DELHI PUBLIC SCHOOL NEWTOWN
SESSION: 2023-24
HALF YEARLY EXAMINATION

CLASS: IX **FULL MARKS: 80**
SUBJECT: CHEMISTRY [SET A] **TIME: 2 HOURS**

General Instructions:

- **The paper consists of seven printed pages.**
- **Section A is compulsory. Attempt *any four* questions from Section B.**
- **Answers should be to the point.**
- **Question numbers should be copied carefully while answering the questions.**

SECTION A

(Attempt all questions from this section)

Question 1

Choose one correct answer to the questions from the given options: **[15]**

i) The molecular formula of Nessler's reagent is:
- **(a) K_2HgI_4**
- **(b) K_3HgI_4**
- **(c) K_4HgI_4**
- **(d) K_2HgI_2**

ii) A metal which reacts with very dilute cold nitric acid to produce hydrogen:
- **(a) Sodium**
- **(b) Magnesium**
- **(c) Calcium**
- **(d) Zinc**

iii) A cation which does not have any metallic element in it is:
- **(a) Ferrocyanide**
- **(b) Phosphate**
- **(c) Ammonium**
- **(d) Dichromate**

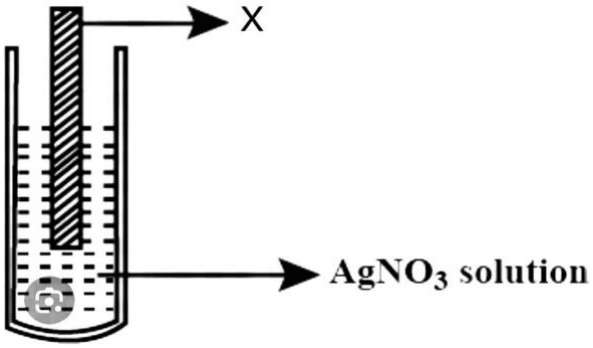
iv) The chemical name of CH_3COONa is:
- **(a) Sodium carbonate**
- **(b) Sodium formate**
- **(c) Sodium oxalate**
- **(d) Sodium acetate**

v) The substance used to remove moisture from hydrogen is:
- **(a) Anhydrous calcium chloride**
- **(b) Concentrated sulphuric acid**

(c) **Silver nitrate solution**
(d) **Lead nitrate solution**

vi) **The salt which on reaction with sodium hydroxide gives a dirty green precipitate is:**
(a) **Ferric sulphate**
(b) **Ferrous sulphate**
(c) **Zinc sulphate**
(d) **Copper sulphate**

vii) **While performing an experiment Radha dipped a metallic rod X in silver nitrate solution, the colour of the solution turned blue. Identify the metal X:**



(a) **Silver**
(b) **Iron**
(c) **Copper**
(d) **Zinc**

viii) **The ion which contains only 2 electrons:**
(a) H^{2+}
(b) H^{+}
(c) H^{2-}
(d) H^{-}

ix) **An atom has 10 neutrons and 10 protons. the valency and type of the element:**
(a) **0, noble gas**
(b) **4, non-metal**
(c) **1+, metal gas**
(d) **2+, metal**

x) **The percentage of oxygen in ammonium nitrate [Given that O = 16, N = 14, H = 1] is:**
(a) **16%**
(b) **60%**
(c) **32%**
(d) **48%**

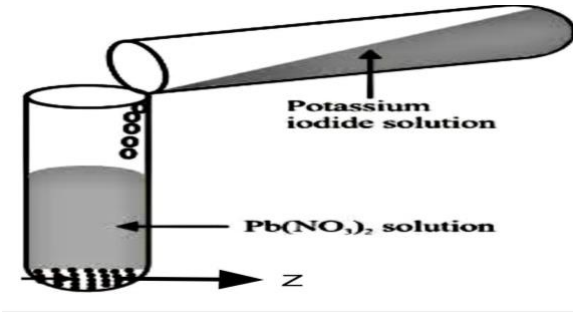
xi) **At constant temperature, if the pressure is reduced to 1/6th for a fixed mass of a gas then its volume will become:**
(a) **3 times**
(b) **1/3 times**
(c) **6 times**

(d) **no change**

xii) **A pungent smelling gas which produces a curdy white precipitate when bubbled through silver nitrate solution is:**

(a) **Carbon monoxide**
(b) **Carbon dioxide**
(c) **Hydrogen**
(d) **Hydrogen chloride**

xiii) **Study the experimental set up given and state the colour and the precipitate Z formed:**



