

CHEMISTRY

BOOKS - R G PUBLICATION

THE d-AND f-BLOCK ELEMENTS

Exercise

1. Zn^{2+} salts are colourless while Cu^{2+} salts are coloured. Give reason.



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2. Give reasons: Why are Zn, Cd, and Hg normally not regarded as transition metals?



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3. Give reasons: Why is first ionization enthalpy of Cu is higher than that of Na?



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4. Give reasons: Name one ore each of the manganese and chromium.



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5. Give reasons: Why is HCl not used to acidify a permanganate solution in volumetric estimation of Fe^{2+} or $C_2O_4^{2-}$?



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6. Give reasons: What is lanthanoid contraction?



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7. In the first transition series of elements, which element shows highest oxidation state?



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8. Transition metal compounds are generally coloured. Why?



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9. What interstitial compounds?



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10. Aqueous solution of Ti^{4+} is colourless, but aqueous solution of Ti^{3+} is violet in

colour. Ex-plain.



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11. Copper (I) and d^{10} configuration, while copper (II) has d^9 configuration. Still Copper (II) is more stable in aqueous solution than Copper (I) Why?



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12. What are lanthanoids?



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13. Give the chemical equation for the reaction between a saturated solution of sodium dichromate and potassium chloride.



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14. Name a transition element of 3d series which does not exhibit variable oxidation state.



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15. In the first transition series of elements, which element shows highest oxidation state?



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16. Give reasons: Why is HCl not used to acidify a permanganate solution in volumetric estimation of Fe^{2+} or $C_2O_4^{2-}$?



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17. Why are powdered substances more effective adsorbents than their crystalline forms?



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18. What are transition elements? Give the general electronic configuration of transition elements.



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19. Silver atom has complete filled d-orbitals ($4d^{10}$) in its ground state. Yet, it is considered as transition element. Why?



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20. Actinoid contraction is greater from element to element than lanthanoid contraction. Why?



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21. Which of the first row transition metal exhibit +7 oxidation state?



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22. How would you account for irregular variation of 1st and 2nd ionisation enthalpies in the 1st series of transition elements?



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23. What interstitial compounds?



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24. Both Cu and Zn have completely filled 3d atomic orbital. Cu is considered as transition element but Zn is not. Explain.



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25. Compare the chemistry of Actinoids with that of the Lanthanoids with special reference to electronic configuration.



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26. Compare the chemistry of Actinoids with that of the Lanthanoids with special reference to oxidation state.



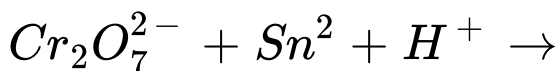
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27. Compare the chemistry of Actinoids with that of the Lanthanoids with special reference to atomic and ionic sizes.



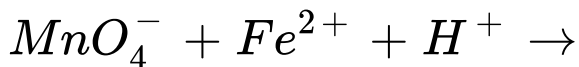
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28. Complete the following reaction equation:



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29. Complete the following reaction equation:



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30. How would you account for the following?

Transition metals and many of their compounds show paramagnetic behaviour.



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31. How would you account for the following?

The enthalpies of atomization of the transition metals are high.



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32. The transition metal compounds are



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33. How potassium permanganate is prepared? Give necessary chemical equations.



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34. Why is Cr^{2+} reducing and Mn^{3+} oxidising when both have d^4 configuration?





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35. Actinoid contraction is greater from element to element than lanthanoid contraction. Why?



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36. What interstitial compounds?



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37. Answer either: Calculate the number of unpaired electrons in the gaseous ion Cr^{3+} .



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38. How does the acidified permanganate solution react with the following? Write the ionic equations for the reactions: (i) KI (ii) iron(II) ion



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39. How does the acidified permanganate solution react with the following? Write the ionic equations for the reactions: oxalic acid



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40. What are transition elements? Give the general electronic configuration of transition elements.



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41. What are alloys? Name the metals used for the formation of bronze.



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42. How would you account for the following?
The transition metal compounds are good catalyst.



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43. Explain the following: In the titration of $FeSO_4$ with $KMnO_4$ in acidic medium, dilute HCl is not used.



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44. What are transition elements? Give the general electronic configuration of transition elements.



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45. Copper (I) and d^{10} configuration, while copper (II) has d^9 configuration. Still Copper (II) is more stable in aqueous solution than Copper (I) Why?



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46. Give two uses of potassium permanganate.



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47. Which has the largest radius?



Answer:



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48. Transition metal compounds are generally coloured. Why?

- A. Due to small size
- B. Due to metallic nature
- C. Due to unpaired d-electrons
- D. None of the above

Answer:



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49. Which of the transition metal forms green compound in its +3 oxidation state and yellow to orange compound in +6 oxidation state?

