Chemistry Worksheets Class 11 on Chapter 11 The p-Block Elements with Answers- Set 2

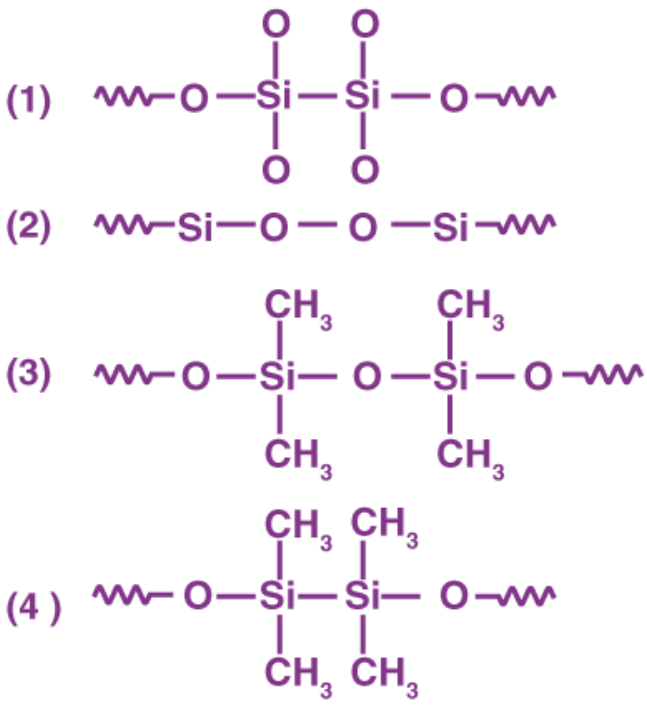
Q-1: Which statement is correct for the carbon family?
a) Tin mainly occurs as Cassiterite, SnO_2.
b) Silicon is the third most abundant element on the Earth's crust.
c) Only two isotopes of carbon are present, ^{12}C and ^{13}C.
d) Germanium is more abundant than other members of the carbon family.

Answer: a) Tin mainly occurs as Cassiterite, SnO_2.

Q-2: Which of the following silicates contains discrete tetrahedral units?
a) Sheet silicates
b) Ortho silicates
c) Three-dimensional silicates
d) Pyrosilicates

Answer: b) Ortho silicates

Q-3: Hydrolysis of dimethyldichlorosilane,$(CH_3)_2SiCl_2$, followed by condensation polymerisation, yields straight chain polymer of



Answer: 3)

Explanation: Hydrolysis of dimethyldichlorosilane,$(CH_3)_2SiCl_2$, followed by condensation polymerisation, yields straight chain polymers called silicones.

Q-4: Which of the following statements is wrong?

a) Feldspar are not aluminosilicates.

b) Beryl is an example of cyclic silicate.

c) Mg_2SiO_4 is an orthosilicate.

d) Basic structural unit in silicates SiO_4^{2-} is the tetrahedron.

Answer: a) Feldspar are not aluminosilicates.

Q-5: Allotropy is due to

a) The differences in the number of atoms in the molecules.

b) Variations in how the atoms are arranged within the crystal molecules.

b) Differing chemical characteristics.

d) All of the above

Answer: d) All of the above

Q-6:
i) Name a crude form of carbon.
ii) How is it formed?
iii) What are its successive stages of transformation?
iv) Name its superior quality.

Answer:
i) Coal is the crude form of carbon.
ii) It was created in nature when plant matter slowly decomposed under the influence of pressure, heat, and a finite amount of air.
iii) Peat, lignite, bituminous, steam coal, and anthracite are the subsequent stages of transformation.
iv) The superior quality is anthracite which burns with a non-smoky flame.

Q-7: Why do boron compounds behave as Lewis acids?
Answer: Three covalent bonds are present in compounds of boron. As a result, they need two electrons to complete their octet. They are considered electron-deficient compounds because they lack electrons. Additionally, an electron-deficient molecule can function as a Lewis acid.

