Nishant Jindal

D & F -BLOCK

2019

1. The lanthanide ion that would show colour is :

(A) Gd^{3+} (B) Sm^{3+} (C) La^{3+} (D) Lu^{3+}

$Sm^{+3} = 4f^{5}$

Sat.
9 — 10 pm
Sunday 11 — 2 pm } Chemical

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2. The statement that is INCORRECT about the interstitial compounds is

(A) they are chemically reactive.

(B) they are very hard.

(C) they have metallic conductivity.

(D) they have high melting points.

They Chemically inert

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3. The maximum number of possible oxidation states of actinoides are shown by:

(A) Nobelium (No) and lawrencium (Lr)

(B) Actinium (Ac) and thorium (Th)

(C) Berkelium (Bk) and californium (Cf)

(D) Neptunium (Np) and plutonium (Pu)

Np Pu = +7 oxid. state (unstable)

Stable highest O.S +6 U

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4. Consider the hydrated ions of Ti^{2+}, V^{2+}, Ti^{3+}, and Sc^{3+}. The correct order of their spin-only magnetic moments is :

(A) $V^{2+} < Ti^{2+} < Ti^{3+} < Sc^{3+}$ (B) $Sc^{3+} < Ti^{3+} < Ti^{2+} < V^{2+}$

(C) $Ti^{3+} < Ti^{2+} < Sc^{3+} < V^{2+}$ (D) $Sc^{3+} < Ti^{3+} < V^{2+} < Ti^{2+}$

$[Ti(H_2O)_6]^{+2}$ $[V(H_2O)_6]^{+2}$ $[Ti(H_2O)_6]^{+3}$ $[Sc(H_2O)_6]^{+3}$

$Sc = 3d^1 4s^2$ $Ti = 3d^2 4s^2$ $V = 3d^3 4s^2$

$Ti^{+2} = 3d^2$

d^0

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5. The highest possible oxidation states of uranium and plutonium, respectively, are :

(A) 6 and 7 (B) 6 and 4 (C) 7 and 6 (D) 4 and 6

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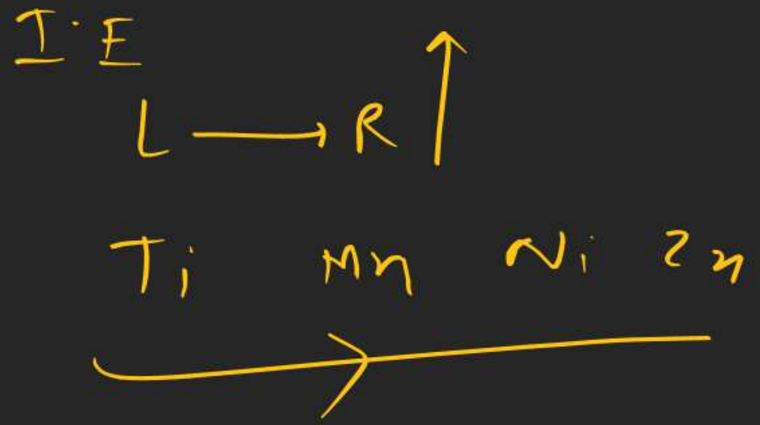
6. The correct order of the first ionization enthalpies is :

(A) $Ti < Mn < Zn < Ni$

(B) $Ti < Mn < Ni < Zn$

(C) $Mn < Ti < Zn < Ni$

(D) $Zn < Ni < Mn < Ti$



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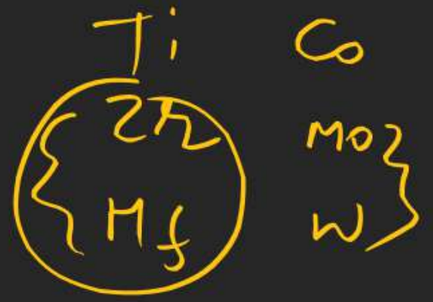
7. The pair that has similar atomic radii is :

(A) Mn and Re

(B) Ti and Hf

(C) Sc and Ni

(D) Mo and W



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8. The transition element that has lowest enthalpy of atomisation is:

(A) Fe (B) Cu (C) V (D) Zn

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9. The effect of lanthanoid contraction in the lanthanoid series of elements by and large means:

(A) increase in both atomic and ionic radii

(B) decrease in atomic radii and increase in ionic radii

(C) decrease in both atomic and ionic radii

(D) increase in atomic radii and decrease in ionic radii

D & F -BLOCK

10. The electrolytes usually used in the electroplating of gold and silver, respectively, are:

(A) $[Au(CN)_2]^-$ and $[Ag(CN)_2]^-$

(B) $[Au(CN)_2]^-$ and $[AgCl_2]^-$

(C) $[Au(OH)_4]^-$ and $[Ag(OH)_2]^-$

(D) $[Au(NH_3)_2]^+$ and $[Ag(CN)_2]^-$

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11. The element that usually does NOT show variable oxidation states is:

(A) Cu (B) Ti (C) Sc (D) V

D & F -BLOCK

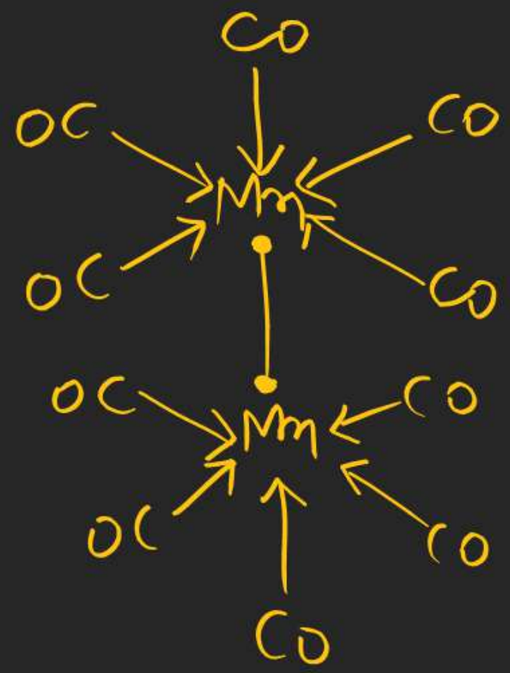
12. $Mn_2(CO)_{10}$ is an organometallic compound due to the presence of :

(A) Mn-C bond

(B) Mn-Mn bond

(C) Mn-O bond

(D) $C - O$ bond



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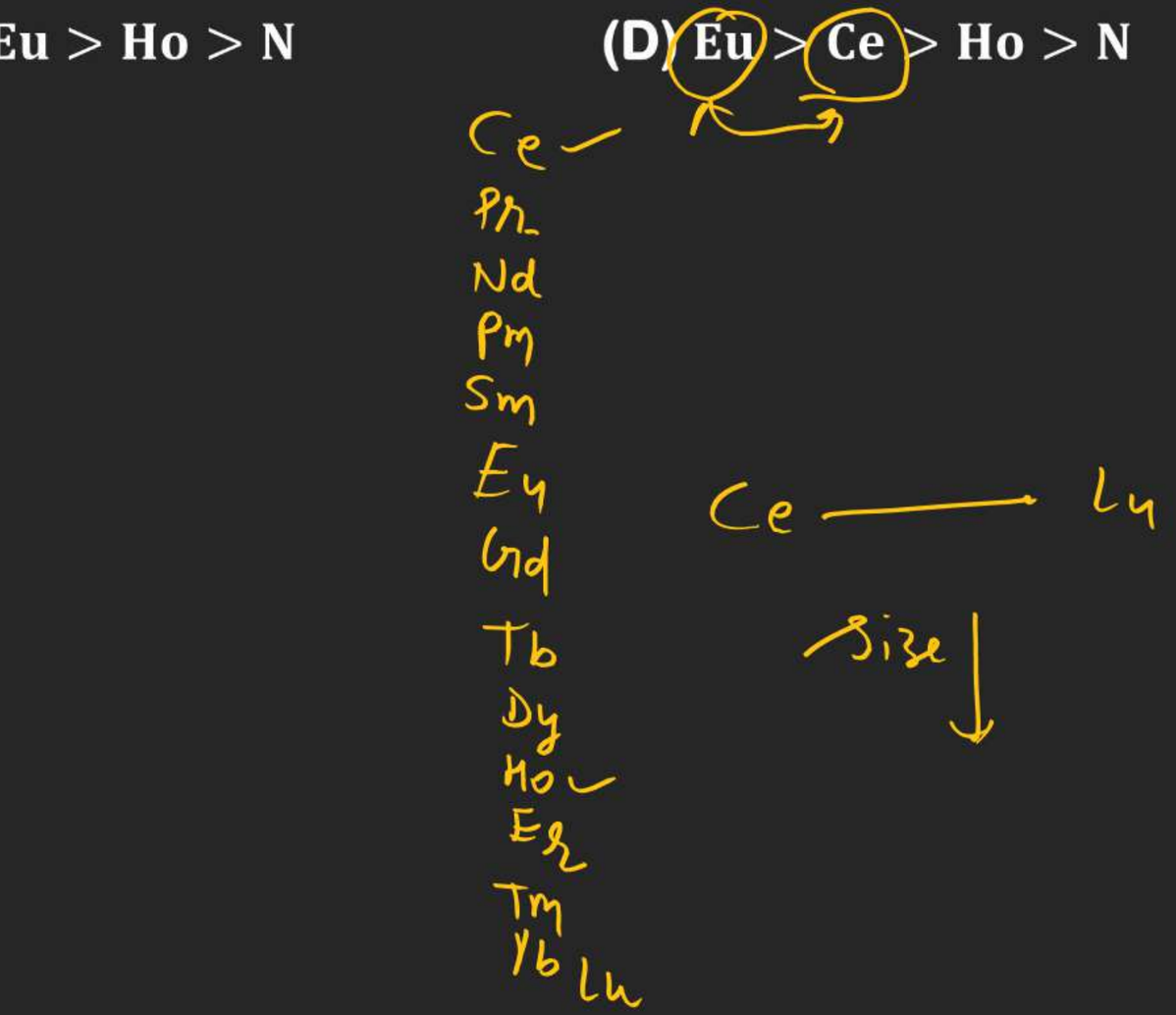
13. The correct order of atomic radii is :

