

COMPLETE p-BLOCK

1. On reaction of Lead Sulphide with dilute nitric acid which of the following is **not** formed ?
 (1) Lead nitrate (2) Sulphur
 (3) Nitric oxide (4) Nitrous oxide
2. Given below are two statements : one is labelled as **Assertion (A)** : and the other is labelled as **Reason (R)**.

Assertion (A) : Both rhombic and monoclinic sulphur exist as S_8 while oxygen exists as O_2 .

Reason (R) : Oxygen forms $p\pi-p\pi$ multiple bonds with itself and other elements having small size and high electronegativity like C, N, which is not possible for sulphur.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

- (1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.
 (2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.
 (3) **(A)** is correct but **(R)** is not correct.
 (4) **(A)** is not correct but **(R)** is correct.
3. Number of oxygen atoms present in chemical formula of fuming sulphuric acid is _____.
4. Match List-I with List-II.

List-I		List-II	
A.	Melting point [K]	I.	Tl > In > Ga > Al > B
B.	Ionic Radius [M^{+3}/pm]	II.	B > Tl > Al \approx Ga > In
C.	$\Delta_f H_1$ [$kJ\ mol^{-1}$]	III.	Tl > In > Al > Ga > B
D.	Atomic Radius [pm]	IV.	B > Al > Tl > In > Ga

Choose the correct answer from the options given below :

- (1) A-III, B-IV, C-I, D-II
 (2) A-II, B-III, C-IV, D-I
 (3) A-IV, B-I, C-II, D-III
 (4) A-I, B-II, C-III, D-IV
5. Among the following halogens F_2 , Cl_2 , Br_2 and I_2 Which can undergo disproportionation reaction?
 (1) Only I_2
 (2) Cl_2 , Br_2 and I_2
 (3) F_2 , Cl_2 and Br_2
 (4) F_2 and Cl_2
6. Given 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) Both **A** and **R** are true and **R** is the correct explanation of **A**.
 (2) **A** is true but **R** is false.
 (3) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
 (4) **A** is false but **R** is true.
7. Identify the **incorrect** statements about group 15 elements :
 (A) Dinitrogen is a diatomic gas which acts like an inert gas at room temperature.
 (B) The common oxidation states of these elements are -3, +3 and +5.
 (C) Nitrogen has unique ability to form $p\pi-p\pi$ multiple bonds.
 (D) The stability of +5 oxidation states increases down the group.
 (E) Nitrogen shows a maximum covalency of 6.
 Choose the **correct** answer from the options given below.
 (1) (A), (B), (D) only (2) (A), (C), (E) only
 (3) (B), (D), (E) only (4) (D) and (E) only

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8. Identify the correct statements about p-block elements and their compounds.
- (A) Non metals have higher electronegativity than metals.
- (B) Non metals have lower ionisation enthalpy than metals.
- (C) Compounds formed between highly reactive nonmetals and highly reactive metals are generally ionic.
- (D) The non-metal oxides are generally basic in nature.
- (E) The metal oxides are generally acidic or neutral in nature.
- (1) (D) and (E) only (2) (A) and (C) only
(3) (B) and (E) only (4) (B) and (D) only
9. Given below are two statements :
- Statement-I:** Gallium is used in the manufacturing of thermometers.
- Statement-II :** A thermometer containing gallium is useful for measuring the freezing point (256 K) of brine solution.
- In the light of the above statement, choose the correct answer from the options given below :
- (1) Both Statement I and Statement II are false.
(2) Statement I is false but Statement II is true.
(3) Both Statement I and Statement II are true.
(4) Statement I is true but Statement II is false.
10. Which of the following material is not a semiconductor.
- (1) Germanium
(2) Graphite
(3) Silicon
(4) Copper oxide
11. The number of ions from the following that are expected to behave as oxidising agent is:
 Sn^{4+} , Sn^{2+} , Pb^{2+} , Tl^{3+} , Pb^{4+} , Tl^{+}
- (1) 3 (2) 4
(3) 1 (4) 2
12. 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 covalence of C is 4 whereas other elements can expand their covalence 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) (C), (D) and (E) Only
(2) (A) and (B) Only
(3) (A), (B) and (C) Only
(4) (C) and (D) Only
13. Given below are two statements :
- Statement I:** In group 13, the stability of +1 oxidation state increases down the group.
- Statement II:** The atomic size of gallium is greater than that of aluminium.
- In the light of the above statements, choose the **most appropriate** answer from the options given below:
- (1) **Statement I** is incorrect but **Statement II** is correct
(2) Both **Statement I** and **Statement II** are correct
(3) Both **Statement I** and **Statement II** are incorrect
(4) **Statement I** is correct but **Statement II** is incorrect
14. 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) 4 (2) 6
(3) 3 (4) 9

