P-Block Element

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1. Which one of the following oxides of nitrogen is a solid?
    1. NO_2
    2. N_2O
    3. N_2O_3
    4. N_2O_5
2. Which one of the following is stable?
    1. NCl_3
    2. NBr_3
    3. NI_3
    4. NF_3
3. The BCl_3 is a planar molecule, whereas NCl_3 is pyramidal because
    1. N-Cl bond is more covalent than B-Cl bond
    2. B-Cl bond is more polar than N-Cl bond
    3. BCl_3 has no lone pair but NCl_3 is a lone pair of electrons
    4. Nitrogen atom is smaller than boron
4. Which of the following is tetrabasic acid?
    1. Metaphosphoric acid
    2. Orthophosphoric acid
    3. Hypophosphoric acid
    4. Hypophosphorous acid
5. The reagent used to distinguish between hydrogen peroxide and ozone is
    1. PbS
    2. Starch and Iodine
    3. $KMnO_4$
    4. Bleaching powder
6. Ozone can be detected by using
    1. mercury
    2. silver
    3. sodium
    4. none of these
7. The correct sequence of decrease in the bond angle of following hydride is
    1. $NH_3 > PH_3 > AsH_3 > SbH_3$
    2. $NH_3 > AsH_3 > PH_3 > SbH_3$
    3. $SbH_3 > AsH_3 > PH_3 > NH_3$
    4. $PH_3 > NH_3 > AsH_3 > SbH_3$
8. Among the following oxides, the least acidic is
    1. P_4O_6
    2. P_4O_{10}

3. As_4O_6
4. As_4O_{10}

9. Which of the following is paramagnetic?
    1. N_2O_3
    2. NO_2
    3. N_2O_5
    4. All of these
10. Concentrated H_2SO_4 is not used to prepare HBr from KBr because it
    1. oxidises HBr
    2. reduces HBr
    3. causes disproportionation of HBr
    4. reacts to slowly with KBr
11. Which of the following is thermally most stable ?
    1. H_2S
    2. H_2O
    3. H_2Se
    4. H_2Te
12. Which of the following oxides react with both HCl and NaOH?
    1. N_2O_5
    2. ZnO
    3. CaO
    4. CO_2
13. Which gas evolves when urea is treated with sodium hydroxide?
    1. Nitrogen
    2. Laughing gas
    3. Ammonia
    4. NO
14. Which of the following is an amphoteric oxide?
    1. Cr_2O_3
    2. Cl_2O_7
    3. SnO_2
    4. None of these
15. Which of the following allotropic forms of sulphur is thermodynamically most stable?
    1. β-monoclinic
    2. γ -monoclinic
    3. Plastic sulphur
    4. Orthorhombic
16. Which of the following does not have a p-o-p bond?
    1. P_4O_6
    2. P_4O_{10}
    3. $H_4P_2O_6$

4. $H_4P_2O_7$

17. Which acid on heating produces phosphine?
    1. Phosphoric acid
    2. Phosphorous acid
    3. Peroxymonophosphoric acid
    4. Metaphosphoric acid
18. Xenon difluoride is
    1. linear
    2. angular
    3. trogonal
    4. pyramidal
19. Which of the following is not a reducing agent
    1. Sulphur Dioxide
    2. Hydrogen Peroxide
    3. Carbon Dioxide
    4. Nitrogen Dioxide
20. Which of the following molecules does not possess a permanent dipole moment.
    1. H_2S
    2. SO_2
    3. SO_3
    4. CS_2
21. Potassium chlorate on heating with concentrated sulphuric acid gives
    1. Chlorine dioxide
    2. $HClO_4$
    3. $KHSO_4$
    4. All of these
22. The most abundant and common oxidation state of sulphur is
    1. -2
    2. +4
    3. +2
    4. +6
23. Ozone is
    1. an unstable, dark blue, diamagnetic gas
    2. an unstable, dark blue, paramagnetic gas
    3. a stable, dark blue, paramagnetic gas
    4. found in the upper atmosphere where it absorbs UV radiation
24. Structure of ClF_3 is
    1. T-shape
    2. Octahedral
    3. Tetrahedral
    4. None of these