(A) N > Ce > Eu > Ho

(B) Ho > N > Eu > Ce

(C) Ce > Eu > Ho > N

(D) Eu > Ce > Ho > N



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D & F -BLOCK

2020

1. $NaCl \xrightarrow[\text{Conc. } H_2SO_4]{K_2Cr_2O_7(s)} (A) \xrightarrow{NaOH} (B) \xrightarrow[+H_2O_2]{\text{dil. } H_2SO_4} (C)$

Determine total number of atoms in per unit formula of (A), (B)&(C)

Chromyl Chloride test

$NaCl \xrightarrow[\text{Conc. } H_2SO_4]{K_2Cr_2O_7} CrO_2Cl_2 \xrightarrow{NaOH} Na_2CrO_4 \xrightarrow{H_2O_2} CrO_5$

$CrO_2Cl_2 = 5$

$Na_2CrO_4 = 7$

$CrO_5 = 6$

18

D & F -BLOCK

2. Among the following least 3^{rd} ionization energy is for

(A) Mn (B) Co (C) Fe (D) Ni

$Fe = 3d^6 4s^2$

$Fe^{+} = 3d^6 4s^1$

$Fe^{+2} = 3d^6 4s^0$

$Fe^{+3} \Rightarrow 3d^5$

3. Assertion: It has been found that for hydrogenation reaction the catalytic activity increases from group 5 to group- 11 metals with maximum activity being shown by groups 7-9 elements of the periodic table. Reason: For 7-9 group elements adsorption rate is maximum.

(A) Both assertion and reason are correct and reason is correct explanation of assertion.

(B) Both assertion and reason are correct and reason is not correct explanation of assertion.

(C) Assertion is true & reason is false.

(D) Both are incorrect

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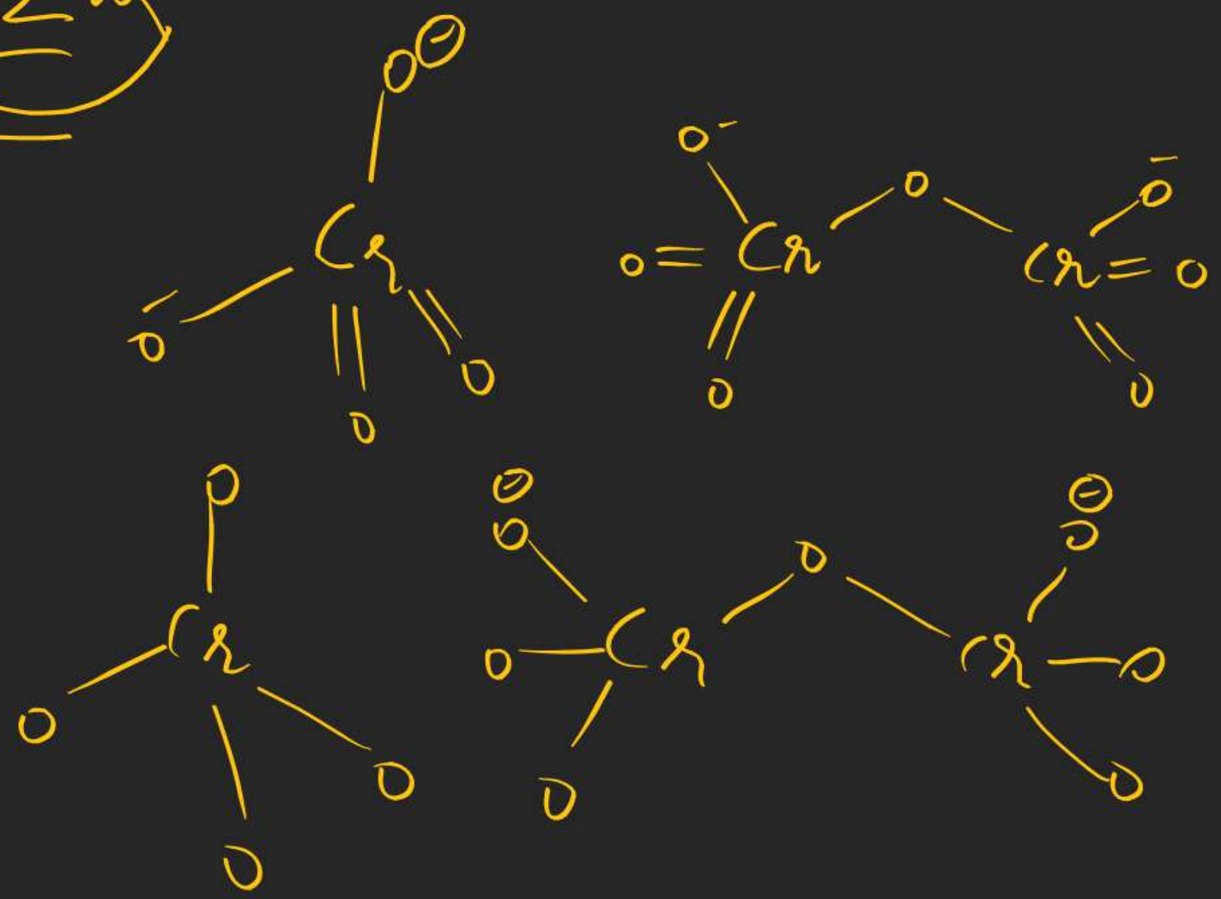
4. Total number of Cr-O bonds in Chromate ion and dichromate ion is.

