CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

ELEMENTS OF D - BLOCK

Problems

1. What are coinage metals ? Are they transition elements ?

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2. Which element has pseudo inert gas electronic configuration?

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3. Elements with the general electronic configuration $(n-1)d^3ns^2$ belong to which group in the modern periodic table ?

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4. Among Cu, Ag, Zn and Cd which one is the biggest atom? why?

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5. Why the decrease in atomic radius amongst a series of transition elements is less when compared with representative elements ?

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6. Among $3d-$, $4d-$ and $5d-$ series elements, which elements has the least and which has the highest I_l?

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7. Name a transition metal which does not exhibit variable oxidation states.

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8. Among ferrous and ferric ions, which one is more stable? Why?

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9. Arrange the MnO_4^- and VO_2^+ ions in the increasing order of their oxidising power.

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10. $FeCl_3$ is known but not FeI_3 Why?

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11. Why is Cr^{2+} acts as reductant and Mn^{3+} as oxidant eventhough both have d^4 configuration ?

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12. Which is a stronger reducing agent among Cr^{2+} and Fe^{2+} ? Why ?

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13. Why Ti^{3+} and Cr^{2+} are readily oxidised in air?

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14. Why is the $E^{\ominus}$ value for the Mn^{3+}/Mn^{2+} couple much more position than that for Cr^{3+}/Cr^{2+} or Fe^{3+}/Fe^{2+} ? Explain.

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15. What is the value of one Bohr magneton in S.I. units?

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16. Calculated spin only magnetic moment of Cr^{x+} is 4.9 BM. Find the 'x' value.

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17. Calculate the spin only magnetic moment of Ti^{3+} in C.G.S unit

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18. $CaCl$ is colourless, while $CuSO_4.5H_2O$ is coloured. Explain?

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19. Eventhough Cu^{2+} has one unpaired d - electron, anhydrous copper sulphate is colourless. Why?

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20. Au(I) is diamagnetic, while Au(III) has a magnetic moment of 2.95 BM. Predict the colour of aurous and auric ions?

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21. Give some examples of the ions which are coloured but diamagnetic in nature.

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22. Potassium dicharomate solution is used to test drunker driver? Discuss.

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23. Vanadium pentoxide is coloured. Why?

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24. Comment on the inter-conversion of dichromate and chromate

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25. What is chemical volcano ?

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26. How many moles of $KMnO_4$ are required to oxidise one mole of ferrous oxalate in acidic medium ?

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27. Why manganate ion $\left(MnO_4^{2-}\right)$ undergo disproportionation in acidic solutions.

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28. Nitric acid is not suitable to acidify potassium permanganate. Why ?

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29. Variability in the oxidation states of lanthanides is limited. Why?

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30. In lanthanide series, which element is well known to exhibit $+4$ oridation state ? Why?

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31. Why $\ln^{2+}$ ions are reductants and $\ln^{4+}$ are oxidants ?

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32. What are the hydrolysis products of $\ln C_2$?

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33. Why actinides are not affected by nitric acid ?

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34. Actinides are called transuranic elements. Explain.

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35. Why actinides are more reactive than lanthanides?

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36. Complex compounds of transition metals are familier, but not inner transition elements. Why?

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Exercise 5 1 1

1. Define transition elements. Give the names and symbols of the metals of the first transition series.

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2. Write the electronic configuration of the elements of first transition series.

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3. Name some d-block elements which have anamolous electronic configurations. Give their outer shell configurations.

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4. Write the configuration of Cut, `Cu^(+), Co^(2+), Mn^(2+),

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5. Name the minerals of manganese and iron. Write their composition.

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Exercise 5 1 2

1. How does manganese show its variable oxidation states?

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2. The atomic radius along the 3d series decreases. Explain on the basis of their electron configuration.

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3. The colour of $\left[Ti(H_2O)_6\right]^{3+}$ is due to

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4. How does a catalyst work in a chemical reaction? Discuss the catalysis with suitable

examples.

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5. How do you classify magnetic substances? Give two examples each.

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6. What do you understand by non-stoichio metric compounds?

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7. What are alloys? How are they prepared?

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8. Mention any four alloys with composition and uses.

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9. Discuss the colour of the transition metal compounds with suitable examples.

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10. Explain the magnetic properties of first transition series metal ions.

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11. Wtite the characteristic properties of transition elements.

