The P Block Elements (15-18)

Question1

Element not showing variable oxidation state is :
[27-Jan-2024 Shift 1]

Options:

A. Bromine

B. Iodine

C. Chlorine

D. Fluorine

Answer: D

Solution:

Solution:
Fluorine does not show variable oxidation state.

Question2

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:
[27-Jan-2024 Shift 2]

Options:

A. Statement I is correct but Statement II is incorrect

B. Both Statement I and Statement II are correct

C. Both Statement I and Statement II are incorrect

D. Statement I is incorrect but Statement II is correct

Answer: C

Solution:

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.

Question3

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:
[30-Jan-2024 Shift 2]

Options:

A. B and C only

B. C and D only

C. A and B only

D. A and D only

Answer: C

Solution:

Solution:
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.

Question4

Give below are two statements:
Statement-I : Noble gases have very high boiling points.
Statement-II: Noble gases are monoatomic gases. They are held together by strong dispersion forces. Because of this they are liquefied at very low temperature. Hence, they have very high boiling points. In the light of the above statements. choose the correct answer from the options given below:
[31-Jan-2024 Shift 1]

Options:

A. Statement I is false but Statement II is true.

B. Both Statement I and Statement II are true.

C. Statement I is true but Statement II is false.

D. Both Statement I and Statement II are false.

Answer: D

Solution:

Solution:
Statement I and II are False
Noble gases have low boiling points
Noble gases are held together by weak dispersion forces.

Question5

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:
[31-Jan-2024 Shift 2]

Options:

A. A and D only

B. B and C only

C. C and D only

D. A and B only

Answer: D

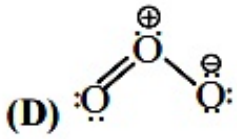
Solution:

Solution:

(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 H_2S to H_2 Te down the group.

(D)  have six lone pairs

---

Question6

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
[1-Feb-2024 Shift 1]

Answer: 3

Solution:

Solution:

Acidic oxide: Cl_2O_7, SiO_2, N_2O_5

Neutral oxide: CO, NO, N_2O

Amphoteric oxide: Al_2O_3, SnO_2, PbO_2

Question7

Reaction of BeO with ammonia and hydrogen fluoride gives 'A' which on thermal decomposition gives BeF_2 and NH_4F. What is 'A' ?
[24-Jan-2023 Shift 1]

Options:

A. $(NH_4)_2BeF_4$

B. H_3NBeF_3

C. $(NH_4)BeF_3$

D. $(NH_4)Be_2F_5$

Answer: A

Solution:

Solution:

$$BeO + 2NH_3 + 4\,HF \rightarrow (NH_4)_2BeF_4 + H_2O$$

$$(NH_4)_2BeF_4 \xrightarrow{\Delta} BeF_2 + NH_4F$$

Question8

Which of the Phosphorus oxoacid can create silver mirror from $AgNO_3$ solution ?
[24-Jan-2023 Shift 1]

Options:

A. $(HPO_3)_n$

B. $H_4P_2O_5$

C. $H_4P_2O_6$

D. $H_4P_2O_7$

Answer: B

Solution:

Solution:
Oxyacid having $P-H$ bond can reduce $AgNO_3$ to Ag.

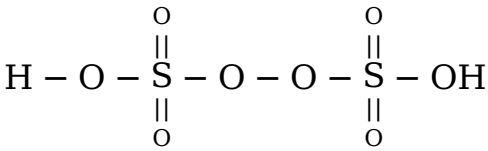
Question9

Sum of π-bonds present in peroxodisulphuric acid and pyrosulphuric acid is
[24-Jan-2023 Shift 2]

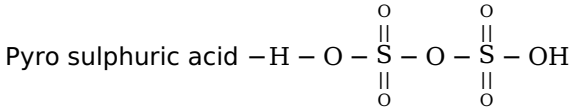
Answer: 8

Solution:

Peroxodisulphuric acid -



No. of π - bonds = 4

Pyro sulphuric acid 

No. of $\pi-$ bonds $= 4$
Total $\pi-$ bonds $= 8$

Question10

Reaction of thionyl chloride with white phosphorus forms a compound [A], which on hydrolysis gives [B], a dibasic acid. [A] and [B] are respectively
[25-Jan-2023 Shift 1]

Options:

A. P_4O_6 and H_3PO_3

B. PCl_3 and H_3PO_3

C. PCl_5 and H_3PO_4

D. $POCl_3$ and H_3PO_4

Answer: B

Solution:

Solution:

$$P_4 + 8SOCl_2 \rightarrow \underset{[A]}{4PCl_3} + 4SO_2 + 2S_2Cl_2$$

$$PCl_3 + 3H_2O \rightarrow \underset{[B]}{H_3PO_3} + 3\,HCl$$

Question11

Some reactions of NO_2 relevant to photochemical smog formation are

Identify A, B, X and Y
[25-Jan-2023 Shift 1]

Options:

A. X = [O], Y = NO, A = O_2, B = O_3

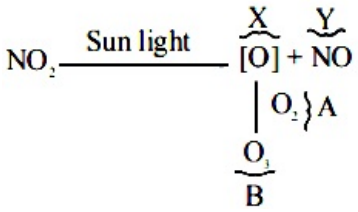
B. X = N_2O, Y = [O], A = O_3, B = NO

C. X = $\frac{1}{2}O_2$, Y = NO_2, A = O_3, B = O_2

D. X = NO, Y = [O], A = O_2, B = N_2O_3

Answer: A

Solution:



Question12

A chloride salt solution acidified with dil. HNO_3 gives a curdy white precipitate, [A], on addition of $AgNO_3$. [A] on treatment with NH_4OH gives a clear solution, B.
[25-Jan-2023 Shift 2]

Options:

A. $H[AgCl_3]\&[Ag(NH_3)_2]Cl$

B. $H[AgCl_3]\&(NH_4)[Ag(OH)_2]$

C. $AgCl\&[Ag(NH_3)_2]Cl$

D. $AgCl\&(NH_4)[Ag(OH)_2]$

Answer: C

Solution:

Solution:

$$Cl^- + AgNO_3 \longrightarrow \underset{\substack{[A]\\ \text{Curcay white precipitate}}}{AgCl}$$

$$AgCl + NH_4OH \longrightarrow \underset{\substack{[B]\\ (\text{Soluble Complex})}}{[Ag(NH_3)_2]Cl}$$

Question13

A. Ammonium salts produce haze in atmosphere.
B. Ozone gets produced when atmospheric oxygen reacts with chlorine radicals.
C. Polychlorinated biphenyls act as cleansing solvents.
D. 'Blue baby' syndrome occurs due to the presence of excess of sulphate ions in water.
Choose the correct answer from the options given below :-
[25-Jan-2023 Shift 2]

Options:

A. A, B and C only

B. B and C only

C. A and C only

D. A and C only

Answer: D

Solution:

Solution:

B. $\dot{Cl} + O_3 \longrightarrow O_2 + \dot{ClO}$

D. 'Blue baby' syndrome occurs due to the presence of excess of nitrate ions in water.

Question14

"A" obtained by Ostwald's method involving air oxidation of NH_3, upon further air oxidation produces "B". "B" on hydration forms an oxoacid of Nitrogen along with evolution of "A". The oxoacid also produces "A" and gives positive brown ring test
[29-Jan-2023 Shift 1]

Options:

A. NO_2, N_2O_5

B. NO_2, N_2O_4

C. NO, NO_2

D. N_2O_3, NO_2

Answer: C

Solution:

Solution:

$$4NH_3 + 5O_2 \xrightarrow{\Delta} \underset{(A)}{4NO} + 6H_2O$$

$$2NO + O_2 \longrightarrow \underset{(B)}{2NO_2}$$

Question15

The number of molecules or ions from the following, which do not have odd number of electrons are _____.
(A) NO_2

(B) ICl_4^-
(C) BrF_3
(D) ClO_2
(E) NO_2^+
(F) NO
[29-Jan-2023 Shift 1]

Answer: 3

Solution:

Solution:
ICl_4^-, BrF_3 and NO_2^+do not have odd number of e^-

Question16

Total number of acidic oxides among
N_2O_3, NO_2, N_2O, Cl_2O_7, SO_2, CO, CaO, Na_2O and NO is _____.
[29-Jan-2023 Shift 2]

Answer: 4

Solution:

Solution:
Acidic oxides are N_2O_3, NO_2, Cl_2O_7, SO_2

Question17

Bond dissociation energy of E − H bond of the " H_2E " hydrides of group 16 elements (given below), follows order.
(A) O
(B) S
(C) Se
(D) Te
[30-Jan-2023 Shift 2]

Options:

A. AB > C > D

B. A > B > D > C

C. B > A > C > D

D. D > C > B > A

Answer: A

Solution:

Solution:
Bond dissociation energy of E-H bond in hydrides of group 16 follows the order
$H_2O > H_2S > H_2Se > H_2Te$

Question18

Identify X, Y and Z in the following reaction. (Equation not balanced)

$Cl\dot{O} + NO_2 \rightarrow xX \xrightarrow{H_2O} xY + xZ$

[31-Jan-2023 Shift 1]

Options:

A. X = $ClONO_2$, Y = HOCl, Z = NO_2

B. X = $ClNO_2$, Y = HCl, Z = HNO_3

C. X = $ClONO_2$, Y = HOCl, Z = HNO_3

D. X = $ClNO_3$, Y = Cl_2, Z = NO_2

Answer: C

Solution:

Solution:
$$Cl\dot{O} + NO_2 \rightarrow \underset{(X)}{ClONO_2} \xrightarrow{+H,\ O} \underset{(Y)}{HOCl} + \underset{(Z)}{HNO_3}$$

Question19

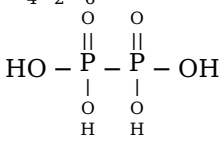
The oxidation sate of phosphorus in hypophosphoric acid is + _____..

[31-Jan-2023 Shift 1]

Answer: 4

Solution:

$H_4P_2O_6$



O.S. of P is +4

Question20

Given below are two statements:
Statement I: Chlorine can easily combine with oxygen to from oxides: and the product has a tendency to explode.
Statement II: Chemical reactivity of an element can be determined by its reaction with oxygen and halogens.
In the light of the above statements, choose the correct answer from the options given below.
[1-Feb-2023 Shift 1]

Options:

A. Both the statements I and II are true

B. Statement I is true but Statement II is false

C. Statement I is false but Statement II is true

D. Both the Statements I and II are false

Answer: A

Solution:

Solution:
Chlorine oxides, Cl_2O, ClO_2, Cl_2O_6 and Cl_2O_7 are highly reactive oxidising agents and tend to explode.

Question21

Sum of oxidation states of bromine in bromic acid and perbromic acid is _____.
[1-Feb-2023 Shift 1]

Answer: 12

Solution:

$HBrO_3$ (Bromic acid)

Ox. State of Br = +5
$HBrO_4$ (per bromic acid)
OX. State of Br = +7
Sum of Ox. State = 12

Question22

The difference between electron gain enthalpies will be maximum between:
[6-Apr-2023 shift 1]

Options:

A. Ne and F

B. Ne and Cl

C. Ar and Cl

D. Ar and F

Answer: B

Solution:

Solution:
Cl has the most negative ΔH_{eg} among all the elements and Ne has the most positive ΔH_{eg}

Question23

	List I Oxide		List II Type of Bond
A	N_2O_4	I.	1N = O bond
B	NO_2	II.	1N − O − N bond
C	N_2O_5	III.	1N − N bond
D	N_2O	IV.	1N = N / N ≡ N bond

Choose the correct answer from the options given below:
[6-Apr-2023 shift 1]

Options:

A. A-II, B-IV, C-III, D-I

B. A-II, B-I, C-III, D-IV

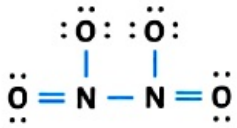
C. A-III, B-I, C-IV, D-II

D. A-III, B-I, C-II, D-IV

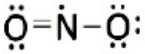
Answer: D

Solution:

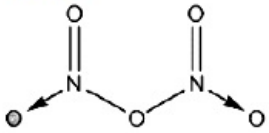
N_2O_4



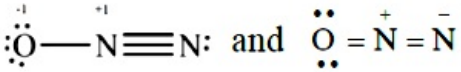
NO_2



N_2O_5



N_2O



Question24

Match List I with List II

	List I Name of reaction		List II Reagent used
A	Hell-Volhard-Zelinsky reaction	I.	$NaOH + I_2$
B	Iodoform reaction	II.	(i) CrO_2Cl_2, CS_2 (ii) H_2O
C	Etard reaction	III.	(i) Br_2 / red phosphorus (ii) H_2O
D	Gatterman-Koch reaction	IV.	CO, HCl, anhyd. $AlCl_3$

Choose the correct answer from the options given below: [6-Apr-2023 shift 1]

Options:

A. A-III, B-II, C-I, D-IV

B. A-III, B-I, C-IV, D-II

C. A-I, B-II, C-III, D-IV

D. A-III, B-I, C-II, D-IV

Answer: D

Solution:

Solution:
HVZ reactions = Br_2/ red P
Iodoform reaction = $NaOH + I_2$
Etard reaction = (i) CrO_2Cl_2, CS_2 (ii) H_2O
Gatterman-Koch Reaction = CO, HCl, Anhydrous, $AlCl_3$

Question25

XeF_4 reacts with SbF_5 to form $[XeFm]^{n+}[SbF_y]^{--}$ m + n + y + z = _____ [8-Apr-2023 shift 1]

Answer: 11

Solution:

Solution:
$XeF_4 + SbF_5 \rightarrow [XeF_3]^+(SbF_6)^-$
m + n + x + y = 3 + 1 + 6 + 1 = 11
Xenon fluoride act as F^-donor and F^-acceptor.

