INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 28

Total Marks : 62

Max. Time : 67 min.

Topic : p-Block Element (Boron & Carbon Family)

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to 7, 9 to 12	(3 marks, 3 min.)	[33, 33]
Subjective Questions ('–1' negative marking) Q.13 to Q.15	(4 marks, 5 min.)	[12, 15]
Multiple choice objective ('–1' negative marking) Q.8	(4 marks, 4 min.)	[4, 4]
Match the Following (no negative marking) Q. 16	(8 marks, 10 min.)	[8, 10]
Fill in the Blanks ('–1' negative marking) Q.17	(3 marks, 3 min.)	[3, 3]
True or False (no negative marking) Q.18	(2 marks, 2 min.)	[2, 2]

1. Diamond and graphite are :

(A) isomers (B) isotopes (C) allotropes (D) none of the above

2. Thermodynamically, the most stable form of carbon is :

(A) diamond (B) graphite (C) fullerenes (D) coal

3. Moderate electrical conductivity is shown by :

(A) silica (B) graphite (C) diamond (D) carborundum

4. The oxide which is not a reducing agent is :

(A) CO_2 (B) CO (C) SO_2 (D) Both (A) & (C)

5. Which one of the following oxides is neutral :

(A) CO (B) SnO_2 (C) ZnO (D) SiO_2

6. A colourless gas which burns with blue flame and reduces CuO to Cu is :

(A) N_2 (B) CO (C) CO_2 (D) NO_2

7. An oxide of carbon (X) reacts with ammonia to produce urea, an important fertilizer. Which of the following combinations will not yield (X) :

(A) $CO_3^{2-} + HCl \xrightarrow{\Delta}$ (B) $CaO + C \xrightarrow{\Delta}$

(C) $C + \text{Excess } O_2 \xrightarrow{\Delta}$ (D) $HCO_3^- + HCl \xrightarrow{\Delta}$

8.* The compounds used as refrigerant are :

(A) NH_3 (B) CCl_4 (C) CF_4 (D) CF_2Cl_2 (E) CH_2F_2

9. The material used in the solar cells contains :

(A) Cs (B) Si (C) Sn (D) Ti

10. The butter of tin is represented by :

(A) $SnCl_2 . 5H_2O$ (B) $SnCl_2$ (C) $SnCl_4$ (D) $SnCl_4 . 5H_2O$

11. When PbO_2 reacts with concentrated HNO_3, the gas evolved is :

(A) NO_2 (B) O_2 (C) N_2 (D) N_2O

12. Red lead is :

(A) PbO (B) PbO_2 (C) Pb_3O_4 (D) Pb_2O_3

13. Give reasons for the following :

Carbon acts as an abrasive and also as a lubricant.

14. Draw the structure of a cyclic silicate, $(Si_3O_9)^{6-}$ with proper labelling.

15. What happens when Pb_3O_4 is treated with nitric acid ?

16.

Column – I	Column – II
(A) Cyclic silicates	(p) Tetrahedral hybridisation.
(B) Single chain silicates	(q) Si – O bonds are 50% ionic and 50% covalent.
(C) Pyro silicates	(r) General formula is $(SiO_3)_n^{2n-}$
(D) Sheet silicates (two dimensional)	(s) Two oxygen atoms per tetrahedron are shared.

17. Fill in the blanks :

(i) One recently discovered allotrope of carbon (e.g., C_{60}) is commonly known as..... ..

(ii) A liquid which is permanently supercooled is frequently called a.....

(iii) Compounds that formally contain Pb^{4+} are easily reduced to Pb^{2+}. The stability of the lower oxidation state is due to.....

(iv) Hydrogen gas is liberated by the action of aluminium with concentrated solution of.....

(v) The formula of litharge is _____ and that of red lead is _____ & both are used as _____ in paints.

(vi) Carbon monoxide is absorbed in a solution of _____ under pressure, while carbon dioxide is absorbed in a solution of _____.

(vii) In drinking soda, _____ gas is present under high pressure in water.

(viii) Glass is attacked by _____ acid.

(ix) Solid form of carbon dioxide is known as _____.

(x) Carbon monoxide combines with chlorine in the presence of sunlight to produce _____.

(xi). A mixture of _____ and CO_2 is obtained when oxalic acid is heated with concentrated H_2SO_4 .

18. True/False

(i) When PbO_2 reacts with a dilute acid, it gives hydrogen peroxide.

(ii) Graphite is better lubricant on the moon than on the earth.

(iii) The tendency for catenation is much higher for C, than for Si.

(iv) Aqueous solution of $AlCl_3$ is acidic due to hydrolysis.

(v) CO_2 can be prepared by dehydration of formic acid.

(vi) Carbon suboxide (C_3O_2) is produced by the reaction of P_4O_{10} with malonic acid.

(vii) Carbon monoxide reduces I_2O_5 to I_2.

(viii) Graphite is less denser than diamond

(ix) Silicones are strongly water repellent.

