

LESSON 1SOME BASIC CONCEPT OF CHEMISTRYChemistry

- 1) 40 ml of methane is completely burnt using 80 ml of oxygen at room temperature. The volume of gas left after cooling to room temperature is
 (a) **40 ml CO₂ gas** (b) 40 ml CO₂ gas and 80 ml H₂O gas (c) 60 ml CO₂ gas and 60 ml H₂O gas
 (d) 120 ml CO₂ gas
- 2) An element X has the following isotopic composition ²⁰⁰X = 90%, ¹⁹⁹X = 8% and ²⁰²X = 2%. The weighted average atomic mass of the element X is closest to
 (a) 201 u (b) 202 u (c) 199 u (d) **200 u**
- 3) Assertion: Two moles of glucose contains
 12.044 × 10²³ molecules of glucose
 Reason: Total number of entities present in one mole of any substance is equal to 6.02 × 10²²
 (a) both assertion and reason are true and the reason is the correct explanation of assertion
 (b) both assertion and reason are true but the reason is not the correct explanation of assertion
 (c) **an assertion is true but reason is false** (d) both assertion and reason are false
- 4) Carbon forms two oxides, namely carbon monoxide and carbon dioxide. The equivalent mass of which element remains constant?
 (a) Carbon (b) **oxygen** (c) both carbon and oxygen (d) neither carbon nor oxygen
- 5) The equivalent mass of a trivalent metal element is 9 g eq⁻¹. The molar mass of its anhydrous oxide is
 (a) **102 g** (b) 27 g (c) 270 g (d) 78 g
- 6) The number of water molecules in a drop of water weighing 0.018 g is
 (a) 6.022 × 10²⁶ (b) 6.022 × 10²³ (c) **6.022 × 10²⁰** (d) 9.9 × 10²²
- 7) 1 g of an impure sample of magnesium carbonate (containing no thermally decomposable impurities) on complete thermal decomposition gave 0.44 g of carbon dioxide gas. The percentage of impurity in the sample is
 (a) 0% (b) 4.4% (c) **16%** (d) 8.4%



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- 8) When 6.3g of sodium bicarbonate is added to 30g of the acetic acid solution, the residual solution is found to weigh 33g. The number of moles of carbon dioxide released in the reaction is
 (a) 3 (b) 0.75 (c) **0.075** (d) 0.3
- 9) When 22.4litre s of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, each at 273 K at 1 atm the moles of HCl (g), formed is equal to
 (a) 2 moles of HCl (g) (b) 0.5 moles of HCl (g) (c) 1.5 moles of HCl (g) (d) **1 moles of HCl (g)**
- 10) Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidising behaviour?
 (a) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$ (b) $C + 2H_2 + SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
 (c) **$BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$** (d) None of the above
- 11) Choose the disproportionation reaction among the following redox reactions.
 (a) $3Mg_{(s)} + N_{2(g)} \rightarrow Mg_3N_{2(s)}$ (a) **$P_{4(s)} + 3NaOH + 3H_2O \rightarrow PH_{3(g)} + 3NaH_2PO_{2(aq)}$**
 (c) $Cl_{2(g)} + 2KI_{(aq)} \rightarrow 2KCl_{(aq)} + I_2$ (d) $Cr_2O_{3(s)} + 2Al_{(s)} \rightarrow Al_2O_{3(s)} + 2Cr_{(s)}$
- 12) The oxidation state of a element in its uncombined state is
 (a) **zero** (b) +1 (c) -1 (d) none
- 13) $Fe^{2+} + Fe^{3+} + e^-$ is a _____ reaction.
 (a) redox (b) reduction (c) **oxidation** (d) decomposition
- 14) Assertion: Fluorine has an oxidation state of -1 in all its compounds. Reason: Fluorine is the most electronegative element of the periodic table.
 (a) **Both assertion and reason are correct and the reason is the correct explanation for the assertion.**
 (b) Both assertion and reason are correct but reason is not the correct explanation for the assertion
 (c) Assertion is true but reason are false. (d) Both assertion and reason are false.
- 15) The oxidation number of oxygen in O_2 is _____
 (a) **0** (b) +1 (c) +2 (d) -2
- 16) The oxidation number of hydrogen in LiH is _____
 (a) +1 (b) **-1** (c) +2 (d) -2
- 17) The equivalent mass of potassium permanganate in alkaline medium is
 (a) 31.6 (b) **52.7** (c) 79 (d) None of these
- 18) Which one of the following represents 180g of water?
 (a) 5 Moles of water (b) 90 moles of water (c) _____ molecules of water
 (d) **6.022×10^{24} molecules of water**
- 19) 7.5 g of a gas occupies a volume of 5.6litres at 00 C and 1 atm pressure. The gas is
 (a) **NO** (b) N_2O (c) CO (d) CO_2
- 20) Total number of electrons present in 1.7 g of ammonia is
 (a) **6.022×10^{23}** (b) _____ (c) _____ (d) _____

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- 21) The oxidation number of Cr in $\text{Cr}_2\text{O}_7^{2-}$ _____ is
 (a) +6 (b) -6 (c) +7 (d) -7
- 22) Among the three metals, zinc, copper and silver, the electron releasing tendency decreases in the following order.
 (a) zinc > silver > copper (b) **zinc > copper > silver** (c) silver > copper > zinc
 (d) copper > silver > zinc
- 23) Consider the following statements :
 (i) Oxidation number of He = zero
 (ii) Increase in oxidation number results in reduction.
 (iii) The substance undergoing the increase in oxidation number is reducing agent.
 Which among the above statement(s) is/are correct?
 (a) only (i) (b) (ii) and (iii) (c) **(i) and (iii)** (d) only (ii)
- 24) Rusting of iron articles is an example of _____ reaction
 (a) Combustion (b) decomposition (c) **redox** (d) hydrolysis
- 25) Identify disproportionation reaction
 (a) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ (b) $\text{CH}_4 + 4\text{Cl}_2 \rightarrow \text{CCl}_4 + 4\text{HCl}$ (c) $2\text{F}_2 + 2\text{OH}^- \rightarrow 2\text{F}^- + \text{O}_2 + \text{H}_2\text{O}$
 (d) $2\text{NO}_2 + 2\text{OH}^- \rightarrow \text{NO}^- + \text{NO}_2^- + \text{H}_2\text{O}$
- 26) Which of the following statement(s) is/are not true about the following decomposition reaction.
 $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$
 (i) Potassium is undergoing oxidation
 (ii) Chlorine is undergoing oxidation
 (iii) Oxygen is reduced
 (iv) None of the species are undergoing oxidation and reduction.
 (a) only (iv) (b) **(i) and (iv)** (c) (iv) and (iii) (d) All of these
- 27) Identify the correct statement(s) with respect to the following reaction :
 $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
 (i) Zinc is acting as an oxidant
 (ii) Chlorine is acting as a reductant
 (iii) Hydrogen is not acting as an oxidant
 (iv) Zn is acting as a reductant
 (a) only (ii) (b) **only (iv)** (c) both (ii) and (iii) (d) both (ii) and (i)



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28) Match the list-I with list-II and select the correct answer using the code given below the lists.

List-I	List-II
A $\text{Cr}_2\text{O}_7^{2-}$	1 +5
B MnO_4^-	2 +6
C VO_2	3 +3
D FeF_3	4 +7

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
3142	4321	2413	3214

29) Match the items in column list-I with relevant items in list-II.

List-I	List-II
A Ions having positive charge	1 anion
B Ions having negative charge	2-1
C Oxidation number of fluorine in NaF	3 0
D The sum of oxidation number of all atoms in a neutral molecule	4 cation

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
3421	1234	2341	4123

30) The correct increasing order of the oxidation state of sulphur in the anions

(a) SO_3^{2-} , SO_4^{2-} , SO_3 , SO_2	(b) SO_2 , SO_3 , SO_4^{2-} , SO_3^{2-}
(c) SO_2 , SO_3^{2-} , SO_3 , SO_4^{2-}	(d) SO_3^{2-} , SO_2 , SO_3 , SO_4^{2-}

31) The equivalent mass of ferrous oxalate is

- (a) _____ (b) _____ (c) _____
 (d) None of these

32) If Avogadro number were changed from 6.022×10^{23} to 6.022×10^{20} , this would change

- (a) the ratio of chemical species to each other in a balanced equation
 (b) the ratio of elements to each other in a compound (c) the definition of mass in units of grams
 (d) **the mass of one mole of carbon**

33) Two 22.4 litre containers A and B contains 8 g of O_2 and 8 g of SO_2 respectively at 273 K and 1 atm pressure, then

- (a) Number of molecules in A and B are same (b) Number of molecules in B is more than that in A.
 (c) **The ratio between the number of molecules in A = to number of molecules in B is 2:1**
 (d) Number of molecules in B is three times greater than the number of molecules in A

34) What is the mass of precipitate formed when 50 ml of 8.5 % solution of AgNO_3 is mixed with 100 ml of 1.865 % potassium chloride solution?

