Chemistry

Chapterwise Practise Problems (CPP) for JEE (Main & Advanced)

Chapter - The s-Block Elements

Level-1

SECTION - A

Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. The pair of compounds which cannot exist together is :

   (A) $NaHCO_3$ and NaOH

   (B) Na_2CO_3 and NaOH

   (C) Na_2CO_3 and $NaHCO_3$

   (D) $NaHCO_3$ and NaCl

2. STATEMENT-1: LiF is insoluble in water.

   STATEMENT-2: Solubility of CsI is very low almost as compared to LiF

   STATEMENT-3: $NaHCO_3$ is more soluble than $KHCO_3$

   Identify the correct combination of true (T) and false (F) of the given three statements

   (A) T, F, T (B) T, T, F

   (C) T, T, T (D) F, T, T

3. Bleaching powder loses its power on keeping for a long time because :

   (A) It changes into calcium hypochlorate

   (B) It changes into calcium chloride and calcium hydroxide

   (C) It absorbs moisture

   (D) It changes into calcium chloride and calcium chlorate.

4. A metal M reacts with N_2 to give a compound 'A'(M_3N). 'A' on heating at high temperature gives back 'M' and 'A' on reacting with H_2O gives a gas B. 'B' turns $CuSO_4$ solution blue on passing through it. A and B can be :

   (A) Rb and NH_3 (B) Li and NH_3

   (C) Na and NH_3 (D) K and NH_3

5. Which is not true about beryllium?

   (A) Aqueous solution of $BeCl_2$ is acidic

   (B) It forms unusual carbide Be_2C

   (C) $Be(OH)_2$ is only basic in nature

   (D) Beryllium halides are electron deficient

6. Which of the following salt(s) is(are) soluble in water?

   (A) LiF (B) Li_3PO_4

   (C) $LiNO_3$ (D) All of these

7. Li_2SO_4 does not form alum

   (A) Due to small size of Li^+ and its inability to show coordination number 6

   (B) Due to its ability to show coordination number 6 and not 4

   (C) Due to its inability to show higher oxidation states

   (D) Due to its high ionisation energy and high lattice energy

8. Potassium superoxide finds use in breathing equipment and safeguards. The use to breathe in oxygen generated internally in the apparatus without being exposed to toxic turnes outside. The supply of oxygen is due to :

   (i) slow decomposition of KO_2

   (ii) reaction of superoxide with moisture in the exhaled air

(iii) reaction of KO_2 with CO_2 in the exhaled air

(A) i, ii and iii are correct

(B) ii and iii are correct

(C) iii is only correct

(D) i and ii are correct

9. Among the following compounds of cement which is present in the highest amount in portland cement?

(A) Ca_2SiO_4 (B) Ca_3SiO_5

(C) Al_2O_3 (D) $Ca_3Al_2O_6$

10. Select the incorrect statement

(A) BeO is insoluble but $BeSO_4$ is soluble in water

(B) BaO is soluble but $BaSO_4$ is insoluble in water

(C) $Ca(HCO_3)_2$ can be isolated in solid slate but not the $NaHCO_3$

(D) LiI is more soluble than KI in ethanol

SECTION - B

Multiple Correct Answer Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE** is/are correct.

11. Which of the following metals are used in photoelectric cells K, Cs can be used in photoelectric cell?

(A) Li (B) Na

(C) K (D) Ca

12. Alkali metals are characterised by their :

(A) high electropositive character

(B) high

(C) low melting points

(D) high solubility in liquid ammonia at –33°C.

13. In certain properties, lithium differs from other alkali metals, it is due to :

(A) exceptionally small size of its atom and ion.

(B) high polarising power of its ion.

(C) low hydration enthalpy of its ion.

(D) high softness of its atom.

14. Select the correct statements.

(A) Except lithium, all other alkali metals form ethynide on reaction with ethyne.

(B) Lithium on combustion in air forms monoxide, Li_2O and the nitride, Li_3N.

(C) All alkali metal hydrogen carbonates are obtained in solid forms.

(D) All alkali metal chlorides, except LiCl do not form hydrates.

