

Basic Exercise

d - Block Elements

1. For a catalyst which condition is not essential :-

- (1) Variable valency (2) High ionisation energy
(3) Empty orbitals (4) Free valency on the surface

Ans. (2)

2. To which of the following series the transition elements from $Z = 39$ to $Z = 48$ belong?

- (1) 3d series (2) 4d series (3) 5d series (4) 6d series

Ans. (2)

3. KMnO_4 on treatment with conc. H_2SO_4 forms a compound (X) which decomposes explosively on heating forming (Y). The (X) and (Y) are respectively

- (1) Mn_2O_7 , MnO_2 (2) Mn_2O , Mn_2O_3 (3) MnSO_4 , Mn_2O_3 (4) Mn_2O_3 , MnO_2

Ans. (1)

4. Which pair of ions is colourless-

- (1) Mn^{+3} , Co^{+3} (2) Fe^{+3} , Cr^{+3} (3) Zn^{2+} , Sc^{3+} (4) Ti^{2+} , Cu^{2+}

Ans. (3)

5. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (Ammonium dichromate) is used in fire works. The green coloured powder blown in air is :

- (1) Cr_2O_3 (2) CrO_2 (3) Cr_2O_4 (4) CrO_3

Ans. (1)

6. $\text{Cr}_2\text{O}_7^{2-} \xrightleftharpoons[X]{Y} 2\text{CrO}_4^{2-}$, X and Y are respectively

- (1) $\text{X} = \text{OH}^-$, $\text{Y} = \text{H}^+$ (2) $\text{X} = \text{H}^+$, $\text{Y} = \text{OH}^-$ (3) $\text{X} = \text{OH}^-$, $\text{Y} = \text{H}_2\text{O}_2$ (4) $\text{X} = \text{H}_2\text{O}_2$, $\text{Y} = \text{OH}^-$

Ans. (1)

7. During estimation of oxalic acid Vs KMnO_4 , self indicator is :

- (1) KMnO_4 (2) Oxalic acid (3) K_2SO_4 (4) MnSO_4

Ans. (1)

8. Colourless solution of the following four salts are placed separately in four different test tubes and a strip of copper is dipped in each one of these. Which solution will turn blue ?

- (1) KNO_3 (2) AgNO_3 (3) $\text{Zn}(\text{NO}_3)_2$ (4) ZnSO_4

Ans. (2)

9. $\text{Cu} + \text{conc. HNO}_3(\text{hot}) \longrightarrow \text{Cu}(\text{NO}_3)_2 + \text{X}$ (oxide of nitrogen) ; then X is :

- (1) N_2O (2) NO_2 (3) NO (4) N_2O_3

Ans. (2)

10. The higher oxidation states of transition elements are found to be the combination with A and B, which are :

- (1) F, O (2) O, N (3) O, Cl (4) F, Cl

Ans. (1)

11. Magnetic moment of x^{n+} is $\sqrt{24}$ B.M. Hence No. of unpaired electron and value of 'n' respectively.
(Atomic number = 26)

- (1) 4, 3 (2) 3, 5 (3) 4, 2 (4) 4, 1

Ans. (3)

12. The product of oxidation of I^- with MnO_4^- in alkaline medium is :

- (1) IO_3^- (2) I_2 (3) IO^- (4) IO_4^-

Ans. (1)

13. Copper becomes green when exposed to moist air for longer period.

- (1) Because of the formation of a layer of cupric oxide on the surface of copper.
- (2) Because of the formation of a layer of basic carbonate of copper on the surface of copper.
- (3) Because of the formation of a layer of cupric hydroxide on the surface of copper.
- (4) (1) and (3) both

Ans. (2)

14. Which of the following oxide of chromium is amphoteric in nature

- (1) CrO
- (2) Cr_2O_3
- (3) CrO_3
- (4) CrO_5

Ans. (2)

15. Compared to Cu^{2+} having $3d^9$ configuration, Cu^+ having $3d^{10}$ configuration :-

- (1) Is more stable
- (2) Is equally stable
- (3) Is less stable
- (4) Stability depends upon nature of copper salt

Ans. (3)

16. Pick out the wrong statement :-

- (1) $\text{K}_2\text{Cr}_2\text{O}_7$ reduces ferric sulphate to ferrous sulphate
- (2) Iron do not form amalgam
- (3) Permanent magnet is made by an alloy called Alnico
- (4) In the Lathanides ionic radius decreases from La^{+3} to Lu^{+3}

Ans. (4)

17. CrO_3 is red or orange in colour. The nature of oxide is :-

- (1) Acidic
- (2) Basic
- (3) Amphoteric
- (4) Neutral

Ans. (1)