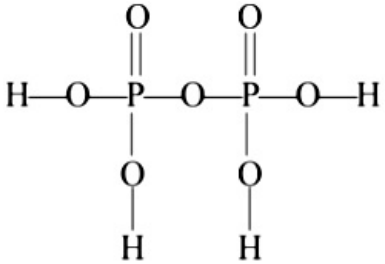
Question26

The ratio of sigma and π bonds present in pyrophosphoric acid is _____ [8-Apr-2023 shift 2]

Answer: 6

Solution:

Solution:



$\frac{\sigma}{\pi} = \frac{12}{2} = 6$

So, Answer is 6

Question27

The difference in the oxidation state of Xe between the oxidised product of Xe formed on complete hydrolysis of XeF_4 and XeF_4 is _____
[10-Apr-2023 shift 2]

Answer: 2

Solution:

Solution:

$\overset{+4}{XeF_4} + H_2O \rightarrow Xe + \overset{+6}{XeO_3} + O_2 + HF$

Difference $= 6 - 4 = (2)$

Question28

Given below are two statement :
Statement I : Methane and steam passed over a heated Ni catalyst produces hydrogen gas
Statement II : Sodium nitrite reacts with NH_4Cl to give H_2O, N_2 and NaCl
In the light of the above statements, choose the most appropriate answer from the options given below:
[11-Apr-2023 shift 1]

Options:

A. Both the statement I and II are incorrect

B. Statement I is incorrect but statement II is correct

C. Statement I is correct but statement II is incorrect

D. Both the statements I and II are correct

Answer: D

Solution:

Solution:

$$CH_4(g) + \underset{\text{Steam}}{H_2O(g)} \xrightarrow[1270K]{Ni} CO(g) + 3H_2(g)$$

$$NaNO_2\ (aq) + NH_4Cl(\ aq\ ) \rightarrow N_2(g) + NaCl(aq) + 2H_2O(\ell)$$

Question29

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : A solution of the product obtained by heating a mole of glycine with a mole of chlorine in presence of red phosphorous generates chiral carbon atom.
Reason R : A molecule with 2 chiral carbons is always optically active.
In the light of the above statements, choose the correct answer from the options given below:
[11-Apr-2023 shift 2]

Options:

A. A is false but R is true

B. Both A and R are true but R is NOT the correct explanation of A

C. A is true but R is false

D. Both A and R are true and R is the correct explanation of A

Answer: C

Solution:

Solution:

$$H_2N-CH_2-COOH \xrightarrow[\text{Red P}]{Cl_2} H_2N-\underset{\underset{Cl}{|}}{\overset{*}{C}}H-COOH$$

Question30

One mole of P_4 reacts with 8 moles $SOCl_2$ to give 4 moles of A, x mole of SO_2 and 2 moles of B . A, B and x respectively are
[11-Apr-2023 shift 2]

Options:

A. $POCl_3$, S_2Cl_2 and 4

B. $POCl_3$, S_2Cl_2 and 2

C. PCl_3, S_2Cl_2 and 4

D. PCl_3, S_2Cl_2 and 2

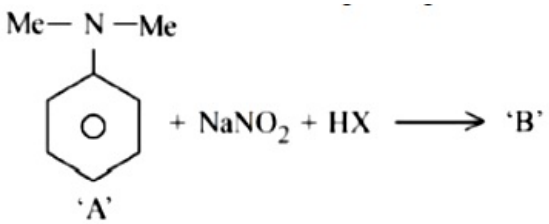
Answer: C

Solution:

$P_4 + 8SOCl_2 \rightarrow 4PCl_3 + 2S_2Cl_2 + 4SO_2$

Question31

The incorrect statement regarding the reaction given below is



[12-Apr-2023 shift 1]

Options:

A. The product ' B ' formed in the above reaction is p-nitroso compound at low temperature

B. ' B ' is N-nitroso ammonium compound

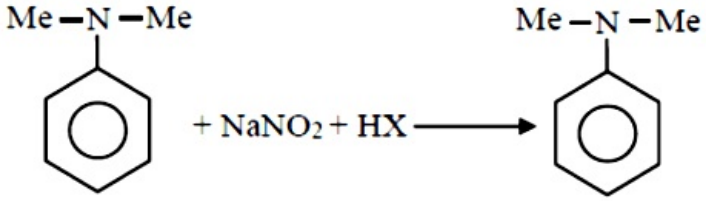
C. The electrophile involved in the reaction is NO^+

D. The reaction occurs at low temperature

Answer: B

Solution:

Solution:
Here electrophile NO^+attack on para position at low temperature



Question32

The incorrect statement from the following for borazine is:
[13-Apr-2023 shift 1]

Options:

A. It is a cyclic compound.

B. It has electronic delocalization.

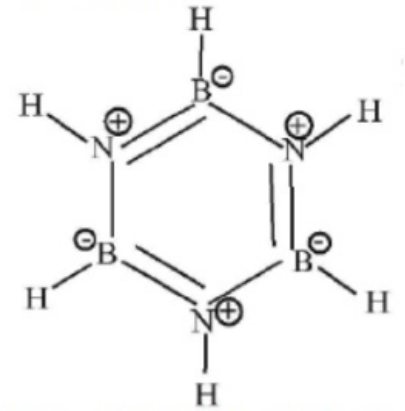
C. It can react with water.

D. It contains banana bonds.

Answer: D

Solution:

Borazine is $B_3N_3H_6$



$B_3N_3H_6 + 9H_2O \rightarrow 3NH_3 + 3H_3BO_3 + 3H_2$

Question33

The correct group of halide ions which can be oxidized by oxygen in acidic medium is
[13-Apr-2023 shift 2]

Options:

A. Cl^-, $Br^-$and I^-only

B. Br^-only

C. $Br^-$and I^-only

D. I'only

Answer: D

Solution:

Solution:
Only I^-among halides can be oxidised to Iodine by oxygen in acidic medium
$4I^-(aq) + 4H^+(aq) + O_2(g) \rightarrow 2I_2(s) + 2H2O(l)$

Question34

The number of $P-O-P$ bonds in $H_4P_2O_7$, $(HPO_3)_3$ and P_4O_{10} are respectively
[15-Apr-2023 shift 1]

Options:

A. 1, 3, 6

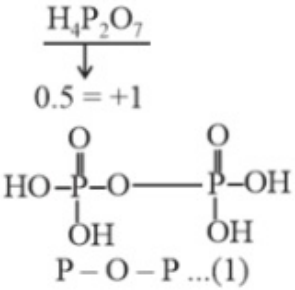
B. 0, 3, 6

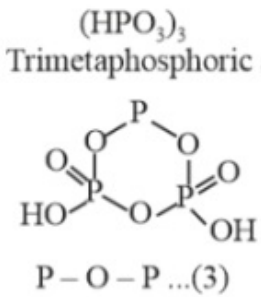
C. 0, 3, 4

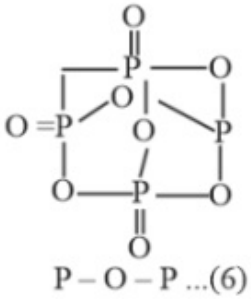
D. 1, 2, 4

Answer: A

Solution:







Question35

Given below are the oxides:
Na_2O, As_2O_3, N_2O, NO and Cl_2O_7
Number of amphoteric oxides is :
[24-Jun-2022-Shift-1]

Options:

A. 0

B. 1

C. 2

D. 3

Answer: B

Solution:

Oxides
$Na_2O \longrightarrow$ Basic
$As_2O_3 \longrightarrow$ Amphoteric
$N_2O \longrightarrow$ Neutral
$NO \longrightarrow$ Neutral
$Cl_2O_7 \longrightarrow$ Acidic
Hence, only one amphoteric oxide is present.

Question36

Identify the correct statement for B_2H_6 from those given below :
(A) In B_2H_6, all B-H bonds are equivalent.
(B) In B_2H_6, there are four 3-centre-2-electron bonds.

(C) B_2H_6 is a Lewis acid.
(D) B_2H_6 can be synthesized from both BF_3 and $NaBH_4$.
(E) B_2H_6 is a planar molecule.
Choose the most appropriate answer from the options given below :
[24-Jun-2022-Shift-1]

Options:

A. (A) and (E) only

B. (B), (C) and (E) only

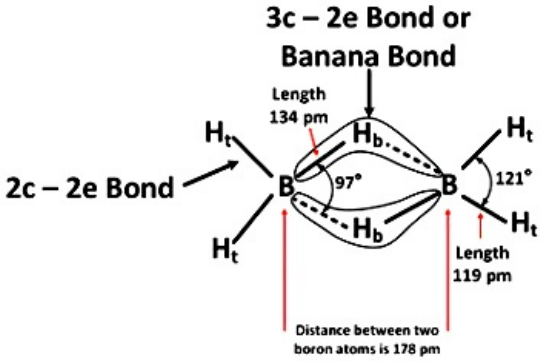
C. (C) and (D) only

D. (C) and (E) only

Answer: C

Solution:

Solution:



H_t – Terminal Hydrogen

H_b – Bridge Hydrogen

It has two 3-centre-2-electron bonds and four 2-centre-2-electron bonds.
Hence, all B − H bonds are not equivalent.
It is an electron deficient compound as the octet of boron is incomplete.
Hence, it can behave as a Lewis acid.
It can be synthesized from both BF_3 and $NaBH_4$

$$2BF_3 + 6\,NaH \xrightarrow{450K} B_2H_6 + 6\,NaF$$

$$2NaBH_4 + I_2 \rightarrow B_2H_6 + 2\,NaI + H_2$$

It is a non-planar molecule.
Hence, only Statements (C) and (D) are correct.

Question37

Which one of the following elemental forms is not present in the enamel of the teeth?
[24-Jun-2022-Shift-1]

Options:

A. Ca^{2+}

B. P^{3+}

C. F^-

D. P^{5+}

Answer: B

Solution:

Solution:
P^{+3} is not present is enamel of teeth.
Th compound present is $[3Ca_3(PO_4)_2 \cdot CaF_2]$
Which contains Ca^{+2}, P^{+5}&F^-

Question38

PCl_5 is well known, but NCl_5 is not. because, [24-Jun-2022-Shift-2]

Options:

A. nitrogen is less reactive than phosphorus.

B. nitrogen doesn't have d-orbitals in its valence shell.

C. catenation tendency is weaker in nitrogen than phosphorus.

D. size of phosphorus is larger than nitrogen.

Answer: B

Solution:

Solution:
PCl_5 is well known but NCl_5 is not because nitrogen does not have vacant d-orbitals in its valence shell.
So, nitrogen cannot expand its octet. On the other hand, phosphorus has vacant d-orbitals in its valence shell which enables it to expand its octet.

Question39

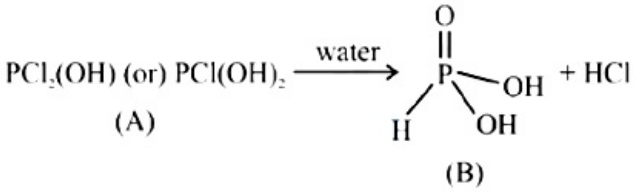
Consider the following reactions: $PCl_3 + H_2O \rightarrow A + HCl$ $A + H_2O \rightarrow B + HCl$ The number of ionisable protons present in the product B is [25-Jun-2022-Shift-2]

Answer: 2

Solution:

Solution:

$PCl_3 + H_2O \xrightarrow[\text{hydrolysis}]{\text{Pattial}} PCl_2(OH)\ \ (or)\ \ PCl(OH)_2 + HCl$



no. of ionisable protons in B = 2

Question40

Consider the following reaction:

$$2HSO_4^-(aq) \xrightarrow[(2)\ \text{Hydrolysis}]{(1)\text{Electrolysis}} 2HSO_4^- + 2H^+ + A$$

The dihedral angle in product A in its solid phase at 110K is : [26-Jun-2022-Shift-1]

Options:

A. 104˚

B. 111.5˚

C. 90.2˚

D. 111.0˚

Answer: C

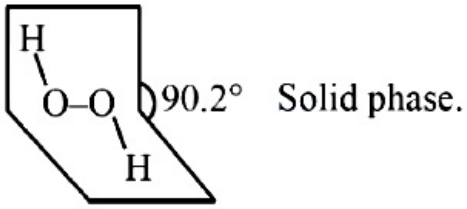
Solution:

Solution:

$2HSO_4^-(aq) \xrightarrow[(2)\ \text{Hydrolysis}]{(1)\text{Electrolysis}} 2HSO_4^- + 2H^+ + \underset{(A)}{H_2O_2}$

A should be H_2O_2

Structure of H_2O_2 is solid phase



Question41

The correct order of melting points of hydrides of group 16 elements is : [26-Jun-2022-Shift-1]

Options:

A. $H_2S < H_2Se < H_2Te < H_2O$

B. $H_2O < H_2S < H_2Se < H_2T\ Te$

C. $H_2S < H_2Te < H_2Se < H_2O$

D. $H_2Se < H_2S < H_2Te < H_2O$

Answer: A

Solution:

Solution:

Hydride	M.P.
H_2O	273K
H_2S	188K
H_2Se	208K
H_2Te	222K

Question42

Consider the following reaction:
A+ alkali →B (Major Product)
If B is an oxoacid of phosphorus with no P − H bond, then A is :
[26-Jun-2022-Shift-1]

Options:

A. White P_4

B. Red P_4

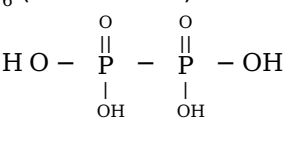
C. P_2O_3

D. H_3PO_3

Answer: B

Solution:

Solution:
Red P_4+ Alkali →$H_4P_2O_6$ (No P-H bond)

Structure of $H_4P_2O_6$ = 

No P-H bond

Question43

Polar stratospheric clouds facilitate the formation of : [26-Jun-2022-Shift-1]

Options:

A. $ClONO_2$

B. HOCl

C. ClO

D. CH_4

Answer: B

Solution:

Solution:
Polar stratospheric clouds provide surface on which hydrolysis of $ClONO_2$ takes place to form HOCl (Hypochlorous acid)
$ClONO_2(g) + H_2O(g) \rightarrow HOCl(g) + HNO_3(g)$

Question44

List - I (Si-Compounds)		List - II (Si-Polymeric/Other Products	
(A)	$(CH_3)_4Si$	(I)	Chain Silicone
(B)	$(CH_3)Si(OH)_3$	(II)	Dimeric Silicone
(C)	$(CH_3)_2Si(OH)_2$	(III)	Silane
(D)	$(CH_3)_3Si(OH)$	(IV)	2D - Silicone

Choose the correct answer from the options given below : [27-Jun-2022-Shift-1]

Options:

A. (A) − (I I I), (B) − (I I), (C) − (I), (D) − (I V)

B. (A) - (IV), (B) - (I), (C) - (II), (D) - (III)

C. (A) − (II), (B) − (I), (C) − (IV), (D) − (III)

D. (A) − (III), (B) − (IV), (C) − (I), (D) − (II)

Answer: D

Solution:

Solution:
$(CH_3)_4$ Si is a silane.
(CH_3) $Si(OH)_3$ polymerise to form 2D silicone.
$(CH_3)_2$ $Si(OH)_2$ polymerise to form chain silicone.
$(CH_3)_3$ Si(OH) form dimer $(CH_3)_3$ $Si - O - Si(CH_3)_3$

Question45

Heating white phosphorus with conc. NaOH solution gives mainly: [27-Jun-2022-Shift-1]

Options:

A. Na_3P and H_2O

B. H_3 PO and NaH

C. $P(OH)_3$ and NaH_2PO_4

D. PH_3 and NaH_2PO_2

Answer: D

Solution:

Solution:
$P_4 + 3$ NaOH + $3H_2O \rightarrow 3NaH_2PO_2 + PH_3$

Question46

The gas produced by treating an aqueous solution of ammonium chloride with sodium nitrite is [27-Jun-2022-Shift-2]

Options:

A. NH_3

B. N_2

C. N_2O

D. Cl_2

Answer: B

Solution:

N_2 gas is produced by treating an aqueous solution of ammonium chloride with sodium nitrite.
$NH_4Cl + NaNO_2 \rightarrow NaCl + N_2(g) \uparrow + 2H_2O$

Question47

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : Fluorine forms one oxoacid.
Reason R : Fluorine has smallest size amongst all halogens and is highly electronegative.
In the light of the above statements, choose the most appropriate answer from the options given below :
[27-Jun-2022-Shift-2]

Options:

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is NOT the correct explanation of A.

