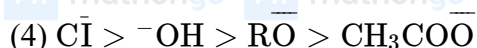
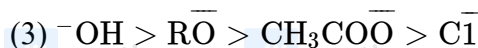
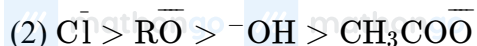
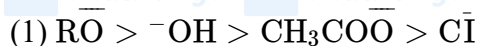


Questions

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Q1 - 2024 (04 Apr Shift 1)

What will be the decreasing order of basic strength of the following conjugate bases?



Q2 - 2024 (04 Apr Shift 1)

The element which shows only one oxidation state other than its elemental form is :

(1) Cobalt

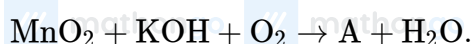
(2) Titanium

(3) Nickel

(4) Scandium

Q3 - 2024 (04 Apr Shift 1)

Consider the following reaction



Product 'A' in neutral or acidic medium disproportionate to give products 'B' and 'C' along with water. The sum of spin-only magnetic moment values of B and C is _____ BM. (nearest integer) (Given atomic number of Mn is 25)

Q4 - 2024 (04 Apr Shift 2)

When MnO_2 and H_2SO_4 is added to a salt (A), the greenish yellow gas liberated as salt (A) is :

(1) CaI_2

(2) NaBr

(3) KNO_3

Questions

MathonGo

(4) NH_4Cl

Q5 - 2024 (04 Apr Shift 2)

A first row transition metal in its +2 oxidation state has a spin-only magnetic moment value of 3.86 BM. The atomic number of the metal is

- (1) 26
- (2) 25
- (3) 23
- (4) 22

Q6 - 2024 (04 Apr Shift 2)

A first row transition metal with highest enthalpy of atomisation, upon reaction with oxygen at high temperature forms oxides of formula M_2O_n (where $n = 3, 4, 5$). The 'spin-only' magnetic moment value of the amphoteric oxide from the above oxides is _____ BM (near integer)

(Given atomic number: Sc : 21, Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26, Co : 27, Ni : 28, Cu : 29, Zn : 30)

Q7 - 2024 (05 Apr Shift 1)

The metal that shows highest and maximum number of oxidation state is :

- (1) Fe
- (2) Mn
- (3) Co
- (4) Ti

Q8 - 2024 (05 Apr Shift 1)

The spin-only magnetic moment value of the ion among Ti^{2+} , V^{2+} , Co^{3+} and Cr^{2+} , that acts as strong oxidising agent in aqueous solution is _____ BM (Near integer).

(Given atomic numbers : Ti : 22, V : 23, Cr : 24, Co : 27)

Questions

MathonGo

Q9 - 2024 (05 Apr Shift 2)

The number of ions from the following that have the ability to liberate hydrogen from a dilute acid is _____.

Ti²⁺, Cr²⁺ and V²⁺

(1) 2

(2) 3

(3) 1

(4) 0

Q10 - 2024 (05 Apr Shift 2)

While preparing crystals of Mohr's salt, dil H₂SO₄ is added to a mixture of ferrous sulphate and ammonium sulphate, before dissolving this mixture in water, dil H₂SO₄ is added here to :

(1) prevent the hydrolysis of ferrous sulphate

(2) prevent the hydrolysis of ammonium sulphate

(3) make the medium strongly acidic

(4) increase the rate of formation of crystals

Q11 - 2024 (05 Apr Shift 2)

The fusion of chromite ore with sodium carbonate in the presence of air leads to the formation of products A and B along with the evolution of CO₂. The sum of spin-only magnetic moment values of A and B is _____ B.M. (Nearest integer) [Given atomic number : C : 6, Na : 11, O : 8, Fe : 26, Cr : 24]

Q12 - 2024 (06 Apr Shift 1)

The number of element from the following that do not belong to lanthanoids is Eu, Cm, Er, Tb, Yb and Lu

(1) 3

(2) 4

(3) 1

(4) 5

Questions

MathonGo

Q13 - 2024 (06 Apr Shift 1)

Among CrO , Cr_2O_3 and CrO_3 , the sum of spin-only magnetic moment values of basic and amphoteric oxides is _____ 10^{-2}BM (nearest integer).

