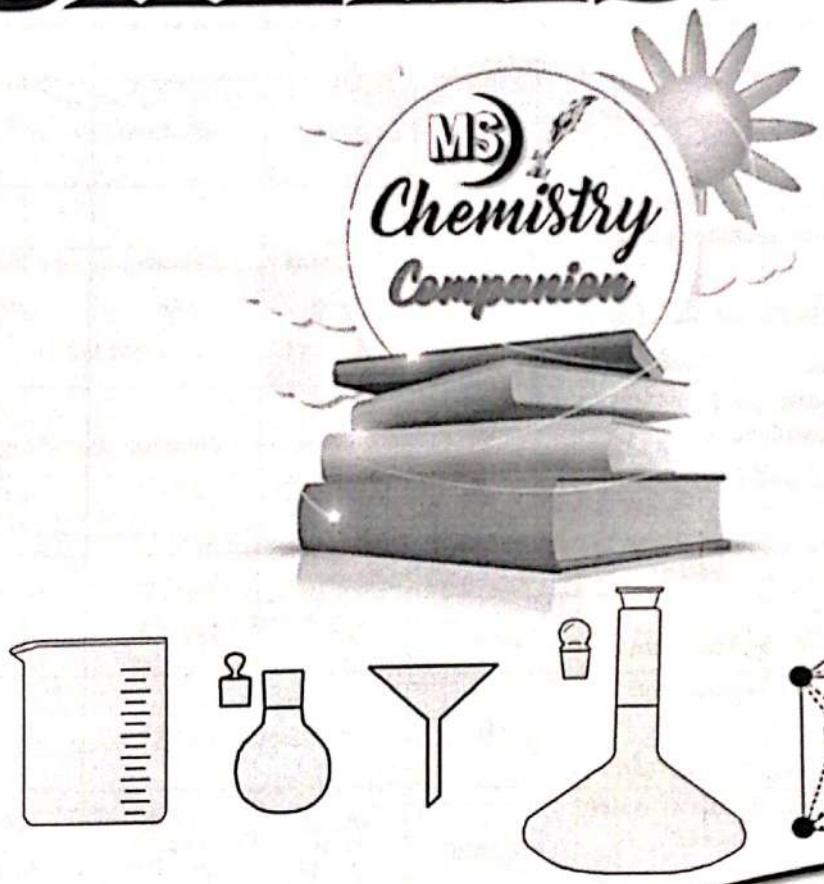
MS CHEMISTRY SERIES

Short Notes
(MS Pass Formula)
Important short
and long question

MS Easy Notes for

9TH

CHEMISTRY



- Complete Solution of Exercise MCQs
- Previous Board Papers (2012-2024)
- Long question of exercise
- Explanation of Important Points

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FUNDAMENTALS OF CHEMISTRY

Sr. #	Questions	A	B	C	D
1 (c) (2016) (2017)	Industrial chemistry deals with the manufacturing of compounds: انڈسٹریل کیمسٹری کا تعلق کمپاؤنڈز کی ایسی تیاری سے ہے جو:	In the laboratory لیبارٹری میں ہو	On micro scale مائیکرو سکیل پر ہو	On commercial scale تجارتی پیمانے پر ہو	On economic scale معاشیاتی پیمانے پر ہو
2 (a) (2016) (2016) (2016)	Which one of the following compounds can be separated by physical means? درج ذیل میں سے کس کے اجزا کو طبیعی طریقوں سے الگ الگ کیا جا سکتا ہے؟	Mixtures مکسچرز	Elements ایلیمنٹس	Compounds کمپاؤنڈز	Radicals ریڈیکلز
3 (a) (2014) (2017) (2018) (2023)	The most abundant element occurring in the oceans is: سمندر میں پائے جانے والے ایلیمینٹس میں سب سے زیادہ کونسا ایلیمنٹ پایا جاتا ہے؟	Oxygen آکسیجن	Hydrogen ہائڈروجن	Nitrogen نائٹروجن	Silicon سلیکان
4 (a)	Which one the following elements are found in most abundance in the Earth's crust? درج ذیل میں سے کون سا ایلیمنٹ کرہ ارض میں سب سے زیادہ پایا جاتا ہے؟	Oxygen آکسیجن	Aluminum ایلومینیم	Silicon سلیکان	Iron آئرن
5 (d)	The third abundant gas found in the Earth's atmosphere is? کرہ ارض میں کثرت کے لحاظ سے تیسرے نمبر پر کون سی گیس پائی جاتی ہے؟	Carbon monoxide کاربن ڈائی آکسائڈ	Oxygen آکسیجن	Nitrogen نائٹروجن	Argon آرگون
6 (b) (2014) (2016) (2019)	One amu (atomic mass unit) is equivalent to: ایک amu (اٹامک ماس یونٹ) کس کے برابر ہے؟	1.66×10^{-24} mg ملی گرام	1.66×10^{-24} g گرام	1.66×10^{-24} kg کلوگرام	1.66×10^{-23} g گرام
7 (a) (2017)	Which one the following molecule is not tri-atomic? درج ذیل میں سے کونسا ٹرائی اٹامک مالیکیول نہیں ہے؟	H_2	O_3	H_2O	CO_2
8 (a) (2021)	The mass of one molecule of water is: پانی کے ایک مالیکیول کا ماس کتنا ہے؟	18 amu	18 gram 18 گرام	18 mg 18 ملی گرام	18 kg 18 کلوگرام
9 (a) (2015) (2021) (2023)	The molar mass of H_2SO_4 is: H_2SO_4 کا مولر ماس ہے؟	98 gram 98 گرام	98 amu	9.8 gram 9.8 گرام	9.8 amu
10 (a)	Which one of the following is a molecular mass of O_2 in amu? درج ذیل میں سے O_2 کا مولر ماس amu میں کون سا ہے؟	32 amu	53.12×10^{-24} amu	1.92×10^{-25} amu	192.64×10^{-25} amu

11 (b)	How many number of moles are equivalent to 8 grams of CO_2? 8 گرام CO_2 کے کتنے مولز کے برابر ہیں؟	0.15	0.18	0.21	0.24
12 (c)	In which one of following pairs has the same number of ions? درج ذیل میں سے کس جوڑے کے ارکان میں آئنز کی تعداد برابر ہے؟	1 mole of NaCl and 1 mole of $MgCl_2$ 1 mole NaCl یا 1 mole $MgCl_2$	½ mole of NaCl and ½ mole of $MgCl_2$ ½ mole NaCl یا ½ mole $MgCl_2$	½ mole of NaCl and 1/3 mole of $MgCl_2$ ½ mole NaCl یا 1/3 mole $MgCl_2$	1/3 mole of NaCl and ½ mole of $MgCl_2$ 1/3 mole NaCl یا ½ mole $MgCl_2$
13 (a)	Which one the following pairs has the same mass? درج ذیل میں سے کس جوڑے کے ارکان کا ماس برابر ہے؟	1 mole of CO and 1 mole of N_2 1 mole CO یا 1 mole N_2	1 mole of CO and 1 mole of CO_2 1 mole CO یا 1 mole CO_2	1 mole of O_2 and 1 mole of N_2 1 mole O_2 یا 1 mole N_2	1 mole of O_2 and 1 mole of CO_2 1 mole O_2 یا 1 mole CO_2

MCQs of Previous Board Papers

14 (b) (2012)	Number of carbon atoms present in **one molecule** of glucose are: گلوکوز کے ایک مالیکیول میں کاربن کے ایٹمز کی تعداد کتنی ہے؟	12	6	11	22
15 (c) (2014)	The symbol of boron is: بورون کا سمبل ہے؟	Be	Br	B	Ba
16 (a) (2014)	Gram atomic mass of hydrogen is ہائڈروجن کا گرام اٹامک ماس ہے؟	1.008 g	2.016 g	1.008 amu	2.016 amu
17 (c) (2015) (2023)	Empirical formula of benzene is: بینزین کا امپریکل فارمولا ہے؟	C_6H_6	C_2H_2	CH	CH_2O
18 (c) (2015)	Mass of Neutron is? نیوٹرون کا ماس ہے:	1.0073 amu	1.0080 amu	1.0087 amu	2.016 amu
19 (a) (2015)	12 g of carbon contain atoms: کاربن کے 12 گرام میں ایٹموں کی تعداد ہے؟	6.02×10^{23}	12.04×10^{23}	1.672×10^{-24}	18.06×10^{23}
20 (b) (2016)	Atomic number of element is expressed by the letter: ایلیمنٹ کا اٹامک نمبر حرف سے ظاہر کیا جاتا ہے؟	Q	Z	N	O
21 (b) (2016)	The molar mass of H_3PO_4 is: H_3PO_4 کا مولر ماس ہے؟	98 amu	98 g 98 گرام	9.8 g 9.8 گرام	96 g 96 گرام
22 (b) (2016)	Example of diatomic molecule is: ڈائی اٹامک مالیکول کی مثال ہے۔	CO_2	HCl	H_2O	O_3
23 (c) (2017)	Atomic number of oxygen: آکسیجن کا اٹامک نمبر ہے۔	6	9	8	10

24 (c) (2018)	The most abundant gas found in the atmosphere is? کرہ ہوائی میں سب سے زیادہ پائی جانے والی کون سی گیس ہے؟	Carbon monoxide کاربن ڈائی آکسائڈ	Oxygen آکسیجن	Nitrogen نائٹروجن	Argon آرگون
25 (a) (2018)	Empirical formula of benzene is: بینزین کا امپریکل فارمولا ہے:	CH	OH	NH_3	CH_4
26 (a) (2019)	The formula of aluminium sulphate is: ایلومینیم سلفیٹ کا فارمولا ہے:	$Al_2(SO_4)_3$	$AlSO_4$	$Al(SO_4)_3$	$Al_3(SO_4)_3$
27 (d) (2022)	Which one is the example of mixture? کونسی ایک مکسچر کی مثال ہے؟	Sugar شوگر	Oxygen آکسیجن	Water پانی	Air ہوا
28 (b) (2022)	The study of manufacturing of chemical compounds on commercial base is: تجارتی پیمانے پر کیمیاوٹنڈز کے بنانے کے طریقوں کا مطالعہ ہے۔	Physical chemistry فزیکل کیمسٹری	Industrial chemistry انڈسٹریل کیمسٹری	Inorganic chemistry ان آرگینک کیمسٹری	Biochemistry بائیو کیمسٹری
29 (b) (2022)	The study of manufacturing of sulphuric acid on commercial base is an application of: صنعتی (تجارتی) پیمانے پر سلفیورک ایسڈ کی تیاری کس کے تحت آتی ہے؟	Organic chemistry آرگینک کیمسٹری	Industrial chemistry انڈسٹریل کیمسٹری	Inorganic chemistry ان آرگینک کیمسٹری	Biochemistry بائیو کیمسٹری
30 (c) (2022)	The development of chemical industry has generated: کیمیکل انڈسٹری کی ترقی نے پیدا کی ہے:	Un-employment بے روزگاری	Malnutrition غذائیت کی کمی	Polluted air آلودہ ہوا	Lack of transport ٹرانسپورٹ کی کمی
31 (c) (2023)	The removal of electrons from an atom gives? ایٹم سے الیکٹرون کے اخراج سے بنتا ہے۔	Anion اینائن	Molecule مالیکیول	Cation کیٹائن	Molecular ion مالیکیولر آئن
32 (b) (2024)	Which one is an example of heterogeneous mixture? ان میں سے کونسی ہیٹروجینس مکسچر کی مثال ہے؟	Air ہوا	Rock چٹان	Ice cream آئس کریم	Gasoline گیسولین
33 (c) (2024)	The mass number is the sum of number of: ماس نمبر مجموعہ ہے:	Proton and electron پروٹان اور الیکٹرون	Neutron and electron نیوٹران اور الیکٹرون کا	Protons and neutrons پروٹانز اور الیکٹرونز کا	Protons only صرف پروٹانز
34 (a) (2024)	The molar mass of H_2SO_4 is: H_2SO_4 کا مولر ماس ہے؟	98 gram of H_2SO_4 98 گرام کے H_2SO_4	96 gram of H_2SO_4 96 گرام کے H_2SO_4	94 gram of H_2SO_4 94 گرام کے H_2SO_4	92 gram of H_2SO_4 92 گرام کے H_2SO_4
35 (d) (2024)	The molecular mass of CO_2 is: CO_2 کا مالیکیولر ماس ہے؟	32 gram	32 amu	44 gram	44 amu

(1) Define industrial chemistry.

Industrial chemistry can be defined as "The branch of chemistry which deals with the manufacturing of chemical compounds on commercial scale" e.g. preparation oxygen (O_2), chlorine (Cl_2), ammonia (NH_3) caustic soda (NaOH) etc.

(2) Define analytical chemistry.

Analytical chemistry is defined as "The branch of chemistry which deals with separation and analysis of a sample to identify its components".

(3) Define physical chemistry.

"The branch of chemistry which deals with the relationship between the composition and physical properties of matter and the changes in them, is called physical chemistry" e.g. behaviour of gases, liquids and solids etc.

(4) Define biochemistry and give its scope.

It deals with all the chemical processes taking place in living organisms. It has application in fields of medicine, food science etc.

(5) Define organic chemistry.

The branch of chemistry which deals with the study of covalent compounds of carbon, hydrogen (hydrocarbons) and their derivatives. Organic compounds may be natural or artificially synthesized.

(6) Define inorganic chemistry.

The branch of chemistry which deals with study of all elements and their compounds except hydrocarbons. It has vast applications in glass industry, cement industry etc.

(7) What is a mixture? Give one example.

Mixture is defined as "When elements or compounds are mixed in any ratio mixture is formed". For example air, ice cream, soil, rock wood etc.

(8) What is difference of homogeneous heterogeneous mixture? (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Homogeneous mixture	Heterogeneous mixture
1	A mixture having throughout uniform composition is called homogeneous mixture.	A mixture having throughout non-uniform composition is called heterogeneous mixture.
2	Examples: Air, ice, cream, sugar, solution etc.	Examples: Wood, soil, rock, etc.

(9) What is relative atomic mass? How is it related to gram? Write its unit.

"The average mass of the atoms of an element as compared to $1/12^{th}$ the mass of an atom of C-12 isotope". The unit of relative atomic mass is called amu (atomic mass unit)

1 amu = 1.66×10^{-24} gram

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(10) Define empirical formula with an example.

The formula which shows the simplest whole number ratio of atoms present in a compound is called empirical formula. For example the empirical formula of benzene is CH.

(11) Define molecular formula with an example.

The formula which shows the actual number of atoms of each element in a molecule is called molecular formula. For example the molecular formula of benzene is C_6H_6.

(12) How molecular formula is derived from empirical formula?

The molecular formula is derived from empirical formula by the following relationship.

Molecular formula = $(\text{Empirical formula})_n$

Where "n" is 1, 2, 3 and so on.

(13) Define valency. Write the valency of Na.

The combining capacity of an element with other element is called valency. The valency of Na is 1+.

(14) Determine the molecular mass of Nitric acid (HNO_3).

Atomic mass of H = 1 amu
Atomic mass of N = 14 amu
Atomic mass of O = 16 amu
Molecular formula = HNO_3
Molecular mass = ?
= 1 (At. Mass of H) + 1 (At. Mass of N) + 3 (At. Mass of O)
= (1 × 1) + (1 × 14) + (3 × 16)
= 1 + 14 + 48

= 63 amu

(15) Define free radical.

It is defined as "Atoms or group of atoms having odd number of electron i.e. unpaired electron is called free radical". e.g. $H^{\cdot}$, $Cl^{\cdot}$, $H_3C^{\cdot}$ etc.

(16) Define ion with an example. How they are formed?

It can be defined as "An atom or group of atoms having a charge on it". For example Na^+, Cl^- etc. These are formed when an electron is added or removed from the valance shell of an atom.

$Na \rightarrow Na^+ + 1e^-$
$Cl + 1e^- \rightarrow Cl^-$

(17) Define cations with an example. How they are formed?

An atom or group of atoms having positive charge on it is called cation. For example Na^+, K^+ etc. These are formed when atoms lose electrons from their valance shell.

$Na \rightarrow Na^+ + 1e^-$

(18) Define anions with an example. How they are formed?

An atom or group of atoms having negative charge on it is called anion. For example Cl^-, O^{2-} etc. These are formed when an atom gain electron.

$Cl + 1e^- \rightarrow Cl^-$

(19) Define types of molecules and give example of each. (Also A long Question).

Monoatomic molecules: A molecule consisting of one atom is called monoatomic molecule. For example neon (Ne) argon (Ar) etc.

Diatomic molecules: A molecule consisting of two atoms is called diatomic molecule. For example H_2, CO, O_2, etc.

Triatomic molecules: A molecule consisting of three atoms is called triatomic molecule. For example H_2O, CO_2, O_3 etc.

Polyatomic molecules: A molecule consisting of many atoms is called polyatomic molecule. For example methane (CH_4), benzene (C_6H_6) etc.

Homoatomic molecules: A molecule containing same type of atoms is called homoatomic molecule. For example Hydrogen (H_2) Sulphur (S_8) Ozone (O_3) Oxygen (O_2) etc.

Heteroatomic molecules: A molecule containingdifferent type of atoms is called heteroatomic molecule. For example Carbon dioxide (CO_2), Water (H_2O) Ammonia (NH_3) Carbon monoxide (CO) etc.

(20) Differentiate between atomic number and mass number.

OR

Define atomic number and atomic mass. (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Atomic number	Mass number
1	Atomic number of an element is equal to the number of protons present in the nucleus of its atoms	Mass number is the sum of protons and neutrons present in the nucleus of an atom.
2	It is denoted by Z.	It is denoted by A

(21) Calculate the number of moles in 9 gram of carbon.

Given mass of carbon = 9 gram
Molar mass of carbon = 12 g mol^{-1}
Number of moles of carbon = $\frac{\text{Known mass of Carbon}}{\text{Molar Mss of C}}$

Number of moles of carbon $= \frac{9}{12}$

Number of moles of carbon $= 0.75$ moles

9 gram of carbon have 0.75 moles (Answer)

(22) Calculate the number of moles in 6 gram of water.

Given mass of water $= 6$ gram

Molar mass of water $= 12$ g mol^{-1}

Number of moles of water $= \frac{\text{Known mass of water}}{\text{Molar Mass of water}}$

Number of moles of water $= \frac{6}{18}$

Number of moles of water $= 0.33$ moles

6 gram of water 0.33 moles (Answer)

(23) What is meant by mole? Give an example. (Also a long question)

A **mole** is defined as "The amount (mass) of a substance that contains 6.02×10^{23} number of particles (atoms, molecules or formula units)". It is abbreviated as "*mol*".