18. Cl_2 gas is obtained by various reactions but not by :

- (1) $\text{KMnO}_4 + \text{conc. HCl} \xrightarrow{\Delta}$
- (2) $\text{KCl} + \text{K}_2\text{Cr}_2\text{O}_7 + \text{conc. H}_2\text{SO}_4 \xrightarrow{\Delta}$
- (3) $\text{MnO}_2 + \text{conc. HCl} \xrightarrow{\Delta}$
- (4) $\text{KCl} + \text{F}_2 \xrightarrow{\Delta}$

Ans. (2)

19. Maximum magnetic moment is shown by :

- (1) d^5
- (2) d^6
- (3) d^7
- (4) d^8

Ans. (1)

20. Disproportion can be shown by

- (1) MnO_4^{2-} in acidic medium
- (2) Cu^+ in aqueous medium
- (3) Cl_2 in alkaline medium
- (4) All of these

Ans. (4)

21. The basic character of the transition metal monoxides follows the order :

(Atomic No. $\text{Ti} = 22$, $\text{V} = 23$, $\text{Cr} = 24$, $\text{Fe} = 26$)

- (1) $\text{TiO} > \text{FeO} > \text{VO} > \text{CrO}$
- (2) $\text{TiO} > \text{VO} > \text{CrO} > \text{FeO}$
- (3) $\text{VO} > \text{CrO} > \text{TiO} > \text{FeO}$
- (4) $\text{CrO} > \text{VO} > \text{FeO} > \text{TiO}$

Ans. (2)

22. AgCl on fusion with sodium carbonate, gives :

- (1) Ag_2CO_3 (2) Ag_2O (3) Ag (4) Ag_2C_2

Ans. (3)

23. Which of the following reactions is used to estimate copper volumetrically ?

- (1) $2\text{Cu}^{2+} + 4\text{F}^- \longrightarrow \text{Cu}_2\text{F}_2 + \text{F}_2$
(2) $\text{Cu}^{2+} + 4\text{NH}_3 \longrightarrow [\text{Cu}(\text{NH}_3)_4]^{2+}$
(3) $2\text{Cu}^{+2} + 2\text{CNS}^- + \text{SO}_2 + 2\text{H}_2\text{O} \longrightarrow \text{Cu}_2(\text{CNS})_2 + \text{H}_2\text{SO}_4 + 2\text{H}^+$
(4) $2\text{Cu}^{2+} + 4\text{I}^- \longrightarrow \text{Cu}_2\text{I}_2 + \text{I}_2$

Ans. (4)

24. Atomic size of gold is almost the same as that of silver. It is due to :

- (1) the same crystal structure of silver and gold
(2) almost the same electropositive character of the two metals
(3) transition metals contraction in a series
(4) the effect of lanthanide contraction

Ans. (4)

f-Block Elements

25. The elements from thorium (At.No. 90) to lawrencium (At.No. 103) in which 5f energy levels are filled up are called:

- (1) lanthanides (2) rare earths (3) actinides (4) transuranics

Ans. (3)

26. Select the element in the following which does not show +4 oxidation state :

- (1) Ti (2) Zr (3) La (4) Pt

Ans. (3)

27. With increase in atomic number the ionic radii of actinides :

- (1) contract slightly (2) increase gradually (3) show no change (4) change irregularly

Ans. (1)

28. The general electronic configuration of lanthanide is :

- (1) $[\text{Xe}] 4f^{1-4} 5d^{0-1} 6s^2$ (2) $[\text{Xe}] 4f^{0-14} 5d^{1-2} 6s^1$
(3) $[\text{Xe}] 4f^{0-14} 5d^{0-1} 6s^{1-2}$ (4) None of these

Ans. (4)

29. Cerium can show the oxidation state of +4 because

- (1) it resemble alkali metals
(2) it has very low value of I.E.
(3) of its tendency to attain noble gas configuration of xenon
(4) of its tendency to attain $4f^7$ configuration

Ans. (3)

30. In aqueous solution Eu^{+2} acts as :

- (1) an oxidising agent (2) reducing agent
(3) can act as redox agent (4) None of them

Ans. (2)

31. The maximum oxidation state shown by actinides is :

- (1) +6 (2) +7 (3) +5 (4) +4

Ans. (2)

32. The outer electronic configuration of gadolinium (At. No. 64) is :

- (1) $4f^7 5d^1 6s^2$ (2) $4f^8 5d^0 6s^2$ (3) $4f^8 5d^1 6s^1$ (4) $4f^7 5d^0 6s^2$

Ans. (1)

33. The most characteristic oxidation state of lanthanides is :

- (1) +2 (2) +3 (3) +4 (4) none of these

Ans. (2)