12 : 00



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5. The oxidation states of transition metal atoms in $K_2Cr_2O_7$, $KMnO_4$ and K_2FeO_4, respectively, are x, y and z. The sum of x, y and z is

$K_2Cr_2O_7$ $KMnO_4$ K_2FeO_4

$2+2x+7(-2)$ $1+x+4(-2)$ $2+x+4(-2)=0$

$x=+6$ $x=+7$ $+6$

12
07
19

D & F -BLOCK

6. The incorrect statement is

(A) Manganate and permanganate ions are paramagnetic

(B) Manganate and permanganate ions are tetrahedral

(C) Manganate ion is green in colour and permanganate ion is purple in colour

(D) In manganate and permanganate ions, the π-bonding takes place by overlap of p-orbitals of oxygen and d-orbitals of manganese

MnO_4^{-2} MnO_4^-

$Mn^{+6} = 3d^1$ $Mn^{+7} = 3d^0$

Paramag. Dia.

D & F -BLOCK

7. The incorrect statement(s) among (a) - (c) is (are)

(a) $W(VI)$ is more stable than $Cr(VI)$.

(b) In the presence of HCl, permanganate titrations provide satisfactory results.

(c) Some lanthanoid oxides can be used as phosphors.

(A) (a) and (b) only

(B) (a) only

(C) (b) and (c) only

(D) (b) only

CrO_3 [O.A]

MoO_3, WO_3 → Stable

MnO_4^- + HCl

D & F -BLOCK

8. The correct electronic configuration and spin only magnetic moment (BM) of $Gd^{3+}(Z = 64)$ respectively, are

(A) $[Xe]5f^7$ and 8.9

(B) $[Xe]4f^7$ and 7.9

(C) $[Xe]5f^7$ and 7.9

(D) $[Xe]4f^7$ and 8.9

$Gd = 4f^7 5d^1 6s^2$

$Gd^{+3} = 4f^7$

7.9

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D & F -BLOCK

9. The lanthanoid that does NOT show +4 oxidation state is

(A) Tb (B) Dy (C) Ce (D) Eu

Eu^{+2}

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D & F -BLOCK

10. Mischmetal is an alloy consisting mainly of

(A) lanthanoid and actinoid metals

(B) actinoid and transition metals

(C) lanthanoid metals

(D) actinoid metals

Misch metal

95% (Ln) + 5% Fe

Small traces of S | Ca | Al | C

Mg

D & F -BLOCK

11. The electronic configurations of bivalent europium and trivalent cerium are :

(atomic number : $Xe = 54, Ce = 58, Eu = 63$)

