CHEMISTRY

BOOKS - BRILLIANT PUBLICATION

p-BLOCK ELEMENTS

Group 13 Boron Family Level I Homework

1. Heavier members of group-13 exhibit oxidation state? (a) +3 only (b) +1 only (c) +1 and +3 both (d) +1,+2 and +3

A. $+3$ only

B. $+1$ only

C. $+1$ and $+3$ both

D. $+1, +2$ and $+3$

Answer:

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2. Which of the following is the strongest oxidising agent?

A. $GaCl_3$

B. $InCl_3$

C. BCl_3

D. TlCl

Answer:

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3. Which of the following metals cannot be extracted by using aluminium as reducing agent?

A. W from WO_3

B. Mn from Mn_3O_4

C. Cr from Cr_2O_3

D. Na from Na_2O

Answer:

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4. Which of the following is not a mineral of boron?

A. Colemanite

B. Kernite

C. Boric anhydride

D. Borax

Answer:

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5. The unexpected order of acidic strength of trihalides of boron can be explained by (1) p π – p π backbonding (2) Hybridisation (3) Trigonal planar structure (4) None of the above

A. $p\pi - p\pi$ backbonding

B. Hybridisation

C. Trigonal planar structure

D. None of the above

Answer:

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6. Boron nitride is isoelectronic with

A. C_2

B. B_2

C. N_2

D. O_2

Answer:

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7. Which of the following is not an electron deficient compound?

A. BCl_3

B. $AlCl_3$

C. B_2H_6

D. Al_2Cl_6

Answer:

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8. When Al is added to KOH solution (1) No action takes place (2) Oxygen gas is evolved (3) Water is produced (4) Hydrogen gas is evolved

A. No action takes place

B. Oxygen gas is evolved

C. Water is produced

D. Hydrogen gas is evolved

Answer:

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9. In which of the following compounds, B atoms are in sp^2 and sp^3 hybridisation states? (1) Borax (2) Diborane (3) Borazole (4) All

A. Borax

B. Diborane

C. Borazole

D. All

Answer:

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10. Which of the following species will not exist? (1) [A l F 6] 3 – (2) [B F 6] 3 – (3)[G a F 6] 3 – (4) [ln F 6] 3 –

A. $[AlF_6]^{3-}$

B. $[BF_6]^{3-}$

C. $[GaF_6]^{3-}$

D. $[\ln F_6]^{3-}$

Answer:

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11. AlO_2^- is known as

A. Aluminium dioxo ion

B. Meta aluminate ion

C. Dioxo aluminium ion

D. Aluminium oxide ion

Answer:

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12. Boron sesqui oxide is (1) B 2 O 3 (2) B O 3 (3) B O 3 ^3- (4) B O 2^-

A. B_2O_3

B. BO_3

C. BO_3^{3-}

D. BO_2^-

Answer:

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Group 13 Boron Family Level Ii

1. Which statement is incorrect? (1) Boron exist in many allotropic forms with B 12 icosahedral units (2) The most abundant metal is present in cyolite and bauxite (3) Gallium exist as a liquid metal on a warm day (4) Boron compounds are electron sufficient

A. Boron exist in many allotropic forms with B_{12} icosahedral units

B. The most abundant metal is present in cyolite and bauxite

C. Gallium exist as a liquid metal on a warm day

D. Boron compounds are electron sufficient

Answer:

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2. Which of the following metals are used for the isolation of boron from B_2O_3?

A. Al and Mg

B. Al and Ga

C. Mg and Cu

D. Mg and Zn

Answer:

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3. Which of the following is not a protonic acid?

A. H_3PO_3

B. H_2SO_3

C. H_3BO_3

D. H_2CO_3

Answer:

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4. Which of the following has structure similar to graphite and is known as inorganic graphite?

A. $B_3N_3H_6$

B. BN

C. B_4C

D. B_2O_3

Answer:

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5. The hybridisation of B atom in boron trihalides (BX_3) after the formation of 1 : 1 addition product with NH_3 is

A. sp

B. sp^2

C. sp^3

D. None of these

Answer:

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6. Which of the following is the weakest Lewis acid? (1) B l 3 (2) B r 3 (3) B C l 3 (4) B F 3

A. Bl_3

B. Br_3

C. BCl_3

D. BF_3

Answer:

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7. Borax is prepared by treating an aqueous solution of colemanite with

A. Na_2CO_3

B. H_2SO_3

C. H_3BO_3

D. NaCl

Answer:

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8. Borax bead contains

A. $B_3N_3H_6 + B_2O_3$

B. $B_3N_3H_6 + NaBO_2$

C. $NaBO_2 + B_2O_3$

D. $NaBO_2 + B(OH)_3$

Answer:

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9. Borax bead test is used to identify

A. Metals which form coloured metaborates

B. Metals which form coloured flames

C. Radioactive metals

D. Inner transition metals

Answer:

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10. The product obtained when HCl or H_2SO_4 is added to an aqueous solution of borax is

A. H_3BO_3

B. $H_2B_4O_7$

C. HBO_2

D. $NaBO_2$

Answer:

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11. In solid state, the $B(OH)_3$ units are

A. Linked by hydrogen bonds and form three dimensional sheets with trigonal symmetry

B. Linked by hydrogen bonds and form two dimensional sheets with almost hexagonal geometry

C. Close to each other and are tightly held and so the crystals cannot be broken easily into small particles

D. Linked by hydrogen bonds intramolecularly and exist as discrete particles

Answer:

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12. Which of the following compound imparts green flame when mixed with methanol or ethanol and the vapours are burnt

A. Diborane

B. Metaboric acid

C. Sodium metaborate

D. Orthoboric acid

Answer:

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13. Which of the following statement is incorrect?

A. Borax is used as fuel in rockets

B. Borax is used in making enamels and paints for earthem pots

C. Boric acid is used as an antiseptic

D. Boron is used in making light composite for air crafts and in atomic reactors

Answer:

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14. Which of the following is not a characteristic of boranes? (1) They undergo spontaneous combustion in air. (2) Their combustion products are water and crystalline boron. (3) They form borohydride complexes (4) They readily get hydrolysed by liberating hydrogen gas

A. They undergo spontaeous combustion in air

B. Their combustion products are water and crystalline boron

C. They form borohydride complexes

D. They readily get hydrolysed by liberating hydrogen gas

Answer:

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15. Which is incorrect?

A. Boric acid is a hydrogen bonded substance

B. In diborane, the banana bond of B-H-B bridge involve delocalisation of the electrons over all these three atoms

C. Like organic benzene, borazine does not give addition products

D. Borax is a based system of two six-membered rings

Answer:

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16. Which of the following statement is incorrect in case of anhydrous aluminium chloride (1) Fumes in moistt air due to formation of HCl gas (2) Prepared by passing dry chlorine over heated mixture of alumina and carbon (3) Being electron deficient, act as Lewis base (4) Used as catalyst in Friedel-Craft's reaction

A. Flames in moistt air due to formation of HCl gas

B. Prepared by passing dry chlorine over heated mixture of alumina and carbon

C. Being electron deficient, act as Lewis base

D. Used as catalyst in Friedel-Craft's reaction

Answer:

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17. Assertion : Gallium has smaller atomic size than aluminium

Reason : Because of greater nuclear attraction due to poor shielding effect of outer shell electrons from the nucleus by the d-electrons

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A)

C. If (A) is correct, but (R) is incorrect

D. If both (A) and (R) are incorrect.

Answer:

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18. Assertion : Borazole, known as inorganic benzene is more reactive than benzene

Reason : In borazole, B-N bonds are polar whereas in benzene C-C are non polar (I) Both assertion and reason are correct and reason is the correct explanation of assertion. (II) Both assertion and reason are correct and reason is not the correct explanation of assertion. (III) Assertion is true and reason is false (IV) Assertion is false,reason is true

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Group 14 Carbon Family Level I Homework

1. Lead pencil contains

A. Lead

B. Graphite

C. Alloy of lead and tin

D. Alloy of lead and graphite

Answer:

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2. When a mixture of carbon monoxide and chlorine is exposed to sunlight, the product formed is

A. Thionyl chloride

B. Phosgene

C. Phosphine

D. Carbon tetrachloride

Answer:

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3. The minerals have silicate chains are collectively called

A. Olivine

B. Zircon

C. Pyroxenes

D. Natrolite

Answer:

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4. $SnCl_2$ can be used as

A. Reducing agent

B. Oxidsing agent

C. Catalyst is Friedel - Crafts's reaction

D. A base

Answer:

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5. Which silicon compound is used as lubricant?

A. Asbestos

B. Silicones

C. Zeolite

D. Mica

Answer:

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6. CO behave as a

A. Lewis acid

B. Lewis base

C. Amphoteric oxide

D. None of these

Answer:

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7. Red lead used as primer for iron to prevent it from rusting is (1) P b 3 O 4 (2) PbO (3) P b O 2 (4) P b 2 O

A. Pb_3O_4

B. PbO

C. PbO_2

D. Pb_2O

Answer:

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8. The anion $(Si_6O_{18})^{12-}$ is present in (1) Pyroxene (2) Beryl (3) Mica (4) Asbestos

A. Pyroxene

B. Beryl

C. Mica

D. Asbestos

Answer:

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9. Silica is soluble in

A. HCl

B. H_2SO_4

C. HNO_3

D. HF

Answer:

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10. Which of the following has least tendency to undergo catenation?

A. C

B. Si

C. Ge

D. Sn

Answer:

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11. Which of the following oxides have a three dimensional structure?

A. CO

B. CO_2

C. SiO_2

D. SO_2

Answer:

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12. Which of the following is an acid anhydride.