34. The stable oxidation state of actinides is :

- (1) +4 (2) +3 (3) +5 (4) +6

Ans. (2)

35. Which of the following f - block elements, will change its group on emitting α -particle (alfa particle) :

- (a) $_{58}\text{Ce}$ (b) $_{70}\text{Lu}$ (c) $_{90}\text{Th}$ (d) $_{92}\text{U}$

Correct answer is :-

- (1) Only a and c (2) Only b and d (3) All (4) None

Ans. (1)

36. Which of the following pair have almost similar size

- (1) Ti_{22} and Zr_{40} (2) Nb_{41} and Ta_{73} (3) Y_{39} and La_{57} (4) Ca_{20} and Ir_{31}

Ans. (2)

37. An increase in both atomic and ionic radii with atomic number occurs in any group of the periodic table. In accordance of this the ionic radii of Ti (IV) and Zr (IV) ions are 0.68 Å and 0.74 Å respectively but for Hf (IV) ion the ionic radius is 0.75 Å, which is almost the same as that for Zr (IV) ion. This is due to :-

- (1) greater degree of covalency in compounds of Hf^{4+}
(2) Lanthanide contraction
(3) Difference in the co-ordination number of Zr^{+4} and Hf^{+4} in their compounds
(4) Actinide contraction

Ans. (2)

Analytical Exercise

1. The correct order of ionic radii of Y^{3+} , La^{3+} , Eu^{3+} and Lu^{3+} is

- (1) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$ (2) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$
 (3) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (4) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

Ans. (4)

2. Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is :

- (1) Ti^{2+} , V^{3+} , Cr^{4+} , Mn^{5+} (2) Ti^{2+} , V^{2+} , Cr^{3+} , Mn^{4+} (3) Ti^+ , V^{4+} , Cr^{6+} , Mn^{7+} (4) Ti^{4+} , V^{3+} , Cr^{2+} , Mn^{5+}

Ans. (1)

3. The aqueous solution containing which one of the following ions will be colourless :-

[Atomic no. : Sc = 21, Fe = 26, Ti = 22, Mn = 25]

- (1) Fe^{2+} (2) Mn^{2+} (3) Ti^{3+} (4) Sc^{3+}

Ans. (4)

4. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is

- (1) +4 (2) +6 (3) +2 (4) +3

Ans. (4)

5. The lanthanide contraction is responsible for the fact that

- (1) Zr and Y have about the same radius (2) Zr and Nb have similar oxidation state
 (3) Zr and Hf have about the same radius (4) Zr and Zn have the same oxidation state

Ans. (3)

6. Which one of the following nitrates will leave behind a metal on strong heating ?

- (1) Copper nitrate (2) Manganese nitrate (3) Silver nitrate (4) Ferric nitrate

Ans. (3)

7. Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solution is added to it. Which of the statements is incorrect for this reaction :-

- (1) $Na_2S_2O_3$ is oxidised (2) CuI_2 is formed (3) Cu_2I_2 is formed (4) Evolved I_2 is reduced

Ans. (2)

8. In which of the following oxidation state of Mn is six

- (1) K_2MnO_4 (2) MnO_2 (3) $KMnO_4$ (4) MnO_4^{-1}

Ans. (1)

9. Which has maximum magnetic moment :-

- (1) Co^{+2} (2) Mn^{+3} (3) Mn^{+2} (4) Cr^{+3}

Ans. (3)

10. Atomic number 21, shows the oxidation states

- (1) +1 (2) +3 (3) -1 (4) +5

Ans. (2)

11. Transition element makes complex compound due to -

- (1) Presence of empty d-orbital (2) large size
 (3) variable valency (4) presence of $2e^-$

Ans. (1)

12. Lanthanoid contraction is caused due to

- (1) the same effective nuclear charge from Ce to Lu
 (2) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge
 (3) the appreciable shielding on outer electrons by 4f electrons from the nuclear charge
 (4) the appreciable shielding on outer electrons by 5d electrons from the nuclear charge

Ans. (2)

13. KMnO_4 is a strong oxidizing agent in acid medium. To provide acid medium H_2SO_4 is used instead of HCl . This is because

- (1) H_2SO_4 is a stronger acid than HCl
- (2) HCl is oxidized by KMnO_4 to Cl_2
- (3) H_2SO_4 is a dibasic acid
- (4) rate is faster in the presence of H_2SO_4

Ans. (2)

14. When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to formation of

- (1) CrO_3
- (2) Cr_2O_3
- (3) CrO_5
- (4) CrO_4^{2-}

Ans. (3)

15. Identify the incorrect statement among the following

- (1) 4f and 5f orbitals are equally shielded
- (2) d-Block elements show irregular and erratic chemical properties among themselves
- (3) La and Lu have partially filled d orbitals and no other partially filled orbitals
- (4) The chemistry of various lanthanoids is very similar