15. Select the correct order of solubility in the water :

(A) LiOH < NaOH < KOH < RbOH

(B) $LiHCO_3 > NaHCO_3 > KHCO_3 > RbHCO_3$

(C) $Li_2CO_3 < Na_2CO_3 < K_2CO_3 < Rb_2CO_3$

(D) CsF < CsCl < CsBr < CsI

16. Select the correct orders from the following :

(A) $NiO<MgO<SrO<K_2O<Cs_2O$: basic character

(B) CsCl<RbCl<KCl<NaCl<LiCl : lattice energy

(C) $Cs^+<Rb^+<K^+<Na^+<Li^+$: size of hydrated ions

(D) CsF<RbF<KF<NaF<LiF : lattice energy

17. Which of the following order is/are correct with respect to their stabilities towards heat?

(A) $Na_2CO_3 < K_2CO_3 < Rb_2CO_3$

(B) RbH < KH < NaH < LiH

(C) $LiHCO_3 < NaHCO_3 < KHCO_3 < RbHCO_3$

(D) $NaO_2 < KO_2 < RbO_2 < CsO_2$

18. Select correct statement(s).

(A) Stability of peroxides and superoxides of alkali metals increases with increase in size of the cation.

(B) Increase in stability of peroxides and superoxides down the group of alkali metals is due to stabilisation of large anions by larger cations through lattice energy effects.

(C) The low solubility of LiF is due to its high lattice energy whereas low solubility of CsI is due to smaller hydration energy.

(D) NaOH is not deliquescent

19. Which of the following is correct regarding diagonal relationship between Al and Be ?

(A) BeO and Al_2O_3 are amphoteric in nature

(B) Both carbide on hydrolysis produce same hydrocarbon

(C) Both can form complex salt

(D) Both have nearly close melting point

20. Be and Al resemble in :

(A) both become passive on reaction with HNO_3 due to formation of oxide layer.

(B) their chlorides are Lewis acids.

(C) chlorides exist in polymeric or dimeric form.

(D) hydroxides are soluble in alkali as well as in acid

SECTION-D

Matrix-Match Type

This **Section D** have "match the following" type question. Question contains two columns, **Col-I** and **Col-II**. Match the entries in **Col-I** with the entries in **Col-II**. One or more entries in **Col-I** may match with one or more entries in **Col-II**.

21. Match the species given in Column - I with the facts given in Column - II.

	Column I		**Column II**
(A)	$NaHCO_3$	(P)	Contains a divalent anion
(B)	$LiHCO_3$	(Q)	Known only in solution
(C)	$KHCO_3$	(R)	Dissolves in water to give alkaline solution
(D)	Na_2CO_3	(S)	Shows hydrogen bonding

22. Match the species given in Column-I with the facts given in Column - II

	Column I		**Column II**
(A)	KO_2	(P)	Does not exist
(B)	Na_2O_2	(Q)	Used in space capsule
(C)	Na_2O	(R)	Diamagnetic
(D)	LiO_2	(S)	Dissolves in water to give alkaline solution

23. Match the species given in Column-I with the facts given in Column - II

	Column I		**Column II**
(A)	Be	(P)	Forms covalent hydride
(B)	Mg	(Q)	Responds flame test
(C)	Sr	(R)	Forms basic oxide
(D)	Ca	(S)	Decomposes cold water

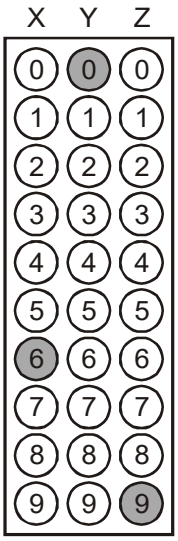
24. Match the species given in Column-I with the facts given in Column - II

	Column I		**Column II**
(A)	$Ca(HCO_3)_2$	(P)	White precipitate
(B)	$Mg(HCO_3)_2$	(Q)	Known only in solution
(C)	$BaCO_3$	(R)	Responsible for hardness of water
(D)	$CaCO_3$	(S)	Dissolves in HCl

SECTION-E

Integer Answer Type

This section contains Integer type questions. The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened. For example, if the correct answers to question numbers X, Y and Z(say) are 6, 0 and 9, respectively, then the correct darkening of bubbles will look like the following :



25. Number of chlorides which are more soluble than KCl from the following list is

    LiCl, NaCl, RbCl, CsCl, $BeCl_2$

26. The number of bicarbonates that do not exist in solid form among the following is

    $LiHCO_3$, $NaHCO_3$, $Ca(HCO_3)_2$, $KHCO_3$, NH_4HCO_3, $Ba(HCO_3)_2$, $Mg(HCO_3)_2$

27. On heating a mxiture containing 3 moles each of Li_2CO_3 and K_2CO_3 under normal conditions, how many moles of CO_2 are evolved?