OR

The quantitative definition of **mole** is "The atomic mass, molecular mass or formula mass of a substance expressed in gram is called mole".

Example: (مختصر سوال کے لیے کوئی ایک پوائنٹ یاد کرلیں)

- 6.02×10^{23} atoms of "C" are equivalent to one mole of carbon.
- 6.02×10^{23} molecules of H_2O are equivalent to one mole of water.
- 6.02×10^{23} formula units of NaCl are equivalent to one mole of sodium chloride.

LONG QUESTIONS

I. Write down differences between compound and mixture. (کوئی سے چار یا پانچ پوائنٹ یاد کرلیں اور پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Compound	Mixture
1	It is formed by the chemical combination.	It is formed by simple mixing of substances.
2	It cannot be separated by physical methods.	It can be separated into its components by physical methods.
3	It has fixed composition.	It does not have fixed composition.
4	It has chemical formula.	It does not have chemical formula.
5	It has sharp melting point.	It does not have fixed melting point.
6	It is always homogeneous.	It may be homogeneous or heterogeneous.
7	Components lose their identity.	Components show their identity.

II. How chemical formula is written? Explain its three steps.

There are following steps involved while writing the chemical formula of compound.

- Symbols of two elements are written side by side in such a way that positive ion first and negative ion latter.
- The valency of each ion is written on the upper right corner of its symbol e.g.

  $Na^{+}Cl^{-}$, $Ca^{2+}Cl^{-}$ and $Ca^{2+}O^{2-}$

- The valency of each ion is brought to the lower right corner of other ion by cross exchange method e.g.

- If the valencies are same, they will be offset otherwise not. They are written as

  NaCl, $CaCl_2$ and CaO

- If a radical is present, then write it in parenthesis. For example aluminum sulphate $Al_2(SO_4)_3$ formation.

III. Write down significance of chemical formula.

Significance:

- It represent the name of compound e.g. H_2O (Water).
- It shows the name of the elements present in the compound.
- It shows the mass of the compound in amu or grams.
- It is one molecule or formula unit of the compound.
- In a balanced chemical equation, it shows the one of compound.

IV. Differentiate between molecule and molecular ion. (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Molecule	Molecular ion
1	It is the smallest particle of an element or compound.	It is formed by gain or loss of electrons by a molecule.
2	It can exist independently.	It cannot exist independently.
3	It is always neutral.	It have negative or positive charge.
4	It is a stable unit.	It is unstable unit (reactive specie).
5	It is formed by combination atoms.	It is formed by ionization of molecule.

STRUCTURE OF ATOMS

Sr. #	Questions	A	B	C	D
1 (b) (2016)	Which one the following results in the discovery of protons: ان میں سے کس کے نتیجے میں پروٹون کی دریافت ہوئی؟	Cathode rays کیتھوڈ ریز	Canal rays کینال ریز	X-rays ایکس ریز	Alpha rays الفا ریز
2 (c)	Which one of the following is the most penetrating? ان میں سے کون سے پارٹیکلز مادے میں سب سے زیادہ سرائیت کرنے والے ہیں؟	Protons پروٹونز	Electrons الیکٹرونز	Neutrons نیوٹرونز	Alpha particles الفا پارٹیکلز
3 (c)	The concept of orbit was used by: ایٹم کے آربٹ کا تصور کس نے پیش کیا:	J.J Thomson جے جے تھامسن	Rutherford رودر فورڈ	Bohr بوہر	Planck پلانکس
4 (d) (2017) (2018) (2019)	Which one the following shell consist of three subshells. ان میں سے کونسا شیل تین سب شیل پر مشتمل ہے؟	O shell O شیل	N shell N شیل	L shell L شیل	M shell M شیل

5 (a) (2016)	Which radioisotope is used for the diagnosis of tumor in the body? کون سا ریڈیو آئسوٹوپ جسم میں ٹیومر کی تشخیص کے لیے استعمال کیا جاتا ہے؟	Cobalt-60 60-کوبالٹ	Iodine-131 131-آیوڈین	Strontium-90 90-سٹرونشیم	Phosphorus-32 32-فاسفورس
نوٹ: آئیوڈین اور کوبالٹ دونوں ہی ٹیومر کی تشخیص (Diagnosis) کے لیے استعمال ہوتے ہیں۔ لیکن آئیوڈین صرف گوئٹر کی تشخیص diagnosis کے لیے استعمال ہوتا ہے۔ جبکہ کوبالٹ کسی بھی قسم کے ٹیومر کی تشخیص diagnosis کے لیے استعمال ہوتا ہے۔					
6 (b)	When U-235 breaks up, it produces: جب یورینیم-235 ٹوٹتا ہے تو اس سے پیدا ہوتے ہیں؟	Electrons الیکٹرونز	Neutrons نیوٹرونز	Protons پروٹونز	Nothing کچھ بھی نہیں
7 (c) (2021)	The p subshell has: p سب شیل مشتمل ہے۔	One orbital ایک آربیٹل پر	Two orbitals دو آربیٹل پر	Three orbitals تین آربیٹل پر	Four orbitals چار آربیٹل پر
نوٹ: کسی بھی سب شیل میں جتنے الیکٹران آتے ہیں۔ اسے 2 سے تقسیم (Divide) کرنے سے اس سب شیل میں موجود نوٹل آربیٹرکا پتا لگایا جا سکتا ہے۔ جیسے p سب شیل میں 6 الیکٹران آسکتے ہیں، اسے 2 سے تقسیم (Divide) کرنے سے جواب 3 آتا ہے۔ مطلب اس میں 3 آربیٹل ہیں۔					
8 (b) (2016) (2023)	Deuterium is used to make: ڈیوٹریم ان میں سے کیا بنانے کے لیے استعمال ہوتا ہے؟	Light water لائٹ واٹر	Heavy water ہیوی واٹر	Soft water سوفٹ واٹر	Hard water ہارڈ واٹر
9 (d)	The isotope C-12 is present in abundance of:	96.9%	97.6%	99.7%	None of these
9.1 (c) (2019)	آئسوٹوپ C-12 کتنی مقدار میں پایا جاتا ہے؟ (9th کی اردو کی کتاب کے مطابق آپشنز (Options) یہ ہیں)	96.9%	97.6%	98.9%	99.7%
10 (a) (2017)	Who discovered the proton? درج ذیل سائنسدانوں میں سے کس نے پروٹون دریافت کیے؟	Goldstein گولڈ سٹائن	J.J Thomson جے جے تھامسن	Neil's Bohr نیل بوہر	Rutherford رودر فورڈ

MCQs of Previous Board Papers

11 (c) (2012)	How many isotopes of oxygen exist? آکسیجن کے کتنے آئسوٹوپس پائے جاتے ہیں؟	2	4	3	5
12 (c) (2012)	If n = 4 than how many electrons can be accommodated in its shells? اگر n = 4 ہو تو اس کے شیلز میں کتنے الیکٹران آسکتے ہیں؟	18	16	32	64
13 (c) (2015)	p subshell can accommodate electrons? p سب شیل میں کتنے الیکٹران آسکتے ہیں؟	2	4	6	8
14 (b) (2015)	Number of neutrons of potassium is: پوٹاشیم میں نیوٹرنز کی تعداد ہے:	19	20	39	18

15 (b) (2015)	Who is the Father of Nuclear Sciences? نیوکلیئر سائنس کا باپ کون ہے:	Neil Bohr نیل بوہر	Rutherford رودر فورڈ	Max Planck میکس پلانکس	J.J Thomson جے جے تھامسن
16 (b) (2014)	"N" shell can accommodate electrons: N شیل میں کتنے الیکٹران آسکتے ہیں؟	18	32	8	2
17 (b) (2015)	Electronic configuration of Nitrogen is: نائٹروجن کی الیکٹرونک کنفگریشن ہے۔	$1s^2, 2s^2, 2p^2$	$1s^2, 2s^2, 2p^3$	$1s^2, 2s^2, 2p^4$	$1s^2, 2s^2, 2p^5$
18 (b) (2014)	"M" shell can accommodate maximum number of electrons: M شیل میں زیادہ سے زیادہ الیکٹران آسکتے ہیں؟	32	18	8	2
19 (c) (2018)	Charge on neutron is: نیوٹران پر چارج ہوتا ہے	Negative منفی	Positive مثبت	No کوئی نہیں	Partial positive جزوی مثبت
20 (b) (2018)	Who discovered the electron? درج ذیل سائنسدانوں میں سے کس نے الیکٹرون دریافت کیے؟	Goldstein گولڈسٹائن	J.J Thomson جے جے تھامسن	Neil's Bohr نیل بوہر	Rutherford رودر فورڈ
21 (c) (2021) (2024)	"L" shell can accommodate electrons: L شیل میں کتنے الیکٹران آسکتے ہیں؟	18	32	8	2
22 (b) (2022)	Number of neutrons in deuterium $^{2}_{1}H$ isotope is ڈیوٹیریم آکسوٹوپ میں نیوٹرنز کی تعداد ہے:	Zero صفر	One ایک	Two دو	Three تین
23 (d) (2022)	Almost all the particles passed through the foil undeflected. This observation was made by: تقریباً تمام الفا پارٹیکلز ورق میں سے بغیر راستہ تبدیل کیے گزر گئے۔ یہ مشاہدہ ہے:	Dalton ڈالٹن	J.J Thomson جے جے تھامسن	Bohr بوہر	Rutherford رودر فورڈ
24 (c) (2023)	M shell consists of no o subshells. M شیل کتنے سب شیل پر مشتمل ہوتا ہے؟	1	2	3	4
24 (c) (2024)	J.J Thomson was a____: جے جے تھامسن ____ تھا:	British Chemist برطانوی کیمیادان	British Economist برطانوی معیشت دان	British Physicist برطانوی طبیعات دان	British Dentist برطانوی دندان ساز

1. Give two characteristics of cathode rays. (Also A long Question).

- They cast a sharp shadow of an opaque (غیر شفاف) object placed in their path.
- They are deflected (جاتا) towards positive plate in an electric filed.
- They raise the temperature of the body on which they fall.
- They travel in a straight line.

2. Write down any two properties of neutrons. (Also A long Question).

Neutrons has following proerties

- Neutrons carry no charge i.e. they are neutral.
- They are highly penetrating.
- Their mass is nearly equal to mass of proton.
- They show no deflection in electric or magnetic field.

3. Give two properties of positive rays. (Also A long Question).

- They travel in a straight line opposite to the direction of cathode rays.
- The nature of these rays depends upon the nature of gas present in discharge tube.
- They show deflection in electric and magnetic field.
- For hydrogen atom, Mass of these particles was found equal to that of proton.

4. For what purpose U-235 is used?

U-235 is used to get large amount of energy by controlled nuclear fission process in nuclear reactors. This energy can be used to generate electricity.

5. A patient has goiter (گلہڑ). How will it be detected?

OR

For what purpose Iodine-131 is used?

Iodine-131 is used to detect or diagnose (تشخیص کرنا) the goiter in thyroid gland.

6. What are the defects of Rutherford's atomic model?

Following are the defects in the Rutherford's atomic model.

- Electron being the charged particle should release energy continuously and ultimately fall into nucleus.
- If the electrons emit energy continuously, they should form a continuous spectrum, but they form line spectrum.

7. Write two observations of Rutherford atomic model.

- Almost all the particles passed through the foil undeflected.
- Out of 20,000 particles, only a few were deflected at fairly large angles and very few bounced back on hitting the gold foil.

8. Write down two postulates of Bohr's atomic theory. (Also A long Question).

- The hydrogen atom consist of a tiny nucleus and electrons are revolving in one of circular orbits having radius "r".
- Each orbit has a fixed energy that is quantized.
- Electrons can revolve only in those orbits which have fix angular momentum (mvr) i.e. $mvr = n\frac{h}{2\pi}$
- When an electron changes its shell, energy is absorbed or released.

9. Define term carbon dating.

"The method of age determination (معلوم کرنا) of old carbon containing objects (fossils) by measuring the radioactivity of C-14 in them is called carbon dating or radio-carbon dating".

10. Define electronic configuration.

OR

What is meant by electronic configuration?

It can be defined as "The distribution of electrons around the nucleus in different shells and subshells according to their increasing energy is called electronic configuration".

11. How many electrons are present in K, L, M and N shells of the atom?

Number of electrons in K shell	= 2	Number of electrons in L shell	= 8
Number of electrons in M shell	= 18	Number of electrons in N shell	= 32

12. How many electrons are present in s, p, d and f subshells of the atom?

Number of electrons in **s** subshell	= 2	Number of electrons in **p** subshell	= 6
Number of electrons in **d** subshell	= 10	Number of electrons in **f** subshell	= 14

13. Write the electronic configuration of Hydrogen, boron, nitrogen, oxygen, sodium, aluminium, Al^{3+} ion, Cl^- ion and phosphorus?

The electronic configuration of **hydrogen** is **$1s^1$.**

The atomic number of Boron is 5 so it have 5 electrons.

Electronic configuration of **boron** is **$1s^2, 2s^2, 2p^1$**

The atomic number of Nitrogen is 7 so it have 7 electrons.
Electronic configuration of **Nitrogen** is $1s^2, 2s^2, 2p^3$
The atomic number of Oxygen is 8 so it have 8 electrons.
Electronic configuration of **Oxygen** is $1s^2, 2s^2, 2p^4$
The atomic number of Sodium is 11 so it have 11 electrons.
Electronic configuration of **sodium** is $1s^2, 2s^2, 2p^6, 3s^1$
The atomic number of Aluminium is 13 so it have 13 electrons.
Electronic configuration of **aluminium** is $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$
When Al^{3+} **ion** is formed, it loses 3 electrons, now number of electrons are 10.
Electronic configuration of Al^{3+} **ion** is $1s^2, 2s^2, 2p^6$
The atomic number of phosphorus is 15 so it have 15 electrons.
Electronic configuration **phosphorus is** $1s^2, 2s^2, 2p^6, 3s^2, 3p^3$
When P^{-3} **ion** is formed, it gains 3 electrons, now number of electrons are 18.
Electronic configuration P^{-3} **ion** is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$
The atomic number of **Cl** is17 so it have 17 electrons
Electronic configuration **Cl** is $1s^2, 2s^2, 2p^6, 3s^2, 3p^5$
When Cl^- **ion** is formed, it gains 1 electron, now number of electrons are 18.
Electronic configuration Cl^- **ion** is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$

14. Write down two isotopes of followings:
Hydrogen, Chlorine, Uranium Oxygen, and Carbon.
There are following isotopes of Chlorine Uranium Oxygen and Carbon.

$^{35}_{17}Cl$ $^{37}_{17}Cl$, $^{234}_{92}U$ $^{235}_{92}U$ $^{238}_{92}U$ $^{16}_{8}O$ $^{17}_{8}O$ $^{18}_{8}O$ $^{12}_{6}C$ $^{13}_{6}C$ $^{14}_{6}C$

Isotopes of hydrogen.

Protium ($^{1}_{1}H$) Deuterium ($^{2}_{1}H$) Tritium ($^{3}_{1}H$)

LONG QUESTIONS

I. **Describe the result of the experiments of Rutherford.**
II. **Write down postulates of Bohr's atomic theory.** (جواب اوپر مختصر سوالوں کے ساتھ دیا گیا ہے)
III. **Write properties of cathode rays.** (جواب اوپر مختصر سوالوں کے ساتھ دیا گیا ہے)
IV. Discuss uses of isotopes in detail.
V. **Give any two differences between Rutherford's atomic theory and Bohr's atomic theory.**
Differences between Rutherford's atomic theory and Bohr's atomic theory are given following.

Sr. No	Rutherford's Atomic Theory	Bohr's Atomic Theory
1	It was based upon classical theory.	It was based upon quantum theory.
2	No idea about orbit was introduced.	Orbits had angular momentum.
3	Atom should produce continuous spectrum.	Atom should produce line spectrum.
4	Atoms should collapse.	Atoms should exist.

