Additional Problems for Self Practice (APSP)

Marked questions are recommended for Revision.

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

PART - I : PRACTICE TEST-1 (IIT-JEE (MAIN Pattern))

Max. Marks : 100 **Max. Time : 1 Hr.**

Important Instructions :

1. The test is of **1 hour** duration.
2. The Test Booklet consists of **25** questions. The maximum marks are **100.**
3. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.
   ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
5. **Test Paper consists of Two (2) Sections.**
   Section-1 contains **20** multiple choice questions. Each question has four choices (1), (2), (3) and (4) out of which **one** is correct. For each question in Section-1, you will be awarded 4 marks if you give the corresponding to the correct answer and zero mark if no given answers. In all other cases, minus one **(–1)** mark will be awarded.
   Section-2 contains **5** questions. The answer to each of the question is a **Numerical Value.** For each question in Section-2, you will be awarded 4 marks if you give the corresponding to the correct answer and zero mark if no given answers. No negative marks will be answered for incorrect answer in this section. In this section answer to each question is **NUMERICAL VALUE** with two digit integer and decimal upto two digit. If the numerical value has more than two decimal places **truncate/round-off** the value to **TWO** decimal placed.

SECTION-1

This section contains **20** multiple choice questions. Each questions has four choices (1), (2), (3) and (4) out of which Only **ONE** option is correct.

1. When a salt is heated with dilute H_2SO_4 and $KMnO_4$ solution, the pink colour of $KMnO_4$ is discharged, the salt is :
(1) a sulphite (2) a carbonate (3) a nitrate (4) a bicarbonate

2. Solution of a salt in dilute H_2SO_4 or acetic acid produces deep blue colour with starch iodide solution. The salt contains :
(1) Br^- (2) I^- (3) Cl^- (4) NO_2^-

3. A test tube containing a nitrate and another containing a bromide and MnO_2 are treated with concentrated H_2SO_4. The reddish brown fumes evolved are passed through water. The water will be coloured by :
(1) the nitrate (2) the bromide (3) both (4) none of the two

4. Colourless salt (A) + dil. H_2SO_4 or $CH_3COOH + KI \longrightarrow$ blue colour with starch. (A) can be
(1) K_2SO_3 (2) Na_2CO_3 (3) NH_4NO_2 (4) NH_4Cl

5. There are four test tubes containing dilute HCl, $BaCl_2$, $HgCl_2$ and KNO_3 solutions. Which of the following reagents will help in the identification of $BaCl_2$?
(1) NaOH (2) K_2CrO_4 (3) $AgNO_3$ (4) both (2) and (3)

6. A brick red colour is imparted to Bunsen flame by a :
(1) Ca salt (2) Sr salt (3) Na salt (4) Co salt

7. Which one of the following metal salts produces a blue coloured bead in cobalt nitrate charcoal cavity test ?
(1) Zn^{2+} (2) Mg^{2+} (3) Sn^{2+} (4) Al^{3+}

8. $BaCl_2$ solution gives a white precipitate with a solution of a salt, which dissolves in dilute hydrochloric acid with the evolution of colourless, pungent smelling gas. The gas as well as the salt both are used as bleaching agent in the textile industries. The salt contains:
(1) sulphite (2) sulphide (3) acetate (4) carbonate

9. Pink colour of acidified $KMnO_4$ is decolourised but there is no evolution of any gas. This may happen with the compound containing the following acid radical.
(1) SO_3^{2-} (2) NO_2^- (3) S^{2-} (4) All of these

10. When KI is added to acidified solution of sodium nitrite :
(1) NO gas is liberated and I_2 is set free (2) N_2 gas is liberated and HI is produced
(3) N_2O gas is liberated and I_2 is set free (4) N_2 gas is liberated and HOI is produced

11. A substance on treatment with dilute H_2SO_4 liberates a colourless gas which produces (i) turbidity with baryta water and (ii) turns acidified dichromate solution green. The reaction indicates the presence of :
(1) CO_3^{2-} (2) S^{2-} (3) SO_3^{2-} (4) NO_2^-

12. Ammonium molybdate test is used for the estimation of :
(1) PO_4^{3-} (2) NO_3^- (3) SO_3^{2-} (4) SO_4^{2-}

13. A colourless gas is dissolved in water and the resulting solution turns red litmus blue ; the gas may have been which one of the following ?
(1) HCl (2) H_2S (3) SO_2 (4) NH_3

14. When Ag reacts with conc. HCl, then products will be :
(1) AgCl, Cl_2 (2) AgCl, H_2 (3) AgCl, H_2, Cl_2 (4) None of these

15. Which of the following salt will evolve sulphur dioxide gas along with formation of yellowish turbidity when treated with dilute H_2SO_4 ?
(1) Sodium sulphide (2) Sodium sulphite (3) Sodium thiosulphate (4) Sodium sulphate

16. Aqueous solution of a salt + $MgSO_4$ solution $\longrightarrow$ no precipitate in cold $\xrightarrow{\text{Heating}}$ White precipitate appears. The salt contains the acidic radical :
(1) CO_3^{2-} (2) HCO_3^- (3) SO_3^{2-} (4) $C_2O_4^{2-}$

17. With Cr_2O_3, colour of the bead in sodium carbonate bead test is :
(1) red (2) blue (3) yellow (4) green

18. Which metal gives violet colour in oxidising flame when heated with borax ?
(1) Fe (2) Pb (3) Co (4) Mn

19. KBr, on reaction with conc. H_2SO_4, gives reddish-brown gas :
(1) Bromine (2) Mixture of bromine and HBr
(3) HBr (4) NO_2

20. An inorganic salt when heated evolves coloured gas which bleaches moist litmus paper. The evolved gas is :
(1) NO_2 (2) SO_2 (3) N_2O (4) I_2

21. How many of the following radical can be confirmed by using dilute HCl?
S^{-2}, $S_2O_3^{2-}$, NO_3^-, NO_2^-, SO_3^{2-}, SO_4^{2-}

22. For the reaction

$SO_3^{2-} + Zn^{+2} + H^+ \longrightarrow$ Gas.