A. Al_2O_3

B. CO

C. CO_2

D. CaO

Answer:

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Group 14 Carbon Family Level Ii

1. $PbCl_2$ is more ionic than PbO_2 because : of inert pair effect, Chlorine is more electronegative than oxygen, Chlorine atom is smaller than oxygen atom, Radius of Pb^{2+} is more than that of Pb^{+4}

A. of inert pair effect

B. Chlorine is more electronegative than oxygen

C. Chlorine atom is smaller than oxygen atom

D. Radius of Pb^{2+} is more than that of Pb^{+4}

Answer:

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2. Which of the following elements does not react with conc.acetic acid?

A. Lead

B. Germanium

C. Silicon

D. Tin

Answer:

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3. Identify the incorrect statement?

A. Ultra pure Si and Ge are used to make transistors, semiconductors and solar cells

B. Pb does not show allotropy

C. Both CCl_4 and $SiCl_4$ undergo hydrolysis

D. PbI_4 does not exist

Answer:

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4. Which of the following statements false?

A. Graphite is thermodynamically the most stable allotrope of carbon

B. In fullerens carbon atoms are sp^3 hybridised

C. Diamond is a bad conductor of electricity

D. Crucibles made of graphite are not prone to dilute acids and alkalies

Answer:

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5. Which of the following statements is incorrect?

A. CO is prepared by the dehydration of formic acid on heating with con.H_2SO_4

B. Automobile exhaust fumes contain CO`

C. CO is a powerful oxidising agent

D. CO molecule act as a ligand

Answer:

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6. Water gas is a mixture of.

A. $CO + H_2$

B. $CO + H_2O$

C. $CO + N_2$

D. $CO_2 + H_2$

Answer:

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7. Carbogen, used for artificial respiration in case of CO poisoning is a mixture of

A. $CO_2 + H_2$

B. $CO_2 + H_2O$

C. $CO_2 + O_2$

D. $CO_2 + O_3$

Answer:

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8. Which is not obtained when metal carbides react with water

A. $Al_4C_3 + H_2O \rightarrow CH \equiv CH$

B. $CaC_2 + H_2O \rightarrow CH \equiv CH$

C. $Mg_2C_3 + H_2O \rightarrow CH_3 - C \equiv CH$

D. $Be_2C + H_2O \rightarrow CH_4$

Answer:

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9. Carborundum is obtained when silica is strongly heated with

A. HF

B. NaOH

C. Coke

D. Na_2CO_3

Answer:

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10. $CaF_2 + H_2SO_4 \rightarrow A + B$

$SiO_2 + \underset{(\text{excess})}{B} \rightarrow C$

The component C contains

A. $[SiF_6]^{4-}$

B. $[SiF_6]^{2-}$

C. $[SiF_4]^{6-}$

D. $[SiF_4]^{4-}$

Answer:

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11. Identify the incorrect statement

A. Silica is used as an acidic flux

B. Silica gel is used as drying agent

C. Kieselguhr is used as water filter

D. Both silica and carbon dioxide molecules are sp hybridised

Answer:

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12. Which of the following silicates share only one oxygen atom?

A. Orthosilicate

B. Pyroxene

C. Pyro silicate

D. Cyclic silicate

Answer:

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13. Which is not correct regarding the uses of zeolites?

A. Widely used as catalyst

B. Used as cation exchangers in the softening of hard water

C. Zeolite called ZSM-5 is used to convert alcohols directly into gasoline

D. Used as a drying agent

Answer:

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14. Which does not form silicone polymer on hydrolysis?

A. $(CH_3)_4Si$

B. $(C_2H_5)_2SiCl_2$

C. $(CH_3)SiCl_3$

D. $(CH_3)_2SiCl_2$

Answer:

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15. Which of the following statements is not correct?

A. The durability and inertness of silicones is due to the high bond enthalpy of Si-O bonds

B. Silicones are used in water proof textiles

C. Silicone rubbers are excellent electrical insulators

D. Silicones always involve cross link between Si and O atoms

Answer:

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16. Assertion : CO reacts with Fe to form $Fe(CO)_5$

Reason : CO is a strong reducing agent

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17. Assertion : Zeolites are widely used as catalyst

Reason : They have closed network solid structure which enables then to take up other smaller molecules : A) if both assertion and reason are true and the reason is the correct explanation of the assertion B) if both assertion and reson are true but reason is not the correct explanation of the assertion. C) If assertion is true but reason is false. D) If the assertion and reason both are false.

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Level I

1. Which gas is liberated when Al_4C_3 is hydrolysed?

A. CH_4

B. C_2H_2

C. C_2H_6

D. CO_2

Answer: A

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2. BCl_3 exists as monomer whereas $AlCl_3$ dimerises through halogen bridging. This is because of the

A. small size of B atom as compare to Al

B. absence of d orbital in B atom

C. $p\pi - p\pi$ back bonding in $AlCl_3$

D. $p\pi - p\pi$ back bonding in BCl_3

Answer: B

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3. Boron when heated with carbon forms

A. B_4C

B. BC_4

C. B_4C_3

D. B_2C_3

Answer: A

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4. The shapes of BF_3 and $\left[BH_4^-\right]$ are respectively

A. planar, tetrahedral

B. tetrahedral, planar

C. planar, planar

D. tetrahedral, tetrahedral

Answer: A

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5. What is the number of free electrons present on each carbon atom in graphite?

A. Zero

B. 3

C. 2

D. 1

Answer: D

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6. Carbon suboxide, C_3O_2 has

A. bent structure

B. trigonal planar sturucture

C. linear structrue

D. distorted tetrahedral structure

Answer: C

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7. Boron can't form which one of the following anions?

A. BF_6^{3-}

B. BH_4^-

C. $B(OH)_4^-$

D. BO_2^-

Answer: A

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8. Which of the following oxide is used to make scratch resistant glass?

A. Cr_2O_3

B. PbO_2

C. SnO_2

D. MgO

Answer: C

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9. Which of the following lead oxide is called "red lead"?

A. PbO

B. PbO_2

C. Pb_2O_3

D. Pb_3O_4

Answer: D

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10. Softening of lead refers to

A. Conversion of lead to litharge

B. Conversion of lead to red lead

C. Removal of metallic impurities from lead

D. Washing lead with HNO_3 followed by an alkali

Answer: C

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11. 'Butter of tin' refers to

A. $SnCl_2.2H_2O$

B. $SnCl_4.5H_2O$

C. $SnBr_2.5H_2O$

D. $SnBr_4.5H_2O$

Answer: B

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12. Which of the following is used in artificial gems?

A. SnO_2

B. B_2O_3

C. Al_2O_3

D. PbO_2

Answer: C

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13. Which of the following is used as a strong yellow pigment for road signs and markings?

A. K_2CrO_4

B. $PbCrO_4$

C. PbS

D. CdS

Answer: B

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14. Boron trichloride on reaction with water produces X along with HCl.X is

A. $BOCl_3$

B. B_2H_6

C. $B(OH)_3$

D. B_2O_3

Answer: C

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15. Which of the following is not a mineral of boron?

A. Colemanite

B. Kernite

C. Boric anhydride

D. Borax

Answer: C

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16. The name and formula of the compound of boron which is called 'inorganic benzene' are

A. Borazole, B_6H_6

B. Borazine, B_6N_6

C. Borazine, $B_3N_3H_6$

D. Borazine, $B_6N_3H_3$

Answer: C

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17. The unexpected order of acidic strength of trihalides of boron can be explained by (1) p π – p π backbonding (2) Hybridisation (3) Trigonal planar structure (4) None of the above

A. $p\pi - p\pi$ back bonding

B. Hybridisation

C. Trigonal planar structure

D. None of the above

Answer: A

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18. Boric acid is polymeric due to -----

A. Its monobasic nature

B. Its acidic nature

C. The presence of hydrogen bonds

D. Its geometry

Answer: C

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19. Al_2O_3 can be converted to anhydrous $AlCl_3$ by heating:

A. A mixture of Al_2O_3 and carbon in dry Cl_2 gas

B. Al_2O_3 with HCl gas

C. Al_2O_3 with Cl_2 gas

D. Al_2O_3 with NaCl in solid state

Answer: A

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20. The stability of +1 oxidation state increases in the sequence:

A. $Tl < In < Ga < Al$

B. $In < Tl < Ga < Al$

C. $Ga < In < Al < Tl$

D. $Al < Ga < In < Tl$

Answer: D

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21. Borax bead test is responded by:

A. Divalent metals

B. Heavy metals

C. Light metals

D. Metals which form coloured metaborates

Answer: D

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22. Aluminium chloride exits as a dimer because aluminium has:

A. Greater ionisation enthalpy

B. Incomplete p-orbital

C. High nuclear charge

D. Larger radius

Answer: B

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23. Boron nitride is isoelectronic with

A. C_2

B. B_2

C. N_2

D. O_2

Answer: A

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24. Which one of the following is hardest compound of boron?

A. Boron carbide

B. Silicon carbide

C. Magnesium boride

D. Silicon boride

Answer: A

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25. Among group 13 elements, the one forming an amphoteric oxide is

A. Tl

B. Al

C. B

D. In

Answer: B

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26. The stability of monohalides of group 13 elements

A. Increases down the group

B. Decreases down the group

C. First increases and then decreases

D. First decreases and then increases

Answer: A

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27. H_3BO_3 is

A. a monobasic acid and weak Lewis acid

B. a monobasic and weak Bronsted acid

C. a monobasic and strong Lewis acid

D. a tribasic and weak Bronsted acid

Answer: A

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28. The name of the structure of silicates in which three oxygen atoms of $[SiO_4]^{4-}$ are shared is

A. pyrosilicate

B. sheet silicate

C. linear-chain silicate

D. three-dimensional silicate

Answer: B

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29. Which of the following is known as pyrene?

A. CS_2

B. Al_4C_3

C. CCl_4

D. Solid CO_2

Answer: C

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30. On heating $Pb(NO_3)_2$, the products formed are:

A. PbO, N_2, O_2

B. $Pb(NO_2)_2$, O_2

C. PbO, NO_2, O_2

D. Pb, N_2, O_2

Answer: C

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31. Which of the following is most basic?

