AIPMT 2006

1. In which of the following pairs are both the ions coloured in aqueous solution?
(At. no. : Sc= 21, Ti = 22, Ni = 28, Cu = 29, Co =27)
(1) Ni^{2+}, Cu^{+} (2) Ni^{2+}, Ti^{3+}
(3) Sc^{3+}, Ti^{3+} (4) Sc^{3+}, Co^{2+}

2. More number of oxidation states are exhibited by the actinoids than by the lanthanoids. The main reason for this is
(1) More active nature of the actinoids
(2) More energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals
(3) Lesser energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals
(4) Greater metallic character of the lanthanoids than that of the corresponding actinoids

AIPMT 2007

3. Which one of the following ions is the most stable in aqueous solution
(1) V^{3+} (2) Ti^{3+} (3) Mn^{3+} (4) Cr^{3+}

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

AIPMT 2008

5. The correct order of decreasing second ionisation enthalpy of Ti (22), V(23), Cr(24) and Mn (25) is:-
(1) Mn>Cr>Ti>V (2) Ti>V>Cr>Mn
(3) Cr>Mn>V>Ti (4) V>Mn>Cr>Ti

AIPMT 2009

6. Which one of the elements with the following outer orbital configurations may exhibit the largest number of oxidation states?
(1) $3d^2 4s^2$ (2) $3d^3 4s^2$
(3) $3d^5 4s^1$ (4) $3d^5 4s^2$

AIPMT 2010

7. Which of the following oxidation states is the most common among the lanthanoids :-
(1) 2 (2) 5 (3) 3 (4) 4

8. Which of the following pairs has the same size?
(1) Zn^{2+}, Hf^{4+} (2) Fe^{2+}, Ni^{2+}
(3) Zr^{4+}, Ti^{4+} (4) Zr^{4+}, Hf^{4+}

9. Which one of the following ions has electronic configuration [Ar]$3d^6$?
(At. no. Mn = 25, Fe = 26, Co = 27, Ni = 28)
(1) Co^{3+} (2) Ni^{3+} (3) Mn^{3+} (4) Fe^{3+}

10. Which of the following ions will exhibit colour in aqueous solutions ?
(1) Sc^{3+} (z = 21) (2) La^{3+} (z = 57)
(3) Ti^{3+}(z = 22) (4) Lu^{3+} (z = 71)

AIPMT Pre. 2011

11. For the four successive transition elements (Cr, Mn, Fe and Co), the stability of +2 oxidation state in gaseous state will be there in which of the following order ?
(1) Mn > Fe > Cr > Co
(2) Fe > Mn > Co > Cr
(3) Co > Mn > Fe > Cr
(4) Cr > Mn > Co > Fe
(At. no. Cr = 24, Mn = 25, Fe = 26, Co = 27)

AIPMT Pre. 2012

12. Which of the statements is not true?
(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

AIPMT Mains 2012

13. Which one of the following does not correctly represent the correct order of the property indicated against it ?
(1) Ti < V < Cr < Mn : increasing melting points
(2) Ti < V < Mn < Cr : increasing 2nd ionization enthalpy
(3) Ti < V < Cr < Mn : increasing number of oxidation states
(4) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

14. The catalytic activity of transition metals and their compounds is described mainly to :-
(1) Their ability to adopt variable oxidation states
(2) Their chemical reactivity
(3) Their magnetic behaviour
(4) Their unfilled d-orbitals

AIPMT 2015

15. Magnetic moment 2.84 B.M. is given by :-
(At. no.), Ni = 28, Ti = 22, Cr = 24, Co = 27)
(1) Ti^{3+} (2) Cr^{2+}
(3) Co^{2+} (4) Ni^{2+}

16. Which of the following processes does not involve oxidation of iron ?
(1) Decolourization of blue $CuSO_4$ solution by iron
(2) Formation of $Fe(CO)_5$ from Fe
(3) Liberation of H_2 from steam by iron at high temperature
(4) Rusting of iron sheets

17. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii ? (Number in the parenthesis are atomic numbers).
(1) Zr (40) & Nb (41) (2) Zr (40) & Hf (72)
(3) Zr (40) & Ta (73) (4) Ti (22) & Zr (40)