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SECTION - A

Straight Objective Type

This section contains multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

1. KO_2 is a yellow solid, when exposed to air becomes white due to the formation of :
   (A) H_2O_2 (B) K_2O
   (C) K_2O and O_3 (D) KOH and K_2CO_3
2. A colourless crystalline solid (x) deliquescent in nature is obtained from kiesserite. It loses 6 molecules of water at 150°C and becomes anhydrous at 200°C, on strong heating it forms a white residue (a purgative) and a suffocating gas. Compound x is
   (A) $CaCl_2.6H_2O$ (B) $MgSO_4.7H_2O$
   (C) $FeSO_4.7H_2O$ (D) $ZnSO_4.7H_2O$
3. When brine solution is saturated with NH_3 and CO_2 a slightly alkaline white sodium salt A is formed which has pH nearly 8.4. 'A' on heating liberates gas 'B', leaving a highly alkaline residue 'C' of pH nearly 10-11. Gas B is colourless and turns a solution of $Ca(OH)_2$ milky. Identify 'A'
   (A) Na_2CO_3 (B) $NaHCO_3$
   (C) Na_2S (D) Na_2SO_4

SECTION - C

Linked Comprehension Type

This section contains paragraphs. Based upon this paragraph, some multiple choice questions have to be answered. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONE/MORE** is/are correct.

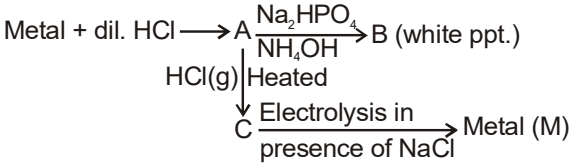
Paragraph for Question Nos. 4 to 6

$$Na \xrightarrow{H_2O} A \xrightarrow{CO_2} B \xrightarrow{SO_2} C$$

$$\xrightarrow[\Delta]{Na_2S/I_2} D \xrightarrow{Ag^+ salt} E\,(complex)$$

4. The compound B and C are :
   (A) Na_2CO_3, Na_2SO_4 (B) $NaHCO_3$, Na_2SO_4
   (C) Na_2CO_3, Na_2SO_3 (D) None of these
5. The compound D is
   (A) Na_2SO_4 (B) $Na_2S_4O_6$
   (C) $Na_2S_2O_5$ (D) $Na_2S_2O_3$
6. Oxidation number of each 'S' atom in compound D :
   (A) +2, +2 (B) +4, 0 (C) +6, –1 (D) +5, –1

Paragraph for Question Nos. 7 to 9



7. The compound A is
   (A) $CaCl_2 \cdot 2H_2O$ (B) $MgCl_2 \cdot 6H_2O$
   (C) $Na_2SO_4 \cdot 10H_2O$ (D) $CaSO_4 \cdot 2H_2O$
8. The compound B is
   (A) $Mg(NH_4)PO_4$ (B) $Ca_3(PO_4)_2 + NH_3$
   (C) $Na(NH_4)HPO_4$ (D) Both (A) and (B)
9. The compound C and metal M are
   (A) NaCl, Na (B) $CaCl_2$, Ca
   (C) $MgCl_2$, Mg (D) $BeCl_2$, Be

Paragraph for Question Nos. 10 to 12

On treatment with cold water, an element (A) reacts readily liberating a colourless, odourless gas (B) and a solution (C). Lithium is reacted with (B) yielding a solid product (D) which effervesce with water to give a strongly basic solution (E). When CO_2 gas is bubbled through solution (C), a white ppt. (F) is formed but this redissolved forming solution (G) when more CO_2 is passed. Precipitate (F) effervesced when moistened with conc. HCl and give deep red colouration to a Bunsen burner flame. (F) on heating with excess of carbon at 2000°C give (H).

10. Metal (A) may be:
    (A) Be (B) Ca (C) Mg (D) H_2
11. Solution (G) contains a salt which :
    (i) causes permanent harness of water
    (ii) can not be obtained in solid state
    (iii) causes temporary hardness of water
    (iv) can be obtained in solid state
    Select the correct statements :
    (A) (i) and (ii) (B) (i) and (iv)
    (C) (ii) and (iii) (D) (ii) and (iv)

12. Solid (H) on hydrolysis gives a gas, which on passing through ammoniacal $AgNO_3$ solution, yields :

(A) white ppt. (B) red ppt.

(C) no ppt. (D) brown ppt.