A. CO

B. GeO

C. SnO

D. PbO

Answer: D

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32. Softening of lead refers to

A. Conversion of lead to PbO

B. Conversion of lead to Pb_3O_4

C. Removal of impurities (metallic) from lead

D. Washing lead with HNO_3 followed by a dilute alkali solution

Answer: C

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33. Which of the following halide of carbon is used as refrigerant?

A. CCl_4

B. CF_4

C. CH_2Cl_2

D. CCl_2F_2

Answer: D

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34. Me_2SiCl_2 on hydrolysis will produce:

A. $Me_2Si(OH)_2$

B. $Me_2Si = O$

C. $-[O-(Me)_2\,Si-O]_n-$

D. $Me_2SiClOH$

Answer: C

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35. Which of the following anions are present in clay?

A. $\left(Si_2O_5^{2}\right)_n$

B. $\left(Si_4O_{11}^{6-}\right)_n$

C. $\left(SiO_3^{2-}\right)_n$

D. $\left(SiO_4^{4-}\right)$

Answer: A

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36. Al_2O_3 formation involves large quantity of heat evolution which makes its use in

A. deoxidizer

B. confectionary

C. indoor photography

D. thermite welding

Answer: D

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37. Thallium shows different oxidation states because:

A. it is a transition metal

B. of inert pair effect

C. of its amphoteric character

D. of its high reactivity

Answer: B

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38. Reactivity of borazole is greater than that of benzene because:

A. borazole is non-polar compound

B. borazole is polar compound

C. borazole is electron deficient compound

D. of localized electrons in it

Answer: B

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39. Mineral of aluminium that does not contain oxygen is:

A. corundum

B. diaspore

C. bauxite

D. cryolite

Answer: D

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40. The precious stone aquamarine is:

A. Mg-Al silicate

B. Be-Al silicate

C. Na-Al silicate

D. fluoro silicate of Al

Answer: B

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41. Which statement is not true about potash alum?

A. Its empirical formula is $KAl(SO_4)_2.\ 12H_2O$

B. Its aqueous solution is basic in nature

C. It is used in dyeing industries

D. On heating it melts and loses its water of crystallization

Answer: B

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42. Heating an aqueous solution of aluminium chloride to dryness will give:

A. $AlCl_3$

B. Al_2Cl_6

C. Al_2O_3

D. $Al(OH)Cl_2$

Answer: C

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43. Which of the following statements regarding aluminium chloride is not correct?

A. Fused aluminium chloride does not conduct electricity

B. Aluminium chloride exists as dimer in organic solvents such as benzene and ether

C. Aluminium chloride exists as monomer in organic solvents such as benzene and ether

D. Aluminium chloride is a covalent compound

Answer: C

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44. Which of the following represents white lead?

A. $Pb(OH)_2.2PbCO_3$

B. $Pb(OH)_2.\ Pb(CH_3COO)_2$

C. $Pb(OH)_2$

D. PbO

Answer: A

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45. The element which exists in liquid state for a wide range of temperature and can be used for measuring high temperature is:

A. B

B. Al

C. Ga

D. In

Answer: C

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46. Water transported through lead pipes becomes poisonous due to the formation of

A. $Pb(OH)_2$

B. $Na_2PbO.3H_2O$

C. PbO_2

D. Pb_3O_4

Answer: A

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47. Name the type of the structure of silicate in which one oxygen atom of $[SiO_4]^{4-}$ is shared?

A. Linear chain silicate

B. Sheet silicate

C. Pyrosilicate

D. Three dimensional

Answer: C

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48. $Na_2B_4O_7.10H_2O$ is correctly represented as:

A. $2NaBO_2.\ Na_2B_2O_3.10H_2O$

B. $Na_2\left[B_4O_5(OH)_4\right].8H_2O$

C. $Na_2\left[B_4(H_2O)_4O_7\right].6H_2O$

D. All of the above

Answer: B

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49. Which tetrahalide does not act as Lewis acid?

A. CCl_4

B. SiF_4

C. $GeCl_4$

D. $SnCl_4$

Answer: A

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50. Lead oxide (PbO) can be dissolved in:

A. HNO_3

B. HCl

C. H_2SO_4

D. H_2O

Answer: A

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Level Ii

1. Which of the following compounds are formed when BCl_3 is treated with water?

A. $B_2O_3 + HCl$

B. $B_2H_6 + HCl$

C. $H_3BO_3 + HCl$

D. None of these

Answer: C

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2. Which of the following statements is correct with respect to the property of elements in the carbon family with an increase in the atomic number? Their

A. atomic size decreases

B. stability of +2 oxidation state increases

C. metallic character decreases

D. ionization energy increases

Answer: B

Watch Video Solution

3. A tetravalent element forms monoxide and dioxide with oxygen. When air is passed over heated element (1273 K), producer gas is obtained. Monoxide of the element is a powerful reducing agent and reduces ferric oxide to iron. Identify the element.

A. Lead

B. Carbon

C. Tin

D. Silicon

Answer: B

Watch Video Solution

4. The B-F bond length in BF_3 is shorter than that in BF_4^-. This is because of

A. resonance in BF_3 but not in BF_4^-

B. $p\pi - p\pi$ back bonding in BF_4^- but not in BF_3

C. $p\pi - p\pi$ back bonding in BF_3 but not in BF_4^-

D. $p\pi - d\pi$ back bonding in BF_3 but not is BF_4^-

Answer: C

Watch Video Solution

5. The stability of hydrides of carbon family is in the order

A. $CH_4 > SiH_4 > GeH_4 > SnH_4 > PbH_4$

B. $CH_4 < SiH_4 < GeH_4 < SnH_4 < PbH_4$

C. $CH_4 > SnH_4 > GeH_4 > SiH_4 > PbH_4$

D. None of the above

Answer: A

Watch Video Solution

6. Heating of an aqueous solution of aluminium chloride to dryness will give

A. $Al(OH)Cl_2$

B. Al_2O_3

C. Al_2Cl_6

D. $AlCl_3$

Answer: B

Watch Video Solution

7. When NaOH is slowly added to $AlCl_3$ (aq). It gives a white precipitate which dissolves as more NaOH is added. This is due to

A. the formation of $Al(OH)_3$

B. the formation of sodium aluminate which is soluble

C. the formation of soluble Al_2O_3

D. the formation of Al^{+3} ion

Answer: B

Watch Video Solution

8. Which of the following statements about SiO_2 is NOT correct?

A. SiO_2 dissolves rapidly in fused NaOH forming silicates

B. SiO_2 reacts only with F_2 amongst halogens

C. Kieselguhr is form of SiO_2 used as an abrasive

D. SiO_2 reacts with hydrochloric acid to form silicon tetrachloride

Answer: C

Watch Video Solution

9. Lead does not dissolve in concentrated HCl because

A. A surface coating of PbO is formed

B. The reaction is kinetically unfavourable

C. A surface coating of $PbCl_2$ is formed

D. A protective layer of $PbCl_4$ is formed

Answer: C

Watch Video Solution

10. What is not true about borax?

A. Molecular formula is $Na_2B_4O_7.10H_2O$

B. Crystalline borax contains tetranuclear unit of $\left[B_4O_5(OH)_4\right]^{2-}$

C. It hydrolyses to give an acidic solution

D. White crystalline solid

Answer: C

Watch Video Solution

11. Aluminium chloride exists as a dimer, Al_2Cl_6 in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives:

A. $Al^{3+} + 3Cl^{\ominus}$

B. $Al_2O_3 + 6HCl$

C. $\left[Al(H_2O)_6\right]^{3+} + 3Cl^{\ominus}$

D. $\left[Al(OH)_6\right]^{3-} + 3HCl$

Answer: C

Watch Video Solution

12. $AlCl_3$ is an electron-deficient compound but AlF_3 is not, due to

A. Atomic size of F is smaller than Cl, which makes AlF_3 more covalent

B. $AlCl_3$ is a covalent compound while AlF_3 is an ionic compound

C. Al in $AlCl_3$ is sp hybridised but in AlF_3, Al is sp^2 hybridised.

D. $AlCl_3$ exists as a dimer but AlF_3 does not

Answer: B

Watch Video Solution

13. When excess of NaOH solution is added in potash alumn the product is:

A. Abluish precipitate

B. Clear solution

C. White precipitate

D. Greenish precipitate

Answer: B

Watch Video Solution

14. BCl_3 does not exist as a dimer but BH_3 exists as B_2H_6 because:

A. Chlorine is more electronegative than hydrogen

B. Large size of chlorine atom does not fit between small, sized boron atoms, while small-sized hydrogen atoms occupy the space between boron atoms.