How many lone pairs are present on the gas?

23. How many of the following ions give borax bead test?
Cr^{+3}, Cu^{2+}, Mn^{2+}, Zn^{2+}

24. How many of the following compounds are soluble in water?
$PbCO_3$, Na_2CO_3, $NaNO_3$, CuCl, $(NH_4)_2SO_3$

25. $Cl^- + H_2SO_4 \longrightarrow$ Gas A

$Cl^- + MnO_4 + conc.H_2SO_4 \longrightarrow$ Gas B

x = number of lone pairs on B
y = Atomicity of Gas A
What is the value of x + y = ?

Practice Test-1 (IIT-JEE (Main Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25					
Ans.										

PART - II : NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC) STAGE-I

1. Which of the metal chloride is insoluble in cold water but dissolves in hot water ? **[NSEC-2002]**
(A) $BiCl_3$ (B) $SnCl_4$ (C) $PbCl_2$ (D) AgCl.

2. A colourless salt when heated imparts lilac colour to the bunsen flame. It turns red litmus blue. The salt is **[NSEC-2004]**
(A) Na_2CO_3 (B) KNO_3 (C) $NaNO_3$ (D) K_2CO_3.

3. The brown compound formed in the ring test for nitrates contains the ion **[NSEC-2005]**
(A) $[Fe(H_2O)_5NO]^{3+}$ (B) $[Fe(H_2O)_5NO]^{2+}$
(C) $[Fe(H_2O)_5NO]^{4+}$ (D) $[Fe(H_2O)_5NO]^{+}$.

4. Sodium nitroprusside $Na_2[Fe(CN)_5NO]$ is used as a reagent for the detection of **[NSEC-2005]**
(A) sulphur (B) nitrogen (C) bromine (D) iodine.

5. The brown ring test for NO_2^- and NO_3^- is due to formation of complex ion with formula : **[NSEC-2006]**
(A) $[Fe(H_2O)_6]^{2+}$ (B) $[Fe(CN)_5(NO)]^{2-}$ (C) $[Fe(H_2O)_5(NO)]^{2+}$ (D) $[Fe(H_2O)(NO)_5]^{2+}$

6. Concentrated sulphuric acid on reaction with NaCl, NaBr and NaI produces HCl, bromine and iodine respectively.What order of oxidizing ability of halogens with reference to sulphuric acid can be established on the basis of this reaction ? **[NSEC-2007]**
(A) $H_2SO_4 > I_2 > Br_2 > Cl_2$ (B) $Cl_2 > H_2SO_4 > Br_2 > I_2$
(C) $H_2SO_4 > Cl_2 > Br_2 > I_2$ (D) $Cl_2 > Br_2 > I_2 > H_2SO_4$

7. Silver nitrate solution when added to a colorless aqueous solution E forms a white precipitate which dissolves in excess of E. If the white precipitate is heated with water it turns black and the supernatant solution gives a white precipitate with acidified barrum nitrate solution. Therefore, E is : **[NSEC-2015]**
(A) Na_2S (B) $Na_2S_2O_3$ (C) Na_2SO_3 (D) Na_2SO_4

8. If a dilute solution of aqueous NH_3 is saturated with H_2S then the product formed is : **[NSEC-2016]**
(A) $(NH_4)_2S$ (B) NH_4HS (C) $(NH_4)_2S_x$ (D) $NH_4OH + S$

9. A colorless water-soluble compound on strong heating liberates a brown colored gas and leaves a yellow residue that turns white on cooling. An aqueous solution of the original solid gives a white precipitate with $(NH_4)_2S$. The original solid is : **[NSEC-2016]**
(A) $Zn(NO_3)_2$ (B) $Ca(NO_3)_2$ (C) $Al(NO_3)_3$ (D) $NaNO_3$

PART - III : HIGH LEVEL PROBLEMS (HLP)

ONLY ONE OPTION CORRECT TYPE

1. What are the products formed when an aqueous solution of magnesium bicarbonate is boiled?
(A) $MgCO_3$, H_2O, CO_2 (B) $Mg(HCO_3)_2$, H_2O (C) $Mg(OH)_2$, H_2O (D) Mg, CO, H_2O

2. NaX (Sodium salt of particular anion 'X') gives brisk effervescence of Y with dilute HCl. On heating, NaX evolves gas Y which can be completely absorbed in conc. KOH solution and is colorless odourless gas. Hence X and Y respectively are :
(A) HSO_3^- ,SO_2 (B) HS^- & H_2S (C) HCO_3^- , CO_2 (D) $HC_2O_4^-$ & CO_2 + CO

3. White precipitate of AgCl turns to greyish or black when :
(A) reacts with Na_3AsO_3 (B) exposed to sunlight
(C) reacts with K_2CrO_4 (D) reacts with concentrated HCl

4. A mixture is known to contain NO_3^- and NO_2^-. Before performing ring test for NO_3^-, the aqueous solution should be made free of NO_2^-. This is done by heating aqueous extract with :
(A) conc. HNO_3 (B) dil HNO_3 (C) urea (D) zinc dust

5. Which of the following will not react with each other when heated together ?
(A) BeO + MgO (B) Li_2CO_3 + BeO (C) MgO + $CaCO_3$ (D) $MgCO_3$ + Al_2O_3

6. An aqueous solution of salt containing an acidic radical $\mathbf{X^-}$ reacts with sodium hypochlorite in neutral medium. The gas evolved produces blue black colour spot on the starch paper. The anion $\mathbf{X^-}$ is :
(A) CH_3COO^- (B) Br^- (C) I^- (D) NO_2^-

