DPP - Daily Practice Problems

Name : _____ Date : _____

Start Time : _____ End Time : _____

CHEMISTRY 18

SYLLABUS : s-Block Elements-2 (Alkaline earth metals)

Max. Marks : 120 **Time : 60 min.**

GENERAL INSTRUCTIONS

- The Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solution booklet.
- Each correct answer will get you 4 marks and 1 mark shall be deduced for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus. Refer syllabus sheet in the starting of the book for the syllabus of all the DPP sheets.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

DIRECTIONS (Q.1-Q.21) : There are 21 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE choice is correct.

Q.1 The thermal stability of alkaline earth metal carbonates $MgCO_3$, $CaCO_3$, $BaCO_3$ and $SrCO_3$ decrease as

(a) $CaCO_3 > SrCO_3 > MgCO_3 > BaCO_3$

(b) $BaCO_3 > SrCO_3 > MgCO_3 > CaCO_3$

(c) $BaCO_3 > SrCO_3 > CaCO_3 > MgCO_3$

(d) $MgCO_3 > CaCO_3 > SrCO_3 > BaCO_3$

Q.2 Iron pipes lying under acidic soil are often attached to blocks of magnesium for protection from rusting. Magnesium offers protection to iron against corrosion because it

(a) prevents air from reaching the surface of iron

(b) is more readily converted into positive ions

(c) is higher than iron

(d) forms a corrosion-resistance alloy with iron

Q.3 A certain metal M is used to prepare an antacid which is used as a medicine in acidity. This metal accidently catches fire which cannot be put out by using CO_2 based extinguishers. The metal M is

(a) Ca (b) C

(c) Mg (d) All of these

Q.4 $Be(OH)_2$ is insoluble in water while $Ba(OH)_2$ is highly soluble due to

(a) Bond order (b) Lattice energy difference

(c) Common ion effect (d) Hard acid

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

Space for Rough Work

Q.5 Among the alkaline earth metals, the element forming predominantly covalent compound is
(a) Barium (b) Strontium
(c) Calcium (d) Beryllium

Q.6 The correct order of the increasing ionic character is
(a) $BeCl_2 < MgCl_2 < CaCl_2 < BaCl_2$
(b) $BeCl_2 < MgCl_2 < BaCl_2 < CaCl_2$
(c) $BeCl_2 < BaCl_2 < MgCl_2 < CaCl_2$
(d) $BaCl_2 < CaCl_2 < MgCl_2 < BeCl_2$

Q.7 Alkaline earth metals are denser than alkali metals because metallic bonding is
(a) Stronger (b) Weaker
(c) Not present (d) Volatile

Q.8 Which of the following statements is false?
(a) $CaOCl_2$ gives OH^-, Cl^- and OCl^- in aqueous solution
(b) Diamond and graphite are allotropes of carbon
(c) Bleaching action of Cl_2 in moist condition is not permanent
(d) Calomel is Hg_2Cl_2

Q.9 Property of the alkaline earth metals that increases with their atomic number is
(a) Ionisation energy
(b) Solubility of their hydroxides
(c) Solubility of their sulphates
(d) Electronegativity

Q.10 Beryllium differs from rest of the members of its family (Group-IIA) in many ways. The reason for this is its
(a) Small size and higher electronegativity
(b) Small size and lower electronegativity
(c) Large size and lower ionisation energy
(d) Large size and largest ionic radius

Q.11 The active constituent of bleaching powder is :
(a) $Ca(OCl)_2$ (b) $Ca(OCl)Cl$
(c) $Ca(ClO_2)_2$ (d) $Ca(ClO_2)Cl$

Q.12 Sodium sulphate is soluble in water whereas barium sulphate is sparingly soluble because
(a) The hydration energy of Na_2SO_4 is less than its lattice energy
(b) The hydration energy of Ba_2SO_4 is more than its lattice energy
(c) The lattice energy of $BaSO_4$ is more than its hydration energy
(d) The lattice energy has no role to play in solubility

Q.13 Alloys of which metal are light and strong and so are used in the manufacture of acroplane parts
(a) Cr (b) Sn (c) Fe (d) Mg

Q.14 A substance absorbs CO_2 and violently reacts with water. That substance is
(a) $CaCO_3$ (b) CaO (c) H_2SO_4 (d) ZnO

Q.15 A major constituent of portland cement except lime is
(a) Silica (b) Alumina
(c) Iron oxide (d) Magnesia

Q.16 Identify the correct statement
(a) Gypsum contains a lower percentage of calcium than plaster of paris
(b) Gypsum is obtained by heating plaster of paris
(c) Plaster of paris can be obtained by hydration of gypsum
(d) Plaster of paris is obtained by partial oxidation of gypsum

