



CHEMISTRY

BOOKS - V PUBLICATION

THE d- AND f- BLOCK ELEMENTS

Question Bank

1. Silver atom has completely filled d- orbitals ($4d^{10}$) in its ground state.

How can you say that it is a transition element?

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2. In the series Sc($Z=21$) to Zn($Z=30$), the enthalpy of atomisation of zinc is the lowest, i.e. $126 \text{ (kJ) mol}^{-1}$. Why?

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3. Which of the 3d series of elements exhibits the largest number of oxidation states. Why?

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4. The $E^0_{(m^{2+}/m)}$ values for copper is positive (0.34 V). What is the reason for this?

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5. How would you account for the irregular variation of ionisation enthalpies (first and second) in the first series of the transition elements?

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6. Why is the highest Oxidation state of a metal exhibited in its oxides or fluoride only?

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7. Which is a stronger oxidising agent Cr^{2+} or Fe^{2+} Why?

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8. Calculate the 'spin only' magnetic moment of M^{2+} (aq) ion (Atomic number Z of M= 27)

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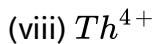
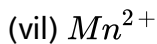
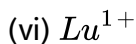
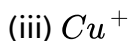
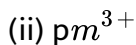
9. Explain why Cu^+ ion is not stable in aqueous solution?

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

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11. Write down the electronic configuration of:



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12. Why are Mn '2+') compounds more stable than Fe towards oxidation to their +3 state?

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13. 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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14. To what extent do the electronic configuration decide the stability of oxidation states first series of the transition elements? justify your answer with examples."

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15. What may be the stable oxidation-state of the transition element with the following d electron configurations. in the ground state of their atoms : $3d^3$, $3d^5$, $3d^8$ and $3d^4$

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16. Name the oxometal anions of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number.

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17. Write any one consequence of lanthanoid contraction.

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18. What are the characteristics of transition elements?

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19. In what way is the electronic configuration of the transition elements different from that of the non-transition elements?

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20. What are the different oxidation states exhibited by the lanthanoids?

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21. Explain giving reasons: i. Transition metals and many of their compounds show paramagnetic behaviour. ii. The enthalpies of atomisation of the transition metals are high. iii. The transition metals generally form coloured compounds. iv. Transition metals and their many compounds act as good catalyst.

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22. What are interstitial compounds? Why are such compounds well known for transition metals?

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23. In what way is the electronic configuration of the transition elements different from that of the non-transition elements?

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24. Describe the preparation of potassium dichromate from iron chromite ore. What is the effect of increasing pH on a solution of potassium dichromate?

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25. Describe the oxidising action of potassium dichromate and write the ionic equations for its reaction with: (i) Iodide (ii) Iron (ii) Solution (iii) H_2S



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26. Describe the preparation of potassium permanganate, How does the acidified permanganate solution react with (i) Iron(II) ions (ii) SO_3^{2-} and (iii) oxalic acid? Write the ionic equations for the reactions.



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27. For $\frac{(M)^{2+}}{M}$ and $\frac{(M)^{3+}}{(M)^{2+}}$ systems the $(E)^0$ values for some metals are as follows: $\frac{(Cr)^{2+}}{Cr} - \frac{(Cr)^3}{(Cr)^{2+}} = 0.4(\sim V)$ Use this data to comment upon:

i. the stability of Feitin acid solution as compared to that of $(Cr)^{3+}$ or $(Mn)^2 +$ ii. the ease with which iron can be oxidised as compared to a similar process for either chromium or manganese metal.



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28. Predict which of the following will be coloured Fe^{3+} and Co^{2+} . Give reasons for each.



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



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30. Compare the chemistry of actinoids with that of the lanthanoids with special reference to: i. electronic configuration ii. oxidation state iii. atomic and ionic sizes and iv, chemical, reactivity.



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31. How would you account for the following: i. Of the d^4 species, Cr^{2+} is strongly reducing while manganese(III) is strongly oxidising. ii. Cobalt(II) is stable in aqueous solution but, in the presence of complexing reagents it is easily oxidised. iii. The d^1 configuration is very unstable in ions?

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32. What is meant by "disproportionation"? Give two examples of disproportionation-reaction in aqueous, solution.