7. Precipitate of $PbSO_4$ is soluble in :
(A) ammonium acetate (6M) (B) dilute HCl
(C) dilute H_2SO_4 (D) none of these

8. Which of the following pair of acidic radical can be distinguished by using dil H_2SO_4?
(I) $C_2O_4^{2-}$ and NO_3^- (II) NO_3^- and NO_2^-
(III) Cl^- and Br^- (IV) HCO_3^- and CO_3^{2-}
(A) I and II (B) II only (C) II and IV (D) III and IV

MATCH THE COLUMN

9. $CuCO_3$ was strongly heated to obtain a residue A and gas B. The residue obtained was treated with a salt of sodium 'X' and oxide Y, which produced a blue colored glassy compound C on heating in oxidizing flame. The same combination of X and Y gave a green colored glassy compound D when $Cr_2(SO_4)_3$ was heated with them in oxidizing flame. Match the following accordingly :

(A)	A	(P)	$Cu(BO_2)_2$
(B)	B	(Q)	Na_2CO_3
(C)	C	(R)	CuO
(D)	X	(S)	CO
		(T)	Cu_2O
		(U)	CO_2
		(V)	$NaBO_2$
		(W)	$Cr(BO_2)_2$

SINGLE AND DOUBLE VALUE INTEGER TYPE

10. A metal salt evolves the dark violet fumes of (X) with MnO_2 and this (X) gives the deep blue colouration with starch solution. Then number of lone pair on central atom in (X).

11. How many of the following will volatilize on heating leaving no solid residue ?
(i) $NaNO_3$ (ii) NH_4NO_3 (iii) $Ca(H_2PO_2)$ (iv) NH_4HCO_3
(v) $N_2H_5HSO_3$ (vi) $AlCl_3$ (vii) $[Cu(NH_3)_4]SO_4$ (viii) $FeSO_4.7H_2O$

12. $Na_2S + Na_2[Fe(CN)_5NO] \rightarrow$ "A" (Violet Color)
In Complex "A", number of type of ambidentate ligand is/are "a" and number of d-orbital involved in hybridisation is/are "b" Then 7a + 8 b will be :

ONE OR MORE THAN ONE OPTIONS CORRECT TYPE

13. Heating which of the following salts in a dry test tube may cause a change in their colour ?
(A) $ZnCO_3$ (white) (B) $Co(NO_3)_2.6H_2O$ (red)
(C) $FeSO_4.6H_2O$ (green) (D) $MnSO_4$ (faint pink)

14. Which of the following combinations will give yellowish precipitate in an aqueous medium ?
(A) $AgNO_3 + NaBr$ (B) $(CH_3COO)_2Pb + Na_2CrO_4$
(C) $AgCl + Na_3AsO_3$ (D) $AgNO_3 + NaNO_2$

15. Which of the following produce red coloured flame during flame test ?
(A) Li (B) Ca^{2+} (C) Sr^{2+} (D) Ba^{2+}

16 When Borax is heated it forms a colourless glassy bead because of formation of :
(A) B_2H_6 (B) $NaBO_2$ (C) B_2O_3 (D) $Na_2B_4O_7$

17. Which of the following anion(s) is/are easily removed from aqueous solution by precipitation?
(A) Cl^- (B) SO_4^{2-} (C) NO_3^- (D) CO_3^{2-}

18. H_2S and SO_2 can be distinguished by :
(A) Litmus paper (B) MnO_4^-/H^+ (C) $(CH_3COO)_2Pb$ (D) None of these

COMPREHENSION

Read the following passage carefully and answer the questions.

Comprehension #

When compound (A) is treated with conc. H_2SO_4, a reddish brown colour gas (B) is evolved. To this solution, a solution of (C) is added slowly from the side of the test tube, a blue ring is obtained at the junction of two layers due to formation of (D).

19. Gas (B) may be :
(A) Cl_2 (B) Br_2 (C) I_2 (D) NO_2

20. Compound (D) has formula :
(A) $C_6H_5NH–C_6H_5$ (B) $(C_6H_5)_2N–N(C_6H_5)_2$
(C) $C_6H_5–NH–NH–C_6H_5$ (D) $C_6H_5-NH-\underset{\underset{O}{\downarrow}}{N}-C_6H_5$

21. Which compound gives same test as compound (A)
(A) NaCl (B) NaBr (C) Na_2CrO_4 (D) Na_2S

PART - IV : PRACTICE TEST-2 (IIT-JEE (ADVANCED Pattern))

Max. Time : 1 Hr. **Max. Marks : 66**

Important Instructions

A. General :

1. The test is of 1 hour duration.
2. The Test Booklet consists of 22 questions. The maximum marks are 66.

B. Question Paper Format :

3. Each part consists of five sections.
4. Section-1 contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE is correct.
5. Section-2 contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE OR MORE THAN ONE are correct.
6. Section-3 contains 6 questions. The answer to each of the questions is a single-digit integer, ranging from 0 to 9 (both inclusive).
7. Section-4 contains 1 paragraphs each describing theory, experiment and data etc. 3 questions relate to paragraph. Each question pertaining to a partcular passage should have only one correct answer among the four given choices (A), (B), (C) and (D).
8. Section-5 contains 1 multiple choice questions. Question has two lists (list-1 : P, Q, R and S; List-2 : 1, 2, 3 and 4). The options for the correct match are provided as (A), (B), (C) and (D) out of which ONLY ONE is correct.

C. Marking Scheme :

9. For each question in Section-1, 4 and 5 you will be awarded 3 marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.
10. For each question in Section-2, you will be awarded 3 marks. If you darken all the bubble(s) corresponding to the correct answer(s) and zero mark. If no bubbles are darkened. No negative marks will be answered for incorrect answer in this section.
11. For each question in Section-3, you will be awarded 3 marks if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marks will be awarded for incorrect answer in this section.

SECTION-1 : (Only One option correct Type)

This section contains 7 multiple choice questions. Each questions has four choices (A), (B), (C) and (D) out of which Only ONE option is correct.