15. 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 liberate 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^3d^2 .
- Choose the **correct** answer from the options given below :
- (1) (C) and (E) only
 (2) (A), (C) and (E) only
 (3) (A), (B), (C) and (E) only
 (4) (A) and (C) only
16. When MnO_2 and H_2SO_4 is added to a salt (A), the greenish yellow gas liberated as salt (A) is :
- (1) NaBr (2) CaI_2
 (3) KNO_3 (4) NH_4Cl
17. The correct order of the first ionization enthalpy is
- (1) $Al > Ga > Tl$
 (2) $Ga > Al > B$
 (3) $B > Al > Ga$
 (4) $Tl > Ga > Al$
18. Among the following oxide of p - block elements, number of oxides having amphoteric nature is
- Cl_2O_7 , CO, PbO_2 , N_2O , NO, Al_2O_3 , SiO_2 , N_2O_5 , SnO_2
19. The strongest reducing agent among the following is :
- (1) NH_3 (2) SbH_3
 (3) BiH_3 (4) PH_3
20. Consider the oxides of group 14 elements SiO_2 , GeO_2 , SnO_2 , PbO_2 , CO and GeO.
- The amphoteric oxides are
- (1) GeO, GeO_2
 (2) SiO_2 , GeO_2
 (3) SnO_2 , PbO_2
 (4) SnO_2 , CO
21. Given below are two statements :
- Statement (I)** : SiO_2 and GeO_2 are acidic while SnO and PbO are amphoteric in nature.
- Statement (II)** : Allotropic forms of carbon are due to property of catenation and $p-d\pi$ bond formation.
- In the light of the above statements, choose the most appropriate answer from the options given below:
- (1) Both Statement I and Statement II are false
 (2) Both Statement I and Statement II are true
 (3) Statement I is true but Statement II is false
 (4) Statement I is false but Statement II is true
22. Given below are two statements :
- Statement I**: Group 13 trivalent halides get easily hydrolyzed by water due to their covalent nature.
- Statement II**: $AlCl_3$ upon hydrolysis in acidified aqueous solution forms octahedral $[Al(H_2O)_6]^{3+}$ ion.
- In the light of the above statements, choose the **correct answer** from the options given below :
- (1) Statement I is true but statement II is false
 (2) Statement I is false but statement II is true
 (3) Both statement I and statement II are false
 (4) Both statement I and statement II are true

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23. Choose the correct statements from the following
- A. All group 16 elements form oxides of general formula EO_2 and EO_3 where $E = S, Se, Te$ and Po . Both the types of oxides are acidic in nature.
- B. TeO_2 is an oxidising agent while SO_2 is reducing in nature.
- C. The reducing property decreases from H_2S to H_2Te down the group.
- D. The ozone molecule contains five lone pairs of electrons.
- Choose the correct answer from the options given below:
1. A and D only 2. B and C only
 3. C and D only 4. A and B only
24. Aluminium chloride in acidified aqueous solution forms an ion having geometry
- (1) Octahedral
 (2) Square Planar
 (3) Tetrahedral
 (4) Trigonal bipyramidal
25. Choose the correct statements about the hydrides of group 15 elements.
- A. The stability of the hydrides decreases in the order $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
- B. The reducing ability of the hydrides increases in the order $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$
- C. Among the hydrides, NH_3 is strong reducing agent while BiH_3 is mild reducing agent.
- D. The basicity of the hydrides increases in the order $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$
- Choose the most appropriate from the option given below:
- (1) B and C only (2) C and D only
 (3) A and B only (4) A and D only
26. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.
- Assertion A :** H_2Te is more acidic than H_2S .
- Reason R:** Bond dissociation enthalpy of H_2Te is lower than H_2S .
- In the light of the above statements. Choose the most appropriate from the options given below.
- (1) Both A and R are true but R is NOT the correct explanation of A.
 (2) Both A and R are true and R is the correct explanation of A.
 (3) A is false but R is true.
 (4) A is true but R is false.
27. Given below are two statements :
- Statement I :** The electronegativity of group 14 elements from Si to Pb gradually decreases.
- Statement II :** Group 14 contains non-metallic, metallic, as well as metalloid elements.
- In the light of the above statements, choose the most appropriate from the options given below :
- (1) Statement I is false but Statement II is true
 (2) Statement I is true but Statement II is false
 (3) Both Statement I and Statement II are true
 (4) Both Statement I and Statement II are false
28. Anomalous behaviour of oxygen is due to its
- (1) Large size and high electronegativity
 (2) Small size and low electronegativity
 (3) Small size and high electronegativity
 (4) Large size and low electronegativity

29. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).
- Assertion (A) :** Melting point of Boron (2453 K) is unusually high in group 13 elements.
- Reason (R) :** Solid Boron has very strong crystalline lattice.
- In the light of the above statements, choose the most appropriate answer from the options given below ;
- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 - (2) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 - (3) (A) is true but (R) is false
 - (4) (A) is false but (R) is true
30. Given below are two statements:
- Statement (I) :** Oxygen being the first member of group 16 exhibits only -2 oxidation state.
- Statement (II) :** Down the group 16 stability of $+4$ oxidation state decreases and $+6$ oxidation state increases.
- In the light of the above statements, choose the **most appropriate** answer from the options given below:
- (1) Statement I is correct but Statement II is incorrect
 - (2) Both Statement I and Statement II are correct
 - (3) Both Statement I and Statement II are incorrect
 - (4) Statement I is incorrect but Statement II is correct
31. 1 mole of PbS is oxidised by "X" moles of O_3 to get "Y" moles of O_2 . $X + Y = \underline{\hspace{2cm}}$.

SOLUTIONS

1. **Ans. (4)**

Sol. $\text{PbS} + \text{HNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_2 + \text{NO} + \text{S} + \text{H}_2\text{O}$

Nitrous oxide (N_2O) is not formed during the reaction.

2. **Ans.(3)**

Sol. Oxygen can form $2p-2p\pi$ multiple bond with itself due to its small size while sulphur cannot form multiple bond with itself as $3p\pi-3p\pi$ bond will be unstable due to large size of sulphur, but sulphur can form multiple bond with small size atom like C and N.

eg. $\text{S} = \text{C} = \text{S}$



3. **Ans. (7)**

Sol. Fuming sulphuric acid is a mixture of conc. $\text{H}_2\text{SO}_4 + \text{SO}_3$ Or $\text{H}_2\text{S}_2\text{O}_7$

So, Number of Oxygen atoms = 7

4. **Ans. (3)**

Sol. Melting point : $\text{B} > \text{A} > \text{T} > \text{In} > \text{Ga}$

Ionic radius (M^{+3}/pm) : $\text{T} > \text{In} > \text{Ga} > \text{A} > \text{B}$

$$(\Delta_{\text{IE}}\text{H})_1 \left[\frac{\text{kJ}}{\text{md}} \right] : \text{B} > \text{T} > \text{A} \approx \text{Ga} > \text{In}$$

Atomic radius (in pm) : $\text{T} > \text{In} > \text{A} > \text{Ga} > \text{B}$

5. **Ans. (2)**

Sol. F_2 do not disproportionate because fluorine do not exist in positive oxidation state however Cl_2 , Br_2 & I_2 undergoes disproportionation.

6. **Ans. (1)**

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

$$\therefore \text{Stability of } \text{A}^{+1} < \text{Ga}^{+1} < \text{In}^{+1} < \text{T}^{+1}$$

7. **Ans. (4)**

Sol. (D) Due to inert pair effect lower oxidation state is more stable.

(E) Nitrogen belongs to 2nd period and cannot expand its octet.

8. **Ans. (2)**

Sol. As electronegativity increases non-metallic nature increases.

Along the period ionisation energy increases.

High electronegativity difference results in ionic bond formation.

Oxides of metals are generally basic and that of non-metals are acidic in nature.

9. **Ans. (4)**

Sol. **Statement - I** \Rightarrow Correct

Statement - II \Rightarrow False

Ga is used to measure high temperature

10. **Ans. (2)**

Sol. Graphite is conductor

11. **Ans. (4)**

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

12. **Ans. (1)**

Sol. (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 $+4$

13. **Ans. (4)**

Sol. **Statement I** : Number of d & f electrons, increases down the group and due to poor shielding of d & f e^- , stability of lower oxidation states increases down the group

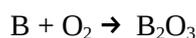
Statement II : The atomic size of aluminium is greater than that of gallium.