C. There is $p\pi - p\pi$ back bonding in BCl_3.

D. Both (B) and (c)

Answer: C

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15. Aluminium is more reactive than iron. But aluminium is less easily corroded than iron because

A. Iron forms mono and divalent ions

B. Iron undergoes reaction easily with water

C. Oxygen forms a protective oxide layer on aluminium

D. Aluminium is a noble metal

Answer: C

Watch Video Solution

16. Orthoboric acid on strong heating to red hot gives. metaboric acid borax boron tri oxide tetraboric acid

A. Boron

B. Boron trioxide

C. Pyroboric acid

D. Metaboric acid

Answer: B

Watch Video Solution

17. Which is correct for the structure of diborane?

A. It contains four (2c, 2e) covalent bonds and two (3c, 2e) covalent bonds.

B. It contains three (2c, 2e) covalent bonds and three (3c, 2e) covalent bonds

C. It contains two (2c, 2e) covalent bonds and four (3c, 2e) covalent bond

D. It contains six (2c, 2e) covalent bonds

Answer: A

Watch Video Solution

18. Which of the following statements is not correct?

A. Silicon is extensively used as a semiconductor

B. Carborundum is SiC

C. Silicon occurs in free state in nature

D. Mica contains the element silicon

Answer: C

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19. Graphite is soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphite

A. has carbon atoms arranged in large planes of rings of strongly bound carbon atoms with weak interplanar bonds

B. is a non-crystalline substance

C. is an allotropic form of carbon

D. has molecules of variable molecular masses like polymers

Answer: A

Watch Video Solution

20. CCl_4 is inert towards hydrolysis but $SiCl_4$ is readily hydrolysed because:

A. Carbon cannot expand its octet but silicon can expand its octet

B. Ionisation enthalpy of carbon is higher than silicon

C. Electronegativity of carbon is higher than that of silicon

D. Carbon forms double and triple bonds

Answer: A

Watch Video Solution

21. Carbonyl chloride (phosgene, $COCl_2$) is prepared by

A. the combination of CO with Cl_2 in sunlight

B. the action of 80% fuming H_2SO_4 boiling in CCI_4

C. oxidising $CHCl_3$ with $K_2Cr_2O_7$ and H_2SO_4

D. all of the above

Answer: D

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22. Al and Ga have the same covalent radii because of: greater shielding power of s-electrons of Ga atoms, poor shielding power of s-electrons of Ga atoms, poor shielding power of d-electrons of Ga atoms, greater shielding power of d-electrons of Ga atoms

A. greater shielding power of s-electrons of Ga atoms

B. poor shielding power of s-electrons of Ga atoms

C. poor shielding power of d-electrons of Ga atoms

D. greater shielding power of d-electrons of Ga atoms

Answer: C

Watch Video Solution

23. The correct Lewis acid order for boron halides is:

A. $BF_3 > BCl_3 > BBr_3 > BI_3$

B. $BCl_3 > BF_3 > BBr_3 > BI_3$

C. $BI_3 > BBr_3 > BCl_3 > BF_3$

D. $BBr_3 > BCl_3 > BI_3 > BF_3$

Answer: C

Watch Video Solution

24. On the addition of mineral acid to an aqueous solution of borax, the compound formed is

A. borodihydride

B. orthoboric acid

C. metaboric acid

D. pyroboric acid

Answer: B

Watch Video Solution

25. In Al_2Cl_6, which statement is incorrect?

A. Four Al-Cl bonds are of same length and two of different length

B. Six Al-Cl bonds are of same length and two of different length

C. The angle Cl-Al-Cl is 118° and 79°

D. The angle Al-Cl-Al is 101°

Answer: A

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26. Aluminium vessels should not be washed with materials containing washing soda because:

A. washing soda is expensive

B. washing soda is easily decomposed

C. washing soda reacts with aluminium to form sodium aluminate

D. washing soda reacts with aluminium to form insoluble aluminium oxide

Answer: C

Watch Video Solution

27. Which of the following statements regarding graphite is not correct?

A. Graphite is a good conductor of electricity

B. Graphite is less dense than diamond

C. The bond length of σ bonded carbon-carbon bond is 154 pm

D. Graphite is thermodynamically more stable than diamond

Answer: C

Watch Video Solution

28. Which of the following statements is correct?

A. The electronegativity of Si is more than that of C

B. Si-Si bonds are as strong as C-C bonds

C. Both C and Si can form $p\pi - p\pi$ bond

D. Both CO_2 and SiO_2 has linear structures

Answer: B

Watch Video Solution

29. Which of the following statements is not correct?

A. Sn(II) salts or lead (II) compounds are essentially ionic whereas tetravalent are generally covalent

B. Lead (II) compounds are more stable than lead (IV) compounds

C. Sn (II) are good oxidizing agent

D. Sn (II) salts are more stable than Sn (IV) salts

Answer: C

Watch Video Solution

30. Which gas is evolved when PbO_2 is treated with concentrated HNO_3 ?

A. NO_2

B. O_2

C. N_2

D. N_2O

Answer: B

Watch Video Solution

31. Inert pair effect causes : increase in stability of the (+IV) oxidation state on descending 14 group, decrease in stability of the (+IV) oxidation state on descending 14 group, decrease in stability of the (+II) oxidation state on descending 14 group, the decrease in tendency to form dimer in group 14.

A. increase in stability of the (+IV) oxidation state on descending 14 group

B. decrease in stability of the (+IV) oxidation state on descending 14 group

C. decrease in stability of the (+II) oxidation state on descending 14 group

D. the decrease in tendency to form dimer in group 14.

Answer: B

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32. Which of these statements are correct in the structure of diborane

A. All hydrogen atoms lie in one plane and boron atoms lie in a plane perpendicular to this plane

B. 2 boron atoms and 4 terminal hydrogen atoms lie in the same plane and 2 bridging hydrogen atoms lie in the perpendicular plane

C. 4 bridging hydrogen atoms and boron atoms lie in one plane and two terminal hydrogen atoms lie in a plane perpendicular to this plane

D. All the atoms are in the same plane

Answer: B

Watch Video Solution

33. Acompound X of boron, reacts with NH_3 on heating to give another compound Y which is called inorganic benzene. The compound X can be prepared by treating BF_3 with Lithium aluminium hydride. The compounds X and Y are represented by the formulas

A. B_2H_6, $B_3N_3H_6$

B. B_2O_3, $B_3N_3H_6$

C. BF_3, $B_3N_3H_6$

D. $B_3N_3H_6$, B_2H_6

Answer: A

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34. For the properties mentioned, the correct trend for the different species is in

A. strength as Lewis acids-$BCl_3 > AlCl_3 > GaCl_3$

B. inert pair effect - $Al > Ga > In$

C. oxidising property-$Al^{3+} > In^{3+} > Tl^{3+}$

D. first ionization enthalpy- $B > Al > Tl$

Answer: A

Watch Video Solution

35. The $\text{product}/s$ formed when diborane is hydrolysed is/are

A. B_2O_3 and H_3BO_3

B. B_2O_3 only

C. H_3BO_3 and H_2

D. H_3BO3 only

Answer: C

Watch Video Solution

36. An alkali metal hydride (NaH) reacts with diborane in 'A' to give a tetrahedral complex 'B' which is extensively used as reducing agent in organic synthesis. The compounds 'A' and 'B' respectively are

A. CH_3COCH_3 and $B_3N_3H_6$

B. $(C_2H_5)_2O$ and $NaBH_4$

C. C_2H_6 and C_2H_5Na

D. C_6H_6 and $NaBH_4$

Answer: B

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37. $H_3BO_3 \xrightarrow{100^\circ C} X \xrightarrow{160^\circ C} Y \xrightarrow{\text{Red hot}} B_2O_3$, X and Y respectively are:

A. X=metaboric acid, Y=Tetraboric acid

B. X=Borax, Y=Metaboric acid

C. X=Tetraboric acid, Y=Metaboric acid

D. X=Tetraboric acid, Y=Borax

Answer: A

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38. Aqueous solution of borax acts as a buffer because:

A. it contains weak acid and its salt with strong base

B. it contains tribasic acid and strong base

C. it contains number of neutral water molecules

D. none of these

Answer: A

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39. An inorganic compound (A) made of two abundant elements in the earth's crust and used in building construction when made to react with carbon, forms a poisonous gas (B). Compounds (A) and (B) are:

A. SiO_2, CO_2

B. SiO_2, CO

C. SiO_2, N_2

D. CaO, CO_2

Answer: B

Watch Video Solution

40. $SiCl_4 \xrightarrow{H_2O} (A) \xrightarrow{\text{Heat}} (B) \xrightarrow[\text{Heat}]{Na_2CO_3} (C)$. The compound (C) is:

A. SiO_2

B. Si

C. SiC

D. Na_2SiO_3

Answer: D

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41. Among the following substituted silanes, the one which will give rise to crosslinked silicone polymner on hydrolysis is

A. R_4Si

B. $RSiCl_3$

C. R_2SiCl_2

D. R_3SiCl

Answer: B

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42. In silicon dioxide : each siliçon atom is surrunded by four oxygen atoms and each oxygen atoms is bonded to two silicon atoms, silicon atom is bonded to two oxygen atoms , there are double bond between silica and oxygen atoms, silicon atom is bonded to five oxygen atoms

A. each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atom

B. each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atoms

C. silicon atom is bonded to two oxygen atoms.

D. there are double bonds between silicon and oxygen atoms

Answer: A

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43. $PbCl_2$ is more ionic than PbO_2 because of

A. the radius of Pb^{2+} is more than that of Pb^{4+}

B. of inert pair effect

C. chlorine is more electronegative than oxygen

D. chlorine atom is smaller than oxygen atom

Answer: A

Watch Video Solution

44. Which one of the following is correct statement?

A. The hydroxide of aluminium is more acidic than that of boron

B. The hydroxide of boron is basic, while that of aluminium is amphoteric

C. The hydroxide of boron is acidic, while that of aluminium is amphoteric

D. The hydroxides of boron and aluminium are amphoteric

Answer: C

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45. Ionisation enthalpy ($\Delta_i H_1$ kJ mol^{-1}) for the elements of Group 13 follows the order

A. $B > Al < Ga > In < Tl$

B. $B < Al < Ga < In < Tl$

C. $B < Al > Ga < In > Tl$

D. $B > Tl > Ga > Al > In$

Answer: D

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46. Which one of the following compounds does not exist?