PERIODIC TABLE AND PERIODICITY OF PROPERTIES

Sr. #	Questions	A	B	C	D
1 (b)	The atomic radii of the elements in Periodic Table: پیریاڈک ٹیبل میں ایلیمنٹس کا اٹامک ریڈیس:	Increase from left to right in a period پیریڈ میں بائیں سے دائیں بڑھتا ہے	Increase from top to bottom in a group گروپ میں اوپر سے نیچے بڑھتا ہے	Do not change from left to right in a period پیریڈ میں بائیں سے دائیں تبدیل نہیں ہوتا	Decrease from top to bottom in a group گروپ میں اوپر سے نیچے کم ہوتا ہے
2 (d) (2015) (2019) (2021) (2023)	The amount of energy given out when an electron is added to an atom is called: جب ایٹم میں ایک الیکٹرون جمع کیا جاتا ہے تو انرجی کی جو مقدار خارج ہوتی ہے، کہلاتی ہے۔	Lattice energy لیٹس انرجی	Ionization energy آئیونائزیشن انرجی	Electronegativity الیکٹرونیگیٹویٹی	Electron affinity الیکٹرون افینٹی
3 (b)	Mendeleev Periodic Table was based upon the: مینڈلیف کے پیریاڈک کی بنیاد ہے۔	Electronic configuration الیکٹرونک کنفگریشن	Atomic mass اٹامک ماس	Atomic number اٹامک نمبر	Completion of a subshell سب شیل کا مکمل ہونا
4 (b) (2016) (2016)	Long form of Periodic Table is constructed on the basis of: لونگ فارم آف پیریاڈک ٹیبل کی بنیاد ہے۔	Mendeleev Postulate مینڈلیف کا اصول	Atomic number اٹامک نمبر	Atomic mass اٹامک ماس	Mass number ماس نمبر
5 (c) (2016) (2017)	4th and 5th period of the long form of Periodic Table are called: لونگ فارم آف پیریاڈک ٹیبل کی موجودہ شکل میں چوتھا اور پانچواں پیریڈ کہلاتا ہے۔	Short periods شارٹ پیریڈ	Normal periods نارمل پیریڈ	Long periods لونگ پیریڈ	Very long periods ویری لونگ پیریڈ
6 (d) (2015) (2018) (2024)	Which one of the following halogen has lowest electronegativity? مندرجہ ذیل میں سے کس ہیلوجن کی الیکٹرونیگیٹویٹی سب سے کم ہے؟	Fluorine فلورین	Chlorine کلورین	Bromine برومین	Iodine آئیوڈین
7 (a)	Along the period, which one of the following decreases: ایک پیریڈ میں ان میں سے کون سی چیز کم ہوتی ہے؟	Atomic radius اٹامک ریڈیس	Ionization energy آئیونائزیشن انرجی	Electron affinity الیکٹرون افینٹی	Electro-negativity الیکٹرونیگیٹویٹی
8 (b) (2014) (2016) (2016) (2017)	Transition elements are: ٹرانزیشن ایلیمنٹس ہوتے ہیں۔	All gases تمام گیسز	All metals تمام میٹلز	All non-metals تمام نان میٹلز	All metalloids تمام میٹلائڈز

9 (c)	Mark the incorrect statement about ionization energy: آئیونائزیشن انرجی کے متعلق غلط بیان کی نشاندہی کریں۔	It is measured in $kJmol^{-1}$ اسکی پیمائش $kJmol^{-1}$ میں کی جاتی ہے	It is absorption of energy یہ انرجی کا جزب ہونا ہے	It decreases in a period یہ پیریڈ میں بتدریج کم ہوتی ہے	It decreases in a group یہ گروپ میں بتدریج کم ہوتی ہے
10 (c)	Point out the incorrect statement about electron affinity: الیکٹرون افینٹی کے متعلق غلط بیان کی نشاندہی کریں۔	It is measured in $kJmol^{-1}$ اسکی پیمائش $kJmol^{-1}$ میں کی جاتی ہے	It involves release of energy اس میں انرجی کا اخراج ہوتا ہے	It decreases in a period یہ پیریڈ میں بتدریج کم ہوتی ہے	It decreases in a group یہ گروپ میں بتدریج کم ہوتی ہے

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11 (c) (2012)	The number of elements present in sixth period: چھٹے پیریڈ میں ایلیمنٹس کی تعداد ہے۔	18	36	32	24
12 (c) (2012)	What is valency of halogens? ہیلوجنز کی ویلنسی ہے	+1	+2	-1	-2
13 (d) (2012)	How many electrons are present in outer most shell of carbon? کاربن کے سب سے باہر والے شیل میں کتنے الیکٹرونز موجود ہیں۔	5	6	3	4
14 (c) (2014)	The radius of carbon atom is? کاربن ایٹم کا ریڈیس ہے۔	154 pm	115 pm	77 pm	38 pm
15 (a) (2014) (2018)	The first period consists of: پہلا پیریڈ مشتمل ہے۔	Two elements دو ایلیمنٹس	Three elements تین ایلیمنٹس	Four elements چار ایلیمنٹس	Five elements پانچ ایلیمنٹس
16 (a) (2014) (2016) (2018)	Which one of the following halogen has the highest electronegativity? مندرجہ ذیل میں سے کس ہیلوجن کی الیکٹرونیگیٹیویٹی سب سے زیادہ ہے؟	Fluorine فلورین	Chlorine کلورین	Bromine برومین	Iodine آئیوڈین
17 (a) (2015)	Which one of the following decreases in periods of periodic table? پیریاڈک ٹیبل کے پیریڈ میں کون سی چیز کم ہوتی ہے۔	Atomic radius اٹامک ریڈیس	Ionization energy آئیونائزیشن انرجی	Electron affinity الیکٹرون افینٹی	Dative covalent bond ڈیٹو کوویلنٹ بانڈ
18 (b) (2015)	Carbon family has general electronic configuration: کاربن فیملی کی الیکٹرونک کنفگریشن ہے۔	ns^2np^1	ns^2np^2	ns^2np^3	ns^2np^4

19 (a) (2016) (2021)	Vertical columns of periodic table are called: پیریاڈک ٹیبل میں عمودی کالم کہلاتی ہیں۔	Groups گروپس	Atomic number اٹامک نمبر	Periods پیریڈز	Atomic mass اٹامک ماس
20 (d) (2016)	The distance between the nuclei of two carbon atom is: کاربن کے دو ایٹمز کے نیوکلیائی کے درمیان فاصلہ ہے۔	115 pm	110 pm	140 pm	154 pm
21 (a) (2017)	In periodic table the first period is called: پیریاڈک ٹیبل میں پہلا پیریڈ کہلاتا ہے۔	Short periods شارٹ پیریڈ	Normal periods نارمل پیریڈ	Long periods لونگ پیریڈ	Very long periods ویری لونگ پیریڈ
22 (a) (2017)	Total groups in Modern periodic table are: ماڈرن پیریاڈک ٹیبل میں گروپس کی کل تعداد ہے؟	18	7	5	10
23 (a) (2018)	How many elements are there in the second period of long form of periodic table: لونگ فارم آف پیریاڈک ٹیبل کے دوسرے پیریڈ میں کتنے ایلیمنٹس پائے جاتے ہیں:	8	18	23	32
24 (b) (2018) (2021)	How many elements are there in the second period of long form of periodic table: لونگ فارم آف پیریاڈک ٹیبل کے دوسرے پیریڈ میں کتنے ایلیمنٹس پائے جاتے ہیں:	2	8	18	32
25 (d) (2018)	The modern periodic Law presented by: جدید پیریاڈک لاء پیش کیا۔	Dobereiner ڈوبرائنر	Newlands نیولینڈ	Mendeleev مینڈلیف	Mosely موزلے
26 (c) (2019)	d-block elements are also named as: d-بلاک ایلیمنٹس کو نام دیا جاتا ہے۔	Alkali metals الکلی میٹلز	Halogens ہیلوجنز	Transition metals ٹرانزیشن میٹلز	Alkaline earth metals الکلائن ارتھ میٹلز
27 (d) (2019)	6th and 7th period of the long form of Periodic Table are called: لونگ فارم آف پیریاڈک ٹیبل کی موجودہ شکل میں چھٹا اور ساتواں پیریڈ کہلاتے ہیں۔	Short periods شارٹ پیریڈ	Normal periods نارمل پیریڈ	Long periods لونگ پیریڈ	Very long periods ویری لونگ پیریڈ
28 (a) (2019)	First ionization energy of sodium atom is: سوڈیم ایٹم کی پہلی آئیونائزیشن انرجی ہے:	+496 $kJmol^{-1}$	+498 $kJmol^{-1}$	+696 $kJmol^{-1}$	+698 $kJmol^{-1}$

29 (b) (2021)	In modern periodic table, 2nd and 3rd periods are called: ماڈرن پیریاڈک ٹیبل میں دوسرا اور تیسرا پیریڈ کہلاتا ہے۔	Short periods شارٹ پیریڈ	Normal periods نارمل پیریڈ	Long periods لونگ پیریڈ	Very long periods ویری لونگ پیریڈ
30 (c) (2022)	Which one element has the lowest atomic radius? کونسا ایک ایلیمینٹ سب سے کم اٹامک ریڈیس رکھتا ہے؟	Li	Be	Ne	F
31 (c) (2022)	Creator of first version of Periodic table of elements: ایلیمینٹس کے پیریاڈک ٹیبل کی پہلی شکل تخلیق کی:	Dobereiner ڈوبرائنر	Newlands نیولینڈ	Mendeleev مینڈلیف	Dalton ڈالٹن
32 (c) (2023)	In the long form of periodic table horizontal lines are called: لانگ فارم آف پیریاڈک ٹیبل میں افقی قطاریں کہلاتی ہیں۔	Groups گروپس	Atomic number بلاکس	Periods پیریڈز	Atomic mass ٹرائی ایڈز
33 (d) (2024)	First period starts with: پہلا پیریڈ شروع ہوتا ہے۔	Alkali metals الکلی میٹلز	Alkaline earth metals الکلائن ارتھ میٹلز	Noble gases نوبل گیسز	Hydrogen ہائیڈروجن

(1) **Why are noble gases not reactive?**
The noble gases are not reactive because they have completely filled valance shells. Therefore they are not reactive.

(2) **State periodic law.**
It can be defined as "The properties of the elements are periodic function of their atomic numbers".

(3) **Write down demerits of Mendeleev's periodic table.**
Mendeleev's periodic law does not show the position of isotopes moreover certain elements are placed in wrong order.

(4) **Write down any two salient features of long form of periodic table. (Also a long question)**
- This table consist of seven horizontal rows called periods.
- Elements of a period show different chemical properties.
- It consist of 18th groups.
- Elements of a group show similar chemical properties.

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(5) **What is the difference b/w Mendeleev's periodic law and modern periodic law?** (ہیچر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Mendeleev's periodic law	Modern periodic law
1	The properties of the elements are periodic function of their atomic masses.	The properties of the elements are periodic function of their atomic numbers.
2	Mendeleev's periodic law does not show the position of isotopes.	There is no need of separate position of isotopes.

(6) **Define groups and periods in the periodic table?**
Groups:
The vertical columns in the periodic table are called groups. There are total eighteen (18) groups in the modern periodic table.
Periods:

The horizontal rows in the periodic table are called periods. There are total seven (7) periods in the modern periodic table.

(7) **How many elements are present in 1st, 2nd, 3rd, 4th, 5th, 6th, and 7th period? Also write name od periods.**

- First (1st) period is called short period and have two (2) elements.
- Second (2nd) and third periods (3rd) are called normal periods and each have eight (8) elements.
- Fourth (4th) and fifth (5th) periods are called long periods and each have eighteen (18) elements.
- Sixth (6th) and seventh (7th) periods are called very long periods. Sixth (6th) period have thirty two (32) elements while seventh (7th) period also have thirty two (32) elements but it is incomplete.

(8) **Why the elements are called s or p or d or f block elements?**

On the basis of completion of a particular subshell, elements with similar subshell electronic configuration are referred as ***block*** of elements.

s-block

The elements in which their valance electron are present in "s" subshell are called s-block elements.

p-block

The elements in which their valance electron are present in "p" subshell are called p-block elements.

d-block

The elements in which their valance electron are present in "d" subshell are called d-block elements.

f-block

The elements in which their valance electron are present in "f" subshell are called f-block elements.

(9) **What are Dobereiner's triads? Give example.**

"In Dobereiner's triads the central element had atomic mass average of the other two elements". For example

Li (7) Na (23) K (39) Average At. Mass $= \frac{7+39}{2} = 23$

(10) **Describe Newlands Law of octaves.**

According to Newlands, "When elements are arranged in increasing order of their atomic masses then properties of every eighth (8th) element are similar to first one". For example Li and Na has same properties.

(11) **Define atomic radius? Write its trend in groups and periods. Write its unit.**

"Half of the distance between the nuclei of the two bonded atoms is called atomic radius". For example the atomic radius of carbon is 77 pm.

Unit:

The **SI** unit of atomic radius is picometer (pm) and nanometer (nm).

In period:

The atomic size decreases in a period because effective nuclear charge increases gradually and shell number do not increase.

In groups:

The atomic size increases in a group because shielding effect increases and number of shells also increases.

(12) **Define ionization energy. ? Write its trend in groups and periods.**

"The amount of energy required to remove the most loosely bound electron from the valance shell of an isolated gaseous atom is called ionization energy". For example

$Na \rightarrow Na^+ + e^-$ $\Delta H = +496$ kJ/mol

It increases in a period because the atomic size decreases in a period, while it decreases in a group because atomic size increases.

(13) **Define electron affinity. Write its trend in groups and periods.**

"The amount of energy released when an electron is added in the valance shell of an isolated gaseous atom is called electron affinity". For example

$F + e^- \rightarrow F^-$ $\Delta H = -328$ kJ/mol

It increases in a period because the atomic size decreases in a period, while it decreases in a group because atomic size increases.

(14) **Define electronegativity. Write its trend in groups and periods.**

It is defined as "The ability of an atom to attract the shared electron pair towards itself in a molecule".

Fluorine has highest value of electronegativity.
It increases in a period because the atomic size decreases in a period, while it decreases in a group because atomic size increases.

(15) What is shielding effect? Write its trend in groups and periods.

The electron present in inner shells screen or shield (چھپا دینا یا کم کر دینا) the force of attraction of nucleus felt by the valance shell electrons. This is called shielding effect.

Trend:

It increases in a group due to increases in number of shells. While it remains constant in a period because number of shells remains constant.

(16) Define effective nuclear charge (Z_{eff}).

It is defined as "The nuclear charge felt (experiences) by valence electrons due to presence of inner electrons is called effective nuclear charge". It is always less than actual nuclear charge.

(17) Write the name or symbols of four noble gases (group 18). شارٹ کٹ صرف یاد کرنے کے لیے ہے۔ پیپر میں نہیں لکھنا۔

Name of element ایلیمنٹ کا نام	Symbol سمبل		Name of element ایلیمنٹ کا نام		Symbol سمبل
Helium ہیلم	ہاں	He	Krypton کرپٹان	کرا	Kr
Neon نی اون	نی	Ne	Xenon زی نان	ایکس	Xe
Argon آرگون	آ	Ar	Radon ریڈان	رے	Rn

(18) Write names of any four elements or symbols of first group (Alkali metals) of periodic table.

شارٹ کٹ صرف یاد کرنے کے لیے ہے۔ پیپر میں نہیں لکھنا۔

Name of element	Symbol		Name of element	Symbol	
Hydrogen	H	حالی	Rubidium	Rb	رب
Lithium	Li		Cesium	Cs	سے
Sodium	Na	نے	Francium	Fr	فریاد
Potassium	K	کی			

(19) Write the symbols of any four elements of halogen (17th) group. شارٹ کٹ صرف یاد کرنے کے لیے ہے۔ پیپر میں نہیں لکھنا۔

Name of element	Symbol		Name of element	Symbol	
Fluorine	F	فرسٹ	Iodine	I	إن
Chlorine	Cl	کلاس	Astatine	At	اٹک
Bromine	Br	برہانی			

(20) Write the symbols of any four elements of 2nd group (alkaline earth metals) شارٹ کٹ صرف یاد کرنے کے لیے ہے۔ پیپر میں نہیں لکھنا۔

Name of element	Symbol		Name of element	Symbol	
Beryllium	Be	بڑے (بڑی)	Strontium	Sr	سر
Magnesium	Mg	مگ (مُگھ)	Barium	Ba	بڑا
Calcium	Ca	کا	Radium	Ra	

STRUCTURE OF MOLECULES

Sr. #	Questions	A	B	C	D
1 (c) (2019)	Atoms reacts with each other because: ایٹم ایک دوسرے کے ساتھ ری ایکٹ کرتے ہیں کیونکہ:	They are attached to each other یہ ایک دوسرے کو اٹریکٹ کرتے ہیں	They are short of electrons ان میں الیکٹرونز کی کمی پائی جاتی ہے	They want to attain stability وہ مستحکم ہونا چاہتے ہیں	They want to disperse وہ بکھرنا چاہتے ہیں
2 (c)	An atom having six electrons in its valence shell will achieve noble gas electronic configuration by: ویلنس شیل میں 6 الیکٹرون رکھنے والا ایٹم نوبل گیس الیکٹرونک کنفگریشن حاصل کرے گا	Gaining one electron ایک الیکٹرون حاصل کر کے	Losing all electrons تمام الیکٹرونز خارج کر کے .	Gaining two electrons دو الیکٹرون حاصل کر کے	Losing two electrons دو الیکٹرونز خارج کر کے
3 (c)	Considering the electronic configuration of atoms which atoms with the given atomic number will be the most stable one? ایٹمز کی الیکٹرونک کنفگریشن کو مد نظر رکھتے ہوئے درج ذیل میں دیے گئے اٹامک نمبرز والے ایٹمز میں سے کون سا ایٹم سب سے زیادہ مستحکم ہو گا؟	6	8	10	12
4 (d) (2016) (2018)	Octet rule is: اوکٹیٹ رول ہے:	Description of eight electrons آٹھ الیکٹرونز کی وضاحت	Picture of electronic configuration الیکٹرونک کنفگریشن کی شکل	Pattern of electronic configuration الیکٹرونک کنفگریشن کا انداز	Attaining of eight electrons آٹھ الیکٹرونز کا حصول
5 (b) (2016) (2016) (2023)	Transfer of electrons between the atoms results in: ایٹمز کے درمیان الیکٹرونز کی منتقلی کا نتیجہ نکلتا ہے؟	Metallic bonding میٹلک بانڈنگ	Ionic bonding آئیونک بانڈنگ	Covalent bonding کوویلنٹ بانڈنگ	Coordinate covalent bonding کوآرڈینیٹ کوویلنٹ بانڈنگ
6 (b)	When an electronegative element combines with an electropositive element the type of bonding is: جب ایک الیکٹرونیگیٹو ایلیمنٹ کسی الیکٹرو پازیٹو ایلیمنٹ کے ساتھ ملتا ہے تو ان کے درمیان بانڈنگ کی قسم ہوتی ہے؟	Covalent کوویلنٹ	Ionic آئیونک	Polar covalent پولر کوویلنٹ	Metallic میٹلک

