OCR

RECOGNISING ACHIEVEMENT

TRANSITION ELEMENTS

Mark Scheme 2815/06
January 2003

The following annotations may be used when marking:

X	=	incorrect response (errors may also be underlined)
^	=	omission mark
bod	=	benefit of the doubt (where professional judgement has been used)
ecf	=	error carried forward (in consequential marking)
con	=	contradiction (in cases where candidates contradict themselves in the same response)
sf	=	error in the number of significant figures

Abbreviations, annotations and conventions used in the Mark Scheme:

/	=	alternative and acceptable answers for the same marking point
;	=	separates marking points
NOT	=	answers not worthy of credit
( )	=	words which are not essential to gain credit
___ (underlining)	=	key words which must be used
ecf	=	allow error carried forward in consequential marking
AW	=	alternative wording
ora	=	or reverse argument

1. (a)(i) voltage/PD (1)

of a cell when the electrode is connected to a reference electrode/ hydrogen electrode (1)

under standard conditions/one of standard conditions specified (1) [3]

(ii) argument based on iron being the more negative system/ based on iron releasing electrons/ argument based on dichromate(VI) being more positive/ based on dichromate(VI) accepting electrons [1]

(iii) $14H^+ + 6Fe^{2+} + Cr_2O_7^{2-} \rightarrow 2Cr^{3+} + 7H_2O + 6Fe^{3+}$

species on correct sides (1)

balancing (1) [2]

(b) green/yellow (1)

red and blue absorbed (1) [2]

(c) orbitals split 2 and 3 (1)

2 above 3 (1) [2]

[Total: 10]

2. (a) zinc (1) [1]

(b)(i) 4.46×10^{-3} (mol) [1]

(ii) 2.23×10^{-3} (mol) [1]

(iii) 4.46×10^{-3} (mol) [1]

(iv) 0.283 g (1)

56.6% (1) [2]

(c)(i) from brown/yellow (1)

to colourless/white (1) [2]

(ii) change blue to colourless more distinct [1]

(d) any eg bronze/cupronickel (1)

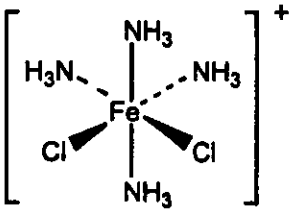
relevant use eg statues/coins/medals (1) [2]

[Total: 11]

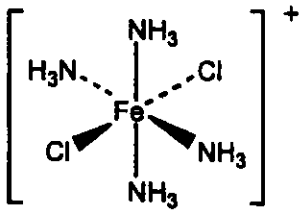
3. (a)(i) $[Fe(NH_3)_4Cl_2]^+$ [1]

(ii) octahedral shape – clearly 3D(1)

cis and trans forms drawn (1)



cis with $2Cl^-$ at 90°



trans with $2Cl^-$ at 180°

labelling (1) [3]

(iii) 6 [1]

(b) anti cancer drug (1)

destroys cell DNA (1) [2]

[Total: 7]

4. (a) +5 [1]

(b) yellow (to green) to blue to mauve/purple all correct (2)/ 3 correct (1)

reaction is reduction (1)

oxidation states are +5 to +4 to +3 to +2 (1)

explanation based on use of SEPs (1)

not reduced to vanadium 0 (1)

effervescence (1)

any correct redox equation (1) [7 max]

(c) catalyst (1)

acts by changing oxidation state (1) [2]

[Total: 10]

5. most common oxidation states are +2 and +3 (1)

+2 is more stable than +3 (1)

stable aqueous ion is $[Co(H_2O)_6]^{2+}$ (1)

this complex is pink (1)

$[CoCl_4]^{2-}$ (1)

this complex is blue (1)

+3 oxidation stabilised by complexing with ammonia (1)

$[Co(NH_3)_6]^{3+}$ (1)

QWC [1]

[8] Max [6]

plus QWC [1]

[Total: [7]