NEET-I 2016

18. Which one of the following statements is correct when SO_2 is passed through acidified $K_2Cr_2O_7$ solution ?
(1) The solution turns blue
(2) The solution is decolourized
(3) SO_2 is reduced
(4) Green $Cr_2(SO_4)_3$ is formed

19. The electronic configurations of Eu(Atomic No 63), Gd(Atomic No 64) and Tb (Atomic No. 65) are
(1) $[Xe]4f^76s^2$, $[Xe]4f^8\ 6s^2$ and $[Xe]4f^85d^16s^2$
(2) $[Xe]4f^65d^16s^2$,$[Xe]4f^7\ 5d^1\ 6s^2$ and $[Xe]4f^96s^2$
(3) $[Xe]4f^65d^16s^2$,$[Xe]4f^75d^16s^2$ and $[Xe]4f^85d^16s^2$
(4) $[Xe]4f^76s^2$, $[Xe]4f^75d^16s^2$ and $[Xe]4f^96s^2$

NEET-II 2016

20. Which one of the followng statements related to lanthanons is **incorrect** ?
(1) All the lanthanons are much more reactive than aluminium
(2) Ce(+4) solutions are widely used as oxidizing agent in volumetric analysis
(3) Europium shows +2 oxidation state.
(4) The basicity decreases as the ionic radius decreases from Pr to Lu.

NEET(UG) 2017

21. Name the gas that can readily decolourise acidified $KMnO_4$ solution :
(1) SO_2 (2) NO_2
(3) P_2O_5 (4) CO_2

22. $HgCl_2$ and I_2 both when dissolved in water containing I^- ions the pair of species formed is
(1) HgI_2, I^- (2) HgI_4^{2-}, I_3^-
(3) Hg_2I_2, I^- (4) HgI_2, I_3^-

23. The reason for greater range of oxidation states in actinoids is attributed to :-
(1) Actinoid contraction
(2) 5f, 6d and 7s levels having comparable energies
(3) 4f and 5d levels being close in energies
(4) The radioactive nature of actinoids

NEET(UG) 2018

24. Which one of the following ions exhibits d–d transition and paramagnetism as well ?

(1) CrO_4^{2-} (2) $Cr_2O_7^{2-}$

(3) MnO_4^- (4) MnO_4^{2-}

25. Match the metal ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the ***correct*** code :

Column I	**Column II**
a. Co^{3+}	i. $\sqrt{8}$ B.M.
b. Cr^{3+}	ii. $\sqrt{35}$ B.M.
c. Fe^{3+}	iii. $\sqrt{3}$ B.M.
d. Ni^{2+}	iv. $\sqrt{24}$ B.M.
	v. $\sqrt{15}$ B.M.

	a	**b**	**c**	**d**
(1)	iv	v	ii	i
(2)	i	ii	iii	iv
(3)	iv	i	ii	iii
(4)	iii	v	i	ii

NEET(UG) 2019

26. Which of the following reactions are disproportionation reaction ?

(a) $2Cu^+ \rightarrow Cu^{2+} + Cu^0$

(b) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(c) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(d) $2MnO_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5MnO_2 + 4H^{\oplus}$

Select the **correct** option from the following :-

(1) (a) and (b) only (2) (a), (b) and (c)

(3) (a), (c) and (d) (4) (a) and (d) only

27. The manganate and permanganate ions are tetrahedral, due to

(1) The π–bonding involves overlap of p–orbitals of oxygen with d–orbitals of manganese

(2) There is no π–bonding

(3) The π–bonding involves overlap of p–orbitals of oxygen with p–orbitals of managanese

(4) The π–bonding involves overlap of d–orbitals of oxygen with d–orbitals of manganate

NEET(UG) 2019 (ODISHA)

28. Match the catalyst with the process :-

Catalyst	**Process**
(i) V_2O_5	(a) The oxidation of ethyne to ethanal
(ii) $TiCl_4+Al(CH_3)_3$	(b) Polymerisation of alkynes
(iii) $PdCl_2$	(c) Oxidation of SO_2 in the manufacture of H_2SO_4
(iv) Nickel complexes	(d) Polymerisation of ethylene

Which of the following is the correct option ?