C. A is correct but R is not correct.

D. A is not correct but R is correct.

Answer: A

Solution:

Solution:
Due to its smaller size, fluorine forms only one oxoacid.
Both the Assertion and Reason are correct and The reason is the correct explanation.

Question48

On the surface of polar stratospheric clouds, hydrolysis of chlorine nitrite gives A and B while its reaction with its reaction with HCl produces B and C. A, B and C are, respectively
[27-Jun-2022-Shift-2]

Options:

A. HOCl, HNO_3, Cl_2

B. Cl_2, HNO_3, HOCl

C. $HClO_2$, HNO_2, HOCl

D. HOCl, HNO_2, Cl_2O

Answer: A

Solution:

Solution:
On the surface of polar stratospheric clouds, hydrolysis of chlorine nitrate as
$ClONO_2 + H_2O \longrightarrow \underset{A}{HOCl} + \underset{B}{HNO_3}$
$ClONO_2 + HCl \longrightarrow \underset{C}{Cl_2} + HNO_3$
Hence A, B and C are $HOCl$, HNO_3 and Cl_2 respectively.

Question49

Nitrogen gas is obtained by thermal decomposition of [28-Jun-2022-Shift-1]

Options:

A. $Ba(NO_3)_2$

B. $Ba(N_3)_2$

C. $NaNO_2$

D. $NaNO_3$

Answer: B

Solution:

Solution:
$Ba(N_3)_2 \xrightarrow{\Delta} Ba + 3N_2$

Question50

Given below are two statements :
Statement I : The pentavalent oxide of group- 15 element, E_2O_5, is less acidic than trivalent oxide, E_2O_3, of the same element.
Statement II : The acidic character of trivalent oxide of group 15 elements, E_2O_3, decreases down the group.
In light of the above statements, choose most appropriate answer from the options given below :
[28-Jun-2022-Shift-1]

Options:

A. Both Statement I and Statement II are true.

B. Both Statement I and Statement II are false.

C. Statement I is true, but Statement II is false.

D. Statement I is false, but Statement II is true.

Answer: D

Solution:

Solution:
As +ve oxidation state increases, EN of element increases hence acidic character increases. Down the group, non-metallic character decreases, acidic character decreases.
Acidic character : $E_2O_5 > E_2O_3$
Down the group, acidic character of E_2O_3 decreases

Question51

Among the following, basic oxide is : [28-Jun-2022-Shift-2]

Options:

A. SO_3

B. SiO_2

C. CaO

D. Al_2O_3

Answer: C

Solution:

Solution:
Since, oxides of metals are basic in nature. Hence CaO is a basic oxide.
SO_3 and SiO_2 are acidic oxides and Al_2O_3 is a amphoteric oxide.

Question52

Among the given oxides of nitrogen; N_2O, N_2O_3, N_2O_4 and N_2O_5, the number of compound/(s) having N − N bond is : [28-Jun-2022-Shift-2]

Options:

A. 1

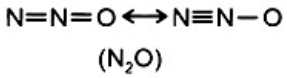
B. 2

C. 3

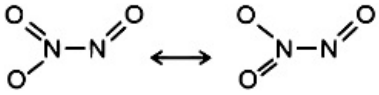
D. 4

Answer: C

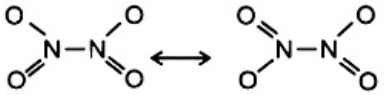
Solution:



(N_2O)



(N_2O_3)



(N_2O_4)

(N_2O_5)

N_2O, N_2O_3 and N_2O_4 contain $N-N$ bond

Question53

Which of the following oxoacids of sulphur contains "S" in two different oxidation states?
[28-Jun-2022-Shift-2]

Options:

A. $H_2S_2O_3$

B. $H_2S_2O_6$

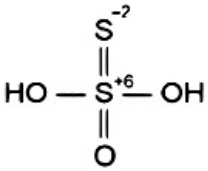
C. $H_2S_2O_7$

D. $H_2S_2O_8$

Answer: A

Solution:

Solution:
In $H_2S_2O_3$, sulphur exhibits two different oxidation states $+6$ and -2.



Question54

The oxoacid of phosphorus that is easily obtained from a reaction of alkali and white phosphorus and has two P-H bonds, is : [29-Jun-2022-Shift-1]

Options:

A. Phosphonic acid

B. Phosphinic acid

C. Pyrophosphorus acid

D. Hypophosphoric acid

Answer: B

Solution:

Solution:
$P_4 + 3\,NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$
oxoacid $= H_3PO_2$ (hypo phosphorus acid) or (phosphinic acid)

Question55

The acid that is believed to be mainly responsible for the damage of Taj Mahal is [29-Jun-2022-Shift-1]

Options:

A. sulfuric acid.

B. hydrofluoric acid.

C. phosphoric acid.

D. hydrochloric acid.

Answer: A

Solution:

Solution:
$CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$
Industries like oil refinery releases SO_2 which causes air pollution. It reacts with water to form acid rain when SO_2 mix with water it forms H_2SO_4 (Sulphuric acid).

Question56

The interhalogen compound formed from the reaction of bromine with

excess of fluorine is a:
[25-Jul-2022-Shift-1]

Options:

A. hypohalite

B. halate

C. perhalate

D. halite

Answer: B

Solution:

Solution:
$Br_2 + \underset{(\text{ Excess })_2}{5F} \longrightarrow 2BrF_5$
If BrF_5 undergoes hydrolysis it will produce halide.

Question57

Match List - I with List - II.

List I (Processes / Reactions)	List II (Catalyst)
(A) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(I) Fe(s)
(B) $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$	(II) Pt(s) − Rh(s)
(C) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	(III) V_2O_5
(D) Vegetable oil(l) $+H_2 \rightarrow$ Vegetable ghee(s)	(IV) Ni(s)

Choose the correct answer from the options given below:
[26-Jul-2022-Shift-1]

Options:

A. (A) − (III), (B) − (I), (C) − (II), (D) − (IV)

B. (A) − (III), (B) − (II), (C) − (I), (D) − (IV)

C. (A) − (IV), (B) − (II), (C) − (I), (D) − (I)

D. (A) − (IV), (B) − (II), (C) − (III), (D) − (I)

Answer: B

Solution:

(A) $2SO_2(g) + O_2(g) \xrightarrow{V_2O_5} 2SO_3$

(B) $4NH_3(g) + 5O_2(g) \xrightarrow{Pt(s)-Rh(s)} 4NO(g) + 6H_2O(g)$

(C) $N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$

(D) Vegetable oil(l) $+ H_2 \xrightarrow{Ni(s)}$ Vegetable ghee(s)

Question58

The number of non-ionisable protons present in the product B obtained from the following reactions is _____. $C_2H_5OH + PCl_3 \rightarrow C_2H_5Cl + A$ $A + PCl_3 \rightarrow B$

[26-Jul-2022-Shift-2]

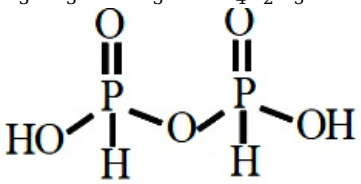
Answer: 2

Solution:

Solution:

$C_2H_5OH + PCl_3 \longrightarrow C_2H_5Cl + H_3PO_3$

$H_3PO_3 + PCl_3 \longrightarrow H_4P_2O_5 + HCl$



Question59

The incorrect statement is

[27-Jul-2022-Shift-1]

Options:

A. The first ionization enthalpy of K is less than that of Na and Li.

B. Xe does not have the lowest first ionization enthalpy in its group.
The first ionization enthalpy of element with atomic number 37 is lower than that of the element with

C. atomic number 38.

D. The first ionization enthalpy of Ga is higher than that of the d-block element with atomic number 30 .

Answer: D

Solution:

On moving down in a group ionisation energy decrease
$\therefore 1^{st}$ ionisation enthalpy order is Li > Na > K
Zn has more ionisation energy as compared to Ga because of their pseudo inert gas configuration.

Question60

Which oxoacid of phosphorous has the highest number of oxygen atoms present in its chemical formula? [27-Jul-2022-Shift-1]

Options:

A. Pyrophosphorus acid

B. Hypophosphoric acid

C. Phosphoric acid

D. Pyrophosphoric acid

Answer: D

Solution:

Solution:
Pyrophosphorous acid →$H_4P_2O_5$.
Hypophosphoric acid →$H_4P_2O_6$.
Phosphoric acid →H_3PO_4.
Pyrophosphoric acid →$H_4P_2O_7$.

Question61

Choose the correct answer from the options given below:

List - I Reaction (A)	List - II Catalyst
(A) $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$	(I) $NO(g)$
(B) $N_2(g) + 3H_2(g) \rightarrow 2N_3(g)$	(II) $H_2SO_4(l)$
(C) $C_{12}H_{22}O_{11}(aq) + H_2O(l) \rightarrow \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$	(III) $Pt(s)$
(D) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(IV) $Fe(s)$

[28-Jul-2022-Shift-1]

Options:

A. (A) − (I I), (B) − (III), (C) − (I), (D) − (IV)

B. (A) − (III), (B) − (II), (C) − (I), (D) − (IV)

C. (A) − (III) ,(B) − (IV), (C) − (II), (D) − (I)

D. (A) - (III), (B) - (II), (C) - (IV), (D) - (I)

Answer: C

Solution:

Solution:

(A) $4NH_3(g) + 5O_2(g) \xrightarrow{Pt(s)} 4NO(g) + 6H_2O(g)$

(B) $N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$

(C) $C_{12}H_{22}O_{11}(aq) + H_2O(l) \xrightarrow{H_2SO_4(l)} \underset{Glucose}{C_6H_{12}O_6} + \underset{Fructose}{C_6H_{12}O_6}$

(D) $2SO_2(g) + O_2(g) \xrightarrow{NO(g)} 2SO_3$

Question62

Match List - I with List - II, match the gas evolved during each reaction.

List - I	List - II
(A) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$	(I) H_2
(B) $KMnO_4 + HCl \rightarrow$	(II) N_2
(C) $Al + NaOH + H_2O \rightarrow$	(III) O_2
(D) $NaNO_3 \xrightarrow{\Delta}$	(IV) Cl_2

Choose the correct answer from the options given below: [28-Jul-2022-Shift-1]

Options:

A. (A) − (II), (B) − (III), (C) − (I), (D) − (IV)

B. (A) − (III), (B) − (I), (C) − (IV), (D) − (II)

C. (A) − (II), (B) − (IV), (C) − (I), (D) − (III)

D. (A) −(III) ,(B) − (IV), (C) − (I), (D) − (II)

Answer: C

Solution:

$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + 4H_2O + Cr_2O_3$

$KMnO_4 + HCl \longrightarrow KCl + MnCl_2 + Cl_2 + H_2O$

$Al + NaOH + H_2O \longrightarrow Na(Al(OH)_4) + H_2$

$2NaNO_3(s) \xrightarrow{\Delta} 2NaNO_2(s) + O_2$

Question63

The number of interhalogens from the following having square pyramidal structure is :
ClF_3, TF_7, BrF_5, BrF_3, I_2Cl_6, IF_5, ClF, ClF_5
[28-Jul-2022-Shift-1]

Answer: 3

Solution:

Solution:
CIF_3 → 3σ bond +2 lone pair
IF_7 → 7σ bond +0 lone pair
BrF_5 → 5σ bond +1 lone pair → Square pyramidal
BrF_3 → 3σ bond +2 lone pair
I_2Cl_6 → 4σ bond +2 lone pair
IF_5 → 5σ bond +1 lone pair → Square pyramidal
CIF → 1σ bond +3 lone pair
CIF_5 → 5σ bond +1 lone pair → Square pyramidal

Question64

White phosphorus reacts with thionyl chloride to give
[28-Jul-2022-Shift-2]

Options:

A. PCl_5, SO_2 and S_2Cl_2

B. PCl_3, SO_2 and S_2Cl_2

C. PCl_3, SO_2 and Cl_2

D. PCl_5, SO_2 and Cl_2

Answer: B

Solution:

Solution:
$$\underset{\text{phosphorous}}{P_4} + \underset{\text{Thionyl chloride}}{8SOCl_2} \longrightarrow 4PCl_3 + 4SO_2 + 2S_2Cl_2$$

Question65

Concentrated HNO_3 HNO 3 reacts with iodine to give

[28-Jul-2022-Shift-2]

Options:

A. HI, NO_2 and H_2O

B. HIO_2, N_2O and H_2O

C. HIO_3, NO_2 and H_2O

D. HIO_4, NO_2 and H_2O

Answer: C

Solution:

Solution:
$I_2 + 10HNO_{3(\text{ conc }} \Rightarrow 2HIO_3 + 10NO_2 + 4H_2O$

Question66

Dinitrogen and dioxygen, the main constituents of air do not react with each other in atmosphere to form oxides of nitrogen because [28-Jul-2022-Shift-2]

Options:

A. N_2 is unreactive in the condition of atmosphere.

B. Oxides of nitrogen are unstable.

C. Reaction between them can occur in the presence of a catalyst.

D. The reaction is endothermic and require very high temperature.

Answer: D

Solution:

Solution:
N_2 is unreactive, its reaction with oxides is endothermic and require very high temperature.
$N_2 + O_2 \overset{(1483-2000K)}{\leftrightharpoons} 2\,NO$
(Endothermic and feasible at high temperature)

Question67

On reaction with stronger oxidizing agent like KIO_4, hydrogen peroxide oxidizes with the evolution of O_2. The oxidation number of I in KIO_4 changes to____ [28-Jul-2022-Shift-2]

Answer: 5

Solution:

Solution:
$KIO_4 + H_2O_2 \longrightarrow KIO_3 + H_2O + O_2$

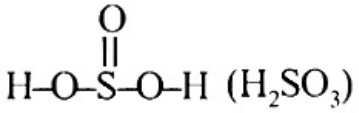
Question68

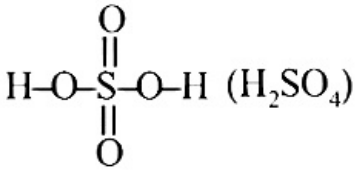
Consider the following sulphur based oxoacids.
H_2SO_3, H_2SO_4, $H_2S_2O_8$ and $H_2S_2O_7$.
Amongst these oxoacids, the number of those with peroxo (O − O) bond is _____.
[29-Jul-2022-Shift-2]

Answer: 1

Solution:

Solution:





Question69

Find A, B and C in the following reactions:
$NH_3 + A + CO_2 \longrightarrow (NH_4)_2CO_3$
$(NH_4)_2CO_3 + H_2O + B \longrightarrow NH_4HCO_3$
$NH_4HCO_3 + NaCl \longrightarrow NH_4Cl + C$
[26 Feb 2021 Shift 1]

Options:

A. A − O_2, B − CO_2, C − Na_2CO_3

B. $A - H_2O$, $B - O_2$, $C - Na_2CO_3$

C. $A - H_2O$, $B - O_2$, $C - NaHCO_3$

D. $A - H_2O$, $B - CO_2$, $C - NaHCO_3$

Answer: D

Solution:

Solution:
The given reaction take place as follows
(i) Ammonia (NH_3) reacts with H_2O and CO_2 to give ammonium carbonate [$(NH_4)_2CO_3$].

$$\underset{(A)}{NH_3 + H_2O} + CO_2 \longrightarrow (NH_4)_2CO_3$$

(ii) Ammonium carbonate react with water (H_2O) and CO_2 to give ammonium hydrogen carbonate (NH_4HCO_3).

$$(NH_4)_2CO_3 + H_2O + \underset{(B)}{CO_2} \longrightarrow 2NH_4HCO_3$$

(iii) Ammonium hydrogen carbonate reacts with sodium chloride ($NaCl$) to give ammonium chloride (NH_4Cl) along with sodium bicarbonate ($NaHCO_3$).

$$NH_4HCO_3 + NaCl \longrightarrow NH_4Cl + \underset{(O_3}{NaHCO}$$

So, $A - H_2O$, $B - CO_2$; $C - NaHCO_3$.