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33. Which metal in the first series of transition metals exhibits +1 oxidation state most frequently, and why?

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34. Calculate the number of unpaired electrons in the following gaseous ions: Mn^{3+} , Cr^{3+} , V^{2+} and Ti^{3+} , Which one of these is the most stable in aqueous solution?

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35. Give example and suggest reasons for the following features of the transition metal chemistry: a. The lowest oxide of transition metal is basic, "the highest is amphoteric/acidic.

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36. Describe the method of preparation of potassium dichromate from chromite ore.

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37. What are alloys? Name an important alloy which contains some of the lanthanoid metals. Mention its uses.

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38. What are inner transition elements? Decide which of the following atomic numbers are the atomic numbers of the inner transition elements :29,59 74,95,102,104

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39. The chemistry of the actinoid elements is not so smooth as that of the lanthanoids. Justify this statement by giving some examples from the oxidation state of these elements.

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40. Which is the last element in the series of the actinoids? Write the electronic configuration of this element. Comment on the possible oxidation state of this element.

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41. Use Hund's' rule to derive the electronic configuration of '(Ce)⁽³⁺⁾' ion and calculate its magnetic moment on the basis of "spin-only formula".

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42. Name the members. of the lanthanide series which exhibit +4 oxidation states and those which exhibit +2 oxidation states. Try to correlate this type of behaviour with the electronic configurations of these elements.

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43. Compare the chemistry of actinoids with that of the lanthanoids with special reference to: i. electronic configuration ii. oxidation state iii. atomic and ionic sizes and iv, chemical, reactivity.

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44. Write the electronic configuration of the element with the atomic numbers 61,91,100 and 109.

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45. Compare the general characteristics of the first series of the transition metals with those of the second and third series metals. in the respective vertical columns. Give special emphasis on the following points: (i) electronic configurations (ii) oxidation states iii) Ionisation enthalpies and iv) atomic sizes.

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46. Write down the number of 3 d electrons in each of the following ions: $(\text{Ti})^{(2+)}$, $(\text{V})^{(2+)}$, $(\text{Cr})^{(3+)}$, $(\text{Mn})^{(2+)}$, $(\text{Fe})^{(2+)}$, you expect the five 3 d-orbitals to be occupied for these hydrated ions (octahedral).

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47. Comment on the statement that elements of the First transition series possess many properties different from those of heavier transition elements.

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48. What can be inferred from the magnetic moment values of the following complex species? $\text{K}_4[\text{Mn}(\text{CN})_6]$, $[\text{Fe}(\text{H}_2\text{O})_6]$, $\text{K}_2[\text{MnCl}_4]$ is 2.2, 5.3 and 5.9 respectively.

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49. 1. Read the conversation:

ZINC: Oh Manganese and iron.... you are lucky, your compounds are coloured. But I cannot give colour to my compounds, which you have. a. Are the words of zinc true? b: Iron cannot put forward a solution for the problem being faced by Zn. Why?

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50. 2. Some d - block elements are given below: (Cr, Mn, Fe, Co, Ni) a. Identify the element which shows maximum paramagnetic behaviour: b. Give reason for the highest paramagnetic property of that element. c. When two electrons, are lost from each atom, is there any change in magnetic properties of - each. Explain?

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51. During the estimation of Mohr's salt by using potassium permanganate, on adding KMnO_4 solution to acidified Mohr's salt solution, pink colour of permanganate vanishes and finally appears at the end point. a. Give the chemistry of the reaction. b. Illustrate the oxidising property of $(\text{KMnO}_4)_3$ in basic medium..

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52. The following is a part of d-block of the periodic table

'(##VPU_HSS_CHE_XII_C08_E03_004_Q01##)'

a. Compare the atomic size of elements of set A B and set B C of same group b. Name the phenomenon behind the relation between elements of set B C c. Give reason for the phenomenon.

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53. Mn exhibits large number of oxidation states in its compounds: Which is the highest oxidation state? Name an industrially important

compound you have studied in. which Mn is in its highest oxidation state.

How is that compound manufactured?