(a) **yellow**
(b) **bluish white**
(c) **dirty green**
(d) **dense white**

xiv) **Which of the following pairs represent two atoms with the same number of neutrons?**

(a) $_{9}F^{19}$ **and** $_{20}Ca^{40}$
(b) $_{6}C^{13}$ **and** $_{7}N^{14}$
(c) $_{11}Na^{23}$ **and** $_{19}K^{39}$
(d) $_{27}Co^{59}$**and** $_{28}Ni^{59}$

xv) **Absolute zero is:**

(a) **273ºC**
(b) **-273K**
(c) **0K**
(d) **290ºC**

Question 2

i) **Write the formula for the following compounds:** **[5]**

(a) **Aluminum nitride**
(b) **Calcium bicarbonate**
(c) **Sodium phosphate**
(d) **Potassium dichromate**
(e) **Zinc acetate**

ii) Balance the following equations: [5]

(a) $Pb_3O_4 + HCl \rightarrow PbCl_2 + H_2O + Cl_2$

(b) $Ca_3N_2 + H_2O \rightarrow Ca(OH)_2 + NH_3$

(c) $NH_3 + Cl_2 \rightarrow NH_4Cl + N_2$

(d) $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

(e) $Al_4C_3 + H_2O \rightarrow Al(OH)_3 + CH_4$

iii) State one appropriate observation for the following chemical reaction taking place: [5]

(a) Chlorine is bubbled through an aqueous solution of potassium bromide.

(b) Calcium is added to cold water.

(c) Moist potassium iodide paper is introduced in a jar of nitrogen dioxide.

(d) Zinc nitrate is heated strongly in a test tube.

(e) Iron nails are added to an aqueous solution of copper sulphate.

iv) Give reasons for the following : [5]

(a) Gas laws are not valid at absolute zero.

(b) Hydrogen gas is not collected by downward displacement of air.

(c) Lime water is not used to distinguish between carbon dioxide and sulphur dioxide.

(d) Sodium is not used for the preparation of hydrogen from acids.

(e) Isotopes have same chemical properties.

v) Zidane took a small amount of a blue crystalline solid [A] in a hard glass test tube which on heating decomposes producing a reddish brown gas [B] with an irritating odour, along with a colourless, odourless neutral gas [C] which rekindles a glowing splinter and leaves behind a black residue [D] .

(a) Identify [A], [B], [C] and [D].

(b) Give a balanced chemical equation in support of your answer. [5]

SECTION B

(Attempt any four questions)

Question 3

i) The composition of two atoms P and Q is given below.

Atom	Neutrons	Protons	Electrons
P	13	11	11
Q	12	11	11

(a) What is the mass number of P?

(b) How are P and Q related to each other?

(c) Are these elements metals or non- metals? [3]

ii) Divers get 'the bends' if they come up too fast because gas in their blood expands, forming bubbles in their blood. If a diver has 0.05l of gas in his blood under a pressure of 250 atm. What will be the volume of gas in his blood when the pressure decreases to 50 atm? [2]

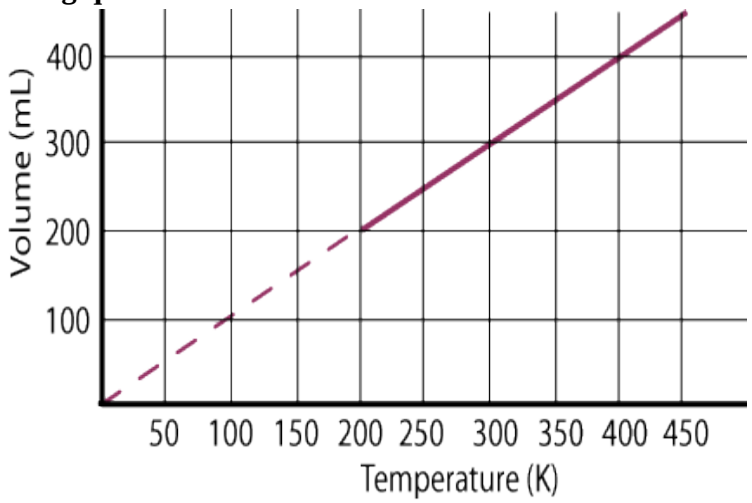
iii) Amongst the metals iron, magnesium, zinc and copper which :
(a) Reacts reversibly with steam.
(b) Reacts with both acids and alkalis to liberate hydrogen.
(c) Reacts with steam forming hydrogen and metallic oxide. [3]

iv) Give a balanced chemical equation for the preparation of the following:
(a) An acid from sulphur dioxide gas.
(b) A salt of a trivalent metal and a greenish yellow gas. [2]