(Given atomic number of Cr is 24)

Q14 - 2024 (06 Apr Shift 1)

The difference in the 'spin-only' magnetic moment values of KMnO_4 and the manganese product formed during titration of KMnO_4 against oxalic acid in acidic medium is _____ BM. (nearest integer)

Q15 - 2024 (06 Apr Shift 2)

Arrange the following elements in the increasing order of number of unpaired electrons in it.

- (A) Sc
- (B) Cr
- (C) V
- (D) Ti
- (E) Mn

Choose the correct answer from the options given below :

- (1) (A) < (D) < (C) < (B) < (E)
- (2) (C) < (E) < (B) < (A) < (D)
- (3) (A) < (D) < (C) < (E) < (B)
- (4) (B) < (C) < (D) < (E) < (A)

Q16 - 2024 (06 Apr Shift 2)

Total number of species from the following with central atom utilising sp^2 hybrid orbitals for bonding is _____.

NH_3 , SO_2 , SiO_2 , BeCl_2 , C_2H_2 , C_2H_4 , BCl_3 , HCHO , C_6H_6 , BF_3 , $\text{C}_2\text{H}_4\text{Cl}_2$

Q17 - 2024 (08 Apr Shift 1)

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Questions

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Iron (III) catalyses the reaction between iodide and persulphate ions, in which

- A. Fe^{3+} oxidises the iodide ion
- B. Fe^{3+} oxidises the persulphate ion
- C. Fe^{2+} reduces the iodide ion
- D. Fe^{2+} reduces the persulphate ion

Choose the most appropriate answer from the options given below:

(1) B only

(2) A only

(3) B and C only

(4) A and D only

Q18 - 2024 (08 Apr Shift 1)

The 'spin only' magnetic moment value of MO_4^{2-} is _____ BM. (Where M is a metal having least metallic radii. among Sc, Ti, V, Cr, Mn and Zn).

(Given atomic number: Sc = 21, Ti = 22, V = 23, Cr = 24, Mn = 25 and Zn = 30)

Q19 - 2024 (08 Apr Shift 2)

Given below are two statements :

Statement (I) : Fusion of MnO_2 with KOH and an oxidising agent gives dark green K_2MnO_4 .

Statement (II) : Manganate ion on electrolytic oxidation in alkaline medium gives permanganate ion.

In the light of the above statements, choose the correct answer from the options given below :

- (1) Statement I is true but Statement II is false
- (2) Both Statement I and Statement II are false
- (3) Statement I is false but Statement II is true
- (4) Both Statement I and Statement II are true

Q20 - 2024 (09 Apr Shift 1)

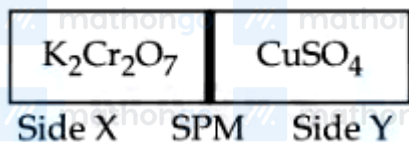
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Questions

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0.05M CuSO_4 when treated with 0.01M $\text{K}_2\text{Cr}_2\text{O}_7$ gives green colour solution of $\text{Cu}_2\text{Cr}_2\text{O}_7$. The two solutions are separated as shown below :

[SPM : Semi Permeable Membrane]



Due to osmosis :

- (1) Molarity of CuSO_4 solution is lowered.
- (2) Molarity of $\text{K}_2\text{Cr}_2\text{O}_7$ solution is lowered.
- (3) Green colour formation observed on side Y.
- (4) Green colour formation observed on side X.

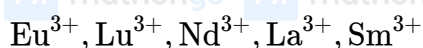
Q21 - 2024 (09 Apr Shift 1)

Electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct?