- (a) **3.59g** (b) 7g (c) 14 g (d) 28 g

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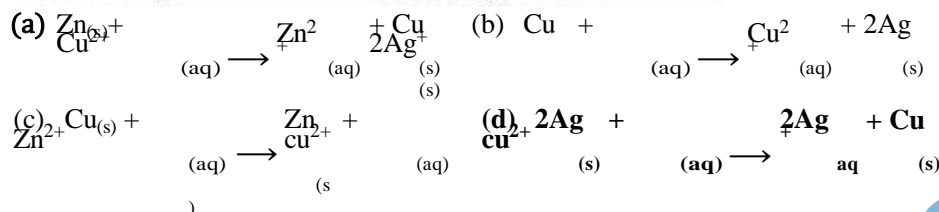
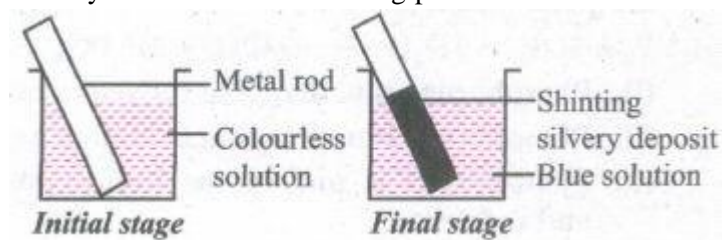
- 35) The mass of a gas that occupies a volume of 612.5 ml at room temperature and pressure (25°C and 1 atm pressure) is 1.1g. The molar mass of the gas is
 (a) 66.25 g mol⁻¹ (b) **44 g mol⁻¹** (c) 24.5 g mol⁻¹ (d) 662.5 g mol⁻¹
- 36) Which of the following contain same number of carbon atoms as in 6 g of carbon-12.
 (a) 7.5 g ethane (b) 8 g methane (c) **both (a) and (b)** (d) none of these
- 37) Which of the following compound(s) has /have a percentage of carbon same as that in ethylene (C₂H₄)
 (a) **propene** (b) ethyne (c) benzene (d) ethane
- 38) Which of the following is/are true with respect to carbon -12
 (a) **relative atomic mass is 12 u** (b) the oxidation number of carbon is +4 in all its compounds.
 (c) 1 mole of carbon-12 contain 6.022×10^{22} carbon atoms. (d) All of these
- 39) Which one of the following is used as a standard for atomic mass.
 (a) **${}^6\text{C}^{12}$** (b) ${}^7\text{C}^{12}$ (c) ${}^6\text{C}^{13}$ (d) ${}^6\text{C}^{14}$
- 40) Assertion (A): Among halogens fluorine is the best oxidant. Reason (R): Fluorine is the most electronegative atom.
 (a) **Both A and R are true and R explains A** (b) Both A and R are true but R does not explain A
 (c) A is true but R is false (d) Both A and R are false
- 41) Maximum oxidation state is present in the central metal atom of which compound
 (a) **CrO₂Cl₂** (b) MnO₂ (c) [Fe(CN)₆]³⁻ (d) MnO
- 42) Identify the correct statements with reference to the given reaction
 $\text{P}_4 + 3\text{OH}^- + 3\text{H}_2\text{O} \longrightarrow \text{PH}_3 + 3\text{H}_2\text{PO}_2^-$
 (i) Phosphorous is undergoing reduction only
 (ii) Phosphorous is undergoing oxidation only
 (iii) Phosphorous is undergoing both oxidation and reduction.
 (iv) Hydrogen is undergoing neither oxidation nor reduction.
 (a) only (iii) (b) **both (iii) and (iv)** (c) only (i) (d) None of these
- 43) Assertion (A): In the reaction between potassium permanganate and potassium iodide, permanganate ions act as oxidising agent.
 Reason (R): Oxidation state of manganese changes from +2 to +7 during the reaction.
 (a) Both A and R are true and R explains A (b) Both A and R are true but R does not explain A
 (c) **A is true but R is false** (d) Both A and R are false
- 44) The change in the oxidation number of S in H₂S and SO₂, in the following industrial reaction:
 $2\text{H}_2\text{S}_{(g)} + \text{SO}_{2(g)} \longrightarrow 3\text{S}_{(s)} + \text{H}_2\text{O}_{(g)}$
 (a) **-2 to 0, +4 to 0** (b) -2 to 0, +4 to -1 (c) -2 to -1, +4 to 0 (d) -2 to -1, +4 to -2
- 45) In which of the following reactions, hydrogen peroxide acts as an oxidising agent?
 (a) $\text{I}_2 + \text{H}_2\text{O}_2 + 2\text{OH}^- \longrightarrow 2\text{I}^- + 2\text{H}_2\text{O} + \text{O}_2$ (b) **$\text{PbS} + 4\text{H}_2\text{O}_2 \longrightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$**
 (c) $2\text{MnO}_4^- + 3\text{H}_2\text{O}_2 \longrightarrow 2\text{MnO}_2 + 3\text{O}_2 + 2\text{H}_2\text{O} + 2\text{OH}^-$ (d) $\text{HOCl} + \text{H}_2\text{O}_2 \longrightarrow \text{H}_2\text{O} + \text{Cl}^- + \text{O}_2$

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46) Identify the redox reaction taking place in a beaker.



47) Consider the following statements

- Matter possesses mass.
- 22-carat gold is a mixture.
- Dry ice is a compound.

Which of the following statement(s) given above is/ are correct?

- (a) 1 & 3 (b) Only 1 (c) 1 & 2 (d) **1, 2, & 3**

48) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A Diamond	1 Heterogeneous mixture
B Aerated drinks	2 Element
C Distilled water	3 Homogeneous mixture
D Sand	4 Compound

(a)	(b)	(c)	(d)
A B C D	A B C D	A B C D	A B C D
2 3 4 1	4 3 1 2	3 1 4 2	2 1 4 3

49) The solid state of matter is converted into gas by

- (a) **sublimation** (b) deposition (c) freezing (d) condensation

50) Identify the incorrect statement about a compound.

- A molecule cannot be separated into its constituent elements by physical methods of separation
- A molecule of a compound has atoms of different elements
- A compound retains the physical properties of its constituent element**
- The ratio of atoms of different elements in a compound is fixed

51) The characteristic feature of orderly arrangement of molecules belongs to

- (a) **Solids** (b) Liquid (c) Gases (d) None of these

52) Which among the following statement(s) describe an element?

- It is a pure substance which could be split into two or more simpler substance.
- It is a pure substance which cannot be split into simpler substance
- Its composition is not uniform
- All the above

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(a) only (iv) (b) **only (ii)** (c) (ii) and (iii) (d) (i) and (iii)

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53) Which form of based on physical characteristics possess neither definite volume nor definite shape?

- (a) Solids (b) Liquids (c) **Gases** (d) Both (a) and (b)

54) Match list I with list II and identify the correct code.

List I	List II
A Bronze	1 Element
B Table Salt	2 Homogeneous mixture
C Gold	3 Alloy
D Petrol	4 Compound

(a)	(b)	(c)	(d)																																
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A	B	C	D																																
4	2	3	1																																

55) Atoms are too small with a diameter of 10^{-10} m and weigh approximately

- (a) **10^{-27} kg** (b) 10^{-27} g (c) 10^{-31} kg (d) 10^{-31}

56) 1 amu (or) 1 u \approx

- (a) 1.6605×10^{-25} kg (b) 1.6605×10^{-26} kg (c) **1.6605×10^{-27} kg** (d) 1.6605×10^{-28} kg

57) 12 g of carbon-12 contains _____ carbon atoms

- (a) **6.022×10^{23}** (b) 6 (c) 12 (d) 12.022×10^{23} kg

58) Statement I: an Equivalent mass of Mg is determined by Oxide Method

Statement II: Molecular mass is calculated using vapour density

(a) **Both the statements are individually true**

(b) Both the statements are individually true and statement II is the correct explanation of statement I.

(c) Statement I is true but statement II is false. (d) Statement I is false but statement II is true

59) The volume occupied by any gas at S.T.P. is _____

- (a) **22.4 litres** (b) 2.24 litres (c) 224 litres (d) 0.224 litres

60) One mole of Sulphuric acid contains _____ oxygen atoms

- (a) 4×10^{23} (b) $4 \times 6.023 \times 10^{23}$ (c) **$4 \times 6.023 \times 10^{23}$** (d) $4 \times 6.023 \times 10^{32}$

61) Unit of Avogadro's number is

- (a) mol (b) g (c) mol^{-1} (d) **No unit**

62) Atomicity of nitrogen is

- (a) 1 (b) **2** (c) 3 (d) Zero

63) Assertion: An element has a fractional atomic mass.

Reason: An element exist as isotope

(a) **Both assertion and reason are correct and reason is the correct explanation for the assertion**

(b) Both assertion and reason are correct but reason is not the correct explanation for an assertion

(c) Assertion is true but reason is false. (d) Both assertion and reason are false

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64) The empirical formula and molecular mass of a compound are CH_2O and 180g respectively.

What will be the molecular formula of the compound?

- (a) $\text{C}_9\text{H}_{19}\text{O}$ (b) CH_2O (c) $\text{C}_6\text{H}_{12}\text{O}_6$ (d) $\text{C}_2\text{H}_4\text{O}_2$

65) One 'U' stands for the mass of

- (a) An atom of carbon-12 (b) $1/12^{\text{th}}$ of the carbon-12 (c) $1/12^{\text{th}}$ of a hydrogen atom
(d) One atom of any of the element

66) What will be the basicity of H_3BO_3 , which is not a protic acid?

