06 Redox Chemistry

Set A Concept Practice

Name	Time 55 minutes	Total 46 marks	Score ____ / 46

A From the lesson

29 MARKS

1 In which species does nitrogen have an oxidation state of +3?

A NO_2 **B** NO_2^- **C** NH_4^+ **D** N_2O

/1

Answer ☐ [1]

Learners' Alley, Redox Chemistry slides

2 Which reaction is **not** a redox reaction?

A $Mg + 2HCl \rightarrow MgCl_2 + H_2$

B $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

C $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

D $CuO + H_2 \rightarrow Cu + H_2O$

/1

Answer ☐ [1]

Learners' Alley, Redox Chemistry slides

3 A colourless gas turns a filter paper spotted with aqueous potassium iodide yellow-brown. What can be deduced?

A The gas is an oxidising agent.

B The gas is a reducing agent.

C The iodide ions are reduced.

D The gas is iodine.

/1

Answer ☐ [1]

Learners' Alley, Redox Chemistry slides

4 Which reaction is a disproportionation?

A $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

B $Cl_2 + 2NaOH \rightarrow NaCl + NaClO + H_2O$

C $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

D $MgO + 2HCl \rightarrow MgCl_2 + H_2O$

/1

Answer ☐ [1]

Learners' Alley, Redox Chemistry slides

5 How many moles of MnO_4^- react with 1.0×10^{-3} mol of Fe^{2+} in acid?

A 2.0×10^{-4} **B** 5.0×10^{-4} **C** 1.0×10^{-3} **D** 5.0×10^{-3}

Answer [1]

/1

Learners' Alley, Redox Chemistry slides

6 Sodium burns in chlorine: $2Na + Cl_2 \rightarrow 2NaCl$.

(a) Write the two half-equations.

.....

..... [1]

(b) Which reactant is oxidised? Explain.

..... [1]

/2

Learners' Alley, Redox Chemistry slides

7 In $CuO + H_2 \rightarrow Cu + H_2O$, which substance is reduced? Explain in terms of oxygen.

..... [1]

/1

Learners' Alley, Redox Chemistry slides

8 Find the oxidation state of

(a) chromium in $Cr_2O_7^{2-}$

..... [1]

(b) sulfur in $Na_2S_2O_3$

..... [1]

(c) hydrogen in NaH

..... [1]

(d) vanadium in VO_2^+

..... [1]

/4

Learners' Alley, Redox Chemistry slides

9 Which of these are redox reactions? Explain using oxidation states.

(a) $NH_3 + HNO_3 \rightarrow NH_4NO_3$

.....

[1]

(b) $CuCO_3 \rightarrow CuO + CO_2$

.....

[1]

(c) $2Cu(NO_3)_2 \rightarrow 2CuO + 4NO_2 + O_2$

.....

[1]

/3

Learners' Alley, Redox Chemistry slides

10 Sulfur dioxide decolourises acidified potassium manganate(VII) and turns acidified potassium dichromate(VI) green.

State whether each of the three substances acts as an oxidising agent or a reducing agent.

.....

.....

[2]

/2

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11 Iron(III) ions oxidise iodide ions and are reduced to iron(II) ions. Write the ionic equation.

.....

[1]

/1

Learners' Alley, Redox Chemistry slides

12 Write the balanced equation for acidified dichromate(VI) ions oxidising iron(II) ions.

.....

.....

[2]

/2

Learners' Alley, Redox Chemistry slides

13 25.0 cm^3 of 0.100 mol dm^{-3} NH_2OH reacts exactly with 25.0 cm^3 of 0.200 mol dm^{-3} Mn^{3+}, which is reduced to Mn^{2+}. Nitrogen in NH_2OH is −1. Find its final oxidation state.

[2]

/2

Learners' Alley, Redox Chemistry slides

14 Is $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$ a disproportionation? Give the oxidation states of nitrogen.

.....

/2 .....

[2]

Learners' Alley, Redox Chemistry slides

15 25.0 cm^3 of an acidified iron(II) solution needs 20.00 cm^3 of 0.0200 mol dm^{-3} $KMnO_4$. Find the concentration of the iron(II) ions.