Ans. (3)

16. The actinoids exhibit more number of oxidation states in general than the lanthanoids. This is because

- (1) the 5f orbitals extend further from the nucleus than the 4f orbitals
- (2) the 5f orbitals are more buried than the 4f orbitals
- (3) there is a similarity between 4f and 5f orbitals in their angular part of the wave function
- (4) the actinoids are more reactive than the lanthanoids

Ans. (2)

17. In $\text{Cr}_2\text{O}_7^{2-} \longrightarrow \text{CrO}_4^{2-}$ reaction the change in oxidation number is :-

- (1) +3
- (2) -3
- (3) 2
- (4) 0

Ans. (4)

18. Which of the following properties of Zr and Hf can be explained due to lanthanide contraction :

- (1) Radius of Zr and Hf is same
- (2) Their EN is same
- (3) They are f-block elements
- (4) All

Ans. (1)

19. Similar sizes of second and third transition elements can be explained on the basis of :

- (1) Inert-pair effect
- (2) Screening effect
- (3) Lanthanide contraction
- (4) Increasing effective nuclear charge

Ans. (3)

20. Iron exhibits +2 and +3 oxidation states. Which of the following statements about iron is incorrect ?

- (1) Ferrous compounds are more easily hydrolysed than the corresponding ferric compounds
- (2) Ferrous oxide is more basic in nature than the ferric oxide
- (3) Ferrous compounds are relatively more ionic than the corresponding ferric compounds
- (4) Ferrous compounds are less volatile than the corresponding ferric compounds

Ans. (1)

21. Four successive members of the first row transition elements are listed below with atomic numbers. Which one of them is expected to have the highest $E_{\text{M}^{3+}/\text{M}^{2+}}^0$ value ?

- (1) Cr (Z=24)
- (2) Mn (Z=25)
- (3) Fe (Z=26)
- (4) Co (Z=27)

Ans. (4)

Previous Year Exercise

1. The reason for greater range of oxidation states in actinoids is attributed to [NEET-2017]
 (1) The radioactive nature of actinoids
 (2) Actinoid contraction
 (3) 5f, 6d and 7s levels having comparable energies
 (4) 4f and 5d levels being close in energies
Ans. (3)
2. Name the gas that can readily decolourises acidified KMnO_4 solution : [NEET-2017]
 (1) CO_2 (2) SO_2 (3) NO_2 (4) P_2O_5
Ans. (2)
3. Which one of the following statements related to lanthanons is incorrect ? [NEET-(Phase-2)-2016]
 (1) Europium shows +2 oxidation state
 (2) The basicity decreases as the ionic radius decreases from Pr to Lu
 (3) All the lanthanons are much more reactive than aluminium
 (4) $\text{Ce}(+4)$ solutions are widely used as oxidizing agent in volumetric analysis
Ans. (3)
4. Jahn-Teller effect is not observed in high spin complexes of [NEET-(Phase-2)-2016]
 (1) d^7 (2) d^8 (3) d^4 (4) d^9
Ans. (2)
5. Which one of the following statements is corrected when SO_2 is passed through acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution ? [NEET-2016]
 (1) Green $\text{Cr}_2(\text{SO}_4)_3$ is formed (2) The solution turns blue
 (3) The solution is decolourized (4) SO_2 is reduced
Ans. (1)
6. The electronic configurations of Eu (Atomic No. 63), Gd (Atomic No. 64) and Tb (Atomic No. 65) are [NEET-2016]
 (1) $[\text{Xe}]4f^7 6s^2$, $[\text{Xe}]4f^7 5d^1 6s^2$ and $[\text{Xe}]4f^9 6s^2$ (2) $[\text{Xe}]4f^7 6s^2$, $[\text{Xe}]4f^8 6s^2$ and $[\text{Xe}]4f^8 5d^1 6s^2$
 (3) $[\text{Xe}]4f^6 5d^1 6s^2$, $[\text{Xe}]4f^7 5f^1$ and $[\text{Xe}]4f^9 6s^2$ (4) $[\text{Xe}]4f^6 5d^1 6s^2$, $[\text{Xe}]4f^8 5d^1 6s^2$ and $[\text{Xe}]4f^6 5d^1 6s^2$
Ans. (1)
7. Gadolinium belongs to 4f series. Its atomic number number is 64. Which of the following is the correct electronic configuration of gadolinium ? [Re-AIPMT-2015]
 (1) $[\text{Xe}]4f^7 5d^1 6s^2$ (2) $[\text{Xe}]4f^6 5d^2 6s^2$ (3) $[\text{Xe}]4f^8 6d^2$ (4) $[\text{Xe}]4f^9 5s^1$
Ans. (1)
8. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Numbers in the parenthesis are atomic numbers) [AIPMT-2015]
 (1) Zr (40) and Ta (73) (2) Ti (22) and Zr (40) (3) Zr (40) and Nb (41) (4) Zr (40) and Hf (72)
Ans. (4)
9. Blue colour of gas produced by [AIIMS-2015]
 (1) Cr_2O_3 (2) Fe_2O_3 (3) MnO (4) CoO
Ans. (4)
10. Coin is made up [AIIMS-2015]
 (1) Cu + Al (2) only Cu (3) only Fe (4) None
Ans. (1)