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1. An inorganic salt when heated with concentrated H_2SO_4 evolves a colourless pungent smelling gas but with concentrated H_2SO_4 and MnO_2, evolves a coloured pungent smelling gas which bleaches moist litmus paper. The coloured gas is :

(A) NO_2 (B) Cl_2 (C) Br_2 (D) I_2

2. Chromyl chloride vapours are dissolved in water and acetic acid and barium acetate solution is added, then:

(A) the solution will remain colourless. (B) the solution will become dark green.
(C) a yellow solution will be obtained. (D) a yellow precipitate will be obtained.

3. When CS_2 layer containing both Br_2 and I_2 (2 : 1) is shaken with excess of chlorine (Cl_2) water, the violet colour due to I_2 disappears and a pale yellow colour appears in the solution. The disappearance of violet colour and appearance of pale yellow colour is due to the formation of :

(A) I_3^- and Br_2 respectively. (B) HIO_3 and BrCl respectively.
(C) ICl and BrCl respectively. (D) I^- and Br^- respectively.

4. A metal salt solution gives a yellow precipitate with silver nitrate. The precipitate dissolves in dilute nitric acid as well as in dilute ammonia solution. The solution contains :
(A) bromide ions (B) iodide ions
(C) phosphate ions (D) chromate ions

5. Which of the following will not give positive chromyl chloride test ?
(A) Copper chloride, $CuCl_2$. (B) Mercuric chloride, $HgCl_2$.
(C) Zinc chloride, $ZnCl_2$. (D) Anilinium chloride $C_6H_5NH_3Cl$.

6. A white sodium salt dissolves in water to give a solution which is neutral to litmus. When silver nitrate solution is added to the solution, a white precipitate is obtained which does not dissolve in dilute HNO_3. The anion is
(A) CO_3^{2-} (B) Cl^- (C) SO_3^{2-} (D) S^{2-}

7. A one litre flask is full of reddish brown bromine fumes. The intensity of brown colour of vapour will not decrease appreciably on adding to the flask some :
(A) pieces of marble (B) animal charcoal powder
(C) carbon tetrachloride (D) carbondisulphide

Section-2 : (One or More than one options correct Type)

This section contains 5 multipole choice questions. Each questions has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

8. Which of the following statements is/are incorrect ?
(A) A filter paper moistened with cadmium acetate solution turns yellow, when brought in contact with H_2S gas.
(B) Both carbonate ions as well as bicarbonate ions in the solutions, give reddish-brown precipitate with mercury(II) chloride.
(C) Sulphites in presence of zinc, reacts with dilute H_2SO_4 to liberate SO_3 gas.
(D) A filter paper moistened with KIO_3 and starch turns blue in contact with SO_2 vapours.

9. Which of the following reagents can be used for making the distinction between AgCl and AgI ?
(A) Sodium arsenite solution. (B) Dilute ammonia solution.
(C) Potassium cyanide solution. (D) Dilute HNO_3.

10. Which of the following statement(s) is/are correct with respect to bromide ions ?
(A) KBr on heating with MnO_2 and concentrated H_2SO_4 liberates Br_2 and SO_2 gases.
(B) KBr on heating with concentrated H_2SO_4 liberates Br_2 and SO_2 gases.
(C) KBr forms HBr with concentrated H_3PO_4.
(D) KBr(s) liberates Br_2 on gentle warming with concentrated H_2SO_4 and $K_2Cr_2O_7$(s).

11. Which of the following imparts green/apple green colour to the Bunsen flame ?
(A) Calcium chloride (B) Volatile boron trifluoride
(C) Barium chloride (D) Ethoxy borate

12. What final product(s) is/are formed in the following series of reactions ?

Concentrated borax solution + silver nitrate solution $\longrightarrow$ Precipitate $\xrightarrow[\text{boiling}]{H_2O}$ Products (final)

(A) Ag_3BO_3 (B) Ag_2O (C) H_3BO_3 (D) $AgBO_2$

Section-3 : (One Integer Value Correct Type.)

This section contains 6 questions. Each question, when worked out will result in one integer from 0 to 9 (both inclusive)

13. How many of following metals give Borax bead test.
Sc, Ti, V, Cr, Mn, Co, Ni, Cu, Zn

14. How many of the following salts impart characteristic colours to the Bunsen flame ?
NaCl, KCl, $CuCl_2$, $BaCl_2$, $CaCl_2$, $SrCl_2$, $ZnCl_2$, $MgCl_2$, $AlCl_3$

15. How many of the following liberate coloured vapour/gas with concentrated H_2SO_4?
KCl (s) + $K_2Cr_2O_7$ (s), KNO_2 (s), KI(s), KBr(s), KCl(s)
KBr (s) + MnO_2 (s), KNO_3, KCl(s) + MnO_2, K_2SO_3

16. Which of the following statements is/are incorrect
(I) Filter paper moistened with cadmium acetate and lead acetate turn black and yellow respectively, when brought in contact with H_2S gas.
(II) Sulphites in presence of Zinc, reacts with dilute H_2SO_4 to liberate H_2S gas.
(III) Stability of carbonates decrease with increasing metallic character.
(IV) Borax bead test is responded generally by p and d block metal salts.
(V) Sodium chloride on heating with aqueous solution of $K_2Cr_2O_7$ and concentrated H_2SO_4 produced white fumes.

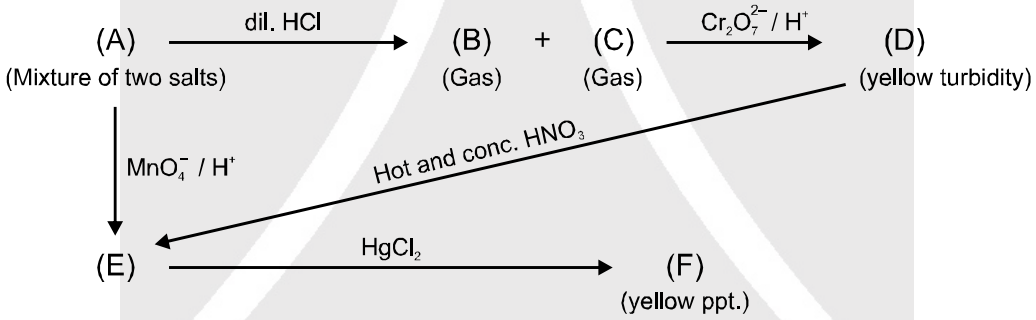
17. How many B–O–B bond(s)(per molecule) is/are present in compound which is used in Borax bead test?