Question70

The correct order of electron gain enthalpy is [26 Feb 2021 Shift 2]

Options:

A. S > Se > Te > 0

B. Te > Se > S > O

C. O > S > Se > Te

D. S > O > Se > Te

Answer: A

Solution:

Solution:
Oxygen is the second most electronegative element in comparison to fluorine. In group - 16 family (O, S, Se, Te), O-atom is smallest in size. So, electron density on O-atom is very high in group -16.
During addition of a free electron to gaseous O-atom,

$$O(g) + e^- \longrightarrow O^-(g)$$

We have to supply a significant amount of energy (endothermic) to overcome the electrostatic repulsion between the approaching electron and O-atom of very high electron density. So, the net value of electron affinity (EA) or (negative) electron gain enthalpy [$\Delta_{eg}H$ or $|\Delta_{eg}H|$] of oxygen decreases to a higher extent in comparison to other elements of group - 16 who have larger size and lower electronegativity.
So, the correct order of EA or $|\Delta_{eg}H|$ of group -16 elements will be S > Se > Te > O.

Question71

Given below are two statements.
Statement I α and β-forms of sulphur can change reversibly between themselves with slow heating or slow cooling.
Statement II At room temperature, the stable crystalline form of sulphur is monoclinic sulphur.
In the light of the above statements, choose the correct answer from the options given below.
[25 Feb 2021 Shift 2]

Options:

A. Both statements I and II are true.

B. Both statements I and II are false.

C. Statement I is true but statement II is false.

D. Statement I is false but statement II is true.

Answer: C

Solution:

Solution:
Two crystalline allotropic forms of sulphur (S_α and S_β) can change reversibly between themselves with slow heating (above 369 K) or cooling.

$$\underset{\text{(Rhombic)}}{S_\alpha} \underset{\text{Cooling}}{\overset{>369K}{\rightleftharpoons}} \underset{\text{(Monoclinic)}}{S_\beta}$$

So, statement 1 is true.
At room temperature or at standard conditions of pressure and temperature, rhombic sulphur is the thermodynamically most stable crystalline allotrope of sulphur ($\Delta_f H^\circ = 0$).
So, statement II is false.

Question72

Among the following allotropic forms of sulphur, the number of allotropic forms, which will show paramagnetism is .....
a. α-sulphur
b. β-sulphur
c. S_2-form
[24 Feb 2021 Shift 2]

Answer: 3

Solution:

Solution:
Only S_2-form of sulphur is paramagnetic in nature. Because S_2 is like O_2 i.e. paramagnetic as per molecular orbital theory. It contains unpaired electron. While α-sulphur and β-sulphur are diamagnetic as they do not have unpaired electron.

Question73

The correct order of bond dissociation enthalpy of halogens is [25 Feb 2021 Shift 2]

Options:

A. $F_2 > Cl_2 > Br_2 > I_2$

B. $I_2 > Br_2 > Cl_2 > F_2$

C. $Cl_2 > Br_2 > F_2 > I_2$

D. $Cl_2 > F_2 > Br_2 > I_2$

Answer: C

Solution:

Solution:
Among halogens (F_2, Cl_2, Br_2 and I_2), bond dissociation enthalpy ($\Delta_{diss}\ H^\circ$) of I_2, is minimum because of larger size of I-atom there is a steric repulsion between bonded I-atoms, which makes I- I bond weakest.
Whereas, smaller size and highest electronegativity of F-atom cause highest electron density on F -atom of F_2 molecule. As a result, $F-F$ bond becomes weaker due to electrostatic repulsion between bonded F-atoms.
Thus, the order of $\Delta_{diss}\ H^\circ$ (in $kJ\ mol^{-1}$) is

$$\underset{242.6}{Cl-Cl} > \underset{192.3}{Br-Br} > \underset{(158.8)\ \text{Electrostatic repulsion}}{F-F} > \underset{151.1\ (\text{Steric repulsion})}{I-I}$$

Question74

Among the following, the number of halide(s) which is/are inert to hydrolysis is [25 Feb 2021 Shift 1]

Options:

A. BF_3

B. $SiCl_4$

C. PCl_5

D. SF_6

Answer: D

Solution:

Solution:
BF_3, $SiCl_4$ and PCl_5 are easily hydrolysed while SF_6 is inert to hydrolys is due to the presence of sterically protected sulphur atom by six$F$ atoms, which does not permit the reactions like hydrolysis to take place.

Thus, only 1 halide is inert to hydrolysis.

Question75

Match List -I with List II.

List-I (Industrial process)	List-II (Application)
A. Haber's process	(i) HNO_3 synthesis
B. Ostwald's process	(ii) Aluminium extraction
C. Contact process	(iii) NH_3 synthesis
D. Hall-Heroult process	(iv) H_2SO_4 synthesis

Choose the correct answer from the options given below: [16 Mar 2021 Shift 1]

Options:

A. A-(ii), B-(iii), C-(iv), D-(i)

B. A-(iii), B-(iv), C-(i), D-(ii)

C. A-(iii), B-(i), C-(iv), D-(ii)

D. A-(iv), B-(i), C-(ii), D-(iii)

Answer: C

Solution:

Solution:
A. Haber's process $-\mathrm{NH_3}$ synthesis
$\mathrm{N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)}$
B. Ostwald's process $-\mathrm{HNO_3}$ synthesis
$\mathrm{4NH_3(g) + 5O_2(g) \longrightarrow 4NO(g) + 6H_2O(g)}$
$\mathrm{2NO(g) + O_2(g) \longrightarrow 2NO_2(g)}$
$\mathrm{4NO_2(g) + 2H_2O(l) + O_2(g) \longrightarrow 4HNO_3(aq)}$
C. Contact process $-\mathrm{H_2SO_4}$ synthesis
$\mathrm{2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)}$
$\mathrm{SO_3(g) + H_2SO_4(aq) \longrightarrow H_2S_2O_7(l)}$
$\mathrm{H_2S_2O_7(l) + H_2O(l) \xrightarrow{\text{Oleum}} 2H_2SO_4(aq)}$
D. Hall-Heroult process- Aluminium extraction
$\mathrm{2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2}$
Correct match is, A→ (iii), B → (i), C → (iv), D→ (ii)

Question76

The absolute value of the electron gain enthalpy of halogens satisfies [17 Mar 2021 Shift 1]

Options:

A. I > Br > Cl > F

B. Cl > Br > F > I

C. Cl > F > Br > 1

D. F > Cl > Br > I

Answer: C

Solution:

Solution:
(c) Order of electron gain enthalpy (absolute value) Cl > F > Br > 1

Element	F	Cl	Br	I
$\Delta H_e(kJ/\text{Mole})$	−328	−349	−325	−295

Absolute value of electron gain enthalpy decreases down the group in a periodic table due to increase in size.
But magnitude of electron gain enthalpy of second period element F Due to small size of ' F ' there is high electronic repulsion between the existing and approaching electron.
Hence, magnitude of electron gain enthalpy decreases.

Question77

A xenon compound ' A ' upon partial hydrolysis gives XeO_2F_2. The number of lone pair of electrons present in compound A is (Round off to the nearest integer).
[18 Mar 2021 Shift 2]

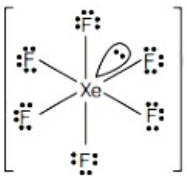
Answer: 19

Solution:

Solution:
Xenon hexa fluoride (A) on partial hydrolysis gives XeO_2F_2 as a product.

$$\underset{\substack{\text{(A)}\\ \text{Xenon hexa fluoride}}}{XeF_6} + 2H_2O \xrightarrow[\text{Partially}]{} XeO_2F_2 + 4HF$$

Structure of XeF_6



∴ Total no. of lone pair = lone pair on Xe + 6× lone pair on F = 1 + 6 × 3 = 19

Question78

Statement I Sodium hydride can be used as an oxidising agent.
Statement II The lone pair of electrons on nitrogen in pyridine makes it basic.
Choose the correct answer from the options given below.
[16 Mar 2021 Shift 2]

Options:

A. Both statement I and statement II are true

B. Both statement I and statement II are false

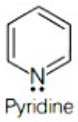
C. Statement I is true but statement II is false

D. Statement I is false but statement II is true

Answer: C

Solution:

Solution:
NaH is not an oxidising agent as $Na^{+}$and H^{-}ions are formed. Na exists only in $+1$ and hydrogen is present in minimum -1 state so, cannot be reduced further. NaH is used as reducing agent. Lone pair on nitrogen in pyridine is localised and does not take part in resonance. So, it can accept H^{+}acting as a base.



So, statement I is true but statement II is false.

Question79

The oxidation states of nitrogen in NO, NO_2, N_2O and $NO_3^{-}$are in the order of
[18 Mar 2021 Shift 2]

Options:

A. $NO_3^{-} > NO_2 > NO > N_2O$

B. $NO_2 > NO_3^{-} > NO > N_2O$

C. $N_2O > NO_2 > NO > NO_3^{-}$

D. $NO > NO_2 > N_2O > NO_3^{-}$

Answer: D

Solution:

Oxidation states of ' N ' in the given compounds are as follows
$NO \rightarrow x + 1(-2) = 0$
$x = +2$

$NO_2 \rightarrow x + 2 \times (-2) = 0$
$x = +4$
$N_2O \rightarrow 2x + (-2) = 0$
$x = +1$
$NO_3^- \rightarrow x + 3(-2) = -1 \Rightarrow x = +5$
Decreasing order of oxidation state of ' N ' is as follows
$NO_3^- > NO_2 > NO > N_2O$.

Question80

A group 15 element, which is a metal and forms a hydride with strongest reducing power among group 15 hydrides. The element is [16 Mar 2021 Shift 1]

Options:

A. Sb

B. P

C. As

D. Bi

Answer: D

Solution:

Solution:
BiH_3 is the strongest reducing agent and have strongest reducing power. The reducing character of the group 15 element hydrides increases down the group. Ammonia is only a mild reducing agent while BiH_3 is the strongest reducing agent amongst all the hydrides. This is due to the decrease in bond energy down the group.

Property	NH_3	PH_3	AsH_3	SbH_3	BiH_3
$\Delta_{diss.}H$ kJ/mol^{-1}	389	322	297	255	
NH_3					
PH_3					
AsH_3	(Increase in reducing power)				
SbH_3					
BiH_3					

So, correct answer is Bi (bismuth).

Question81

The number of ionisable hydrogens present in the product obtained from a reaction of phosphorus trichloride and phosphonic acid is [18 Mar 2021 Shift 1]

Options:

A. 3

B. 0

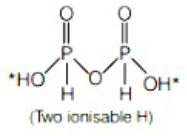
C. 2

D. 1

Answer: C

Solution:

$PCl_3 + H_3PO_3 + H_2O \longrightarrow H_4P_2O_5 + HCl$
Phosphorus trichloride + Phosphonic acid → Pyrophosphoric acid + Hydrochloric acid
Product is pyrophosphoric acid, i.e. $H_4P_2O_5$.
The structure of pyrophosphoric acid shows that it has two acidic or ionisable hydrogen, i.e. $^*H$.



Question82

The set that represents the pair of neutral oxides of nitrogen is [17 Mar 2021 Shift 2]

Options:

A. NO and N_2O

B. N_2O and N_2O_3

C. N_2O and NO_2

D. NO and NO_2

Answer: A

Solution:

Solution:
N_2O and NO are neutral oxides of nitrogen, whereas NO_2 and N_2O_3 are acidic oxides.
Neutral oxides are neither acidic nor basic. These oxides neither react with acids nor with bases.

Question83

Which of the following compound cannot act as a Lewis base? [17 Mar 2021 Shift 1]

Options:

A. NF_3

B. PCl_5

C. SF_4

D. ClF_3

Answer: B

Solution:

Solution:
PCl_5 has no lone-pair on the central atom but has empty d -orbital in valence shell, so that it can accept a pair of electrons (from a
Lewis acid Species which accepts a pair of electron in their vacant orbital e.g. BF_3, $AlCl_3$, PCl_5.

Lewis base Species which can donate a pair of electron, e.g. $\ddot{P}Cl_3$, $\ddot{N}H_3$, $\ddot{N}F_3$, $:\ddot{C}lF_3$, $\ddot{S}F_4$.

Question84

The reaction of white phosphorus on boiling with alkali in inert atmosphere resulted in the formation of product A. The reaction of 1mol of A with excess of $AgNO_3$ in aqueous medium gives mol(s) of Ag (Round off to the nearest integer).
[17 Mar 2021 Shift 1]

Answer: 4

Solution:

Solution:
$P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + \underset{\substack{\text{(A)}\\ \text{Sodiumhypophosphite}}}{3NaH_2PO_2}$
1 mole of NaH_2PO_2 reacts with excess of $AgNO_3$ in aqueous medium to give 4 moles of Ag.
$NaH_2PO_2 + 4AgNO_3 + 2H_2O \longrightarrow 4Ag + H_3PO_4 + NaNO_3 + 3HNO_3$
Hence, 1 mole produce 4 mole of Ag.