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54. Transition elements show various oxidation -states and many, of the transition metal ions are attracted by a magnetic field. a. Give reason for variability of oxidation state. b. Name the two types of magnetic behaviour. c. The observed magnetic moment of Sc^{3+} was found to be 'zero '. Calculate the magnetic moment of Sc^{3+} , using the 'spin-only' formula and compare the result of observed and calculated magnetic moment.

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55. On what ground can you say that Sc(Z=21) is a transition element but Zn(Z=30) is not?

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56. Silver atom has completely filled d- orbitals ($4d^{10}$) in its ground state.

How can you say that it is a transition element?

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57. Calculate the magnetic moment of the divalent ion in aqueous solution if its atomic number is 26

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

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59. Chromium (Cr), Molybdenum (Mo) and Tungsten '(W)' are hard metals whereas Zn, Cd Hg and are not so hard. Why?

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60. Cuprous ion (Cu^+) can not be considered as a transition element while cupric ion ' $(\text{Cu})^{(2+)}$ ' is a transition metal ion. Why?

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61. The atomic radii of the second and third transition series are almost the same. Why?

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62. d-block elements have high melting and boiling points. Why?

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63. Manganese and technetium have very low melting points. Why?

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64. Name the transition element with highest density?

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65. K_2PtCl_6 is a well known compound while the corresponding nickel salt is unknown?

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66. Copper cannot liberate H_2 from acids. Why?

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67. Copper is the only element in the 1st transition series with a positive reduction potential. Why?

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68. All the bonds between manganese and oxygen in KMnO_4 are covalent. Why?

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69. Which is the highest oxidation state shown by any transition metal?

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70. $\text{Cr}_2\text{O}_7^{2-}$ is a strong oxidising agent whereas MoO_3 and WO_3 are not oxidising agents. Why?

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71. Highest fluoride of Mn is MnF_4 , whereas highest oxide is Mn_2O_7 .

Why?

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72. Draw the structure of Mn_2O_7 ?

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73. Name the catalyst used in (i) the manufacture of sulphuric acid by contact process (ii) Fischer Tropsch process in the synthesis of petrol.

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74. Name the catalyst used in i) the oxidation of ammonia to nitric acid by Ostwald's process. ii) the synthesis of ammonia by Haber process.



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75. Transition elements act as catalysts. Why?

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76. Why the transition metal compounds are coloured?

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77. Give the spin only formula for calculating the magnetic moment of a transition metal ion?

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78. Name the ores of Titanium?

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79. . Name the metal, with highest melting point?

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80. Name the common ores of i) Chromiüm ii) Molybdenum iii) Tungsten

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81. How is potassium permanganate prepared in the laboratory?

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82. What is the reaction between $KMnO_4$ and sodium thiosulphate?

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83. Potassium permanganate $KMnO_4$ is not a primary standard Why?

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84. Actinoids show, a large number of oxidation states Why?

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85. Write the reason for the statement given below: Transition elements shows variable oxidation state.

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86. Which of the following would be coloured?

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

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87. Why do transition elements have many irregularities in their electronic configuration?

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88. Which one is paramagnetic is Sc^{3+} or Cr^{4+} . Why?

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89. Which is more basic $LaOH_3$ or $LuOH_3$. Why?

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90. Why Sm^{2+} , Eu^{2+} and Yb^{2+} in solutions 'are good reducing agents but an aqueous solution of Ce^{4+} is a good oxidising agent?

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91. Why is the third ionisation energy of manganese (At No. 25) unexpectedly high?

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92. Write all possible oxidation states of an element having atomic number 25

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93. Why is it not advisable to dissolve $KMnO_4$ in conc. H_2SO_4

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94. Write the electronic configuration of Gadolinium ($Z = 64$) and its most stable oxidation state

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95. There is a covalency between Mn and Oxygen in permanganate ion.

Why?

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96. The +3 oxidation states of lanthanum ($z=57$), gadolinium ($z=64$) and lutetium ($z=71$) are exceptionally stable. Why?

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97. What happens when chromates are kept in acidic solution and dichromates in the alkaline solution?

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98. What is meant by 18 carat gold?





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99. Which divalent metal ion has maximum paramagnetic character among the first transition metals? Why?



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100. Write ionic equation for the reaction between $Cr_2O_7^{2-}$ ions and Fe^{2+} ions in acidic medium?