Q-8: The ammoniacal cupric chloride solution quickly absorbs carbon monoxide but not carbon dioxide. Explain.
Answer: Due to the presence of lone pairs of electrons on carbon in CO, it acts as a Lewis base (or ligand) and thus forms a soluble complex with ammoniacal cuprous chloride solution.
$CuCl + NH_3 + CO \rightarrow [Cu(CO)(NH_3)]^+Cl^-$
(soluble complex)
On the other hand, CO_2 does not act as a Lewis base since it does have a lone pair of electrons on the carbon atom and hence does not dissolve in ammoniacal cuprous chloride solution.

Q-9: Identify the acidic, basic or amphoteric oxide among the following.
B_2O_3, Al_2O_3, Ga_2O_3, In_2O_3, TlO_3

Answer:
Acidic: B_2O_3,
Basic: In_2O_3, TlO_3
Amphoteric: Al_2O_3, Ga_2O_3

Q-10: What is the reason for the decrease in oxidising power of the carbon family?
Answer: The inert pair effect causes the stability of the +2 oxidation state to increase and the stability of the +4 oxidation state to decrease as one moves down the group in the carbon family. As a result, oxidising power decreases down the group.

Q-11: Why is the boron family considered the most heterogenous family?

Answer: The boron family is the most heterogeneous family since there is no consistent trend in any of the properties, and because they follow d-block, lanthanoid contraction, and weak d-orbital shielding, their properties vary greatly.

Q-12: a) What is glass?
b) Name the compound used as a catalyst in petrochemical industries.
Answer:
a) Glass is a transparent or translucent amorphous supercooled solid solution of silicates and borates.
b) Zeolites are the compound used as a catalyst in petrochemical industries.

Q-13: Why is there irregularity in metallic character in gallium on moving down the group in the boron family?
Answer: Gallium's metallic nature is irregular due to the shielding effect. Gallium has 10 electrons filled in d-orbitals, which results in reduced shielding and a decrease in size and metallic character.

Q-14: Give two uses of
a) Boric acid
b) Alums

Answer:
a) Boric acid:
i) It is used in glass industries and in food industries as a preservative.
ii) It is also used as an antiseptic and eye wash under the name 'boric lotion'.

b) Alums:
i) Alums are used to purify water.
ii) They are also used in leather tanning and as a mordant.

Q-15: Why do the properties of tin different from germanium despite the same electronegativity?
Answer: The properties of germanium are different from tin due to the poor shielding effect of the 5f subshell (Lanthanoid Contraction).

Q-16: Complete the following reactions.
a) $CaCO_3(s) + 2HCl\ (aq) \rightarrow$
b) $SiO_2 + 2NaOH \rightarrow$
c) $2C + O_2 + 4N_2 \xrightarrow{1273K}$
d) $4BF_3 + 3LiAlH_4 \rightarrow$

Answer:
a) $CaCO_3 + 2HCl \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

b) $SiO_2 + 2NaOH \rightarrow Na_2SiO_3 + H_2O$

c) $2C + O_2 + 4N_2 \xrightarrow{1273K} 2CO\ (g) + 4N_2(g)$

d) $4BF_3 + 3LiAlH_4 \rightarrow 2B_2H_6 + 3AlF_3 + 3LiF$

Q-17:

a) Define silicates.

b) What is the hybridisation of Si in SiO_4^{2-}?

c) Give two examples of orthosilicates.

Answer:

a) Silicates are the oxide anions of silicones.

b) For calculating the hybridisation of Si in SiO_4^{2-}, we need to first find the steric number of Si.

Steric Number = Number of lone pairs on Si-atom + Number of bond pairs made by Si-atom

= 0 + 4

= 4

According to VSEPR theory, a steric number equal to 4 corresponds to sp^3 hybridisation.

c) Sodium orthosilicate (Na_4SiO_4) and Zirconium silicate ($ZrSiO_4$) are the two examples of orthosilicates.

