** 3 and 4 only

30 In which change is the nitrogen reduced?

A NH_3 to NO **B** NH_3 to NO_3^- **C** N_2 to NH_3 **D** N^{3-} to N_2

31 The reaction between hydrogen sulphide and sulphur dioxide is represented by the equation shown.

$$2H_2S(g) + SO_2(g) \rightarrow 2H_2O(l) + 3S(s)$$

reactants products

What occurs in this reaction?

A Both reactants are reduced.

B The two reactants are neither oxidised nor reduced.

C Hydrogen sulphide is oxidised and sulphur dioxide is reduced.

D Sulphur dioxide is oxidised and hydrogen sulphide is reduced.

32 Which change is an example of oxidation?

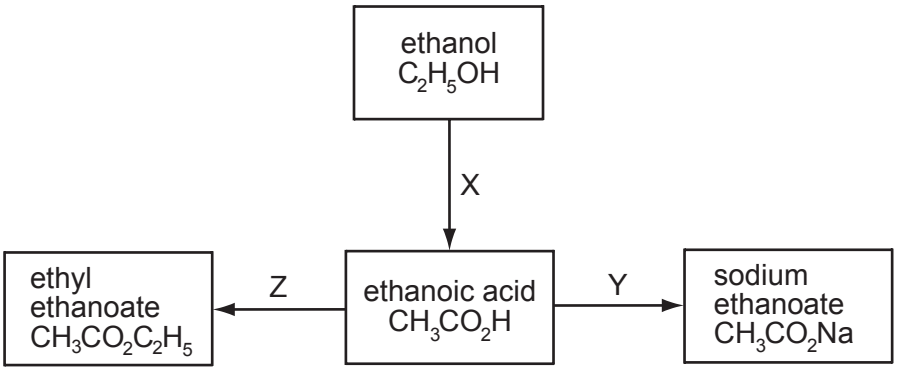
A chloride ions to chlorine atoms

B copper(II) ions to copper atoms

C iron(III) ions to iron(II) ions

D oxygen atoms to oxide ions

33 Which of the reactions X, Y and Z involve oxidation?



A X only **B** X and Y **C** Y only **D** Y and Z

34 Which compound, when added to aqueous iron(II) sulphate, takes part in a redox reaction?

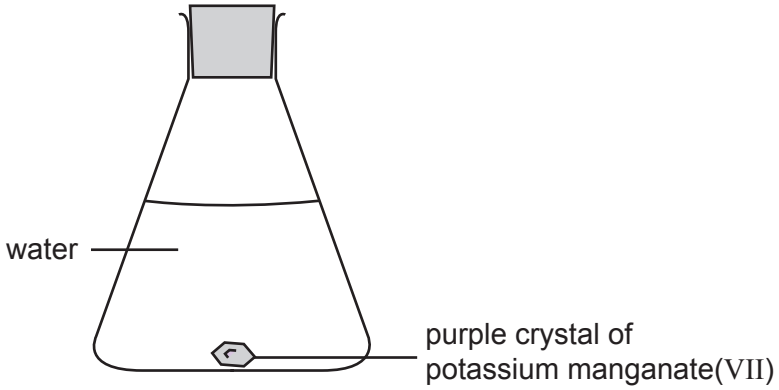
A ammonia

B barium chloride

C acidified potassium dichromate(VI)

D sodium hydroxide

35 The experiment is set up as shown and left until there is no further change.



What is observed?

A a colourless layer below a purple layer

B a colourless liquid with the purple crystal unchanged

C a purple layer below a colourless layer

D a uniformly purple solution

36 A colourless gas is passed into each of three different solutions. The results are shown in the table.

solution of	potassium iodide	acidified potassium dichromate(VI)	acidified potassium manganate(VII)
result	stays colourless	orange to green	purple to colourless

What is the colourless gas?

A an acid

B an alkali

C an oxidising agent

D a reducing agent

37 Separate samples of hydrogen peroxide are added to aqueous potassium iodide and to acidified potassium dichromate(VI). The iodide ions are oxidised and dichromate(VI) ions are reduced.

What colour changes are seen?

	potassium iodide	acidified potassium dichromate(VI)
A	colourless to brown	purple to colourless
B	brown to colourless	purple to colourless
C	colourless to brown	orange to green
D	brown to colourless	orange to green

38 In which line in the table is **all** the information correct?

	reaction at electrode	electrode	product
A	$2X^- \rightarrow X_2 + 2e^-$	cathode	metal
B	$X^+ + e^- \rightarrow X$	anode	metal
C	$2X^- \rightarrow X_2 + 2e^-$	anode	non-metal
D	$X^+ + e^- \rightarrow X$	cathode	non-metal

39 Small portions of aqueous potassium iodide and of acidified, aqueous potassium manganate(VII) were added to four solutions. The colour changes seen are shown in the table.

solution number	potassium iodide	potassium manganate(VII)
1	colourless to red	purple to colourless
2	colourless to red	no change
3	no change	purple to colourless
4	no change	no change

Which solutions contained an oxidising agent?

A 1 only **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 4 only

40 Dilute sulphuric acid is electrolysed using inert electrodes.

Which equation represents the reaction at the anode (+ve)?

A $O_2^{2-} \rightarrow O_2 + 2e^-$

B $2H^+ + 2e^- \rightarrow H_2$

C $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

D $SO_4^{2-} \rightarrow O_2 + SO_2 + 2e^-$

41 Which series of changes includes both oxidation and reduction?

A $C \rightarrow CO \rightarrow CO_2$

B $PbO_2 \rightarrow PbO \rightarrow Pb$

C $N_2 \rightarrow NH_3 \rightarrow NO$

D $C_2H_2 \rightarrow C_2H_4 \rightarrow C_2H_6$

42 Substance X liberates iodine from aqueous potassium iodide and decolourises acidified aqueous potassium manganate(VII).

How is the behaviour of X described?

A as an oxidising agent only

B as an oxidising agent and a reducing agent

C as neither an oxidising agent nor a reducing agent

D as a reducing agent only

43 When acidified potassium manganate(VII) is reduced, which colour change occurs?

A from colourless to purple

B from green to orange

C from orange to green

D from purple to colourless