A. $B_2H_4(CH_3)_2$

B. $B_2H_3(CH_3)_3$

C. $B_2H_2(CH_3)_4$

D. $B_2H(CH_3)_5$

Answer: D

Watch Video Solution

47. Which of the following statements is not correct?

A. Organosilicon polymers are known as silicones

B. Silicones have the general formula $(R_2SiO)_n$ where $R = -CH_3, -C_2H_5, -C_6H_5$ etc.

C. Hydrolysis of dialkyldichlorosilane produces cross-linked silicon polymer

D. Hydrolysis of alkyltrichlorosilane produces cross-linked silicon polymer

Answer: C

Watch Video Solution

48. Which of the following statements is not correct?

A. Tin (IV) chloride is an ionic compound

B. Tin (IV) chloride undergoes hydrolysis with water

C. With excess of hydrochloric acid, tin (IV) chloride forms hexachlorostannic acid (H_2SnCl_6)

D. Tin (II) chloride can reduce Fe (III) to Fe(II), Cu(II) to Cu(I), Hg(II) to Hg(0) and Au(III) to Au(0)

Answer: A

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49. Which of the following statements is correct?

A. Aluminium chloride ($AlCl_3$) is a Lewis acid because it can donate electrons

B. All the Al-Cl bonds in Al_2Cl_6 are equivalent

C. Aluminium exists in two polymorphic forms, namely, $\alpha - Al_2O_3$ and $\gamma - Al_2O_3$

D. Anhydrous aluminium chloride can be prepared by heating hydrated salt

Answer: C

Watch Video Solution

50. Which of the following statements is incorrect regarding B_2H_6?

A. Banana bonds are longer but stronger than normal B-H bonds

B. B_2H_6 is also known as 3e-2e compound

C. The hybridization of B in B_2H_6 is sp^3 while that of sp^2 in BF_3.

D. It cannot be prepared by reacting BF_3 with $LiBH_4$ in the presence of dry ether.

Answer: D

Watch Video Solution

Level Ii Assertion Reason Type

1. Assertion : Silicones are hydrophobic in nature.

Reason : Si-O-Si linkages are moisture sensitive.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

2. Assertion : Pb^{4+} compounds are stronger oxidizing agents than Sn^{4+} compounds.

Reason : The higher oxidation states for the group 14 elements are more stable for the heavier members of the group due to 'inert pair effect'.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

3. Assertion : $Al(OH)_3$ is amphoteric in nature.

Reason : Al-O and O-H bonds can be broken with equal ease in $Al(OH)_3$.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

4. Assertion : Alums are isomorophous crystalline double salts which are soluble in water.

Reason : Due to hydrolysis, the aqueous solutions of alums have acidic character.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

Watch Video Solution

5. Assertion : H_3PO_3 is a dibasic acid. It also shows reducing character.

Reason : H_3PO_3 contains two OH^- groups and in it one H-atoms is directly linked to P-atom.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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6. In the following question, an Assertion (A) is followed by a corresponding Reason (R). Use the following keys to choose the appropriate answer.

Assertion : BF_3 is a weaker Lewis acid than BCl_3.

Reason : In BF_3 molecule, back bonding $(p\pi - p\pi)$ is stronger than in BCl_3. : If both (A) and (R) are correct and (R) is the correct explanation of (A)., If both (A) and (R) are correct, but (R) is not the correct explanation of (A)., If (A) is correct, but (R) is incorrect., If both (A) and (R) are incorrect.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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7. Assertion : Boron always forms covalent compounds.

Reason : The small size of B^{3+} favours formation of covalent bonds.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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8. Assertion : Coloured cations can be identified by borax bead test.

Reason : Transparent bead $(NaBO_2 + B_2O_3)$ forms coloured bead with coloured cation.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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9. Assertion : $PbCl_2$ is more stable than $PbCl_4$

Reason : $PbCl_4$ is a powerful oxidising agent.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

Watch Video Solution

10. Assertion : Between $SiCl_4$ and CCl_4 only $SiCl_4$ reacts with water.

Reason : $SiCl_4$ is ionic and CCl_4 is covalent.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

11. Assertion : Graphite is a good conductor of heat and electricity,

Reason : Graphite has all the electrons firmly held in C-C, σ-bonds.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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12. Assertion : In CO_2 molecule, C-atom undergoes sp^2 hybridisation.

Reason : CO_2 molecule has net dipole moment zero

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: D

Watch Video Solution

13. Assertion : In diborane, each Batom is sp^3 hybridised.

Reason : In diborane, the terminal 2-centre-2-electron B-H bonds are called banana bonds.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

Watch Video Solution

14. Assertion : Sn in +2 oxidation state is a reducing agent while Pb in +4 state is an oxidising agent.

Reason : Inert pair effect is due to participation of s electrons in bond formation.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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15. Assertion : CO_2 is a gas at room temperature while SiO_2 is a crystalline soild.

Reason : SiO_2 is a network of silicon and oxygen atoms joined by multiple bonds.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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16. Assertion : The heavier p-block elements do not form strong π bonds.

Reason : The heavier elements of p-block form $d\pi - p\pi$ or $d\pi - d\pi$ bonds.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: A

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17. Assertion : Atomic radius of Ga is larger than that of aluminium.

Reason : Atomic radius always increases down the group.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: D

Watch Video Solution

18. Assertion : $B(OH)_3$ is acidic while $In(OH)_3$ is basic.

Reason : $B(OH)_3$ has highly H-bonded network structure.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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19. Assertion : In water, orthoboric acid behaves as a weak monobasic acid.

Reason : In water, orthoboric acid acts as a proton acceptor.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: C

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20. Assertion : $AlCl_3$ forms dimer Al_2Cl_6 but dissolves in water to form $\left[Al(H_2O)_6\right]^{3+}$ and $Cl^{\ominus}$ ions.

Reason : Aqueous solution of $AlCl_3$ is acidic due to hydrolysis.

A. If both (A) and (R) are correct and (R) is the correct explanation of (A).

B. If both (A) and (R) are correct, but (R) is not the correct explanation of (A).

C. If(A) is correct, but (R) is incorrect.

D. If both (A) and (R) are incorrect.

Answer: B

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Level I

1. Which gas is liberated when Al_4C_3 is hydrolysed ?

A. CH_4

B. C_2H_2

C. C_2H_6

D. CO_2

Answer: A

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2. BCl_3 exists as monomer whereas $AlCl_3$ dimerises through halogen bridging. This is because of the

A. small size of B atom as compare to Al

B. absence of d orbital in B atom

C. $p\pi - p\pi$ back bonding in $AlCl_3$

D. $p\pi - p\pi$ back bonding in BCl_{23}

Answer: B

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3. Boron when heated with carbon forms

A. B_4C

B. BC_4

C. B_4C_3

D. B_2C_3

Answer: A

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4. The shapes of BF_3 and $\left[BH_4^-\right]$ are respectively

A. planar, tetrahedral

B. tetrahedral, planar

C. planar, planar

D. tetrahedral, tetrahedral

Answer: D

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5. What is the number of free electrons present on each carbon atom in graphite?

A. Zero

B. 3

C. 2

D. 1

Answer: D

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6. The structure of Carbon suboxide, C_3O_2 is

A. bent structure

B. trigonal planar sturucture

C. linear structrue

D. distorted tetrahedral structure

Answer: C

Watch Video Solution

7. Boron can't form which one of the following anions?

A. BF_6^{3-}

B. BH_4^-

C. $B(OH)_4^-$

D. BO_2^-

Answer: A

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8. Among the following oxides which can be used to make scratch resistant glass?

A. Cr_2O_3

B. PbO_2

C. SnO_2

D. MgO

Answer: C

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9. Which of the following lead oxide is called "red lead"?

A. PbO

B. PbO_2

C. Pb_2O_3

D. Pb_3O_4

Answer: D

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10. Softening of lead refers to

A. Conversion of lead to litharge

B. Conversion of lead to red lead

C. Removal of metallic impurities from lead

D. Washing lead with HNO_3 followed by an alkali

Answer: C

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11. 'Butter of tin' refers to

A. $SnCl_2.\ 2H_2O$

B. $SnCl_4.5H_2O$

C. $SnBr_2.5H_2O$

D. $SnBr_4.5H_2O$

Answer: B

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12. Which of the following is used in artificial gems?

A. SnO_2

B. B_2O_3

C. Al_2O_3

D. PbO_2

Answer: C

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13. Which of the following is used as a strong yellow pigment for road signs and markings?

A. K_2BrO_4

B. $PbCrO_4$

C. PbS

D. CdS

Answer: B

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14. Boron trichloride on reaction with water produces X along with HCl.X is

A. $BOCl_3$

B. B_2H_6

C. $B(OH)_3$

D. B_2O_3

Answer: C

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15. Which of the following is not a mineral of boron?

A. Colemanite

B. Kernite

C. Boric anhydride C Boric anhus

D. Borax

Answer: C

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16. The name and formula of the compound of boron which is called 'inorganic benzene' are

A. Borazole, B_6H_6

B. Borazine, B_6N_6

C. Borazine, $B_3N_3H_6$

D. Borazine, $B_6N_3H_3$

Answer: C

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17. The unexpected order of acidic strength of trihalides of boron can be explained by (1) p π – p π backbonding (2) Hybridisation (3) Trigonal planar structure (4) None of the above

A. $p\pi - p\pi$ back bonding

B. Hybridisation

C. Trigonal planar structure

D. None of the above

Answer: A

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18. Boric acid is polymeric due to -----

A. Its monobasic nature

B. Its acidic nature

C. The presence of hydrogen bonds

D. Its geometry

Answer: C

Watch Video Solution

19. Al_2O_3 can be converted to anhydrous $AlCl_3$ by heating:

A. A mixture of Al_2O_3 and carbon in dry Cl_2 gas

B. Al_2O_3 with HCl gas

C. Al_2O_3 with Cl_2 gas

D. Al_2O_3 with NaCl in solid state

Answer: A

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20. The stability of +1 oxidation state increases in the sequence:

A. Tl lt In lt Ga lt Al

B. In lt Tl lt Ga lt Al

C. Ga lt In lt A lt Tl

D. Al lt Ga lt In lt Tl

Answer: D

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21. Borax bead test is responded by:

A. Divalent metals

B. Heavy metals

C. Light metals

D. Metals which form coloured metaborates

Answer: D

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22. Aluminium chloride exits as a dimer because aluminium has:

A. Greater ionisation enthalpy .

B. Incomplete p-orbital

C. High nuclear charge

D. Larger radius

Answer: B

Watch Video Solution

23. Boron nitride is isoelectronic with

A. C_2

B. B_2

C. N_2

D. O_2

Answer: A

Watch Video Solution

24. Which one of the following is hardest compound of boron?

A. Boron carbide

B. Silicon carbide

C. Magnesium boride

D. Silicon boride

Answer: A

Watch Video Solution

25. Among group 13 elements, the one forming an amphoteric oxide is

A. Tl

B. Al

C. B

D. In

Answer: B

Watch Video Solution

26. The stability of monohalides of group 13 elements

A. Increases down the group

B. Decreases down the group

C. First increases and then decreases

D. First decreases and then increases

Answer: A

Watch Video Solution

27. H_3BO_3 is

A. a monobasic acid and weak Lewis acid

B. a monobasic and weak Bronsted acid

C. a monobasic and strong Lewis acid

D. a tribasic and weak Bronsted acid

Answer: A

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28. The name of the structure of silicates in which three oxygen atoms of $[SiO_4]^{4-}$ are shared is

A. pyrosilicate

B. sheet silicate

C. linear-chain silicate

D. three-dimensional silicate

Answer: B

Watch Video Solution

29. Which of the following is known as pyrene?

A. CS_2

B. Al_4C_3

C. CCl_4

D. Solid CO_2

Answer: C

Watch Video Solution

30. On heating $Pb(NO_3)_2$, the products formed are:

A. pbO, N_2, O_2

B. $Pb(NO_2)_2$, O_2

C. PbO, NO_2, O_2

D. Pb, N_2, O_2

Answer: C

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31. Which of the following is most basic?

A. CO

B. GeO

C. SnO

D. PbO

Answer: D

Watch Video Solution

32. Softening of lead refers to

A. Conversion of lead to PbO

B. Conversion of lead to Pb_3O_4

C. Removal of impurities (metallic) from lead

D. Washing lead with HNO_3 followed by a dilute alkali solution

Answer: C

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33. Which of the following halide of carbon is used as refrigerant?

A. CCl_4

B. CF_4

C. CH_2Cl_2

D. CCl_2F_2

Answer: D

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34. Me_2SiCl_2 on hydrolysis will produce:

A. $Me_2Si(OH)_2$

B. $Me_2Si=O$

C. $\left[-O-(Me)_2Si-O-\right]_n$

D. $Me_2SiClOH$

Answer: C

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35. Which of the following anions are present in clay?

A. 'Al_2 O_3'

B. CO

C. (CO_2)

D. CaO

Answer: A

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36. Al_2O_3 formation involves large quantity of heat evolution which makes its use in

A. deoxidizer

B. confectionary

C. indoor photography

D. thermite welding

Answer: D

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37. Thallium shows different oxidation states because:

A. it is a transition metal

B. of inert pair effect

C. of its amphoteric character

D. of its high reactivity

Answer: B

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38. Reactivity of borazole is greater than that of benzene because:

A. borazole is non-polar compound

B. borazole is polar compound

C. borazole is electron deficient compound

D. of localized electrons in it

Answer: B

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39. Mineral of aluminium that does not contain oxygen is:

A. corundum

B. diaspore

C. bauxite

D. cryolite

Answer: D

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40. The precious stone aquamarine is:

A. Mg-Al silicate

B. Be-Al silicate

C. Na-Al silicate

D. fluoro silicate of Al

Answer: B

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41. Which statement is not true about potash alum?

A. Its empirical formula is $KAl(SO_4)_2 . 12H_2O$

B. Its aqueous solution is basic in nature

C. It is used in dyeing industries

D. On heating it melts and loses its water of crystallization

Answer: B

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42. Heating an aqueous solution of aluminium chloride to dryness will give:

A. $AlCl_3$

B. Al_2Cl_6

C. Al_2O_3

D. $Al(OH)Cl_2$

Answer: C

Watch Video Solution

43. Which of the following statements regarding aluminium chloride is not correct?

A. Fused aluminium chloride does not conduct electricity

B. Aluminium chloride exists as dimer in organic solvents such as benzene and ether

C. Aluminium chloride exists as monomer in organic solvents such as benzene and ether

D. Aluminium chloride forms double salt $AlCl_3.6NH_3$ with ammonia

Answer: C

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44. Which of the following represents white lead?

A. $Pb(OH)_2.2PbCO_3$

B. $Pb(OH)_2Pb(CH_3COO)_2$

C. $Pb(OH)_2$

D. PbO

Answer: A

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45. The element which exists in liquid state for a wide range of temperature and can be used for measuring high temperature is:

A. B

B. Al

C. Ga

D. In

Answer: C

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46. Water transported through lead pipes becomes poisonous due to the formation of

A. $Pb(OH)_2$

B. $Na_2PbO.\ 3H_2O$

C. PbO_2

D. Pb_3O_4

Answer: A

Watch Video Solution

47. Name the type of the structure of silicate in which one oxygen atom of $[SiO_4]^{4-}$ is shared?

A. Linear chain silicate

B. Sheet silicate

C. Pyrosilicate

D. Three dimensional

Answer: C

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48. $Na_2B_4O_7.10H_2O$ is correctly represented as:

A. $2NaBO_2.\ Na_2O_3.\ 10H_2O$

B. $Na_2\left[B_4O_5(OH)_4\right].\ 8H_2O$

C. $Na_2\left[B(H_2O)_4O_7\right].\ 6H_2O$

D. All of the above

Answer: B

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49. Which tetrahalide does not act as Lewis acid?

A. CCl_4

B. SiF_4

C. $GeCl_4$

D. $SnCl_4$

Answer: A

Watch Video Solution

50. Lead oxide (PbO) can be dissolved in:

A. HNO_3

B. HCl

C. H_2SO_4

D. H_2O

Answer: A

Watch Video Solution

Level Ii

1. Which of the following compounds are formed when BCl_3 is treated with water?

A. $B_2O_3 + HCl$

B. $B_2H_6 + HCl$

C. $H_3BO_4 + HCl$

D. None of these

Answer: C

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2. Which of the following statements is correct with respect to the property of elements in the carbon family with an increase in the atomic number? Their

A. atomic size decreases

B. stability of+2 oxidation state increases

C. metallic character decreases

D. ionization energy increases

Answer: B

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3. A tetravalent element forms monoxide and dioxide with oxygen. When air is passed over heated element (1273 K), producer gas is obtained. Monoxide of the element is a powerful reducing agent and reduces ferric oxide to iron. Identify the element.

A. Lead

B. Carbon

C. Tin

D. Silicon

Answer: B

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4. The B-F bond length in BF_3 is shorter than that in BF_4^-. This is because of

A. resonance in BF_3 but not in BF_4^-

B. $p\pi - p\pi$ back bonding in BF_4^- but not in BF_3

C. $p\pi - p\pi$ back bonding in BF_3 but not in BF_4^-

D. $p\pi - d\pi$ back bonding in BF_3 but not is BF_4^-

Answer: C

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5. The stability of hydrides of carbon family is in the order

A. $CH_4 > SiH_4 > GeH_4 > SnH_4 > PbH_4$

B. $CH_4 > SiH_4 > GeH_4 > SnH_4 > PbH_4$

C. $CH_4 > SnH_4 > GeH_4 > SiH_4 > PbH_4$

D. None of these

Answer: A

Watch Video Solution

6. Heating of an aqueous solution of aluminium chloride to dryness will give

A. $Al(OH)Cl_2$

B. Al_2O_3

C. Al_2Cl_6

D. $AlCl_3$

Answer: B

Watch Video Solution

7. When NaOH is slowly added to $AlCl_3$ (aq). It gives a white precipitate which dissolves as more NaOH is added. This is due to

A. the formation of $Al(OH)_3$

B. the formation of sodium aluminate which is soluble

C. the formation of soluble Al_2O_3

D. the formation of Al^{+3} ion

Answer: B

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8. Which of the following statements about SiO_2 is NOT correct?

A. SiO_2 dissolves rapidly in fused NaOH forming silicates

B. SiO_2 reacts only with F_2 amongst halogens

C. Kieselguhr is form of SiO_2, used as an abrasive

D. SiO_2 reacts with hydrochloric acid to form silicon tetrachloride

Answer: C

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9. Lead does not dissolve in concentrated HCl because

A. A surface coating of PbO is formed

B. The reaction is kinetically unfavourable

C. A surface coating of $PbCl_2$ is formed

D. A protective layer of $PbCl_4$ is formed

Answer: C

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10. What is not true about borax?

A. Molecular formula is $Na_2B_4O_7.\ 10H_2O$

B. Crystalline borax contains tetranuclear unit of $\left[B_4O_5(OH)_4\right]^{2-}$

C. It hydrolyses to give an acidic solution

D. White crystalline solid

Answer: C

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11. Aluminium chloride exists as a dimer, Al_2Cl_6 in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives:

A. $Al^{3+} + 3Cl^{\Theta}$

B. $Al_2O_3 + 6HCl$

C. $\left[Al(H_2O)_6\right]^{3+} + 3Cl^{\Theta}$

D. $\left[Al(OH)_6\right]^{3-} + 3HCl$

Answer: C

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12. $AlCl_3$ is an electron-deficient compound but AlF_3 is not, due to

A. Atomic size of F is smaller than Cl, which makes AIF_3 more covalent

B. $AlCl_3$ is a covalent compound while AlF_3 is an ionic compound

C. Al in $AICI_3$ is sp^3 hybridised but in AlF_3. Al is sp^2 hybridised.

D. $AlCl_3$ exists as a dimer but AlF_6 does not

Answer: B

Watch Video Solution

13. When excess of NaOH solution is added in potash alumn the product is:

A. Abluish precipitate

B. Clear solution

C. White precipitate

D. Greenish precipitate

Answer: B

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14. BCl_3 does not exist as a dimer but BH_3 exists as B_2H_6 because:

A. Chlorine is more electronegative than hydrogen

B. Large size of chlorine atom does not fit between small, sized boron atoms, while small-sized hydrogen atoms occupy the space between boron atoms.