7 (a) (2016) (2017)	A bond form between to non-metals is expected to be: دونان میٹلز کے درمیان بننے والا بانڈ ممکنہ طور پر ہو گا؟	Covalent کوویلنٹ	Ionic آئیونک	Polar covalent پولر کوویلنٹ	Metallic مٹیلک
8 (b) (2016) (2019)	A bond pair in covalent molecules usually has: کوویلنٹ مالیکیولز میں موجود بانڈ پیئر عموماً رکھتا ہے۔	One electron ایک الیکٹرون	Two electrons دو الیکٹرونز	Three electrons تین الیکٹرونز	Four electrons چار الیکٹرونز
9 (b)	Which of the following compounds is not directional in its bonding? درج ذیل میں سے کونسا کمپاؤنڈ بانڈنگ کے لحاظ سے غیر سمتی ہے؟	CH_4	KBr	CO_2	H_2O
10 (c) (2017)	Ice floats on water because: برف پانی کے اوپر کیوں تیرتی ہے؟	Ice is denser than water برف پانی سے کثیف ہے	Ice is crystalline in nature برف کی ساخت کرسٹلائن ہوتی ہے	Water is denser than ice پانی برف سے کثیف ہے	Water molecules move randomly پانی کے مالیکول بے ترتیبی سے حرکت کرتے ہیں
11 (c)	Covalent bond involves the: کوویلنٹ بانڈ نتیجہ ہے:	Donation of electrons الیکٹرونز کا عطیہ	Acceptance of electrons الیکٹرونز کی ایکسیپٹنس (حاصل کرنے) کا	Sharing of electrons الیکٹرونز کی شیئرنگ کا	Repulsion of electrons الیکٹرونز کی ریپلسو فورسز
12 (d) (2019) (2021)	How many covalent bonds does C_2H_2 molecule have? C_2H_2 کا مالیکیول کتنے بانڈز پر مشتمل ہے؟	Two دو	Three تین	Four چار	Five پانچ
	H—C≡C—H مالیکیول میں ٹوٹل بانڈ پوچھے گئے ہیں۔ 3 بانڈ کاربن ایٹمز کے درمیان ہیں اور ایک ایک بانڈ کاربن اور ہائیڈروجن کے درمیان ہیں۔ تو ٹوٹل بانڈ 5 ہیں۔				
13 (b) (2014) (2016) (2018) (2018)	Triple covalent bond involves how many electrons? ٹرپل کوویلنٹ بانڈ میں کتنے الیکٹرون حصہ لیتے ہیں۔	Eight آٹھ	Six چھے	Four چار	Only three صرف تین
14 (c)	Which pair of the molecules has same type of covalent bonds? درج ذیل میں مالیکیولز کا کون سا جوڑا ایک جیسے کوویلنٹ بانڈ پر مشتمل ہے۔	O_2 and HCl O_2 اور HCl	O_2 and N_2 O_2 اور N_2	O_2 and C_2H_4 O_2 اور C_2H_4	O_2 and C_2H_2 O_2 اور C_2H_2
	Hint: See the structures of above molecules. These are given just to make the idea clear. O=O, H—Cl, N≡N $H_2C=CH_2$, HC≡CH				
15 (a) (2016)	Identify the compound which is not soluble in water. درج ذیل میں سے کونسا کمپاؤنڈ پانی میں حل پزیر نہیں ہے؟	C_6H_6	NaCl	KBr	$MgCl_2$

16 (b) (2014) (2023) (2024)	Which one of the following is an electron deficient molecule? درج ذیل میں سے کس مالیکیول میں الیکٹرونز کی کمی پائی جاتی ہے؟	NH_3	BF_3	N_2	O_2
17 (d) (2021) (2023)	Identify which pair has polar covalent bonds. درج ذیل میں کون سا پیئر پولر کوویلنٹ بانڈ رکھتا ہے۔	O_2 and Cl_2 O_2 اور Cl_2	H_2O and N_2 H_2O اور N_2	H_2O and C_2H_2 H_2O اور C_2H_2	H_2O and HCl H_2O اور HCl
18 (c)	Which one of the following is the weakest force among the atoms? درج ذیل میں سے ایٹمز کے درمیان پائی جانے والی کمزور ترین فورس کون سی ہے؟	Ionic force آئیونک فورس	Metallic force مٹیلک فورس	Intermolecular force انٹرمالیکیولر فورس	Covalent force کوویلنٹ فورس

MCQs of Previous Board Papers

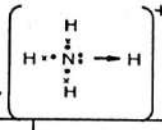
19 (c) (2012)	What is the valency of halogens? ہیلوجنز کی ویلنسی کیا ہے	+1	+2	-1	-2
20 (c) (2014)	The bond formed due to mutual sharing of electrons is called: الیکٹرونز کے باہمی اشتراک سے بننے والا بانڈ کہلاتا ہے۔	Metallic bond مٹیلک بانڈ	Ionic bond آئیونک بانڈ	Covalent bond کوویلنٹ بانڈ	Coordinate covalent bond کوآرڈینیٹ کوویلنٹ بانڈ
21 (c) (2014)	Melting point of Sodium Chloride is: سوڈیم کلورائیڈ کا میلٹنگ پوائنٹ ہے:	700 °C	1413 °C	800 °C	100 °C
22 (b) (2015) (2024)	The difference of electronegativity between two elements is more than 1.7 the bond will be: اگر دو ایلیمنٹس کی الیکٹرونیگیٹویٹی کا فرق 1.7 سے زیادہ ہو تو ان کے درمیان بننے والا بانڈ ہو گا۔	Covalent bond کوویلنٹ بانڈ	Ionic bond آئیونک بانڈ	Non-polar نان پولر	None کوئی بھی نہیں
23 (c) (2015)	The weakest force among the atoms is: ایٹمز کے درمیان پائی جانے والی کمزور ترین فورس ہے؟	Ionic force آئیونک فورس	Metallic force مٹیلک فورس	Intermolecular force انٹرمالیکیولر فورس	Covalent force کوویلنٹ فورس
24 (b) (2015)	Chemical bond formed between two similar atoms is: دو ایک جیسے ایٹموں کے درمیان بننے والا کیمیکل بانڈ ہو گا؟	Polar bond پولر بانڈ	Non-polar bond نان پولر بانڈ	Metallic bond مٹیلک بانڈ	Dative covalent bond ڈیٹو کوویلنٹ بانڈ

25 (c) (2015) (2018) (2023)	Which one of the following is boiling point of sodium chloride? درج ذیل میں سے کونسا سوڈیم کلورائیڈ کا بوائلنگ پوائنٹ ہے؟	1000 °C	1100 °C	1413 °C	1314 °C
26 (c) (2016)	Which one is an ionic compound: درج ذیل میں سے کون سا آئیونک ہے؟	HCl	CH_4	NaCl	BF_3
27 (a) (2018)	Atomic number of sodium is: سوڈیم کا ایٹمی نمبر ہوتا ہے:	11	10	12	13
28 (b) (2018)	Electronegativity of chlorine is: کلورین کی الیکٹرونیگیویٹی ہوتی ہے:	3.1	3.2	3.3	3.4
کلورین کی الیکٹرونیگیویٹی کی Actual ویلیو 3.2 ہوتی ہے، کچھ ٹیکسٹ بکس میں 3.0 بھی لکھی گئی ہے۔ اگر پیپر میں 3.0 کا آپشن آتا ہے تو ٹیکسٹ بک کے مطابق 3.0 والا جواب ڈرست ہو گا۔					
29 (a) (2019)	The example of triple covalent bond is: ٹرپل کوویلنٹ بانڈ کی مثال ہے:	N_2	H_2	O_2	HCl
30 (b) (2021)	If the difference of electronegativity between two elements is less than 1.7, the bond will be: اگر دو ایلیمنٹس کی الیکٹرونیگیٹویٹی کا فرق 1.7 سے کم ہو، تو بانڈ ہو گا۔	Metallic مٹیلک	Covalent کوویلنٹ	Ionic آئیونک	Coordinate covalent کوآرڈینیٹ کوویلنٹ
31 (c) (2021)	Which type of bond is present in O_2 molecule? O_2 مالیکیول میں کس قسم کا بانڈ پایا جاتا ہے؟	Ionic bond آئیونک بانڈ	Single Covalent bond سنگل کوویلنٹ بانڈ	Double Covalent bond ڈبل کوویلنٹ بانڈ	Triple covalent bond ٹرپل کوویلنٹ بانڈ
32 (d) (2022)	Chlorine atom has electrons in the valence shell: کلورین ایٹم اپنے ویلنس شیل میں الیکٹرونز رکھتا ہے؟	1	2	5	7
32 (b) (2022)	The chemical bond formed by mutual sharing of their valence shell electrons is called: کیمیکل بانڈ جو ویلنس شیلز کے الیکٹرونز کے باہمی اشتراک سے بنتا ہے، کہلاتا ہے۔	Ionic آئیونک	Covalent کوویلنٹ	Metallic مٹیلک	Coordinate کوآرڈینیٹ
33 (a) (2022)	Polar covalent compounds easily dissolve in: پولر کوویلنٹ کمپاؤنڈز آسانی سے حل ہو جاتے ہیں۔	Water پانی میں	Benzene بینزین میں	Ether ایتھر میں	Acetone ایسی ٹون میں

33 (b) (2022)	Which of the following has a coordinate covalent bond: درج ذیل میں سے کس میں کو آرڈینیٹ کوویلنٹ بانڈ پایا جاتا ہے؟	NaCl	NH_4Cl	H_2O	NH_3

NaCl میں آئیونک بانڈ ہوتا ہے۔ H_2O میں ایٹمز کے درمیان کوویلنٹ بانڈ ہوتا ہے۔ NH_3 میں بھی ایٹمز کے درمیان کوویلنٹ بانڈ ہوتا ہے جب کہ NH_4Cl میں تمام قسم کے بانڈ آئیونک، کوویلنٹ اور کو آرڈینیٹ کوویلنٹ بانڈ پائے جاتے ہیں۔ اس میں NH_3 میں ایٹمز کے درمیان کوویلنٹ بانڈ، جب کہ امونیم آئن میں نائٹروجن اور ہائیڈروجن میں کو آرڈینیٹ کوویلنٹ بانڈ، جب کہ امونیم آئن اور کلورائیڈ (Cl^-) آئن میں آئیونک بانڈ موجود ہے۔

سٹرکچر میں امونیم آئن میں نائٹروجن اور ہائیڈروجن میں کو آرڈینیٹ کوویلنٹ بانڈ دیکھا جاسکتا ہے۔

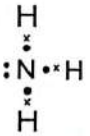


34 (c) (2024)	The example of triple covalent bond is: ٹرپل کوویلنٹ بانڈ کی مثال ہے:	CH_4	C_2H_4	C_2H_2	C_6H_6
35 (a) (2024)	A compound which is covalent in nature. ایک کوویلنٹ کمپاؤنڈ ہے؟	H_2SO_4	NaCl	KOH	$CaCl_2$

(1) Why do atoms react?

Those atoms which do not have 2 or 8 electrons in their valance shell they lose, gain or share electrons to complete their valence shell like noble gases. Therefore atoms react with each other.

(2) Differentiate b/w lone pair and bond pair of electrons? (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Lone pair	Bond pair
1	The electron pair available on an atom is known as lone pair. **OR** The electron pair which is present on one atom is called lone pair.	The electron pair which is involved in bonding is known as bond pair. **OR** The electron pair which is present between two atoms is called bond pair.
2	For example: - In ammonia $:NH_3$ there is ***one lone pair***.	In NH_3 there are three bond pair. 

(3) What is the difference polar and non-polar covalent bonds? (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Polar Covalent bond	Non-Polar Covalent bond
1	A covalent bond in which the shared electron pair is ***not equally attracted*** between two bonded atoms is called polar covalent bond. OR The type of covalent bond which is formed between different atoms.	A covalent bond in which the shared electron pair ***is equally attracted*** between two bonded atoms is called non-polar covalent bond. OR The type of covalent bond which is formed between similar atoms.
2	For example bond in HCl $H^{\delta+}$ —— $Cl^{\delta-}$ is polar in nature.	For example bond in H_2 is non-polar in nature H —— H

(4) Metals are good conductor of electricity. Why?

Metals are good conductors of electricity in solid or liquid state due to presence of free or mobile electrons in them.

(5) Ionic compounds conduct electricity in solution or molten form. Why?

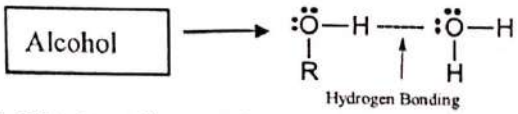
Ionic compounds conduct electricity in solution or molten form due to presence of free ions in molten or solution form.

(6) Why does ice float on water?

Ice float on water because the density of ice is less than water.

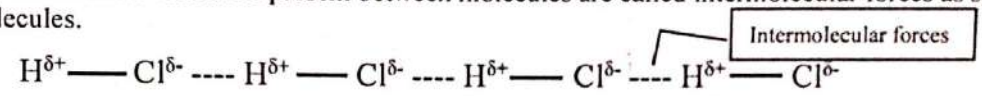
(7) Why alcohol is soluble in water?

Alcohol is soluble in water due to formation of hydrogen bonding.



(8) What are intermolecular forces? Give one example.

The forces of attraction which are present between molecules are called intermolecular forces as shown in HCl molecules.



(9) What do you mean by malleability and ductility?

"The property of metals by virtue of which a metal can be rolled into sheets is called malleability".

"The property of metals by virtue of which a metal can be drawn into wires is called ductility".

(10) Define chemical bond. Write names of four different types.

"The force of attraction between atoms which holds them together in a substance".

There are following types of chemical bond.

- Ionic bond
- Covalent bond
- Coordinate covalent bond
- Metallic bond

(11) Define octet rule and duplet rule.

Octet rule:

"Attaining EIGHT electrons in valence shell is called octet rule". For example noble gases.

Duplet rule:

"Attaining TWO electrons in valence shell is called duplet rule". For example Hydrogen and Helium.

(12) Write any two properties of ionic compounds. (Also a long question)

- They are crystalline solids.
- They have high melting and boiling points.
- Mostly they are soluble in polar solvents like water (H_2O).
- They are poor conductor in solid state but good conductor in molten or solution form.

(13) Write any two properties covalent compound. (Also a long question)

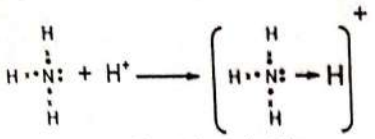
- They have usually low melting and boiling points.
- Molecules having 3-D bonding have more melting and boiling points.
- They are bad conductors of electricity.
- They are insoluble in water. But may dissolve in non polar solvents.

(14) Write two physical properties of metals. (Also a long question)

- They have high melting and boiling points.
- They have metallic luster.
- They are malleable and ductile.
- Due to larger size they have less ionization energy and form cation easily.
- They are good conductor of heat and electricity.

(15) Define the co-ordinate covalent bond. Give one example.

The type of covalent bond in which the bond pair of electrons is donated only by one bonded atom. For example



(16) Define covalent bond. Give one example.

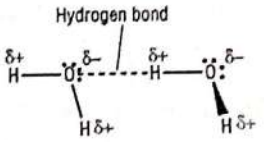
The type of bond which is formed by mutual sharing of electrons is called covalent bond. For example H-H, O=O, H-Cl.

(17) What is metallic bond?

A bond formed between metal atoms (positively charged ions) due to mobile or free electrons is called metallic bond.

(18) Define hydrogen bonding. Show the hydrogen bonding in water molecule.

The force of attraction which is present between partial positive hydrogen atom of one molecule and partial negative highly electronegative atom of other molecule is known as hydrogen bonding. It is shown by dotted line (---) in water molecule.



LONG QUESTIONS

I. **Describe major properties of metals.** (جواب اوپر مختصر سوالوں کے ساتھ دیا گیا ہے)

II. **State four properties of ionic compounds.** (جواب اوپر مختصر سوالوں کے ساتھ دیا گیا ہے)

III. **State four properties of covalent compounds.** (جواب اوپر مختصر سوالوں کے ساتھ دیا گیا ہے)

IV. **Define the ionic bond. Explain it with the help of an example.**

The bond formed by complete transfer of electron from an atom to another atom is called ionic bond. For example the formation of NaCl.

$$2Na + Cl_2 \rightarrow 2NaCl$$

Sodium has only one electron in its valance shell and it donates this electron easily and form a positive ion. At the same time chlorine has seven electron in its valance shell and needs one electron to complete its valence shell. It accepts this electron from sodium and form a negative ion.

$$Na \rightarrow Na^+ + 1e^-$$
$$Cl + 1e^- \rightarrow Cl^-$$

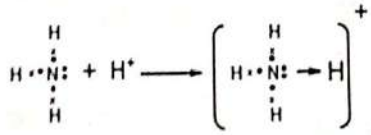
Both of these atoms are now changed into oppositely charged ions. They combine with each other due to strong electrostatic forces of attraction and ionic bond is formed.

$$Na^+ + Cl^- \rightarrow NaCl$$

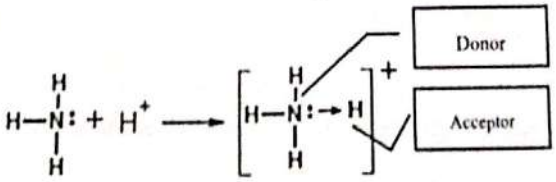
V. **How coordinate covalent bond is formed? Explain with examples.**

The type of covalent bond in which the bond pair of electrons is donated only by one bonded atom is called coordinate covalent bond. The atom which donates electron is called donor atom and which accepts electron is called acceptor atom. A small arrow is used to indicate the donation of electron from donor to acceptor.

When a proton (H^+) approaches (come near to) ammonia (NH_3), it accept lone pair from NH_3 and form coordinate covalent bond. Formation of NH_4^+ ion is shown in following diagram.



دونوں میں سے کوئی ایک سٹرکچر بنالیں۔



VI. Define covalent bond. Explain its types with the help of examples.

The type of bond which is formed by mutual sharing of electrons is called covalent bond. Group 13 to group 17 elements form covalent bond when combine with each other.

It have following types.

- Single covalent bond
- Double covalent bond
- Triple covalent bond
- Polar covalent bond
- Non-polar covalent bond

Single covalent bond:

A single covalent bond can be defined as

"A covalent bond formed by mutual sharing of **one pair of electrons** between two atoms is called single covalent bond". **One line** is used to indicate the **one pair of electrons** between two bonded atoms. For example hydrogen molecule has single covalent bond H-H.

Double covalent bond:

A double covalent bond can be defined as

"A covalent bond formed by sharing of **two pair of electrons** between two atoms is called double covalent bond". **Two lines** are used to indicate these **two pairs of electrons** between two bonded atoms. For example oxygen molecule has double covalent bond O=O.

Triple covalent bond:

A triple covalent bond can be defined as

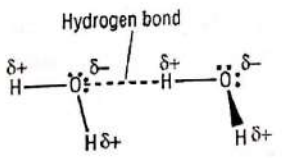
"A covalent bond formed by sharing of **three pair of electrons** between two atoms is called triple covalent bond". **Three lines** are used to indicate these **three pairs of electrons** between two bonded atoms. For example nitrogen molecule has triple covalent bond N≡N.

Polar and Non polar covalent bond:

Sr. No	Polar Covalent bond	Non-Polar Covalent bond
1	A covalent bond in which the shared electron pair is ***not equally attracted*** between two bonded atoms is called polar covalent bond. OR The type of covalent bond which is formed between different atoms.	A covalent bond in which the shared electron pair ***is equally attracted*** between two bonded atoms is called non-polar covalent bond. OR The type of covalent bond which is formed between similar atoms.
2	For example bond in HCl $H^{\delta+}$ —— $Cl^{\delta-}$ is polar in nature.	For example bond in H_2 is non-polar in nature H —— H

VII. Define hydrogen bonding. How it affects the physical properties of compounds?

The force of attraction which is present between partial positive hydrogen atom of one molecule and partial negative high electronegative atom of other molecule is known as hydrogen bonding. It is shown by dotted line (---) in water molecule.