25. In two forms NCl3 whereas P can form both PCl3 and PCl5. Why?
    1. N atom has is larger than P in size
    2. P is more reactive towards Cl than N
    3. P has d orbitals which can be used for bonding but N2 does not have d orbitals
    4. None of these
26. Which characteristic is not correct about sulphuric acid?
    1. Sulphonating agent
    2. Reducing agent
    3. Oxidizing agent
    4. Highly Vicious
27. Which of the following is planar?
    1. XeF_4
    2. XeO_4
    3. XeO_2F_2
    4. $XeOF_4$
28. Which of the following halide ions is the most basic?
    1. Cl^-
    2. Br^-
    3. I^-
    4. F^-
29. Which of the following gives nitrogen on heating?
    1. Ammonium nitride
    2. Ammonium nitrate
    3. Ammonium nitrite
    4. Ammonium hydroxide
30. One of the reasons why F-F bond is weak is that
    1. The repulsion between the Non Bonding pairs of electrons of the two fluorine atoms is high
    2. The F-F Bond distance is small and hence intermolecular repulsion is small
    3. The ionization enthalpy of the fluorine atom is very high
    4. The F-F Bond distances large
31. The mixture of NaI and $NaIO_3$ is treated with hot conc. H_2SO_4. The iodine-containing product formed is
    1. HIO_3
    2. $NaIO_4$
    3. I_2
    4. HIO_4
32. When bleaching powder is treated with carbon dioxide
    1. Calcium chloride is formed
    2. No reaction occurs

3. Chlorine is evolved
4. It absorbs the gas

33. PtF_6 converts O_2 to
    1. $O_2^-PtF_6^+$
    2. $O_2^+PtF_6^-$
    3. $F_2^+PtO_2$
    4. F_2O^+Pt
34. Which of the following has the greatest reducing power?
    1. HBr
    2. HI
    3. HCl
    4. HF
35. XeF_6 on complete hydrolysis gives
    1. XeO_3
    2. Xe
    3. XeO_2
    4. XeO_4
36. Which of the following statements is not correct?
    1. Krypton is obtained during radioactive disintegration
    2. Argon is used in electric bulbs
    3. Half life of radon is only 3.8 days
    4. Helium is used in producing very low temperatures
37. Which of the following noble gas is not found in the atmosphere?
    1. Rn
    2. Kr
    3. Ne
    4. Ar
38. What is the colour produced when ammonia is passed through a solution of copper sulphate?
    1. Red
    2. Orange
    3. Yellow
    4. Blue
39. What is the correct order of electron affinities among halogens?
    1. $F_2 > Cl_2 > Br_2 > I_2$
    2. $Cl_2 > Br_2 > F_2 > I_2$
    3. $F_2 < Cl_2 < Br_2 < I_2$
    4. $I_2 < Br_2 < F_2 < Cl_2$
40. What is the hybridisation of Xe in XeF_2?
    1. sp^3
    2. sp^2
    3. sp^2d

4. sp^3d

41. Which one of the following undergoes thermal decomposition?
    1. XeF_2
    2. XeF_4
    3. ZeF_6
    4. None of these
42. Which of the following is the least oxidising in nature?
    1. $HClO_3$
    2. $HClO_4$
    3. $HClO_2$
    4. HClO
43. Which one of the following is the most stable thermally?
    1. HI
    2. HBr
    3. HCl
    4. HF
44. The crystals of ferrous sulphate on heating give
    1. $FeO + SO_2 + H_2O$
    2. $FeO + SO_3 + H_2SO_4 + H_2O$
    3. $Fe_2O_3 + SO_2 + SO_3 + H_2O$
    4. $Fe_2O_3 + H_2SO_4 + H_2O$
45. Pure chlorine is obtained
    1. By heating MnO_2 with HCl
    2. By heating bleaching powder with HCl
    3. By heating $PtCl_4$
    4. By heating a mixture of NaCl and MnO_2 with conc. H_2SO_4
46. The element which forms oxides in all the oxidation states from +1 to +5 is
    1. N
    2. P
    3. As
    4. Sb
47. Which one of the following acts as an antichlor?
    1. MnO_2
    2. $Na_2S_2O_3$
    3. $K_2Cr_2O_7$
    4. Na_2SO_4
48. N_2O_3 is
    1. An acidic oxide and the anhydride of HNO_2
    2. An acidic oxide and the anhydride of $H_2N_2O_2$
    3. A neutral oxide and the anhydride of HNO_3
    4. A basic oxide and the anhydride of HNO_2
49. $(NH_4)_2CrO_7$ on heating liberates a gas. The same gas will be obtained by

1. Heating NH_4NO_3
2. Treating Mg_3N_2 with H_2O
3. Heating NH_4NO_2
4. Heating H_2O_2 on $NaNO_2$

50. According to Le Chatlier's principle, low temperature is required for more yield of ammonia in Haber's process. What is the temperature commercially kept for the process?
    1. 350-450℃
    2. 450-550℃
    3. 250-350℃
    4. 150-250℃

Answer

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1 . (4)

N_2O_5 exists as a solid under the temperature of 273 K. After this temperature, it starts too decompose.

2. (4)

The unstable nature of NBr_3, NCl_3 and NI_3 is due to low polarity of the N-X bond and large size difference between nitrogen and halogen atoms. The size of nitrogen and fluorine are comparable.