- (a) One (b) Two (c) Three (d) Four

67) In the reaction $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$, NH_3 is acidic in. the reason for its acidic is _____

- (a) Acceptance of one H^+ from water (b) A release of one OH^- ion (c) Due to the nitrogen atom
(d) All the above

68) Match the following prefixes with their multiples.

Equivalent	Molecular Mass	
A E_{kMnO_4} (Acidic)	1	M/2
B E_{kMnO_4} (Neutral)	2	M
C $\text{E}_{\text{H}_3\text{PO}_2}$	3	M/3
4 $\text{E}_{\text{H}_3\text{PO}_3}$	4	M/5

- (a) (b) (c) (d)

ABCD	ABCD	ABCD	ABCD
4321	4213	3421	3142

69) Calculate the percentage of N in ammonia molecule.

- (a) 121.42% (b) 28.35% (c) **82.35%** (d) 28.53%

70) If a beaker holds 576g of water, what will be the gram molecules of water in that beaker?

- (a) 23 gram molecule (b) 23% (c) 32% (d) **32 gram molecule**

71) Assertion: The atomic masses of most of the elements. are in the fraction.

Reason: The atomic mass represents the ratio of the average mass of the atom to one avogram.

- (a) Both assertion and reason are correct and the reason is the correct explanation for assertion
(b) **Both assertion and reason are correct but the reason is not the correct explanation for an assertion**
(c) Assertion is true but reason are false (d) Both assertion and reason are false

72) Assertion: The number of oxygen atoms in 16g of oxygen and 16g of ozone is same

Reason Each of the species represent 1g atom of oxygen

- (a) **Both assertion and reason are correct and the reason is the correct explanation for an assertion**
(b) Both assertion and reason are correct but a reason is not the correct explanation for assertion
(c) Assertion is true but reason are false. (d) Both assertion and reason are false

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73) Assertion: The ash produced by burning paper in air is lighter than the original mass of paper.

Reason: The residue left after combustion of a chemical entity is always lighter

- (a) Both assertion and reason are correct and reason is the correct explanation for assertion.
 (b) Both assertion and reason are correct but reason is not the correct explanation for assertion
 (c) **Assertion is true but reason are false** (d) Both assertion and reason are false

74) Assertion: Oxalic acid is a dibasic acid

Reason: It contains two basic radicals

- (a) Both assertion and reason are correct and reason is the correct explanation for assertion.
 (b) Both assertion and reason are correct but reason is not the correct explanation for assertion
 (c) **Assertion is true but reason are false** (d) Both assertion and reason are false

75) How many moles of magnesium phosphate $Mg_3(PO_4)_2$ will contain 0.25 moles of oxygen atoms?

- (a) 0.02 (b) **3.125×10^{-2}** (c) 1.25×10^{-2} (d) 2.5×10^{-2}

76) Assertion: Equal volumes of all the gases do not contain equal number of atoms

Reason: Atom is the smallest particle which takes part in chemical reactions.

- (a) Both assertion and reason are correct and reason is the correct explanation for assertion
 (b) **Both assertion and reason are correct but reason is not the correct explanation for assertion**
 (c) Assertion is true but reason are false (d) Both assertion and reason are false

77) Match the list I with List II and select the correct answer using the code given below the lists.

List-I	List -II
A) An	1 6.02×10^{23} Ne atoms
B) Vapour Density	2 0.01 moles of solute in one L of solution
C) 22.4 L at S.T.P	3 Molecular mass/2
D) Centimolar solution	4 molecular mass/empirical formula mass

- (a)

A	B	C	D
2	3	4	1

 (b)

A	B	C	D
4	3	1	2

 (c)

A	B	C	D
3	1	4	2

 (d)

A	B	C	D
2	1	4	3

78) A compound has an empirical formula C_2H_4O . If the value of $n = 2$ the molecular formula of the compound is _____

- (a) C_2H_4O (b) CH_2O (c) CH_2 (d) **$C_4H_8O_2$**

79) Give an example of molecule in which the ratio of the molecular formula is six times the empirical formula.

- (a) **$C_6H_{12}O_6$** (b) CH_2O (c) CH_4 (d) Na_2CO_3

80) Two elements X and Y (atomic mass of X = 75; Y = 16) combine to give a compound having 76% of X. The formula of the compound is?

- (a) XY (b) X_2Y (c) X_2Y_2 (d) **X_2Y_3**

81) The compound in which mass percentage of carbon is 75% and that of hydrogen is 25% is

- (a) C_2H_6 (b) C_2H_2 (c) **CH₄** (d) C_2H_4

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82) Equal volume of N_2 and H_2 react to form ammonia under suitable condition then the limiting reagent is

- (a) H_2 (b) N_2 (c) NH_3 (d) No Reactant is a limiting reagent

83) What is the ratio of empirical formula mass to molecular formula mass of benzene?

- (a) 1:6 (b) 6:1 (c) 2:3 (d) 3:2

84) Limiting reagent in a chemical reaction is that reactant which

- (a) leaves some amount unreacted after the completion of reaction
 (b) reacts completely in the reaction (c) does not react in the reaction (d) All of these

85) If ten volumes of dihydrogen gas react with five volumes of dioxygen gas, how many volumes of water vapour would be produced?

- (a) 1 (b) 2 (c) 5 (d) 10

86) Match the list-I with list-II and select the correct answer using the code given below the lists

List-I	List-II
A Molecular formula	1 Completely consumed
B Stoichiometric Equation	2 Left unreacted
C Limiting reagent	3 n x Empirical formula
D Excess reagent	4 Balanced equation

- (a) (b) (c) (d)

A	B	C	D
3	4	2	1

A	B	C	D
3	4	1	2

A	B	C	D
4	3	1	2

A	B	C	D
4	3	1	2

87) Assertion: When 4 moles of H_2 reacts with 2 moles of O_2 then 4 moles of water is formed.

Reason: O_2 will act as limiting reagent.

- (a) Both assertion and reason are true and reason is the correct explanation of assertion
 (b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) Only assertion is true but reason is false (d) Both assertion and reason are false.

88) Assertion: $KAlS_2H_{12}O_{20}$ is the empirical formula of potash alum.

Reason: It is a double salt.

- (a) Both assertion and reason are correct and reason is the correct explanation for assertion
 (b) Both assertion and reason are correct but reason is not the correct explanation for assertion
 (c) Assertion is true but reason are false (d) Both assertion and reason are false

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LESSON-2
QUANTUM MECHANICS

- 1) The energy of light of wavelength 45 nm is
(a) $6.67 \times 10^{15} \text{J}$ (b) $6.67 \times 10^{11} \text{J}$ (c) **$4.42 \times 10^{-18} \text{J}$** (d) $4.42 \times 10^{-15} \text{J}$
- 2) The energies E^1 and E^2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths λ_1 and λ_2 will be
(a) $\frac{\lambda_1}{\lambda_2} = 1$ (b) $\lambda_1 = 2\lambda_2$ (c) $\lambda_1 = \sqrt{25 \times 50} \lambda_2$ (d) $2\lambda_1 = \lambda_2$
- 3) Splitting of spectral lines in an electric field is called
(a) Zeeman effect (b) Shielding effect (c) Compton effect (d) **Stark effect**
- 4) According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon?
(a) $n = 6$ to $n = 1$ (b) $n = 5$ to $n = 4$ (c) $n = 5$ to $n = 3$ (d) **$n = 6$ to $n = 5$**
- 5) Which of the following pairs of d-orbitals will have electron density along the axes?
(a) d_{z^2} , d_{xz} (b) d_{xz} , d_{yz} (c) **d_{z^2} , $d_{x^2-y^2}$** (d) d_{xy} , $d_{x^2-y^2}$
- 6) The electronic configuration of Eu (Atomic no. 63) Gd (Atomic no. 64) and Tb (Atomic no. 65) are
(a) $[\text{Xe}] 4f^6 5d^1 6s^2$, $[\text{Xe}] 4f^7 5d^1 6s^2$ and $[\text{Xe}] 4f^8 5d^1 6s^2$
(b) **$[\text{Xe}] 4f^7, 6s^2$, $[\text{Xe}] 4f^7 5d^1 6s^2$ and $[\text{Xe}] 4f^9 6s^2$** (c) $[\text{Xe}] 4f^7, 6s^2$, $[\text{Xe}] 4f^7 6s^2$ and $[\text{Xe}] 4f^7 5d^1 6s^2$
(d) $[\text{Xe}] 4f^9 5d^1 6s^2$, $[\text{Xe}] 4f^7 5d^1 6s^2$ and $[\text{Xe}] 4f^9 6s^2$
- 7) Based on equation $E = -2.178 \times 10^{-18} \text{J} \left(\frac{1}{n^2}\right)$ certain conclusions are written. Which of them is not correct?
(a) Equation can be used to calculate the change in energy when the electron changes orbit
(b) **For $n = 1$, the electron has a more negative energy than it does for $n = 6$ which means that the electron is more loosely bound in the smallest allowed orbit**
(c) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus.
(d) Larger the value of n , the larger is the orbit radius.
- 8) Which of the following pairs of d-orbitals will have electron density along the axes?
(a) d_{z^2} , d_{xz} (b) d_{xz} , d_{yz} (c) **d_{z^2} , $d_{x^2-y^2}$** (d) d_{xy} , $d_{x^2-y^2}$