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101. $HgCl_2$ and $SnCl_2$ can not exist together in an aqueous solution. Why?



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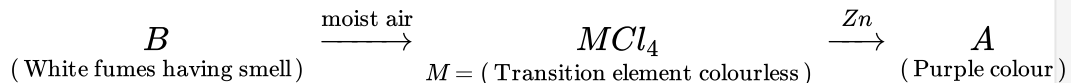
102. Explain (i) A soluble of ferric chloride on standing gives a brown precipitate (ii) ' $\text{Fe}_2(\text{O})_3$ ' is amphoteric in nature.

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103. When a white crystalline compound 'X' is heated with $K_2Cr_2O_7$ and concentrated H_2SO_4 a red dish brown gas 'A' is evolved. On passing 'A' into caustic soda solution, a yellow coloured solution of 'B' is obtained. Neutralising the solution 'B' with acetic acid and on subsequent addition of lead acetate a yellow precipitate C is obtained. When 'X' is heated with NaOH a colourless gas is evolved and on passing this a gas into K_2HgI_4 (Nessler's reagent) solution a reddish brown precipitate D is formed. Identify '(A), (B), (C), (D) and X. Write equations for the reactions involved.

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104.



.Identify '(A),(B)' and MCl_4 Also explain colour difference between MCl_4 and '(A)'

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105. a. 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.

(b) what happens when an acidic solution of the green compound 'B' is allowed to stand for sometime? Give the equations involved. What is this type of reaction called?

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106. Describe giving reason which one of the following pairs has the property indicated i. Fe or Cu has higher melting point ii. $(\text{Co})^{2+}$ or $(\text{Ni})^{2+}$ has lower magnetic moment.

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107. Explain a. The lowest oxide of a transition metal ($\text{Cr}, Z=24$) is basic whereas the highest oxide is usually acidic

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108. Hydrated copper sulphate, is blue while anhydrous copper sulphate is colourless, Why?

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109. An aqueous blue coloured solution of a transition metal sulphate reacts with H_2S in acidic medium to give a black precipitate A, which is

insoluble in warm aqueous solution of KOH. The blue solution on treatment with KI in weakly acidic medium, turns yellow and produces a white precipitate B. Identify the transition metal ion. Write the chemical reactions involved in the formation of A and B.

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110. Give ionic equations for the oxidation of iodides with $KMnO_4$ in acidic medium and in alkaline medium.

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111. Write ionic equation for the reduction of MnO_4^- to Mn^{2+} by H_2O_2 , in acidic medium.

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112. Can lanthanum '(z)=57)' exhibit '+4', oxidation state. Explain?



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113. Give complete chemical equations for reaction between concentrated HCl and KMnO_4



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114. Explain why (a) Ce^{4+} is a good oxidising agent whereas Sm^{2+} is a good reducing agent (b) $\text{La}(\text{OH})_3$ is stronger base than $\text{Lu}(\text{OH})_3$



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115. Explain why the E^0 value for the $\frac{\text{Mn}^{3+}}{\text{Mn}^{2+}}$ couple is much more positive than that for $\frac{\text{Cr}^{3+}}{\text{Cr}^{2+}}$ or $\frac{\text{Fe}^{3+}}{\text{Fe}^{2+}}$



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116. Complete the table suitably.

Gas filled in the discharge lamp	Colour
Hydrogen	(a)
(b)	Orange red
Nitrogen	(c)
(d)	Green

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117. Transition elements show variable oxidation state. a) Do you agree with, this statement? b) Illustrate with an example

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118. Some information regarding a particular, compound is given below. i) A deep, purple black crystal which is moderately soluble in water at room temperature and it is prepared from pyrolusite a) Identify the compound b) Give the chemical reactions involved in the preparation of, this

compound - c) Upon heating to 746 K, what happens to this compound?

Give the equation

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119. Write the general outer electronic configuration of d-block elements.

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120. What is a transition elements?

