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

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Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

Electrons in copper(II) ions can be excited by the absorption of light with a wavelength of 600 nm.

What is the increase in energy, in J, for each electron excited?

Speed of light, $c = 3.00 \times 10^{8}$ m s^{-1}
Planck's constant, $h = 6.63 \times 10^{-34}$J s

A 3.98×10^{-40} ⬭

B 1.33×10^{-39} ⬭

C 3.32×10^{-28} ⬭

D 3.32×10^{-19} ⬭

(Total 1 mark)

Q2.

Which one of the following reactions in aqueous solution has the most positive change in entropy?

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

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

C $[Cu(H_2O)_6]^{2+} + EDTA^{4-} \rightarrow [Cu(EDTA)]^{2-} + 6H_2O$

D $[Cu(H_2O)_6]^{2+} + 2H_2NCH_2CH_2NH_2 \rightarrow [Cu(H_2NCH_2CH_2NH_2)_2(H_2O)_2]^{2+} + 4H_2O$

(Total 1 mark)

Q3.

The vanadium does **not** have an oxidation state of +3 in

A $[V(H_2O)_6]^{3+}$

B $[V(C_2O_4)_3]^{3-}$

C $[V(OH)_3(H_2O)_3]$

D $[VCl_4]^{3-}$

(Total 1 mark)

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Q4.

A 0.0720 g sample of reducing agent **R** was dissolved in water and acidified with an excess of dilute H_2SO_4. The resulting solution was found to react with exactly 18.0 cm^3 of a 0.0200 mol dm^{-3} solution of $KMnO_4$.

In this reaction, 5 mol of **R** react with 3 mol of $KMnO_4$. The M_r of **R** is

A 120

B 167

C 240

D 333

(Total 1 mark)

Q5.

In which one of the following reactions is a heterogeneous catalyst **not** used?

A $N_2 + 3H_2 \rightarrow 2NH_3$

B $CO + NO \rightarrow CO_2 + \frac{1}{2}N_2$

C $CO_2 + C \rightarrow 2CO$

D $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$

(Total 1 mark)

Q6.

Use your knowledge of the chemistry of transition metals to predict which of the following will convert $[Mn(H_2O)_6]^{2+}$ into MnO_4^{2-}

A an acid and a reducing agent

B an acid and an oxidising agent

C an alkali and a reducing agent

D an alkali and an oxidising agent

(Total 1 mark)

Q7.

Which one of the following could **not** act as a ligand?

A F^-

B CH_3CH_3

C NH_2NH_2

D CH_3OCH_3

(Total 1 mark)

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Q8.

Which one of the following would **not** reduce an acidified aqueous solution of potassium dichromate(VI)?

A CH_3COOH

B Zn

C CH_3CHO

D $Fe^{2+}(aq)$

(Total 1 mark)

Q9.

Which one of the following would **not** react with aqueous silver nitrate to produce a precipitate that is soluble in concentrated aqueous ammonia?

A $CaBr_2$

B $[COCl_4]^{2-}$

C $(CH_3)_4N^+I^-$

D CH_3COCl

(Total 1 mark)

Q10.

In the table below, which one of the following complex ions has a correct shape, co-ordination number and oxidation state?

	Complex	**Shape**	**Co-ordination number**	**Oxidation state of central cation**
A	$[Ag(CN)_2]^-$	Linear	2	–1
B	$[CuCl_4]^{2-}$	Tetrahedral	4	–2
C	$[Cr(C_2O_4)_3]^{3-}$	Octahedral	3	+3
D	$[Cu(NH_3)_4(H_2O)_2]^{2+}$	Octahedral	6	+2

(Total 1 mark)

Q11.

Which one of the following can act as an oxidising agent but not as a reducing agent?

A CH_3CHO

B Fe^{2+}

C I^-

D MnO_4^-

(Total 1 mark)

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Q12.

Which one of the following statements about the reaction below is **false**?

$$[Cu(H_2O)_6]^{2+} + EDTA^{4-} \rightleftharpoons [Cu(EDTA)]^{2-} + 6H_2O$$

A $[Cu(EDTA)]^{2-}$ is a more stable complex than $[Cu(H_2O)_6]^{2+}$

B Both $[Cu(H_2O)_6]^{2+}$ and $[Cu(EDTA)]^{2-}$ are octahedral complexes.

C There is an increase in entropy when the reaction occurs.

D There is a redox reaction.

(Total 1 mark)

Q13.