C. There is $p\pi - p\pi$ back bonding inBCl_3.

D. Both (B) and (C)

Answer: C

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15. Aluminium is more reactive than iron. But aluminium is less easily corroded than iron because

A. Iron forms mono and divalent ions

B. Iron undergoes reaction easily with water

C. Oxygen forms a protective oxide layer on aluminium

D. Aluminium is a noble metal

Answer: C

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16. When orthoboric acid is heated to red heat the residue is

A. Boron

B. Boron trioxide

C. Pyroboric acid

D. Metaboric acid

Answer: B

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17. Which is correct for the structure of diborane?

A. It contains four (2c, 2e) covalent bonds and two(3c, 2e) covalent bonds.

B. It contains three (2c, 2e) covalent bonds and three (3c, 2e) covalent bonds

C. It contains two (2c, 2e) covalent bonds and four (3c, 2e) covalent bond

D. It contains six (2c, 2e) covalent bonds

Answer: A

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18. Aqueous solution of borax acts as a buffer because:

A. it contains weak acid and its salt with strong base

B. it contains tribasic acid and strong base

C. it contains number of neutral water molecules

D. none of these

Answer: A

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19. An inorganic compound (A) made of two abundant elements in the earth's crust and used in building construction when made to react with carbon, forms a poisonous gas (B). Compounds (A) and (B) are:

A. SiO_2, CO_2

B. SiO_2, CO

C. SiO_2, N_2

D. CaO, CO_2

Answer: B

Watch Video Solution

20. $SiCl_4 \xrightarrow{H_2O} (A) \xrightarrow{\text{Heat}} (B) \xrightarrow[\text{Heat}]{Na_2CO_3} (C)$. The compound (C) is:

A. SiO_2

B. Si

C. SiC

D. Na_2SiO_3

Answer: D

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21. Among the following substituted silanes, the one which will give rise to crosslinked silicone polymner on hydrolysis is

A. R_4Si

B. $RSiCl_3$

C. R_2SiCl_2

D. R_3SiCl

Answer: B

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22. In silicon dioxide : each siliçon atom is surrunded by four oxygen atoms and each oxygen atoms is bonded to two silicon atoms, silicon atom is bonded to two oxygen atoms , there are double bond between silica and oxygen atoms, silicon atom is bonded to five oxygen atoms

A. each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atom

B. each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atom

C. silicon atom is bonded to two oxygen atoms.

D. there are double bonds between silicon and oxygen atoms

Answer: A

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23. $PbCl_2$ is more ionic than PbO_2 because of

A. the radius of Pb^{2+} is more than that of Pb^{4+}

B. of inert pair effect

C. chlorine is more electronegative than oxygen

D. chlorine atom is smaller than oxygen atom

Answer: A

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24. Which one of the following is correct statement?

A. The hydroxide of aluminium is more acidic than that of boron

B. The hydroxide of boron is basic, while that of aluminium is amphoteric

C. The hydroxide of boron is acidic, while that of aluminium is amphoteric

D. The hydroxides of boron and aluminium are amphoteric

Answer: C

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25. Ionisation enthalpy ($\Delta_i H_1$ kJ mol^{-1}) for the elements of Group 13 follows the order

A. B gt Al gt Ga gt In gt Tl

B. B lt Al lt Ga lt In lt Tl

C. B lt Al gt Ga lt In gt Ti

D. B gt Tl gt Ga gt Al gt In

Answer: D

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26. Which one of the following compounds does not exist?

A. $B_2H_4(CH_3)_2$

B. $B_2H_3(CH_3)_3$

C. $B_2H_2(CH_3)_4$

D. $B_2H(CH_3)_5$

Answer: D

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27. Which of the following statements is not correct?

A. Organosilicon polymers are known as silicones

B. Silicones have the general formula $(R_2SiO)_n$ where $R = -CH_3, -C_2H_5, -C_6H_5,$ etc.

C. Hydrolysis of dialkyldichlorosilane produces cross-linked silicon polymer

D. Hydrolysis of alkyltrichlorosilane produces cross-linked silicon polymer

Answer: C

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28. Which of the following statements is not correct?

A. Tin (IV) chloride is an ionic compound

B. Tin (IV) chloride undergoes hydrolysis with water

C. With excess of hydrochloric acid, tin (IV) chloride forms hexachlorostannic acid (H_2SnCl_6)

D. Tin (II) chloride can reduce Fe (III) to Fe(II), Cu(II) to Cu(I), Hg(II) to Hg(0) and Au(III) to Au(0)

Answer: A

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29. Which of the following statements is correct?

A. Aluminium chloride $(AlCl_3)$ is a Lewis acid because it can donate electrons

B. All the Al-Cl bonds in Al_2Cl_6 are equivalent

C. Aluminium exists in two polymorphic forms, namely, $\alpha - Al_2O_3$ and $\gamma - Al_2O_3$

D. Anhydrous aluminium chloride can be prepared by heating hydrated salt

Answer: C

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30. Which of the following statements is incorrect regarding B_2H_6?

A. Banana bonds are longer but stronger than normal B - H bonds

B. B_2H_6 is also known as 3c - 2e compound

C. The hybridization of B in B_2H_6 is sp^3 while that of sp^2 in BF_3

D. It cannot be prepared by reacting BF_3 with $LiBH_3$ in the presence of dry ether.

Answer: D

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Level Iii Single Correct Answer Type

1. Which of the following statements is not correct?

A. $LiAlH_4$ and $LiGaH_4$ are reducing agents in inorganic chemistry

B. BF_3 is a useful catalyst in Feriedel - Crafts reaction

C. $LiAlH_4$ is used as a reducing agent in organic chemistry for selectively reducing the functional groups

D. The fluorides of Al and Ga are covalent in character

Answer: D

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2. Which of the following statements is not correct ?

A. $\underset{(\text{borax})}{Na_2\left[B_4O_2(OH)_4\right].8H_2O} + 2HCl \rightarrow 2NaCl + 4H_3BO_3 + 5H_2O$

B. $2BN + 6H_2O \rightarrow 2H_3BO_3 + 2NH_3$

C.

$$H_3BO_3 \xrightarrow[-H_2O]{375K} \underset{(\text{metaboric acid})}{HBO_2}, \quad 4HBO_2 \xrightarrow[-H_2O]{435K} \underset{(\text{tetraboric acid})}{H_2B_4O_7}, \quad H_2B_4O_7 \xrightarrow[-H_2O]{\text{red he}}$$

D. H_3BO_3 is a weak monobasic acid as it liberates hydrogen ions as

$$H_3BO_3 \rightarrow H^+ + H_2BO_3^-$$

Answer: D

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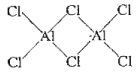
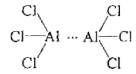
3. In the gaseous phase, aluminium chloride at low temperatures (420-480 K) exists as

A. dimer Al_2Cl_3,



B. dimer Al_2Cl_3,



C. trigonal planar $AlCl_3$

D. $Al^{3+}\left(3Cl^{-}\right)$

Answer: A

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4. Which of the following statements regarding the structure of aluminium chloride is correct?

A. All the bond angles $Cl-Al-Cl$ and $Al-Cl-Al$ in Al_2Cl_3 are identical

B. All the bond lengths $Cl-Al$ in Al_2Cl_3 are identical

C. All the bond lengths Cl - Al as well as all the bond angles Cl - Al - Cl and Al - Cl - Al are different

D. The bond lengths of terminal Al - Cl and bridged Al - Cl bonds are different and also outer bond angle Cl - Al - Cl and bridged bond angles Cl - Al - Cl and Al - Cl - Al have different values

Answer: D

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5.

Column I		Column II	
A)	Inorganic benzene	p)	Diamond
B)	Inorganic graphite	q)	Mordant
C)	Jeweller's borax	r)	BN
D)	Alum	s)	$B_3N_3H_6$
E)	An abrasive	t)	$Na_2B_4O_7.5H_2O$

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6.

Column I		Column II	
A)	Shows $p\pi - p\pi$ back bonding	p)	Graphite
B)	Lewis acid	q)	BCl_3
C)	Shows inert pair effect	r)	BF_3
D)	Lead pencil	s)	Gallium

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7.

Column I		Column II	
A)	$Bi^{3+} \rightarrow (BiO)^{+}$	p)	Heat
B)	$[AlO_2]^{-} \longrightarrow Al(OH)_3$	q)	Hydrolysis
C)	$SiO_4^{4-} \longrightarrow Si_2O_7^{6-}$	r)	Acidification
D)	$(B_4O_7)^{2-} \longrightarrow [B(OH)_3]$	s)	Dilution by water

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8. Match the column 1 with column 2

Column I		Column II	
A)	B_2H_6	p)	Borax
B)	BF_3	q)	Lewis Acid
C)	$AlCl_3$	r)	$p\pi - p\pi$ back bonding
D)	H_3BO_3	s)	$NaBH_4$

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Level Iii Statement Type

1. Statement 1 : The tendency for catenation is much higher for Si than for C.

Statement2 : The M-Mbond energy decreases down the group.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

Answer: D

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2. Assertion : Pb^{4+} compounds are stronger oxidizing agents than Sn^{4+} compounds.

Reason : The higher oxidation states for the group 14 elements are more stable for the heavier members of the group due to 'inert pair effect'.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

Answer: C

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3. Statement 1 : H_3PO_3, is a dibasic acid. It also shows reducing character.

