Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Inorganic 2

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Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) Covalent

Do not allow dative covalent or coordinate (covalent)

1

(b) $Cl^{(-)}$ not donating lone pair (to $Cu^{(2+)}$)

$Cl^{(-)}$ does not form a coordinate/dative bond (to $Cu^{(2+)}$)

Allow without charges but penalise incorrect charges
Cl^-/it is bonded ionically (to Cu^{2+})

1

(c) $[Cu(H_2O)_6]^{2+} + 4NH_3 \longrightarrow [Cu(NH_3)_4(H_2O)_2]^{2+} + 4H_2O$

1

Deep blue / Royal blue / Dark blue (solution)

1

Allow combination of:

$[Cu(H_2O)_6]^{2+} + 2NH_3 \longrightarrow [Cu(H_2O)_4(OH)_2] + 2NH_4^+$

$[Cu(H_2O)_4(OH)_2] + 4NH_3 \longrightarrow [Cu(NH_3)_4(H_2O)_2]^{2+} + 2H_2O + 2OH^-$

Do not penalise missing square brackets

Ignore initial colour of Cu^{2+} (aq)

(d) $CuCO_3$ or copper carbonate

Penalise incorrect oxidation state

Allow correct formula for basic copper carbonate

1

(e) HCl/ hydrochloric acid

Ignore concentration

Allow soluble chloride salt

Also allow any reagent which leads to a change in colour of solution due to a change in ligands (e.g. $NH_2CH_2CH_2NH_2$) or change in oxidation state (e.g. SO_2) and associated correct equations.

1

$[Cu(H_2O)_6]^{2+} + 4Cl^- \longrightarrow [CuCl_4]^{2-} + 6H_2O$

$[Cu(H_2O)_6]^{2+} + 4HCl \longrightarrow [CuCl_4]^{2-} + 6H_2O + 4H^+$

Mark independently

1

(f) $(3)d^{10}$ or has full (3)d (sub) shell/orbital

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Penalise incorrect principal quantum number

1

It is colourless/cannot absorb (frequencies of) visible light

Ignore clear

1

[9]

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Q2.

(a) Moles MnO_4^- $\frac{26.50 \times 0.02}{1000}$ $= 5.30 \times 10^{-4}$

1

Moles in 25cm^3 sample / pipette $C_2O_4^{2-}$ (from acid and salt)
$= 5.30 \times 10^{-4}$ **$\times$ 5/2 = (1.325×10^{-3})**

1

Moles NaOH = $\frac{10.45 \times 0.1}{1000}$ ($= 1.045 \times 10^{-3}$)

1

So moles $C_2O_4^{2-}$ from acid in 25cm^3 sample / pipette
$= 1.045 \times 10^{-3}$ **$\div$ 2** $= 5.225 \times 10^{-4}$

1

Hence moles $C_2O_4^{2-}$ in sodium ethanedioate in 25 cm^3

$= 1.325 \times 10^{-3} - 5.225 \times 10^{-4}$ $(= 8.025 \times 10^{-4})$

1

So moles $C_2O_4^{2-}$ in sodium ethanedioate in original sample
$= 8.025 \times 10^{-4}$ **$\times$ 10** **($= 8.025 \times 10^{-3}$)**

1

Mass $Na_2C_2O_4 = 8.025 \times 10^{-3}$ **$\times$ 134(.0) = 1.075(35) g**
So % sodium ethanedioate in original sample

1

$\frac{1.075(35)}{1.90} \times 100$ $= 56.6$ % to 3 sig fig

1

The first CE is penalised by 2 marks; further errors are penalised by one mark each

M2 = M1 × 5/2

M4 = M3 ÷ 2

M5 = M2 – M4 (do not allow if negative and do not allow = M4-M2)

If no subtraction, max = 5 (M1, M2, M3, M4 and M6)

If incorrect subtraction, max = 6 (M1, M2, M3, M4, M6 and M7)

M6 = M5 × 10

(M6 can be scored by multiplying M2 and M4 by 10 before subtraction (giving $1.325 \times 10^{-2} - 5.225 \times 10^{-3} = 8.025 \times 10^{-3}$)

M7 = M6 × 134

M8 = (M7/1.90) × 100 Allow 56.5 – 56.8%

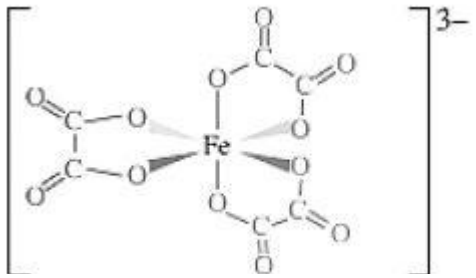
(b) $[Fe(H_2O)_6]^{3+} + 3C_2O_4^{2-} \longrightarrow [Fe(C_2O_4)_3]^{3-} + 6H_2O$

1

There are 6 Fe–O bonds broken and then made / same number and type of bond being broken and made.

1

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(c) 

Ignore all charges even if wrong
Ignore absence of square brackets
Candidates do not need to show 3D shape

1

90° or 180°

1

optical

1

(d) The ethanedioic acid is only present in small quantities/low concentration in these foods.

1

[14]

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