(1) i-c, ii-d, iii-a, iv-b (2) i-a, ii-b, iii-c, iv-d

(3) i-a, ii-c, iii-b, iv-d (4) i-c, ii-a, iii-d, iv-b

29. When neutral or faintly alkaline $KMnO_4$ is treated with potassium iodide, iodide ion is converted into 'X'. 'X' is-

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

30. The oxidation state of Cr in CrO_5 is :

(1) –6 (2) +12 (3) +6 (4) +4

NEET(UG) 2020

31. The calculated spin only magnetic moment of Cr^{2+} ion is :

(1) 2.84 BM (2) 3.87 BM

(3) 4.90 BM (4) 5.92 BM

32. Identify the incorrect statement.

(1) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same

(2) Cr^{2+} (d^4) is a stronger reducing agent than Fe^{2+}(d^6) in water.

(3) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

(4) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

NEET(UG) 2020(COVID-19)

33. The oxidation number of the underlined atom in the following species

(1) $Cu_2\underline{O}$ is –1 (2) $\underline{Cl}O_3^-$ is +5

(3) $K_2\underline{Cr}_2O_7$ is + 6 (4) $H\underline{Au}Cl_4$ is +3

Identify the incorrect option.

34. Match the following aspects with the respective metal.

Aspects	**Metal**
(a) The metal which reveals a maximum number of oxidation states	(i) Scandium
(b) The metal although placed in 3d-series is considered not as a transition element	(ii) Copper
(c) The metal which does not exhibit variable oxidation states	(iii) Manganese
(d) The metal which in +1 oxidation state in aqueous solution undergoes disproportionation	(iv) Zinc

Select the correct option :

(1) (a)-(i) (b)-(iv) (c)-(ii) (d)-(iii)

(2) (a)-(iii) (b)-(iv) (c)-(i) (d)-(ii)

(3) (a)-(iii) (b)-(i) (c)-(iv) (d)-(ii)

(4) (a)-(ii) (b)-(iv) (c)-(i) (d)-(iii)

NEET(UG) 2021

35. The **incorrect** statement among the following is :

(1) Actinoid contraction is greater for element to element than Lanthanoid contraction.

(2) Most of the trivalent Lanthanoid ions are colorless in the solid state.

(3) Lanthanoids are good conductors of heat and electricity.

(4) Actinoids are highly reactive metals, especially when finely divided.

36. Zr (Z =40) and Hf (Z =72) have similar atomic and ionic radii because of :

(1) Belonging to same group

(2) Diagonal relationship

(3) Lanthanoid contraction

(4) Having similar chemical properties

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	**2**	**3**	**4**	**2**	**3**	**4**	**3**	**4**	**1**	**3**	**1**	**4**	**1**	**1**	**4**
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	**2**	**2**	**4**	**4**	**1**	**1**	**2**	**2**	**4**	**1**	**1**	**1**	**1**	**3**	**3**
Question	31	32	33	34	35	36									
Answer	**3**	**1**	**1**	**2**	**2**	**3**									

1. Given below are two statements :

Statement-I : Ag is a transition element.

Statement-II : Ag atom has completely filled d-orbital ($4d^{10}$) in it's ground state.

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

(1) Both Statement-I and II are incorrect.

(2) Statement-I is correct while II is incorrect.

(3) Statement-I and II both are correct.

(4) Statement-I is incorrect and II is correct.

2. Given below are two statements :

Statement-I : All the transition elements show typical metallic properties such as high tensile strength, ductility but low thermal and electrical conductivity.

Statement-II : Zn, Cd & Hg are very hard and have low volatility.

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

(1) Statement-I is correct while II is incorrect.

(2) Both Statement-I and II are incorrect.

(3) Statement-I and II both are correct.

(4) Statement-I is incorrect and II is correct.

3. Given below are two statements :

Statement-I : Transition elements exhibit higher enthalpies of atomisation.

Statement-II : Transition elements have stronger inter atomic interaction.