14. **Ans. (4)**

Sol. More abundant isotope = B^{11}

[Number of neutrons = 6]

$x = 6$



Oxidation state of B in $\text{B}_2\text{O}_3 = +3$

So, $y = 3$

Hence $x + y = 9$

15. Ans.(1)

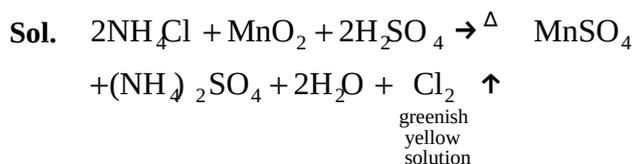
Sol. A. size order $T > In > Al > Ga > B$

B. Electronegativity order $B > Al < Ga < In < T$

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

So, only C, E statements are correct.

16. Ans. (4)



17. Ans. (4)

Sol. (i) due to lanthanide contraction T has more I.E. as compared to Ga and A

(ii) due to scandide contraction Ga has more I.E. as compared to A

18. Ans. (3)

Sol. Acidic oxide: $\text{Cl}_2\text{O}_7, \text{SiO}_2, \text{N}_2\text{O}_5$

Neutral oxide: $\text{CO}, \text{NO}, \text{N}_2\text{O}$

Amphoteric oxide: $\text{Al}_2\text{O}_3, \text{SnO}_2, \text{PbO}_2$

19. Ans. (3)

Sol. Strongest reducing agent : BiH_3 explained by its low bond dissociation energy.

20. Ans. (3)

Sol. SnO_2 and PbO_2 are amphoteric

21. Ans. (3)

Sol. SiO_2 and GeO_2 are acidic and SnO, PbO are amphoteric.

Carbon does not have d-orbitals so can not form $\text{p}\pi\text{-d}\pi$ Bond with itself. Due to properties of catenation and $\text{p}\pi\text{-p}\pi$ bond formation. carbon is able to show allotropic forms.

22. Ans. (4)

Sol. In trivalent state most of the compounds being covalent are hydrolysed in water. Trichlorides on hydrolysis in water form tetrahedral $[\text{M}(\text{OH})_4]^-$ species, the hybridisation state of element M is sp^3 .

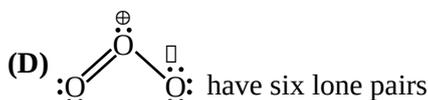
In case of aluminium, acidified aqueous solution forms octahedral $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ ion.

23. Ans. (4)

Sol. (A) All group 16 elements form oxides of the EO_2 and EO_3 type where E = S, Se, Te or PO.

(B) SO_2 is reducing while TeO_2 is an oxidising agent.

(C) The reducing property increases from ~~B~~ to H_2Te down the group.



24. Ans. (1)

Sol. AlCl_3 in acidified aqueous solution forms octahedral geometry $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$

25. Ans. (3)

Sol. On moving down the group, bond strength of M-H bond decreases, which reduces the thermal stability but increases reducing nature of hydrides, hence A and B are correct statements.

26. Ans.(2)

Sol. Due to lower Bond dissociation enthalpy of H_2Te it ionizes to give H^+ more easily than H_2S .

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Sol.	Gr-14	EN
	C	2.5
	Si	1.8
	Ge	1.8
	Sn	1.8
	Pb	1.9

The electronegativity values for elements from Si to Pb are almost same. So Statement I is false.

28. Ans. (3)**Sol.** Fact Based.**29. Ans. (2)****Sol.** Solid Boron has very strong crystalline lattice so its melting point unusually high in group 13 elements**30. Ans. (3)****Sol.** Statement-I: Oxygen can have oxidation state from -2 to $+2$, so statement I is incorrect
Statement- II: On moving down the group stability of $+4$ oxidation state increases whereas stability of $+6$ oxidation state decreases down the group, according to inert pair effect.
So both statements are wrong.**31. Ans. (8)****Sol.** $\text{PbS} + 4\text{O}_3 \rightarrow \text{PbSO}_4 + 4\text{O}_2$ $x = 4, y = 4$