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121. Transition elements are

A. s-block

B. p-block

C. d-block

D. none of these

Answer: C

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122. The first transition element is

A. chromium

B. scandium

C. nickel

D. copper

Answer: B

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123. Cr has electronic configuration

A. $3s^2 3p^6 3d^4 4s^2$

B. $3s^2 3p^4 3d^3 4s^1$

C. $3s^2 3p^6 3d^6$

D. none of these

Answer: B

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124. In the first transition series, the highest oxidation state is exhibited by:

A. Mn

B. Ni

C. Fe

D. Cr

Answer: A



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125. Transition elements are coloured

- A. due to small size
- B. due to metallic nature
- C. due to unpaired d-electrons
- D. all

Answer: C



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126. Transition metals are often paramagnetic due to

- A. high m.p and b.p
- B. the presence of vacant orbitals

C. the presence of unpaired electrons

D. malleability and ductility

Answer: C

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127. Which one of the following has the least magnetic moment?

A. Cu^{2+}

B. Ni^{3+}

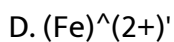
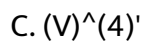
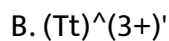
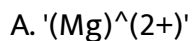
C. Co^{2+}

D. Fe^{2+}

Answer: A

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128. Which of the following has maximum number of unpaired electrons?



Answer: D



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129. The transition metals are mostly

A. diamagnetic

B. paramagnetic

C. neither diamagnetic nor paramagnetic

D. both diamagnetic and paramagnetic

Answer: B



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130. Mercury is a liquid metals because

- A. It has a completely filled d- orbitals that prevents d-d overlapping of orbitals
- B. it has a completely filled d-orbitals that causes d-d overlapping
- C. it has a completely filled s-orbital
- D. it has a small atomic size

Answer: A



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131. Arrange the following ions in order of their magnetic moment (i)

'(V)⁽²⁺⁾' (ii) '(Mn)⁽²⁺⁾(iii) (Fe)⁽²⁺⁾(iv) (Ni)⁽²⁺⁾' [(V)(z)=23), (Mn)(z)=25),

(Fe)(z=26), (Ni)(z) 28]

- A. (ii)<(iii)<(i)<(iv)
- B. (iii)<(iv)<(ii)<(1)
- C. (iii)<(ii)<(iv)<(i)
- D. (iv)<(1)<(iii)<(ii)

Answer: C

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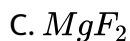
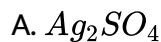
132. Which of the following compounds is not coloured

- A. $Na_2[CuCl_4]$
- B. $Na_2[CdCl_4]$
- C. $K_4[Fe(CN)_6]$
- D. $K_3[Fe(CN)_6]$

Answer: B

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133. Which of the following compounds is expected to be coloured?



Answer: B

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134. Number of moles of $K_2Cr_2O_7$, reduced by one mole of Sn^{2+} ions is:

A. 44199

B. 3

C. 44202

D. 6

Answer: A



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135. The colourless species is

A. VCl_3

B. $VOSO_4$

C. Na_3VO_4

D. $[V(H_2O)_6](SO)_4(H_2O)$

Answer: C



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136. Which compound does not dissolve in hot dilute HNO_3 ?

A. HgS

B. PbS

C. CuS

D. CdS

Answer: A



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137. $(CrO)_3$ dissolves in aqueous $(NaOH)$ to give

A. $(CrO_4)^{2-}$

B. $(CrOH)_3$

C. $(CrO_4)^{7-}$

D. $(CrOH)_2$

Answer: A

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138. Which chromium compound is widely used in tanning of leather?

A. Cr_2O_3

B. $\text{Cr}_2\text{O}_2\text{Cl}_2$

C. CrCl_3

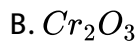
D. $\text{K}_2\text{SO}_4 \cdot \text{Cr}(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$

Answer: D

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139. Which of the following oxides of chromium is amphoteric in nature?

A. CrO

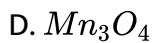
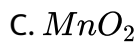
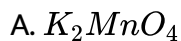


Answer: C



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140. Manganese exhibits maximum oxidation state in



Answer: B



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141. The number of moles of acidified $KMnO_4$ required to convert one mole of sulphite ion into sulphate ion is:

A. $4/5$

B.

C.

D.

