

p-Block Elements

Question1

Which of the following halides cannot be hydrolysed?

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Options:

A. CCl_4

B. SiCl_4

C. GeCl_4

D. SnCl_4

Answer: A

Solution:

Among the given halides, only CCl_4 cannot be hydrolysed due to absence of vacant d-orbitals.

Question2

NO_2 gas is

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Options:

A. colourless, neutral



B. colourless, acidic

C. brown, acidic

D. brown neutral

Answer: C

Solution:

NO_2 gas is brown and acidic, so the correct choice is:

Option C: brown, acidic

NO_2 stands for nitrogen dioxide, which is a reddish-brown gas known for its characteristic pungent smell. It is one of the primary pollutants resulting from the combustion of fossil fuels and is a contributor to atmospheric reactions that produce smog and acid rain. As an acidic gas, NO_2 can dissolve in water to form nitric and nitrous acids, contributing to environmental issues such as acid rain.

Question3

A metalloid is

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Options:

A. Bi

B. Sb

C. P

D. Se

Answer: B

Solution:

A metalloid can be defined as chemical elements whose physical and chemical properties lies in between metal and non-metal. Among the given option only antimony (Sb) is metalloid.



Question4

What is the oxidation number of S in $\text{H}_2\text{S}_2\text{O}_8$?

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Options:

A. +5

B. +4

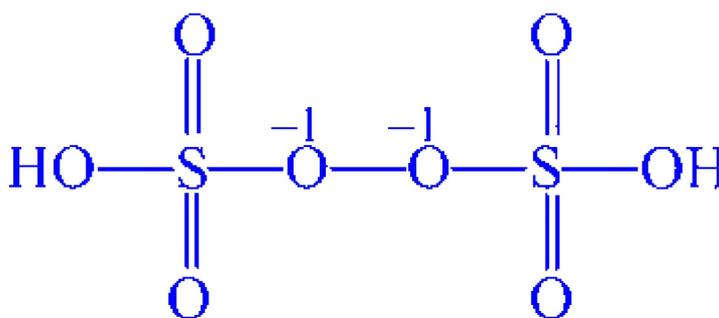
C. +7

D. +6

Answer: D

Solution:

The structure of $\text{H}_2\text{S}_2\text{O}_8$ is as follows



Let the oxidation state of sulphur be x . Then,

$$2x + 2 + 2(-1) + 6(-2) = 0$$

$$\therefore x = +6$$

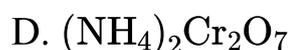
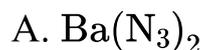
Thus, the oxidation state of S in $\text{H}_2\text{S}_2\text{O}_8$ is +6 .

Question5

Which of the following compound does not give dinitrogen on heating?

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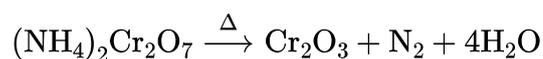
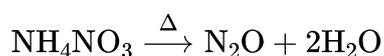
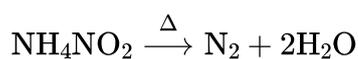
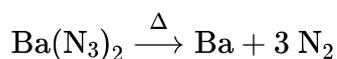
Options:



Answer: C

Solution:

Among the given compounds, only ammonium nitrate does not produce N_2 gas on decomposition.

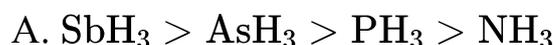


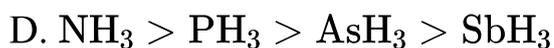
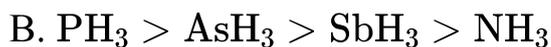
Question6

The correct decreasing order of basicity of hydrides of group- 15 elements is

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Options:





Answer: D

Solution:

In general, the basicity of group 15 hydrides decreases on moving down the group from NH_3 to SbH_3 . This is due to the increasing size of the central atom and the decreasing availability of lone pair for donation. Thus, the correct order of basicity of hydrides is



Question7

Which one of the following oxoacids of phosphorus can reduce AgNO_3 to metallic silver?