Q-18: i) Draw the structure of diborane.

ii) a) How many bonds have a bond length of 119 pm?

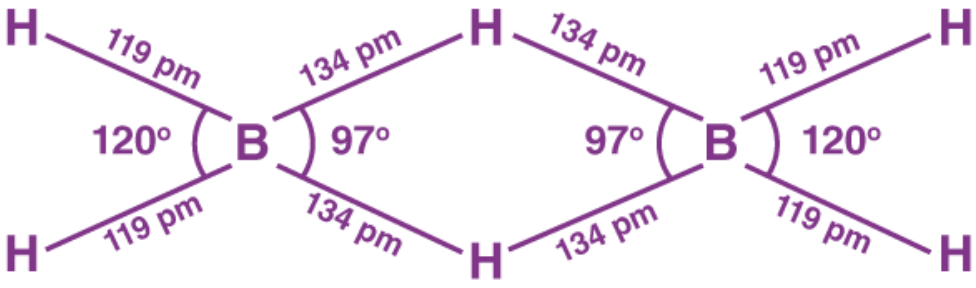
b) How many bonds have a bond angle of 120°?

c) How many atoms are present in the same plane?

d) How many bridging hydrogens are there in it?

Answer:

i) The structure of diborane is given below:



ii) a) Number of bonds having a bond length of 119 pm = 4
b) Number of bonds having a bond angle of 120^0 = 2
c) Number of atoms present in the same plane = 6
d) Number of bridging hydrogens = 2

Q-19: Give a reason for the following.
(i) Boron has a high melting point.
(ii) Except for boron, other elements of group 13 show a +1 oxidation state.

Answer:
i) Due to its tiny atomic size, which results in strong covalent interactions with the neighbouring atoms, boron has a high melting temperature of 2352 K. To dissolve the bonds between boron atoms, a significant amount of heat must be applied because of their close-packed structure when in their solid state.

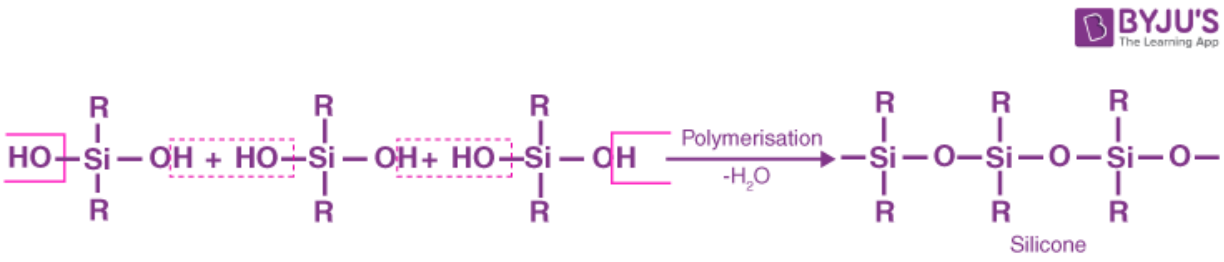
ii) Other elements of group 13 show a +1 oxidation state due to the inert pair effect.

Q-20: Give the preparation reaction of silicones and their two uses.
Answer: Alkyl chloride reacts with silicon at 537 K in the presence of a copper catalyst to give dialkyl dichlorosilane with other substituted chlorosilane.The reaction for the same is given below:

$$2RCl + Si \xrightarrow[570K]{Cu\ powder} R_2SiCl_2$$

R_2SiCl_2 on hydrolysis gives dialkyl dihydroxy silane. The reaction for the same is given below:
$R_2SiCl_2 + 2H_2O \rightarrow R_2Si(OH)_2$ (Here R is methyl group)

$R_2Si(OH)_2$ on polymerisation gives silicones. The reaction for the same is given below:



The two uses of silicones are:
1. Silicones are used in surgical and cosmetic plants.
2. It is also used as a lubricant.