Question85

The product obtained from the electrolytic oxidation of acidified sulphate solutions, is :
[27 Jul 2021 Shift 1]

Options:

A. HSO_4^-

B. HO_3SOOSO_3H

C. HO_2SOSO_2H

D. $H O_3SOSO_3H$

Answer: B

Solution:

Solution:
Electrolysis of concentrated solution of acidified sulphate solution yields $H_2S_2O_8$

Question86

Number of Cl = O bonds in chlorous acid, chloric acid and perchloric acid respectively are :
[27 Jul 2021 Shift 2]

Options:

A. 3, 1 and 1

B. 4, 1 and 0

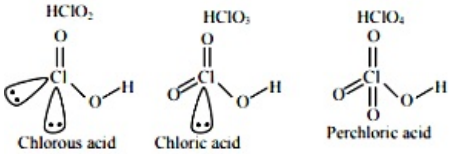
C. 1, 1 and 3

D. 1, 2 and 3

Answer: D

Solution:

Solution:
Number of Cl = O bonds



Question87

The oxidation states of ' P′ in $H_4P_2O_7$, $H_4P_2O_5$ and $H_4P_2O_6$, respectively, are:
[27 Jul 2021 Shift 1]

Options:

A. 7,5 and 6

B. 5,4 and 3

C. 5,3 and 4

D. 6,4 and 5

Answer: B

Solution:

Solution:
Oxidation state of P in $H_4P_2O_7$, $H_4P_2O_5$ and $H_4P_2O_6$ is 5, 3 & 4 respectively
$H_4P_2O_7$
$2x + 4(+1) + 7(-2) = 0$
$x = +5$
$H_4P_2O_5$
$2x + 4(+1) + 5(-2) = 0$
$x = +3$
$H_4P_2O_6$
$2x + 4(+1) + 6(-2) = 0$
$x = +4$

Question88

Which one of the following group-15 hydride is the strongest reducing agent?
[22 Jul 2021 Shift 2]

Options:

A. AsH_3

B. BiH_3

C. PH_3

D. SbH_3

Answer: B

Solution:

Solution:
Among 15^{th} group hydrides, BiH_3 is strongest reducing agent.

Question89

Chemical nature of the nitrogen oxide compound obtained from a reaction of concentrated nitric acid and P_4O_{10} (in 4 : 1 ratio) is :
[20 Jul 2021 Shift 1]

Options:

A. acidic

B. basic

C. amphoteric

D. neutral

Answer: C

Solution:

Solution:
$4HNO_3 + P_4O_{10}$
↓
$2N_2O_5 + (HPO_3)_4$
Ans. N_2O_5 is acidic in nature.

Question90

The depositions of X and Y on ground surfaces is referred to as wet and dry depositions, respectively. X and Y are
[31 Aug 2021 Shift 2]

Options:

A. X = Ammonium salts, Y = CO_2

B. X = SO_2, Y = Ammonium salts

C. X = Ammonium salts, Y = SO_2

D. X = CO_2, Y = SO_2

Answer: C

Solution:

Solution:
Oxides of nitrogen and sulphur are acidic and settle down on ground as dry deposition.
Ammonium salts in rain drops result in wet deposition.
∴ X = Ammonium salts
Y = SO_2

Question91

Consider the sulphides HgS, PbS, CuS, Sb_2S_3, As $_2S_3$ and CdS. Number of these sulphides soluble in 50%HNO_3 is
[31 Aug 2021 Shift 1]

Answer: 4

Solution:

PbS, CuS, As_2S_3, CdS, are soluble in 50% HNO_3 while HgS, Sb_2S_3 are insoluble in 50% HNO_3.

Question92

In polythionic acid, $H_2S_xO_6$(x = 3 to 5) the oxidation state(s) of sulphur is/are
[27 Aug 2021 Shift 1]

Options:

A. only +5

B. only +6

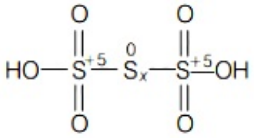
C. +3 and +5

D. 0 and +5

Answer: D

Solution:

Solution:
Polythionic acid with a small number of sulphur atoms (3 to 5) are most stable. The oxidation state of sulphur in polythionic acid are 0 and +5 only. They have straight chain of sulphur.



where x = 3 to 6.

Question93

Chalcogen group elements are
[26 Aug 2021 Shift 2]

Options:

A. Se, Tb and Pu

B. Se, Te and Po

C. S, Te and Pm

D. O, Ti and Po

Answer: B

Solution:

Oxygen family is also known as chalcogen family.
O, Se, S, Te and Po are chalcogen family member.

Question94

Which one of the following correctly represents the order of stability of oxides, X_2O(X = halogen) ?
[31 Aug 2021 Shift 2]

Options:

A. Br > Cl > I

B. Br > I > Cl

C. Cl > I > Br

D. I > Cl > Br

Answer: D

Solution:

Solution:
Iodine oxygen bond is stable due to greater polarity of bond.
Stability of chlorine oxygen bond is due to multiple bond formation of oxygen with d-orbital of chlorine atom.
Bromine lacks both these characteristics. So, the stability order of oxide is I > Cl > Br.

Question95

The number of halogen (s) forming halic (V) acid is
[31 Aug 2021 Shift 1]

Answer: 3

Solution:

Solution:
The halic (V) acids formed by chlorine (Cl), bromine (Br) and iodine (I) are $HClO_3$, $HBrO_3$ and HIO_3 respectively.

Question96

Which one of the following is used to remove most of plutonium from spent nuclear fuel?
[27 Aug 2021 Shift 2]

Options:

A. ClF_3

B. O_2F_2

C. I_2O_5

D. BrO_3

Answer: B

Solution:

Solution:
Dioxygen difluoride is used to remove the plutonium from spent nuclear fuel.

$$3F-O-O-F+\underset{\text{(From i nuclear fuel)}}{Pu}\rightarrow Pu\,F_6+3O_2\uparrow$$

Therefore, the option (b) is correct.

Question97

Choose the incorrect statement. [26 Aug 2021 Shift 1]

Options:

A. Cl_2 is more reactive than ClF.

B. F_2 is more reactive than ClF.

C. On hydrolysis ClF froms HOCl and HF.

D. F_2 is a stronger oxidising agent than Cl_2 in aqueous solution.

Answer: A

Solution:

Solution:
The Cl_2 is more reactive than ClF is incorrect statement as reactivity order can be written as follows
F_2 > ClF (interhalogen compounds) > Cl_2.
Interhalogen compounds are more reactive than pure halogen compounds as the bonds are polar and weaker than pure halogen compounds.
∴ statement (a) is incorrect.
F_2 is highly reactive among all interhalogens or pure halogen compounds due to strong interelectronic repulsion between F - atoms.

Question98

Match List-I with List-II.

List-I (Species)	List-II (Number of lone pair of electrons on the central atom)
A . XeF_2	1. 0
B . XeO_2F_2	2. 1
C . XeO_3F_2	3. 2
D . XeF_4	4. 3

Choose the most appropriate answer from the options given below:
[27 Aug 2021 Shift 1]

Options:

A. A-4 B-1 C-2 D-3

B. A-3 B-4 C-2 D-1

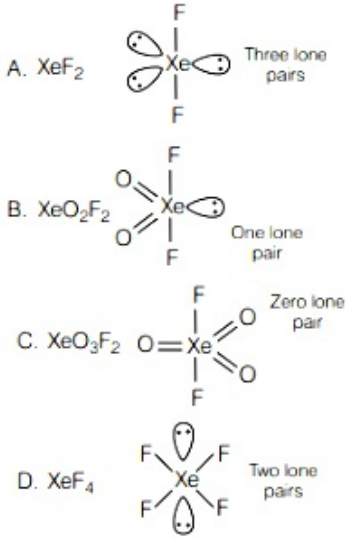
C. A-3 B-2 C-4 D-1

D. A-4 B-2 C-1 D-3

Answer: D

Solution:

The geometries of



So, the correct match is A-4, B-2, C-1, D-3.

Question99

Which one of the following is formed (mainly) when red phosphorus is heated in a sealed tube at 803K ?
[27 Aug 2021 Shift 2]

Options:

A. White phosphorus

B. Yellow phosphorus

C. β-black phosphorus

D. α-black phosphorus

Answer: A

Solution:

Solution:
When red phosphorus is heated in a sealed tube at 803K, α -black phosphorus is formed.
Therefore, option (d) is correct.

Question100

Number of paramagnetic oxides among the following given oxides is Li_2O, Na_2O_2, KO_2, HgO and K_2O [1 Sep 2021 Shift 2]

Options:

A. 1

B. 2

C. 3

D. 0

Answer: A

Solution:

Solution:
For the oxides Li_2O, CaO, Na_2O_2, KO_2, MgO and K_2O ,
$Li_2O \Rightarrow O^{2-}$
$CaO \Rightarrow O^{2-}$
$Na_2O_2 \Rightarrow {O_2}^{2-}$
$KO_2 \Rightarrow {O_2}^{-}$
$MgO \Rightarrow O^{2-}$
$K_2O \Rightarrow O^{2-}$
$\therefore$ Electronic configuration of ${O_2}^{2-}$ molecule is
$\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2, \pi^* 2p_x^2 = \pi^* 2p_y^2$
Hence, ${O_2}^{2-}$ is diamagnetic in nature as no unpaired electron is present.
Electronic configuration of O^{2-} is : $1s^2, 2s^2, 2p^6$
Hence, O^{2-} is also diamagnetic.
Electronic configuration of ${O_2}^{-}$ is :
$\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_x^2, \pi 2p_y^2 = \pi 2p_z^2 \pi^* 2p_y^2 = \pi^* 2p_z^1$
Since, unpaired electron is present in $\pi^* 2p_z$ orbital.
Therefore, ${O_2}^{-}$ is paramagnetic in nature.
$\therefore$ Only KO_2 is paramagnetic oxide.

Question101

The oxide without nitrogen-nitrogen bond is
[1 Sep 2021 Shift 2]

Options:

A. N_2O

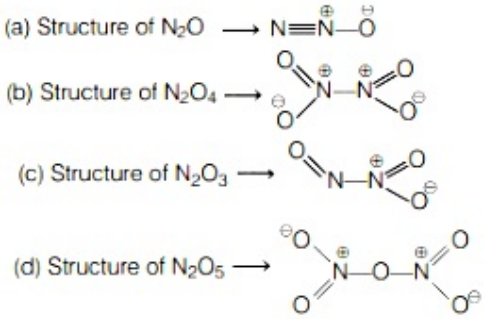
B. N_2O_4

C. N_2O_3

D. N_2O_5

Answer: C

Solution:



The oxide without nitrogen-nitrogen bond is N_2O_5.

Question102

The number of bonds between sulphur and oxygen atoms in $S_2O_8^{2-}$ and the number of bonds between sulphur and sulphur atoms in rhombic sulphur, respectively, are:
[Jan. 08,2020(I)]

Options:

A. 4 and 6

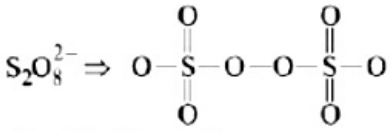
B. 8 and 8

C. 8 and 6

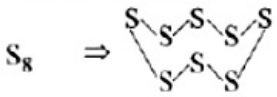
D. 4 and 8

Answer: B

Solution:



No. of S – O bond – 8



No. of S – S bond – 8

Question103

White phosphorus on reaction with concentrated N aOH solution in an inert atmosphere of CO_2 gives phosphine and compound (X) . (X) on acidification with HCl gives compound (Y). The basicity of compound (Y) is:
[Jan. 08,2020 (II)]

Options:

A. 2

B. 1

C. 4

D. 3

Answer: B

Solution:

Solution:

$P_4 + 3NaOH + 3H_2O \longrightarrow PH_3 + 3\underset{(X)}{NaH_2PO_2}$

$\underset{(X)}{NaH_2PO_2} \xrightarrow{HCl} \underset{(Y)}{H_3PO_2}$

Basicity of $H_3PO_2 = 1$

Question104

Arrange the following bonds according to their average bond energies in descending order: C − Cl , C − Br, C − F , C − I
[Jan. 08,2020 (II)]

Options:

A. C − F > C − Cl > C − Br > C − I

B. C − Br > C − I > C − C1 > C − F

C. C − I > C − Br > C − Cl > C − F

D. C − Cl > C − Br > C − I > C − F

Answer: A

Solution:

Solution:

Generally, bond energy $\propto \frac{1}{\text{Bond length}}$

Question105

Chlorine reacts with hot and concentrated NaOH and produces compounds (X) and (Y). Compound (X) gives white precipitate with silver nitrate solution. The average bond order between Cl and O atoms in (Y) is _____.
[NV Jan. 07,2020 (I)]

Answer: 1.67

Solution:

Solution:

$$3Cl_2 + \underset{\text{Hot \& conc.}}{6NaOH} \longrightarrow \underset{(X)}{5NaCl} + \underset{(Y)}{NaClO_3} + 3H_2O$$

$$\underset{(X)}{NaCl} + AgNO_3 \longrightarrow \underset{\text{(white ppt.)}}{AgCl} + NaNO_3$$

Average bond order between Cl and O atom in $NaClO_3$

$= \frac{5}{3} = 1.67$

Question106

In the following reactions, products (A) and (B), respectively, are:
$NaOH + Cl_2 \rightarrow$ (A) + side products (hot and conc.)
$Ca(OH)_2 + Cl_2 \rightarrow$ (B) + side products (dry)
[Jan. 07,2020 (II)]

Options:

A. $NaClO_3$ and $Ca(ClO_3)_2$

B. $NaClO_3$, and $Ca(OCl)_2$

C. $NaOCl$ and $Ca(OCl)_2$

D. $NaOCl$ and $Ca(ClO_3)_2$

Answer: B

Solution:

Solution:

$$6NaOH + 3Cl_2 \rightarrow \underset{\text{(A, Sodium chlorate)}}{5NaCl + NaClO_3} + 3H_2O$$

$$2Ca(OH)_2 + Cl_2 \rightarrow \underset{\text{(B, Calcium hypochlorite)}}{Ca(OCl)_2} + CaCl_2 + H_2O$$

Question107

The correct statement with respect to dinitrogen is: [Sep. 06,2020 (I)]

Options:

A. N_2 is paramagnetic in nature.

B. it can combine with dioxygen at 25˚C.

C. liquid dinitrogen is not used in cryosurgery.

D. it can be used as an inert diluent for reactive chemicals.

Answer: D

Solution:

Solution:
(a) N_2 is diamagnetic in nature.
(b) $N_2 + O_2 \overset{2000K}{\rightleftharpoons} NO(g)$
(c) Liquid N_2 is used in cryosurgery.
(d) Because of its inertness, it is used where an inert atmosphere is required.