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12. Transition elements have high melting points. Why ?

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13. $CuSO_4.5H_2O$ has pale blue colour while $ZnSO_4, 7h_2O$ is white. Discuss.

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14. Predict which of the following will be coloured in aqueous solution?

$Ti^{3+}, V^{3+}, Cu^{+}, Sc^{3+}, Mn^{2+}, Fe^{3+}$ and Co^{2+}

. Give reasons for each

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15. The most common oxidation state of first transition series is $+2$. Explain.

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16. Write the characteristic properties of transition elements.

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Exercise 5 1 3

1. How the acidic nature, covalent character changes with the oxidation state for oxides of a transition metal.

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2. Explain the preparation of potassium dichro mate and potassium permanganate. Write their

uses.

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3. Discuss on the structures of chromate, dichromate, manganate and permanganate ions.

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4. Write any four oxidising properties of potassium dichromate.

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5. Write the oxidation properties of $KMnO_4$ in acidic and neutral medium.

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Exercise 5 1 4

1. Write the names and outer electronic configurations of $4f$ - series elements.

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2. What are the oxidation states exhibited by the Lanthanides? Write examples.


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Exercise 5 1 5

1. What are rare earths and transuranic elements?


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Exercise 5 2

1. Give some examples for the ions with pseudo inert gas electronic configuration.

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2. Explain the possible oxidation states of chromium by using electronic configuration.

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3. How the maximum and minimum oxidation states of transition elements related to configuration?

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4. What is the oxidation state of central metal in $\left[Ni(CO)_4\right]$ and $\in \left[Fe(CO)_5\right]$?

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5. How heat of atomisation changes in 3d-series elements are stable?

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6. Why copper(I) compounds undergo disproportionation in aqueous solutions.

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7. Transition elements exhibit their highest oxidation states in oxides and fluorides. Discuss.

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8. Among Fe^{2+} and Cr^{2+}, which is stronger reductant? Why?

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9. Ni^{2+} is more stable than Pt^{2+}, but Pt^{4+} is more stable than Ni^{4+}. Why?

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10. Ferrous oxalate is used in developing black and white photographic film. Discuss.

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11. In 3d-series which element has positive $E^{\circ}_{M^{2+}/M}$ value? Why?

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12. Fe^{3+} can oxidise halide ions. Discuss.

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13. Why calculated magnetic moment of Co^{2+} is less than the experimental magnetic

moment?

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14. Mn^{x+} has a magnetic moment of 4.9 BM. Calculate the value of x in the given ion.

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15. A salt of 3d metal gave a white precipitate with NH_4OH, but dissolves in excess NH_4OH. Name the 3d metal.

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16. What is the percentage of number of ferro ions in the non-stoichiometric compound $Fe_{0.93}O$.

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17. Addition of appreciable amount $KMnO_4$ in conc. H_2SO_4 explodes. Explain.

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18. An aqueous solution of $Al_2(SO_4)_3$, $FeSO_4$ and chrome alum is heated with excess Na_2O_2. A brown residue and an yellow filtrate are obtained. Discuss.

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19. E° for Mn^{3+}, Mn^{2+} is more positive than that for Fe^{3+}, Fe^{2+}, Why?

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20. Amongest the bivalent ions of 3d-elements, Mn(II) shows maximum paramagnetic character, Substantiate.

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21. Copper is regarded as transition metal, though it has completely filled 3d-orbitals. Explain.

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22. Compounds of iron are coloured and paramagnetic. Explain.

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23. In 3d-series which element cannot displace hydrogen gas from dilute acids? Why?

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24. Mn^{3+} is less stable than Mn^{2+} and Mn^{4+} ions. Why?

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25. Acidified dichromate solution turns green when sodium sulphide is added to it. Explain.

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26. How lanthanides differ from actinides in their oxidation states?

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27. Is any actinide has no electrons in 5f-subshell? If so name it.

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28. What is actinoid contraction ?

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29. Only chelate complexes of lanthanides are known, other complexes are less stable. Substainliate.

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30. Basic nature of $Lu(OH)_2$ is less than that of $La(OH)_3$. Why?

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31. Which lanthanide is synthetic? Write its electronic configuration.

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32. Trivalent ions of $Eu(Z = 63)$ and $Tb(Z = 65)$ have same colours. Explain.

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33. Eu^{2+} is good reductant, but Ce^{4+} is good oxidant. Explain.

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