- (1) Stability of Cu(I) and Cu(II) depends on nature of copper salts
- (2) Cu(II) is more stable
- (3) Cu(I) and Cu(II) are equally stable
- (4) Cu(II) is less stable

Q22 - 2024 (09 Apr Shift 1)

Number of colourless lanthanoid ions among the following is _____



Q23 - 2024 (09 Apr Shift 2)

Give below are two statements:

Statement I : The higher oxidation states are more stable down the group among transition elements unlike p-block elements.

Questions

MathonGo

Statement II : Copper can not liberate hydrogen from weak acids.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are true

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are false

(4) Statement I is true but Statement II is false

Q24 - 2024 (09 Apr Shift 2)

A transition metal 'M' among Sc, Ti, V, Cr, Mn and Fe has the highest second ionisation enthalpy. The spin-only magnetic moment value of M^{+} ion is _____. BM (Near integer)

(Given atomic number Sc : 21, Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26)

Questions

MathonGo

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Answer Key

/// mathongo /// mathongo /// mathongo /// mathongo /// mathongo /// mathongo

Q1 (1) athongo /// math Q2 (4) /// mathongo Q3 (4) athongo /// mat Q4 (4) /// mathongo

Q5 (3) athongo /// math Q6 (0) /// mathongo Q7 (2) athongo /// mat Q8 (5) /// mathongo

Q9 (2) athongo /// math Q10 (1) /// mathongo Q11 (6) thongo /// mat Q12 (3) /// mathongo

Q13 (877) ongo /// math Q14 (6) /// mathongo Q15 (3) thongo /// mat Q16 (6) /// mathongo

Q17 (4) thongo /// math Q18 (0) /// mathongo Q19 (4) thongo /// mat Q20 (1) /// mathongo

Q21 (2) thongo /// math Q22 (2) /// mathongo Q23 (1) thongo /// mat Q24 (6) /// mathongo

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Solutions

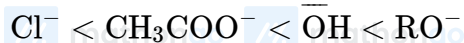
MathonGo

Q1

Strong acid have weak conjugate base Acidic strength :



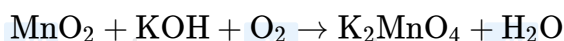
Conjugate base strength :



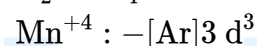
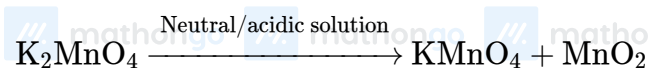
Q2

Co, Ti, Ni can show +2, +3 and +4 oxidation state, But 'Sc' only shows +3 stable oxidation state.

Q3



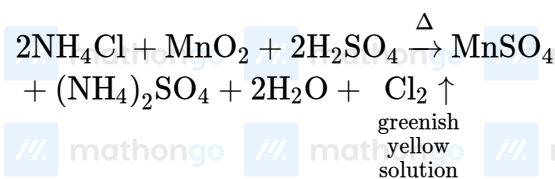
(A)



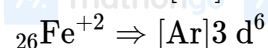
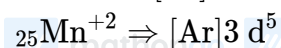
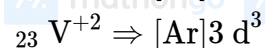
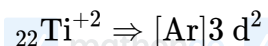
$$n = 3, \mu = \sqrt{3(3+2)} = 3.87 \text{ B.M.}$$

Nearest integer is (4).

Q4



Q5



Q6

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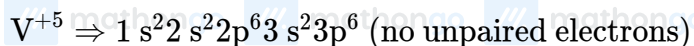
Solutions

MathonGo

'V' has highest enthalpy of atomisation (515 kJ/mol) among first row transition elements.



Here ' V ' is in +5 oxidation state



Q7

Mn shows highest oxidation state (Mn^{+7}) in 3 d series metals.

Q8

Strong oxidising agent = Co^{+3}

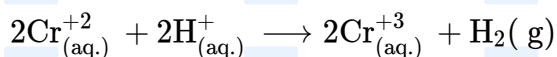
No. of unpaired e^- in Co^{+3} [$3d^6$] = 4

Hence $\mu = \sqrt{n(n+2)} = \sqrt{24} BM$

Nearest integer = 5

Q9

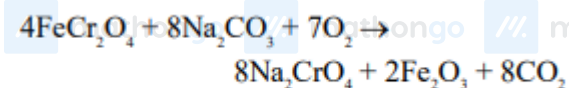
The ions Ti^{+2} , $V^{+2}Cr^{+2}$ are strong reducing agents and will liberate hydrogen from a dilute acid, eg.