Question108

The reaction of NO with N_2O_4 at 250K gives : [Sep. 06,2020 (II)]

Options:

A. N_2O

B. NO_2

C. N_2O_3

D. N_2O_5

Answer: C

Solution:

$2NO + N_2O_4 \xrightarrow{250K} 2N_2O_3$

Question109

Reaction of ammonia with excess Cl_2 gives:
[Sep. 05,2020 (II)]

Options:

A. NH_4Cl and N_2

B. NH_4Cl and HCl

C. NCl, and NH_4Cl

D. NCl_3 and HCl

Answer: D

Solution:

Solution:

$NH_3 + \underset{(excoss)_2}{3Cl} \longrightarrow NCl_3 + 3HCl$

If NH_3 is used in excess then NH_4Cl is formed instead of NCl_3

$8NH_3 + 3Cl_2 \longrightarrow 6NH_4Cl + N_2$(excess)

Question110

On heating, lead (II) nitrate gives a brown gas (A). The gas (A) on cooling changes to a colourless solid\/liquid (B). (B) on heating with NO changes to a blue solid (C). The oxidation number of nitrogen in solid (C) is:
[Sep. 04,2020 (I)]

Options:

A. +5

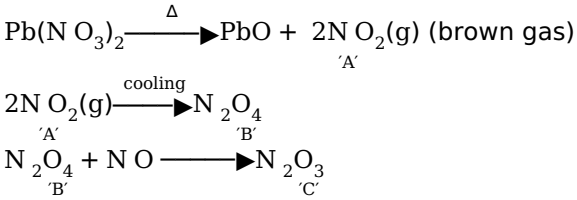
B. +2

C. +3

D. +4

Answer: C

Solution:



Question111

Aqua regia is used for dissolving noble metals (Au, Pt, etc.). The gas evolved in this process is:
[Sep. 03,2020 (I)]

Options:

A. NO

B. N_2O_5

C. N_2

D. N_2O_3

Answer: A

Solution:

Solution:
Aqua regia is $HNO_3 : HCl$ 1 : 3

$Au + 4H^+ + NO_3 + 4Cl^- \longrightarrow AuCl_4^- + NO + 2H_2O$

$3Pt + 16H^+ + 4NO_3^- + 18Cl^- \longrightarrow 3PtCl_6^{2-} + 4NO + 8H_2O$

Question112

In a molecule of pyrophosphoric acid, the number of P − OH , P = O and P − O − P bonds/ moiety(ies) respectively are:
[Sep. 03,2020 (I)]

Options:

A. 2,4 and 1

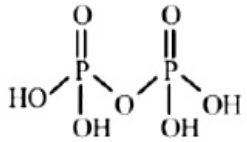
B. 3,3 and 3

C. 4,2 and 0

D. 4,2 and 1

Answer: D

Solution:



Pyrophosphoric acid

No. of P = O bond = 2.
P − OH bond = 4
P − O − P bond = 1.

Question113

On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with H_2 in the presence of a catalyst gives another gas (C) which is basic in nature. (A) should not be: [Sep. 02,2020 (I)]

Options:

A. NaN_3

B. $Pb(NO_3)_2$

C. $(NH_4)_2Cr_2O_7$

D. NH_4NO_2

Answer: B

Solution:

Solution:
$Pb(NO_3)_2$ does not produce nitrogen gas on heating.

(a) $NaN_3 \xrightarrow{300^\circ C} 3N_2 + 2Na$

(b) $Pb(NO_3)_2 \xrightarrow{\Delta} PbO + 2NO_2$

(c) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + H_2O$

(d) $NH_4NO_2 \xrightarrow{\Delta} N_2 + 2H_2O$

Question114

Reaction of an inorganic sulphite X with dilute H_2SO_4 generates compound Y. Reaction of Y with NaOH gives X. Further, the reaction of X with Y and water affords compound Z. Y and Z, respectively, are: [Sep. 06,2020(II)]

Options:

A. SO_2 and Na_2SO_3

B. SO_3 and $NaHSO_3$

C. SO_2 and $NaHSO_3$

D. S and Na_2SO_3

Answer: C

Solution:

Solution:

$$\underset{(X)}{Na_2SO_3} + H_2SO_4 \rightarrow Na_2SO_4 + H_2SO_3 \rightarrow H_2O + \underset{(Y)}{SO_2} \xrightarrow{NaOH} \underset{(X)}{Na_2SO_3} \xrightarrow{SO_2 + H_2O} \underset{(Z)}{NaHSO_3}$$

Question115

If the boiling point of H_2O is 373K , the boiling point of H_2S will be: [Sep. 03,2020(I)]

Options:

A. less than 300K

B. equal to 373K

C. more than 373K

D. greater than 300K but less than 373K

Answer: A

Solution:

Solution:
At room temperature, water is liquid and has boiling point $373K$ due to hydrogen bonding. Whereas H_2S is a gas and it has no hydrogen bonding. Hence boiling point of H_2S is less than $300K$ (boiling point of H_2S is $-60^{\circ}C$).

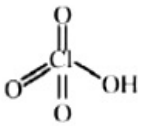
Question116

The number of Cl = O bonds in perchloric acid is, "_____". [NV Sep. 06,2020(I)]

Answer: 3

Solution:

The structure of perchloric acid is



The number Cl = O bond in $HClO_4$ is 3 .

Question117

The reaction in which the hybridisation of the underlined atom is affected is:
[Sep. 04,2020 (II)]

Options:

A. $\underset{-}{H_3PO_2} \xrightarrow{\text{Disproportionation}}$

B. $\underset{-}{H_2SO_4} + NaCl \xrightarrow{420K}$

C. $\underset{-}{x_N}H_3 \xrightarrow{H^+}$

D. $\underset{-}{xX}eF_4 + SbF_5 \longrightarrow$

Answer: D

Solution:

Solution:

$\underset{sp^3}{\underset{-}{H_3PO_2}} \xrightarrow{\text{Disproportionation}} \underset{sp^3}{\underset{-}{H_3PO_4}} + \underset{Sp^3}{\underset{-}{PH_3}}$

(b) $\underset{sp^3}{\underset{-}{H_3SO_4}} + NaCl \xrightarrow{420K} \underset{sp^3}{\underset{-}{Na_2SO_4}} + 2HCl$

(c) $\underset{sp^3}{\underset{-}{NH_3}} \xrightarrow{H^+} \underset{sp^3}{\underset{-}{NH_4^+}}$

(d) $\underset{sp^3d^2}{XeF_4} + SbF_5 \longrightarrow [\underset{sp^3d}{XeF_3}]^+[SbF_6]^-$

Question118

The pair that contains two P − H bonds in each of the oxoacids is:
[Jan. 10,2019 (II)]

Options:

A. $H_4P_2O_5$ and $H_4P_2O_6$

B. H_3PO_2 and $H_4P_2O_5$

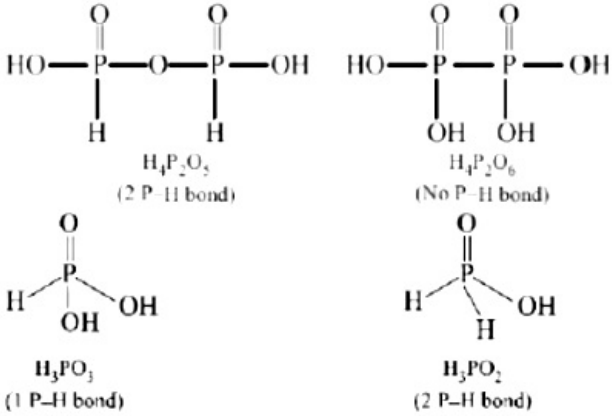
C. H_3PO_3 and H_3PO_2

D. $H_4P_2O_5$ and H_3PO_3

Answer: B

Solution:

Solution:



Question119

Good reducing nature of H_3PO_2 is attributed to the presence of: [Jan. 09,2019 (II)]

Options:

A. Two $P-OH$ bonds

B. One $P-H$ bond

C. Two $P-H$ bonds

D. One $P-OH$ bond

Answer: C

Solution:

Solution:
Structure of H_3PO_2.

$$H-\overset{\overset{O}{\|}}{\underset{\underset{H}{|}}{P}}-OH$$

Greater the number of $P-H$ bonds present in the acid, greater will be its reducing property.

Question120

Iodine reacts with concentrated HNO_3 to yield Y along with other products. The oxidation state of iodine in Y, is: [Jan. 12,2019(I)]

Options:

A. 5

B. 7

C. 3

D. 1

Answer: A

Solution:

Solution:
Conc. HNO_3 oxidises I_2 to iodic acid (HIO_3).
$I_2 + 10HNO_3 \rightarrow \underset{Y_3}{2HIO} + 10NO_2 + 4H_2O$
In HIO_3 oxidation state of iodine is +5 .

Question121

Chlorine on reaction with hot and concentrated sodium hydroxide gives: [Jan. 12,2019(II)]

Options:

A. Cl^- and ClO_3^-

B. Cl^- and ClO^-

C. ClO_3^- and ClO_2^-

D. Cl^- and ClO_2^-

Answer: A

Solution:

Solution:
$3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$

Question122

The non-metal that does not exhibit positive oxidation state is : [Jan. 12,2019(II)]

Options:

A. Chlorine

B. Iodine

C. Fluorine

D. Oxygen

Answer: C

Solution:

Solution:
Fluorine is most electronegative element in periodic table and exhibits O . S. value of -1 only.

Question123

The type of hybridisation and number of lone pair(s) of electrons of Xe in $XeOF_4$, respectively, are:
[Jan. 10, 2019(I)]

Options:

A. sp^3d^2 and 1

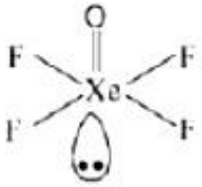
B. sp^3d and 2

C. sp^3d^2 and 2

D. sp^3d and 1

Answer: A

Solution:



sp^3d^2, no. of lone pair = 1

Question124

The number of pentagons in C_{60} and trigons (triangles) in white phosphorous, respectively, are:
[April. 10,2019 (II)]

Options:

A. 20 and 3

B. 12 and 4

C. 12 and 3

D. 20 and 4

Answer: B

Solution:

Solution:
Number of pentagons in C_{60} (Buckminsterfullerene) = 12
Number of triangles in P_4 (White phosphorous) = 4

Question125

The correct order of the oxidation states of nitrogen in NO, N_2O, NO_2 and N_2O_3 is:
[April. 09,2019 (I)]

Options:

A. $NO_2 < NO < N_2O_3 < N_2O$

B. $NO_2 < N_2O_3 < NO < N_2O$

C. $N_2O < N_2O_3 < NO < NO_2$

D. $N_2O < NO < N_2O_3 < NO_2$

Answer: D

Solution:

Solution:

Oxide	oxidation state
N_2O	+1
NO	+2
N_2O_3	+3
NO_2	+4

So, $N_2O < NO < N_2O_3 < NO_2$

Question126

The oxoacid of sulphur that does not contain bond between Sulphur atoms is :
[April 10,2019(1)]

Options:

A. $H_2S_4O_6$

B. $H_2S_2O_3$

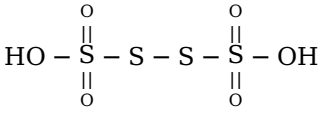
C. $H_2S_2O_7$

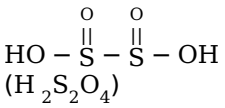
D. $H_2S_2O_4$

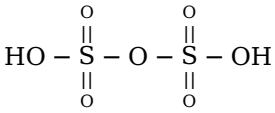
Answer: C

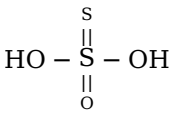
Solution:

Solution:


($H_2S_4O_6$)


($H_2S_2O_4$)


($H_2S_2O_7$)


($H_2S_2O_3$)

Question127

HF has highest boiling point among hydrogen halides, because it has: [April 9,2019 (II)]

Options:

A. strongest van der Waals' interactions

B. lowest ionic character

C. strongest hydrogen bonding

D. lowest dissociation enthalpy

Answer: C

Solution:

Solution:
Due to strong H-bonding between HF molecules. HF has highest boiling point among the hydrogen halides.

Question128

The noble gas that does NOT occur in the atmosphere is:
[April 10, 2019 (II)]

Options:

A. He

B. Kr

C. Ne

D. Ra

Answer: D

Solution:

Solution:
Radon is radioactive element and not present in atmosphere.

Question129

The compound that does not produce nitrogen gas by the thermal decomposition is :
[2018]

Options:

A. $Ba(N_3)_2$

B. $(NH_4)_2Cr_2O_7$

C. NH_4NO_2

D. $(NH_4)_2SO_4$

Answer: D

Solution:

$Ba(N_3)_2 \xrightarrow{\Delta} Ba + 3N_2$

(b) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} Cr_2O_3 + N_2 + 4H_2O$

(c) $NH_4NO_2 \xrightarrow{\Delta} N_2 + 2H_2O$

(d) $(NH_4)_2SO_4 \xrightarrow{\Delta} 2NH_3 + H_2SO_4$

NH_3 is evolved in reaction (d).

Question130

Among the oxides of nitrogen: N_2O_3, N_2O_4 and N_2O_5; the molecule(s) having nitrogen-nitrogen bond is/are:
[Online April 16, 2018]

Options:

A. N_2O_3 and N_2O_4

B. N_2O_4 and N_2O_5

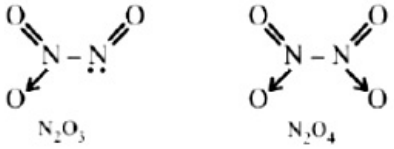
C. N_2O_3 and N_2O_5

D. Only N_2O_5

Answer: A

Solution:

Solution:



Question131

The number of P − O bonds in P_4O_6 is:
[Online April 15, 2018(II)]

Options:

A. 9

B. 6

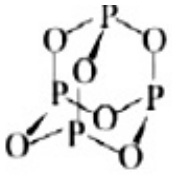
C. 12

D. 18

Answer: C

Solution:

The number of P − O bonds in P_4O_6 = 12



Question132

For per gram of reactant, the maximum quantity of N_2 gas is produced in which of the following thermal decomposition reactions? (Given: Atomic wt : Cr = 52u, Ba = 137u).
[Online April 15, 2018(II)]

Options:

A. $Ba(N_3)_2(s) \rightarrow Ba(C) + 3N_2(g)$

B. $(NH_4)_2Cr_2O_7(s) \rightarrow N_2(g) + 4H_2O(g) + Cr_2O_3(s)$

C. $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$

D. $2NH_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$

Answer: C

Solution:

Solution:
(a) Molar mass of $Ba(N_3)_2(s) = 221g / mol$
1 mole of $Ba(N_3)_2(s)$ gives 3 moles of N_2
Hence, $\frac{1g}{221g / mol}$ moles of $Ba(N_3)_2(s)$ will give $3 \times \frac{1}{221}$
$= 0.014$ moles of N_2
(b) Molar mass of $(NH_4)_2Cr_2O_7 = 252g / mol$.
1 mole of $(NH_4)_2Cr_2O_7$ gives 1mol e of N_2
Hence, $\frac{1g}{252g / mol}$ moles of $(NH_4)_2Cr_2O_7$ will give
$1 \times \frac{1}{252} = 0.0039$ moles of N_2
(c) Molar mass of $NH_3 = 17g / mol$.
2 mole of NH_3 gives 1 mole of N_2
Hence $\frac{1g}{17g / mol}$ moles of NH_3 will give $\frac{1}{2 \times 17} = 0.0297$ moles of N_2
(d) Molar mass of $NH_4NO_3 = 80g / mol$.
1 mole of NH_4NO_3 gives 1 mole of N_2
Hence $\frac{1g}{80g / mol}$ moles NH_4NO_3 will give $1 \times \frac{1}{80} = 0.0125$ moles of N_2
Hence thermal decomposition of NH_3 will produce maximum amount of N_2

Question133

In KO_2, the nature of oxygen species and the oxidation state of oxygen atom are, respectively:
[Online April 15,2018 (II)]

Options:

A. Superoxide and-1

B. Superoxide and $-1 / 2$

C. Peroxide and $-1 / 2$

D. Oxide and -2

Answer: B

Solution:

Solution:
In KO_2, the nature of oxygen species and the oxidation state of oxygen atom are superoxide (superoxide ion is O_2^-) and $-1/2$ respectively.
Let x be oxidation state of oxygen. The oxidation state of K is +1. Hence
$+1 + 2(x) = 0$
$2x = -1$
$x = -\frac{1}{2}$