Question 4

i) The formula of an oxide of a metal M is M_2O_3. Write down the formula of its : [3]
(a) Sulphate
(b) Fluoride
(c) Phosphate

ii) Study the following graph of volume versus temperature given below and answer the following questions:



(a) What is the volume of the gas at 300K?
(b) At what temperature will the gas occupy 250 ml?
(c) State the law represented by the above graph. [3]

iii) Bromine occurs in nature in the form of isotopes $_{35}Br^{79}$ (49.7%) and $_{35}Br^{81}$ (50.3%), calculate the average atomic mass of a bromine atom. [2]

iv) How would you distinguish between the following: [2]
(a) Carbon dioxide and sulphur dioxide (using acidified potassium dichromate solution)
(b) Chlorine and hydrogen chloride (using moist starch iodide paper)

Question 5

i) Name the following: **[3]**

(a) A gas which acts as an oxidizing as well as a reducing agent.

(b) A carbonate which does not decompose on heating.

(c) A compound which on heating decomposes to produce nitrogen as one of the gaseous product.

ii) Elements X, Y and Z has atomic numbers 6, 17 and 12 respectively. Which one: **[3]**

(a) Will gain one electron to achieve the octet electronic configuration?

(b) Has four electron in its valence shell?

(c) Has a tendency to achieve the electronic configuration of neon?

iii) Hydrated calcium sulphate {$CaSO_4.xH_2O$] contains 21% water of crystallization. Calculate the value of x in hydrated calcium sulphate. [Ca=40, S=32, O=16, H=1] **[2]**

iv) Draw the orbit diagram of the structure of the following atoms : **[2]**

(a) Potassium

(b) Silicon

Question 6

i) Correct the following statements by adding suitable word/s. **[3]**

(a) Ammonia gas turns red litmus paper blue.

(b) A brown precipitate is obtained when sodium hydroxide solution is added to a solution of ferric sulphate solution.

(c) Oxygen turns pyrogallol solution brown.

ii) With respect to the industrial preparation of hydrogen answer the following: **[3]**

(a) Write the chemical equation for the production of water gas.

(b) Write the chemical equation for the catalyzed reaction.

(c) How is hydrogen separated from unused carbon monoxide?

iii) Complete and balance the following ionic equations and classify them into oxidation or reduction reaction : **[4]**

(a) $Mn^{5+} \rightarrow Mn^{3+}$

(b) $Cl^- \rightarrow Cl_2$.

(c) $Cu \rightarrow Cu^{2+}$

(d) $O_2 \rightarrow O^{2-}$

Question 7

i) 100 ml of nitrogen collected at 27°C and 720 mm Hg is cooled to -73°C under a pressure of 760 mm Hg. What is the volume occupied by the gas? **[3]**

ii) Write balanced equations for the following conversions: **[3]**

(a) Copper carbonate to copper oxide

(b) Lead to sodium plumbite

(c) Silver chloride to silver

iii) With respect to the equations given below answer as instructed: **[4]**

(a) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ (identify the oxidizing agent)

(b) $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$ (identify the substance undergoing reduction)

(c) $MnO_2 + 4HCl \rightarrow MnCl_2 + 4H_2O + Cl_2$ (identify the reduced product)

(d) $H_2S + Cl_2 \rightarrow 2HCl + S$ (identify the oxidized product)

Question 8

i) In the given diagram of atom Q, shell C contains one-fourth of the number of electrons present in shell B : **[5]**

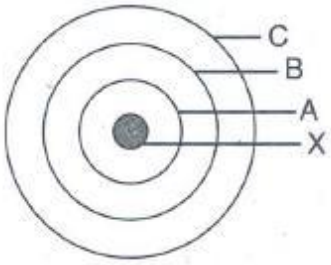
(a) What is the atomic number of Q?

(b) Write the electronic configuration of Q?

(c) If the number of neutrons present in Q is 14, what is the mass number of Q?

(d) State whether Q forms a cation or anion?

(e) Write the formula of the compound formed between Q and oxygen.



ii) A small piece of potassium metal is put into a small trough containing water. **[5]**

(a) Name the gas formed in the reaction.

(b) Give one chemical test for the identification of the gas.

(c) Write an equation for the reaction taking place.

(d) State the type of reaction taking place.

(e) State one relevant observation for the reaction between potassium and water.