Q10

Fe^{+2} ions undergoes hydrolysis, therefore while preparing aqueous solution of ferrous sulphate and ammonium sulphate in water dilute sulphuric acid is added to prevent hydrolysis of ferrous sulphate.

Q11



A B

Spin only magnetic moment

For Na_2CrO_4 $\mu_B = 0$

For Fe_2O_3 $\mu_B = 5.9$ sum = 5.9

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Solutions

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Q12

Cm is Actinide

Q13

CrO Basic oxide

Cr₂O₃ Amphoteric oxideIn CrO, Cr exist as Cr⁺² and have μ only = 4.90In Cr₂O₃, Cr exist as Cr⁺³ and have μ only = 3.87

Sum of spin only magnetic moment

$$= 4.90 + 3.87 = 8.77$$

$$\mu_{\text{only}} = 8.77 \times 10^{-2}$$

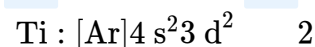
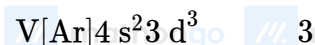
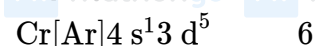
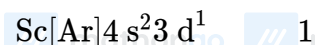
Ans. 8.77

Q14

Spin only magnetic moment of Mn in KMnO₄ = 0 Spin only value of manganese product formed during titration of KMnO₄ against oxalic acid in acidic medium is = 6

Q15

Unpaired electron



Q16

Central atom utilising sp² hybrid orbitalsSO₂, C₂H₄, BCl₃, HCHO, C₆H₆, BF₃

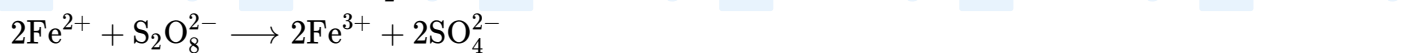
Q17

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Solutions

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Fe^{+3} oxidises I^- to I_2 and convert itself into Fe^{+2} . This Fe^{+2} reduces $\text{S}_2\text{O}_8^{2-}$ to SO_4^{2-} and converts itself into Fe^{+3} .

Q18

Metal having least metallic radii among Sc, Ti, V, Cr, Mn & Zn is Cr.

Spin only magnetic moment of CrO_4^{2-} .

Here Cr^{+6} is in d^0 configuration (diamagnetic).

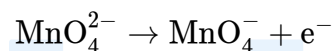
Q19



Dark green

Electrolytic oxidation in alkaline medium :

At anode :



Q20

Only solvent Molecules are allowed to pass through the SPM.



Q21

Cu(II) is more stable than Cu(I) because hydration energy of Cu^{+2} ion compensate IE_2 of Cu .

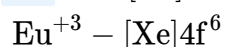
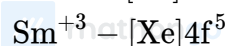
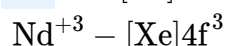
Q22

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Solutions

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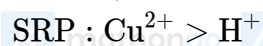
La^{+3} and Lu^{+3} do not show any colour because no unpaired electron is present.

Q23

On moving down the group in transition elements, stability of higher oxidation state increases, due to increase in effective nuclear charge.

$$\Rightarrow E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = 0.34 \text{ V}$$

$$\Rightarrow E_{\text{H}^{+}/\text{H}_2}^{\circ} = 0$$



Cu can't liberate hydrogen gas from weak acid.

Q24

Among given metals, Cr has maximum IE_2

because Second electron is removed from stable configuration $3d^5$



\therefore No of unpaired e^{-} in Cr^{+} is 5, $n = 5$

$$\text{So, Magnetic moment} = \sqrt{n(n+2)} \text{ B.M}$$

$$= \sqrt{5(5+2)} = 5.92 \text{ BM} \approx 6$$

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