Question134

In XeO_3F_2, the number of bond pair(s), π -bond(s) and lone pair(s) on Xe atom respectively are: [Online April 15,2018 (II)]

Options:

A. 5,3,0

B. 5,2,0

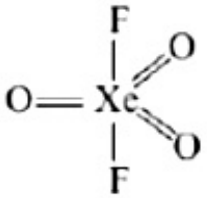
C. 4,2,2

D. 4,4,0

Answer: A

Solution:

Structure of XeO_3F_2



So, bond pairs = 5, π bonds = 3 lone pairs = 0

Question135

Xenon hexafluoride on partial hydrolysis produces compounds 'X' and 'Y'. Compounds 'X', 'Y' and the oxidation state of Xe are respectively: [Online April 15,2018 (I)]

Options:

A. $XeOF_4$(+6) and XeO_3(+6)

B. XeO_2(+4) and XeO_3(+6)

C. $XeOF_4(+6)$ and $XeO_2F_2(+6)$

D. $XeO_2F_2(+6)$ and $XeO_2(+4)$

Answer: C

Solution:

Solution:

$$XeF_6 + H_2O \xrightarrow[\text{hydrolysis}]{\text{partial}} \overset{+6}{\underset{X}{Xe}}OF_4 + 2HF$$

$$\underset{X}{XeOF_4} + H_2O \longrightarrow \overset{+6}{\underset{Y}{Xe}}O_2F_2 + 2HF$$

Question136

The number of $P-OH$ bonds and the oxidation state of phosphorus atom in pyrophosphoric acid ($H_4P_2O_7$) respectively are : [Online April 9, 2017]

Options:

A. four and four

B. five and four

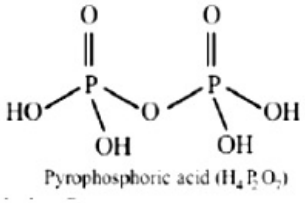
C. five and five

D. four and five

Answer: D

Solution:

Solution:



Pyrophosphoric acid ($H_4P_2O_7$)

Oxidation State:
Each P atom is bound to one oxygen $= -1$
$2OH = -1 \times 2 = -2$
1 Oxygen $= -2$
Total $= -5$
$P = +5$

Question137

A metal 'M' reacts with nitrogen gas to afford 'M_3N'. M_3N ' on heating at high temperature gives back ' M ' and on reaction with water

produces a gas 'B'. Gas 'B' reacts with aqueous solution of $CuSO_4$ to form a deep blue compound. 'M' and 'B' respectively are:
[Online April 8, 2017]

Options:

A. Li and NH_3

B. Ba and N_2

C. Na and NH_3

D. Al and N_2

Answer: A

Solution:

Solution:

$$Li(s) + N_2(g) \underset{\text{high temperature}}{\rightleftharpoons} 2Li_3N(s)$$

$$Li_3N + 3H_2O \longrightarrow 3LiOH + NH_3$$

$$CuSO_4 + 4NH_3 \longrightarrow \underset{\text{deep blue compound}}{[Cu(NH_3)_4]SO_4}$$

Question138

The number of S = O and S − OH bonds present 1n peroxodi sulphuric acid and pyro sulphuric acid respectively are :
[Online April 8,2017]

Options:

A. (2 and 2) and (2 and 2)

B. (2 and 4) and (2 and 4)

C. (4 and 2) and (2 and 4)

D. (4 and 2) and (4 and 2)

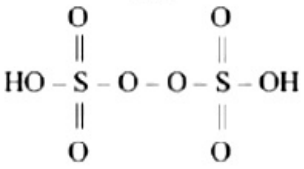
Answer: D

Solution:

Solution:

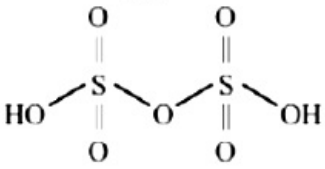
$H_2S_2O_8$

Peroxodisulphuric acid



$H_2S_2O_7$

Pyrosulphuric acid



No. of S = O bonds (4)	4
No. of S = OH bonds (2)	2

Question139

The correct sequence of decreasing number of π -bonds in the structures of H_2SO_3, H_2SO_4 and $H_2S_2O_7$ is : [Online April 9,2017]

Options:

A. $H_2SO_3 > H_2SO_4 > H_2S_2O_2$

B. $H_2SO_4 > H_2S_2O_7 > H_2SO_3$

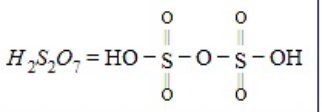
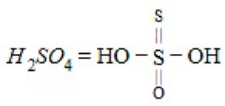
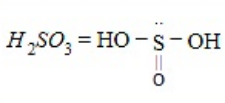
C. $H_2S_2O_7 > H_2SO_4 > H_2SO_3$

D. $H_2S_2O_7 > H_2SO_3 > H_2SO_4$

Answer: C

Solution:

Solution:

Compounds	Number of π-bonds
	4
	2
	1

Question140

The products obtained when chlorine gas reacts with cold and dilute aqueous N aOH are :

[2017]

Options:

A. ClO and ClO_3^-

B. ClO_2^- and ClO_3^-

C. Cl^- and ClO^-

D. Cl^- and ClO_2^-

Answer: C

Solution:

Solution:
$Cl_2 + \underset{\text{[cold and dilute]}}{NaOH} \longrightarrow NaCl + NaClO + H_2O$

Question141

XeF_6 on partial hydrolysis with water produces a compound ' X ' . The same compound ' $X^{'}$ ' is formed when XeF_6 reacts with silica. The compound ' X ' is:
[Online April 9,2017]

Options:

A. XeF_2

B. XeF_4

C. $XeOF_4$

D. XeO_3

Answer: C

Solution:

Solution:
$XeF_6 + H_2O \longrightarrow XeOF_4 + 2HF$ (Partial hydrolysis) $XeF_6 + 2H_2O \longrightarrow XeO_2F_2 + 4HF$
$SiO_2 + 2XeF_6 \longrightarrow \underset{\text{(Xenone oxytetrafluoride)}}{2XeOF_4} + SiF_4$

Question142

The compound of xenon with zero dipole moment is
[Online May 19,2017]

Options:

A. XeO_3

B. XeF_4

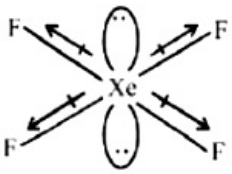
C. $XeOF_4$

D. XeO_2

Answer: B

Solution:

Solution:
XeF_4 has zero dipole moment. It has square planar structure due to which the bond moments of $Xe-F$ cancel each other.



Question143

The pair in which phosphorus atoms have a formal oxidation state of +3 is:
[2016]

Options:

A. Orthophosphorous and hypophosphoric acids

B. Pyrophosphorous and pyrophosphoric acids

C. Orthophosphorous and pyrophosphorous acids

D. Pyrophosphorous and hypophosphoric acids

Answer: C

Solution:

Solution:

Acid	Formula	Oxidation state of phosphorus
Pyrophosphorous acid	$H_4P_2O_5$	+3
Pyrophosphoric acid	$H_4P_2O_7$	+5
Orthophosphorous acid	H_3PO_3	+3
Hypophosphoric acid	$H_4P_2O_6$	+4

Question144

Identify the incorrect statement :
[Online April 10,2016]

Options:

A. The S-S-S bond angles in the S_8 and S_6 rings are the same.

B. Rhombic and monoclinic sulphur have S_8 molecules.

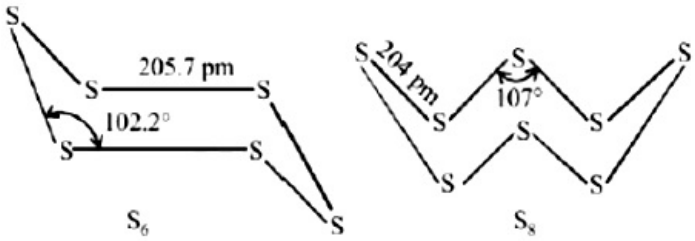
C. S_2 is paramagnetic like oxygen

D. S_8 ring has a crown shape.

Answer: A

Solution:

Solution:
The S_6 molecule has a chair-form hexagon ring with the approx same bond length as that in S_8, but with some what smaller bond angles i.e. bond lengths are approx same but bond angles are different.



Question145

Aqueous solution of which salt will not contain ions with the electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6$?
[Online April 10,2016]

Options:

A. NaF

B. K Br

C. N aCl

D. CaI_2

Answer: A

Solution:

Solution:
NaF is composed of Na^+ and F^-.

$Na^+ \longrightarrow [He]2s^2 2p^6$
$F^- \longrightarrow [Ne]2s^2 2p^6$
Hence configuration of Na^+ and F^- do not match with the configuration given in the question.

Question146

Which intermolecular force is most responsible in allowing xenon gas to liquefy?
[Online April 9,2016]

Options:

A. Instantaneous dipole-induced dipole

B. Ion-dipole

C. Ionic

D. Dipole- dipole

Answer: A

Solution:

Solution:
Instantancous dipole-induced dipole forces are most responsible in allowing xenon gas to liquify.

Question147

Which of the following compound has a P-P bond?
[Online April 11, 2015]

Options:

A. $H_4P_2O_5$

B. $(HPO_3)_3$

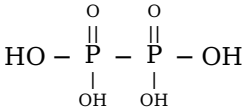
C. $H_4P_2O_6$

D. $H_4P_2O_7$

Answer: C

Solution:

Solution:
$H_4P_2O_6$ has P-P linkage



Question148

Assertion: Nitrogen and oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen. Reason: The reaction between nitrogen and oxygen requires high temperature. [2015]

Options:

A. The assertion is incorrect, but the reason is correct

B. Both the assertion and reason are incorrect

C. Both assertion and reason are correct, and the reason is the correct explanation for the assertion

D. Both assertion and reason are correct, but the reason is not the correct explanation for the assertion

Answer: C

Solution:

Solution:
Nitrogen and oxygen in air do not react to form oxides of nitrogen in atmosphere because the reaction between nitrogen and oxygen requires high temperatures.

Question149

Which among the following is the most reactive? [2015]

Options:

A. I_2

B. ICl

C. Cl_2

D. Br_2

Answer: B

Solution:

Solution:
Order of reactivity of halogens
$Cl_2 > Br_2 > I_2$
But the interhalogen compounds are generally more reactive than halogens (except F_2), since the bond between two dissimilar electronegative elements is weaker than the bond between two similaratoms i.e, $X-X$

Question150

The least number of oxyacids are formed by:
[Online April 10,2015]

Options:

A. Chlorine

B. Nitrogen

C. Fluorine

D. Sulphur

Answer: C

Solution:

Solution:
Flourine is the most electronegative element \& has least tendency to form double bonds.

Question151

Chlorine water on standing loses its colour and forms :
[Online April 11,2015]

Options:

A. HCl only

B. HCl and $HClO_2$

C. HCl and $HOCl$

D. $HOCl$ and $HOCl_2$

Answer: C

Solution:

Solution:
Chlorinated water is yellow in colour on standing following reaction occurs
$Cl_2 + H_2O \longrightarrow HCl + HOCl$
Thus, HCl and HOCl are formed.

Question152

Which one has the highest boiling point?
[2015]

Options:

A. K r

B. Xe

C. He

D. N e

Answer: B

Solution:

Solution:
Xe. As we move down the group, the melting and boiling points show a regular increase due to corresponding increase in the magnitude of their van der waal forces of attraction as the size of the atom increases.

Question153

The geometry of X eOF $_4$ by VSEPR theory is : [Online April 10,2015]

Options:

A. pentagonal planar

B. octahedral

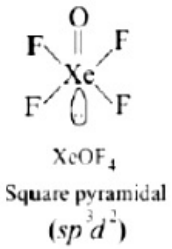
C. square pyramidal

D. trigonal bipyramidal

Answer: C

Solution:

Solution:
ln X eOF $_4$, X e is sp^3d^2, hybridised having 6 bond pairs and 1 lone pair respectively.



$XeOF_4$
Square pyramidal
(sp^3d^2)

Question154

Which one of the following does not have a pyramidal shape? [Online April 11, 2014]

Options:

A. $(CH_3)_3N$ (b)

B. $(SiH_3)_3N$ (c)

C. $P(CH_3)_3$

D. $P(SiH_3)_3$

Answer: B

Solution:

Solution:
In case of $N(SiH_3)_3$, N atom is sp^2 hybridised, the lone pair is present in 2p orbital and it is transferred to empty dorbital of Si forming $d\pi - p\pi$ bond. Hence nitrogen with sp^2 hybridisation has trigonal planar shape.

Question155

Shapes of certain interhalogen compounds are stated below. Which one of them is not correctly stated?
[Online April 11,2014]

Options:

A. IF_7: pentagonal bipyramid

B. BrF_5: trigonal bipyramid

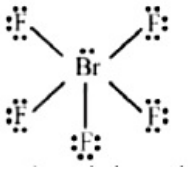
C. BrF_3: planar T-shaped

D. ICl_3 : planar dimeric

Answer: B

Solution:

Solution:
The molecular geometry of BrF_5 is square pyramidal with asymmetric charge distribution on the central atom.



Question156

Which of the following xenon-oxo compounds may not be obtained by hydrolysis of xenon fluorides?
[Online April 12, 2014]

Options:

A. XeO_2F_2

B. $XeOF_4$

C. XeO_3

D. XeO_4

Answer: D

Solution:

$$XeF_6 + H_2O \xrightarrow{\text{Partial}} XeOF_4 + 2HF$$
$$XeF_6 + 2H_2O \xrightarrow{\text{Partial}} XeO_2F_2 + 4HF$$
$$XeF_6 + 3H_2O \xrightarrow{\text{Complete}} XeO_3 + 6HF$$

Question157

Electron gain enthalpy with negative sign of fluorine is less than that of chlorine due to :
[Online April 9,2013]

Options:

A. High ionization enthalpy of fluorine

B. Smaller size of chlorine atom

C. Smaller size of fluorine atom

D. Bigger size of 2p orbital of fluorine

Answer: C

Solution:

Solution:
The electron gain enthalpy order for halogens is $Cl > F > Br > I$ Due to small size of fluorine the extra electron to be added feels more electron-electron repulsion. Therefore fluorine has less value for electron affinity than chlorine.

Question158

Trigonal bipyramidal geometry is shown by:
[Online April 9,2013]

Options:

A. XeO_2F_2

B. XeO_3F_2

C. $FXeOSO_2F$

D. $[XeF_8]^{2}$

Answer: B

Solution:

Solution:
The hybridization of XeO_3F_2 is sp^3d and its structure is trigonal bipyramidal in which oxygen atoms are situated on the plane and the fluoride atoms are on the top and bottom.