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- 9) Two electrons occupying the same orbital are distinguished by
 (a) azimuthal quantum number (b) **spin quantum number** (c) magnetic quantum number
 (d) orbital quantum number
- 10) The maximum number of electrons in a sub shell is given by the expression
 (a) $2n^2$ (b) $2l+1$ (c) **$4l+2$** (d) none of these
- 11) For d-electron, the orbital angular momentum is
 (a) $\frac{3}{2}$ (b) $\frac{5}{2}$ (c) $\frac{7}{2}$ (d) $\frac{9}{2}$
- 12) Match the list I with List II and select the correct answer using the code given below the list

List I	List II
Ap orbital	1 Clover leaf
Bs orbital	2 Dumb bell with doughnut
Cdz ²	3 Dumb bell
Dd _{xy}	4 Spherical

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1324	4312	4421	2143

- 13) Consider the following statements and pick the incorrect statement(s).
 1. Schrodinger wave equation is used to determine the probability of finding an electron at a given point in space.
 2. The energy of an electron at infinity is positive.
 3. Angular momentum quantum number gives information regarding subshells.
 (a) 1&3 (b) only 1 (c) **only 2** (d) 1,2 & 3
- 14) The number of nodes in s orbital of any energy level is equal to
 (a) n (b) $2n^2$ (c) **n-1** (d) n-2
- 15) How many nodes are possible for 2s orbital?
 (a) **1** (b) 2 (c) 3 (d) zero
- 16) The subsidiary quantum number decides _____
 (a) **the shape of the orbital** (b) the orientation of the orbital (c) energy level of the orbital
 (d) the spin of the electron
- 17) As per Aufbau principle, arrange the orbitals in increasing order of energy
 (a) $4p > 4d > 5s > 5p$ (b) $4p < 4d < 5s < 5p$ (c) $4d < 4p < 5s < 5p$ (d) **$4p < 5s < 4d < 5p$**
- 18) The electronic configuration of copper is _____
 (a) $[\text{Ar}]4s^23d^9$ (b) **$[\text{Ar}]4s^13d^{10}$** (c) $[\text{Ar}]4s^03d^{10}$ (d) All
- 19) In multi-electron atom, 4s-orbital is lower in energy than
 (a) **3d-orbital** (b) 3p-orbital (c) 2s-orbital (d) 2p-orbital
- 20) Shape of an orbital is given by
 (a) Principal quantum number (b) Spin quantum number (c) **Azimuthal quantum number**
 (d) Magnetic quantum number

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- 21) Orientation of orbitals is given by
 (a) **Magnetic quantum number** (b) Spin quantum number (c) Azimuthal quantum number
 (d) Principal quantum number
- 22) Which one of the following orbitals is spherical in shape?
 (a) **4s** (b) 3p (c) 3d (d) 4f
- 23) Which of the following configuration is correct for iron?
 (a) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$ (b) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$ (c) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7$
 (d) **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$**
- 24) Which of the following has maximum number of unpaired d-electrons?
 (a) N^{3+} (b) **Fe^{2+}** (c) Zn^+ (d) Cu^+
- 25) Which of the following electronic configuration represent the element in ground state?
 (a) $1s^2 2s^1 2p^1$ (b) **$1s^2 2s^2 2p^1$** (c) $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$ (d) $1s^2 2s^2 2p_x^2 2p_y^2 2p_z^6 3s^2 3p_x^1 3p_y^1 3p_z^1 3d^1$
- 26) What is the maximum numbers of electrons that can be associated with the following set of quantum numbers? $n = 3, l = 1$ and $m = -1$
 (a) 4 (b) 6 (c) **2** (d) = 10
- 27) The total number of orbitals associated with the principal quantum number $n = 3$ is
 (a) **9** (b) 8 (c) 5 (d) 7
- 28) If $n = 6$, the correct sequence for filling of electrons will be,
 (a) **$ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$** (b) $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$ (c) $ns \rightarrow (n-2)f \rightarrow np \rightarrow (n-1)d$
 (d) none of these are correct
- 29) Consider the following sets of quantum numbers:
- | | n | l | m | s |
|-------|---|---|----|-----|
| (i) | 3 | 0 | 0 | + - |
| (ii) | 2 | 2 | 1 | - - |
| (iii) | 4 | 3 | -2 | + - |
| (iv) | 1 | 0 | -1 | + - |
| (v) | 3 | 4 | 3 | - - |
- Which of the following sets of quantum number is not possible?
 (a) (i), (ii), (iii) and (iv) (b) **(ii), (iv) and (v)** (c) (i) and (iii) . (d) (ii), (iii) and (iv)
- 30) How many electrons in an atom with atomic number 105 can have $(n + l) = 8$?
 (a) 30 (b) **17** (c) 15 (d) unpredictable
- 31) Electron density in the yz plane of $3d_{x^2-y^2}$ orbital is
 (a) **zero** (b) 0.50 (c) 0.75 (d) 0.90
- 32) If uncertainty in position and momentum are equal, then minimum uncertainty in velocity is
 (a) $-\sqrt{-}$ (b) $\sqrt{-}$ (c) $-\sqrt{-}$ (d) $-\sqrt{-}$

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33) Match the quantum numbers with the information provided by these.

Quantum number	Information Provided
A Principal quantum number	1 orientation of the orbital
B Azimuthal quantum number	2 energy and size of orbital
C Magnetic quantum number	3 spin of electron
D Spin quantum number	4 shape of the orbital

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1234	2431	3241	4321

34) Match species given in List-I with the electronic configuration of list-II.

List-I	List-II
A Cr	1 [Ar]3d ⁸ 4s ⁰
B Fe ²⁺	2 [Ar]3d ¹⁰ 4s
C Ni ²⁺	3 [Ar]3d ⁶ 4s ⁰
D Cu	4 [Ar]3d ⁶ 4s ¹

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
3421	4321	4312	3412

35) A macroscopic particle of mass 100 g and moving at a velocity of 100 cm S⁻¹ will have a de Broglie wavelength of

- (a) 6.6×10^{-29} em (b) 6.6×10^{-30} em (c) 6.6×10^{-31} em (d) 6.6×10^{-32} em

36) The ratio of de Broglie wavelengths of a deuterium atom to that of an α - particle, when the velocity of the former is five times greater than that of later, is

- (a) 4 (b) 0.2 (c) 2.5 (d) 0.4

37) The energy of an electron in the 3rd orbit of hydrogen atom is -E. The energy of an electron in the first orbit will be

- (a) -3E (b) — (c) — (d) -9E

38) Time independent Schrodinger wave equation is

- (a) $H\psi = E\psi$ (b) $\nabla^2 \psi + (E + V)\psi = 0$ (c) $\nabla^2 \psi + (E - V)\psi = 0$
 (d) All of these

39) Which of the following does not represent the mathematical expression for the Heisenberg uncertainty principle?

- (a) $\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$ (b) $\Delta x \cdot \Delta v \geq \frac{h}{4\pi m}$ (c) $\Delta E \cdot \Delta t \geq \frac{h}{4\pi}$ (d) $\Delta E \cdot \Delta x \geq \frac{h}{4\pi}$

40) J. J. Thomson's cathode ray experiment revealed that atoms consist of

- (a) electrons (b) protons (c) neutrons (d) photons

41) In Rutherford's gold foil experiment, a thin gold foil was bombarded with a stream of fast moving

- (a) B particles (b) α -particles (c) γ particles (d) δ particles

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42) Consider the following statements

1. $\lambda = h / mv$ is valid only when the particle travels at speed much less than the speed of light.
2. Einstein's mass-energy relationship is $E=mc^2$
3. The angular momentum (mvr) of the electron must be equal to an integral multiple of $h/4\pi$.

Which of the following statements given above is/ are correct?

- (a) 1&3 (b) Only 1 (c) **1 & 2** (d) 1, 2 & 3

43) Match the list I with List II and select the correct answer using the code given below the lists.

List I		List II	
A	The energies of electrons are quantized	1	Thomson's atomic model
B	Atom is a positively charged sphere in which the electrons are Embedded	2	Bohr atom model
C	Planetary model	3	De Broglie
D	Dual nature of the microscopic particles	4	Rutherford

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1324	4312	3142	2143

44) Using s, p, d, f notations, describe the orbital with the following quantum numbers $n = 2, l = 1$.

- (a) 2s (b) 1s (c) **2p** (d) 1p

45) The nucleus of an atom contains

- (a) Electrons and protons (b) **Neutrons and protons** (c) Electrons, protons and neutrons
(d) Neutrons and electrons

46) Which is the lightest among the following?

- (a) An atom of hydrogen (b) **An electron** (c) A neutron (d) A proton

47) The atomic number of an element is 17 and its mass number is 37.

The number of protons, electrons and neutrons present in the neutral atom are:

- (a) 17,37,20 (b) 20,17,37 (c) **17,17,20** (d) 17,20,17 (e) 37,20,17.

48) How many neutrons and protons respectively are present in the ${}^6_6\text{C}^{13}$ nuclei?