(A) $[Xe]4f^7, [Xe]4f^1$

(B) $[Xe]4f^7 6s^2, [Xe]4f^1$

(C) $[Xe]4f^7 6s^2, [Xe]4f^1 5d^1 6s^2$

(D) $[Xe]4f^7, [Xe]4f^1 5d^1 6s^2$

$Ce = 4f^1 5d^1 6s^2$

$Ce^{+3} = 4f^1$

$Eu = 4f^7 6s^2$

$Eu^{+2} = 4f^7$

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D & F -BLOCK

2021

1. Identify the element for which electronic configuration in +3 oxidation state is $[Ar]3\,d^5$:

(A) Ru (B) Mn (C) Co (D) Fe

$Fe = 3d^6 4s^2$

$Fe^{+3} = 3d^5$

D & F -BLOCK

2. In the given chemical reaction, colors of the Fe^{2+} and Fe^{3+} ions, are respectively:

$$5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$$

(A) Yellow, Orange

(B) Yellow, Green

(C) Green, Orange

(D) Green, Yellow

Fe^{+2} = green

Fe^{+3} = yellow

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D & F -BLOCK

3. The Eu^{2+} ion is a strong reducing agent in spite of its ground state electronic configuration (outermost):

[Atomic number of $Eu = 63$]

(A) $4f^7 6\,s^2$ (B) $4f^6$ (C) $4f^7$ (D) $4f^6 6\,s^2$

Half filled

D & F -BLOCK

4. Which one of the following lanthanides exhibits +2 oxidation state with diamagnetic nature ?

(Given Z for $Nd = 60, Yb = 70, La = 57, Ce = 58$)

(A) Nd (B) Yb (C) La (D) Ce

$Yb = 4f^{14}6s^2$

D & F -BLOCK

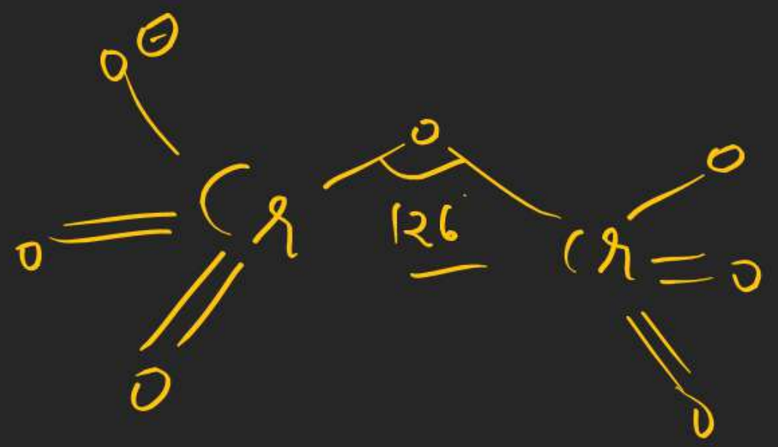
5. In the structure of the dichromate ion, there is a :

(A) linear symmetrical $Cr - O - Cr$ bond.

(B) non-linear symmetrical $Cr - O - Cr$ bond.

(C) linear unsymmetrical $Cr - O - Cr$ bond.

(D) non-linear unsymmetrical $Cr - O - Cr$ bond.



D & F -BLOCK

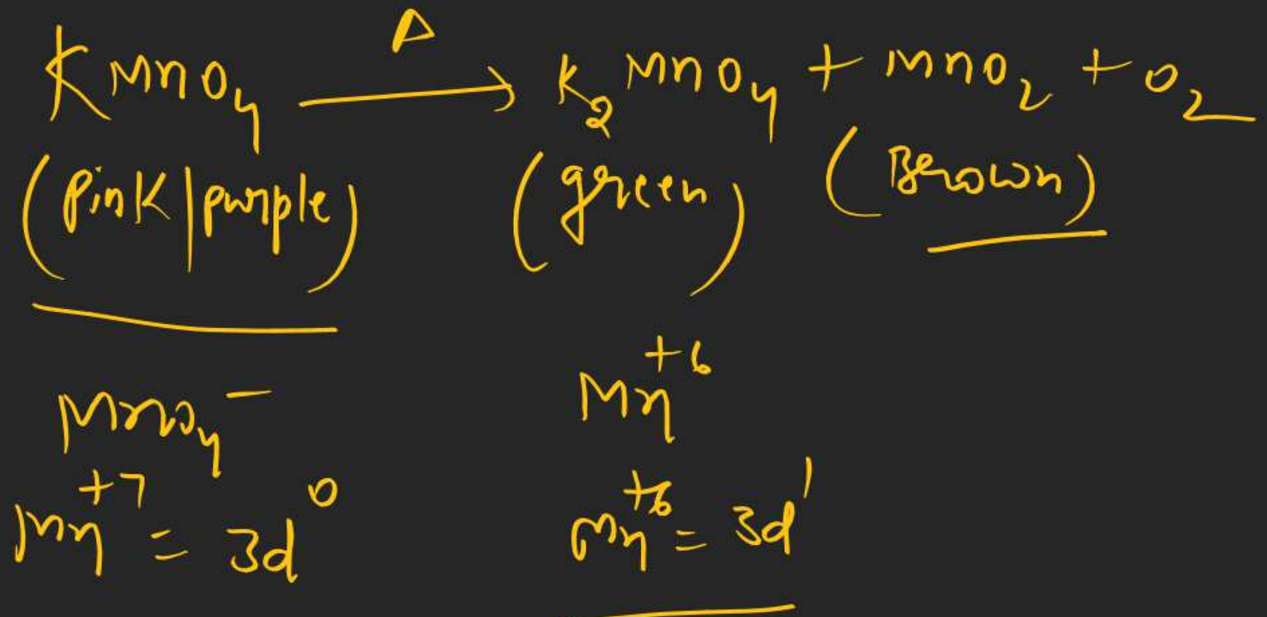
6. Potassium permanganate on heating at $513\ K$ gives a product which is :

