OCR

RECOGNISING ACHIEVEMENT

TRENDS + PATTERNS

Mark Scheme 2815/01
June 2002

2815/01   **Mark Scheme**   **June 2002**

Question	Expected Answers	Marks
1 (a) (i)	has at least one ion with a partially filled d-orbital	1
(ii)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3\ 4s^2$	1
(b) (i)	$Fe(OH)_2$ green	2
	$Fe(OH)_3$ / $Fe_2O_3.xH_2O$ brown/red-brown/rust coloured/orange-brown	2
	both solid	1
(ii)	$[Cu(H_2O)_6]^{2+} + 2OH^- \rightarrow Cu(OH)_2 + 6H_2O$ / $Cu^{2+} + 2OH^- \rightarrow Cu(OH)_2$	1
	$Cu(OH)_2$ obtains 1 mark if not part of balanced equation	1
	$[Cu(H_2O)_6]^{2+} + 4NH_3 \rightarrow [Cu(NH_3)_4(H_2O)_2]^{2+} + 4H_2O$	1
	$[Cu(NH_3)_4(H_2O)_2]^{2+}$ / $[Cu(NH_3)_4]^{2+}$ =1mark if not part of balanced equation	1

N.B. Correctly balanced equations obtain both marks

[Total: 11]

Question	Expected Answers	Marks
2 (a)	absorbs violet/blue / 400 nm - 450 nm No other absorbance below 650 nm	1
(b)	absorbs the complementary colour it transmits	1
(c)	K : Cr : F = 0.818 : 0.410 : 2.46 (correct ratios obtain this mark)	1
	2K : 1Cr : 6F / K_2CrF_6	1
(d)	F^- / fluoride	1
	Don't accept fluorine or F	

[Total: 5]

Question	Expected Answers	Marks

3 (a) *correctly labelled:*
atomisation of chlorine + atomisation of caesium   **1**

· 1st ionisation energy + 1st electron affinity   **1**

formation of CsCl + LE   **1**

(b) $-443 = + 76 + (+122) + (+376) + (-349) + LE$ **1**

$LE = -668 \, kJ \, mol^{-1}$ (allow ecf here if 1 mistake only in step 1)   **1**

(c) Na^+ smaller than Cs^+ (don't accept sodium smaller first time)   **1**

Na^+ has a larger charge density   **1**

attracts the anion/Cl^- more strongly/ sodium chloride has the stronger bonding   **1**

(d) dissolves / no reaction
do not accept "nothing"   **1**

colourless / neutral / pH 7   **1**

(e) add aqueous $AgNO_3$ **1**

chloride gives a white ppt   **1**

iodide gives a yellow ppt   **1**

Alternative answer

Pass chlorine/use NaOCl & HCl

No change with CsCl

Iodine displaced/brown solution with CsI

[Total: 13]

Question	Expected Answers	Marks

4 (a) $2MnO_4^- + 16H^+ + 5C_2O_4^{2-} \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$ **2**

1 mark for correct species, 1 mark for correct balancing including electrons if present

(b) amount of $C_2O_4^{2-} = (25.0/1000) \times 0.0400 = 0.001 \, mol$ **1**

amount of MnO_4^- required $= 0.001 \times (2/5) = 0.0004 \, mol$ **1**

vol of MnO_4^- required $= 0.0004/0.0200 \times 1000 = 20 \, cm^3 / 0.02 \, dm^3$ **1**

(Allow ecf on parts 2 & 3)

[Total 5]

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Question	Expected Answers	Marks

5 **(a)** $2Al + \frac{3}{2}O_2 \rightarrow Al_2O_3$ **1**

$2P + 3Cl_2 \rightarrow 2PCl_3$ / $2P + 5Cl_2 \rightarrow 2PCl_5$ /   **1**
$P_4 + 6Cl_2 \rightarrow 4PCl_3$ / $P_4 + 10Cl_2 \rightarrow 4PCl_5$

correct oxidation numbers in 2 equations   **2**

show oxidation or reduction by increase/decrease in oxidation numbers   **1**

Credit electron transfer if used for Al_2O_3

QWC for good organisation?   **1**

(b) Al_2O_3 does not react / does not dissolve   **1**

PCl_5 exothermic reaction/vigorous reaction   **1**

White fumes/steamy fumes/misty fumes   **1**

HCl produced/acidic solution produced   **1**

$PCl_5 + 4H_2O \rightarrow H_3PO_4 + 5HCl$ / $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$ /   **1**
$PCl_5 + H_2O \rightarrow POCl_3 + 2HCl$

not a redox reaction   **1**

N.B. max 5 marks

                                                    [Total: 11]