



1. Arrange Ce^{3+} , La^{3+} , Pm^{3+} and Yb^{3+} in increasing order of their ionic radius – [AIEEEE-2002]

(1) $\text{Yb}^{3+} < \text{Pm}^{3+} < \text{Ce}^{3+} < \text{La}^{3+}$	(2) $\text{Ce}^{3+} > \text{Yb}^{3+} < \text{Pm}^{3+} < \text{La}^{3+}$
(3) $\text{Yb}^{3+} > \text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+}$	(4) $\text{Pm}^{3+} < \text{La}^{3+} < \text{Ce}^{3+} > \text{Yb}^{3+}$

2. Most common oxidation states shown by cerium are: [AIEEEE-2002]

(1) +2, +4	(2) +3, +4	(3) +3, +5	(4) +2, +3
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3. The radius of La^{3+} is 1.06 \AA , which of the following given values will be closest to the radius of Lu^{3+} (At no. of Lu = 71, La = 57)– [AIEEEE-2003]

(1) 1.6 \AA	(2) 1.4 \AA	(3) 1.06 \AA	(4) 0.85 \AA
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4. Cerium ($Z = 58$) is an important member of the lanthanoids. Which of the following statements about cerium is INCORRECT– [AIEEEE-2004]
 - (1) Cerium (IV) acts as an oxidising agent
 - (2) The +3 oxidation state of cerium is more stable than the +4 oxidation state
 - (3) The +4 oxidation state of cerium is not known in solutions
 - (4) The common oxidation states of cerium are +3 and +4

5. The lanthanoid contraction is responsible for the fact that– [AIEEEE-2005]

(1) Zr and Y have about the same radius	(2) Zr and Nb have similar oxidation state
(3) Zr and Hf have about the same radius	(4) Zr and Zn have similar oxidation state

6. Lanthanoid contraction is caused due to [AIEEEE-2006]
 - (1) the same effective nuclear charge from Ce to Lu
 - (2) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge
 - (3) the appreciable shielding on outer electrons by 4f electrons from the nuclear charge
 - (4) the appreciable shielding on outer electrons by 5d electrons from the nuclear charge

7. Larger number of oxidation states are exhibited by the actinoids than those by the lanthanoids, the MAIN reason being [AIEEEE-2008]
 - (1) 4f orbitals more diffused than the 5f orbitals
 - (2) lesser energy difference between 5f and 6d than between 4f and 5d orbitals
 - (3) more energy difference between 5f and 6d than between 4f and 5d orbitals
 - (4) more reactive nature of the actinides than the lanthanides



8. Knowing that the chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statements is INCORRECT? [AIEEE-2009]
- (1) Ln(III) compounds are generally colourless
 - (2) Ln(III) hydroxides are mainly basic in character
 - (3) Because of the large size of the Ln(III) ions the bonding in its compounds is predominantly ionic in character
 - (4) The ionic sizes of Ln(III) decrease in general with increasing atomic number
9. In context of the lanthanoids, which of the following statements is NOT CORRECT? [AIEEE-2011]
- (1) Because of similar properties the separation of lanthanoids is not easy
 - (2) Availability of 4f electrons results in the formation of compounds in +4 state for all the members of the series
 - (3) There is a gradual decrease in the radii of the members with increasing atomic number in the series
 - (4) All the members exhibit +3 oxidation state
10. Which of the following forms stable +4 oxidation state? [J EE(Main)-2012]
- (1) La(Z = 57) (2) Eu(Z = 63) (3) Gd(Z = 64) (4) Ce(Z = 58)
11. The number of unpaired electrons in Gadolinium [Z = 64] is: [J EE(Main)-2012]
- (1) 2 (2) 6 (3) 8 (4) 3
12. The highest possible oxidation states of uranium and plutonium, respectively, are: [J EE(Main)-2019]
- (1) 6 and 4 (2) 7 and 6 (3) 4 and 6 (4) 6 and 7
13. The electronic configurations of bivalent europium and trivalent cerium are (atomic number : Xe = 54, Ce = 58, Eu = 63) [J EE(Main)-2020]
- (1) [Xe] 4f⁴ and [Xe] 4f⁹ (2) [Xe] 4f⁷ and [Xe] 4f¹
(3) [Xe] 4f⁷ 6s² and [Xe] 4f² 6s² (4) [Xe] 4f² and [Xe] 4f⁷
14. Which one of the following lanthanoids does not form MO₂? [J EE(Main)-2021]
[M is lanthanoid metal]
- (1) Nd (2) Yb (3) Dy (4) Pr



15. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason: [JEE(Main)-2021]
Assertion A: Size of Bk^{3+} ion is less than Np^{3+} ion.
Reason R: The above is a consequence of the lanthanoid contraction. In the light of the above statements, choose the correct answer from the options given below:
(1) is false but is true
(2) Both are true but R is not the correct explanation of A
(3) Both are true and R is the correct explanation of A
(4) R is true but is false
16. Given below are two statements:
Statement I: The E° value of $\text{Ce}^{4+}/\text{Ce}^{3+}$ is +1.74 V
Statement II: Ce is more stable in Ce^{4+} state than Ce^{3+} state.
In the light of the above statements, choose the most appropriate answer from the options given below: [JEE(Main)-2021]
(1) Both statement I and statement II are correct
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and statement II are incorrect
(4) Statement I is correct but statement II is incorrect.
17. Cerium (IV) has a noble gas configuration. Which of the following is correct statement about it? [JEE(Main)-2022]
(1) It will not prefer to undergo redox reactions.
(2) It will prefer to gain electron and act as an oxidizing agent
(3) It will prefer to give away an electron and behave as reducing agent
(4) It acts as both, oxidizing and reducing agent.
18. The most common oxidation state of Lanthanoid elements is +3. Which of the following is likely to deviate easily from +3 oxidation state? [JEE(Main)-2022]
(1) Ce (At. No. 58) (2) La (At. No. 57) (3) Lu (At. No. 71) (4) Gd (At. No. 64)
19. The 'f' orbitals are half and completely filled, respectively in lanthanide ions
(Given: Atomic no. Eu, 63; Sm, 62; Tm, 69; Tb, 65; Yb, 70; Dy, 66) [JEE(Main)-2022]
(1) Eu^{2+} and Tm^{2+} (2) Sm^{2+} and Tm^{3+}
(3) Tb^{4+} and Yb^{2+} (4) Dy^{3+} and Yb^{3+}
20. Which one of the lanthanoids given below is the most stable in divalent form? [JEE(Main)-2022]
(1) Ce (Atomic Number 58) (2) Sm (Atomic Number 62)
(3) Eu (Atomic Number 63) (4) Yb (Atomic Number 70)



21. Which of the following pair is not isoelectronic species?
(At. no. Sm, 62; Er, 68; Yb, 70; Lu, 71; Eu, 63; Tb, 65; Tm, 69)
(1) Sm^{2+} and Eu^{3+} (2) Yb^{2+} and Lu^{3+} (3) Eu^{2+} and Tb^{4+} (4) Tb^{2+} and Tm^{4+}

[JEE(Main)-2022]

ANSWER KEY

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| 1. | (1) | 2. | (2) | 3. | (4) | 4. | (3) | 5. | (3) | 6. | (2) | 7. | (2) |
| 8. | (1) | 9. | (2) | 10. | (4) | 11. | (3) | 12. | (4) | 13. | (2) | 14. | (2) |
| 15. | (4) | 16. | (4) | 17. | (2) | 18. | (1) | 19. | (3) | 20. | (3) | 21. | (4) |