CHEMISTRY

The d- and f-Block Elements

Speed TEST 50 Chapter-wise

No. of Questions	Maximum Marks	Time
45	180	1 Hour

GENERAL INSTRUCTIONS

- This test contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solutions provided at the end of this book.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

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

2. The addition of excess of aqueous HNO_3 to a solution containing $[Cu(NH_3)_4]^{2+}$ produces
(a) Cu^+ (b) $[Cu(H_2O)_4]^{2+}$
(c) $Cu(OH)_2$ (d) $Cu(NO_3)_2$

3. The "spin-only" magnetic moment [in units of Bohr magneton, (μ_B)] of Ni^{2+} in aqueous solution would be (At. No. Ni = 28)
(a) 6 (b) 1.73 (c) 2.84 (d) 4.90

4. In the form of dichromate, Cr (VI) is a strong oxidising agent in acidic medium but Mo (VI) in MoO_3 and W (VI) in WO_3 are not because _____ .
(i) Cr (VI) is more stable than Mo(VI) and W (VI).
(ii) Mo (VI) and W(VI) are more stable than Cr(VI).
(iii) Higher oxidation states of heavier members of group-6 of transition series are more stable.
(iv) Lower oxidation states of heavier members of group-6 of transition series are more stable.
(a) (i) and (ii) (b) (ii) and (iii)
(c) (i) and (iv) (d) (ii) and (iv)

5. Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them ?
(a) $(n-1)d^3\, ns^2$ (b) $(n-1)d^5\, ns^1$
(c) $(n-1)d^8\, ns^2$ (d) $(n-1)d^5\, ns^2$

6. $(n-1)d^{10}ns^2$ is the general electronic configuration of
(a) Fe, Co, Ni (b) Cu, Ag, Au
(c) Zn, Cd, Hg (d) Se, Y, La

RESPONSE GRID 1. (a)(b)(c)(d) 2. (a)(b)(c)(d) 3. (a)(b)(c)(d) 4. (a)(b)(c)(d) 5. (a)(b)(c)(d) 6. (a)(b)(c)(d)

Space for Rough Work

7. In the following salts the highest value of magnetic moment is observed in
(a) $MnSO_4.4H_2O$ (b) $CuSO_4.5H_2O$
(c) $FeSO_4.6H_2O$ (d) $ZnSO_4.7H_2O$

8. Which one of the following transition metal ions shows magnetic moment of 5.92 BM?
(a) Mn^{2+} (b) Ti^{3+} (c) Cr^{3+} (d) Cu^{2+}

9. Which of the following statements is incorrect?
(a) Zn,Cd and Hg due to presence of completely filled *d*-orbitals $[(n-1)d^{10}ns^2]$ are not studied along with other transition metals.
(b) Zn, Cd and Hg have low m.p and are comparitively softer than other transition metals.
(c) Metallic bond made by elements with d^5 configuration is stronger as compared to metalic bond made by elements with d^3 configuration.
(d) Metals of 5*d* series forms strong metallic bonds as compared with metals of 3*d* series.

10. Super conductors are derived from compounds of
(a) p-Block elements (b) lanthanides
(c) actinides (d) transition elements

11. Which of the following compounds has colour but no unpaired electrons?
(a) $KMnO_4$ (b) K_2MnO_4
(c) $MnSO_4$ (d) $MnCl_2$

12. What is the percentage of lanthanoid metal in mischmetall?
(a) 90% (b) 20% (c) 5% (d) 95%

13. Which of the following in its oxidation state shows the paramagnetism ?
(a) Tb(IV) (b) Lu(III) (c) Ce(IV) (d) La(III)

14. In neutral or faintly alkaline medium, thiosulphate is quantitatively oxidized by $KMnO_4$ to
(a) SO_3^{2-} (b) SO_4^{2-} (c) SO_2 (d) SO_5^{2-}

15. Wrought iron, pig iron and steel differ in properties due to
(a) carbon content (b) malleability
(c) conductivity (d) softness

16. The lanthanide contraction is responsible for the fact that
(a) Zr and Zn have the same oxidation state
(b) Zr and Hf have about the same radius
(c) Zr and Nb have similar oxidation state
(d) Zr and Y have about the same radius

17. $KMnO_4$ can be prepared from K_2MnO_4 as per the reaction:

$$3MnO_4^{2-} + 2H_2O \rightleftharpoons 2MnO_4^{2-} + MnO_2 + 4OH^-$$

The reaction can go to completion by removing OH^- ions by adding.
(a) KOH (b) CO_2 (c) SO_2 (d) HCl

