



CHEMISTRY

FOR IIT JEE ASPIRANTS OF CLASS 11

FOR CHEMISTRY

F-BLOCK ELEMENTS

WE 1

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



Watch Video Solution

WE 2

1. Name a member of the lanthanoid series which is well known to exhibit +4 oxidation state.



Watch Video Solution

WE 6

1. On the basis of lanthanoid contraction, explain the following:

(i) Nature of bonding in La_2O_3 and Lu_2O_3 .

(ii) Trends in the stability of oxo salts of lanthanoids from La to Lu.

(iii) Stability of the complexes of lanthanoids.

(iv) Radii of 4d and 5d block elements.

(v) Trends in acidic character of lanthanoids oxides.



Watch Video Solution

1. Which sub shell is filled up progressively in actinoids

A. $1.4f$

B. $5f$

C. $6d$

D. $7s$

Answer: B



View Text Solution

2. General valence shell electronic configuration of f – block elements is

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

B. $(n - 2) f^{1-14} (n - 1) d^{0-5} n s^{0-2}$

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

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

Answer: A



Watch Video Solution

3. The inner transition elements are the elements which the added electrons go to

A. $(n-1)d$ -orbitals

B. $(n-2)f$ -orbitals

C. $(n-1)d$ -orbitals and $(n-1)f$ -orbitals

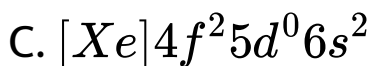
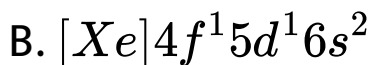
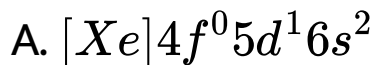
D. $(n-1)d$ -orbitals and ns orbitals

Answer: B



Watch Video Solution

4. The expected electronic configuration of cerium is



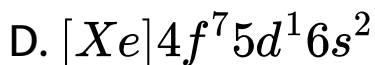
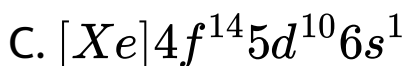
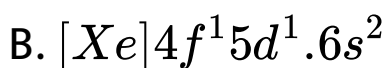
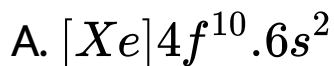
D. Both 2 and 3

Answer: B



Watch Video Solution

5. Which of the following is not the configuration of lanthanoid



Answer: C



View Text Solution

6. The element with the electronic configuration $[Xe]^{54}4f^{14}5d^16s^2$ is a

A. Representative element

B. Transition element

C. Actinide element

D. Lanthanide element

Answer: D



Watch Video Solution

7. Lanthanoids are

A. 14 elements in the seventh period (At.

No. 90 to 103) that are filling 5f sublevel.

B. 14 elements in the sixth period (At. No.

58 to 71) that are filling 4f sublevel.

C. 14 elements in the seventh period (AT.

No. 58 to 71) that are filling 4f sublevel.

D. 14 elements in the sixth period (AT. No.

90 to 103)

Answer: B



Watch Video Solution

8. Which of the following lanthanoids is radiocative ?

A. Cerium

B. Promethium

C. Thulium

D. Lutetium

Answer: B



Watch Video Solution

9. Which of the following are all radioactive elements.

A. Transition elements.

B. P block elements

C. Lathanides.

D. Actinides.

Answer: D



View Text Solution

10. The most common lanthanoid is :

A. Lanthanum

B. Cerium

C. Samarium

D. Plutonium

Answer: B



[Watch Video Solution](#)

11. Non-Lanthanoid atom is

A. La

B. Lu

C. Pr

D. Pm

Answer: A



[View Text Solution](#)

12. Which of the following is a Lanthanoid

A. Ta

B. Rh

C. Th

D. Lu

Answer: D



View Text Solution

13. Lanthanides are characterized by the filling of the

- A. penultimate 4f energy level
- B. antepenultimate 4f energy level
- C. penultimate 5f energy level
- D. antepenultimate 5f energy level

Answer: B



View Text Solution

14. The most common and stable oxidation state of a lanthanide is

A. +4

B. +3

C. +6

D. +2

Answer: B



Watch Video Solution

1. The most common oxidation states of cerium are

A. +2 and +4

B. +3 and +4

C. +3 and +5

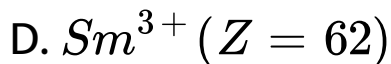
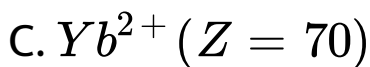
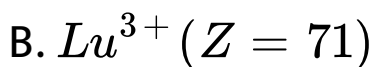
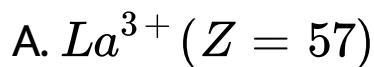
D. +2 and +3

Answer: B



Watch Video Solution

2. Which of the following ion is paramagnetic



Answer: D



View Text Solution

3. The atomic and ionic radii (M^{3+} ions) of Lanthanide elements decrease with increase in atomic number. This effect is called

A. Lanthanoid contraction

B. Lanthanoid expansion

C. Actinoid contraction

D. Actionoid expansion

Answer: A



View Text Solution

4. Lanthanide contraction is caused due to -

A. the 4f electrons, which are gradually added, create a strong shielding effect

B. the 4f orbitals are greater in size than the 3d and 3f orbitals

C. the 5f orbitals strongly penetrate into the 4f orbitals

D. the poor shielding effect of 4f electrons is coupled with increased attraction

between the nucleus and the added electrons.

Answer: D



Watch Video Solution

5. 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



Watch Video Solution

6. Which elements among the Lanthanides has the smallest atomic radius ?

A. Cerium

B. Lutetium

C. Europium

D. Gadolinium

Answer: B



View Text Solution

7. Lanthanides are separated best by

A. Fractional crystallisation

B. Solvent extraction

C. Complex formation using EDTA

D. Ion exchange resins

Answer: D



View Text Solution

8. The separation of lanthanides by the ion exchange method is based on

A. The solubility of the nitrates

B. Size of the hydrated M^{3+} ions

C. Size of the unhydrated M^{3+} ions

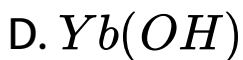
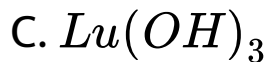
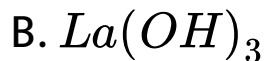
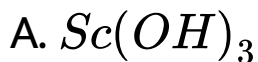
D. Basicity of the hydroxides

Answer: B



View Text Solution

9. Which of the following is the strongest base



Answer: B



View Text Solution

10. $KMnO_4$ and $K_2Cr_2O_7$ are replaced in volumetric analysis by

A. La(III) salts

B. Ce(III) salts

C. Ce(IV) salt

D. Gd(III) salts

Answer: C



View Text Solution

11. Assertion: Ce^{4+} is used as an oxidising agent in volumetric analysis.

Reason: Ce^{4+} has the tendency to attain +3 oxidation state.

A. Statement I is true, Statement II is true,
Statement II is a correct explanation of
Statement I.

- B. Statement I is true, Statement II is true,
Statement II is not the correct
explanation of statement I
- C. Statement I is true, Statement II is false.
- D. Statement I is false, Statement II is true.

Answer: A



Watch Video Solution

12. Statement - I :- Sm^{3+} , Dy^{3+} have same colour (yellow)

Statement - II :- Both ions are having same unpaired electrons

A. Statement I is true, Statement II is true,

Statement II is a correct explanation of

Statement I.

B. Statement I is true, Statement II is true,

Statement II is not the correct

explanation of statement I

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true.

Answer: A



View Text Solution

13. Statement - I :- La^{3+} , Lu^{3+} ions are colourless

Statement - II :- They do not contain unpaired electrons

A. Statement I is true, Statement II is true,
Statement II is a correct explanation of
Statement I.

B. Statement I is true, Statement II is true,
Statement II is not the correct
explanation of statement I

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true.

Answer: A



View Text Solution

Level II C W

1. The stable +2 ions of lanthanides in aqueous solution are



Answer: A



View Text Solution

Others

1. SRP values of lanthanides lies between

A. -2.2 to $-2.4V$

B. 4 to $2 V$

C. 1 to $5 V$

D. 0.1 to $-0.2V$

Answer: A



View Text Solution

2. Ion with maximum number of unpaired electrons



D. Gd^{3+}

Answer: D



View Text Solution

3. What factor make the separation of Lanthanides a formidable task

A. Similarity in ionic size

B. Constant charge of + 3

C. Small charge radius ratio

D. All of these

Answer: D



View Text Solution

4. In the coinage metals (IB) group, the I.E decreases from Cu to Ag and the increases from Ag to Au this is attributed to

A. Increased atomic size

B. Increased ionic radius

C. Increased nuclear density

D. Lanthanuide contraction

Answer: D



View Text Solution

5. Ionic radii of zirconium and hafnium become almost identical because

A. They are 'd' block elements

B. They belongs to the same

C. Of increased nuclear charge

D. Of Lanthanide contraction

Answer: D



View Text Solution

6. Lanthanoids used in glass blower's goggles

are

A. Pr and Nd

B. Eu and Gd

C. Tb and Dy

D. Em and Sm

Answer: A



[View Text Solution](#)

7. Which lanthanoide compounds is used as a most powerful liquid lasers after dissolving it in selenium oxychloride

A. Cerium oxide

B. Neodymium oxide

C. Promethium sulphate

D. Ceric sulphate

Answer: B



View Text Solution

8. Which one of the following pairs of elements is called chemical twins because of their very similar chemical properties

A. Mn and W

B. Mo and Tc

C. Fe and Re

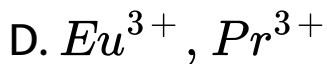
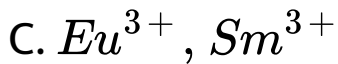
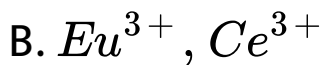
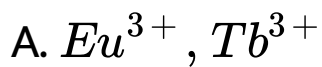
D. Hf and Zr

Answer: D



View Text Solution

9. Pair of ions which are having same number of unpaired electrons

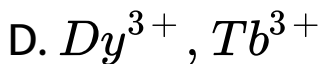
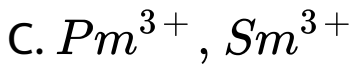
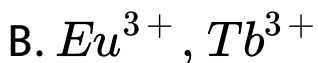
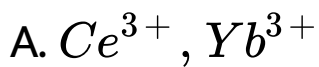


Answer: A



View Text Solution

10. Pair of ions which are having only one unpair electron



Answer: A



View Text Solution

11. Cerium ($Z = 58$) is an important member of the lanthanoids . Which of the following statements about cerium is incorrect ?

- A. The + 3 oxidation state of cerium is more stable than the + 4 oxidation state.
- B. The common oxidation states of cerium are + 3 and + 4
- C. Cerium (IV) acts as an oxidizing agent
- D. The + 4 oxidation state of cerium is not known in solutions.

Answer: D



Watch Video Solution

12. In which of the following Lanthanoids oxidation state + 2 is most stable ?

A. Ce

B. Eu

C. Tb

D. Dy

Answer: B



View Text Solution

13. Lanthanoid contraction occurs because

- A. the 4f electrons, which are gradually added, create a strong shielding effect
- B. the 4f orbitals are greater in size than the 3d and 3f orbitals
- C. the 5f orbitals strongly penetrate into the 4f orbitals
- D. the poor shielding effect of 4f electrons is coupled with increased attraction

between the nucleus and the added electrons.

Answer: D



View Text Solution

14. 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



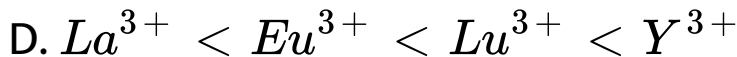
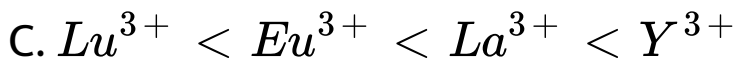
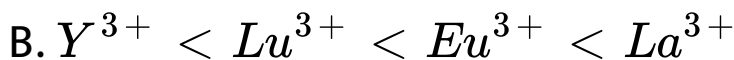
Watch Video Solution

15. The correct order of ionic radii Y^{3+} , La^{3+}

, Eu^{3+} and Lu^{3+} is

(*AT. No: Y = 39, La = 57, Eu = 63, Lu = 71*)

A. $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$



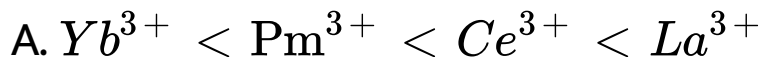
Answer: C

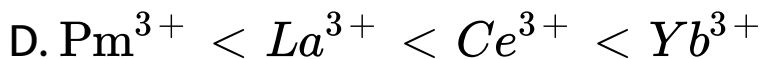
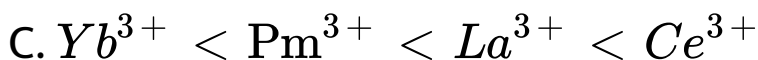
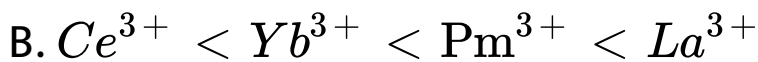


Watch Video Solution

16. Arrange Ce^{3+} , La^{3+} , Pm^3 and Yb^{3+} in

increasing order of their size -



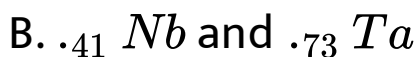
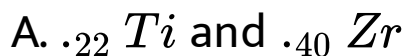


Answer: A



Watch Video Solution

17. Which of the two have almost similar size



C. ${}_{39}Y$ and ${}_{57}La$

D. ${}_{20}Ca$ and ${}_{31}Ir$

Answer: B



Watch Video Solution

18. Identify the incorrect statement among the following :

A. d-block element show irregular and erratic chemical properties among

themselves

B. La and Lu have partially filled d-orbitals

and no other partially filled orbitals

C. The chemistry of various lanthanoids is

very similar

D. 4f - and 5f - orbitals are equally shielded

Answer: D



Watch Video Solution

19. In context of the lanthanoids, which of the following statements is not correct?

A. There is a gradual decrease in the radii of the members with increasing atomic number in the series

B. All the member exhibit + 3 oxidation state

C. because of milar properties the separation of lanthanoids is not easy

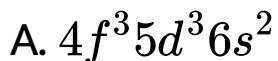
D. Availability of 4f electrons results in the formation of compounds in + 4 state for all the members of the series.

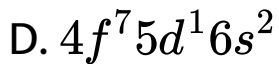
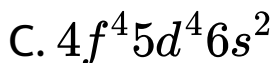
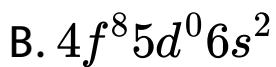
Answer: D



Watch Video Solution

20. The outer electronic configuration of Gd (At.No. 64) is





Answer: D



Watch Video Solution

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

A. the 5f orbitals are more buried than the 4f orbitals

B. there is a similarity between 4f and 5f orbitals in their angular part of the wave function

C. actinoids are more reactive than lanthanoids

D. the 5f orbitals extend farther from the nucleus than the 4f orbitals

Answer: D



Watch Video Solution

22. Larger number of oxidation states are exhibited by the actinoids than those by the lanthanoids, the main reason being

A. the 4f orbitals are more diffused than the 5f orbitals

B. lesser energy difference between 5f and 6d than between 4f and 5d orbitals

C. more energy difference between 5f and 6d than between 4f and 5d orbitals

D. more reactive nature of actinids than that of lanthanoids

Answer: B



Watch Video Solution

23. Knowing that the chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statement is incorrect?

A. because of the large size of Ln (III) ions, the bonding in their compounds is predominately ionic in character.

B. the ionic size of Ln (III) decreases in general with increasing atomic number

C. Ln (III) compounds are generally colourless

D. Ln (III) hydroxides are mainly basic in character.

Answer: C



Watch Video Solution

24. In context of the lanthanoids, which of the following statements is not correct?

A. There is a gradual decrease in the radii of the members with increasing atomic number in the series.

B. All the member exhibit + 3 oxidation state

C. because of similar properties the separation of lanthanoids is not easy.

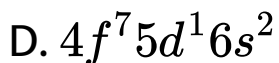
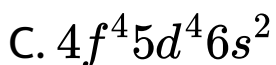
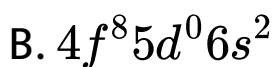
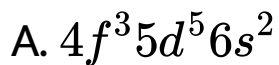
D. Availability of 4f electrons results in the formation of compounds in + 4 state for all the members of the series.

Answer: D



Watch Video Solution

25. The outer electrons configuration of *Lu* (Atomic No.,71) is :



Answer: D



Watch Video Solution

26. Match the property given in Column I with the element given in Column II.

	Column I (Property)		Column II (Element)
A.	Lanthanoid which shows +4 oxidation state	1.	Pm
B.	Lanthanoid which can show +2 oxidation state	2.	Ce
C.	Radioactive lanthanoid	3.	Lu
D.	Lanthanoid which has $4f^7$ electronic configuration in +3 oxidation state	4.	Eu
E.	Lanthanoid which has $4f^{14}$ electronic configuration in +3 oxidation state	5.	Gd
		6.	Dy

A → 2, B → 4, C → 3, D → 5, E → 1



Watch Video Solution