- (a) 6, 13 (b) 6, 7 (c) 13, 6 (d) **7, 6**

49) Maximum number of electrons in a subshell with $l = 3$ and $n = 4$ is

- (a) 10 (b) 12 (c) **14** (d) 16

50) Almost the entire mass of an atom is concentrated in the ----

- (a) proton (b) electrons (c) neutrons (d) **nucleus**

51) Mass number is equal to the _

- (a) number of protons + number of electrons (b) **number of protons + number of neutrons**
(c) number of neutrons + number of electrons (d) number of electrons

52) The fixed circular paths around the nucleus are caused _

- (a) **orbits** (b) Orbitals (c) nucleons (d) Mesons

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- 53) Name the element whose isotope has mass number 14 and 8 neutrons.
(a) **Carbon** (b) Nitrogen (c) Oxygen (d) Fluorine
- 54) The radius of nucleus is approximately _____ times smaller than the radius of atom.
(a) **1,00,000** (b) 5,000 (c) 10,000 (d) 200
- 55) The charge to mass ratio of electron was found to be
(a) (a) $1.6022 \times 10^{-19} \text{C kg}^{-1}$ (b) (b) $1.925 \times 10^{12} \text{C kg}^{-1}$ (c) **$1.758 \times 10^{11} \text{C kg}^{-1}$** (d) $1.869 \times 10^{13} \text{C kg}^{-1}$
- 56) When α - rays strike a thin gold foil then,
(a) most of the α - rays do not pass through the gold foil. (b) most of the α - rays get deflected back.
(c) most of the α rays get deflected through small angles.
(d) **most of the α - rays pass through without any deviation.**
- 57) Isotopes have
(a) **same number of protons** (b) same number of neutrons (c) different number of electrons
(d) different atomic number.
- 58) The number of neutron(s) present in deuterium is
(a) 0 (b) **1** (c) 2 (d) 3
- 59) Neutrons was discovered by
(a) Rutherford (b) **Chadwick** (c) Bohr (d) Thomson
- 60) ${}_6\text{C}^{14}$ and ${}_7\text{N}^{14}$ are
(a) isotones (b) isoelectronic (c) **isobars** (d) isotopes
- 61) Which of the following conclusions could not be derived from Rutherford's α -particle scattering experiment?
(a) Most of the space in the atom is empty.
(b) The radius of the atom is about 10^{-10} m while that of the nucleus is 10^{-15} m
(c) **Electrons move in a circular path of fixed energy called orbits.**
(d) Nucleus and the electrons are held together by electrostatic force of attraction
- 62) Which of the following about the electron is incorrect?
(a) It is a negatively charged particle. (b) **The mass of electron is equal to the mass of neutron .**
(c) It is a basic constituent of all the atoms (d) electron mass = $9.10938356 \times 10^{-31}$ kilograms
- 63) Which of the following properties of atom could be explained correctly by Thomson model of an atom?
(a) **Overall neutrality of atom.** (b) Spectra of hydrogen atom.
(c) Position of protons, electrons and neutrons in atom . (d) Stability of atom.
- 64) In which of the following pairs, the ions are isoelectronic?
(i) Na^+ , Mg^{2+} (ii) Al^{3+} , O^-
(iii) Na^+ , O^{2-} (iv) N^{3-} , Cl^-
(a) Only (i) (b) **Both (i) & (iii)** (c) Both (iii) & (iv) (d) Only (ii)

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- 65) If $E_n = -313.6/n^2$, If the value of $E_i = -34.84$ to which value 'n' corresponds
 (a) 4 (b) **3** (c) 2 (d) 1
- 66) Dual character of an electron was explained by
 (a) Bohr (b) Heisenberg (c) **de-Broglie** (d) Pauli
- 67) de-Broglie equation is
 (a) $\lambda = mv/h$ (b) $\lambda = hmv$ (c) $\lambda = hv/m$ (d) **$\lambda = h/mv$**
- 68) The value of Bohr radius for hydrogen atom is
 (a) **0.529×10^{-8} cm** (b) 0.529×10^{-8} cm (c) 0.529×10^{-12} cm (d) 0.529×10^{-12} cm
- 69) Which of the following particle having same kinetic energy, would have the maximum de-Broglie wave length
 (a) α -particle (b) proton (c) **β -particle** (d) neutron
- 70) If the energy of an electron in the second Bohr orbit of H-atom is -E, what is the energy of the electron in the Bohr's first orbit?
 (a) 2E (b) **-4E** (c) -2E (d) 4E
- 71) The energy of electron in an atom is given by $E_n =$
 (a) _____ (b) _____ (c) _____ (d) _____
- 72) The energy of the second Bohr orbit of the hydrogen atom is -3.41 eV. The energy of the second Bohr orbit of the He^+ ion will be _____
 (a) -6.82 eV (b) **-13.62 eV** (c) -1.70 eV (d) -0.85 eV
- 73) Schrodinger wave equation is applied to determine _____
 (a) Probability of finding electron at a given point in space (b) Wave motion of the electron
 (c) Probability density of electron in a given region (d) **All of the above**
- 74) Bohr's equation for energy of an electron in a hydrogen atom is given as _____
 (a) $E = \text{---} \text{KJmol}^{-1}$ (b) $E = \text{---} \text{KJmol}^{-1}$ (c) $E = hv$ (d) $E = \text{---} \text{KJmol}^{-1}$
- 75) The effect which represents the splitting of spectral lines by external electric field is _____
 (a) **Stark effect** (b) Zeeman effect (c) Raman effect (d) None of these
- 76) According to Bohr's theory angular momentum of an electron in 6th orbit is
 (a) 2.5 — (b) 6 — (c) **3 —** (d) —
- 77) When an electron jumps from lower orbit to higher orbit
 (a) energy is released (b) **energy is absorbed** (c) no change in energy (d) it radiates energy
- 78) Which of the following set of quantum number is possible?
 (a) $n=4, l=2, m=-2, s=-2$ (b) $n=4, l=4, m=0, s=1/2$ (c) **$n=4, l=3, m=-3, s=1/2$** (d) $n=4, l=0, m=0, s=0$
- 79) What is the maximum number of orbitals that can be identified with the following quantum numbers? $n=3, l=1, m_1=0$
 (a) **1** (b) 2 (c) 3 (d) 4
- 80) Maximum number of electrons in a subshell of an atom is determined by the following
 (a) $2l+1$ (b) $4l-2$ (c) $2n^2$ (d) **$4l+2$**

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81) Who modified Bohr's theory by introducing elliptical orbits for electrons path?

- (a) Rutherford (b) Thomson (c) Hund (d) **Sommerfeld**

82) The de-Broglie wavelength of a particle with mass 1.9×10^{-35} kg and velocity 100 m/s is

- (a) 6.63×10^{-35} m (b) 6.63×10^{-34} m (c) **6.63×10^{-33} m** (d) 6.65×10^{-35} m

83) Which of the following is not among shortcomings of Bohr's model?

- (a) Bohr theory could not account for the fine lines in the atomic spectrum
 (b) Bohr theory was unable to account for the splitting of the spectral lines in the presence of magnetic field
 (c) No explanation for using the principle of quantisation of angular momentum
 (d) **It did not give information about energy level**

84) What will be the wavelength of a ball of mass 0.1 kg moving with a velocity of 10 ms⁻¹?

- (a) **6.62×10^{-34} m** (b) 6.626×10^{-34} m (c) 6.626×10^{-34} m (d) 6.626×10^{-34} m

85) The de-Broglie wavelength associated with a matter particle is

- (a) Directly proportional to the momentum of the particle
 (b) Directly proportional to the velocity of the particle
 (c) **Inversely proportional to the momentum of the particle**
 (d) Inversely proportional to Planck's constant

86) The wavelength associated with an electron moving with velocity 10^{10} ms⁻¹ is

- (a) 6.62×10^{-10} m (b) **7.28×10^{-14} m** (c) 3.69×10^{-12} m (d) 4.92×10^{-11} m

87) Electronic configuration of species M^{2+} is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ and its atomic weight is 56 . The number of neutrons in the nucleus of species M is

- (a) 26 (b) 22 (c) **30** (d) 24

88) Assertion: The spectrum of He^+ is expected to be similar to that of hydrogen

Reason: He^+ is also one electron system.

- (a) **If both assertion and reason are true and reason is the correct explanation of correct explanation of assertion.**
 (b) If both assertion and reason are true but reason is not the correct explanation of assertion
 (c) If assertion is true but reason is false (d) If both assertion and reason are false

89) Assertion: Number of radial and angular nodes for $3p$ orbital are $1, 1$ respectively.

Reason: Number of radial and angular nodes depends only on principal quantum number.