18. In brown ring complex, if number of ambidentate is/are "a" and oxidation state of iron is/are "b" then a + b =?

SECTION-4 : Comprehension Type (Only One options correct)

This section contains 1 paragraphs, each describing theory, experiments, data etc. 3 questions relate to the paragraph. Each question has only one correct answer among the four given options (A), (B), (C) and (D)

Paragraph For Questions 19 to 21



19. Find the anion(s) :
(A) SO_3^{2-} (B) SO_3^{2-} , S^{2-} (C) SO_3^{2-} , CO_3^{2-} (D) $S_2O_3^{2-}$

20. Find out (E) :
(A) S^{2-} (B) CO_3^{2-} (C) $S_2O_3^{2-}$ (D) SO_4^{2-}

21. Find out (F) :
(A) $HgSO_4.2HgO$ (B) $HgSO_4.3HgO$ (C) $HgSO_4$ (D) $Hg_2SO_4.3HgO$

SECTION-5 : Matching List Type (Only One options correct)

This section contains 1 questions, each having two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (A), (B), (C) and (D) out of which one is correct.

22. Match List-I with List-II and select the correct answer using the codes given below the lists :

	List-I		**List-II**
P.	White turbidity	1.	$IO_3^- + SO_2 + \text{starch} \longrightarrow$
Q.	Rotten egg smell	2.	$SO_2 + MnO_4^- \longrightarrow$
R.	Colourless solution	3.	$Zn + NaOH + SO_2 \longrightarrow$
S.	Blue colour	4.	$CO_2 + Ca(OH)_2 \longrightarrow$

Code :

	P	Q	R	S		P	Q	R	S
(A)	1	3	2	4	(B)	3	2	4	1
(C)	4	3	2	1	(D)	4	1	2	3

Practice Test-2 (IIT-JEE (ADVANCED Pattern)

OBJECTIVE RESPONSE SHEET (ORS)

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.										
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.										
Que.	**21**	**22**								
Ans.										

APSP Answers

PART - I

1.	(1)	**2.**	(4)	**3.**	(2)	**4.**	(3)	**5.**	(2)
6.	(1)	**7.**	(4)	**8.**	(1)	**9.**	(4)	**10.**	(1)
11.	(3)	**12.**	(1)	**13.**	(4)	**14.**	(4)	**15.**	(3)
16.	(2)	**17.**	(4)	**18.**	(4)	**19.**	(1)	**20.**	(1)
21.	4	**22.**	2	**23.**	3	**24.**	3	**25.**	8

PART - II

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

PART - III

1.	(A)	**2.**	(C)	**3.**	(B)	**4.**	(C)	**5.**	(C)
6.	(C)	**7.**	(A)	**8.**	(B)	**9.**	A→R, B→U, C→P, D→V		
10.	3	**11.**	4 (ii, iv, v, vi)	**12.**	30	**13.**	(ABCD)	**14.**	(AB)
15.	(ABC)	**16**	(BC)	**17.**	(ABD)	**18.**	(ABC)	**19.**	(D)
20.	(B)	**21.**	(C)						

PART - IV

1.	(B)	**2.**	(D)	**3.^**	(B)	**4.**	(C)	**5.**	(B)
6.	(B)	**7.**	(A)	**8.**	(BC)	**9.**	(AB)	**10.**	(BCD)
11.	(BCD)	**12.**	(BC)	**13.**	5	**14.**	6	**15.**	7
16.	4 (I), (III), (IV) & (V)			**17.**	5	**18.**	1	**19.**	(B)
20.	(D)	**21.**	(A)	**22.**	(C)				

APSP Solutions

PART - I

1. SO_3^{2-} reduces $KMnO_4$ to colourless Mn^{2+}

$5SO_3^{2-} + 2MnO_4^- + 6H^+ \longrightarrow 2Mn^{2+} + 5SO_4^{2-} + 3H_2O$

2. Nitrite ion liberates I_2 from potassium iodide turning starch blue.

$2NO_2^- + 3I^- + 4CH_3COOH \longrightarrow I_3^- + 2NO\uparrow + 4CH_3COO^- + 2H_2O$

I_2 + starch $\longrightarrow$ blue colour

3. NO_3^- gives NO_2 with concentrated H_2SO_4 which on passing through water form colourless $HNO_3(\ell)$ and $HNO_2(\ell)$. Br^- + MnO_2 on heating with concentrated H_2SO_4 gives Br_2 gas which on passing through water imparts it a reddish brown colour.

4. $2NO_2^- + 3I^- + 4CH_3COOH \longrightarrow I_3^- + 2NO\uparrow + 4CH_3COO^- + 2H_2O$.

I_3^- + starch $\longrightarrow$ blue colouration.

5. $Ba^{2+} + CrO_4^{2-} \longrightarrow BaCrO_4\downarrow$ (yellow) ; $Ag^+ + Cl^- \longrightarrow AgCl\downarrow$ (white).

6. Ca salts impart brick red colour to the flame.

7. Al_2O_3.CoO formed in the test is blue in colour. It is called as thenard's blue.

8. $Ba^{2+} + SO_3^{2-} \longrightarrow BaSO_3\downarrow$ (white)

$BaSO_3 + 2HCl \longrightarrow BaCl_2 + SO_2$(colourless pungent smelling gas) + H_2O

SO_3^{2-} and SO_2 both act as bleaching agent.