Q.17 Which of the following decreases on going gradually from Be to Ba (in periodic table)?
(a) Basic character of hydroxides
(b) Solubility of sulphates in water
(c) Solubility of hydroxides in water
(d) Strength of elements as reducing agent

Q.18 Point out the incorrect statement regarding Be (Group-IIA)
(a) It forms an ionic carbide
(b) Its carbonate decomposes on heating
(c) Its halides are covalent
(d) It is easily attacked by water

Q.19 The correct order of the solubility of sulphates of alkaline earth metals in water is
(a) Be > Ca > Mg > Ba > Sr
(b) Mg > Be > Ba > Ca > Sr
(c) Be > Mg > Ca > Sr > Ba
(d) Mg > Ca > Ba > Be > Sr

RESPONSE GRID					
	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ
	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ
	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ

Space for Rough Work

Q.20 Lithopone is

(a) $BaO+ZnSO_4$ (b) $ZnO+ BaSO_4$

(c) $BaS+ ZnSO_4$ (d) $ZnS+ BaSO_4$

Q.21 The alkaline earth metals Ba, Sr, Ca and Mg may be arranged in the order of their decreasing first ionisation potential as

(a) Mg, Ca, Sr, Ba (b) Ca, Sr, Ba, Mg

(c) Sr, Ba, Mg, Ca (d) Ba, Mg, Ca, Sr

DIRECTIONS (Q.22-Q.24) : In the following questions, more than one of the answers given are correct. Select the correct answers and mark it according to the following codes:

Codes :

(a) 1, 2 and 3 are correct **(b)** 1 and 2 are correct

(c) 2 and 4 are correct **(d)** 1 and 3 are correct

Q.22 Which of the following statements regarding lithopone are correct ?

(1) Lithopone is cheap and possesses good covering power.

(2) Lithopone is prepared by mixing barium sulphide and zinc sulphate.

(3) Lithopone is a mixture of barium sulphate and zinc sulphide.

(4) Lithopone is a yellow pigment.

Q.23 Which of the following statements are correct ?

(1) The heats of hydration of the dipositive alkaline earth metal ions decrease with increase in their ionic size.

(2) Hydration of alkali metal ions is less than that of alkaline earth metals.

(3) Alkaline earth metal ions, because of their much larger charge to size ratio, exert a much stronger electrostatic attraction on the oxygen of water molecule surrounding them.

(4) All the oxides of alkaline earth metals are amphoteric in nature.

Q.24 Correct statements regarding the dissolution of alkaline earth metals in liquid NH_3 is–

(1) Due to high L.E. and I.E. Be and Mg do not dissolve in liquid NH_3

(2) Deep blue colour is due to absorption spectrum of solvated electron

(3) Solution conducts electricity at all concentration

(4) Solution remains paramagnetic at all concentration

DIRECTIONS (Q.25-Q.27) : Read the passage given below and answer the questions that follows :

An element A burns in nitrogen to give an ionic compound B. The compound B reacts with water to give C and D. A solution of C becomes milky on bubbling carbon dioxide.

Q.25 A is–

(a) Calcium (b) Calcium nitride

(c) Limewater (d) Ammonia

Q.26 B is–

(a) Calcium (b) Calcium nitride

(c) Limewater (d) Ammonia

Q.27 C is–

(a) Calcium (b) Calcium nitride

(c) Limewater (d) Ammonia

RESPONSE GRID					
	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ
	25. ⓐⓑⓒⓓ	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ		

Space for Rough Work

DIRECTIONS (Q. 28-Q.30) : Each of these questions contains two statements: Statement-1 (Assertion) and Statement-2 (Reason). Each of these questions has four alternative choices, only one of which is the correct answer. You have to select the correct choice.

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a 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 False, Statement-2 is True.

(d) Statement - 1 is True, Statement-2 is False.

Q.28 Statement 1 : Magnesium continues to burn in nitric oxide.

Statement 2 : During burning heat evolved does not decompose NO.

Q.29 Statement 1 : Anhydrous BaO_2 is used for preparing H_2O_2.

Statement 2 : Hydrated BaO_2 is not available.

Q.30 Statement 1 : Mg is not present in enamel of human teeth.

Statement 2 : Mg is an essential element for biological functions of human.

RESPONSE GRID	28.ⓐⓑⓒⓓ	29.ⓐⓑⓒⓓ	30.ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM SHEET 18 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	36	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

DAILY PRACTICE PROBLEMS

CHEMISTRY SOLUTIONS (18)

(1) **(c)** The thermal stability of group 2 carbonates increases down the group as the basicity of metal hydroxides increases from $Be(OH)_2$ to $Ba(OH)_2$.

(2) **(b)** Due to its electropositive and reactive nature, magnesium is readily converted into positive ions on contact with iron pipes and hence, iron pipes remains as it is.

(3) **(c)** $Mg(OH)_2$ (milk of magnesia) is used as an antacid. Also, Mg continues to burn in CO_2 atmosphere as it reduces CO_2 to C.