18. On the basis of data given below,

$$E^\circ_{Sc^{3+}/Sc^{2+}} = -0.37\ V,\ E^\circ_{Mn^{3+}/Mn^{2+}} = +1.57\ V$$

$$E^\circ_{Cr^{2+}/Cr} = -0.90\ V,\ E^\circ_{Cu^{2+}/Cu} = 0.34\ V$$

Which of the following statements is incorrect?
(a) Sc^{3+} has good stability due of $[Ar]3d^04s^0$ configuration.
(b) Mn^{3+} is more stable than Mn^{2+}.
(c) Cr^{2+} is reducing in nature.
(d) Copper does not give H_2 on reaction with dil. H_2SO_4

19. Green vitriol is
(a) $FeSO_4.7H_2O$ (b) $ZnSO_4.7H_2O$
(c) $CaSO_4.2H_2O$ (d) $CuSO_4.5H_2O$

20. Number of moles of $K_2Cr_2O_7$ reduced by one mole of Sn^{2+} ions is
(a) $\frac{1}{3}$ (b) 3 (c) $\frac{1}{6}$ (d) 6

21. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^\circ_{M^{2+}/M}\right)$ value has a positive sign?
(a) Co (Z = 27) (b) Ni (Z = 28)
(c) Cu (Z = 29) (d) Fe (Z = 26)

RESPONSE GRID					
	7. (a)(b)(c)(d)	8. (a)(b)(c)(d)	9. (a)(b)(c)(d)	10. (a)(b)(c)(d)	11. (a)(b)(c)(d)
	12. (a)(b)(c)(d)	13. (a)(b)(c)(d)	14. (a)(b)(c)(d)	15. (a)(b)(c)(d)	16. (a)(b)(c)(d)
	17. (a)(b)(c)(d)	18. (a)(b)(c)(d)	19. (a)(b)(c)(d)	20. (a)(b)(c)(d)	21. (a)(b)(c)(d)

Space for Rough Work

22. Which of the following factors may be regarded as the main cause of lanthanoide contraction?
(a) Greater shielding of 5*d* electrons by 4*f* electrons
(b) Poorer shielding of 5*d* electrons by 4*f* electrons.
(c) Effective shielding of one of 4*f* electrons by another in the subshell
(d) Poor shielding of one of 4*f* electron by another in the subshell

23. AgCl is soluble in NH_4OH solution. The solubility is due to the formation of
(a) AgOH (b) Ag_2O
(c) $\left[Ag(NH_3)_2\right]^+$ (d) NH_4Cl

24. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are
(a) II, III in haematite and III in magnetite
(b) II, III in haematite and II in magnetite
(c) II in haematite and II, III in magnetite
(d) III in haematite and II, III in magnetite

25. In acidic medium $KMnO_4$ oxidises $FeSO_4$ solution. Which of the following statements is correct?
(a) 10 mL of 1N $KMnO_4$ solution oxidises 10 mL of 5 N $FeSO_4$ solution
(b) 10 mL of 1M $KMnO_4$ solution oxidises 10 mL of 5 N $FeSO_4$ solution
(c) 10 mL of 1M $KMnO_4$ solution oxidises 10 mL of 1M $FeSO_4$ solution
(d) 10 mL of 1N $KMnO_4$ solution oxidises 10 mL of 0.1M $FeSO_4$ solution

26. In which of the following lanthanides oxidation state +2 is most stable?
(a) Ce (b) Eu (c) Tb (d) Dy

27. Acidified solution of chromic acid on treatment with H_2O_2 gives blue colour which is due to
(a) $CrO_3 + H_2O + O_2$ (b) $CrO_5 + H_2O$
(c) $H_2Cr_2O_7 + H_2O + O_2$ (d) None of these

28. Which of the following is used in the preparation of chlorine?
(a) Only MnO_2
(b) Only $KMnO_4$
(c) Both MnO_2 and $KMnO_4$
(d) Either MnO_2 or $KMnO_4$

29. An explosion take place when conc. H_2SO_4 is added to $KMnO_4$. Which of the following is formed?
(a) Mn_2O_7 (b) MnO_2
(c) $MnSO_4$ (d) M_2O_3

30. Which of the following statements are correct ?
(i) Chromium has the highest melting point among the series 1 metals.
(ii) Number of unpaired electrons is greater in Cr than other elements of series 1.
(iii) In any row the melting point of transition metal increases as the atomic number increases.
(a) (i) and (iii) (b) (i) and (ii)
(c) (ii) and (iii) (d) (i), (ii) and (iii)

31. In the laboratory, manganese (II) salt is oxidised to permanganate ion in aqueous solution by
(a) hydrogen peroxide (b) conc. nitric acid
(c) peroxodisulphate (d) dichromate

32. Which of the following statements about the interstitial compounds is incorrect ?
(a) They are chemically reactive.
(b) They are much harder then the pure metal.
(c) They have higher melting points than the pure metal.
(d) They retain metallic conductivity.