These forces are developed between molecules that have a hydrogen atom bonded to high electronegative atom like Fluorine, oxygen and Nitrogen.

Effects on physical properties:

- Due to presence of these forces the melting and boiling points of compounds increases.
- For example boiling point of water is greater than alcohol because water has extensive and strong hydrogen bonding.

- It also affects solubility of molecules. Alcohol is soluble in water due to formation of hydrogen bonding.

PHYSICAL STATES OF MATTER

Sr. #	Questions	A	B	C	D
1 (b) (2016) (2017)	How many times liquids are denser than gases? مائع گیسز سے کتنے گنا بھاری ہیں؟	100 times 100 گنا	1000 times 1000 گنا	10,000 times 10،000 گنا	100,000 times 10،0000 گنا
2 (c)	Gases are the lightest form of matter and their densities are expressed in terms of : گیسز مادہ کی ہلکی ترین حالت ہیں اور ان کی ڈینسٹیز کو کن یونٹس میں ظاہر کیا جاتا ہے؟	mg cm^{-3}	g cm^{-3}	g dm^{-3}	kg dm^{-3}
3 (c)	At freezing point which one of the following coexists in dynamic equilibrium: فریزنگ پوائنٹ پر ان میں سے کون سے ڈائنامک ایکوی لبریم میں ہوتے ہیں؟	Gas and solid گیس اور ٹھوس	liquid and gas مائع اور گیس	liquid and solid مائع اور ٹھوس	All of these یہ تمام
4 (b)	Solid particles possess which one of the following motions? ٹھوس پارٹیکلز میں ان میں سے کون سی موشن پائی جاتی ہے:	Rotational motions روٹیشنل موشن	Vibrational motions وائبریشنل موشن	Translation motions ٹرانسلیشنل موشن	Both translation and vibrational motions ٹرانسلیشنل اور وائبریشنل موشن دونوں
5 (d)	Which one of the following is not amorphous? ان میں سے کونسا ٹھوس ایمورفس نہیں ہے؟	Rubber ربڑ	Plastic پلاسٹک	Glass گلاس	Glucose گلوکوز
6 (a) (2018) (2024)	One atmospheric pressure is equal to how many pascals: 1 atm پریشر کتنے پاسکلز کے برابر ہوتا ہے؟	101325	10325	106075	10523
7 (c) (2016)	In the evaporation process, liquid molecules which leave the surface of the liquid have: ایویپوریشن میں جو مالیکیولز مائع کی سطح کو چھوڑتے ہیں ان میں ہوتی ہے؟	Very low energy بہت کم انرجی	Moderate energy درمیانی انرجی	Very high energy بہت زیادہ انرجی	None of these ان میں سے کوئی بھی نہیں

8 (a) (2014) (2016) (2018) (2023)	Which one of the following gas diffuses fastest? ان میں سے کون سی گیس تیزی سے ڈیفیوژ کرتی ہے؟	Hydrogen ہائڈروجن	Helium ہیلیم	Fluorine فلورین	Chlorine کلورین
نوٹ: جس گیس کا مالیکیولر ماس جتنا کم ہوگا، وہ اُتنی تیزی کے ساتھ ڈیفیوژ کرے گی۔ اور جس کا ماس جتنا زیادہ ہوگا۔ اُس کی ڈیفیوژن کم رفتار سے ہوگی۔					
9 (d)	Which one of the following does not affect the boiling point? ان میں سے کون سی چیز بوائلنگ پوائنٹ پر اثر انداز نہیں ہوتی:	Intermolecular forces انٹرمالیکولر فورسز	External pressure بیرونی پریشر	Nature of liquid مائع کی فطرت	Initial temperature of liquid مائع کا ابتدائی ٹمپریچر
10 (b)	Density of a gas increases, when its: گیس کی ڈینسٹی بڑھتی ہے جب	Temperature is increased ٹمپریچر بڑھتا ہے	Pressure is increased پریشر بڑھتا ہے	Volume is kept constant والیم کو کونسٹنٹ رکھا جاتا ہے	None of these ان میں سے کوئی بھی نہیں
11 (b)	The vapour pressure of a liquid increases with the: مائع کا ویپر پریشر کب بڑھتا ہے؟	Increase of pressure پریشر میں اضافے سے	Increase of temperature ٹمپریچر میں اضافے سے	Increase of intermolecular forces انٹرمالیکولر فورسز میں اضافے سے	Increase of polarity of molecules مالیکیولز کی پولیرٹی میں اضافے سے

MCQs of Previous Board Papers

12 (b) (2012)	Example of crystalline form of carbon is کاربن کی کرسٹلائن شکل کی مثال ہے	Coal کوئلہ	Graphite گریفائیٹ	Cock کوک	Lamp black لیمپ بلیک
13 (c) (2014) (2018)	The densities of gases are expressed in terms of: گیسز کی ڈینسٹیز کو کن یونٹس میں ظاہر کیا جاتا ہے؟	mg cm^{-3}	g cm^{-3}	g dm^{-3}	kg dm^{-3}
14 (d) (2015)	How much concentration of salt is required to kill unwanted bacteria? ناپسندیدہ بیکٹیریا کو مارنے کے لیے کتنے کنسنٹریشن نمک کی ضرورت ہوتی ہے:	5 %	10 %	15 %	20 %
15 (c) (2015) (2015)	The temperature at which an ideal gas would have zero volume is: وہ ٹمپریچر جس پر کسی آئیڈیل گیس کا والیوم زیرو ہوگا؟	- 760 °C	- 173.5 °C	- 273.15 °C	0 °C
16 (c) (2016)	The boiling point of water is: پانی کا بوائلنگ پوائنٹ ہے؟	0 °C	60 °C	100 °C	120 °C
17 (b) (2017)	Atmospheric pressure is measured by: ایٹموسفیرک پریشر کو معلوم کرنے کے لیے استعمال کیا جاتا ہے؟	Thermometer تھرمومیٹر	Barometer بیرومیٹر	Manometer مانومیٹر	Kelvin scale کیلون سکیل

18 (c) (2019)	The density of gold is: سونے کی ڈینسٹی ہے؟	2.70 g/cm^3	7.86 g/cm^3	19.3 g/cm^3	4.88 g/cm^3
19 (a) (2019)	Which one of the following is crystalline solid? ان میں سے کونسا کرسٹلائن ٹھوس ہے؟	Diamond ہیرا	Rubber ربڑ	Plastic پلاسٹک	Glass گلاس
20 (c) (2021)	273 K in Kelvin scale is equal to: کیلون سکیل میں 273K برابر ہوتا ہے۔	100 °C	32 °C	0 °C	-273 °C
21 (d) (2022)	The scale of temperature in Kelvin scale starts from °C? کیلون سکیل میں ٹمپریچر °C سے شروع ہوتا ہے۔	100	-100	273	-273
22 (c) (2022)	Escaping of gas molecules through a tiny hole in the space with lesser pressure is called: گیس مالیکیولز کا ایک باریک سوراخ سے کم پریشر والی جگہ کی طرف اخراج کہلاتا ہے؟	Diffusion ڈفیوژن	Compression کمپریشن	Effusion ایفیوژن	Density ڈینسٹی
23 (d) (2022)	Which one liquid evaporates rapidly? کونسا ایک مائع زیادہ تیزی سے ویپر میں تبدیل ہوتا ہے؟	$C_{10}H_{22}$	C_9H_{20}	C_8H_{18}	C_6H_{14}
نوٹ: جس مائع کا مالیکیولر ماس جتنا کم ہوگا (مطلب جس میں کاربن اور ہائیڈروجن کی تعداد کم ہوگی)، وہ اتنی تیزی کے ساتھ ویپرز میں تبدیل ہوگا۔ اور جس کا ماس جتنا زیادہ ہوگا (مطلب جس میں کاربن اور ہائیڈروجن کی تعداد زیادہ ہوگی)۔ اُس کی ایویپوریشن کی رفتار کم ہوگی۔					
24 (c) (2022) (2024)	The transition temperature of Tin (Sn = Stannum) is: ٹن (Sn) کا ٹرانزیشن ٹمپریچر ہے۔	15.2 °C	14.2 °C	13.2 °C	12.2 °C
25 (d) (2023)	Vapour pressure of water in mm Hg at 100 °C? 100 °C پر پانی کا ویپر پریشر mmHg میں ہوتا ہے؟	55.3	149.5	355.1	760

(1) Define a diffusion of gas with an example.

"The spontaneous (خود بخود) mixing up of molecules by random motion and collisions to form a homogeneous mixture".

OR (دونوں تعریفوں میں سے کوئی ایک یاد کرلیں۔)

Movement of gas molecules from an area of higher concertation to an area of lower concentration to form homogeneous mixture is called diffusion.

Example:-

The spreading (پھیلنا) of fragrance (خوشبو) of rose.

(2) Define effusion and give an example. (2023)

Effusion:

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It can be defined as "Escaping of gas molecules through a tiny hole in the space with lesser pressure is called effusion".

Example:

When a tyre gets puncture, air effuses out.

Dependence:

It depends upon molecular mass of gas, lighter gases (having less molecular mass) effuse faster.

(3) Define standard atmospheric pressure. Write its units.

Standard atmospheric pressure can be defined as

"The pressure exerted (ٹ) by a mercury column of 760 mm height at sea level".

UNITS:-

Its various units are given here

1 atm = 760 torr = 760 mm of Hg = 76 cm of Hg (1 mm of Hg = One torr)
= 101325 Nm^{-2} = 101325 Pa (One Nm^{-2} = One Pa)

(4) Why are the densities of gases lower than that of liquids?

The densities of gases lower than that of liquids because they have light mass and occupies more volume due to presence of weak intermolecular forces.

(5) Why are the gases compressible?

Gases are compressible because there are large empty spaces between gas molecules due to presence of weak intermolecular forces.

(6) What is absolute zero? OR What do you know about absolute zero of temperature?

"It is the temperature at which an ideal gas would have zero volume". Its value is zero kelvin (0 K) or -273.15 °C.

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(7) Does Kelvin scale show a negative temperature?

No, Kelvin scale does not show a negative temperature.

(8) What do you mean by condensation?

The process of changing gases or vapours into liquid state is called condensation.

(9) Why is the boiling point of water higher than that of alcohol?

The boiling point of water is higher than that of alcohol because intermolecular forces (i.e. Hydrogen bonding) are stronger in water as compare to alcohol.

(10) What do you mean by dynamic equilibrium?

It can be defined as

"The state at which rate of evaporation and rate of condensation becomes equal is called dynamic equilibrium".

$$\text{Liquid} \underset{\text{Condense}}{\overset{\text{Vapourize}}{\rightleftharpoons}} \text{Vapours}$$

(11) Define the boiling point of liquid.

"The temperature at which the vapour pressure of a liquid becomes equal to external atmospheric pressure is called boiling point of that liquid" e.g. boiling point of water is 100 °C at 1 atm pressure.

(12) Define the freezing point of liquid.

When vapour pressure of a liquid state becomes equal to the vapour pressure of the solid state this is called freezing point. For example freezing point of water is 0 °C.

(13) Define evaporation.

"The spontaneous process of changing of a liquid into vapours is called evaporation".

(14) What do you mean by vapour pressure?

The pressure exerted by the vapours of a liquid at dynamic equilibrium with the liquid at a specific temperature is called vapour pressure.

(15) Define Boyle's law. Write its mathematical form. (Also a long questions part)

"The volume of a given mass of a gas is inversely proportional to its pressure, if the temperature remains constant".

$$\text{Volume} \propto \frac{1}{\text{pressure}} \quad \text{or} \quad V \propto \frac{1}{P}$$

$$V = \frac{k}{P}$$

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$PV = k$

(16) Define Charles's law. Write its mathematicl form. (Also a long questions part)

"The volume of a given mass of a gas is directly proportional to the absolute temperature, if the pressure remains constant". Mathematically it can be written as

Volume $\propto$ Temperature

$V \propto T$

$V = kT$

$k = \frac{V}{T}$

(17) Define the term allotropy with examples.

"The existence of an element in more than one forms in same physical state is called allotropy". For example oxygen has two allotropes i.e. oxygen (O_2) and ozone (O_3).

(18) Define transition temperature and give an example.

The temperature at which one allotrope changes into another is called ***transition temperature.***

$$Sn_{\text{Grey (Cubic)}} \underset{}{\overset{13.2\,^\circ C}{\rightleftharpoons}} Sn_{\text{White (Tetragonal)}}$$

(19) In which form Sulphur exits at 100 °C.

At 100 °C Sulphur exists in monoclinic form.

(20) What are amorphous solids? Give an example.

نوٹس کی دونوں اقسام کو ملا کر ایک لانگ سوال بھی بن سکتا ہے

Those solids in which the particles are not regularly arranged are called amorphous solids. For example rubber glue etc.

(21) What are crystalline solids? Give examples.

Those solids in which the particles are regularly arranged are called crystalline solids. For example diamond, sodium chloride.

(22) Convert the following units.

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(A) 850 mm of Hg to atm.

760 mm of Hg = 1 atm

1 mm of Hg $= \frac{1}{760}$

850 mm of Hg $= \frac{1}{760} \times 850 = 1.12$ atm

So 850 mm of Hg = 1.12 atm

(B) 205000 Pa to atm.

101325 Pa = 1 atm

1 Pa $= \frac{1}{101325}$

205000 Pa $= \frac{1}{101325} \times 205000 = 2.02$ atm

So 205000 Pa = 2.02 atm

(C) 560 torr to cm Hg.

760 torr = 76 cm of Hg

1 torr $= \frac{76}{760}$

560 torr $= \frac{76}{760} \times 560 = 56$ cm of Hg

So 560 torr = 56 cm of Hg

(D) 1.25 atm to Pa

1 atm = 101325 Pa

1.25 atm = 101325 × 1.25 = 126656 Pa

So 1.25 atm = 126656.25 Pa

(23) Convert the following units.

As K = (T) °C + 273

K = 750 + 273 = 1023 K

So 750°C = 1023 K

(B) 150 °C to K

As K = (T) °C + 273

K = 150 + 273 = 423 K

So 150°C = 423 K

(C) 100 K to °C

As °C = (T) K - 273

°C = 100 - 273 = -173 °C

So 100 K = -173 °C

(D) 172 K to °C

As °C = (T) K - 273

°C = 172 - 273 = -173 °C

So 172 K = -101 °C

LONG QUESTIONS

I. **Describe four factors which effect on the diffusions of liquids.**

Movement of liquid molecules from an area of higher concertation to an area of lower concentration to form homogeneous mixture is called diffusion in liquids.

It depends upon following factors.

- **Temperature:**
  It increases with increase in temperature because at high temperature the kinetic energy of molecules increases and they overcome intermolecular forces.
- **Intermolecular forces or nature of liquid:**
  It decreases with increase in strength of intermolecular forces. Polar liquid have strong intermolecular forces while non-polar have weak intermolecular forces. So it is larger for non-polar liquids and smaller for polar liquids.
- **Size of molecules:**
  It is smaller for large size molecules and vice versa.

II. **Define boiling point and how it is affected by different factors?**

"The temperature at which the vapour pressure of a liquid becomes equal to external atmospheric pressure is called boiling point of that liquid" e.g. boiling point of water is 100 °C at 1 atm pressure.

The boiling point depends upon following factors.

- **Intermolecular forces or nature of liquid:**
  It decreases with increase in strength of intermolecular forces. Polar liquid have strong intermolecular forces while non-polar have weak intermolecular forces. So it is larger for non-polar liquids and smaller for polar liquids.
- **External pressure:**
  By increasing external pressure, the boiling point of the liquid increases and vice versa.

III. **Define vapour pressure and explain different factors on which is depends.**

The pressure exerted by the vapours of a liquid at dynamic equilibrium with the liquid at a specific temperature is called vapour pressure.

$$\text{Liquid} \underset{\text{Condense}}{\overset{\text{Vapourize}}{\rightleftharpoons}} \text{Vapours}$$

It depends upon following factors.

- **Temperature:**
  It increases with increase in temperature because at high temperature the kinetic energy of molecules increases and they overcome intermolecular forces.
- **Intermolecular forces or nature of liquid:**
  It decreases with increase in strength of intermolecular forces. Polar liquid have strong intermolecular forces while non-polar have weak intermolecular forces. So it is larger for non-polar liquids and smaller for polar liquids.
- **Size of molecules:**
  It is smaller for large size molecules and vice versa.

IV. Define evaporation. Explain the factors which effect on evaporation.

"The spontaneous process of changing of a liquid into vapours is called evaporation". It is a continuous process and takes place at all temperatures. It depend upon following factors.

- **Temperature:**
  It increases with increase in temperature because at high temperature the kinetic energy of molecules increases and they overcome intermolecular forces.
  Intermolecular forces:
  It decreases with increase in strength of intermolecular forces. Polar liquid have strong intermolecular forces while non-polar have weak intermolecular forces. So it is larger for non-polar liquids and smaller for polar liquids.
- **Size of molecules:**
  It is smaller for large size molecules and vice versa.