(4) **(b)** On moving down the group; lattice energy decreases with increase in size of cation.

(5) **(d)** Beryllium because of small atomic size and high ionization energy.

(6) **(a)** $BeCl_2 < MgCl_2 < CaCl_2 < BaCl_2$

As we go down the group I.E. decreases. Hence ionic character increases.

(7) **(a)** Alkaline earth metals are denser than alkali metals because they can be packed more tightly due to their greater charge and smaller radii.

(8) **(c)** Bleaching action of Cl_2 in moist condition is permanent.

$$Cl_2 + H_2O \rightarrow HCl + HClO$$

$$HClO \rightarrow HCl + O$$

$$Cl_2 + H_2O \rightarrow 2HCl + \bullet$$

(9) **(b)** Solubility of group 2 hydroxides increases down the group. This is because both lattice energy and hydration energy decrease down the group as the size of cation increases but L.E. decreases more rapidly than H.E. and hence, their solubility increases down the group.

(10) **(a)** (i) Small atomic size.
(ii) High electronegativity
(iii) Absence of *d*-orbitals

(11) **(a)** $2Ca(OH)_2 + 2Cl_2 \longrightarrow \underset{\text{Bleaching powder}}{CaCl_2 + Ca(OCl)_2} + 2H_2O$

(12) **(c)** The solubility of a salt in water depends on lattice energy (L.E.) and hydration energy (H.E.).
If H.E. > L.E., salt dissolves
If H.E. < L.E., salt does not dissolve.

(13) **(d)** Duralium (Al = 95%, Cu = 4%, Mn = 0.5%, Mg = 0.5%) being light, tough and durable is used for the manufacture of aeroplanes and automobile parts.

(14) **(b)** $CaO + CO_2 \rightarrow CaCO_3$

$CaO + H_2O \rightarrow Ca(OH)_2$

(15) **(a)** Average composition of portland cement is :

Lime (CaO)	50– 60%
Magnesium oxide (MgO)	2–3%
Silica (SiO_2)	20–25%
Ferric oxide (Fe_2O_3)	1–2%
Alumina (Al_2O_3)	5–10%
Sulphur trioxide (SO_3)	1–2%

(16) **(a)**

(17) **(b)** The solubilities of group 2 sulphates decrease down the group because the L.E. almost remains constant but the H.E. decreases from Be^{2+} to Ba^{2+}.

(18) **(d)** Be does not react with water.

(19) **(c)** Be > Mg > Ca > Sr > Ba

On moving down the group lattice energy remains almost constant as the sulphate is so big that small increase in the size of the cations from Be to Ba does not make any difference. However the hydration energy decreases from Be^{+2} to Ba^{+2}. This causes decrease in the solubility of the sulphates as the ionic size increases.

(20) **(d)** ZnS + $BaSO_4$ is lithopone. It is used as a white pigment.

(21) **(a)**

Element	–	Mg	Ca	Sr	Ba
I.E.	–	737	590	549	503

On moving down the group from Mg to Ba, I.E. value, decreases due to increase in atomic size and screening effect of electrons which overweigh the effect of increased nuclear charge.

(22) **(a)** Lithopone is a white pigment.

(23) **(a)** Hydration energy $\propto \dfrac{\text{Charge on cation}}{\text{Size of cation}}$.

Hence they show high hydration because of their much larger charge to size ratio.

(24) **(a)** The solution becomes diamagnetic when concentration of metal increases and electrons are going to become paired up within the solvent cage.

(25) **(a)** **(26)(b)** **(27)(c)**

$$A \xrightarrow{\text{burns, nitrogen}} \underset{\text{ionic compound}}{B} \xrightarrow{H_2O} C \downarrow_{CO_2} + D$$

milky solution

Since the solution of C becomes milky on bubbling CO_2 into it, C is lime water ($Ca(OH)_2$). Thus the element A is calcium and B is the compound of calcium with nitrogen. Nitrides on reacting with water give the corresponding hydroxide and ammonia. Therefore, A is calcium (Ca), B is calcium nitride (Ca_3N_2) and C is lime water ($Ca(OH)_2$).

(28) **(d)** When Mg is burnt in nitric oxide, it continues to burn because during burning the heat evolved decomposes NO to N_2 and O_2. Oxygen, thus produced, helps Mg to burn.
Here statement-1 is true but statement-2 is false.

(29) **(c)** Anhydrous BaO_2 is not used for preparing H_2O_2 because it reacts with H_2SO_4 and the reaction ceases after some time due to formation of $BaSO_4$ on BaO_2.

(30) **(b)** Enamel the hardest substance of the body is composed of fluoropatite $[3Ca_3(PO_4)_2.CaF_2]$ not magnesium. Magnesium is an essential element as it acts as a co-factor of many enzymes of glycolysis.