A. Cr

B. Co

C. Fe

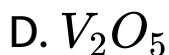
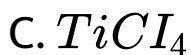
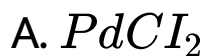
D. Ni

Answer:



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50. In Waker process the catalys used is



Answer:



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51. The similar properties of Hf & Zr is due to:

A. they belong to the same series.

B. they have same density

C. they have almost same electrode
potential

D. lanthanide contraction

Answer:



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52. The formation of M^{2+} ion from transition metal 'M' is governed by :

A. sum of electrode potential value and ionisation energy

B. sum of hydration energy and atomisation energy.

C. sum of first two ionisation energies and enthalpy of atomisation.

D. presence of 4S electrons.

Answer:



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53. The $E^\circ (M^{2+} / M)$ value for copper is positive because:

A. the electronic configuration of Cu is anomalous.

B. low value of heat of atomisation & low value of heat of hydration.

C. High value of heat of atomisation & low value of heat of hydration.

D. None of the above

Answer:



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54. Which of the following undergo disproportionation in aqueous solution?

A. Cu^{2+}



Answer:



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55. The emitted colour of Ti^{4+} ion is

A. Purple

B. Green

C. Red

D. Colourlex

Answer:



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56. Which of the following metal does not form MO type oxide?

A. Sc

B. Ti

C. Mn

D. V

Answer:



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57. In the dichromate dianion

A. 4 Cr-O bonds are equivalent

B. all Cr-O bonds are equivalent

C. all Cr-O bonds are equivalent

D. 6 Cr-O bonds are equivalent

Answer:



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58. What are transition elements? Give the general electronic configuration of transition elements.



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59. What are transition elements? Give the general electronic configuration of transition elements.



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60. Give reasons: Why are Zn, Cd, and Hg normally not regarded as transition metals?



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61. Silver atom has complete filled d-orbitals ($4d^{10}$) in its ground state. Yet, it is considered as transition element. Why?



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62. Why third ionisation enthalpy of Mn is very high?



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63. The variability of oxidation states of a transition element is differed by unity but in case of a non-transition element it is differed by two only.



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64. Flourine is more electronegative than oxygen. Oxygen foms compound Mn_2O_7 with manganese where Oxidation state of Mn is +7

but with fluorine, manganese forms MnF_4

where oxidation state of Mn is +4 Explain.



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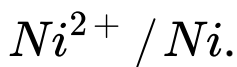
65. Between the couple Cr^{3+} / Cr^{2+} and Fe^{3+} / Fe^{2+} whose E value is more positive?

Why?



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66. Give the reason for negative E° value for



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67. What is 'spin only' formula?



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68. The observed magnetic moment of a transition metal ion is 5.96 BM. Calculate the

number of unpaired electrons.



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69. Copper (I) and d^{10} configuration, while copper (II) has d^9 configuration. Still Copper (II) is more stable in aqueous solution than Copper (I) Why?



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70. Draw the structure of $Cr_2O_7^{2-}$ ion.



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71. At room temperature why the reaction between oxalic acid and acidified $KMnO_4$ is very slow?



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72. Why La^{3+} ions are coloured?



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73. Write the composition of mischmetal.



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74. Write the composition of mischmetal.



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75. What are inner transition elements.



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76. What are coinage metals.



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77. Explain the following phenomenon:

Transition metals are much harder than the alkali metals.



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78. Actinoid contraction is greater from element to element than lanthanoid contraction. Why?



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79. How will you prepare: K_2MnO_4 from MnO_2 ?



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80. How will you prepare: $Na_2Cr_2O_7$ from Na_2CrO_4 ?



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81. Account for the following: Mn^{2+} is more stable than Fe^{2+} towards oxidation to +3 state.



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82. Account for the following: The enthalpy of atomization is lowest for Zn in 3d series of the transition elements.



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83. Account for the following: Actinoid elements show wide range of oxidation state.



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84. Explain the following facts: Among lanthanoids Ln(III) compounds are predominant, However, occasionally in solutions or in solid compounds, +2 and +4 ions are also obtained.



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85. The $E_{M^{2+}/M}^{\ominus}$ for copper is positive (+0.34V) It is only metal in the first series of transition elements showing this type of behaviour. Explain.





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86. Explain the following facts: The metallic radii of the 3rd (5d) series of transition metals are nearly the same as those of the corresponding members of the 2nd series.



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87. Explain briefly how +2 state becomes more and more stable in the first half of the first

row transition elements with increasing atomic number?



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88. Write three general characteristics of transition elements.



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89. Discuss about the melting point of transition elements.



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90. "In a given series of the transition elements the atomic size increases but this variation in size is very small". Explain.



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91. Account for the following: The enthalpy of atomization is lowest for Zn in 3d series of the transition elements.



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92. What is meant by 'Exchange energy'? How this energy affect the ionisation energy especially for chromium and copper?



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93. Compare the stability of +2 oxidation state for the elements of first transition series.



