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

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Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Mark Schemes

Q1.

(a) An electron pair on the ligand

1

Is donated from the ligand to the central metal ion

1

(b) Blue precipitate

1

Dissolves to give a dark blue solution

1

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

1

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

1

(c) $[Cu(NH_3)_4(H_2O)_2]^{2+} + 2H_2NCH_2CH_2NH_2 \longrightarrow [Cu(H_2NCH_2CH_2NH_2)_2(H_2O)_2]^{2+} + 4NH_3$

1

(d) Cu–N bonds formed have similar enthalpy / energy to Cu–N bonds broken

1

And the same number of bonds broken and made

1

(e) 3 particles form 5 particles / disorder increases because more particles are formed / entropy change is positive

1

Therefore, the free-energy change is negative

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M2 can only be awarded if M1 is correct

1

[11]

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Q2.

(a) $4Fe(s) + 6H_2O(g) + 3O_2(g) \rightarrow 4Fe(OH)_3(s)$

Accept fractions, multiples and equations showing formation of hydrated hydroxide.

1

Correct states as above

Lose this mark if any state is missing or incorrect.

1

(b) Aluminium (metal) forms an oxide coat (on exposure to air)

1

This coat prevents / inhibits further reaction (by water or oxygen)

Ignore references to a 'less reactive coating' unless further qualified.

1

[4]

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Q3.

(a) $Cr(OH)_3 + 3H_2O + 3H^+ \rightarrow [Cr(H_2O)_6]^{3+}$

Can start with $Cr(H_2O)_3(OH)_3$ for each equation

Ignore any unnecessary preliminary preparation of $Cr(OH)_3$

1

Green / grey−green solid

Mark colours independently from equations

Allow green ppt.

1

Forms green / purple / ruby / violet <u>solution</u>

ignore shades of colours

1

$Cr(OH)_3 + 2H_2O + OH^- \rightarrow [Cr(H_2O)_2(OH)_4]^-$

Allow with 5 or 6 OH^- provided complex has co−ordination number of 6

Penalise complex ions with incorrect charges overall or if shown on ligand.

1

Forms green <u>solution</u>

Note that for each equation final complex must be 6 co−ordinate

1

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

Allow two correct equations via intermediate hydroxide in both cases even if first equation uses OH^- instead of NH_3

1

Blue (solution)

Mark colours independently from equations

1

Dark / deep / royal blue <u>solution</u>

1

$[Co(H_2O)_6]^{2+} + 6NH_3 \rightarrow [Co(NH_3)_6]^{2+} + 6H_2O$

1

pink / red (solution)

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1

Brown / straw / yellow <u>solution</u>

ignore darkens in air / with time

1

[11]

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