(A) paramagnetic and colourless

(B) diamagnetic and green

(C) diamagnetic and colourless

(D) paramagnetic and green



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D & F -BLOCK

7. Which one of the following is used to remove most of plutonium from spent nuclear fuel?

(A) ClF_3 (B) O_2F_2 (C) I_2O_5 (D) BrO_3

$O_2F_2 + Pu \rightarrow PuF_6$

F-Block

Halogen = 16th

Reactivity towards oxygen

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D & F -BLOCK

8. The number of f electrons in the ground state electronic configuration of Np(Z=93) is (Nearest integer)

$_{93}Np = 5f^4 6d^1 7s^2$

4

D & F -BLOCK

9. The nature of oxides V_2O_3 and $\overset{+2}{CrO}$ is indexed as ' X′ and ′Y′ type respectively. The correct set of X and Y is:

(A) X = basic Y = amphoteric (B) X = amphoteric Y = basic

(C) X = acidic Y = acidic (D) X = basic Y = basic

Pb Zn Be Al Ga Sn $\overset{+4/+3}{Cr}$

all the posible oxides and hydroxides are Amphoteric

V_2O_5 | As_2O_3

D & F -BLOCK

10. The number of $4f$ electrons in the ground state electronic configuration of Gd^{2+} is [Atomic number of $Gd = 64$]

(7)

$Gd = 4f^7 5d^1 6s^2$

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D & F -BLOCK

11. Which one of the following when dissolved in water gives coloured solution in nitrogen atmosphere?

(A) $CuCl_2$ (B) $AgCl$ (C) $ZnCl_2$ (D) Cu_2Cl_2

$Cu^{+2} = 3d^9$

d^0 d^{10} → Colourless

$Zn^{+2} = 3d^{10}$

Cu

$Ag^{+} = 4d^{10}$ $Cu^{+} = 3d^{10}$

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D & F -BLOCK

12. The set having ions which are coloured and paramagnetic both is -

(A) Cu^{2+}, Cr^{3+}, Sc^{+}

(B) $Cu^{2+}, Zn^{2+}, Mn^{4+}$

(C) Sc^{3+}, V^{5+}, Ti^{4+}

(D) $Ni^{2+}, Mn^{7+}, Hg^{2+}$

$Ti = 3d^2 4s^2$

Zn
Cd
Hg

D & F -BLOCK

13. The correct order of following 3 d metal oxides, according to their oxidation numbers is:

(a) CrO_3 (b) Fe_2O_3 (c) MnO_2 (d) V_2O_5 (e) Cu_2O

(A) (d) > (a) > (b) > (c) > (e)

(B) (a) > (c) > (d) > (b) > (e)

(C) (a) > (d) > (c) > (b) > (e)

(D) (c) > (a) > (d) > (e) > (b)

D & F -BLOCK

15. Number of electrons present in $4f$ orbital of Ho^{3+} ion is (Given Atomic No. of $Ho = 67$)

10

$Ho = 4f^{11} 6s^2$

$Ho^{+3} = 4f^{10}$

16. Given below are two statement: one is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: Size of Bk^{3+} ion is less than Np^{3+} ion. Reason R : The above is a consequence of the lanthanoi contraction. In the light of the above statements, choose the correct answer from the options given below :

(A) A is false but R is true

(B) Both A and R are true but R is not the correct explanation of A

(C) Both A and R are true and R is the correct explanation of A

(D) A is true but R is false

D & F -BLOCK

17. Given below are two statements:

Statement I : The E° value of Ce^{4+}/Ce^{3+} is $+1.74$ V

Statement II : Ce is more stable in Ce^{4+} state than Ce^{3+} state.