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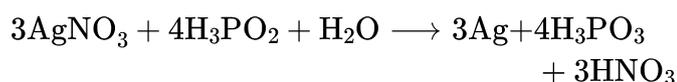
Options:



Answer: A

Solution:

Hypophosphorus acid (H_3PO_2) is a strong reducing agent which can effectively reduce Ag^+ ions to Ag and itself gets oxidised to phosphorus acid [H_3PO_3] as follows



Question8

Which of the following hydrides is electron deficient?

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Options:

A. CaH_2

B. CH_4

C. B_2H_6

D. NaH

Answer: C

Solution:

An electron-deficient hydride is a compound that has fewer valence electrons than are required to completely satisfy the traditional bonding requirements based on the concept of two electrons for every single bond between atoms. To determine if a hydride is electron deficient, we must consider the valence electrons and bonding in each given molecule.

Let's examine each option:

Option A: CaH_2

Calcium hydride consists of calcium ions (Ca^{2+}) and hydride ions (H^-). Each calcium atom provides two electrons to form two ionic bonds with two hydride ions. This compound is not electron deficient; it is an ionic hydride where the bonding requirements for both the metal and the hydrogen are fulfilled.

Option B: CH_4

Methane, CH_4 , has a central carbon atom bonded to four hydrogen atoms. Carbon has four valence electrons and needs four more to complete its octet, which it gains by forming covalent bonds with the four hydrogen atoms (each hydrogen providing one electron). In methane, all atoms have full valence shells, so it is not electron deficient.

Option C: B_2H_6

Diborane (B_2H_6) is a molecule where each boron atom contributes three valence electrons, and each hydrogen atom contributes one electron. In a simple model where we would expect each pair of atoms to be connected by a single bond (two electrons per bond), the two boron atoms together with six hydrogen atoms would require 12 electrons for conventional two-electron bonds. However, diborane has only 12 valence electrons in total (6 from boron and 6 from hydrogen), which are not enough to form conventional bonds for all atoms involved. Diborane forms multiple-center bonds, where two electrons are shared by more than two atoms, specifically in the form of two three-center two-electron bonds, often referred to as banana bonds. This is indicative of electron deficiency. Therefore, B_2H_6 is electron deficient.



Option D: NaH

Sodium hydride consists of sodium ions (Na^+) and hydride ions (H^-). Sodium loses one electron to the hydride ion, and this fulfilling the octet rule (or the duet rule for hydrogen). Each resultant ion has a complete octet or duet, and thus this ionic compound is not electron deficient.

Based on the explanation above, the electron-deficient hydride among the given options is:

Option C: B_2H_6

Question9

$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ on heating liberates a gas. The same gas will be obtained by

KCET 2022

Options:

A. heating NH_4NO_2

B. treating H_2O_2 with NaNO_2

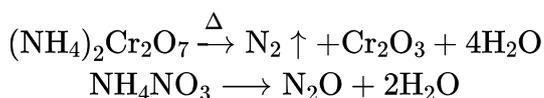
C. treating Mg_3N_2 with H_2O

D. heating NH_4NO_3

Answer: A

Solution:

$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ and NH_4NO_2 both on heating liberate nitrogen gas. The reaction involve are as follows



Question10

The strong reducing property of hypophosphorus acid is due to

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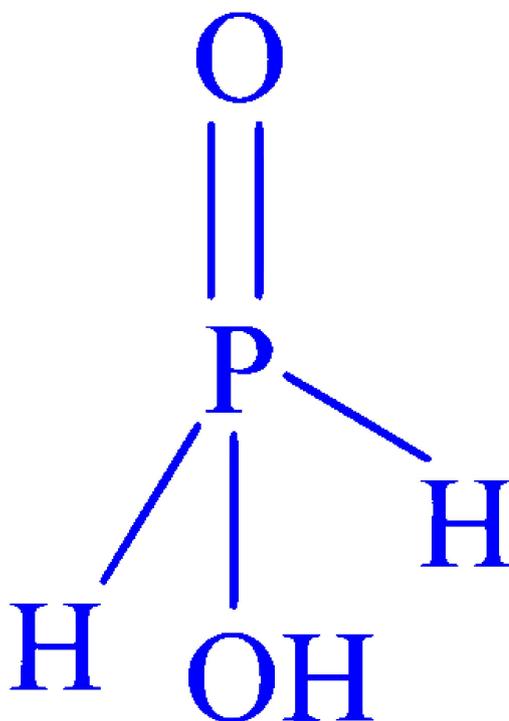
Options:

- A. the positive valency of phosphorus
- B. two P – H bonds
- C. presence of phosphorus in its highest oxidation state
- D. its concentration

Answer: B

Solution:

The strong reducing property of hypophosphorus acid is due to the presence of two P – H bonds. Its structure is as follows



Question11

In the detection of II group acid radical, the salt containing chloride is treated with concentrated sulphuric acid, the colourless gas is liberated. The name of the gas is

KCET 2021

Options:

- A. hydrogen chloride gas
- B. chlorine gas
- C. sulphur dioxide gas
- D. hydrogen gas

Answer: A

Solution:

In the detecting of II group acid radical, when salt containing chloride is treated with concentrated sulphuric acid, the colourless gas is liberated. The name of the gas is hydrogen chloride gas.

Question12

The number of six membered and five membered rings in Buckminster fullerene respectively is

KCET 2021

Options:

- A. 20, 12
- B. 12, 20



C. 14, 18

D. 14, 11

Answer: A

Solution:

The number of six membered and five membered rings in Buckminster fullerence respectively is 20 and 12.

Question13

Which of the following compound on heating gives N_2O ?

KCET 2021

Options:

A. $Pb(NO_3)_2$

B. NH_4NO_3

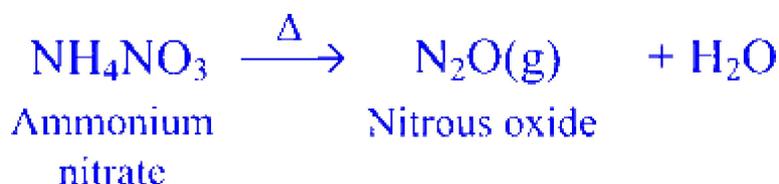
C. NH_4NO_2

D. $NaNO_3$

Answer: B

Solution:

NH_4NO_3 on heating gives nitrous oxide (N_2O). Its reaction is as follow

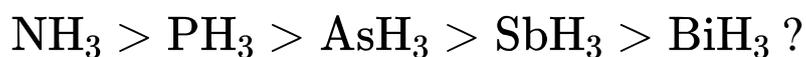


Nitrous oxide is also called laughing gas.

Question14



Which of the following property is true for the given sequence?



KCET 2021

Options:

- A. Reducing property
- B. Thermal stability
- C. Bond angle
- D. Acidic character

Answer: B

Solution:

Thermal stability of the hydrides of nitrogen family decreases down the group as



Because on moving down the group size increase (from N to Bi). As a result, bond strength decreases.

Question15

XeF_6 on partial hydrolysis gives a compound X , which has square pyramidal geometry ' X ' is

KCET 2021

Options:

- A. XeO_3
- B. XeO_4
- C. XeOF_4



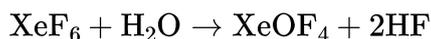
D. XeO_2F_2

Answer: C

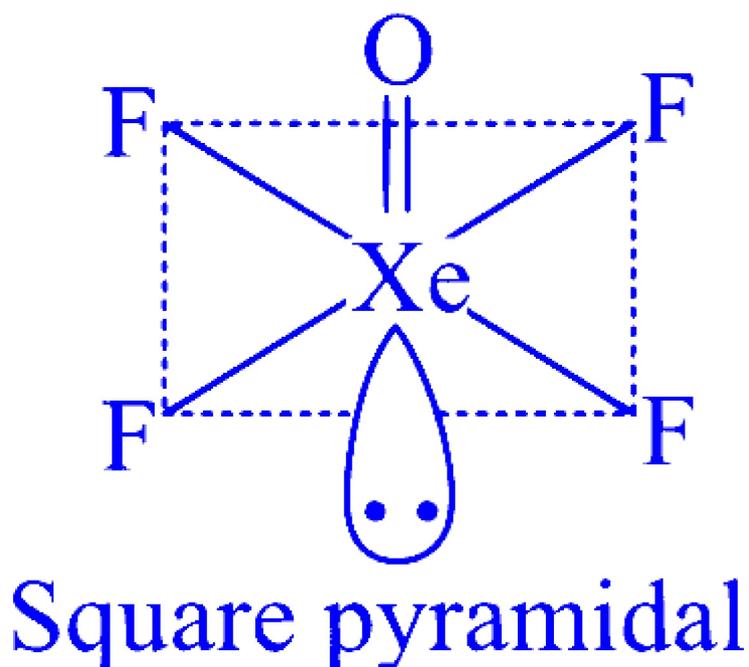
Solution:

XeF_6 on partial hydrolysis with water gives XeOF_4 .