- (a) both assertion and reason are true and reason is the correct explanation of assertion.
 (b) both assertion and reason are true but reason is not the correct explanation of assertion.
 (c) **assertion is true but reason is false** (d) both assertion and reason are false

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- 90) Assertion (A): Isotopes of a given element show the same type of chemical behavior.
Reason (R): The chemical properties of an atom are governed by the number of electrons in the atom.
- (a) **Both A and R are true and R is the correct explanation of A**
(b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false
(d) Both A and R are false
- 91) Assertion (A): Energy of an electron is taken negative.
Reason (R): Energy of electron at infinity is zero.
- (a) **Both A and R are true and R is the correct explanation of A**
(b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false
(d) Both A and R are false
- 92) Assertion (A): Bohr's orbits are also called stationary states.
Reason (R): Electrons are stationary in an orbit.
- (a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A (c) **A is true but R is false**
(d) Both A and R are false
- 93) Assertion (A): Angular momentum of an electron in an atom is quantized
Reason (R): In an atom only those orbits are permitted in which angular momentum of the electron is natural number multiple of $\frac{h}{2\pi}$
- (a) **Both A and R are true and R is the correct explanation of A**
(b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false
(d) Both A and R are false
- 94) Assertion (A): The orbitals having equal energy are known as degenerate orbitals.
Reason (R): The three 2p orbitals are degenerate in the presence of external magnetic field.
- (a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A (c) **A is true but R is false**
(d) Both A and R are false
- 95) Assertion (A): In a multi-electron atom, the electrons in different subshell have different energies.
Reason (R): Energy of an orbital depends upon $n + l$ value.
- (a) **Both A and R are true and R is the correct explanation of A**
(b) Both A and R are true but R is not the correct explanation of A (c) A is true but R is false
(d) Both A and R are false

LESSON-3
PERIODIC CLASSIFICATION

- 1) What would be the IUPAC name for an element with atomic number 222?
(a) bibibium (b) bididium (c) didibium (d) **bibibium**
- 2) The electronic configuration of the elements A and B are $1s^2, 2s^2, 2p^6, 3s^2$ and $1s^2, 2s^2, 2p^5$ respectively. The formula of the ionic compound that can be formed between these elements is
(a) AB (b) **AB₂** (c) A₂B (d) none of the above
- 3) The group of elements in which the differentiating electron enters the anti penultimate shell of atoms are called
(a) p-block elements (b) d-block elements (c) s-block elements (d) **f-block elements**
- 4) In which of the following options the order of arrangement does not agree with the variation of property indicated against it?
(a) **I < Br < Cl < F (increasing electron gain enthalpy)**
(b) Li < Na < K < Rb (increasing metallic radius) (c) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)
(d) B < C < O < N (increasing first ionisation enthalpy)
- 5) Which of the following elements will have the highest electro negativity
(a) Chlorine (b) Nitrogen (c) Cesium (d) **Fluorine**
- 6) Various successive ionisation enthalpies (in kJ mol⁻¹) of an element are given below.

IE ₁	IE ₂	IE ₃	IE ₄	IE ₅
577.5	1,810	2,750	11,580	14,820

 The element is
(a) phosphorus (b) Sodium (c) **Aluminium** (d) Silicon
- 7) In the third period the first ionization potential is of the order
(a) Na > Al > Mg > Si > P (b) **Na < Al < Mg < Si < P** (c) Mg > Na > Si > P > Al (d) Na < Al < Mg < Si < P

- 8) Identify the wrong statement.
- (a) **Amongst the isoelectronic species, smaller the positive charge on cation, smaller is the ionic radius**
- (b) Amongst isoelectronic species greater the negative charge on the anion, larger is the ionic radius
- (c) Atomic radius of the elements increases as one moves down the first group of the periodic table
- (d) Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table
- 9) Which one of the following arrangements represent the correct order of least negative to most negative electron gain enthalpy
- (a) $\text{Al} < \text{O} < \text{C} < \text{Ca} < \text{F}$ (b) $\text{Al} < \text{Ca} < \text{O} < \text{C}$ (c) $\text{C} < \text{F} < \text{O} < \text{Al} < \text{Ca}$ (d) **$\text{Ca} < \text{Al} < \text{C} < \text{O} < \text{F}$**
- 10) The correct order of electron gain enthalpy with negative sign of F, Cl, Br and I having atomic number 9, 17, 35 and 53 respectively
- (a) $\text{I} > \text{Br} > \text{Cl} > \text{F}$ (b) $\text{F} > \text{Cl} > \text{Br} > \text{I}$ (c) **$\text{Cl} > \text{F} > \text{Br} > \text{I}$** (d) $\text{Br} > \text{I} > \text{Cl} > \text{F}$
- 11) Which one of the following is the least electronegative element?
- (a) Bromine (b) Chlorine (c) Iodine (d) **Hydrogen**
- 12) The element with positive electron gain enthalpy is
- (a) Hydrogen (b) Sodium (c) **Argon** (d) Fluorine
- 13) The correct order of decreasing electronegativity values among the elements X, Y, Z and A with atomic numbers 4, 8, 7 and 12 respectively
- (a) **$\text{Y} > \text{Z} > \text{X} > \text{A}$** (b) $\text{Z} > \text{A} > \text{Y} > \text{X}$ (c) $\text{X} > \text{Y} > \text{Z} > \text{A}$ (d) $\text{X} > \text{Y} > \text{A} > \text{Z}$
- 14) The electronic configuration of the atom having maximum difference in first and second ionisation energies is
- (a) **$1s^2, 2s^2, 2p^6, 3s^1$** (b) $1s^2, 2s^2, 2p^6, 3s^2$ (c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1$ (d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$
- 15) Which of the following is second most electronegative element?
- (a) **Chlorine** (b) Fluorine (c) Oxygen (d) Sulphur
- 16) IE_1 and IE_2 of Mg are 179 and 348 kcal mol⁻¹ respectively. The energy required for the reaction $\text{Mg} \rightarrow \text{Mg}^{2+} + 2e^-$ is
- (a) +169 kcal mol⁻¹ (b) -169 kcal mol⁻¹ (c) **+ 527 kcal mol⁻¹** (d) -527 kcal mol⁻¹
- 17) In a given shell the order of screening effect is
- (a) **$s > p > d > f$** (b) $s > p > f > d$ (c) $f > d > p > s$ (d) $f > p > s > d$
- 18) Which of the following orders of ionic radii is correct
- (a) $\text{H}^- > \text{H}^+ > \text{H}$ (b) $\text{Na}^+ > \text{F}^- > \text{O}^{2-}$ (c) $\text{F}^- > \text{O}^{2-} > \text{Na}^+$ (d) **None of these**
- 19) The First ionisation potential of Na, Mg and Si are 496, 737 and 786 kJ mol⁻¹ respectively. The ionisation potential of Al will be closer to
- (a) 760 kJ mol⁻¹ (b) **575 kJ mol⁻¹** (c) 801 kJ mol⁻¹ (d) 419 kJ mol⁻¹

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20) Which one of the following is true about metallic character when we move from left to right in a period and top to bottom in a group?

- (a) **Decreases in a period and increases along the group**
 (b) Increases in a period and decreases in a group (c) Increases both in the period and the group
 (d) Decreases both in the period and in the group

21) How does electron affinity change when we move from left to right in a period in the periodic table?

- (a) **Generally increases** (b) Generally decreases (c) Remains unchanged
 (d) First increases and then decreases

22) Which of the following pairs of elements exhibit diagonal relationship?

- (a) Be and Mg (b) Li and Mg (c) Be and B (d) **Be and Al**

23) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A A halogen	1 Cesium
B An alkali metal	2 Germanium
C A chalcogen	3 Iodine
D A metalloid	4 Selenium

- (a)

A	B	C	D
1	3	2	4

 (b)

A	B	C	D
4	3	1	2

 (c)

A	B	C	D
3	1	4	2

 (d)

A	B	C	D
2	1	4	3

24) Period of an element is represented by _____ quantum number

- (a) **Principal** (b) Azimuthal (c) Magnetic (d) Spin

25) The first list of 23 chemical elements was published by _____ in the year 1789.

- (a) Berzelius (b) Dobereiner (c) **Lavoisier** (d) John Dalton

26) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A Chancourtois	1 Addition of synthetic elements
B Rang	2 Families and periods Long form
C Glenn Seaborg	3 Modern periodic law
D Moseley	4 First periodic law

- (a)

A	B	C	D
1	3	2	4

 (b)

A	B	C	D
4	2	1	3

 (c)

A	B	C	D
3	4	1	2

 (d)

A	B	C	D
2	1	4	3

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- 27) Which of the following statement (s) about the Modern Periodic Table is are incorrect
- The elements in the Modern Periodic Table are arranged on the basis of their decreasing atomic number.
 - The elements in the Modern Periodic Table are arranged on the basis of their increasing atomic masses.
 - Isotopes are placed in adjoining group (s) in the Periodic Table.
 - The elements in the Modern Periodic Table are arranged on the basis of their increasing atomic number.
- (a) (i) only (b) **(i), (ii) and (iii)** (c) (i), (ii) and (iv) (d) (iv) only
- 28) Which of the following is Dobereiner's triad?
- (a) Ne, Ca, Na (b) H_2, N_2, O_2 (c) **Li, Na, K** (d) Na, Br, K
- 29) The statement that is not correct for modern classification of element is
- The properties of elements are periodic function of these atomic numbers.
 - The ionisation enthalpy of the elements generally increase with increase in atomic number
 - For transition elements the 3d orbitals are filled after 3p-orbitals and before 4s orbitals.
 - Each period contain 18 elements.
- (a) 1 and 2 (b) 2 and 3 (c) 4 only (d) **3 only**
- 30) What would be the formula of the compound formed by A and B, where A has the valence 3 and B has the valence 3?
- (a) **AB** (b) AB_3 (c) A_3B (d) $3AB_3$
- 31) An element M combines with Cl. What would be the formula of the compound obtained if M has a valence of 2?
- (a) MCl (b) **MCl_2** (c) M_2Cl (d) M_2Cl_2
- 32) Law of triad was unable to explain for the element
- (a) Ca, Sr and Ba (b) **Fe, Co, Ni** (c) Li, Na, K (d) Cl, Br, I
- 33) Law of octaves was proposed by _____
- (a) Lothar Meyer (b) Johann Dobereiner (c) **Newland** (d) Mendeleev
- 34) _____ proposed modern periodic law.
- (a) **Henry Moseley** (b) Mendeleev (c) Newland (d) Dobrainer
- 35) The atomic weight of Au is _____
- (a) 195 (b) **197** (c) 198 (d) 196
- 36) The horizontal rows in the periodic table are called as _____
- (a) group (b) family (c) **period** (d) column

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37) Match the list I with list II and select the correct answer using the code given below the list.