Answer:



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142. The equivalent weight of $K_2Cr_2O_7$ in acid medium is equal to

A. $1/3$ molecular weight

B. $1/2$ molecular weight

C. $1/6$ molecular weight

D. 1/5 molecular weight

Answer: C

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143. An aqueous solution of $FeSO_4 \cdot Al_2(SO_4)_3$ and chrome alum is heated with excess of Na_2O_2 and filtered. The materials obtained are

A. a colourless filtrate and a green residue

B. a yellow filtrate and a green residue

C. a yellow filtrate and a brown residue

D. a green filtrate and a brown residue

Answer: C

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144. In acidic medium, one mole of ' MnO_4^- ' accepts how many moles of electrons in a redox process,

- A. 1
- B. 3
- C. 5
- D. 6

Answer: C



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145. In the standardisation of $\text{Na}_2\text{S}_2\text{O}_3$ using $\text{K}_2\text{Cr}_2\text{O}_7$ by iodometry the equivalent weight of $\text{K}_2\text{Cr}_2\text{O}_7$ is

- A. $\frac{1}{2}$ molecular weight
- B. $\frac{1}{6}$ molecular weight
- C. $\frac{1}{3}$ molecular weight

D. same as molecular weight

Answer: B

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146. $K_2[HgI_4]$ detects the ion/group)

A. NH_3

B. NO

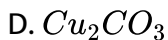
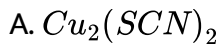
C. NH_2^-

D. Cl^-

Answer: C

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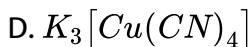
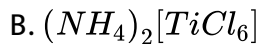
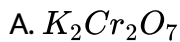
147. The compound used for gravimetric estimation of $Cu(II)$ is



Answer: A

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148. Among the following compounds that is both paramagnetic and coloured is



Answer: C



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149. Vanadium (iii) oxide is a strong

- A. drying agent
- B. oxidising agent
- C. reducing agent
- D. wetting agent

Answer: C



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150. Least paramagnetic property is shown by

- A. Fe
- B. Mn

C. Ni

D. Cu

Answer: D

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151. When MnO_2 is fused with KOH , a coloured compound is formed. The product and its colour is

A. K_2MnO_4 . purple green)

B. KMnO_4 (a purple)

C. Mn_2O_3 , brown)

D. Mn_2O_4 black)

Answer: A

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152. In the dichromate dianion

- A. 4 (Cr)-(O) bonds are equivalent)
- B. 6 (Cr)-(O) boinds are equivalent)
- C. All) (Cr)-(O) bonds are equivalent)
- D. All Cr-O bonds are nontequivalent

Answer: B



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153. A red solid is insoluble in water. However, it becomes soluble if some KI is added to water. Heating the red solid in a test tube results in liberation of some violet coloured fumes and droplets of a metal appear on the cooler parts of test tube. The red solid is

- A. $(\text{HgI})_2$
- B. $(\text{Hg})_2\text{O}$

C. (Pb)₃ (O)₄

D. (NH)₄ (Cr)₂ (O)₇

Answer: A



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154. Titanium shows magnetic moment of '1.73 (BM)' in its compound.

What is the oxidation number of 'T' in the compound.

A. 1

B. 4

C. 3

D. 2

Answer: C



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155. In nitroprusside ion, iron and NO exist as $Fe(II)$ and NO^+ rather than the $Fe(III)$ and NO . These forms can be differentiated by: estimating the concentration of iron, measuring the concentration of CN, measuring the solid state magnetic moment, thermally decomposing the compound

- A. estimating the concentration of iron
- B. measuring the concentration of CN
- C. measuring the solid state magnetic moment
- D. thermally decomposing the compound

Answer: C

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156. One mole of acidified ' $(K)_2 (Cr)_2 (O)_7$ ' on reaction with excess of ' (KI) ' will liberate moles of ' (I) '

A. 6

B. 1

C. 7

D. 3

Answer:

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157. Of the following, which has the highest magnetic moment

A. $(V)^{(3+)}$

B. $(Mn)^{(2+)}$

C. $(Fe)^{(2+)}$

D. $(Cu)^{(2+)}$

Answer: B

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158. For decolorisation of 1 mole of 'KMnO₄' the moles of 'H₂O₂' required is

A. 1/2

B. 3/2

C. 5/2

D. 7/2

Answer: C



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159. Which one of the following metal ions is colourless?

A. V²⁺

B. (Cr)⁽³⁺⁾

C. $(\text{Zn})^{(2+)}$

D. $(\text{Ti})^{(3)}$

Answer: C



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160. Copper can be extracted from

A. kupfer-nickel

B. Dolomite

C. Malachite

D. Galena

Answer: C



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161. The value of 'spin only' magnetic moment for one of the following configurations, is $2.84BM$. The correct one is : d^4 (in strong ligand field) , d^2 (in weak ligand field) , d^3 (in weak as well as strong fields) , d^5 (in strong ligand field)

A. d^4 (in strong ligand field)

B. d^2 (in weak ligand field)

C. d^3 (in weak as well as strong fields)

D. d^5 (in strong ligand field)

Answer: A

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162. The highest magnetic moment is shown by the transition metal with the configuration.

A. $3d^2$

B. $3d^{(5)}$

C. $3d^{(7)}$

D. $3d^{(9)}$

Answer: B



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163. A certain metal will liberate hydrogen from dilute acids. It will react with, water to form hydrogen only when the metal is heated and the water is in the form of steam. The metal is probably

A. Iron

B. potassium

C. copper

D. mercury

Answer: A

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164. For successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy?

A. (vanadium)($z=23$)

B. manganese)($z=25$)

C. chromium)($z=24$)

D. (iron)($z=26$)

Answer: B

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165. Which of the following properties would you not expect copper (Cu) to exhibit?

A. high thermal conductivity

B. ductility

C. malleability

D. low electrical conductivity

Answer: B

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166. Verdigris is

A. basic copper acetate

B. basic lead acetate

C. basic lead

D. none

Answer: A

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167. When ammonia is added to a cupric salt solution the deep blue colour so observed is due to the formation of

- A. $[\text{Cu}(\text{OH})_4]^{2-}$
- B. $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- C. $[\text{Cu}(\text{H}_2\text{O})_2(\text{NH}_3)]^{2+}$
- D. $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$

Answer: B

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168. . In solid $\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$ copper is coordinated to

- A. five water molecules
- B. four water molecules

C. one sulphate ion

D. one water molecule

Answer: B

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169. . AgCl is soluble in)

A. aquaregia

B. (H)₂ (SO)₄

C. HCl

D. (NH)₃

Answer: D

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170. AgCl dissolves in ammonia due to the formation, of



Answer: C



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171. Galvanisation is the

A. deposition of zinc on Fe

B. deposition of Al on Fe

C. deposition of tin on Fe

D. deposition of Cu on Fe

Answer: A



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172. Cinnabar is an ore of

A. Hg

B. Cu

C. P

D. Zn

Answer: A



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173. Nessler's reagent is

A. K_2HgI_4

B. $K_2HgI_4 + (KOH)$

C. $K_2HgI_2 + (KOH)$

D. $K_2HgI_4 + (Hg)$

Answer: B

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174. Which of the following melts in boiling water

A. Gun metal

B. wood metal

C. monel metal

D. bell metal

Answer: B

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175. Which of the following elements involve gradual filling of 5f level

- A. lanthanoid
- B. actinoids
- C. transition metals
- D. coinage metals

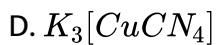
Answer: B



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176. Which compound is formed when excess of KCN is added to an aqueous solution of copper sulphate?

- A. $CuCN_3$
- B. $CuCN$
- C. $K_2[CuCN_4]$



Answer: D

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177. Which of the following belongs to the actinide series of elements

A. Y

B. Ta

C. U

D. Y

Answer: C

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178. Which of the following statement is not correct?