/2

[2]

Learners' Alley, Redox Chemistry slides

16 12.0 g of $FeSO_4 \cdot (NH_4)_2SO_4 \cdot xH_2O$ is made up to 250 cm^3. 25.0 cm^3 of this solution needs 25.50 cm^3 of 0.0200 mol dm^{-3} $K_2Cr_2O_7$. Find x.

/3

[3]

Learners' Alley, Redox Chemistry slides

B Practice

17 MARKS

17 Which formula contains nitrogen with an oxidation state of +5?

A NO_2 **B** N_2O_4 **C** NH_4^+ **D** HNO_3

/1

Answer [1]

2023 XMS O Prelim P1 Q28

18 In which substance does the nitrogen atom have the same oxidation state as the nitrogen atom in HNO_2?

A NF_3 **B** NH_4^+ **C** NO **D** NO_2^+

/1

Answer [1]

2024 Woodlands O Prelim P1 Q19

19 Which oxidation state of the underlined element is correct?

	substance	oxidation state
A	$H\underline{N}O_3$	+3
B	$Ca\underline{S}O_4$	+6
C	$\underline{Fe}O$	−3
D	$NaH\underline{C}O_3$	+3

A row A **B** row B **C** row C **D** row D

/1

Answer [1]

2024 Zhonghua O Prelim P1 Q21

20 In which substance does the sulfur atom have the same oxidation number as the sulfur atom in SO_2?

A H_2SO_4 **B** K_2SO_3 **C** Na_2S **D** $Na_2S_2O_3$

/1

Answer [1]

2024 CHIJ O Prelim P1 Q22

21 The oxide of titanium, TiO_2, is used as a 'whitener' in toothpaste. It is obtained from the ore iron(II) titanate, $FeTiO_3$. What is the change in the oxidation number of titanium from $FeTiO_3$ to TiO_2?

A +3 to +2 **B** +3 to +4 **C** +6 to +4 **D** no change

/1

Answer [1]

2022 SJI O Prelim P1 Q24

22 In which reaction does the oxidation state of iron remain unchanged?

A $Fe + 2FeCl_3 \rightarrow 3FeCl_2$

B $Fe_2O_3 + 6HCl \rightarrow 2FeCl_3 + 3H_2O$

C $2Fe + 3Cl_2 \rightarrow 2FeCl_3$

D $2FeCl_2 + Cl_2 \rightarrow 2FeCl_3$

/1

Answer ☐ [1]

2024 AMKSS O Prelim P1 Q21

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

/1

Answer ☐ [1]

2024 ANDSS O Prelim P1 Q17

24 Which reaction is not a redox reaction?

A $Mg + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2$

B $2Mg(NO_3)_2 \rightarrow 2MgO + 4NO_2 + O_2$

C $SO_2 + NO_2 \rightarrow SO_3 + NO$

D $SO_3 + H_2O \rightarrow H_2SO_4$

/1

Answer ☐ [1]

2024 SCSS O Prelim P1 Q20

25 Iron(II) chloride solution reacts with chlorine gas: $2FeCl_2(aq) + Cl_2(g) \rightarrow 2FeCl_3(aq)$. Which statements about this reaction are correct?

1 Fe^{2+} ions are reduced to Fe^{3+} ions.
2 Chlorine acts as a reducing agent.
3 Fe^{2+} ions each lose an electron.
4 Cl_2 molecules are reduced to Cl^- ions.

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

/1

Answer ☐ [1]

2024 Zhenghua O Prelim P1-P3 Q24

26 The reaction between copper and concentrated nitric acid is shown: $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$. Which statement about this reaction is correct?

A HNO_3 is a reducing agent.

B The oxidation state of nitrogen in $Cu(NO_3)_2$ is −5.

C Cu loses electrons during the reaction.

D The oxidation state of oxygen has changed.

/1

Answer ☐ [1]

2025 MSHS O Prelim P1 Q15

27 Acidified potassium manganate(VII) can be used to detect ethanol vapour in the breath of a person who has drunk alcohol. The acidified potassium manganate(VII) turned from purple to colourless in the presence of ethanol vapour. Which explanation is correct?