(x). Silicones are synthetic organosilicon compounds having repeated R_2SiO units held by Si-Si linkages.

Answer Key

DPP No. # 28

1.	(C)	**2.**	(B)	**3.**	(B)	**4.**	(A)	**5.**	(A)
6.	(B)	**7.**	(B)	**8.***	(AD)	**9.**	(B)	**10.**	(D)
11.	(B)	**12.**	(C)						

16. (A → p, q, r, s) ; (B → P , Q , R , S) ; (C → P , Q) ; (D → P , Q)

17. **(i)** Fullerene **(ii)** Glass **(iii)** Inert pair effect.

(iv) NaOH. **(v)** PbO, Pb_3O_4, pigments

(vi) ammonical copper (I) chloride, KOH or NaOH **(vii)** CO_2

(viii) hydrofluoric **(ix)** dry ice

(x) carbonyl chloride (phosgene) **(xi).** carbon monoxide

18.	**(i)**	False	**(ii)**	True	**(iii)**	True	**(iv)**	True	**(v)** False
	(vi)	True.	**(vii)**	True	**(viii)**	True	**(ix)**	True	**(x).** False

Hints & Solutions

DPP No. # 28

2. As differ in their crystal structures and physical properties.

4. CO_2 can not act as reducing agent because carbon is in its highest oxidation state, i.e., +4.

6. CO burns with blue flame and also acts as reducing agent ; used in the extraction of various metal from their oxide ores.

7. (X) is CO_2 because $CO_2 + NH_3$ under pressure gives urea, in reaction (B) does not produce CO_2

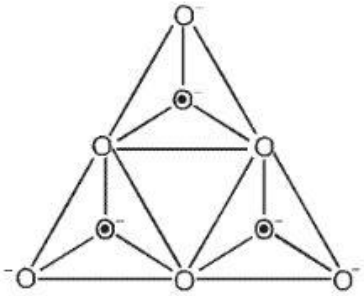
$$CaO + C \xrightarrow{\Delta} CaC_2 + CO.$$

10. Hydrated chloride of tin(IV) is white in colour and is known by the name 'butter of tin' ore oxymercurate of tin".

11. $2PbO_2 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + 2H_2O + O_2$

12. Red lead pigment contains Pb_3O_4.

14.



$Si_3O_9^{6-}$

• Silicon
O Oxygen

15. $Pb_3O_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + 2H_2O + PbO_2$

16. (A) Two oxygen atoms per tetrahedron are shared forming rings. $(SiO_3)_n^{2n-}$. Hybridisation of each Si is sp^3.

(B) Two oxygen atoms per tetrahedran are shared forming a chain of tetrahedron , $(SiO_3)_n^{2n-}$. Hybridisation of each Si atom is sp^3.

(C) One oxygen atom per tetrahedron is shared. $Si_2O_7^{2-}$. Hybridisation of each Si atom is sp^3.

(D) Three oxygen atoms per tetrahedron are shared. $(Si_2O_5)_n^{2-}$, sp^3 hybridisation.

Note : EN difference between Si – O is 1.7. ∴ 50% ionic and 50% covalent.

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(i) Fullerene

(ii) Glass

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(v) Litharge = PbO and red lead = Pb_3O_4 are used as pigments in paints.

(vi) CO is readily absorbed by an ammonical solution of copper (I) chloride to give $CuCl.CO.2H_2O$.

$$2NaOH + CO_2 \longrightarrow Na_2CO_3$$

(vii) It is fact.

(viii) $SiO_2 + 6HF \longrightarrow H_2SiF_6 + 2H_2O$

(ix) CO_2 (s) is know as dry ice.

CO_2 (s) को शुष्क बर्फ कहा जाता है।

(x) $CO + Cl_2 \xrightarrow{\text{sun light}} COCl_2$

(xi). $H_2C_2O_4 \xrightarrow[-H_2O]{\text{conc. } H_2SO_4, \Delta} CO + CO_2$

18.

(i) False

(ii) True

(iii) True

(iv) $AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$

(v) $HCOOH \xrightarrow[\Delta]{P_4O_{10}} CO + H_2O$

(vi) True.

(vii) $I_2O_5 + 5CO \longrightarrow 5CO_2 + I_2$

(viii) Graphite has layered structure. Layers are held by van der Waal's forces and distance between two layers is 340 pm and therefore, graphite is less denser than diamond.

(ix) In silicones the silicon atoms are surrounded by non-polar alkyl or aryl groups.

(x). Having repeated R_2SiO units held by Si—O—Si linkage.

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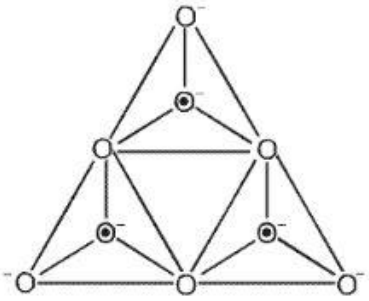

$Si_3O_9^{6-}$ • Silicon
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