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

(A) Both statement I and statement II are correct

(B) Statement I is incorrect but statement II is correct

(C) Both statement I and statement II are incorrect

(D) Statement I is correct but statement II is incorrect.

$\Delta G = -nFE^0$

$Ce^{+3} > Ce^{+4}$

Ce^{+4} (S.D.A)

Ce^{+3}

D & F -BLOCK

20. The common positive oxidation states for an element with atomic number 24 , are :

(A) +2 to +6

(B) +1 and +3 to +6

(C) +1 and +3

(D) +1 to +6

$Cr = 3d^5 4s^1$

+2 — +6

D & F -BLOCK

21. On complete reaction of $FeCl_3$ with oxalic acid in aqueous solution containing KOH, resulted in the formation of product A. The secondary valency of Fe in the product A is

$$FeCl_3 + H_2C_2O_4 \longrightarrow [Fe(ox)_3]^{-3}$$

D & F -BLOCK

2021

22. The incorrect statement among the following is :

(A) $VOSO_4$ is a reducing agent

(B) Red colour of ruby is due to the presence of ~~Cr^{3+}~~ Co^{+3}

(C) Cr_2O_3 is an amphoteric oxide

(D) RuO_4 is an oxidizing agent

Rubby — Red — Cr^{+3}

Sap. — Blue Co

D & F -BLOCK

23. What is the correct order of the following elements with respect to their density?

(A) Cr < Fe < Co < Cu < Zn

(B) Cr < Zn < Co < Cu < Fe

(C) Zn < Cu < Co < Fe < Cr

(D) Zn < Cr < Fe < Co < Cu

D & F -BLOCK

24. In which of the following pairs, the outer most electronic configuration will be the same?

(A) Fe^{2+} and Co^{+}

(B) Cr^{+} and Mn^{2+}

(C) Ni^{2+} and Cu^{+}

(D) V^{2+} and Cr^{+}

$3d^1 4s^2$ $3d^2 4s^2$ $3d^3 4s^2$ $3d^5 4s^1$ $3d^5 4s^2$ $3d^6 4s^2$ $3d^7 4s^2$ $3d^8 4s^2$ $3d^{10} 4s^1$ $3d^{10} 4s^2$

Sc Ti V Cr Mn Fe Co Ni Cu Zn

D & F -BLOCK

25. On treating a compound with warm dil. H_2SO_4, gas X is evolved which turns $K_2Cr_2O_7$ paper acidified with dil. H_2SO_4 to a green compound Y. X and Y respectively are :

(A) $X = SO_2, Y = Cr_2(SO_4)_3$

(B) $X = SO_2, Y = Cr_2O_3$

(C) $X = SO_3, Y = Cr_2O_3$

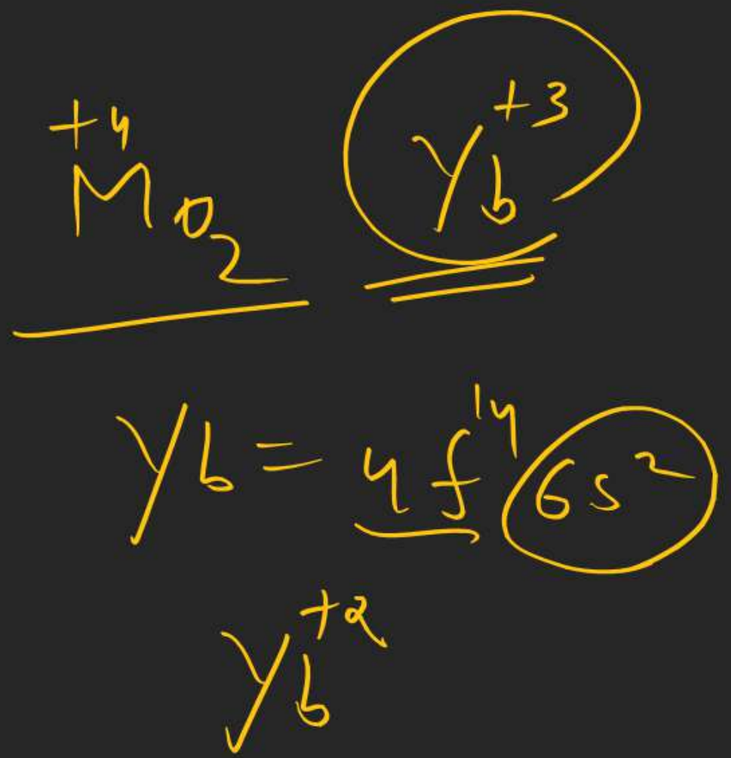
(D) $X = SO_3, Y = Cr_2(SO_4)_3$

$SO_2 + Cr_2O_7^{-2} \longrightarrow Cr^{+3} + SO_4^{-2}$

D & F -BLOCK

26. Which one of the following lanthanoids does not form MO_2 ? [M is lanthanoid metal]

(A) Nd (B) Yb (C) Dy (D) Pr



D & F -BLOCK

27. Dichromate ion is treated with base, the oxidation number of Cr in the product formed is :

(6)