11. Highly unstable species is [AIIMS- 2015]
 (1) Sc(II) (2) Ti(II) (3) Co(II) (4) V(II)
Ans. (1)
12. Which of the following is diamagnetic [AIIMS- 2015]
 (1) Aurum (2) Tungsten (3) Palladium (4) Niobium
Ans. (3)
13. The pair of compounds that can exist together is [AIPMT-2014]
 (1) FeCl_3 , SnCl_2 (2) HgCl_2 , SnCl_2 (3) FeCl_2 , SnCl_2 (4) FeCl_3 , KI
Ans. (3)
14. The reaction of aqueous KMnO_4 with H_2O_2 in acidic conditions gives [AIPMT-2014]
 (1) Mn^{4+} and O_2 (2) Mn^{2+} and O_2 (3) Mn^{2+} and O_3 (4) Mn^{4+} and MnO_2
Ans. (2)
15. Which magnetic moment 2.83 BM is given by which of the following ions ? (At. nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28) [AIPMT-2014]
 (1) Ti^{3+} (2) Ni^{2+} (3) Cr^{3+} (4) Mn^{2+}
Ans. (2)
16. Reason of lanthanoid contraction is [AIPMT-2014]
 (1) Negligible screening effect of 'f' orbitals (2) Increasing nuclear charge
 (3) Decreasing nuclear charge (4) Decreasing screening effect
Ans. (1)
17. Which of the following lanthanoid ions is diamagnetic ? (At. nos. Ce = 58, Sm = 62, Eu = 63, Yb = 70) [NEET-2013]
 (1) Sm^{2+} (2) Eu^{2+} (3) Yb^{2+} (4) Ce^{2+}
Ans. (3)
18. Which of the following statements about the interstitial compounds is incorrect ? [NEET-2013]
 (1) They are chemically reactive
 (2) They are much harder than the pure metal
 (3) They have higher melting points than the pure metal
 (4) They retain metallic conductivity
Ans. (1)
19. Which of the following element has lowest melting point : [AIIMS- 2013]
 (1) Cr (2) Fe (3) Ni (4) Cu
Ans. (4)
20. Maximum no. of unpaired electrons are present in :- [AIIMS- 2013]
 (1) Gd^{+3} (2) Yb^{+2} (3) Tb^{+2} (4) Pm^{+3}
Ans. (1)
21. $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium converts into : [AIIMS- 2013]
 (1) Cr^{2+} (2) Cr^{3+} (3) Cr^{4+} (4) Cr^{+5}
Ans. (2)
22. Magnetic moment of Cr^{2+} is nearest to :- [AIIMS- 2013]
 (1) Fe^{2+} (2) Mn^{2+} (3) Co^{+2} (4) Ni^{2+}
Ans. (1)