List I	List II
A De Chancourtois	1 Addition of synthetic elements.
B Moseley	2 first periodic law
C Newland	3 Modern periodic law
D Glenn Seaborg	4 Law of octaves

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1234	3241	2341	2314

38) Consider the following statements according to modern periodic table.

- (i) Modern periodic table contains 18 vertical columns and 7 horizontal rows.
(ii) The elements after uranium are called transuranium elements
(iii) The 17th group elements are called chalcogens
(iv) The elements of Groups 13 to 18 are called p-block elements.

which of the following statement(s) given above is/are correct.

- (a) (i), (iii) & (iv) (b) (i), (ii) & (iii) (c) **(i), (ii) & (iv)** (d) all the 4 statements

39) The vertical columns in the periodic table are called as

- (a) family (b) **group** (c) period (d) both (a) and (c)

40) There are _____ periods in the periodic table.

- (a) 18 (b) **7** (c) 6 (d) 5

41) The number of groups in the periodic table

- (a) 7 (b) **18** (c) 5 (d) 6

42) The element with atomic number 57 belongs to _____

- (a) s-block (b) p-block (c) **d-block** (d) f-block

43) Lithium shows diagonal relationship with _____

- (a) **Mg** (b) Al (c) Na (d) Si

44) The electronic configuration of nitrogen is _____

- (a) $1s^2 2s^2 2p^3$ (b) $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$ (c) $1s^2 2s^2 2p^3$ (d) **both (a) and (b)**

45) The first transition series is from _____ to _____

- (a) **Sc to Zn** (b) Hf to Hg (c) Y to Cd (d) Ac to Lr

46) The element with Z = 24 is placed in the _____ period

- (a) 5 (b) 2 (c) 3 (d) **4**

47) _____ is the lightest metal known.

- (a) Na (b) **Li** (c) Mg (d) Al

48) He is placed in _____ group.

- (a) 1 (b) 2 (c) 17 (d) **18**

49) Pd has exceptional electronic configuration of $4d^{10} 5s^0$ It belongs to period _____ and group _____

- (a) 4, 11 (b) **5, 10** (c) 6, 9 (d) 3, 16

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- 50) The elements at the extreme left of periodic table has strong behaviour _____
(a) Oxidizing (b) **Reducing** (c) both oxidation and reducing (d) electro negative
- 51) On moving diagonally across the periodic table, the second and third period elements show certain similarities. Pick out the pair which shows such a property.
(a) Be & Na (b) **Be & Al** (c) Be & Mg (d) B & Al
- 52) d-block elements form _____ compounds.
(a) ionic (b) covalent (c) Coordinate (d) **both (a) and (b)**
- 53) X, Y and Z are three members of a Dobereiner's triad. If the atomic mass of X is 7 and that of Z is 39, what is the atomic mass of Y?
(a) **23** (b) 7 (c) 46 (d) 39
- 54) Modern periodic law is.
(a) **The physical and chemical properties of the elements are periodic functions of their atomic numbers.**
(b) The physical and chemical properties of the elements depend upon the energy of the electrons.
(c) The physical and chemical properties of the elements depend upon atomic weight.
(d) None of these
- 55) Elements which generally exhibit multiple oxidation states and whose ions are usually coloured are
(a) metalloids (b) **transition elements** (c) non-metals (d) gases
- 56) The elements eka aluminum and eka silicon named by Mendeleev known today as
(a) **gallium and germanium** (b) germanium and silicon (c) aluminium and silicon
(d) indium and thallium
- 57) Find the incorrect statement.
(a) **Smallest atom of periodic table is He**
(b) p-block elements are metals, nonmetals and metalloids
(c) Noble gases have 8 valence electrons except He
(d) Valence electron and valency is same for group I
- 58) Valence electrons in the atom of element A is 4 and in the element B is 2. Most probable compound formed from A and B is
(a) AB_3 (b) **AB_2** (c) A_2B_3 (d) A_2B
- 59) Which of the following set has atomic numbers of only representative elements?
(a) **2,10,17,35** (b) 2,12,22,32 (c) 3,15,35,45 (d) 4,20,36,79
- 60) Halogens belong to the
(a) s-block (b) **p-block** (c) d-block (d) Zero group of the periodic table
- 61) Characteristic of transition elements is incomplete
(a) **d-orbitals** (b) f-orbitals (c) p-orbitals (d) s-orbitals
- 62) In the first transition series the incoming electron enters the
(a) 4d-orbital (b) **3d-orbital** (c) 5d-orbital (d) 6d-orbital

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63) The number of elements in the first period of the modern periodic table is _____

- (a)
- 2**
- (b) 8 (c) 18 (d) 32

64) Group 16 of the periodic table is called as _____

- (a) oxygen family (b) chalcogen family (c)
- both a and b**
- (d) halogen family

65) The metal which is a liquid at room temperature is _____

- (a) Gallium (b)
- Mercury**
- (c) Germanium (d) Tellurium

66) Representative elements are those which belong to

- (a) s and d-blocks (b)
- s and p-blocks**
- (c) p and d-blocks (d) d and f-blocks

67) The element with atomic number 103 is _____

- (a)
- lawrencium**
- (b) Mendeleevium (c) fermium (d) nobelium

68) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A Metalloid	1 Cerium
B Noble gas	2 Nobelium
C Trans uranium element	3 Arsenic
D Lanthanide	4 Argon

- (a) (b) (c) (d)

(a)	(b)	(c)	(d)
A B C D	A B C D	A B C D	A B C D
1 3 2 4	4 2 1 3	3 4 2 1	2 1 4 3

69) Elements whose atoms have their sand p-sub-levels complete are the _____

- (a) Normal elements (b) Transition elements (c) Halogens (d)
- Inert gases**

70) Excluding hydrogen and helium, the smallest element in the periodic table is _____

- (a) Lithium (b) Oxygen (c)
- Fluorine**
- (d) Chlorine

71) Match the list I with list II and select the correct answer using the code given below the list.

List I	List II
A Unnilbium	1 Bohrium
B Unnil hexium	2 Ronigenium
C Unnnunium	3 scaborgium
D Unnilseplium	4 Nobelium

- (a) (b) (c) (d)

(a)	(b)	(c)	(d)
A B C D	A B C D	A B C D	A B C D
1 2 4 3	3 1 4 2	4 3 2 1	4 3 1 2

72) The general electronic configuration of s-block element is _____

- (a)
- ns^1
- (b)
- ns^2
- (c)
- ns^1
- and
- ns^2
- (d)
- ns^{1-2}**

73) The p-block elements comprise of group

- (a) 1,2 (b)
- 13 to 18**
- (c) 3 to 12 (d) 12 to 18

74) The general electronic configuration of p-block element is _____

- (a)
- ns^{1-2}
- (b)
- np^{1-6}
- (c)
- np^6
- (d)
- $ns^2 np^6$**

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- 75) The general electronic configuration of d-block element is _____
 (a) ns^2np^6 (b) $(n-1)d^{1-10}ns^{0-2}$ (c) $(n-1)d^1ns^{0-}$ (d) $(n-1)d^{0-10}ns^2$
- 76) d-block elements form _____ compounds.
 (a) ionic (b) covalent (c) metallic (d) **both (a) and (b)**
- 77) The elements in which extra electrons enters into $(n - 2)$ f-orbitals are called _____ elements.
 (a) p-block (b) d-block (c) **f-block** (d) s-block
- 78) The element with atomic number 31 belongs to _____
 (a) s-block (b) **p-block** (c) d-block (d) f-block
- 79) The oxidation state of alkali metal is _____
 (a) +2 (b) **+1** (c) +3 (d) 0
- 80) All the elements in a group in the periodic table have the same
 (a) electronic configuration (b) **number of electrons in the valence shell** (c) atomic number
 (d) atomic weight
- 81) Which pair of elements has the same characteristic chemical properties?
 (a) $Z = 13, Z = 22$ (b) $Z = 2, Z = 4$ (c) $Z = 4, Z = 24$ (d) **$Z = 3, Z = 11$**
- 82) The IUPAC name of element having atomic number 108 is
 (a) **Unniloctium** (b) Ununoctium (c) Nilniloctium (d) Ununoctinium
- 83) Pick the metalloid among the following elements
 (a) P (b) S (c) **Si** (d) Al
- 84) Which one among the following exhibits a valency greater than 4?
 (a) Na (b) **P** (c) H (d) Ar
- 85) Which one among the following species has the largest atomic radius?
 (a) **Na** (b) Mg (c) Al (d) Si
- 86) The correct order of size among Br, Br^+, Br^- is
 (a) $Br < Br^+ < Br^-$ (b) **$Br^+ < Br < Br^-$** (c) $Br < Br^- < Br^+$ (d) $Br^- < Br^+ < Br$
- 87) The elements having highest ionization energies within their periods are called _____
 (a) Halogens (b) **Noble gases** (c) Alkali metals (d) Transition elements
- 88) Arrange the following ions in order of decreasing ionic radii He, Li^{2+}, Be^{3+}
 (a) **$He > Li^{2+} > Be^{3+}$** (b) $Li^{2+} > Be^{3+} > He$ (c) $He > Li^{2+} > Be^{3+}$ (d) $Be^{3+} > Li^{2+} > He$
- 89) Across the period, Ionisation energy _____
 (a) **increases** (b) decreases (c) does not vary (d) first decreases and then increases
- 90) Which among the following has the highest ionisation energy
 (a) **Ne** (b) Na (c) K (d) Kr

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91) Which of the following statements are correct?