SOLUTIONS

Sr. #	Questions	A	B	C	D
1 (a) (2016) (2016) (2019)	Mist is an example of solution: ڈھند کس سلوشن کی مثال ہے؟	Liquid in gas گیس میں مائع	Gas in liquid مائع میں گیس	Solid in gas گیس میں ٹھوس	Gas in solid ٹھوس میں گیس
2 (b)	Which one of the following is a liquid in solid solution? ان میں سے کون سا سلوشن ٹھوس میں مائع ہے	Sugar in water پانی میں شوگر	Butter مکھن	Opal اوپل	Fog کہر
3 (b)	Concentration is ratio of: کنسنٹریشن کس کی نسبت ہے:	Solvent to solute سولوینٹ سے سولیوٹ کی	Solute to solution سولیوٹ سے سلوشن کی	Solvent to solution سولوینٹ سے سلوشن کی	Both a and b a اور b دونوں
4 (d) (2015)	Which of the following solution contains more water? ان میں سے کس سلوشن میں پانی زیادہ ہے؟	2M	1M	0.5M	0.25M
5 (d)	A 5 percent (W/W)sugar solution means that: 5٪ شوگر سلوشن سے مراد ہے کہ	5 g of sugar is dissolved in 90 g of water 90 گرام پانی میں 5 گرام شوگر حل کی گئی ہے	5 g of sugar is dissolved in 100 g of water 100 گرام پانی میں 5 گرام شوگر حل کی گئی ہے	5 g of sugar is dissolved in 105 g of water 105 گرام پانی میں 5 گرام شوگر حل کی گئی ہے	5 g of sugar is dissolved in 95 g of water 95 گرام پانی میں 5 گرام شوگر حل کی گئی ہے
6 (b)	If the solute-solute forces are strong enough than those of solute –solvent forces. The solute: اگر سولیوٹ-سولیوٹ فورسز، سولیوٹ-سولوینٹ سے زیادہ مضبوط ہوں تو سولیوٹ:	Dissolved readily بلا تامل حل ہو جاتا ہے	Does not dissolve حل نہیں ہوتا	Dissolves slowly آہستہ سے حل ہوتا ہے	Dissolves and precipitates حل ہوتا ہے اور رسوب بنتے ہیں

7 (d) (2018)	Which of the following will show negligible effect of temperature on its solubility? ان میں سے کس کی سولوبیلٹی پر ٹمپریچر کا معمولی اثر ہو گا:	KCl	KNO_3	$NaNO_3$	NaCl
8 (c) (2016)	Which of the following is heterogeneous mixture? درج ذیل میں سے کونسا ہیٹروجینیس مکسچر ہے؟	Milk دودھ	Ink روشنائی	Milk of magnesia ملک آف میگنیشیا	Sugar solution شوگر کا سلوشن
9 (c) (2017) (2019) (2024)	Tyndall effects shown by: ٹنڈل ایفیکٹ کا مظاہرہ کرتے ہیں؟	Sugar solution شوگر کا سلوشن	Paints پینٹس	Jelly جیلی	Chalk solution چاک کا سلوشن
10 (c) (2018)	Tyndall effects is due to: ٹنڈل ایفیکٹ کس وجہ سے ہے؟	Blockage of beam of light روشنی کی شعاعوں کے رکنے کی وجہ سے	Non-scattering of beam of light روشنی کی شعاعوں کے منتشر نہ ہونے کی وجہ	Scattering of beam of light روشنی کی شعاعوں کے منتشر ہونے کی وجہ سے	Passing through beam of light روشنی کی شعاعوں کے گزرنے کی وجہ سے
11 (c)	If 10 cm^3 of alcohol is dissolved in 100 g of water, it is called: اگر 100 گرام پانی میں 10cm^3 الکحل حل کیا جائے تو یہ کہلاتا ہے:	% w/w	% w/v	% v/w	% v/v
12 (d) (2017)	When a saturated solution is diluted it turns into: جب ایک سیچوریٹڈ سلوشن کو ڈائلیوٹ کیا جاتا ہے تو یہ بن جاتا ہے۔	Supersaturated solution سپر سیچوریٹڈ سلوشن	Saturated solution سیچوریٹڈ سلوشن	A concentrated solution کنسنٹریٹڈ سلوشن	Unsaturated solution اَن سیچوریٹڈ سلوشن
13 (d) (2019)	Molarity is the number of moles of solute dissolved in: مولیریٹی سولیوٹ کے مولز کی تعداد ہے جو حل شدہ ہو:	1 Kg of solution سلوشن کے 1 کلوگرام میں	100 g of solvent سولوینٹ کے 100 گرام میں	1dm^3 of solvent سولوینٹ کے 1dm^3 میں	1dm^3 solution سلوشن کے 1dm^3 میں

MCQs of Previous Board Papers

14 (d) (2012)	The gas which can be absorbed by Palladium: پلاڈیم جو گیس جذب کر سکتی ہے؟	CO_2	N_2	O_2	H_2
15 (b) (2012)	Alcohol in water is an example of: پانی میں الکوحل مثال ہے:	Gas in liquid مائع میں گیس	Liquid in liquid مائع میں مائع	Solid in gas گیس میں ٹھوس	Gas in gas گیس میں گیس
16 (a) (2014)	Air is an example of solution: ہوا ایک سلوشن کی مثال ہے:	Gas in gas گیس میں گیس	Gas in solid ٹھوس میں گیس	Solid in gas گیس میں ٹھوس	Gas in liquid مائع میں گیس

17 (b) (2015)	The number of moles of solute dissolved in one dm^3 of the solution is called: سولیوٹ کے مولز کی وہ تعداد جو 1dm^3 سلوشن میں حل ہو، کہلاتی ہے:	Solubility سولوبیلٹی	Molarity مولیریٹی	Colloid کولائڈز	Suspension سسپنشن
18 (a) (2016)	Which thing is soluble in carbon tetrachloride: کون سی چیز کاربن ٹیٹرا کلورائیڈ میں حل پزیر ہے:	Grease گریس	Alcohol الکوحل	Sugar شوگر	Sodium chloride سوڈیم کلورائیڈ
19 (d) (2017)	Which one is universal solvent: کونسا یونیورسل سولوینٹ ہے؟	Benzene بینزین	Alcohol الکوحل	HCl	Water پانی
20 (a) (2017)	The minimum components of a solution are: سلوشن کے کم سے کم اجزا ہوتے ہیں؟	2	4	5	3
21 (b) (2018) (2018)	Brass is a solid solution of: پیتل ٹھوس سلوشن کی مثال ہے:	C + Cu	Zn + Cu	Zn + Ag	Au + Zn
22 (b) (2018)	Example of "gas in liquid" is: "مائع میں گیس" کی مثال ہے:	Air ہوا	Oxygen in water پانی میں آکسیجن	Mist دھند	Smoke in air ہوا میں دھواں
23 (c) (2018)	Alloy metals are example of: الائے میٹلز مثال ہے:	Liquid in gas گیس میں مائع	Liquid in solid ٹھوس میں مائع	Solid in solid ٹھوس میں ٹھوس	Solid in liquid مائع میں ٹھوس
24 (a) (2019)	Example of aqueous solution is: ایکوئس سلوشنز کی مثال ہے:	Sugar in water پانی میں شوگر	Ether ایتھر	Petrol پٹرول	Benzene بینزین
25 (b) (2021)	If 10 g of sugar is dissolved in 100 g of solution , it is called: اگر 10 گرام شوگر کو پانی میں حل کر کے 100 گرام سلوشن بنایا جائے تو اسے کہتے ہیں۔	% v/v	% m/m	% m/v	% v/m
26 (d) (2021)	Which compound is not soluble in water? کونسا کمپاؤنڈ پانی میں حل نہیں ہوتا؟	Sugar شوگر	Alcohol الکوحل	Glucose گلوکوز	Benzene بینزین
27 (d) (2021)	Which one solution is more concentrated? کونسا سلوشن زیادہ کنسنٹریٹڈ ہوتا ہے؟	0.1 M	0.25 M	1.0 M	2.0 M
28 (b) (2021)	If 40 g of NaOH are dissolved in 1 dm^3 of solution, the solution will be? اگر 1 dm^3 میں NaOH کے 40 گرام حل ہوں تو سلوشن ہوا گا؟	0.5 M	1.0 M	2.0 M	2.5 M

29 (a) (2022)	Solubility of which one salt increases with the increase in temperature: کس ایک سالٹ کی سولوبیلٹی ٹمپریچر کے بڑھنے سے بڑھتی ہے؟	$NaNO_3$	Li_2SO_4	$Ce_2(SO_4)_3$	NaCl
30 (d) (2022)	A solution formed by dissolving a substance in water is called: ایسا سلوشن جو کسی شے کو پانی میں حل کرنے سے وجود میں آئے، کہلاتا ہے:	Sugar مرکب	Sugar شوگر	Electricity الیکٹریسٹی	Aqueous ایکوئس
31 (b) (2023) (2023)	If a solute in grams, is dissolved in 100 g of the solution, the percentage is: سولیوٹ کی گرامز میں وہ مقدار جو 100 گرام سلوشن میں حل ہو، پرسینٹیج کہلاتی ہے:	% v/v	% m/m	% m/v	% v/m
32 (c) (2023)	The solvent in which polar covalent compounds are soluble. وہ سالوینٹ جس میں پولر کوویلنٹ کمپاؤنڈز حل ہو جاتے ہیں۔	Petrol پٹرول	Ether ایتھر	Water پانی	Benzene بینزین
33 (a) (2023)	One of these settles in water. ان میں سے جو چیز پانی کی تہ میں بیٹھ جاتی ہے۔	Honey شہد	Kerosene oil کیروسین آئل	Benzene بینزین	NaCl سوڈیم کلورائیڈ
34 (c) (2024)	In soft drinks, solvent is: سوفٹ ڈرنکس میں سولوینٹ ہے؟	Carbon dioxide کاربن ڈائی آکسائیڈ	Salt سالٹ	Water پانی	Sugar شوگر
35 (d) (2024)	The example of colloids is: کولائیڈز کی ایک مثال ہے؟	Chalk in water پانی میں چاک	Milk of magnesia ملک آف میگنیشیا	Paint پینٹ	Jelly جیلی
36 (c) (2024)	Opal is an example of solution: اوپلز سلوشن کی مثال ہے:	Liquid in gas گیس میں مائع	Solid in gas گیس میں ٹھوس	Solid in solid ٹھوس میں ٹھوس	Gas in solid ٹھوس میں گیس
37 (c) (2024)	Molar solutions are prepared in____: مولر سلوشن____ میں تیار کیے جاتے ہیں۔	Test tube ٹیسٹ ٹیوب	Pipette پیپٹ	Measuring flask میرنگ فلاسک	All تمام میں

(1) Why the suspensions does not form a homogeneous mixture.
The suspensions do not form a homogeneous mixture because its particles are big enough and remains undissolved.

(2) Why we stir paints thoroughly before using?
Paints are examples of suspensions. If we do not stir the paint before use, the particles will settle down.

(3) What do you mean by, like dissolves like? Explain with examples.

OR

What is general principle of solubility?
The general principle of solubility is "*Like dissolves like*".

- Ionic and polar substances are soluble in polar solvents
- Non-polar substances are soluble in non-polar solvents.

(4) Why is iodine soluble in CCl_4 and not in water?

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Iodine is non-polar and soluble in non-polar solvent CCl_4. While water is polar solvent and iodine is non-polar. Therefore iodine is not soluble in water.

(5) Why test tube becomes cold when KNO_3 is dissolved in water.

When KNO_3 is dissolved in water test tube becomes cold because heat is absorbed.

(6) Why are the colloids quite stable?

Colloids are quite stable because particles of colloids do not settle down for a long time.

(7) Why does the colloid show Tyndall effect?

Colloid show Tyndall effect because there particles are large enough to scatter the beam of light.

(8) What is Tyndall effect and on what factors it depends?

"The scattering of the path of beam light by colloid particles is called Tyndall effect". It depends upon the size of particles in colloids.

(9) Define Molarity. Write its formula.

"Number of moles of solute dissolved in one dm^3 of the solution is called molarity". It is represented by M. The formula used for the preparation of molar solution is as follows.

$$\text{Molarity (M)} = \frac{\text{Mass of solute (g)}}{\text{Molar mass of solute}(g\,mol^{-1}) \times \text{Volume of solution } (dm^3)}$$

(10) Define percentage $\frac{\text{Mass}}{\text{Mass}}\left(\frac{m}{m}\%\right)$?

"The mass of solute in grams dissolved in 100 gram of solution is called %m/m". Its general formula is

$$\%\text{ age}\frac{m}{m} = \frac{\text{Mass of solute (g)}}{\text{Mass of solution (g)}} \times 100$$

(11) Define percentage $\frac{\text{Mass}}{\text{Volume}}\left(\frac{m}{v}\%\right)$?

"The mass of solute in grams dissolved in 100 cm^3 of the solution is called %m/v". Its general formula is

$$\%\text{ age}\frac{m}{v} = \frac{\text{Mass of solute (g)}}{\text{Volume of solution } (cm^3)} \times 100$$

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(12) Define percentage $\frac{\text{Volume}}{\text{Mass}}\left(\frac{v}{m}\%\right)$?

"The volume of a solute in cm^3 dissolved in 100 g of the solution is called %v/m". Its general formula is

$$\%\text{ age}\frac{v}{m} = \frac{\text{Volume of solute } (cm^3)}{\text{Mass of solution (g)}} \times 100$$

(13) Define percentage $\frac{\text{Volume}}{\text{Volume}}\left(\frac{v}{v}\%\right)$?

"The volume of a solute in cm^3 dissolved per 100 cm^3 of the solution is called %v/v". Its general formula is

$$\%\text{ age}\frac{v}{v} = \frac{\text{Volume of solute } (cm^3)}{\text{Volume of solution } (cm^3)} \times 100$$

(14) Define solubility.

"The number of grams of the solute dissolved in 100 gram of a solvent to prepare a saturated solution at a specific temperature is called solubility".

(15) What is meant by aqueous solution? Give an example

"The solution in which water acts as solvent is known as aqueous solution". For example sugar in water and table salt in water.

(16) Define solute and solvent.

Solute:

"The component of solution which is present in smaller quantity is called solute".

Solvent:

"The component of solution which is present in larger quantity is called solvent".

For example salt solution is made by dissolving salt in water, here water is solvent and slat is solute.

(17) Define aqueous solution.

The solution formed by dissolving a substance in water is called aqueous solution. For example salt solution is made by dissolving salt in water, here water is solvent and slat is solute.

(18) Define saturated solution.

"A solution containing maximum amount of solute at a given temperature is called saturated solution".

(19) Define supersaturated solution.

"The solution which is more concentrated than a saturated solution is called supersaturated solution".

(20) Define unsaturated solution?

A solution which contains lesser amount of solute than that which is required to saturate it at a given temperature.

(21) What is difference between dilute and concentrated solution? (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Dilute solution	Concentrated solution
1	Those solutions which have relatively small amount of solute are called dilute solutions.	Those solutions which have relatively large amount of solute are called concentrated solutions.

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Long questions

I. Define solubility and what is the general principle of solubility? Explain.

It can be defined as

"The number of grams of the solute dissolved in 100 gram of a solvent to prepare a saturated solution at a specific temperature is called solubility".

The general principle of solubility is ***"Like dissolves like".***

- Ionic and polar substances are soluble in polar solvents. Ionic solids and polar covalent compounds are soluble in water e.g. NaCl, sugar and alcohol all are soluble in water.
- Non-polar substances are not soluble in polar solvents. Non-polar covalent compounds are not soluble in water e.g. ether, benzene and petrol are insoluble in water.
- Non-polar substances are soluble in non-polar solvents (also called organic solvents). For example grease, paints naphthalene are soluble in ether or carbon tetra chloride (CCl_4) etc.

II. What is the difference among the following? (پیپر میں کسی ایک کی خصوصیات بھی پوچھی جاسکتی ہیں یا کوئی سے 2 کا فرق پوچھا جاسکتا)

(i) Solution (ii) Colloids (iii) Suspensions

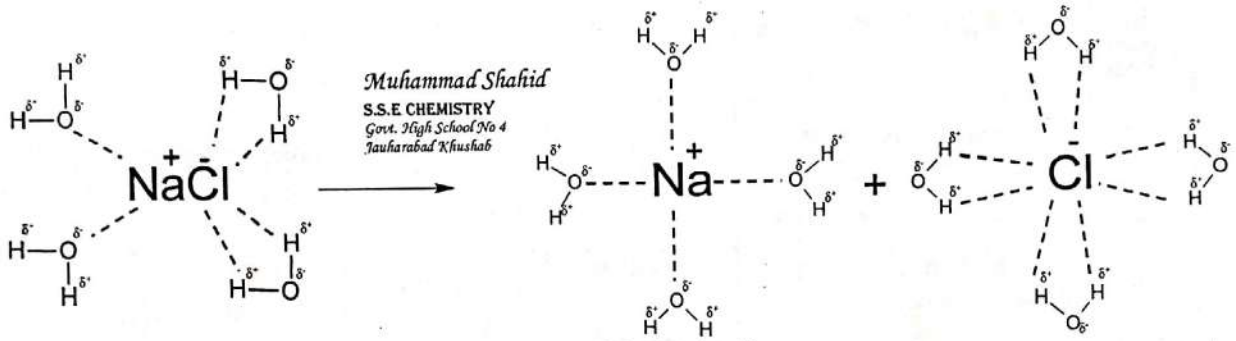
Sr. No	Solutions	Colloid	Suspension
1	The particles have diameter 10^{-8} cm.	Their size is in between solutions and suspensions.	The particles have diameter 10^{-5} cm.
2	It form a homogeneous mixture.	It appears as homogeneous but actually it forms heterogeneous mixture.	It form a heterogeneous mixture.
3	Particles cannot be seen by naked eye.	Particles cannot be seen by naked eye.	Particles can be seen by naked eye.
4	Particles can pass through filter paper.	Particles can pass through filter paper.	Particles cannot pass through filter paper.
5	They do not show tyndall effect.	They show tyndall effect.	They do not show tyndall effect.

III. Describe the solute-solvent interaction for the preparation of solution.

To dissolve a solute in a solvent following three events must occur.

- Solute particles must separate.
- Solvent particles must separate.
- Solute and solvent particles must attract and mix up.

In solid NaCl, the positive Na^+ ions and negative Cl^- ions are held together by strong electrostatic forces of attractions. Water is a polar molecule. When solid NaCl is added into water it dissolves readily because the attractive interactions between ions of NaCl and polar water molecules are strong enough to overcome the attractive forces present between Na^+ ions and Cl^- ions.
In this process the positive end of the water dipole is oriented towards the Cl^- ions and the negative end of water dipole is oriented towards Na^+ ions. This ion-dipole interaction is so strong that they pull these ions from their positions in the crystal thus NaCl dissolves in water as shown in the figure.



IV. What is solubility? How temperature effect it. Write in detail.

It can be defined as
"The number of grams of the solute dissolved in 100 gram of a solvent to prepare a saturated solution at a specific temperature is called solubility".
Temperature has major effect on solubility. When a solute is dissolved in solvent there are following three possibilities.

Heat is absorbed:
When salts like KNO_3, $NaNO_3$ and KCl are dissolved in water the test tube becomes cold. It is an ***endothermic*** process. Usually solubility increases with increase in temperature for such solutes.

Solvent + solute + Heat → Solution

Heat is given out:
When salts like Li_2SO_4 etc. are dissolved in water the test tube becomes warm. It is an ***exothermic*** process. Usually solubility decreases with increase in temperature for such solutes.

Solvent + solute → Solution + Heat

No change in heat:
In some cases during solution formation neither the heat is absorbed nor released. When salts like NaCl is added in water, the solution temperature remains almost the same. In such solutions the temperature has minimum effect on solubility.