The reaction involve is as follows



The structure of XeOF_4 is



Question16

A colourless, neutral, paramagnetic oxide of nitrogen ' P ' on oxidation gives reddish brown gas Q . Q on cooling gives colourless gas R . R on reaction with P gives blue solid S . Identify P , Q , R , S respectively

KCET 2021

Options:

A. N_2O , NO , NO_2 , N_2O_5

B. N_2O , NO_2 , N_2O_4 , N_2O_3

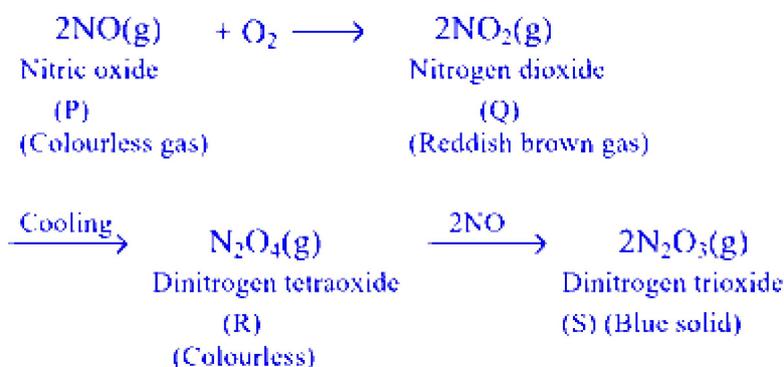
C. NO , NO_2 , N_2O_4 , N_2O_3

D. NO , NO , N_2O_4 , N_2O_5

Answer: C

Solution:

The complete given chemical reaction take place as follows



Note Nitric oxide is paramagnetic as it contain unpaired electron as per molecular orbital theory.

Question17

Aqueous solution of a salt (A) forms a dense white precipitate with BaCl_2 solution. The precipitate dissolves in dilute HCl to produce a gas (B) which decolourises acidified KMnO_4 solution. A and B respectively are

KCET 2020

Options:

A. BaSO_3 , SO_2

B. BaSO_4 , H_2S

C. BaSO_3 , H_2S

D. BaSO_4 , SO_2

Answer: A

Solution:

$\text{BaSO}_3(aq) + \text{BaCl}_2(aq) \longrightarrow \text{BaSO}_4 + \text{other product dense white precipitate}$

$\text{BaSO}_4 + \text{HCl} \longrightarrow \text{SO}_2(g) + \text{other product white ppt.}$

We know that, KMnO_4 can be decoloured by gas SO_2 . So, *A* will be BaSO_3 and *B* will be SO_2 .

Question18

Phosphorus pentachloride

KCET 2020

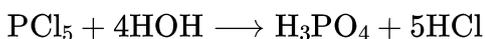
Options:

- A. on hydrolysis gives an oxo-acid of phosphorus which is tribasic
- B. on hydrolysis gives an oxo-acid of phosphorus which is a good reducing agent
- C. Has all the five equivalent bonds
- D. exists as an ionic solid in which cation has octahedral structure and anion has tetrahedral structure

Answer: A

Solution:

Phosphorus pentachloride on hydrolysis gives an oxo acid of phosphorus which is tribasic.



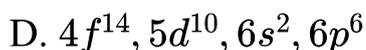
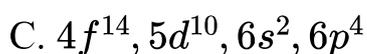
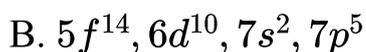
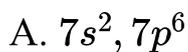
Here, phosphoric acid (H_3PO_4) is tribasic.

Question19

The last element of the *p*-block in 6 th period is represented by the outer most electronic configuration.

KCET 2020

Options:



Answer: D

Solution:

The last element in the sixth period will be noble gas Rn with atomic number 86 and electronic configuration $4f^{14}, 5d^{10}, 6s^2, 6p^6$.

