

## Questions

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## Q1 - 2024 (05 Apr Shift 1)

The number of neutrons present in the more abundant isotope of boron is ' $x$ '. Amorphous boron upon heating with air forms a product, in which the oxidation state of boron is ' $y$ '. The value of  $x + y$  is \_\_\_\_\_

- (1) 3
- (2) 9
- (3) 4
- (4) 6

## Q2 - 2024 (05 Apr Shift 2)

The correct statements from the following are :

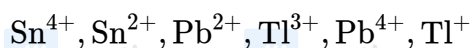
- (A) The decreasing order of atomic radii of group 13 elements is  $Tl > In > Ga > Al > B$ .
- (B) Down the group 13 electronegativity decreases from top to bottom.
- (C) Al dissolves in dil. HCl and liberates  $H_2$  but conc.  $HNO_3$  renders Al passive by forming a protective oxide layer on the surface.
- (D) All elements of group 13 exhibits highly stable +1 oxidation state.
- (E) Hybridisation of Al in  $[Al(H_2O)_6]^{3+}$  ion is  $sp^3 d^2$ .

Choose the correct answer from the options given below :

- (1) (A), (C) and (E) only
- (2) (A) and (C) only
- (3) (C) and (E) only
- (4) (A), (B), (C) and (E) only

## Q3 - 2024 (06 Apr Shift 2)

The number of ions from the following that are expected to behave as oxidising agent is :



- (1) 3
- (2) 2

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(3) 1

(4) 4

## Q4 - 2024 (06 Apr Shift 2)

Evaluate the following statements related to group 14 elements for their correctness.

(A) Covalent radius decreases down the group from C to Pb in a regular manner.

(B) Electronegativity decreases from C to Pb down the group gradually.

(C) Maximum covalance of C is 4 whereas other elements can expand their covalance due to presence of d orbitals.

(D) Heavier elements do not form  $p\pi - p\pi$  bonds.

(E) Carbon can exhibit negative oxidation states.

Choose the correct answer from the options given below :

(1) (A), (B) and (C) Only

(2) (C), (D) and (E) Only

(3) (C) and (D) Only

(4) (A) and (B) Only

## Q5 - 2024 (08 Apr Shift 1)

Give below are two statements: One is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: The stability order of +1 oxidation state of Ga, In and Tl is  $Ga < In < Tl$ .

Reason R: The inert pair effect stabilizes the lower oxidation state down the group.

In the light of the above statements, choose the correct answer from the options given below:

(1) A is true but R is false.

(2) A is false but R is true.

(3) Both A and R are true and R is the correct explanation of A.

(4) Both A and R are true but R is NOT the correct explanation of A.

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Answer Key

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**Q1 (2)** mathongo /// ma **Q2 (3)** /// mathongo **Q3 (2)** mathongo /// mc **Q4 (2)**o /// mathongo

**Q5 (3)** athongo /// mathongo /// mathongo /// mathongo /// mathongo /// mathongo

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#MathBoleTohMathonGo

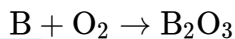
## Solutions

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Q1

More abundant isotope =  $B^{11}$ 

[Number of neutrons = 6 ]

 $x = 6$ Oxidation state of B in  $B_2O_3 = +3$ So,  $y = 3$ Hence  $x + y = 9$ 

Q2

A. size order  $Tl > In > Al > Ga > B$ B. Electronegativity order  $B > Al < Ga < In < Tl$ 

D. B, Al are more stable in +3 oxidation state

So, only C, E statements are correct.

Q3

Due to inert pair effect;  $Tl^{+3}$  and  $Pb^{+4}$  can behave as oxidising agents.

Q4

(A) Down the group; radius increases

(B) EN does not decrease gradually from C to Pb.

(C) Correct.

(D) Correct.

(E) Range of oxidation state of carbon ; -4 to +4

Q5

The relative stability of +1 oxidation state progressively increases for heavier elements due to inert pair effect.

 $\therefore$  Stability of  $Al^{+1} < Ga^{+1} < In^{+1} < Tl^{+1}$ 

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