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94. Write four factors which affect the relative stability of various oxidation states for transition elements.



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95. Why E° values for Mn and Ni are negative?



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96. For $\frac{M^{2+}}{M}$ and $\frac{M^{3+}}{M^{2+}}$ systems the E°

values for some metals are as follow.

Cr^{2+}/Cr	-0.9V	$\text{Cr}^{3+}/\text{Cr}^{2+}$	-0.4V
Mn^{2+}/Mn	-1.2V	$\text{M}^{3+}/\text{Mn}^{2+}$	+1.5V
Fe^{2+}/Fe	-0.4V	$\text{Fe}^{3+}/\text{Fe}^{2+}$	+0.8V

use this data to comment upon;

(i) the stability of Fe^{3+} in acid solution as compared to that of Cr^{3+} or Mn^{3+} .

(ii) the case with which iron can be oxidised as compared to a similar process for either chromium or manganese metal? (M^{2+}/M আৰু M^{3+}/M^{2+} তদ্বয়ৰ কিছুমান ধাতুৰ E° ৰ মান হ'ল—)

Cr^{2+}/Cr	-0.9V	$\text{Cr}^{3+}/\text{Cr}^{2+}$	-0.4V
Mn^{2+}/Mn	-1.2V	$\text{M}^{3+}/\text{Mn}^{2+}$	+1.5V
Fe^{2+}/Fe	-0.4V	$\text{Fe}^{3+}/\text{Fe}^{2+}$	+0.8V



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97. Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only



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98. Explain the following facts: transition elements form coloured compounds



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99. Explain the following facts: Transition elements and their compounds show catalytic properties



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100. Explain the following facts: transition elements form complex compounds



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101. Explain the following facts: Transition metals form alloy



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102. Explain the following facts: Transition elements form interstitial compounds



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103. How $K_2Cr_2O_7$ is prepared? Write the necessary reactions involved.



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104. What happens when potassium dichromate reacts with H_2S and KI in acidic medium?



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105. Indicate the steps in the preparation of $KMnO_4$.



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106. Write the cause of lenthanide contraction.



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107. Actinoid contraction is greater from element to element than lanthanoid

contraction. Why?



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108. What is meant by disproportionation'. Give two examples of disproportionation reaction in aqueous solution.



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109. Compare the chemistry of actinoids with that of the lanthanoids with special reference

to chemical reactivity.



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110. Write three applications of d-block elements.



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111. Explain the following: Cu(I) ion is not known in aqueous solution



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112. How would you account for the following?

The enthalpies of atomization of the transition metals are high.



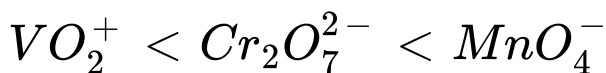
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113. Explain the following: Co (II) is stable in aqueous solution but in the presence of the complexing agents, it is easily oxidised.



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114. Explain the following: The oxidizing power of oxoanions are in the order



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115. Explain the following: The colour of potassium dichromate



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116. What happens when: Copper sulphate reacts with potassium iodide



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117. What happens when: Potassium permanganate is heated to 513K



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118. What happens when: What happens when: Oxalic acid react with $KMnO_4$ in acidic

medium



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119. What happens when: $KMnO_4$ reacts with KI in basic medium.



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120. What happens when: Manganous salt oxidised by $KMnO_4$ in presence of ZnO.



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121. Why is the highest oxidation state of a metal exhibited in its oxide or fluoride only



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122. How would you account for irregular variation of 1st and 2nd ionisation enthalpies in the 1st series of transition elements?



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123. In the first transition series of elements, which element shows highest oxidation state?



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124. Which transition metal of 3d series has positive $E^\circ (M^{2+} / M)$ value and why?



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125. Write the electronic configuration of Ce^{3+} ion, and calculate the magnetic moment on the basis of 'spin-only' formula (Atomic no of Ce=58)



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126. Explain the following: Co (II) is stable in aqueous solution but in the presence of the complexing agents, it is easily oxidised.



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127. The colour of potassium dichromate solution changes with the change of pH of the solution Explain how.



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128. Which metal in the first series of transition metal exhibit +1 oxidation state most frequently and why?



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129. Mention one factor in favour of presence of metal-metal bonding in compounds of the heavy transition elements.



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130. In p-block elements the lower oxidation state is favoured by heavier elements whereas in d-block elements this is just opposite why?



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131. What are interstitial compounds? Mention principal physical and chemical properties of these compounds.



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132. A blackish brown coloured solid 'A' when fused with alkali metal hydroxides in presence of air, produces a dark green coloured compound 'B' which on electrolytic oxidation in alkaline medium gives a dark purple

coloured compound 'C' Identify A, B and C and write the reactions involved.



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133. What happens when a acidic solution of the green compound 'B' is allowed to stand for some time. Give the equation involved. What in the type of reaction called?



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