JEE MAIN ANSWER KEY & SOLUTIONS

SUBJECT :- CHEMISTRY
CLASS :- 12th **PAPER CODE :- CWT-5**
CHAPTER :- D & F BLOCK

ANSWER KEY

1.	(B)	**2.**	(A)	**3.**	(A)	**4.**	(C)	**5.**	(D)	**6.**	(A)	**7.**	(C)
8.	(B)	**9.**	(B)	**10.**	(D)	**11.**	(A)	**12.**	(A)	**13.**	(C)	**14.**	(B)
15.	(C)	**16.**	(B)	**17.**	(A)	**18.**	(B)	**19.**	(D)	**20.**	(C)	**21.**	4
22.	75	**23.**	6	**24.**	60	**25.**	6	**26.**	3.87	**27.**	7	**28.**	18
29.	0.85	**30.**	2.84										

SOLUTIONS

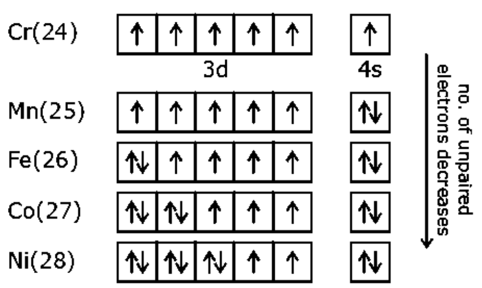
1. (B)
Sol. Due to larger size phosphorus, does not enter into void sites between the packed atoms of the crystalline metal.

2. (A)
Sol. Cerium ^{58}Ce [Xe]$4f^1$ $5d^1$ $6s^2$
Its most stable oxidation state is +3 but +4 is also existing.

3. (A)
Sol. Cr^+ has stable half filled electronic configuration, ^{18}[Ar] $3d^5$ $4s^0$. the removal of one more electron from this stable half filled configuration will require higher energy.

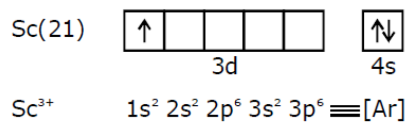
4. (C)
Sol. Cr(+3) oxidation state is stable because of t2g half filled.

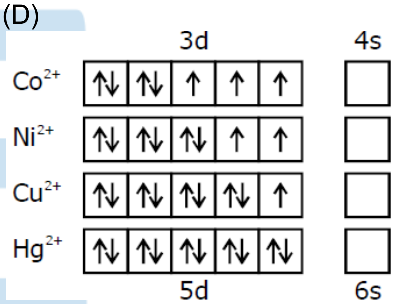
5. (D)
Sol. Zn ($3d^{10}$ $4s^2$)
No. of unpaired electrons in d-orbitals are responsible for metallic bonding.

6. (A)
Sol.


7. (C)
Sol. Np (93) : $5f^4$ $6d^1$ $7s^2$
Pu (94) : $5f^6$ $7s^2$
} common oxidation states +3, +4, +5, +6, +7
There is very small energy gap between 5f, 6s and 7s subshells. Hence, all their electrons can take part in bond formation.

8. (B)
Sol. The deep purple colour of KMnO4 is not due to d-d transition but due to charge transfer (from O to Mn) reducing the oxidation state of Mn from +7 to +6 momentarily.

9. (B)
Sol.


10. (D)
Sol.


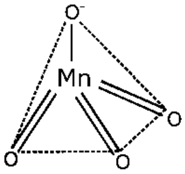
11. (A)
Sol. Mn^{+2} has half filled d-orbital and Cr^{+3} has half filled t_{2g} orbital and hence they are stable states.
$$\underset{\text{(Yellow)}}{2CrO_4^{2-}} + 2H^+ \longrightarrow \underset{\text{Orange red}}{Cr_2O_7^{2-}} + H_2O$$

12. (A)
Sol. Highest oxidation state of transition metal is acidic. Lowest oxidation state of transition metal is basic.

13. (C)
Sol. Cerium can also show the oxidation state of +4 in solution as it leads to a noble gas configuration, from ^{54} [Xe] $4f^1$ 5d1 $6s^2$ to ^{54}[Xe], after losing four electrons. It is only Ce^{4+} which exist in solution among the lanthanides.

14. (B)
Sol. (P) - (ii), (Q) - (i), (R) - (iv), (S) - (iii)
$TiCl_3$ → Ziegler-Natta polymerisation
$PdCl_2$ → Wacker process
$CuCl_2$ → Deacon's process
V_2O_5 → Contact process

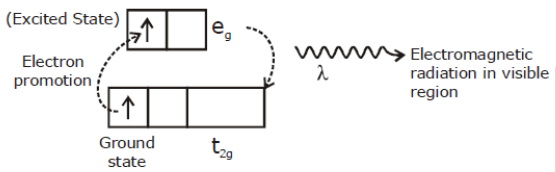
15. (C)
Sol. Tetrahedral structure of $MnO4^{-}$



16. (B)
Sol. Electrical conductivity; Ag > Au > Al
Density ; Os > Au > Hg
Melting Point ; Cr < Mo < W
Atomic Size ; Sc > Ti > V

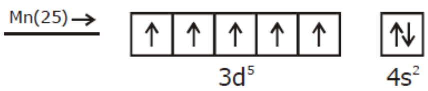
17. (A)
Sol. Greater the number of valence electrons, stronger is the resultant bonding and higher the enthalpy of atomisation.

18. (B)
Sol.



19. (D)
Sol. Fe^{2+} ; $3d^6\,4s^0$, Fe^{3+} ; $3d^5\,4s^0$
Stable configuration
$Fe^{2+} \rightarrow Fe^{3+} + e^-$ IE_3 is small (less than IE_2).

20. (C)
Sol.



Maximum O.S. = 7

21. 4
Sol. $\sqrt{15} = \sqrt{n(n+2)}$; n = 3, and three unpaired electrons are found when Mn is in Mn^{4+} i.e., $3d^3\,4s^0$ configuration as its metal electron configuration is ${}^{18}[Ar]\,3d^5\,4s^2$.
Mn in state = +4

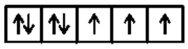
22. 75
Sol. 24 carats gold is considered 100% pure.
18 carat gold is $\frac{100}{24} \times 18 = 75\%$ pure

23. 6
Sol. In alkaline medium ; $Mn^{+7} \longrightarrow Mn^{+6}$

24. 60
Sol. 60 pm

25. 6
Sol. ${}^{26}Fe$ – $[Ar]3d^6\,4s^2$
Fe^{2+}(24 electrons) – $[Ar]3d^6\,4s^0$

26. 3.87
Sol. d^7



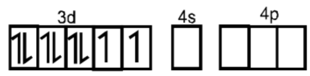
$n = 3;\ m = \sqrt{3(3+2)}$ BM
$= \sqrt{15}$ BM
= 3.87 B.M.

27. 7
Sol. Actinides show +7 maximum oxidation state.

28. 18
Sol. Cu (29) : $1s^2\,2s^2\,2p^6\,3s^2\,\underbrace{3p^6\,3d^{10}\,4s^1}_{\text{Total } 18e^-}$

29. 0.85
Sol. Due to lanthanide contraction there occurs net decrease in size. Only one 0.85Å is smaller one. So radius of ${}^{71}Lu^{3+}$ will be closest to 0.85Å.

30. 2.84
Sol. Valence shell electron configuration of ${}^{28}Ni^{2+}$ is $3d^8\,4s^0$. Or



So, number of unpaired electrons (n) = 2
$\therefore\ \mu = \sqrt{n(n+2)} = \sqrt{2(2+2)} = \sqrt{8} \approx 2.84$