3. (3)

Presence of bond pairs and lone pairs affect the shape of the molecule. This is due to the fact that lone pairs and bond pairs repel each other and affect the shape.

BCl_3 has 3 bond pairs and 0 lone pair

NCl_3 has 3 bond pairs and 1 lone pair

4. (3)

Tetrabasic acid means an acid having four hydrogens that can be replaced.

Hypophosphorous acid – H_3PO_2

Metaphosphoric acid – HPO_3

Orthophosphoric acid – H_3PO_4

Hypophosphoric acid – $H_4P_2O_6$

Hypophosphoric acid has 4 replaceable hydrogens.

5. (2)

Iodine is used in the quantitative estimation of ozone.

6. (1)

Ozone reacts with mercury to form mercurous oxide, which sticks to the walls of the container. Therefore, the presence of ozone can be detected by mercury.

7. (1)

As we move down the group, the radius of elements increases and electronegativity decreases so bond angle decreases.

8. (3)

Acidic character of oxides decreases with the decrease in the oxidation state and also decreases down the group.

9. (2)

NO_2 is paramagnetic due to the presence of an unpaired electron in the nitrogen.

10. (1)

Conc. H_2SO_4 can not be used to prepare HBr from KBr because conc. H_2SO_4 oxidises HBr to bromine.

11. (2)

H_2O is the most stable as there is a formation of hydrogen bonds.

The order goes like : $H_2Te < H_2Se < H_2S < H_2O$

12. (2)

ZnO is an amphoteric oxide, therefore it reacts with both HCl and NaOH.

13. (3)

$NH_2CONH_2 + 2NaOH \rightarrow 2NH_3 + NH_2CO_3$

14. (1)

Cr_2O_3 is an amphoteric oxide.

15. (4)

Orthorhomic sulphur is the most stable form of sulphur having eight sulphur atoms arranged in an octahedron.

16. (3)

$H_4P_2O_6$ (Hypophosphoric acid) doesn't have any P-O-P bond.

17. (3)

H_3PO_5 (Peroxymonophosphoric acid) gives H_3PO_4 (orthophoric acid) and PH_3 (phosphine).

18. (1)

XeF_2 has a linear shape.

19. (2)

Carbon dioxide is an oxidising agent.

20. (4)

CS_2 has a linear shape, hence doesn't have a permanent dipole moment.

21. (4)

$3KClO_3 + 3H_2SO_4 \rightarrow 2KHSO_4 + HClO_4 + 2ClO_2 + H_2O$

22. (2)

Sulphur's most common oxidation state is +4.

23. (1)

Ozone is an unstable, dark blue, diamagnetic gas.

24. (1)

ClF_3 is of T-shape

25. (3)

There is no vacant d-orbital in the outermost orbit of nitrogen. Thus nitrogen show valency only 3. There are vacant d-orbital is in the outermost orbit of phosphorus and hence it shows variable covalency 3 and 5 in ground state and excited state respectively. Hence, nitrogen forms only NCl_3 but phosphorus forms PCl_3 and PCl_5 both.

26. (2)

H_2SO_4 is a strong oxidising agent and can oxidise both metals and non-metals. It's not a reducing agent.

27. (1)

XeF_4 has a square planar structure.

28. (4)

F^- ion is the most electronegative, most unstable and the most basic .

29. (3)

Ammonium nitrite on thermal decomposition gives ammonia.

30. (2)

The F-F Bond distance is small and hence intermolecular repulsion is small.

31. (3)

$5\ NaI + NaIO_3 + 3H_2SO_4 \rightarrow 3Na_2SO_4 + 3I_2 + 3H_2O$

32. (3)

When bleaching powder is treated with carbon dioxide chlorine is evolved.

33. (2)

$O_2^+PtF_6^-$

34. (2)

HI has the strongest reducing agent among halogen acids because of lowest bond dissociation enthalpy.

35. (1)

$XeF_2 + 3H_2O \rightarrow 6HF + XeO_3$

36. (1)

Krypton is not obtained during radioactive disintegration.

37. (1)

Radon and helium is not found in the atmosphere.

38. (4)

The complex formed is $[Cu(NH_3)_4]^{2+}$ which is square planar and paramagnetic and has a deep blue colour.

39. (2)

The electron affinity of chlorine is maximum in the periodic table and so the bond dissociation enthalpy. Fluorine has lower bond dissociation enthalpy than Br_2 and Cl_2. Due to small size electronic repulsion is very high. I_2 has lowest bond dissociation enthalpy due to its quite larger size it is easiest to break the bond.

40. (4)

Xe in XeF_2 has sp^3d hybridisation.