23. Which of the statements is not true? [AIPMT (Prelims) –2012]
 (1) $K_2Cr_2O_7$ solution in acidic medium is orange
 (2) $K_2Cr_2O_7$ solution becomes yellow on increasing the pH beyond 7
 (3) On passing H_2S through acidified $K_2Cr_2O_7$ solution, a milky colour is observed
 (4) $Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis
Ans. (4)
24. Which one of the following does not correctly represent the correct order of the property indicated against it? [AIPMT(Prelims)-2012]
 (1) $Ti < V < Cr < Mn$: Increasing number of oxidation states
 (2) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: Increasing magnetic moment
 (3) $Ti < V < Cr < Mn$: Increasing melting points
 (4) $Ti < V < Mn < Cr$: Increasing 2nd ionization enthalpy
Ans. (3)
25. Which of the following exhibits only +3 oxidation state ? [AIPMT Mains–2012]
 (1) U (2) Th (3) Ac (4) Pa
Ans. (3)
26. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^\circ_{M^{2+}/M}\right)$ values has a positive sign ? [AIPMT Mains–2012]
 (1) Co (Z = 27) (2) Ni (Z = 28) (3) Cu (Z = 29) (4) Fe (Z = 26)
Ans. (3)
27. Acidified $K_2Cr_2O_7$ solution turns green when Na_2SO_3 is added to it. This is due to the formation of : [AIPMT (Prelims) –2011]
 (1) $CrSO_4$ (2) $Cr_2(SO_4)_3$ (3) CrO_4^{2-} (4) $Cr_2(SO_3)_3$
Ans. (2)
28. For the four successive transition elements (Cr, Mn, Fe and Co), the stability of +2 oxidation state will be there in which of the following order ? (At. nos. Cr = 24, Mn = 25, Fe = 26, Co = 27) [AIPMT (Prelims) –2011]
 (1) $Cr > Mn > Co > Fe$ (2) $Mn > Fe > Cr > Co$ (3) $Fe > Mn > Co > Cr$ (4) $Co > Mn > Fe > Cr$
Ans. (2)
29. Which of the following ions will exhibit colour in aqueous solutions ? [AIPMT (Prelims) –2010]
 (1) La^{3+} (z = 57) (2) Ti^{3+} (z = 22) (3) Lu^{3+} (z = 71) (4) Sc^{3+} (z = 21)
Ans. (2)
30. Which one of the following ions has electronic configuration $[Ar]3d^6$? [AIPMT (Prelims) –2010]
 (2) Ni^{3+} (3) Mn^{3+} (4) Fe^{3+} (1) Co^{3+}
Ans. (4)
31. Which of the following pairs has the same size ? [AIPMT (Prelims) –2010]
 (1) Fe^{2+} , Ni^{2+} (2) Zr^{4+} , Ti^{4+} (3) Zr^{4+} , Hf^{4+} (4) Zn^{2+} , Hf^{4+}
Ans. (3)
32. Which of the following oxidation states is the most common among the lanthanoids ? [AIPMT (Prelims) –2010]
 (1) 4 (2) 2 (3) 5 (4) 3
Ans. (4)
33. The correct order of decreasing second ionisation enthalpy of Ti (22), V(23), Cr(24) and Mn (25) is:- [AIPMT (Prelims) –2008]
 (1) $Ti > V > Cr > Mn$ (2) $Cr > Mn > V > Ti$ (3) $V > Mn > Cr > Ti$ (4) $Mn > Cr > Ti > V$
Ans. (2)

34. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be [AIPMT (Prelims) –2008]

- (1) 0.2 moles (2) 0.6 moles (3) 0.4 moles (4) 7.5 moles

Ans. (2)

35. Identify the incorrect statement among the following [AIPMT (Prelims) –2007]

- (1) Shielding power of 4f electrons is quite weak.
(2) There is a decrease in the radii of the atoms or ions as one proceeds from La to Lu.
(3) Lanthanoid contraction is the accumulation of successive shrinkages.
(4) As a result of lanthanoid contraction, the properties of 4d series of the transition elements have no similarities with the 5d series of elements.

Ans. (4)

36. Which one of the following ions is the most stable in aqueous solution [AIPMT (Prelims) –2007]

(Atomic number Ti = 22, V = 23, Cr = 24, Mn = 25)

- (1) Mn^{2+} (2) Cr^{3+} (3) V^{3+} (4) Ti^{3+}

Ans. (2)

37. More number of oxidation states are exhibited by the actinoids than by the lanthanoids. The main reason for this is [AIPMT (Prelims) –2006]

- (1) More energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals
(2) Lesser energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals
(3) Greater metallic character of the lanthanoids than that of the corresponding actinoids
(4) More active nature of the actinoids

Ans. (2)

38. Copper sulphate dissolves in excess of KCN to give [AIPMT (Prelims) –2006]

- (1) CuCN (2) $[\text{Cu}(\text{CN})_4]^{3-}$ (3) $[\text{Cu}(\text{CN})_4]^{2-}$ (4) $\text{Cu}(\text{CN})_2$

Ans. (2)

39. In which of the following pairs are both the ions coloured in aqueous solution ? [AIPMT (Prelims) –2006]

(At. no. : Sc = 21, Ti = 22, Ni = 28, Cu = 29, Co = 27)

- (1) $\text{Ni}^{2+}, \text{Ti}^{3+}$ (2) $\text{Sc}^{3+}, \text{Ti}^{3+}$ (3) $\text{Sc}^{3+}, \text{Co}^{2+}$ (4) $\text{Ni}^{2+}, \text{Cu}^{+}$

Ans. (1)

40. The number of moles of KMnO_4 reduced one mole of KI in alkaline medium is [AIPMT (Prelims) –2005]

- (1) One fifth (2) Five (3) One (4) two

Ans. (4)

41. The aqueous solution containing which one of the following ions will be colourless ? [AIPMT (Prelims) –2005]

(Atomic no. Sc = 21, Fe = 26, Ti = 22, Mn = 25)