9. (1) $5SO_3^{2-} + 2MnO_4^- + 6H^+ \longrightarrow 2Mn^{2+} + 5SO_4^{2-} + 3H_2O$

(2) $2MnO_4^- + 5NO_2^- + 6H^+ \longrightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

(3) $2MnO_4^- + H_2S + 6H^+ \longrightarrow 2Mn^{2+} + 5S\downarrow + 8H_2O$

10. $NO_2^- + 2I^- + 4CH_3COOH \longrightarrow I_2 + 2NO\uparrow + 4\,CH_3COO^- + 2H_2O$

11. $SO_3^{2-} + Ba(OH)_2 \longrightarrow BaSO_3\downarrow$ (white) + $2OH^-$.

$3SO_2 + Cr_2O_7^{2-} + 2H^+ \longrightarrow 2Cr^{3+}$ (green colour solution) + $3SO_4^{2-} + H_2O$.

13. NH_3 is basic

14. E^o_{SRP} of Ag = 0.80 V, E^o_{SRP} of Cl^- = 1.36 V, E^o_{SRP} of H^+ = 0.00 V. So Ag can not oxidize Cl^- and can not reduce H^+.

15. $S_2O_3^{2-}$ + dil.$H_2SO_4 \xrightarrow{\Delta} SO_2\uparrow$ (Suffocating gas) $2Cl^- + S\downarrow$ (yellow turbidity or white turbidity) + H_2O

16. $HCO_3^- + Mg^{2+} \rightarrow Mg(HCO_3)_2$ (No PPt) $\xrightarrow{\Delta}$ $MgCO_3\downarrow$

19. $KBr + H_2SO_4 \longrightarrow KHSO_4 + HBr$, $2HBr + 9\,H_2SO_4 \longrightarrow Br_2 + 2H_2O + SO_2$

20. Some nitrates on heating give NO_2 which bleaches moist litmus paper due to its oxidizing nature.

PART - III

1. $2Mg(HCO_3)_2 \rightarrow 2MgCO_3 + CO_2 + H_2O$

2. $NaHCO_3 + HCl \longrightarrow NaCl + H_2O + CO_2\uparrow$

(NaX) (Y)

$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2\uparrow$

$CO_2 + 2KOH \longrightarrow K_2CO_3 + H_2O$

CO_2 is colourless & odourless gas.

3. $2\,AgCl \xrightarrow{h\nu} 2\,Ag\downarrow (black) + Cl_2\uparrow$.

4. $NO_2^- + H^+ \longrightarrow HNO_2$
$CO(NH_2)_2 + HNO_2 \longrightarrow 2N_2\uparrow + CO_2\uparrow + 3H_2O$

5. $BeO + MgO \xrightarrow{\Delta} MgBeO_2$
$Li_2CO_3 + BeO \xrightarrow{\Delta} Li_2BeO_2 + CO_2\uparrow$
$MgCO_3 + Al_2O_3 \xrightarrow{\Delta} Mg(AlO_2) + CO_2\uparrow$

6. $OCl^- + 3I^- + H_2O \longrightarrow I_3^- + 2OH^- + Cl^-$
I_3^- + starch $\longrightarrow$ blue -black spot on starch paper appears due to the formation of iodine-starch adsorption complex.

7. $PbSO_4 + 2CH_3COONH_4 \longrightarrow (NH_4)_2SO_4 + (NH_4)_2[Pb(CH_3COO)_4]$

8. (I) $\begin{cases} \rightarrow C_2O_4^{2-} + 2H^+ \xrightarrow{dil.H_2SO_4} \text{No vapours or gas is evolved} \\ \rightarrow NO_3^- : \text{No reaction with dil. } H_2SO_4 \end{cases}$

(II) $\begin{cases} \rightarrow NO_3^- : \text{No reaction with dil.} H_2SO_4 \xrightarrow{\text{disproportionation}} HNO_3 + NO\uparrow \xrightarrow{\text{atm.air}} NO_2\uparrow \\ \rightarrow NO_2^- + H^+ \xrightarrow{dil.H_2SO_4} HNO_2 \end{cases}$

Hence, distincition is posssible.

(III) Both Cl^- and Br^- have no reaction with dil. H_2SO_4.

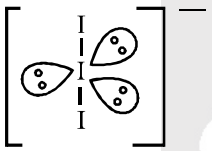
(IV) Both HCO_3^- and CO_3^{2-} produce $CO_2\uparrow$ which evolves with efferverscences.

9. $CuCO_3 \xrightarrow{\Delta} \underset{(A)}{CuO}\downarrow + \underset{(B)}{CO_2}\uparrow$

$$CuO + \underbrace{\overset{(X)}{NaBO_2 + B_2O_3}}_{\text{Borax bead}} \longrightarrow \underbrace{Cu(BO_2)_2}_{\text{(C) Blue bead}} + NaBO_2$$

$Cr_2(SO_4)_3 \xrightarrow[\text{Bead test}]{\text{Borax}}$ Green colored metaborate

10. $3I^- + MnO_2 + H_2SO_4 \longrightarrow I_3^-\uparrow + Mn^{2+} + SO_4^{2-} + H_2S$
I_3^- + starch $\rightarrow$ Blue color due to starch Iodine complex



11. $NH_4NO_3 \xrightarrow{\Delta} N_2O\uparrow + 2H_2O\uparrow$
$NH_4HCO_3 \xrightarrow{\Delta} NH_3\uparrow + H_2O\uparrow + CO_2\uparrow$
$N_2H_5HSO_3 \xrightarrow{\Delta} N_2H_4\uparrow + H_2O\uparrow + SO_2\uparrow$
$AlCl_3 \xrightarrow{\Delta} AlCl_3(g)$ (sublimes)

12. $A \equiv Na_4[Fe(CN)_5NOS]$
Ambidentate ligand [a] = CN^-, NOS^-
$a = 2$
Hybridisation $\Rightarrow d^2sp^3 \Rightarrow b = 2$
$7a + 8b = 30$

13. $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2\uparrow$. ZnO is yellow when hot.
(white)

$Co(NO_3)_2.6H_2O \xrightarrow{\Delta} CoO$ (black) $+ 2NO_2\uparrow + \frac{1}{2}O_2\uparrow + 6H_2O\uparrow$

$2FeSO_4.6H_2O \xrightarrow{\Delta} Fe_2O_3$ (brown) + $SO_2\uparrow + SO_3\uparrow + 6H_2O\uparrow$

$3MnSO_4 \xrightarrow{\Delta} Mn_3O_4 + 2SO_2\uparrow + SO_3\uparrow$

(faint pink) (black)

14. $AgNO_3 + NaBr \longrightarrow AgBr\downarrow$ (Yellow ppt.)