Question20

A Lewis acid 'X' reacts with LiAlH_4 in ether medium to give a highly toxic gas. This gas when heated with NH_3 gives a compound commonly known as inorganic benzene. The gas is

KCET 2020

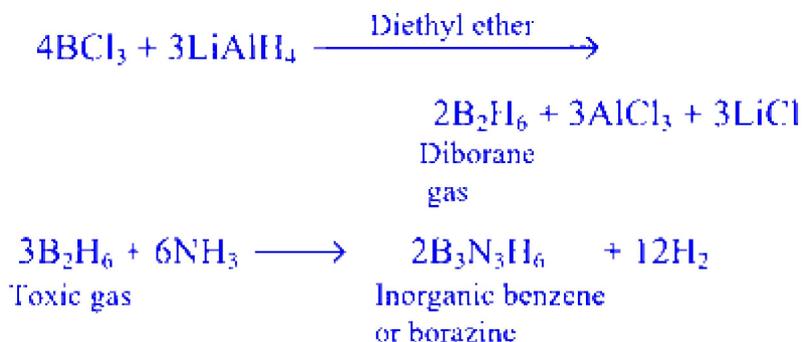
Options:



Answer: B



Solution:



So, the toxic gas is diborane.

Question21

0.1 mole of XeF_6 is treated with 1.8 g of water. The product obtained is

KCET 2019

Options:

- A. XeO_3
- B. XeO_2F_2
- C. XeOF_4
- D. $\text{Xe} + \text{XeO}_3$

Answer: C

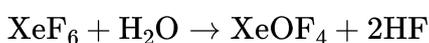
Solution:

Key Idea When 0.1 mole of XeF_6 is treated with 1.8 g of water, the product obtained is XeOF_4 .

$$\therefore \text{Moles of water} = \frac{\text{Given mass of water}}{\text{Molecular mass}} = \frac{1.8}{18} = 0.1 \text{ mole}$$

when 0.1 mole of XeF_6 react with 0.1 mole of H_2O then XeOF_4 and HF are formed.

Reaction involved is as follows :



Question22

The metal nitrate that liberates NO_2 on heating

KCET 2019

Options:

A. NaNO_3

B. LiNO_3

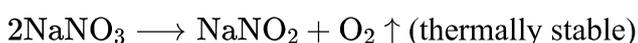
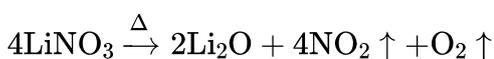
C. KNO_3

D. RbNO_3

Answer: B

Solution:

LiNO_3 (lithium nitrate) on heating gives a mixture of Li_2O , NO_2 and O_2 while nitrates of rest of alkali metals yield nitrite and oxygen.



Question23

When PbO_2 reacts with concentrated HNO_3 , the gas evolved is

KCET 2018

Options:

A. NO_2

B. O_2

C. N_2

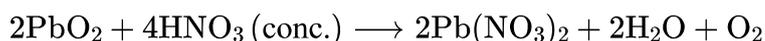


D. N_2O

Answer: B

Solution:

When lead(IV) oxide (PbO_2) reacts with concentrated nitric acid (HNO_3), the following chemical reaction occurs:



This reaction results in the formation of lead(II) nitrate ($\text{Pb}(\text{NO}_3)_2$), water (H_2O), and oxygen gas (O_2). Therefore, the gas evolved during this reaction is oxygen (O_2).

Question24

Plaster of Paris is represented as

KCET 2017

Options:

A. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

B. CaSO_4

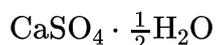
C. $\text{CaSiO}_4 \cdot \text{H}_2\text{O}$

D. $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

Answer: D

Solution:

Plaster of Paris is chemically represented as:



In the arts and construction fields, gypsum is primarily used in its partially dehydrated form, which is known as Plaster of Paris.



Question25

Addition of mineral acid to an aqueous solution of borax, the following compound is formed

KCET 2017

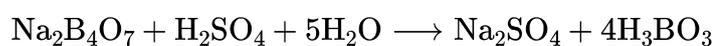
Options:

- A. pyroboric acid
- B. boron hydride
- C. meta boric acid
- D. orthoboric acid

Answer: D

Solution:

When a mineral acid is added to an aqueous solution of borax, the following chemical reaction takes place:



In this reaction, orthoboric acid (H_3BO_3) is formed.