- (1) Sc^{3+} (2) Fe^{2+} (3) Ti^{3+} (4) Mn^{2+}

Ans. (1)

42. Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them expected to have the highest third ionization enthalpy ? [AIPMT (Prelims) –2005]

- (1) Vanadium (Z = 23) (2) Chromium (Z = 24) (3) Iron (Z = 26) (4) Manganese (Z = 25)

Ans. (4)

43. The main reason for larger number of oxidation states exhibited by the actinides than the corresponding lanthanides, is [AIPMT (Prelims) –2005]

- (1) Lesser energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals
(2) Larger atomic size of actinides than the lanthanides
(3) More energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals
(4) Greater reactive nature of the actinides than the lanthanides

Ans. (1)

Question asked prior to Medical Ent. Exams. 2005

44. The catalytic activity of transition metals and their compounds is ascribed mainly to

- (1) Their magnetic behaviour
- (2) Their unfilled d-orbitals
- (3) Their ability to adopt variable oxidation states
- (4) Their chemical reactivity

Ans. (3)

45. Which one of the following elements shows maximum number of different oxidation states in its compounds ?

- (1) Gd (2) La (3) Eu (4) Am

Ans. (4)

46. Without losing its concentration ZnCl_2 solution cannot be kept in contact with

- (1) Pb (2) Al (3) Au (4) Ag

Ans. (2)

47. Which ion is colourless ?

- (1) Cr^{4+} (2) Sc^{3+} (3) Ti^{3+} (4) V^{3+}

Ans. (2)

48. General electronic configuration of lanthanides is

- (1) $(n-2)f^{1-14} (n-1) d^{0-1} ns^2$ (2) $(n-2)f^{10-14} (n-1) d^{0-1} ns^2$
(3) $(n-2)f^{0-14} (n-1) d^{10} ns^2$ (4) $(n-2)d^{0-1} (n-1) f^{1-14} ns^2$

Ans. (1)

49. Which of the following shows maximum number of oxidation states ?

- (1) Cr (2) Fe (3) Mn (4) V

Ans. (3)

50. In the silver plating of copper, $\text{K}[\text{Ag}(\text{CN})_2]$ is used instead of AgNO_3 . The reason is

- (1) A thin layer of Ag is formed on Cu
- (2) More voltage is required
- (3) Ag^+ ions are completely removed from solution
- (4) Less availability of Ag^+ ions, as Cu can not displace Ag from $[\text{Ag}(\text{CN})_2]^-$ ion

Ans. (4)

51. CuSO_4 when reacts with KCN forms CuCN, which is insoluble in water. It is soluble in excess of KCN, due to formation of the following complex

- (1) $\text{K}_2[\text{Cu}(\text{CN})_4]$ (2) $\text{K}_3[\text{Cu}(\text{CN})_4]$ (3) $\text{Cu}(\text{CN})_2$ (4) $\text{Cu}[\text{K Cu}(\text{CN})_4]$

Ans. (2)

52. Which of the following is expected to be coloured in solutions ?

- (1) Cu^+ (2) Cu^{2+} (3) Ti^{4+} (4) Sc^{3+}

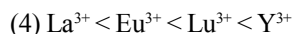
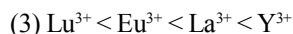
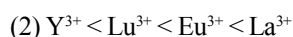
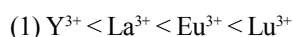
Ans. (2)

53. The basic character of the transition metal monoxides follows the order (Atomic nos. Ti = 22, V = 23, Cr = 24, Fe = 26)

- (1) $\text{VO} > \text{CrO} > \text{TiO} > \text{FeO}$ (2) $\text{CrO} > \text{VO} > \text{FeO} > \text{TiO}$
(3) $\text{TiO} > \text{FeO} > \text{VO} > \text{CrO}$ (4) $\text{TiO} > \text{VO} > \text{CrO} > \text{FeO}$

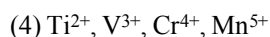
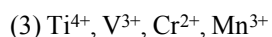
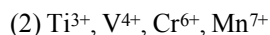
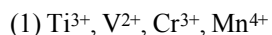
Ans. (4)

54. The correct order of ionic radii of Y^{3+} , La^{3+} , Eu^{3+} and Lu^{3+} is (Atomic nos. Y = 39, La = 57, Eu = 63, Lu = 71)



Ans. (2)

55. Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is (At. Nos. Ti = 22, V = 23, Cr = 24, Mn = 25)



Ans. (4)

56. Lanthanoids are

(1) 14 elements in the sixth period (atomic number 90 to 103) that are filling 4f sublevel

(2) 14 elements in the seventh period (atomic number 90 to 103) that are filling 5f sublevel