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

(1) Statement-I is correct while II is incorrect.

(2) Statement-I and II both are correct.

(3) Both Statement-I and II are incorrect.

(4) Statement-I is incorrect and II is correct.

4. Given below are two statements :

Statement-I : Cr^{+2} act as reducing agent and Mn^{+3} act as oxidising agent.

Statement-II : $E^0(M^{+2}/M)$ value for all 3d-series element's are negative.

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

(1) Statement-I is incorrect and II is correct.

(2) Statement-I and II both are correct.

(3) Both Statement-I and II are incorrect.

(4) Statement-I is correct while II is incorrect.

5. Given below are two statements :

Statement-I : All Cu(II) halides are known except the iodide.

Statement-II : Increasing order of oxidising power is $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$

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

(1) Both Statement-I and II are incorrect.

(2) Statement-I is incorrect and II is correct.

(3) Statement-I and II both are correct.

(4) Statement-I is correct while II is incorrect.

6. Given below are two statements :

Statement-I : Ce^{+4} is a strong oxidant but Eu^{+2} is a strong reducing agent.

Statement-II : All lanthanoid ion in +3 oxidation state are paramagnetic.

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

(1) Statement-I and II both are correct.

(2) Both Statement-I and II are incorrect.

(3) Statement-I is correct while II is incorrect.

(4) Statement-I is incorrect and II is correct.

7. Match the column :

Column I (Catalysis)		Column II (Process)	
(i)	Ni in the presence of Hydrogen	(a)	Zieglar-Natta catalyst
(ii)	$CuCl_2$	(b)	Contact process
(iii)	V_2O_5	(c)	Vegetable oil to vegetable ghee
(iv)	$TiCl_4+Al(CH_3)_3$	(d)	Decon process

(1) i-a, ii-b, iii-c, iv-d
(2) i-c, ii-d, iii-b, iv-a
(3) i-c, ii-d, iii-a, iv-b
(4) i-b, ii-c, iii-d, iv-a

8. Match the column :

Column I (Property)		Column II (Element)	
(i)	Lanthanoid which show +4 oxidation state	(a)	Pm
(ii)	Lanthanoid which can show +2 oxidation state	(b)	Gd
(iii)	Radioactive lanthanoid	(c)	Ce
(iv)	Lanthanoid which has $4f^7$ configuration in +3 oxidation state	(d)	Eu

(1) i-a, ii-b, iii-c, iv-d
(2) i-c, ii-d, iii-b, iv-a
(3) i-c, ii-d, iii-a, iv-b
(4) i-b, ii-c, iii-d, iv-a

9. Match the column :

Column I		Column II	
(a)	$FeSO_4.7H_2O$	(p)	Green vitriol
(b)	$MgSO_4.7H_2O$	(q)	Blue vitriol
(c)	$ZnSO_4.7H_2O$	(r)	Eupsum salt
(d)	$CuSO_4.5H_2O$	(s)	White vitriol

(1) a-p, b-r, c-s, d-q
(2) a-q, b-r, s-s, d-p
(3) a-r, b-s, c-p, d-q
(4) a-q, b-p, c-s, d-r

10. Match the column :

Column I (Composition)		Column II (Alloy)	
(a)	Cu + Ni	(p)	Silver UK coins
(b)	Ni+Cu+ Zn	(q)	German silver
(c)	Cu+ Zn+ Sn	(r)	Gun metal
(d)	Ln(95%)+Fe	(s)	Misch metal

(1) a-p, b-q, c-r, d-s
(2) a-q, b-r, c-s, d-p
(3) a-s, b-q, c-r, d-p
(4) a-q, b-p, c-s, d-r

11. Match the column :

Column I (Compound)		Column II (Properties)	
(i)	K_2MnO_4	(a)	Amphoteric
(ii)	$KMnO_4$	(b)	Paramagnetic & green coloured
(iii	$K_2Cr_2O_7$	(c)	Diamagnetic & purple coloured
(iv)	V_2O_5	(d)	Diamagnetic & orange coloured

(1) i-a, ii-b, iii-c, iv-d (2) i-c, ii-d, iii-b, iv-a
(3) i-b, ii-c, iii-d, iv-a (4) i-d, ii-a, iii-b, iv-c

12. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .

Assertion (A) : $K_2Cr_2O_7$ is used as a primary standard solution in Titration.

Reason (R) : It is not a hygroscopic in nature.

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

(1) If (A) & (R) both are correct and (R) is the correct explanation of (A).
(2) If (A) & (R) both are correct but (R) is not the correct explanation of (A).
(3) (A) is not correct but (R) is incorrect.
(4) (A) & (R) both are correct.

13. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .

Assertion (A) : The 3rd ionisation energy of Gd is abnormally low.

Reason (R) : Exchange energy of 4f subshell is high.

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

(1) If (A) & (R) both are correct and (R) is the correct explanation of (A).

(2) If (A) & (R) both are correct but (R) is not the correct explanation of (A).

(3) (A) is not correct but (R) is incorrect.

(4) (A) & (R) both are correct.

14. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .

Assertion (A) : Ce^{+4} can oxidise water and it is a good analytical reagent.

Reason (R) : The E^0 value for Ce^{+4}/Ce^{+3} is +1.74V.

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

(1) If (A) & (R) both are correct and (R) is the correct explanation of (A).

(2) If (A) & (R) both are correct but (R) is not the correct explanation of (A).

(3) (A) is not correct but (R) is incorrect.

(4) (A) & (R) both are correct.

15. Given below are two statements; one is labelled as **Assertion (A)** and the other is labelled as **Reason(R)** .

Assertion (A) : Eu^{+2} & Yb^{+2} are reducing agent.

Reason (R) : Both ions have strong tendency to convert into stable +3 in its aq. solution.

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

(1) If (A) & (R) both are correct and (R) is the correct explanation of (A).

(2) If (A) & (R) both are correct but (R) is not the correct explanation of (A).

(3) (A) is not correct but (R) is incorrect.

(4) (A) & (R) both are correct.

16. Which of the following oxides are Amphoteric in nature.

(A) V_2O_5 (B) Cr_2O_3

(C) CrO_5 (D) Mn_2O_7

(1) If A, B and C options are correct.

(2) If A & B both options are correct.

(3) If B & D both are options correct.

(4) If A & C both are options correct.

17. Which of the following statement is correct.

(A) In Lanthanide series metallic radius regularly decreases from La to Lu.

(B) La is actually an elements of transition series rather than lanthanide.

(C) $La(OH)_3$ is less basic than $Lu(OH)_3$

(D) The atomic radius of Zr & Hf are nearly similar because of lanthanoid contraction.

(1) If A, B and C options are correct.

(2) If A & B both options are correct.

(3) If B & D both are options correct.

(4) If A & C both are options correct.

18. Which of the following element does not $[Ar]3d^5$ in its electronic configuration.

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

(1) If A, B and C options are correct.

(2) If A & B both options are correct.

(3) If B & D both are options correct.

(4) If A & C both are options correct.

19. Which of the following order of given properties are correct.

(A) $CrO > Cr_2O_3 > CrO_3$: Melting point

(B) $Mn_2O_7 > Mn_2O_3 > MnO$: Acidic nature

(C) $CrO_3 > MoO_3 > WO_3$: Oxidising nature character

(D) $V_2O_5 > V_2O_4 > V_2O_3$: Basic nature

(1) If A, B and C options are correct.

(2) If A & B both options are correct.

(3) If B & D both are options correct.

(4) If A & C both are options correct.

20. MnO_4^{-2} can be converted to MnO_4^-

(A) By oxidation of O_3
(B) By electrolytic oxidation
(C) By the addition of dil. H_2SO_4
(D) By the addition of HCl

(1) If A, B and C options are correct.
(2) If A & B both options are correct.
(3) If B & D both are options correct.
(4) If A & C both are options correct.

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	**3**	**2**	**2**	**4**	**3**	**3**	**2**	**3**	**1**	**1**	**3**	**1**	**1**	**1**	**1**
Question	16	17	18	19	20										
Answer	**2**	**3**	**3**	**1**	**1**										