33. Which of the following elements shows maximum number of different oxidation states in its compounds?
(a) Eu (b) Ld (c) Gd (d) Am

34. Identify the product and its colour when MnO_2 is fused with solid KOH in the presence of O_2.
(a) $KMnO_4$, purple (b) K_2MnO_4, dark green
(c) MnO, colourless (d) Mn_2O_3, brown

RESPONSE GRID					
	22. (a)(b)(c)(d)	**23.** (a)(b)(c)(d)	**24.** (a)(b)(c)(d)	**25.** (a)(b)(c)(d)	**26.** (a)(b)(c)(d)
	27. (a)(b)(c)(d)	**28.** (a)(b)(c)(d)	**29.** (a)(b)(c)(d)	**30.** (a)(b)(c)(d)	**31.** (a)(b)(c)(d)
	32. (a)(b)(c)(d)	**33.** (a)(b)(c)(d)	**34.** (a)(b)(c)(d)		

Space for Rough Work

35. In the extraction of silver from argentite ore. The ore is treated with dil. solution of NaCN in water in the presence of Y, whereby the following reaction takes place :

$Ag_2X + 4NaCN + 2Y \rightarrow 2Na[Ag(CN)_2] + Na_2XO_4 \cdot X$ and Y in this reaction are respectively :

(a) S and S (b) S and O_2

(c) O and O_2 (d) O and S

36. Which of the following compound is called Turnbull's blue?

(a) Ferricyanide (b) Ferrous ferricyanide

(c) Ferrous cyanide (d) Ferri-ferrocyanide

37. Which of the following element is responsible for oxidation of water to O_2 in biological process?

(a) Fe (b) Mn (c) Cu (d) Mo

38. Consider the following statements

(i) $La(OH)_3$ is the least basic among hydroxides of lanthanides.

(ii) Zr^{4+} and Hf^{4+} posses almost the same ionic radii.

(iii) Ce^{4+} can act as an oxidizing agent.

Which of the above is/are true ?

(a) (i) and (iii) (b) (ii) and (iii)

(c) (ii) only (d) (i) and (ii)

39. For making Ag from $AgNO_3$, which of the following is used

(a) PH_3 (b) phosphonium iodide

(c) Na_2CO_3 (d) NH_3

40. Which of the following conversions can be carried out by both acidified $K_2Cr_2O_4$ and acidified $KMnO_4$?

(i) $Fe^{2+} \rightarrow Fe^{3+} + e^-$

(ii) $I^- \rightarrow IO_3^-$

(iii) $I^- \rightarrow I_2$ (iv) $H_2S \rightarrow S$

(a) (i) and (iii) (b) (ii) and (iv)

(c) (i), (iii) and (iv) (d) (i), (ii) and (iii)

41. The catalytic activity of transition metals and their compounds is mainly due to :

(a) their magnetic behaviour

(b) their unfilled *d*-orbitals

(c) their ability to adopt variable oxidation state

(d) their chemical reactivity

42. Match the columns

	Column-I		Column -II
A.	Metal of the 3*d*-series which does not form MO type oxide.	I.	Manganese
B.	Metal of the 3*d*-series which forms most covalent oxide.	II.	Vanadium
C.	Metal of the 3*d*-series which forms the amphoteric oxide.	III.	Scandium

(a) A – I; B – III; C – II (b) A – III; B – I; C – II

(c) A – III; B – II; C – I (d) A – II; B – I; C – III

43. The basic character of the transition metal monoxides follows the order

(Atomic Nos.,Ti = 22, V = 23, Cr = 24, Fe = 26)

(a) TiO > VO > CrO > FeO (b) VO > CrO > TiO > FeO

(c) CrO > VO > FeO > TiO (d) TiO > FeO > VO > CrO

44. Excited state configuration of Mn^{2+} is

(a) t_{2g}^4 (b) $t_{2g}^3 e_g^2$ (d) $t_{2g}^4 e_g^2$ (d) $t_{2g}^5 e_g^0$

45. What would happen when a solution of potassium chromate is treated with an excess of dilute nitric acid?

(a) $Cr_2O_7^{2-}$ and H_2O are formed

(b) CrO_4^{2-} is reduced to +3 state of Cr

(c) CrO_4^{2-} is oxidized to +7 state of Cr

(d) Cr^{3+} and $Cr_2O_7^{2-}$ are formed

RESPONSE GRID					
	35. (a)(b)(c)(d)	**36.** (a)(b)(c)(d)	**37.** (a)(b)(c)(d)	**38.** (a)(b)(c)(d)	**39.** (a)(b)(c)(d)
	40. (a)(b)(c)(d)	**41.** (a)(b)(c)(d)	**42.** (a)(b)(c)(d)	**43.** (a)(b)(c)(d)	**44.** (a)(b)(c)(d)
	45. (a)(b)(c)(d)				

CHEMISTRY CHAPTERWISE SPEED TEST-50			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	42	Qualifying Score	65
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work