A Ethanol has been oxidised.

B Ethanol is an oxidising agent.

C Acidified potassium manganate(VII) has been oxidised.

D Acidified potassium manganate(VII) is a reducing agent.

/1

Answer ☐ [1]

2024 PLMGSS O Prelim P1 Q26

28 The equation for the reaction between sodium sulfite and potassium manganate(VII) is shown: $2MnO_4^- + 6H^+ + 5SO_3^{2-} \rightarrow 2Mn^{2+} + 3H_2O + 5SO_4^{2-}$. Which ion is reduced and what is the reducing agent?

	ion that is reduced	reducing agent
A	MnO_4^-	H^+
B	MnO_4^-	SO_3^{2-}
C	SO_3^{2-}	H^+
D	SO_3^{2-}	MnO_4^-

A row A **B** row B **C** row C **D** row D

/1

Answer ☐ [1]

2025 JYSS O Prelim P1 Q23

29 Colour changes are often seen when redox reactions occur. Which colour change is due to the reduction of the underlined reagent?

A <u>CuO</u> changes to $CuSO_4$

B <u>KI</u> changes to I_2

C <u>$FeCl_2$</u> changes to $FeCl_3$

D <u>MnO_4^-</u> changes to Mn^{2+}

/1

Answer ☐ [1]

2024 NASS O Prelim P1-P2 Q25

30 When chlorine gas dissolves in water a reaction occurs: $Cl_2 + H_2O \rightarrow HCl + HClO$. Which row shows the oxidation number of chlorine in the chlorine-containing species?

	Cl_2	HCl	HClO
A	−1	−1	−1
B	0	−1	−1
C	−1	+1	+1
D	0	−1	+1

A row A **B** row B **C** row C **D** row D

/1

Answer ☐ [1]

2024 USS O Prelim P2 Q28

31 Disproportionation is a reaction in which the same element is both oxidised and reduced. Which reaction is an example of disproportionation?

A $Cu + 2H_2SO_4 \rightarrow CuSO_4 + 2H_2O + SO_2$

B $Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$

C $MgO + 2HCl \rightarrow MgCl_2 + H_2O$

D $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

/1

Answer ☐ [1]

2024 Bukit View O Prelim P1 Q24

32 Substance X, which is not brown, was bubbled into a solution containing sodium iodide and sodium chloride. The solution turned brown. Which statements can be deduced about substance X?

1 Substance X is an oxidising agent.
2 Substance X must be bromine gas.
3 The iodide in the solution was reduced to aqueous iodine.

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

/1

Answer ☐ [1]

2023 XMS O Prelim P1 Q25

33 Some statements about acids are given below.

I pH is a measure of the H^+ concentration in a solution.
II The strength of an acid depends on its concentration.
III Universal Indicator turns orange when placed in a solution of any acid.
IV When acids react with metals, hydrogen ions gain electrons.

Which statements about acids are correct?

A I and II only **B** I and IV only **C** I, II and III **D** I, II and IV

/1

Answer ☐ [1]

2024 SMSS O Sec3 P1 Q11

10 The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
							1 H hydrogen 1.0										2 He helium 4.0
3 Li lithium 6.9	4 Be beryllium 9.0		**Key** atomic number atomic symbol name relative atomic mass									5 B boron 10.8	6 C carbon 12.0	7 N nitrogen 14.0	8 O oxygen 16.0	9 F fluorine 19.0	10 Ne neon 20.2
11 Na sodium 23.0	12 Mg magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 Al aluminium 27.0	14 Si silicon 28.1	15 P phosphorus 31.0	16 S sulfur 32.1	17 Cl chlorine 35.5	18 Ar argon 39.9
19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium –	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57–71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

lanthanoids	57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium –	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.1	71 Lu lutetium 175.0
actinoids	89 Ac actinium –	90 Th thorium 232.0	91 Pa protactinium 231.0	92 U uranium 238.0	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –