



CHEMISTRY

BOOKS - IIT-JEE PREVIOUS YEAR (CHEMISTRY)

PERIODIC CLASSIFICATION AND PERIODIC PROPERTIES

Jee Main And Advanced

1. The statement that is not correct for periodic classification of elements is

A. the properties of elements are the periodic functions of their atomic numbers

B. non-metallic elements are lesser in number than metallic elements

C. the first ionisation energies of elements along a period do not vary in a regular

manner increase in atomic number

D. for transition elements of d - subshells
are filled with electrons monotonically
with increase in atomic number

Answer: D



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2. Which of the following statements is/are true for the long form of the periodic table?

A. it reflects the sequence of filling the electrons in the order of sub-energy level s , p , d and f

B. it helps to predict the stable valency states of the elements

C. it reflects trends in physical and chemical properties of the elements

D. it helps to predict the relative ionicity of the bond between any two elements

Answer: B::C::D



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3. The ionic radii of N^{3-} , O^{2-} and F^{-} are respectively given by:

A. 1.36, 1.40 and 1.71

B. 1.36, 1.71 and 1.40

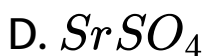
C. 1.71, 1.40 and 1.36

D. 1.71, 1.36 and 1.40

Answer: C



4. Which one of the following alkaline earth metal sulphates has its hydration enthalpy greater than its lattice enthalpy?



Answer: B::C::D



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5. Which among the following is the most reactive group



Answer: D



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6. Which one has the highest boiling point?

A. *He*

B. *Ne*

C. *Kr*

D. *Xe*

Answer: D



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7. The first ionisation potential of Na is $5.1eV$.

The value of electrons gain enthalpy of Na^+ will be

A. $-2.55eV$

B. $-2.1eV$

C. $-10.2eV$

D. $+2.55eV$

Answer: B::C::D



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8. Which of the following represents the correct order of increasing first ionisation enthalpy for *Ca*, *Ba*, *Se*, and *Ar*?

A. $Ca < S < Ba < Se < Ar$

B. $S < Se < Ca < Ba < Ar$

C. $Ba < Ca < Se < S < Ar$

D. $Ca < Ba < S < Se < Ar$

Answer: C



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9. The least stable in amongst the following is

:



Answer: B::C::D



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10. The set representing the correct order of the first ionisation potential is

A. $K > Na > Li$

B. $Be > Mg > Ca$

C. $B > C > N$

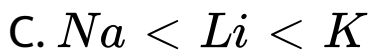
D. $Ge > Si > C$

Answer: B::C::D



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11. The correct order of radii is



Answer: B::C::D



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12. The incorrect statement among the following

A. The first ionisation potential of Al is less than the first ionisation potential of Mg

B. The second ionisation potential of Mg is greater than the second ionisation potential of Na

C. The first ionisation potential of Na is less than the first ionisation potential

of Mg

D. The third ionisation of Mg is greater than third ionisation potential of Na

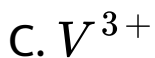
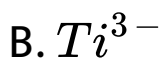
Answer: B::C::D



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

A. Mg^{2+}



Answer: D



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14. Which has the most stable +2 oxidation state ?



B. *Pb*

C. *Fe*

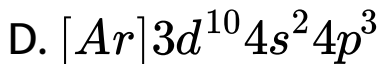
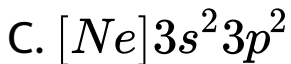
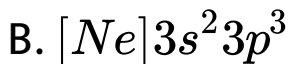
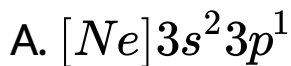
D. *Ag*

Answer: B::C::D



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15. Amongst the following elements (whose electronic configuration an given below) the one having highest ionization energy is

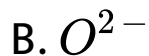
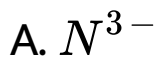


Answer: B::C::D



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16. Which one of the following is the smallest in size?



Answer: D



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17. The first ionisation potential of Na , Mg , Al and Si are in the order

A. $Na < Mg > Al < Si$

B. $Na > Mg > Al > Si$

C. $Na < Mg < Al > Si$

D. $Na > Mg > Al < Si$

Answer: A



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18. The electronegativity of the following elements increases in the order

A. *C, N, Si, P*

B. *N, Si, C, P*

C. *Si, P, C, N*

D. *P, Si, N, C*

Answer: C



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19. Atomic radii of fluorine and neon in Angstrom units are respectively given by

A. 0.72, 1.60

B. 1.60, 1.60

C. 0.72, 1.72

D. None of these

Answer: A



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20. The first ionisation potential in electron volts of nitrogen and oxygen atoms are respectively given by

A. 14.6, 13.6

B. 13.6, 14.6

C. 13.6, 13.6

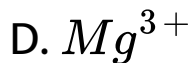
D. 14.6, 14.6

Answer: A



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21. The hydration enthalpy of Mg^{2+} ion is higher than that of



Answer: B::C::D



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22. Which of the following element has the highest ionisation energy ?

A. boron

B. carbon

C. nitrogen

D. oxygen

Answer: C



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23. The correct order of the second ionisation potential of carbon, nitrogen, oxygen and fluorine is

A. $C > N > O > F$

B. $O > N > F > C$

C. $O > F > N > C$

D. $F > O > N > C$

Answer: C



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24. The option (s) with only amphoteric oxides is (are)

A. NO , B_2O_3 , PbO , SnO_2

B. Cr_2O_3 , CrO , SnO , PbO

C. Cr_2O_3 , BeO , SnO , SnO_2

D. ZnO , Al_2O_3 , PbO , PbO_2

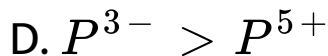
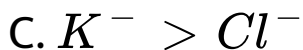
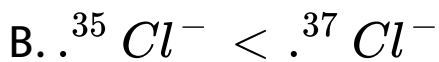
Answer: A::B



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25. Ionic radii of :

A. $Ti^{4-} < Mn^{-}$



Answer: D



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26. Sodium sulphate is soluble in water, whereas barium sulphate is sparingly soluble because

- A. the hydration energy of sodium sulphate is more than its lattice energy
- B. the lattice energy of barium sulphate is more than its hydration energy
- C. the lattice energy has no role to play in solubility
- D. the hydration energy of sodium sulphate is less than its lattice energy

Answer: A::B



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27. Statement I Nitrogen and oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen.

Statement II The reaction between nitrogen and oxygen requires high temperature.

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

Statement II is the 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



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28. Assertion (A) : Pb^{+4} compounds are stronger oxidising agents than Sn^{4+} compounds .

Reason (R): The higher oxidation states for group 14 elements are more stable for the heavier members of the group due to inert pair effect .

A. Statement I is true: Statement II is true,
Statement II is the 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: C



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29. Band gap in germanium is small.

The energy spread of each germanium atomic energy level is infinitesimally small.

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

Statement II is the 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: C



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30. Assertion: The first ionisation energy of Be is greater than that of B .

Reason: 2p-orbital is lower in energy than 2s-orbital.

- A. Statement I is true: Statement II is true,
Statement II is the 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: C



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31. Assertion (A) : F atom has less electron than Cl^{\ominus} atom

Reason (R) : Additional electrons are repelled more effectively by $3p$ electron in Cl atom than by $2p$ electron in F atom

A. Statement I is true: Statement II is true,
Statement II is the 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: C



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32. Compounds that formally contain Pb^{4+} are easily reduced to Pb^{2+} . The stability of the lower oxidation state is due to



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33. Ca^{2+} has a smaller ionic radius than K^{\oplus} because it has ".....".



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34. On Mulliken scale the average of IP and EA is known as _____ .



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35. The energy released when an electron is added to a neutral gaseous atom is calledof atom



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36. The basic nature of the hydroxides of group 13 decreases progressively down the group.



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37. The decreasing order of electron affinity of *F*, *Cl* and *Br* is $F > Cl > Br$.



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38. In group *IA* of alkali metals, the ionisation potential decrease down the group, Therefore, lithium is a poor reducing agent.



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39. The softness of group *IA* metals increase down the group with increasing atomic number.



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40. Arrange the following ions in order of their decreasing ionic radii.



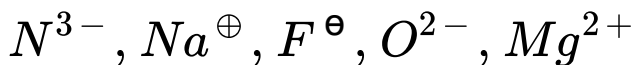
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41. Compare qualitatively the first and second ionisation potentials of copper and zinc. Explain the observation.



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42. Arrange the following as stated: Increasing order of ionic size



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43. Give reason for the following :

- a. The first ionisation enthalpy of carbon is greater than that of boron, whereas the reverse is true for the second ionisation enthalpy .
- b. Solid carbon dioxide is known as dry ice .

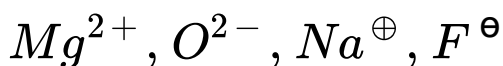
c. Why does not silicon form an analogue of graphite ?



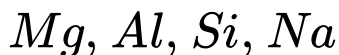
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44. Arrange the following in the given order

(a) Decreasing ionic size,

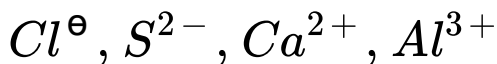


(b) Increasing first ionisation energy :



(c) Increasing bond length F_2, N_2, Cl_2, O_2

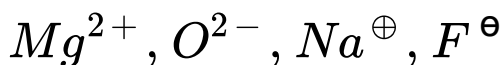
(d) The order of their increasing size:



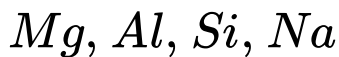
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45. Arrange the following in the given order

(a) Decreasing ionic size,

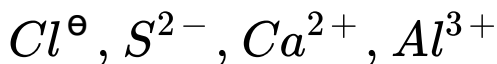


(b) Increasing first ionisation energy :



(c) Increasing bond length F_2, N_2, Cl_2, O_2

(d) The order of their increasing size:



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46. $N_0/2$ atoms of $X(g)$ are converted into $X^+(g)$ by energy E_1 . $N_0/2$ atoms of $X(g)$ are converted into $X^-(g)$ by the energy E_2 . Hence ionisation potential and electron affinity of $X(g)$ are :

$$A. \frac{2E_2}{N_0}, \frac{2(E_1 - E_2)}{N_0}$$

B. $\frac{2E_1}{N_0}, \frac{2E_2}{N_0}$

C. $\frac{(E_1 - E_2)}{N_0}, \frac{2E_2}{N_0}$

D. None is correct

Answer: B

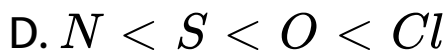
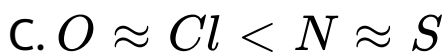
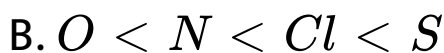


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47. The correct electron affinity order of

N, O, S, Cl is:

A. $N < O < S < Cl$



Answer: D



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48. If Aufbau and Hund's rule are not used, then incorrect statement is



B. Na will be in same s -block (if these rules are true)

C. Cu would be s -block element

D. Magnetic moment of $Cr(24)$ would be zero

Answer: A



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49. A compound of vanadium has a magnetic moment of $1.73BM$. Work out the electronic configuration of vanadium in the compound

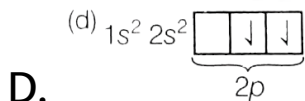
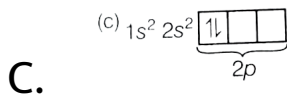
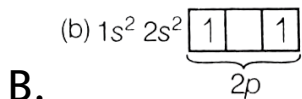
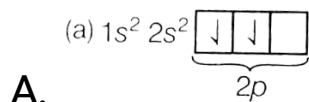


Answer: C



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50. Which of the following can be acceptable electronic configuration of carbon atom in the ground state?



Answer: A::B::D



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51. Which of the following statement is (are) correct regarding periodic table?

A. In a period ionisation energy increases monotonically from left to right

B. Electronegativity increases from left to right

C. Electron affinity decreases monotonically from top to bottom in a group

D. Transition elements starts only from fourth period of the periodic table

Answer: A::C



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52. Assertion Nitrogen has higher first ionisation energy than oxygen.

Reason Atomic radius of nitrogen is smaller than that of oxygen.

A. Both Assertion and Reason are correct and Reason is the correct explanation on the Assertion.

B. Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion

C. Assertion is correct but Reason is incorrect

D. Assertion is incorrect but Reason is correct

Answer: C



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53. Assertion: $SnCl_2$ is a good reducing agent while $PbCl_2$ is stable although both Sn and Pb belongs to same group of periodic table.

Reason: Pb show inert pair effect.



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54. Match the statements of Column I with values of Column II

Column I	Column II
A. Be ($Z = 4$)	p. Paramagnetic
B. C ($Z = 6$)	q. Diamagnetic
C. Mg^{2+} ($Z = 12$)	r. No valence shell orbital without electron
D. N ($Z = 7$)	s. Has higher IE than both elements, on left and right in the period.



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55. In ground state of oxygen, in how many ways its p -electrons can be represented in box

diagram without violating either Hund's rule of Pauli's exclusion principle?



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Objective Type

1. The first ionisation potential of nitrogen and oxygen atoms are related as follows.

A. The ionisation potential of oxygen potential of oxygen is less than the

ionisation potential of nitrogen

B. the ionisation potential of nitrogen is greater than the ionisation potential of oxygen

C. The two ionisation potential values are comparable

D. The difference between the two ionisation potential is too large

Answer: A::B::C



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Comprehension Type

1. Let's consider a hypothetical planet pseudo Earth which is similar to our earth in several aspects. The similarities are

On pseudo earth:

(i) There are same number of elements as on our earth and they are known by the same name.

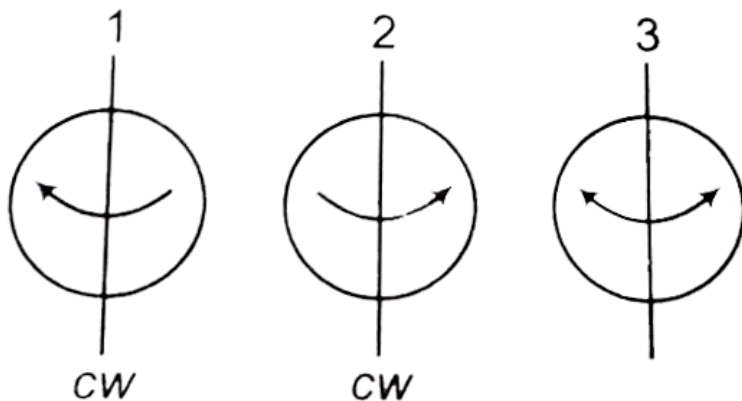
(ii) Pauli's exclusion principal, Hund's Rule and Aufbau principle are known to the people of

pseudo earth in the same manner as we know on our earth.

(iii) They classify elements as representative, transition and inner- transition elements in the same manner as we classify on our earth.

However, there is one basic difference in understanding the electrons, spin on these two earths. On our earth the electron can have only two spin directions. clock wise (1) and anti-clockwise (2), while on pseudo earth there is an additional possible value of spin quantum number called neutral spin (3) in which electron is believed to be fluctuating

harmonically between clockwise and anti-clockwise directions, about its axis. Answer the following three question based on the above information.



The first noble gas on pseudo earth would be

A. *He*

B. *H*

C. *Li*

D. Ne

Answer: C



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2. Let's consider a hypothetical planet pseudo Earth which is similar to our earth in several aspects. The similarities are

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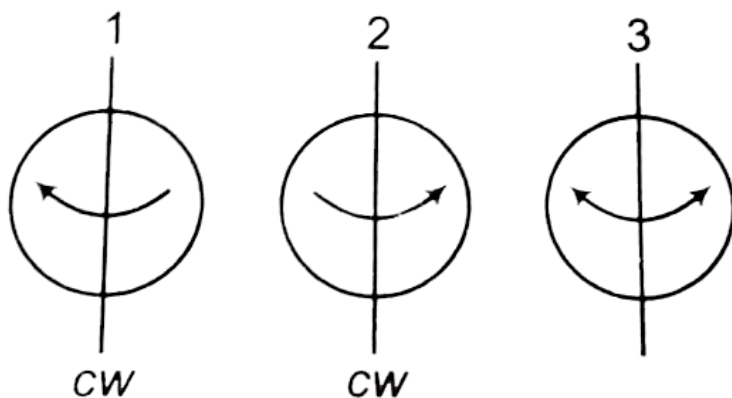
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is an additional possible value of spin quantum number called neutral spin (3) in which electron is believed to be fluctuating harmonically between clockwise and anti-clockwise directions, about its axis. Answer the following three question based on the above information.



The long form of periodic table on this pseudo earth will have how many groups?

A. 18

B. 24

C. 27

D. 36

Answer: C



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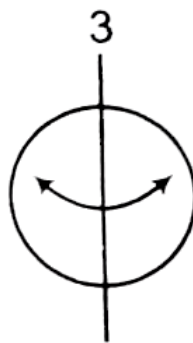
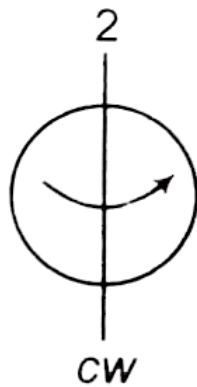
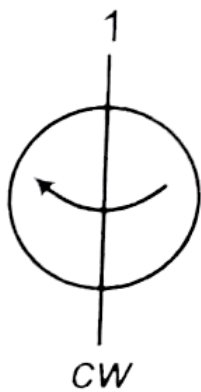
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On pseudo earth, atomic number of the first transition metal would be

A. 21

B. 26

C. 29

D. 31

Answer: D



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