(3) 14 elements in the sixth period (atomic number = 58 to 71) that are filling the 4f sublevel

(4) 14 elements in the seventh period (atomic number = 50 to 71) that are filling 4f sublevel

Ans. (3)

57. Which of the following statement is not correct

(1) $La(OH)_2$ is less basic than $Lu(OH)_3$

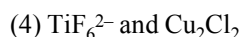
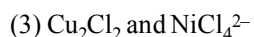
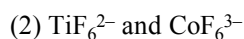
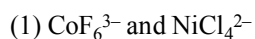
(2) In lanthanide series ionic radius of Lu^{+3} ion decreases

(3) La is actually an element of transition series rather lanthanides

(4) Atomic radius of Zr and Hf are same because of lanthanide contraction

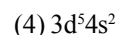
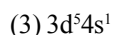
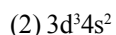
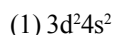
Ans. (1)

58. Out of TiF_6^{2-} , CoF_6^{3-} , Cu_2Cl_2 and $NiCl_4^{2-}$ (Z of Ti = 21, Co = 27, Cu = 29, Ni = 28) the colourless species are



Ans. (4)

59. Which one of the elements with the following outer orbital configurations may exhibit the largest number of oxidation states ?



Ans. (4)

60. The highest possible oxidation state shown by osmium in its compound is



Ans. (2)

ASSERTION & REASON QUESTIONS

These questions consist of two statements each, printed as *Assertion* and *Reason*. While answering these Questions you are required to choose any one of the following four responses.

- A. If both *Assertion* & *Reason* are True & the *Reason* is a correct explanation of the *Assertion*.
- B. If both *Assertion* & *Reason* are True but *Reason* is not a correct explanation of the *Assertion*.
- C. If *Assertion* is True but the *Reason* is False.
- D. If both *Assertion* & *Reason* are False.

1. *Assertion* : 1st ionisation potential of mercury is greater than cadmium
Reason : Hg has stable electronic configuration ($5d^{10} 6s^2$)

Ans. (B)

2. *Assertion* : Zr and Hf have about the same atomic radius.
Reason : Zr and Hf lies in the same group.

Ans. (B)

3. *Assertion* : Zn, Cd, Hg are transition metal.
Reason : Outer most shell is completely filled in Zn, Cd, Hg

Ans. (C)

4. *Assertion* : Cu^+ is more stable than Cu^{+2}
Reason : $\Delta I.P.$ is greater than 16 eV

Ans. (D)

5. *Assertion* : In magnetic field weight of MnSO_4 increases
Reason : MnSO_4 is paramagnetic

Ans. (A)

6. *Assertion* : KMnO_4 is dark pink coloured compound
Reason : In the KMnO_4 charge transfer spectrum occurs.

Ans. (A)

7. *Assertion* : Hg is the only metal which is liquid at 0°C .
Reason : It has very high IP and weak metallic bond

Ans. (A)

8. *Assertion* : Valency of transition elements is variable
Reason : Energy of ns and (n-1)d orbital is almost same.

Ans. (A)

9. *Assertion* : Melting point of Mn less than that of Fe
Reason : Mn has less number of unpaired e^- than Fe in atomic state

Ans. (C)

10. *Assertion* : Solution of Na_2CrO_4 in water is intensely coloured.
Reason : Ox. state of Cr in Na_2CrO_4 is +6.

Ans. (B)

11. **Assertion** : Ce^{+4} acts as oxidising agent in aqueous medium
Reason : +4 is common oxidation state of lanthanides
Ans. (C)
12. **Assertion** : Neptunium is transuranic element.
Reason : It is heavier than uranium
Ans. (A)
13. **Assertion** : $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$
Reason : Lanthanum is d-block element
Ans. (B)
14. **Assertion** : Actinides show much higher range of oxidation states
Reason : Energy difference between 5f and 6d orbitals is large
Ans. (B)
15. **Assertion** : All the lanthanide elements exhibits a common oxidation state of +3 in their compounds.
Reason : The atoms of the lanthanide elements contains three electron in their outermost shell.
Ans. (C)
16. **Assertion** : $\text{K}_2\text{Cr}_2\text{O}_7$ is used as a primary standard in volumetric analysis. [AIIMS-2006]
Reason : It has a good solubility in water.
Ans. (C)
17. **Assertion** : Change in colour of acidic solution of potassium dichromate by breath is used to test drunk drivers.
Reason : Change in colour is due to the complexation of alcohol with potassium dichromate.
Ans. (C)
18. **Assertion** : Eu^{2+} & Yb^{+2} are reducing agent for their ions.
Reason : Both ions have stable half filled configuration.
Ans. (C)