$Pb^{2+} + CrO_4^{2-} \longrightarrow PbCrO_4\downarrow$ (Yellow ppt.)

$AgCl + Na_3AsO_3 \longrightarrow Ag_3AsO_3\downarrow$ (Yellow ppt.)

$Ag^+ + NO_2^- \longrightarrow AgNO_2\downarrow$ (White ppt.)

16 $Na_2B_4O_7.10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{\Delta} \underset{\text{glassy bead}}{2NaBO_2 + B_2O_3}$

17. All nitrate are water soluble.

18. H_2S, SO_2 both are acidic so turns blue litmus red but SO_2 is a bleaching agent which turns red litmus colourless.

MnO_4^-/H^+ oxidising agent, so SO_2 is oxidised to SO_4^{2-} & H_2S is oxidized to sulphur

$2MnO_4^- + 5SO_2 + 2H_2O \rightarrow 2Mn^{+2} + 5SO_4^{-2} + 4H^+$

$2MnO_4^- + 5H_2S + 6H^+ \rightarrow 2Mn^{+2} + \underset{\text{(yellow)}}{5S} + 8H_2O$

$Pb^{2+} + S^{2-} \longrightarrow PbS$ - (black ppt.), SO_2 will not give black precipitate so can be distinguished.

(19-21) $NaNO_3 + H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$

(A)

$2HNO_3 \longrightarrow H_2O + 2NO_2\uparrow + [O]$

(B)

$2C_6H_5NHC_6H_5 + [O] \longrightarrow (C_6H_5)_2N{-}N(C_6H_5)_2 + H_2O$

blue ring (D)

This testing also given by various oxidizing agent like CrO_4^{2-}, $Cr_2O_7^{2-}$, ClO_3^- etc.

PART - IV

1. $Cl^- + H_2SO_4 \longrightarrow HCl\uparrow$ (colourless) + HSO_4^-

$MnO(OH)_2 + 2H_2SO_4 + 2Cl^- \longrightarrow Mn^{2+} + Cl_2\uparrow$ (yellowish green) + $2SO_4^{2-} + 3H_2O$

$Cl_2 + H_2O \longrightarrow 2HCl + [O]$

Litmus + [O] $\longrightarrow$ colourless oxidised form

Cl_2 is a yellowish green gas which bleaches litmus paper by oxidation.

2. $CrO_2Cl_2 + 2H_2O \longrightarrow H_2CrO_4 + 2HCl$

$H_2CrO_4 + (CH_3COO)_2Ba \longrightarrow BaCrO_4\downarrow$ (Yellow) + $2CH_3COOH$

3. $5Cl_2 + I_2 + 6H_2O \longrightarrow 2HIO_3$ (colourless) + $10HCl$

$Br_2 + Cl_2 \rightleftharpoons 2BrCl$ (pale yellow)

4. Ag_3PO_4 is yellow precipitate which is soluble in both dilute ammonia solution and dilute HNO_3.

$HPO_4^{2-} + 3Ag^+ \longrightarrow Ag_3PO_4\downarrow + H^+$

$Ag_3PO_4 + 2H^+ \longrightarrow H_2PO_4^-\downarrow + 3Ag^+$;

$Ag_3PO_4\downarrow + 6NH_3 \longrightarrow 3[Ag(NH_3)_2]^+ + PO_4^{3-}$

Pale yellow precipitate of AgBr is not soluble in dilute HNO_3; bright yellow precipitate of AgI is not soluble in both; Ag_2CrO_4 is obtained as red precipitate.

5. $HgCl_2$ fails to give positive chromyl chloride test because of its covalent nature i.e., it does not dissociate to give Cl^-.

6. $NaCl + AgNO_3 \longrightarrow AgCl \downarrow$ (white) $+ NaNO_3$; $Ag_2S \downarrow$ (black).
Ag_2CO_3 and Ag_2SO_3 dissolves in dilute HNO_3 liberating CO_2 and SO_2 respectively.
Both Ag_2CO_3 and Ag_2SO_3 are white. AgCl is white but insoluble in dilute HNO_3. NaCl solution is neutral to litmus as it is a salt of strong acid and strong base.

7. Marble ($CaCO_3$) do not react, adsorb, absorb or dissolve Br_2. As such there is no change in colour of Br_2. Remaining dissolves or absorb or adsorb bromine.

8. (A) $Cd^{2+}(aq) + H_2S(g) \longrightarrow CdS \downarrow$ (yellow) $+ 2H^+(aq)$
(B) $CO_3^{2-} + 4Hg^{2+} + 3H_2O \longrightarrow HgCO_3.3HgO \downarrow$ (reddish-brown) $+ 6H^+$
HCO_3^- (aq) does not give precipitate.
(C) $SO_3^{2-} + 3Zn + 8H^+ \longrightarrow H_2S \uparrow + 3Zn^{2+} + 3H_2O$
(D) $5SO_2 + 2IO_3^- + 4H_2O \longrightarrow I_2 + 5SO_4^{2-} + 8H^+$

9. (A) $3AgCl \downarrow + AsO_3^{3-} \longrightarrow Ag_3AsO_3 \downarrow$ (yellow) $+ 3Cl^-$
AgI is unaffected by this treatment.
(B) $AgCl + 2NH_3 \longrightarrow [Ag(NH_3)_2]Cl$
AgI is not soluble in dilute ammonia solution.
(C) Both soluble in potassium cyanide, forming soluble complexes.
(D) Both insoluble in dilute HNO_3.