ELECTROCHEMISTRY

Sr. #	Questions	A	B	C	D
1 (b) (2016) (2017) (2023)	Spontaneous chemical reactions take place in: از خود ہونے والا کیمیکل ری ایکشن کس سیل میں ہوتا ہے؟	Electrolytic cell الیکٹرولیٹک سیل	Galvanic cell گیلوانک سیل	Nelson's cell نیلسن سیل	Downs cell ڈاؤنز سیل

2 (a) (2019)	Formation of water from hydrogen and oxygen is: ہائڈروجن اور آکسیجن سے پانی کا بننا کونسا کیمیکل ری ایکشن ہے؟	Redox reaction ریڈاکس ری ایکشن	Acid-base reaction اساس-تیزاب ری ایکشن	Neutralization نیوٹرلائزیشن	Decomposition تحلیل
3 (b)	Which one of the following is not an electrolytic cell? درج ذیل میں سے الیکٹرولیٹک سیل نہیں:	Downs cell ڈاؤنز سیل	Galvanic cell گیلوانک سیل	Nelson's cell نیلسن سیل	Both a and c a اور c دونوں
4 (b) (2016) (2017) (2018)	The oxidation number of chromium in $K_2Cr_2O_7$ is: $K_2Cr_2O_7$ میں کرومیم کا آکسیڈیشن نمبر کیا ہوتا ہے؟	+2	+6	+7	+14
5 (a) (2014) (2016) (2018)	Which one of the following is not an electrolyte? درج ذیل میں سے کون سا الیکٹرولائٹ نہیں ہے؟	Sugar solution شوگر کا سلوشن	Sulphuric acid solution سلفیورک ایسڈ کا سلوشن	Lime solution چونے کا سلوشن	Sodium chloride solution سوڈیم کلورائیڈ کا سلوشن
6 (b) (2016)	The most common example of corrosion is: کروژن کی سب سے عام مثال کون سی ہے؟	Chemical decay کیمیکل توڑ پھوڑ	Rusting of iron لوہے کو زنگ لگنا	Rusting of aluminum ایلومینیم کو زنگ لگنا	Rusting of tin ٹن کو زنگ لگنا
7 (b)	Nelson's cell is used to prepare caustic soda along with gases. Which of the following gas is produced at cathode: نیلسن سیل گیسوں کے ساتھ کاسٹک سوڈا تیار کرنے کے لیے استعمال کیا جاتا ہے۔ درج ذیل میں سے کون سی گیس کیتھوڈ پر پیدا ہوتی ہے؟	Cl_2	H_2	O_3	O_2
8 (d) (2021)	During the formation of water from hydrogen and oxygen, which of the following does not occur: ہائڈروجن اور آکسیجن سے پانی بننے کے عمل کے دوران درج ذیل میں سے کیا واقع نہیں ہوتا ہے:	Hydrogen has oxidized ہائڈروجن کی آکسیڈیشن ہوگئی ہے	Oxygen has reduced آکسیجن کی ریڈکشن ہوگئی ہے	Oxygen gains electrons آکسیجن الیکٹرون حاصل کرتی ہے	Hydrogen behaves as oxidizing agent ہائڈروجن آکسیڈائزنگ ایجنٹ کے طور پر کام کرتی ہے
9 (a) (2014) (2019) (2023) (2023)	The formula of rust is: زنگ کا فارمولا ہے؟	$Fe_2O_3.nH_2O$	Fe_2O_3	$Fe(OH)_3.nH_2O$	$Fe(OH)_3$
10 (b)	In the redox reaction between Zn and HCl, the oxidizing agent is: زنک اور ہائڈروکلورک ایسڈ کے درمیان ریڈاکس (Redox) ری ایکشن کے دوران آکسیڈائزنگ ایجنٹ کون سا ہوتا ہے؟	Zn	H^+	Cl^-	H_2

MCQs of Previous Board Papers

11 (d) (2012)	Whose oxidation number is +2? درج ذیل میں سے کس کا آکسیڈیشن نمبر 2+ ہے؟	K^{+1}	Na^{+1}	O^{-2}	Ca^{+2}
12 (b) (2012)	In electroplating of silver, anode is made of? سلور کی الیکٹر پلیٹنگ میں اینوڈ بنا ہوتا ہے:	Copper کاپر کا	Silver سلور کا	Gold گولڈ کا	Zinc زنک کا
13 (b) (2014) (2014) (2015) (2019)	The oxidation number of chlorine in $KClO_3$ is? $KClO_3$ میں کلورین کا آکسیڈیشن نمبر کیا ہوتا ہے؟	+6	+5	+1	-2
14 (b) (2015)	What is obtained from fused NaCl? پگھلے ہوئے سوڈیم کلورائیڈ سے کیا حاصل ہوتا ہے؟	NaOH	Sodium metal سوڈیم میٹل	Both A and B A اور B دونوں	None کوئی بھی نہیں
20 (c) (2015) (2016)	The oxidation number of all elements in free state: آزاد حالت میں ایلیمنٹس کا آکسیڈیشن نمبر کیا ہوتا ہے	+1	-1	Zero صفر	+2
16 (c) (2015)	Which one of the following is used for the production of sodium metal: درج ذیل میں سے کونسا سوڈیم میٹل کی تیاری میں استعمال ہوتا ہے:	Galvanic cell گیلوانک سیل	Nelson's cell نیلسن سیل	Downs cell ڈاؤنز	Electroplating الیکٹر پلیٹنگ
17 (c) (2016)	The oxidation number of Mn in $KMnO_4$ is: $KMnO_4$ میں Mn کا آکسیڈیشن نمبر کیا ہوتا ہے؟	+2	+3	+7	+6
18 (b) (2016)	During electroplating of chromium, the electrolyte which is used in electrolytic cell is: کرومیم کی الیکٹر پلیٹنگ میں الیکٹرولیٹک سیل میں الیکٹرولائٹ استعمال ہوتا ہے۔	$CrCl_3$	$Cr_2(SO_4)_3$	$CuSO_4$	$NiSO_4$
19 (d) (2016)	Anode of down's cell is made of: ڈاؤنز سیل میں اینوڈ بنا ہوتا ہے؟	Steel سٹیل کا	Copper کوپر کا	Calcium کیلشیم کا	Carbon کاربن کا
20 (d) (2017)	Depositing of one metal over the other by means of electrolysis is: الیکٹرولیسیز کے ذریعے ایک میٹل کے اوپر دوسری میٹل کی تہ جمانے کے عمل کو کہا جاتا ہے	Corrosion کروژن	Reduction ریڈکشن	Oxidation آکسیڈیشن	Electroplating الیکٹرو پلیٹنگ

21 (c) (2017)	Electrochemistry is branch of chemistry which deals with relationship between: الیکٹروکیمسٹری، کیمسٹری کی وہ شاخ ہے جو تعلق کو بیان کرتی ہے۔	Carbon and its compounds کاربن اور اس کے کمپاؤنڈز کو	Solute and solutions سولیوٹ اور سلوشن کے	Electricity and chemical reactions الیکٹریسٹی اور کیمیکل ری ایکشن کے	Metals and non-metals میٹلز اور نان میٹلز کے
22 (a) (2018)	The oxidation number of hydrogen in HCl is: HCl میں ہائڈروجن کا آکسیڈیشن نمبر ہے۔	+1	+2	+4	+3
23 (d) (2018)	Loss of electron is called: الیکٹرونز کا اخراج کہلاتا ہے:	Hydrogenation ہائیڈروجینیشن	Hydration ہائیڈریشن	Reduction ریڈکشن	Oxidation آکسیڈیشن
24 (d) (2018) (2021)	Which one of the following solution is strong electrolyte? درج ذیل میں سے کون سا سلوشن طاقتور الیکٹرولائٹ ہے؟	Solution of benzene بینزین کا سلوشن	Solution of acetic acid ایسٹک ایسڈ کا سلوشن	Sugar solution شوگر کا سلوشن	Solution of H_2SO_4 H_2SO_4 کا سلوشن
25 (c) (2019)	The oxidation number of sulphur in H_2SO_4 is: H_2SO_4 میں سلفر کا آکسیڈیشن نمبر کیا ہوتا ہے؟	+2	+4	+6	+7
26 (b) (2021) (2024)	The oxidation number of oxygen in OF_2 is: OF_2 میں آکسیجن کا آکسیڈیشن نمبر ہے۔	+1	+2	-1	-2
27 (a) (2021)	The oxidation number of oxygen in peroxides is: پر آکسائیڈز میں آکسیجن کا آکسیڈیشن نمبر ہے۔	-1	-2	+1	+2
28 (d) (2022)	The oxidation number of oxygen in peroxides is: پر آکسائیڈز میں آکسیجن کا آکسیڈیشن نمبر ہے۔	-4	-3	-2	-1
29 (c) (2022)	Slow and continuous eating away of a metal by the surrounding medium is called? کسی میٹل کا ارد گرد کے کسی میڈیم کی وجہ سے کروڈ ہو جانے کا نام ہے؟	Paint پینٹ	Alloy الائے	Corrosion کروژن	Stains سٹینز
30 (d) (2022)	Which one is non-electrolyte? کون سا ایک الیکٹرولائٹ نہیں ہے؟	CH_3COOH	NaOH	HCl	Benzene بینزین
31 (b) (2022) (2023)	Which is an example of reducing agent: کون سی ایک ریڈیوسنگ ایجنٹ کی مثال ہے؟	Cl_2	Zn	Br_2	O_2
نوٹ: میٹلز زیادہ تر ریڈیوسنگ ایجنٹ کے طور پر کام کرتی ہیں اور نان میٹلز آکسیڈائزنگ ایجنٹ کے طور پر۔					
32 (a) (2024)	A non-electrolyte is? ایک نان الیکٹرولائٹ ہے؟	Benzene بینزین	Sodium hydroxide سوڈیم ہائیڈروآکسائیڈ	Sodium chloride سوڈیم کلورائیڈ	Sulphuric acid سلفیورک ایسڈ

33 (b) (2024)	There are ___ types of electrochemical cells. الیکٹروکیمیکل سیل کی اقسام ہیں۔	1	2	3	4
34 (c) (2024)	In reaction $\overset{0}{H_2} + \overset{0}{O_2} \rightarrow \overset{+1\ -2}{H_2O}$, "H" act as: $\overset{0}{H_2} + \overset{+1\ -2}{O_2} \rightarrow H_2O$ اس ری ایکشن میں H بطور عمل کرتا ہے۔	Oxidizing agent آکسیڈائزنگ ایجنٹ	Reduction ریڈکشن	Reducing agent ریڈیوسنگ ایجنٹ	All تمام
شارٹ Trick: جس کی اپنی آکسیڈیشن ہوتی ہے وہ ریڈیوسنگ ایجنٹ کے طور پر کام کرتا ہے اور جس کی اپنی ریڈکشن ہوتی ہے وہ آکسیڈائزنگ ایجنٹ کے طور پر کام کرتا ہے۔					

(1) Define redox reaction.

The chemical reactions in which oxidation and reduction processes takes place are called redox reactions. For example formation of NaCl.

$2Na + Cl_2 \rightarrow 2NaCl$

(2) Define oxidation and reduction in terms of electrons. Give an example.

The loss of electron by an atom or ion is called oxidation e.g.

$Na^0 \rightarrow Na^+ + 1e^-$

The gain of electron by an atom or ion is called reduction e.g.

$Cl + 1e^- \rightarrow Cl^-$

(3) Differentiate between strong and weak electrolytes. (Also a long question) (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Strong electrolytes	Weak electrolytes
1	The electrolytes which completely ionizes in their aqueous solution are called strong electrolytes.	The electrolytes which ionizes to a small extent in their aqueous solution are called weak electrolytes.
2	These are good conductors of electricity.	These are poor conductors of electricity.
3	For example solution of NaOH and HCl.	For example solution of CH_3COOH and $Ca(OH)_2$.
4	$NaOH \rightleftharpoons Na^+ + OH^-$	$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$

(4) Differentiate between electrolyte and non-electrolyte. (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Electrolyte	Non–Electrolyte
1	The substances which can conduct electricity in their aqueous solutions or molten (پگھلی ہوئی حالت) state, are called electrolytes.	The substances which do not conduct electricity in their aqueous solutions or molten (پگھلی ہوئی حالت) state, are called non-electrolytes.
2	For example solution of salts, acids or bases.	For example sugar solution and benzene.

(5) Differentiate between spontaneous and non-spontaneous reaction. (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Spontaneous reactions	Non-spontaneous reactions
1	The reactions which takes place by their own without any external agent, are called spontaneous reactions.	The reactions which cannot takes place by their own, are called non-spontaneous reactions.
2	For example reaction in Galvanic cell.	For example reaction in Nelson's cell and Downs cell.

(6) What is the difference between valency and oxidation state? (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr.No	Valency	Oxidation state or Oxidation number
1	The combining capacity of an element with other element is called valency.	Apparent charge assigned to an atom of an element in a molecule or in an ion is called oxidation state.
2	It can never be zero.	It may be zero.
3	It is always whole number.	It may be whole number or in fraction.

(7) Define oxidation and reduction with an example. (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Oxidation	Reduction
1	The process in which oxygen is added or hydrogen or electron are removed is known as oxidation reaction.	The process in which oxygen is removed or hydrogen or electron are added is known as reduction reaction.
2	For example Reduction $2ZnO + C \rightarrow 2Zn + CO_2$ Oxidation Reduction $H_2S + Cl_2 \rightarrow S + 2HCl$ Oxidation Reduction $2Na^0 + Cl_2^0 \rightarrow 2Na^{1+}Cl^{-1}$ Oxidation	Removal of Oxygen Addition of Oxygen Addition of hydrogen Removal of hydrogen Addition of electron Removal of electron

(8) What is galvanizing? Why is galvanizing done?
Galvanizing is a process in which a thin Zinc layer is coated on iron sheet. It is done to protect iron from corrosion. It is done to protect iron from corrosion.

(9) Name the metal which is used for galvanizing iron?
Zinc (Zn) is used for the process of galvanizing.

(10) Why is O_2 necessary for rusting?
Oxygen (O_2) is necessary for rusting because there is no rusting without oxygen. ***Oxygen act as oxidizing agent.***

$$2Fe \rightarrow 2Fe^{2+} + 4e^-$$
$$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$$

Next the Fe^{+2} ions formed spread throughout the iron sheet and react with oxygen (O_2) to form the salt $Fe_2O_3.nH_2O$ which is called rust.

$$2Fe^{2+} + \tfrac{1}{2}\,O_2 + (2+n)\,H_2O \rightarrow Fe_2O_3nH_2O_{(rust)} + 4\,H^+$$

(11) What is metallic coating? OR State the best method for protection of metal from corrosion.
The method in which a layers of metal is coated with another metal is called metallic coating. This is the best method for prevention from corrosion.

(12) Define electroplating. Give its uses.
"The process of depositing (جمع کرنا) of one metal over the other by means of electrolysis is called as electroplating".

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USES:

It is used for silver plating of jewelry, steel and tableware etc.

(13) How is electroplating of tin on steel carried out?

OR

How electroplating of tin is carried out?

- Electroplating of tin on steel is carried out by placing the steel into a container containing solution of tin salt.
- The steel is connected to an electrical circuit, acting as cathode. While the other electrode made of tin metal act as anode.
- When an electrical current is passed through the circuit, tin metal ions present in the solution deposit on steel.

(14) Define electrochemical cell. Write the names of its types.

"It is a system in which two electrodes are dipped in the solution of an electrolyte which are connected to the battery". It is an energy storage device. It has two types

i. Electrolytic cell **ii.** Galvanic cell

(15) Which type of chemical reaction takes place in electrolytic cell?

Non-spontaneous chemical reaction takes place in an electrolytic cell.

(16) What is salt bridge? What is its basic function?

Salt bridge is a U-shaped glass tube. It consist of a saturated solution of strong electrolyte supported in a jelly type material.

Function:

The function of salt bridge is to keep the solutions of two-half cells neutral.

(17) What is difference between anode and cathode? (کوئی سے 2 یاد کر لیں۔) (پیپر میں دونوں الگ الگ بھی پوچھے جا سکتے ہیں)

Sr. No	Anode	Cathode
1	The electrode where oxidation takes place is called anode.	The electrode where reduction takes place is called cathode.
2	$Zn \rightarrow Zn^{2+} + 2e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$
3	In electrolytic cell it is positively charged.	In electrolytic cell it is negatively charged.
4	In galvanic cell it is negatively charged.	In galvanic cell it is positively charged.

(18) What is corrosion? Give its example.

It can be defined as:

"Slow and continuous eating away of a metal by the surrounding medium is called corrosion".

It is a redox chemical reaction.

Example:

Common example of corrosion is rusting of iron.

(19) Write two methods for prevention of corrosion.

The following methods are used for prevention of corrosion.

- Removal of stains
- Paints and greasing
- Alloying
- Metallic coating

(20) How galvanizing of iron sheets is done?

- The process of coating a thin layer of zinc on iron is called galvanizing.
- This process is carried out by dipping a clean iron sheet in a zinc chloride bath and then heating it.
- After this iron sheet is removed, rolled into molten zinc metal bath and finally air-cooled.

(21) Define alloy and give example.

It can be defined as:

"Alloy is a homogeneous mixture of one metal with one or more other metals or non-metals".

Example:

The best example of alloy is "stainless steel", which is a good combination of iron (Fe), Chromium (Cr) and Nickle (Ni).

(22) What is the name of the by-product produced in the Downs cell?

Chlorine (Cl_2) is produced as a byproduct in Downs cell.

(23) Name the by-products produces in Nelson's cell?

Hydrogen gas (H_2) and chlorine gas (Cl_2) are the byproduct produced in Nelson's cell.

(24) Find out the oxidation number of chlorine in $KClO_3$.

OR

Find out the oxidation number of chlorine in $KClO_3$ as O.N of K = +1 and O.N of O = -2

➡ Oxidation number of Cl in $KClO_3$

Oxidation number of K = +1
Oxidation number of O = -2
Oxidation number of Cl = ?
[O.N of K] + [O.N of Cl] + 3[O.N of O] = 0
[+1] + [O.N of Cl] + 3[-2] = 0
[O.N of Cl] -6 +1 = 0
[O.N of Cl] -5 = 0
O.N of Cl = +5
So O.N of Cl is +5

(25) Find the oxidation number of nitrogen in HNO_3.