A. $(\text{La})(\text{OH})_3$ is less basic than $\text{Lu}(\text{OH})_3$

B. In lanthanide series, ionic radius decreases from

C. La is actually an element of transition series rather than lanthanides.

D. Atomic radius of 'Zr' and 'Hf' are same because of lanthanide contraction.

Answer: A

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179. General electronic configuration of lanthanides is A. $(n-2)f^{1-14}(n-1)s^2p^6d^0-1ns^2$ B. $(n-2)f^{10-14}(n-1)d^0-1ns^2$ C. $(n-2)f^{0-14}(n-1)d^{10}ns^2$ D. $(n-2)d^0-1(n-1)f^{0-14}ns^2$ General electronic configuration of lanthanides is [2002] a) $(n-2)f^{1-14}(n-1)s^2p^6d^0-1ns^2$ b) $(n-2)f^{10-14}(n-1)d^0-1ns^2$ c) $(n-2)f^{0-14}(n-1)d^{10}ns^2$ d) $(n-2)d^0-1(n-1)f^{1-14}ns^2$

A. $(n-2) f^{(1-14)}(n-1) s^{(2)} p^{(6)} d^{(0-1)} + n s^{(2)}$

B. $(n-2) f^{(10-14)}(n-1) d^{(0-1)} n s^{(2)}$

C. $(n-2) f^{(0-14)}(n-1) d^{(10)} n s^{(2)}$

D. $(n-2) d^{(0-1)}(n-1) f^{(0-14)} n s^{(1)}$

Answer: A

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180. Lanthanide contraction is due to increase in

A. shielding by 4f electrons

B. atomic number

C. effective nuclear charge

D. size of 4f orbital

Answer: C

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181. The lanthanide contraction is responsible for the fact that

- A. Zr and Y have about the same radius
- B. Zr and Nb have similar oxidation state
- C. Zr and Hf have about the same radius
- D. Zr and Zn have the same oxidation state

Answer: C



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182. Which one of the following elements shows maximum number of different oxidation states in its compounds?

- A. Eu
- B. La

C. Gd

D. Am

Answer: D

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183. Arrange Ce^{3+} , La^{3+} , Pm^{3+} and Yb^{3+} in increasing order of their ionic radii. (a) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{La}^{3+}$ (b) $\text{Ce}^{3+} < \text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+}$ (c) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+}$ (d) $\text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+} < \text{Yb}^{3+}$.

A. $(\text{Yb})^{(3+)} < (\text{Pm})^{(3+)} < (\text{Ce})^{(3+)} < (\text{La})^{(3+)}$

B. $(\text{Ce})^{(3+)} < (\text{Yb})^{(3+)} < (\text{Pm})^{(3+)} < (\text{La})^{(3+)}$

C. $(\text{Yb})^{(3+)} < (\text{Pm})^{(3+)} < (\text{La})^{(3+)} < (\text{Ce})^{(3+)}$

D. $(\text{Pm})^{(3+)} < (\text{La})^{(3+)} < (\text{Ce})^{(3+)} < (\text{Yb})^{(3+)}$

Answer: A

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184. Lanthanide contraction is observed in

A. Gd

B. at

C. Xe

D. Ac

Answer: A



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185. Which of the following is not an actinide?

A. curium

B. californium

C. uranium

D. terbium

Answer: D

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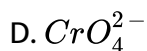
186. The actinoids exhibit more number of oxidation states in general than the lanthanoids. This is because

- A. the 5 f orbital extend farther from the nucleus than the '4 (f)' orbitals.
- B. the '5 (f)' orbitals are more buried than the '4 (f)' orbitals
- C. there is a similarity between '4 (f)' and 5 f orbitals in their angular part of the wave function.
- D. the actinoids are more reactive than the lanthanoids

Answer: A

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187. When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to the formation of



Answer: C



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188. $K_2Cr_2O_7$ reacts with NH_4Cl in presence of H_2SO_4 The product formed is

A. chromyl chlorate with green vapour

B. chromous chloride with white vapour

C. chromous chloride with blue vapour

D. chromyl chloride with deep red colour

Answer: D

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189. Identify the incorrect statement among the following

A. 4f and 5f orbitals are equally shielded

B. d- block elements show irregular and erratic chemical properties among themselves

C. La and Lu have partially filled d orbitals and no other partially filled orbitals

D. the chemistry of various lanthanoids is very similar

Answer: A

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190. The purple colour of $(KMnO)_4$ is due to : $C.T(L) \rightarrow (M)$,
 $C.T(M) \rightarrow (L), d-d, p-d$

A. $C.T(L) \rightarrow (M)$

B. $C.T(M) \rightarrow (L)$

C. $d-d$

D. $p-d$

Answer: A



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