41. (3)

XeF_6 on thermal decomposition gives XeF_2, XeF_4 and F_2

42. (2)

The oxidation state of chlorine in $HClO_4$, $HClO_3$, $HClO_2$ and HClO is 7, 5, 3 and 1. The chlorine with the highest oxidation state has the lowest potential of getting oxidised.

43. (4)

The H-X bond strength decreases from HF to HI.

44. (3)

$FeSO_4$ on heating gives $Fe_2O_3 + SO_2 + SO_3 + H_2O$.

45. (3)

Pure chlorine is obtained on heating $PtCl_4$.

46. (1)

Nitrogen has an oxidation state varying from +1 to +5.

47. (2)

An antichlor is a substance used to decompose residual HCl or chlorine after chlorine-based bleaching in order to prevent ongoing reaction. $Na_2S_2O_3$ acts as an antichlor.

48. (1)

Nitrogen in N_2O_3 has an oxidation state of +3 and so does in HNO_2. Hence, N_2O_3 is an anhydride of HNO_2. N_2O_3 is an acidic oxide.

49. (3)

$(NH_4)_2CrO_7$ on heating liberates nitrogen gas which can also be obtained from heating NH_4NO_2.

50. (2)

The temperature required for Haber's process is 450-550°C.

Assertion and Reasoning

Codes

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

(b) Both A and R are true and but R is not a correct explanation of A

(c) A is true but R is false

(d) A is false, but R is true

1. **Assertion (A)** Valency of noble gas is 0.

Reason (R) Noble gases possess complete octet.

2. **Assertion (A)** F_2 has lower bond dissociation enthalpy then Cl_2.

Reason (R) Fluorine is more electronegative than chlorine.

3. **Assertion (A)** Acidic character of group 16 hydrides increases from H_2O to H_2Te.

Reason (R) Thermal stability of hydrides decreases down the group.

4. **Assertion (A)** Interhalogen compounds are more reactive than halogens (except chlorine).

Reason (R) They all undergo hydrolysis giving halide ion derived from the smaller halogen.

5. **Assertion (A)** Halogens are not found in free state in nature.

Reason (R) Halogens are highly reactive compound.

6. **Assertion (A)** F_2 has low reactivity.

Reason (R) F-F bonds $\Delta_{bond}H$.

7. **Assertion (A)** Ozone layer in the upper region of atmosphere protect earth from UV radiation.

Reason (R) Ozone is a powerful oxidizing agent as compared to oxygen.

8. **Assertion (A)** S shows paramagnetic nature, when present in vapour state.

Reason (R) S exists as S_2 in vapour state.

9. **Assertion (A)** F_2 is a strong oxidizing agent.

Reason (R) Electron gain enthalpy of fluorine is less negative.

10. **Assertion (A)** PbI_4 is not a stable compound.

Reason (R) Iodide stabilizes higher oxidizing state.

11. **Assertion (A)** Solubility of noble gases in water decreases with increasing size of the noble gas.

Reason (R) Solubility of noble gases in water is due to dipole-induced dipole interaction.

Answer

1. (a)

Noble gases possess the electronic configuration ns^1np^6 and has 8 electrons in their outer shell, hence there valency is 0.

2. (b)

Flourine has low bond dissociation enthalpy due to small atomic size number of electrons create large repulsion in bonded electron.

3. (b)

The acidic character increases down the group and thermal stability of hydrides decreases down the group due to decrease in bond (H-E) dissociation enthalpy down the group.

4. (b)

Interhalogen compounds are more reactive than halogens because X-X' bond in interhalogens in weaker than X-X bond in halogen (except F-F bond).

5. (a)

Halogens are highly reactive as they have seven electrons in their outermost orbit and they want to stabilize by acquiring an electron. therefore, they do not occur in free state.

6. (d)

F_2 is more reactive that other halogens because its valence electrons are more closer to nucleus and its more electronegative so, bonded electrons repel each other causing low bond dissociation enthalpy.

7. (b)

Ozone layer filters the radiation coming from sun, hence serves as the protective layers.

8. (a)

In vapor state S exists as S_2 and it behaves like O_2. It has 2 unpaired electrons in antibonding pi orbitals. Presence of these unpaired electrons make S paramagnetic.

9. (b)

As F_2 has low bond dissociation energy and high hydration energy than Cl_2 but less electron gain enthalpy due to its smaller size. Due to these factors F_2 wins in getting reduced fastly.

10. (c)

Small highly elctronegative atoms such as F^- can stabilise higher oxidation state.

11. (d)

PbI4 is not a stable compound because Pb shows (II) oxidation state more frequently than Pb (IV) due to inert pait effect. Iodide cannot stabilize higher oxidation states.