➡ Oxidation number of N in HNO_3

Oxidation number of H = +1
Oxidation number of O = -2
Oxidation number of Mn = ?
[O.N of H] + [O.N of N] + 3[O.N of O] = 0
[+1] + [O.N of N] + 3[-2] = 0
[O.N of N] -6 +1 = 0
[O.N of N] -5 = 0
O.N of N = +5
So O.N of N is +5

LONG QUESTIONS

I. Define oxidation number. Write four rules for assigning oxidation numbers.

It can be defined as:

"The apparent charge assigned to an atom of an element in a molecule or ion is called oxidation number".

OR

The apparent charge present on an atom of an element present in a molecule or ion is called oxidation number".

Example: In HCl, oxidation number of H is +1 and that of Cl is -1.

- The O.N of all elements in free state is zero.
- The O.N of simple ion is the charge of the ion. For example O.N of Na^+ is +1.
- The O.N of hydrogen in its all compounds is +1.
- The O.N of oxygen in its all compounds is -2. In peroxide it is -1 and in OF_2 is +2.
- In any substance, the more E.N. (electronegative) atom gets –ve charge.
- In neutral molecules the algebraic sum of the O.N of all the elements is zero.

II. Discuss the electrolysis of water.

(From book)

III. What do you know about the rusting of iron?

The corrosion of iron is called **rusting**. The important condition for rusting is moist air. There will be no rusting if water vapours or air is absent. Stains and dents on the surface of the iron provide the sites for rusting. This region is called anodic region. The loss of electron damages the object. These free electrons reach to an area of relatively high O_2 concentration which acts as cathode. The following redox reaction takes place.

$$2Fe + O_2 + 4H^+ \rightarrow 2Fe^{2+} + 2H_2O$$

The Fe^{+2} ions formed spreads throughout the surrounding water and reacts with O_2 to form the rust ($Fe_2O_3.nH_2O$).

$$2Fe^{2+} + \tfrac{1}{2} O_2 + (2+n)\, H_2O \rightarrow Fe_2O_3.nH_2O\ (rust) + 4H^+$$

This process continues until the whole piece of iron is eaten away.

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IV. What is difference between electrolytic and galvanic cell? (پیپر میں دونوں الگ الگ بھی پوچھے جاسکتے ہیں)

Sr. No	Electrolytic cell	Galvanic cell
1	It consist of one complete cell.	It consist of two half cells.
2	Non-spontaneous chemical reaction takes place.	Spontaneous chemical reaction takes place.
3	Battery is used.	No battery is used.
4	Salt bridge is not used.	Salt bridge is used.
5	Electrical energy is converted into chemical energy.	Chemical energy is converted into electrical energy.
6	Anode has positive charge while cathode has negative charge.	Anode has negative charge while cathode has positive charge.

CHEMICAL REACTIVITY

Sr. #	Questions	A	B	C	D
1 (d) (2016) (2016)	Metals can form ions carrying charges? میٹلز کون سے آئن والا چارج بناتی ہیں؟	Uni-positive یونی پوزیٹو	Di-positive ڈائی پوزیٹو	Tri-positive ٹرائی پوزیٹو	All of them یہ تمام
2 (d) (2016) (2018) (2023)	Which one of the following metal burns with a brick red flame? ان میں سے کونسی میٹل ہوا میں گرم ہونے پر سرخی مائل شعلے کے ساتھ جلتی ہے۔	Sodium سوڈیم	Magnesium میگنیشیم	Iron آئرن	Calcium کیلشیم
3 (b)	Sodium is extremely reactive metal, but it does not react with: سوڈیم بہت ری ایکٹو میٹل ہے، لیکن یہ ری ایکٹ نہیں کرتی۔	Hydrogen ہائڈروجن کے ساتھ	Nitrogen نائٹروجن کے ساتھ	Sulphur سلفر کے ساتھ	Phosphorus فاسفورس کے ساتھ
4 (c)	Which one of the following lightest metal? ان میں سے ہلکا ترین اور پانی پر تیرنے والا کون سا ایلیمنٹ ہے؟	Calcium کیلشیم	Magnesium میگنیشیم	Lithium لیتھیم	Sodium سوڈیم

5 (b)	Pure alkali metals can be cut simply by knife but iron cannot because of alkali metals have: خالص الکلی میٹلز کو چاقو سے کاٹا جا سکتا ہے مگر آئرن کو نہیں: اس کی وجہ ہے۔	Strong metallic bonding طاقتور میٹلک بانڈنگ	Weak metallic bonding کمزور میٹلک بانڈنگ	Non-metallic bonding نان میٹلک بانڈنگ	Moderate metallic bonding معتدل میٹلک بانڈنگ
6 (a) (2017)	Which of the following is less malleable? درج ذیل میں سے کونسی میٹل کم میلیبل ہے؟ (اُردو کی کتاب کے مطابق MCQ کی Statement ایسے ہے۔)	Sodium سوڈیم	Iron آئرن	Gold گولڈ	Silver سلور
7 (c)	Metals lose their electrons easily because: میٹلز آسانی سے الیکٹرون خارج کرتی ہیں کیونکہ	They are electronegative یہ الیکٹرونیگیٹیو ہیں	They have electron affinity ان کی الیکٹرون افینٹی ہوتی ہے	They are electropositive یہ الیکٹروپازیٹو ہوتی ہیں	Good conductors حرارت کی اچھی کنڈکٹر ہیں
8 (c)	Which one of the following is brittle?	Sodium	Aluminium	Selenium	Magnesium
	ان میں سے کونسی میٹل آسانی سے ٹوٹ جاتی ہے: (اُردو کی کتاب کے مطابق MCQ کی Statement ایسے ہے۔)	سوڈیم	ایلومینیم	سیلینیم	میگنیشیم
8.1 (a)	اُردو کی بک میں لفظ میٹل آیا ہے، اس لیے جواب سوڈیم ہے کیونکہ میٹلز میں سے سوڈیم آسانی سے ٹوٹ جاتی ہے۔ جبکہ انگلش میڈیم کی بک میں لفظ میٹل نہیں ہے۔ پھر جواب سیلینیم ہے۔ کیونکہ یہ ایک نان میٹل ہے اور نان میٹلز آسانی سے ٹوٹ جاتی ہیں یعنی کہ Brittle ہوتی ہیں۔				
9 (c) (2021)	Which one of the following non-metal is lustrous? درج ذیل میں سے کونسی نان میٹل چمکدار ہے؟	Sulphur سلفر	Phosphorus فاسفورس	Iodine آئیوڈین	Carbon کاربن
10 (d) (2021)	Non-metal are generally soft, but which one of the following is extremely hard? نان میٹلز عام طور پر نرم ہیں لیکن ان میں سے کونسی نہایت سخت ہے؟	Graphite گریفائیٹ	Phosphorus فاسفورس	Iodine آئیوڈین	Diamond ڈائمنڈ
11 (d) (2016)	Which one of the following will not react with dilute HCl? درج ذیل میں سے کون ہلکے HCl کے ساتھ ری ایکٹ نہیں کرتا؟	Sodium سوڈیم	Potassium پوٹاشیم	Calcium کیلسیم	Carbon کاربن
MCQs of previous Sargodha Board papers					
12 (d) (2014)	Which one is used in coin making? ان میں سے کون سکے بنانے میں استعمال ہوتی ہے؟	Lead لیڈ	Iron آئرن	Zinc زنک	Silver سلور

13 (d) (2014)	The least conductor of heat is? حرارت کی سب سی کم ترکنڈکٹر ہے۔	Iron آئرن	Gold گولڈ	Silver سلور	Lead لیڈ
14 (d) (2014)	Which of the following has the highest electronegativity? درج ذیل میں سے کس کی الیکٹرونیگیٹویٹی سب سے زیادہ ہے	Iodine آئیوڈین	Bromine برومین	Chlorine کلورین	Fluorine فلورین
15 (b) (2014) (2017)	Transition elements are? ٹرانزیشن میٹلز ہیں؟	All gases تمام گیسز	All metals تمام میٹلز	All metalloids تمام میٹلائڈز	All non-metals تمام نان میٹلز
16 (c) (2014)	The most reactive metal is? سب سے زیادہ ری ایکٹیو میٹل ہے؟	Iron آئرن	Gold گولڈ	Cesium سیزیم	Aluminium ایلومینیم
17 (c) (2015)	Which metal is ***more*** malleable? ان میں سے کونسی میٹل زیادہ میلیبل ہے	Sodium سوڈیم	Iron آئرن	Gold گولڈ	Silver سلور
18 (c) (2017)	Melting point of sodium is: سوڈیم کا میلٹنگ پوائنٹ ہے:	100 °C	496 °C	97 °C	650 °C
19 (c) (2018)	One gram of which metal can be drawn into wire of one and half kilometer long. کس دھات کے ایک گرام کو کھینچ کر ڈیڑھ کلومیٹر لمبی تار بنائی جاسکتی ہے۔	Calcium کیلشیم	Iron لوہا	Gold سونا	Silver سلور
20 (c) (2018)	The lightest metal is? سب سے ہلکی میٹل ہے؟	Na	K	Li	Pb
21 (d) (2019)	Which of the following metal is heaviest: درج ذیل میں سے بھاری میٹل ہے؟	Cesium سیزیم	Uranium یورینیم	Platinum پلاٹینم	Osmium اوسمیم
22 (b) (2019)	Which of the following is the mixture of Stainless Steel: درج ذیل میں سے اسٹین لیس سٹیل کا مکسچر ہے؟	Zn + Cr + Fe	Ni + Cr + Fe	Co + Cr + Fe	Co + Ni + Cr
23 (b) (2019) (2024)	Colour of flame of sodium is: سوڈیم کے شعلے کا رنگ ہوتا ہے؟	White سفید	Golden yellow سنہری پیلا	Brick red سرخی مائل	Violet بنفشی
24 (c) (2022)	The most abundant metal is? سب سے زیادہ کثرت سے پائی جانے والی میٹل ہے؟	Iron آئرن	Copper کاپر	Aluminium ایلومینیم	Zinc زنک
25 (b) (2022)	Metals form ionic compound with: میٹلز ____ مل کر آئیونک کمپاؤنڈز بناتی ہیں۔	Metalloids میٹلائڈز	Halogens ہیلوجنز	Noble gases نوبل گیسز	Transition elements ٹرانزیشن ایلیمنٹس

26 (b) (2023)	The halogen which exists in liquid form at room temperature. ہیلوجن جو روم ٹمپریچر پر مائع حالت میں پائی جاتی ہے۔	Iodine آئیوڈین	Bromine برومین	Chlorine کلورین	Fluorine فلورین
27 (d) (2024)	The most electropositive alkali metal is? سب سے زیادہ الیکٹروپازیٹو الکلی میٹل ہے؟	Li	Na	K	Rb

(1) Why the reactivity of metals increases down the group?
The reactivity of metals increases down the group because the atomic size increases down the group and removal of electron becomes easy from valence shell and cation formation becomes easy by removal of electron.

(2) Write the names of any four least reactive metals.
Following metals are least reactive:
Copper, mercury, silver and gold.

(3) State two physical properties of the metals. (Also A long Question).
- They are good conductor of electricity.
- They have high melting & boiling point.
- Almost all the metals are solids (except mercury).
- They have high densities.

(4) Write any two chemical properties of metals. (Also A long Question).
- They form ionic compounds with non-metals.
- They easily lose electron and form positive ion.
- They react with water rapidly.
- They have metallic bonding.

(5) Write any two physical properties of non-metals. (Also A long Question).
- They are bad conductor of electricity.
- They have low melting and boiling point.
- They are brittle.
- They are not shiny.

(6) Write any two chemical properties of non-metals. (Also A long Question).
- They form ionic compounds with metals.
- They easily gain electron and form negative ion.
- They usually do not react with water.
- They don't react with dilute acids.

(7) Define metallic character.
OR
Define electropositive character. Write its trend.
Metals have the tendency to lose their valence electrons. This property of metals is called metallic character or electropositivity.
Trend:
Atomic size decreases along the period due to increase in nuclear charge so metallic character decreases along the period.
Atomic size increases down the group due to addition of extra shell so metallic character increases down the group.

(8) Name a metal which exists in liquid form?
Mercury is a metal which exists in liquid form.

(9) What is the nature of metal oxide?
Mostly the *metal oxides are basic* in nature.

(10) Why ionization energies of alkaline earth metals are higher than alkali metals?
The ionization energy of alkaline earth metals is higher than alkali metals because the size of alkaline earth metals is smaller and nuclear charge is higher than alkali metals.

(11) Why magnesium is harder than sodium?
Magnesium is harder than sodium because it forms strong metallic bonding than sodium.

(12) Why ionization energy of Na is less than Mg?
The ionization energy of Na (Sodium) is less than Mg (Magnesium) because the size of Na is larger and nuclear charge is less than Mg.

(13) Why the ionization energy of Na is more than K?
The ionization energy of Na (Sodium) is more than K (Potassium) because the atomic size of Na is smaller than K.

(14) Why sodium metal is more reactive than magnesium metal?
Sodium (Na) metal is more reactive than magnesium (Mg) because Na has larger size than Mg.

(15) Name the best ductile and malleable metal?
The best ductile and malleable metals are Gold (Au) and Silver (Ag).

(16) Why is gold used to make jewelry?
Gold is used to make jewelry because it is not even affected by any mineral acid or base.

(17) Why silver & gold are least reactive?
Silver & gold are least reactive because they do not lose their valence electrons easily.

(18) Why is platinum used for making jewelry?

OR

What are unique characteristics of platinum? OR Write uses of platinum.
Platinum is used to make jewelry items because of its unique characteristics e.g. beauty, colour, flexibility (لچک), strength, and resistance to tarnish (تبدیل ہو جانا). It also provides a secure setting for diamonds and other gemstones (جواہرات) by enhancing their brilliance (چمک دمک).

(19) What do you mean by 24 carat gold?
Purity of gold (Au) is shown by carats. It indicates the number of parts by weight of gold which is present in 24 parts of alloy. 24 carat gold is pure.

(20) What do you mean by 22 carat gold?
22 carat gold means that 22 parts pure gold is alloyed with 2 parts of either silver or copper for making jewelry and ornaments.

(21) Give the applications (uses) of silver?
- It is used in making ornaments.
- Its alloys with copper are widely used in making coins.
- Its compounds are widely used in photographic films and dental preparations.
- It also have uses in mirror industry.

(22) Write the two uses of Magnesium.
- It is used in flash light bulbs and in fireworks.
- It is used in the manufacturing (تیار کرنا) of light alloys.
- In thermite process magnesium ribbon is used to ignite (جلانا) aluminum powder.
- It is used as anode for prevention of corrosion.

(23) Write two uses of calcium.
- It is used to remove Sulphur from petroleum products.
- It is used as reducing agent to produce Cr, U and Zr.

(24) Write two uses of sodium metal.
- In sodium vapour lamps it is used to produce yellow light.
- It is used as a reducing agent in the extraction of metals like Ti.

(25) Write two properties of silver metals.
- It is white lustrous metal.
- Excellent conductor of heat and electrolyte.
- It is highly ductile and malleable metal.
- Its polished surface is good reflector of light.

(26) Give the reaction of magnesium with O_2 and N_2.
Magnesium reacts with nitrogen and form stable nitrides.

$$3Mg + N_2 \rightarrow Mg_3N_2$$

Magnesium reacts with oxygen and form oxides.

$2Mg + O_2 \rightarrow 2MgO$

(27) Give chemical reaction of methane with chlorine in bright light.

In the presence of bright sunlight Chlorine reacts with methane violently.

$CH_4 + Cl_2 \rightarrow C + 4HCl$

LONG QUESTIONS

- Write a detail note on significance of non-metals.
- Write four physical properties of metals.
- Write four Chemical properties of metals.
- Write four physical properties of non-metals.
- Write four chemical properties of non-metals.

ان چار long سوالوں کے جواب اوپر پہلے چار مختصر سوالوں میں موجود ہیں۔ آپ وہ چار مختصر سوال یاد کر لیں، آپ کا لونگ سوال بھی یاد ہو جائے گا۔

Student must learn the following statements for MCQs.

- The most abundant metal is **aluminium.**
- The most precious metal is **platinum.**
- The most useable metal is **iron.**
- The most reactive metal is **cesium.**
- The most valuable metal is **uranium.**
- The lightest metal is **Lithium.**
- The heaviest metal **is Osmium.**
- The least conductor of heat is **lead.**
- The best conductor metals are **silver** and **gold.**
- The most ductile and malleable metals are **silver** and **gold.**

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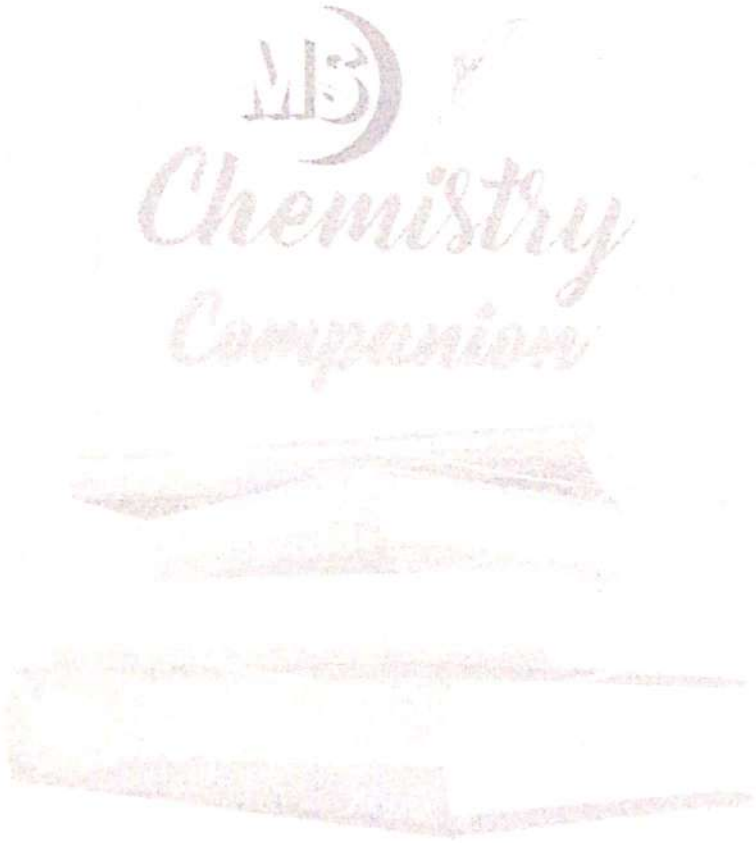
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