Statement 2 : H_3PO_3 contains two OH^- groups and in it one H-atoms is directly linked to P-atom.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

Answer: A

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4. Statement 1 : Sn in +2 oxidation state is a reducing agent while Pb in +4 state is an oxidising agent.

Statement 2 : Inert pair effect is due to participation of s electrons in bond formation.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

Answer: C

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5. Statement 1 : The heavier p-block elements do not form strong π bonds.

Statement 2 : The heavier elements of p-block form $d\pi - p\pi$ or $d\pi - d\pi$ bonds. : Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.; Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.; Statement 1 is True, Statement 2 is False.; Statement 1 is False, Statement 2 is True.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

Answer: A

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6. Statement 1 : $AICI_3$ forms dimer $AlCl_6$ but dissolves in water to form $\left[Al(H_2O)_6\right]^{3+}$ and Cl^{Θ} ions.

Statement 2 : Aqueous solution of $AICI_3$ is acidic due to hydrolysis.

A. Statement 1 is True, statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

Answer: B

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Level Iii Linked Comprehension Type Paragraph I

1. All the boron trihalides except Bl_3, may be prepared by direct reaction between the elements. Boron trihalides consistoftrigonal-planar BX_3 molecules. Unlike the halides of the other elements in the group they are monomeric in the gas, liquid and solid states, BF_3 and BCI_3 are gases, BBr_3 is a volatile liquid and BI_3 is a solid. Boron trihalides are Lewis acids because they form Lewis complexes with suitable bases.

$$BF_{3(g)} + :NH_{3(g)} \rightarrow F_3B - NH_{3(g)}$$

However, boron chlorides, bromides and iodides are susceptible (sensitive) to protolysis by mild proton sources such as water, alcohols and even amines for example BCl_3 undergoes rapid hydrolysis.

$$BCl_{3(g)} + 3H_2O((l)) \rightarrow 3(OH)_{3(aq.)} + 3HCl_{(aq.)}$$

It is supposed that the first step in the above reaction is the formation of the complex $Cl_3B \leftarrow OH_2$ which then eliminates HCl and reacts further with water.

Which of the following is the best order of Lewis acid strength of $BF_3 BCl_3$ and BBr_3 ?

A. $BF_3 > BCl_3 > BBr_3$

B. $BF_3 = BCl_3 = BBr_3$

C. $BF_3 < BCl_3 > BBr_3$

D. $BBr_3 > BF_3 > BCl_3$

Answer: C

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2. All the boron trihalides except Bl_3, may be prepared by direct reaction between the elements. Boron trihalides consistoftrigonal-planar BX_3 molecules. Unlike the halides of the other elements in the group they are monomeric in the gas, liquid and solid states, BF_3 and BCI_3 are gases,

BBr_3 is a volatile liquid and BI_3 is a solid. Boron trihalides are Lewis acids because they form Lewis complexes with suitable bases.

$BF_{3(g)} + :NH_{3(g)} \rightarrow F_3B - NH_{3(g)}$

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$BCl_{3(g)} + 3H_2O((l)) \rightarrow 3(OH)_{3(aq.)} + 3HCl_{(aq.)}$

It is supposed that the first step in the above reaction is the formation of the complex $Cl_3B \leftarrow OH_2$ which then eliminates HCl and reacts further with water.

Which of the following is the correct prediction about observed B-X bond length, in BX_3 molecule?

A. B-F bond length in BF_3 is found to be less than theoretical value because the electronegativety values of B (2.04) and F(4.0) suggest the bond to be ionic and hence the attraction between oppositely charged ions must decrease the bond length.

B. BF_3 and $[BF_4]^-$ have equal B - F bond length.

C. The decrease in the B - F bond length in BF_3, is due to delocalised $p\pi - p\pi$ bonding between valcant 2p - orbital of B and filled 2p - orbital of F.

D. The correct B - X bond length order is $B - F > B - Cl > B - Br > B - I$

Answer: C

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3. All the boron trihalides except Bl_3, may be prepared by direct reaction between the elements. Boron trihalides consist of trigonal-planar BX_3 molecules. Unlike the halides of the other elements in the group they are monomeric in the gas, liquid and solid states, BF_3 and BCI_3 are gases, BBr_3 is a volatile liquid and BI_3 is a solid. Boron trihalides are Lewis acids because they form Lewis complexes with suitable bases.

$BF_{3(g)} + :NH_{3(g)} \rightarrow F_3B - NH_{3(g)}$

However, boron chlorides, bromides and iodides are susceptible

(sensitive) to protolysis by mild proton sources such as water, alcohols and even amines for example BCl_3 undergoes rapid hydrolysis.

$$BCl_{3(g)} + 3H_2O((l)) \rightarrow 3(OH)_{3(aq.)} + 3HCl_{(aq.)}$$

It is supposed that the first step in the above reaction is the formation of the complex $Cl_3B \leftarrow OH_2$ which then eliminates HCl and reacts further with water.

Which of the following is correct?

A. $B(OCH_3)_3$ is much weaker Lewis acid than BBr_3

B. $B(OH)_{3(aq.)}$ behave as triprotic acid

C. $[H_2BO_3]^-_{(aq.)}$ is a conjugate base of $H_3BO_{3(aq.)}$

D. BF_3 does not react with ethers.

Answer: A

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Level Iii Linked Comprehension Type Paragraph Ii

1.

What is the formula of the bucky ball?

A. P_4

B. S_8

C. Ti_3

D. C_{60}

Answer: D

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2. Elemental carbon appears in many structural forms or allotropes. Three of these forms are crystalline-diamond, I graphite and the recently discovered fullerene (bucky ball) - while more than 40 others including coke and carbon black are amorphous. Now there seems to be set a fourth crystalline allotrope of carbon, reported in 1995 by Rich and Lagow

at the University of Texas.

In bucky ball each atom is:

A. sp^2 - hybridised element with extensive delocalised molecular orbital

B. sp^2- hybridised element with localised molecular orbital

C. sp^3- hybridised element with delocalised molecualr orbital

D. sp^3- hybridised element with localised molecular orbital.

Answer: A

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3. Consider the following statements about bucky ball

A: It is also called fullerene

B:It is also called Buckministerfullerene

C:Bucky tubes (made of fullerenes) are several times stronger than steel wires

D:Bucky ball is a plastic polymer

Select correct statement(s),

A. A,C,D

B. A,B,C

C. A,B,D

D. B,C,D

Answer: B

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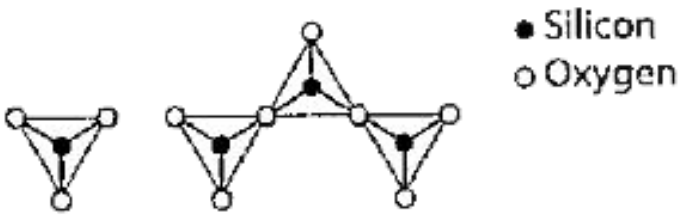
Level Iii Linked Comprehension Type Paragraph Iii

1. Silica covers an entire group of minerals, which have the general formula SiO_2, the most common of which is quartz, which is a framework silicate with SiO_4 tetrahedra arranged in spirals. The spirals can turn in a clockwise or anticlockwise direction resulting in two mirror images, optically active, varieties of quartz.

The following structures represent various silicate anions. Their formulas are respectively



A. SiO_3^{2-} and $Si_3O_7^{2-}$

B. SiO_4^{4-} and $Si_3O_9^{6-}$

C. SiO_4^{2-} and $Si_3O_6^{2-}$

D. SiO_3^{4-} and $Si_3O_7^{8}$

Answer: B

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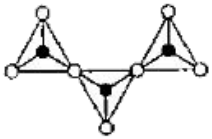
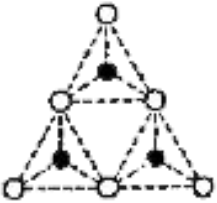
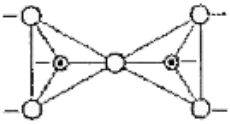
2. Silica covers an entire group of minerals, which have the general formula SiO_2, the most common of which is quartz, which is a framework silicate with SiO_4 tetrahedra arranged in spirals. The spirals can turn in a

clockwise or anticlockwise direction resulting in two mirror images, optically active, varieties of quartz.

$Si_3O_9^{6-}$ (having three tetrahedral) is represented as

A. 

B. 

C. 

D. Both (A) and (B)

Answer: B

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3. Silica covers an entire group of minerals, which have the general formula SiO_2, the most common of which is quartz, which is a framework silicate with SiO_4 tetrahedra arranged in spirals. The spirals can turn in a clockwise or anticlockwise direction resulting in two mirror images, optically active, varieties of quartz.

The silicate anion in the mineral kinoite is a chain of three SiO_4^{4-} tetrahedra that share coners with adjacent tetrahedra. The mineral also contains Ca^{2+} ions, Cu^{2+} ions and water molecules in a 1 : 1 : 1 ratio. The mineral is represented as

A. $CaCuSi_3O_{10}.\ H_2O$

B. $CaCuSi_3O_{10}.\ 2H_2O$

C. $Ca_2Cu_2Si_3O_{10}.2H_2O$

D. $CaCuSi_3O_{10}.\ 3H_2O$

Answer: C

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Level Iii Linked Comprehension Type Paragraph Iv

1. Which among the following is the strongest oxidising agent?

A. SnO_2

B. SiO_2

C. GeO_2

D. PbO_2

Answer: D

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2. Which of the statements are true about : Elements of group 13

A. exhibit oxidation state of +3 only

B. form M and $M3^+$ ions

C. exhibit oxidation states of +1 and +3

D. form M^- and M^+ ions

Answer: C

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3. Which of the following statements is incorrect?

A. CO is used as a reducing agent

B. TI(III) salts undergo disproportionation

C. CO_2 is a greenhouse gas

D. SiO_2 is a covalent solid

Answer: B

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