Question159

XeO_4 molecule is tetrahedral having : [Online April 22, 2013]

Options:

A. Two $p\pi - d\pi$ bonds

B. One $p\pi - d\pi$ bonds

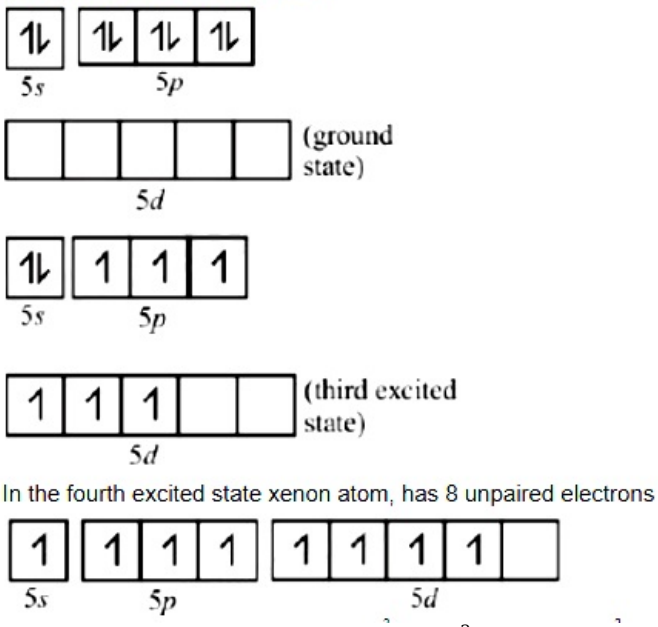
C. Four $p\pi - d\pi$ bonds

D. Three $p\pi - d\pi$ bonds

Answer: C

Solution:

Solution:
Xenon undergo sp^3 hybridisation.



One s and three p orbitals undergo sp^3 hybridisation. Four sp^3 hybrid orbitals form four σ bonds with oxygen atoms. They are $\sigma sp^3 - p$. Four $p\pi - d\pi$ bonds are also formed with oxygen atoms by the unpaired electrons.

Question160

Which has trigonal bipyramidal shape? [Online April 23,2013]

Options:

A. $XeOF_4$

B. XeO_3

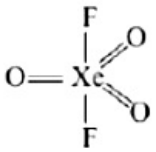
C. XeO_3F_2

D. $XeOF_2$

Answer: C

Solution:

Solution:
The shape of XeO_3F_2 is trigonal Pyramidal.



Question161

The molecule having smallest bond angle is : [2012]

Options:

A. NCl_3

B. $AsCl_3$

C. $SbCl_3$

D. PCl_3

Answer: C

Solution:

Solution:
All the members form volatile halides of the type AX_3. All halides are pyramidal in shape. The bond angle decreases on moving down the group (from NCl_3 to $SbCl_3$) due to decrease in bond pair-bond pair repulsion or increase in lone pair-bond pair repulsion.

Question162

The number of S − S bonds in SO_3, $S_2O_3^{2-}$ $S_2O_6^{2-}$ and $S_2O_8^{2-}$ respectively are
[Online May 26,2012]

Options:

A. 1,0,0,1

B. 1,0,1,0

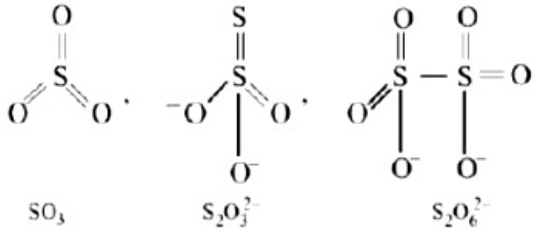
C. 0,1,1,0

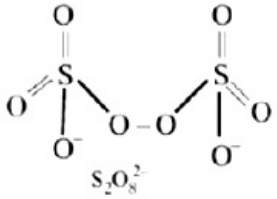
D. 0,1,0,1

Answer: C

Solution:

Solution:





Hence (c) is the correct option.

Question163

Which of the following has maximum number of lone pairs associated with Xe?
[2011RS]

Options:

A. XeF_4

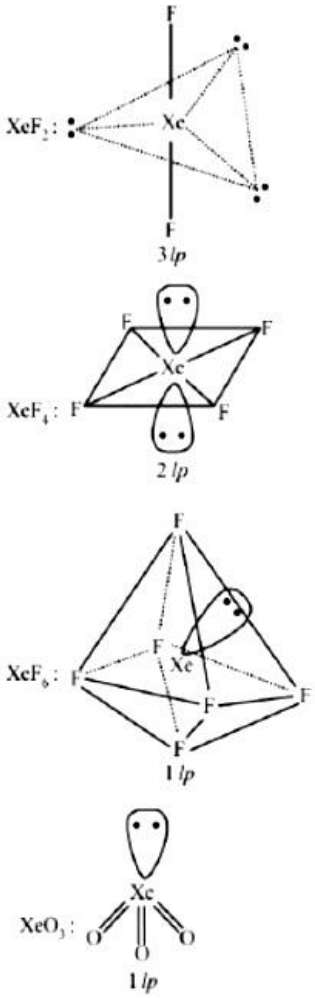
B. XeF_6

C. XeF_2

D. XeO_3

Answer: C

Solution:



Question164

Which one of the following reactions of xenon compounds is not feasible?
[2009]

Options:

A. $3XeF_4 + 6H_2O \longrightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$

B. $2XeF_2 + 2H_2O \longrightarrow 2Xe + 4HF + O_2$

C. $XeF_6 + RbF \longrightarrow Rb[XeF_7]$

D. $XeO_3 + 6HF \longrightarrow XeF_6 + 3H_2O$

Answer: D

Solution:

Solution:
The products of the concerned reaction react each other forming back the reactants. $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$

Question165

Regular use of the following fertilizers increases the acidity of soil? [2007]

Options:

A. Ammonium sulphate

B. Potassium nitrate

C. Urea

D. Superphosphate of lime.

Answer: A

Solution:

Solution:
$(NH_4)_2SO_4 + 2H_2O \longrightarrow 2H_2SO_4 + NH_4OH$
H_2SO_4 is strong acid and increases the acidity of soil.

Question166

Identify the incorrect statement among the following. [2007]

Options:

A. Br_2 reacts with hot and strong NaOH solution to give NaBr and H_2O

B. Ozone reacts with SO_2 to give SO_3

C. Silicon reacts with $NaOH_{(aq)}$ in the presence of air to give Na_2SiO_3 and H_2O

D. Cl_2 reacts with excess of NH_3 to give N_2 and HCl.

Answer: D

Solution:

Solution:
$3Br_2 + 6NaOH \rightarrow 5NaBr + NaBrO_3 + 3H_2O$
$O_3 + SO_2 \rightarrow O_2 + SO_3$
$Si + 2NaOH + O_2 \rightarrow Na_2SiO_3 + H_2O$
Cl_2 reacts with excess of ammonia to produce ammonium chloride and nitrogen.

$$\begin{array}{l} 2NH_3 + 3Cl_2 \longrightarrow N_2 + 6HCl \\ 6NH_3 + 6HCl \longrightarrow 6NH_4Cl \\ \hline 8NH_3 + 3Cl_2 \longrightarrow N_2 + 6NH_4Cl \end{array}$$

Question167

Which of the following statements is true?
[2006]

Options:

A. $HClO_4$ is a weaker acid than $HClO_3$

B. HNO_3 is a stronger acid than HNO_2

C. H_3PO_3 is a stronger acid than H_2SO_3

D. In aqueous medium HF is a stronger acid than HCl

Answer: B

Solution:

Solution:
The $H\overset{+5}{N}O_3$ is stronger than $H\overset{+3}{N}O_2$. The more the oxidation state of N , the more is the acid character.

Question168

What products are expected from the disproportionation reaction of hypochlorous acid?
[2006]

Options:

A. HCl and Cl_2O

B. HCl and $HClO_3$

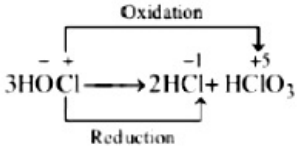
C. $HClO_3$ and Cl_2O

D. $HClO_2$ and $HClO_4$

Answer: B

Solution:

Solution:
During disproportionation same compound undergoes simultaneous oxidation and reduction.



Question169

The number of hydrogen atom(s) attached to phosphorus atom in hypo phosphorous acid is
[2005]

Options:

A. three

B. one

C. two

D. zero

Answer: C

Solution:

Solution:

hypophosphorous acid is $H-O-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{P}}\rightarrow O$

Two H-atoms are attached to p-atom.

Question170

The correct order of the thermal stability of hydrogen halides ($H-X$) is
[2005]

Options:

A. $HI > HCl < HF > HBr$

B. $HCl < HF > HBr < HI$

C. $HF > HCl > HBr > HI$

D. $HI < HBr > HCl < HF$

Answer: C

Solution:

Solution:
The H-X bond strength decreases from HF to HI. i.e. $HF > HCl > HBr > HI$. Thus HF is most stable while HI is least stable. The decreasing stability of the hydrogen halide is also reflected in the values of dissociation energy of the $H-X$ bond

$\overset{H-F}{135 kcal\ mol^{-1}}\ \overset{H-Cl}{103 kcal\ mol^{-1}}\ \overset{H-Br}{87 kcal\ mol^{-1}}\ \overset{H-I}{71 kcal\ mol^{-1}}$

Question171

Which among the following factors is the most important in making fluorine, the strongest oxidizing halogen ?

[2004]

Options:

A. Hydration enthalpy

B. Ionization enthalpy

C. Electron affinity

D. Bond dissociation energy

Answer: D

Solution:

Solution:
Fluorine has low dissociation energy of $F - F$ bond, and reaction of atomic fluorine is exothermic in nature.

Question172

Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solution is added to it. Which of the statements is incorrect for this reaction? [2004]

Options:

A. $Na_2S_2O_3$ is oxidised

B. CuI_2 is formed

C. Cu_2L_2 is formed

D. Evolved I_2 is reduced

Answer: B

Solution:

Solution:
$4\overset{-1}{K}\overset{}{I} + 2CuSO_4 \rightarrow \overset{0}{I}_2 + Cu_2I_2 + 2K_2SO_4$
$\overset{0}{I}_2 + 2\overset{2+}{Na}_2S_2O_3 \rightarrow Na_2\overset{+2.5}{S}_4O_6 + 2\overset{-1}{Na}I$
In this CuI_2 is not formed.

Question173

Which one of the following statement regarding helium is incorrect? [2004]

Options:

A. It is used to produce and sustain powerful superconducting magnets

B. It is used as a cryogenic agent for carrying out experiments at low temperatures

C. It is used to fill gas balloons instead of hydrogen because it is lighter and non-inflammable

D. It is used in gas-cooled nuclear reactors

Answer: C

Solution:

Solution:
Helium is heavier than hydrogen although it is noninflammable

---

Question174

What may be expected to happen when phosphine gas is mixed with chlorine gas?
[2003]

Options:

A. PCl_3 and HCl are formed and the mixture warms up

B. PCl_5 and HCl are formed and the mixture cools down

C. $PH_3 . Cl_2$ is formed with warming up

D. The mixture only cools down

Answer: B

Solution:

Solution:
On mixing phosphine with chlorine gas, PCl_5 and HCl are formed. The mixture cools down.
$PH_3 + 4Cl_2 \longrightarrow PCl_5 + 3HCl$

Question175

Which one of the following substances has the highest proton affinity?
[2003]

Options:

A. H_2S

B. NH_3

C. PH_3

D. H_2O

Answer: B

Solution:

Solution:
Among the given compounds, the NH_3 is most basic. Hence it has highest proton affinity.

Question176

Concentrated hydrochloric acid when kept in open air, sometimes produces a cloud of white fumes. The explanation for it is that [2003]

Options:

A. oxygen in air reacts with the emitted HCl gas to form a cloud of chlorine gas

B. strong affinity of HCl gas for moisture in air results in forming of droplets of liquid solution which appears like a cloudy smoke.

C. due to strong affinity for water, concentrated hydrochloric acid pulls moisture of air towards itself. This moisture forms droplets of water and hence the cloud.

D. concentrated hydrochloric acid emits strongly smelling HCl gas all the time.

Answer: A

Solution:

Solution:
$$\underset{\text{air}}{4HCl + O_2} \longrightarrow \underset{\text{cloud of white fumes}}{2Cl_2 \uparrow} + 2H_2O$$

Question177

In case of nitrogen, NCl_3 is possible but not NCl_5 while in case of phosphorus, PCl_3 as well as PCl_5 are possible. It is due to [2002]

Options:

A. availability of vacant d orbitals in P but not in N

B. lower electronegativity of P than N

C. lower tendency of H-bond formation in P than N

D. occurrence of P in solid while N in gaseous state at room temperature.

Answer: A

Solution:

Solution:
$_{7}N = 1s^2 2s^2 2p^3$; $_{15}P = 1s^2 2s^2 2p^6 3s^2 3p^3$ Note: In phosphorus the 3d -orbitals are available. Hence phosphorus can form pentahalides but nitrogen can not form pentahalide due to absence of d -orbitals.

Question178

Number of sigma bonds in P_4O_{10} is [2002]

Options:

A. 6

B. 7

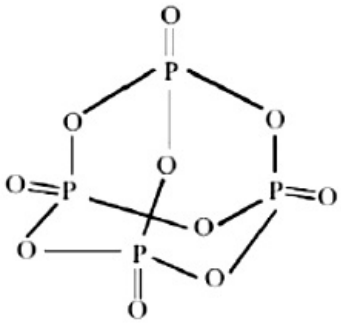
C. 17

D. 16 .

Answer: D

Solution:

Solution:



Question179

Oxidation number of Cl in $CaOCl_2$ (bleaching power) is: [2002]

Options:

A. zero, since it contains Cl_2

B. -1, since it contains Cl^-

C. $+1$, since it contains ClO^-

D. +1 and -1 since it contains ClO^- and Cl^-

Answer: D

Solution:

Solution:
$CaOCl_2$ can also be written as
$Ca(OCl)Cl_{x_1}x_2$
Hence oxidation no of Cl in OCl^- is
$-2 + x_1 = -1$
$x_1 = 2 - 1 = +1$
Oxidation no. of another Cl is -1 as it is present as Cl^-.

Question180

In XeF_2, XeF_4, XeF_6, the number of lone pairs on Xe are respectively [2002]

Options:

A. 2,3,1

B. 1,2,3

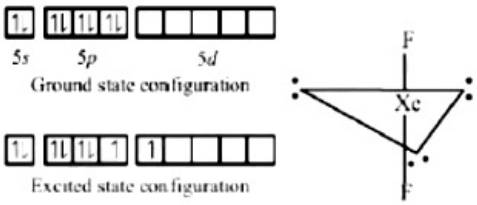
C. 4,1,2

D. 3,2,1

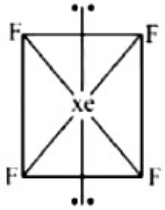
Answer: D

Solution:

Solution:
In the formation of XeF_2, sp^3d hybridisation occurs which gives the molecule a trigonal bipyramidal structure.



In the formation of XeF_4, sp^3d^2 hybridization occurs which gives the molecule an octahedral structure.



In the formation of XeF_6, sp^3d^β hybridization occurs which gives the molecule a pentagonal bipyramidal structure.