Paragraph for Question Nos. 13 and 14

Aqueous solution of salt of metal X $\xrightarrow{\text{Conc. } H_2SO_4}$ An acid that evolves I_2 from KI

Aqueous solution of salt of metal X $\xrightarrow{Zn/NaOH}$ B(g)

$$X + \text{air} \xrightarrow{\text{burning}} Y + M \text{ (metal oxide)}$$

$$Y + H_2O \longrightarrow Z + \underset{(Gas)}{B}$$

Note that Zn/NaOH is a reducing agent.

X imparts colour to the flame and forms hydrated salt.

13. The metal present in salt may be

(A) Li (B) Mg

(C) Ca (D) Both (1) & (3)

14. The anion may be present in aqueous solution of salt of metal X –

(A) H^- (B) NH_2^- (C) NO_3^- (D) N_3^-

Paragraph for Question Nos. 15 and 16

When 10.0 g of a white solid (X) is heated 4.4 g of an acid gas (1) and 1.8 g of a neutral gas (2) are evolved leaving behind a solid residue (Y) of weight 13.8 g. (1) turns lime water milky and (2) condenses into liquid which changes anhydrous $CuSO_4$ blue. The aqueous solution of (Y) is alkaline to litmus and give 19.7 g white ppt (Z) with $BaCl_2$ solution. (Z) gives carbon dioxide with an acid. (Atomic mass in g/mol of K = 39, Na = 23, O = 16, H = 1, Ca = 40 and Mg = 12)

15. The formula of compound (X) in the above paragraph will be

(A) $KHCO_3$ (B) $Mg(HCO_3)_2$

(C) $Ca(HCO_3)_2$ (D) $NaHCO_3$

16. The formula of compound (Y) is

(A) K_2CO_3 (B) $MgCO_3$

(C) $CaCO_3$ (D) Na_2CO_3

SECTION-E

Integer Answer Type

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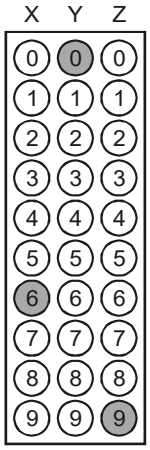

17. How many of the following elements form acetylide on direct heating with 'C' ?

Li, Na, K, Be, Mg, Ca, Rb

18. The number of hydroxides which decompose to oxides on heating from the given list is

$Mg(OH)_2$, $Ca(OH)_2$, LiOH, NaOH, KOH, AgOH, $Hg(OH)_2$, $Al(OH)_3$

19. Number of solid compounds which shows hydrogen bonding from the following list is

$NaHCO_3$, $KHCO_3$, H_3BO_3, KH_2PO_4, $Ca(HCO_3)_2$, $LiHCO_3$, $(NH_4)_2H_2PO_4$

20. On heating with NH_3, how many of the following metals form imide?

Li, Na, K, Rb, Cs

21. Out of following how many compounds exist in hydrated state?

(i) NaCl (ii) KCl

(iii) $MgCl_2$ (iv) Na_2CO_3

(v) $BeCl_2$ (vi) LiCl

(vii) Na_2SO_4 (viii) $CaSO_4$

22. What is the number of chlorides in the given list which dissolve in excess of NaOH solution?

$SnCl_2$, $CrCl_3$, $AlCl_3$, $FeCl_3$, $ZnCl_2$, $BeCl_2$, AgCl

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ANSWERS

LEVEL-1

1. (A)	2. (B)	3. (D)	4. (B)	5. (C)	6. (C)
7. (A)	8. (B)	9. (B)	10. (C)	11. (C,D)	12. (A,C,D)
13. (A,B)	14. (A,B,D)	15. (A,C)	16. (A,B,C,D)	17. (A,B,C,D)	18. (A,B,C)
19. (A,B,C)	20. (A,B,C,D)	21. (A-r,s,B-q,r,s,C-r,s,D-p,r)		22. (A-q,s,B-r,s,C-r,s,D-p)	
23. (A-p,B-p,r,C-q,r,s,D-q,r,s)		24. (A-q,r,s,B-q,r,s,C-p,s,D-p,s)		25. (4)	26. (4)
27. (3)					

LEVEL-2

1. (D)	2. (B)	3. (B)	4. (C)	5. (D)	6. (B)
7. (B)	8. (A)	9. (C)	10. (B)	11. (C)	12. (A)
13. (D)	14. (C)	15. (A)	16. (A)	17. (3)	18. (6)
19. (5)	20. (1)	21. (6)	22. (4)		

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