$$\underset{\text{(acidic)}}{Cr_2O_7^{-2}} \underset{pH>7}{\overset{pH<7}{\rightleftharpoons}} \underset{\text{(Basic)}}{CrO_4^{-2}}$$

$$Cr_2O_7^{-2} + NaOH \longrightarrow CrO_4^{-2}$$

+6

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D & F -BLOCK

2022

1. The reaction of H_2O_2 with potassium permanganate in acidic medium leads to the formation of mainly:

(A) Mn^{2+} (B) Mn^{4+} (C) Mn^{3+} (D) Mn^{6+}

$KMnO_4 + H_2O_2 \longrightarrow Mn^{+2} + O_2$

D & F -BLOCK

2. Among Co^{3+}, Ti^{2+}, V^{2+} and Cr^{2+} ions, one if used as a reagent cannot liberate H_2 from dilute mineral acid solution, its spin-only magnetic moment in gaseous state is B.M. (Nearest integer)

$Co^{+3} = 3d^6$

4.90

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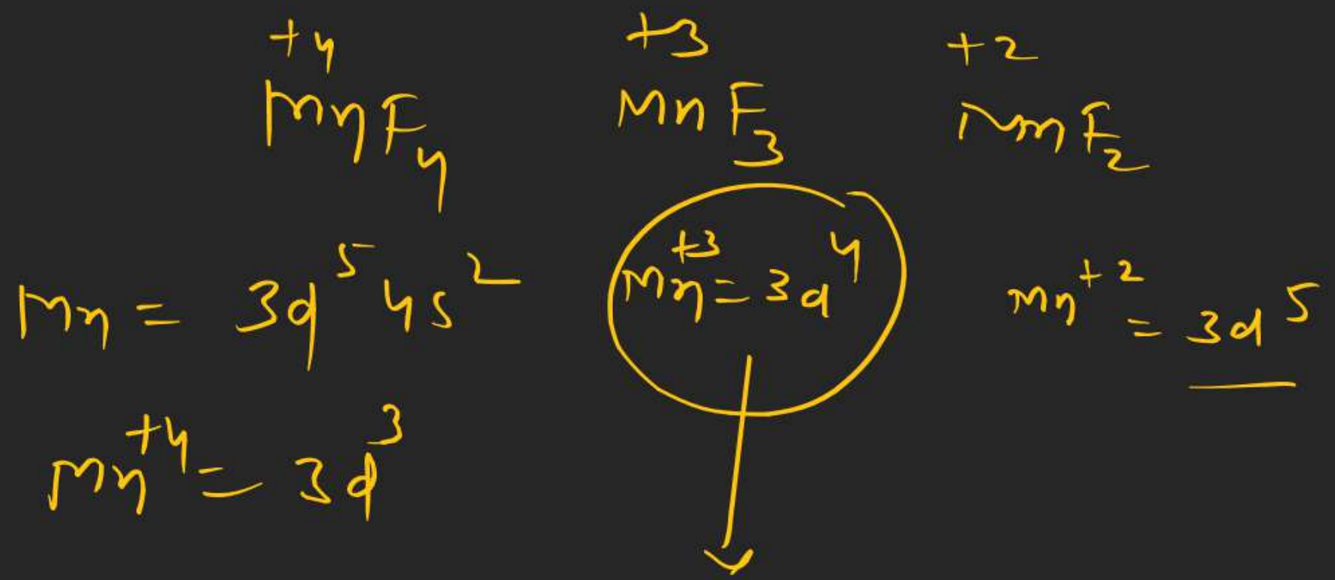
D & F -BLOCK

4. The spin-only magnetic moment value of the compound with strongest oxidizing ability among MnF_4, MnF_3 and MnF_2 is B.M. [nearest integer]



5. Given below are two statements:

Statement I : Iron (III) catalyst, acidified $K_2Cr_2O_7$ and neutral $KMnO_4$ have the ability to oxidise I^- to I_2 independently.

Statement II: Manganate ion is paramagnetic in nature and involves $p\pi - p\pi$ bonding.

In the light of the above statements, choose the correct answer from the options.

(A) Both statement I and Statement II are ture

(B) Both statement I and Statement II are false

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

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