10. (A) $2KBr + MnO_2 + 2H_2SO_4 \longrightarrow Br_2\uparrow + 2K^+ + Mn^{2+} + 2SO_4^{2-} + 2H_2O$
(B) $2KBr + 2H_2SO_4 \longrightarrow Br_2\uparrow + SO_2\uparrow + SO_4^{2-} + 2K^+ + 2H_2O$
(C) $KBr + H_3PO_4 \longrightarrow HBr + H_2PO_4^- + K^+$
(D) $6KBr + K_2Cr_2O_7 + 7H_2SO_4 \longrightarrow 3Br_2 + 2Cr^{3+} + 2K^+ + 7SO_4^{2-} + 7H_2O$

11. BF_3 colour the flame green; $B(OC_2H_5)_3$ burns with green edged flame ; Barium chloride (volatile) gives apple green colour to flame.

12. $B_4O_7^{2-} + 4Ag^+ + H_2O \longrightarrow 4AgBO_2\downarrow$ (white) $+ 2H^+$
$2AgBO_2\downarrow + 3H_2O \xrightarrow[\Delta/H_2O]{\text{Hydrolysis}} Ag_2O\downarrow$ (brown) $+ 2H_3BO_3$

13. Cr, Mn, Fe, Co, Ni, Cu give Borax bead test.

14. NaCl-Golden yellow; KCl-Lilac; $CuCl_2$-bluish-green, $BaCl_2$-Apple green; $SrCl_2$-Crimson; $CaCl_2$-Brick red.

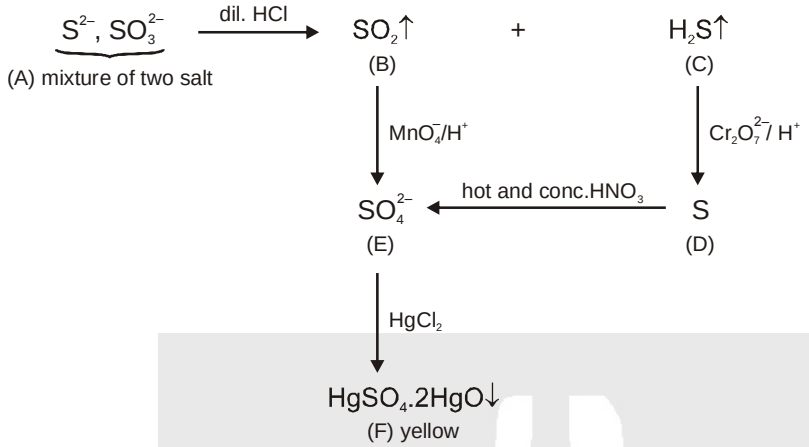
15. (i) $4Cl^- + Cr_2O_7^{2-} + 6H^+ \longrightarrow 2CrO_2Cl_2 \uparrow$ (deep red) $+ 3H_2O$
(ii) $NO_2^- + H^+ \longrightarrow HNO_2$; $3HNO_2 \longrightarrow HNO_3 + NO \uparrow + H_2O$
$2NO \uparrow + O_2 \uparrow \longrightarrow NO_2 \uparrow$ (brown)
(iii) $3I^- + 2H_2SO_4 \longrightarrow I_3^- \uparrow$ (violet) $+ SO_4^{2-} + 2H_2O + SO_2$
(iv) $2KBr + 2H_2SO_4 \longrightarrow Br_2 \uparrow$ (reddish brown) $+ SO_2\uparrow + NO_4^{2-} + 2K^+ + 2H_2O$
(v) $Cl^- + H_2SO_4 \longrightarrow HCl \uparrow$ (colourless) $+ HSO_4^-$
(vi) $2KBr + MnO_2 + 2H_2SO_4 \longrightarrow Br_2\uparrow$(reddish-brown) $+ 2K^+ + Mn^{2+} + 2SO_4^{2-} + 2H_2O$
(vii) $4NO_3^- + 2H_2SO_4 \longrightarrow NO_2 \uparrow$ (brown)
(viii) $KCl + MnO(OH)_2 + 2H_2SO_4 \longrightarrow Mn^{2+} + Cl_2\uparrow$(yellowish green) $+ 2SO_4^{2-} + 3H_2O$
(ix) $SO_3^{2-} + 2H^+ \longrightarrow SO_2 \uparrow$ (colourless) $+ H_2O$

16. (I) $Pb^{+2} + H_2S \longrightarrow \underset{\text{black}}{PbS\downarrow}$
$Cd^{+2} + H_2S \longrightarrow \underset{\text{yellow}}{CdS\downarrow}$
(II) $Zn + H_2SO_4 + SO_3^- \longrightarrow H_2S\uparrow + Zn^{2+}$
(III) Stability of carbonate $\propto$ metallic character
(IV) Borax bead test is responded by d-block metal salt.
(V) $NaCl + K_2Cr_2O_7 + H_2SO_4 \longrightarrow CrO_2Cl_2\uparrow + Cr^{3+} + SO_4^{2-}$

17. $Na_2B_4O_7.10H_2O$ contains 5 B–O–B bonds
Borax

18. a = 0 H_2O, NO^+ are not ambidentate ligand
b = 1 Fe^{+1}
a + b = 1

(19 - 21)



22. $1 \rightarrow$ $IO_3^- + SO_2 \longrightarrow I_2 + SO_4^{2-}$

I_2 + Starch $\longrightarrow$ deep blue colour

$2 \rightarrow$ $SO_2 + MnO_4^- \longrightarrow MnSO_4 + SO_4^{2-}$
colourless

$3 \rightarrow$ $Zn + NaOH + SO_2 \longrightarrow H_2S\uparrow + Zn^{2+}$
rotten egge smell

$4 \rightarrow$ $CO_2 + Ca(OH)_2 \longrightarrow CaCO_3\downarrow$ (milky)