Aqueous $C_2O_4^{2-}$ ions react with MnO_4^- ions in acidic solution according to the equation

$$5\ C_2O_4^{2-} + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

Under the same conditions Fe^{2+} ions also react with MnO_4^- ions. How many moles of MnO_4^- ions are required to react exactly with one mole of $Fe(C_2O_4).2H_2O$?

A 0.4

B 0.6

C 2.5

D 7.5

(Total 1 mark)

Q14.

The percentage of iron in a sample of impure iron(II) sulphate crystals can be determined by titrating solutions, made from separate weighed samples acidified with dilute sulphuric acid, against a standard solution of potassium manganate(VII).

Which one of the following would lead to an inaccurate result?

A transferring the weighed sample of iron(II) sulphate into a wet conical flask

B failing to measure accurately the volume of water used to dissolve each weighed sample of iron(II) sulphate

C transferring the standard solution of potassium manganate(VII) from its original container to the burette using a wet beaker

D failing to measure accurately the volume of dilute sulphuric acid added to the mixture before titration

(Total 1 mark)

Q15.

The percentage of iron in a sample of impure iron(II) sulphate crystals can be determined by titrating solutions, made from separate weighed samples acidified with dilute sulphuric acid, against a standard solution of potassium manganate(VII).

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Which one of the following statements explains why dilute hydrochloric acid is unsuitable for use in this titration?

A HCl will oxidise Fe^{2+} to Fe^{3+}

B Cl^- will reduce Fe^{3+} to Fe^{2+}

C Cl^- will reduce MnO_4^-

D HCl is a strong acid

(Total 1 mark)

Q16.

The percentage of iron in a sample of impure iron(II) sulphate crystals can be determined by titrating solutions, made from separate weighed samples acidified with dilute sulphuric acid, against a standard solution of potassium manganate(VII).

Which one of the following would lead to the greatest error in the calculation of the percentage of iron(II) in the sample?

A an error of 0.005 g made when weighing out a sample of mass 0.987 g

B an end-point error of 0.1 cm^3 in 25.0 cm^3

C an error of 5 cm^3 when measuring out 25.0 cm^3 of dilute sulphuric acid

D using the average of the titration values 25.4, 25.7 and 25.9 when the correct value is 25.5 cm^3

(Total 1 mark)

Q17.

Which one of the following statements is true?

A A blue solution containing the ion $[CoCl_4]^{2-}$ turns pink when added to an excess of water.

B A purple solution is formed when chlorine is bubbled into aqueous sodium bromide.

C A yellow precipitate is formed when aqueous silver nitrate is added to aqueous sodium chloride.

D A green solution containing the ion $[CuCl_4]^{2-}$ turns blue when added to an excess of concentrated hydrochloric acid.

(Total 1 mark)

Q18.

Which of the species given below can behave as ligands?

NH_2^- NH_3 NH_4^+

A all three

B only NH_3

C NH_3 and NH_4^+

D NH_2^- and NH_3

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(Total 1 mark)

Q19.

When vanadium reacts with chlorine at 400°C, a brown compound is obtained. When an aqueous solution containing 0.193 g of this compound was treated with aqueous silver nitrate all the chlorine in the compound was precipitated as silver chloride. The mass of silver chloride (AgCl) produced was 0.574 g. Which one of the following could be the formula of the brown compound?

A VCl

B VCl_2

C VCl_3

D VCl_4

(Total 1 mark)

Q20.

In which one of the following reactions does the metal species undergo reduction?

A $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

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

C $CrO_7^{2-} + 2OH^- \rightarrow 2CrO_4^{2-} + H_2O$

D $TiO_2 + 2C + 2Cl_2 \rightarrow TiCl_4 + 2CO$

(Total 1 mark)

Q21.

The oxidation of ethanedioate (*oxalate*) ions by manganate(VII) ions can be represented by the half equations:

$$C_2O_4^{2-}(aq) \rightarrow 2CO_2(g) + 2e^-$$

$$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)$$

What volume (in cm^3) of 0.02 M $KMnO_4$ is required to oxidise completely a solution containing 0.02 mol of ethanedioate ions?

A 25

B 40

C 250

D 400

(Total 1 mark)

Q22.

Which one of the following electronic configurations is that of a transition element?

A $[Ar]\ 4s^2 3d^{10}$

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B [Ar] $4s^2 3d^9$

C [A] $4s^2 3d^0$

D [Ar] $4s^2 3d^{10} 4p^1$

(Total 1 mark)

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