- (i) Helium has the highest first ionisation enthalpy
 (ii) Chlorine has less electron affinity than fluorine
 (iii) Ne has more ionisation energy than Boron.
 (iv) The ionisation energy noble gases are zero
 (a) (i), (ii) and (iii) (b) (i) and (iii) (c) (i), (iii) and (iv) (d) (i), (ii), (iii) and (iv)

92) Which of the following factor decreases across the period?

- (a) Ionisation energy (b) electron affinity (c) **atomic radius** (d) electronegativity

93) Match the list I with list II and select the correct answer using the code given below the list.

List I	List II
A Ionisation energy	1 ionic compound
B electro negativity	2 Alloys
C s-block elements	3 KJ mol^{-1}
D d-block elements	4 No unit

- (a)

A	B	C	D
1	2	3	4

 (b)

A	B	C	D
3	2	1	4

 (c)

A	B	C	D
2	3	1	4

 (d)

A	B	C	D
3	4	1	2

94) The most electronegative element of the periodic table is _____

- (a) Iodine (b) **Flourine** (c) Chlorine (d) Oxygen

95) With respect to chlorine, hydrogen will be

- (a) **Electropositive** (b) Electronegative (c) Neutral (d) None of these

96) "The relative tendency of a bonded atom in a molecule to attract the shared pair of electrons towards itself" is termed as _____

- (a) electron gain enthalpy (b) **electronegativity** (c) electron affinity (d) ionisation energy

97) Which of the following property has no unit?

- (a) ionisation energy (b) **electronegativity** (c) electron affinity (d) atomic radius

98) Among the elements given below, _____ has the highest value of electro negativity.

- (a) Li (b) Ne (c) **F** (d) Be

99) In a group with decrease in electronegativity the metallic character

- (a) decreases across a period
 (b) increases down the group
 (c) does not vary

Which of the above statement(s) is true

- (a) a only (b) **b only** (c) both (a) and (b) (d) (c) only

100) Which of the following processes involves absorption of energy?

- (a) $\text{Cl}_{(g)} + e^- \rightarrow \text{Cl}^-$ (b) $\text{O}^- + e^- \rightarrow \text{O}^{2-}$ (c) $\text{O} + e^- \rightarrow \text{O}^-$ (d) $\text{S} + e^- \rightarrow \text{S}^-$

101) Which set of elements shows positive electron gain enthalpy?

- (a) He, N, O (b) Ne, N, Cl (c) O, Cl, F (d) **N, He, Ne**

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102) Which of the following has the highest positive electron gain enthalpy?

- (a) F (b) O^- (c) Na^+ (d) Mg^{2+}

103) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A.Element with first highest ionization enthalpy	1.Fluorine
B.Element with second highest ionization enthalpy	2.Chlorine
C.Element with highest electron gain enthalpy	3.Sodium
D.Element with highest electronegativity	4.Neon

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1324	4321	3142	2143

104) Ionisation enthalpy is an _____ process.

- (a) exothermic (b) **endothermic** (c) reversible (d) both (a) and (b)

105) The effective nuclear charge across the period (from left to right)

- (a) Decreases (b) **Increases** (c) First decreases and then increases
(d) First increases and then decreases

106) Which of the following N^{3-} , O^{2-} , F^- is largest in size?

- (a) N^{3-} (b) O^{2-} (c) F^- (d) All of these

107) The radii of F, F^- , O and O^{2-} are in the order

- (a) $O^{2-} > O > F^- > F$ (b) $F^- > O^{2-} > F > O$ (c) **$O^{2-} > F^- > O > F$** (d) $O > F^- > F > O$

108) Which of the following atom has the lowest ionization enthalpy?

- (a) $1s^2 2s^2 2p^3$ (b) **$1s^2 2s^2 2p^6 3s^1$** (c) $1s^2 2s^2 2p^6$ (d) $1s^2 2s^2 2p^5$

109) Which of the following statement is incorrect?

- (a) The ionization potential of nitrogen is greater than that of oxygen
(b) **The electronegativity of F is greater than that of Cl.**
(c) The ionization potential of Mg is greater than aluminium.
(d) The electronegativity of F is greater than that of Cl.

110) Correct order of 1st ionization potential among elements Be, B, C, N, O is

- (a) $B < Be < C < O < N$ (b) **$B < Be < C < N < O$** (c) $Be < B < C < N < O$ (d) $Be < B < C < O < N$

111) Ionic radii are

- (a) **Inversely proportional to effective nuclear charge**
(b) Inversely proportional to square of effective nuclear charge
(c) Directly proportional effective nuclear charge
(d) Directly proportional to square of effective nuclear charge.

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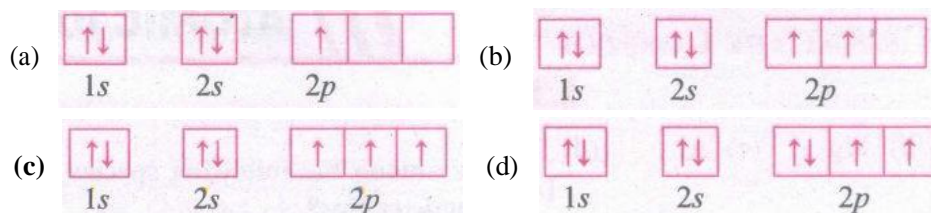
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112) Which of the following sets contain only isoelectronic ions?

- (a) Zn^{2+} , Ca^{2+} , Ga^{3+} , Al^{3+} (b) K^+ , Ca^{2+} , Sc^{3+} , Cl^- (c) P^{3-} , S^{2-} , Cl^- , Al^{3+} (d) Ti^{4+} , Ar , Cr^{3+} , V^{5+}

113) Which orbital diagram gives an insight to the highest ionization energy?



114) Pick the incorrect statement about the factors affecting ionization energy

(a) **More is the shielding of valence electrons more is the ionization energy**(b) Ionization enthalpy \propto effective nuclear charge

(c) Half filled or full filled atomic orbitals have high ionization energy

(d) Larger is the atomic radii lower is ionization energy

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LESSON-4
HYDROGEN

- 1) Which of the following statements about hydrogen is incorrect?
(a) Hydrogen ion, H_3O^+ exists freely in solution. (b) Dihydrogen acts as a reducing agent.
(c) **Hydrogen has three isotopes of which tritium is the most common.**
(d) Hydrogen never acts as cation in ionic salts
- 2) Water gas is
(a) $\text{H}_2\text{O}_{(g)}$ (b) $\text{CO} + \text{H}_2\text{O}$ (c) **$\text{CO} + \text{H}_2$** (d) $\text{CO} + \text{N}_2$
- 3) Which one of the following statements is incorrect with regard to ortho and para dihydrogen?
(a) They are nuclear spin isomers
(b) **Ortho isomer has zero nuclear spin whereas the para isomer has one nuclear spin**
(c) The para isomer is favoured at low temperatures
(d) The thermal conductivity of the para isomer is 50% greater than that of the ortho isomer
- 4) Ionic hydrides are formed by
(a) halogens (b) chalogens (c) inert gases (d) **group one elements**
- 5) Tritium nucleus contains
(a) 1 p+0 n (b) 2 p+1 n (c) **1 p + 2 n** (d) none of these
- 6) Non-stoichiometric hydrides are formed by
(a) **palladium, vanadium** (b) carbon, nickel (c) manganese, lithium (d) nitrogen, chlorine
- 7) If a body of a fish contains 1.2 g hydrogen in its total body mass, if all the hydrogen is replaced with deuterium then the increase in body weight of the fish will be
(a) **1.2 g** (b) 2.4 g (c) 3.6 g (d) $\sqrt{4.8g}$
- 8) The hardness of water can be determined by volumetrically using the reagent
(a) sodium thio sulphate (b) potassium permanganate (c) hydrogen peroxide (d) **EDTA**
- 9) The cause of permanent hardness of water is due to
(a) $\text{Ca}(\text{HCO}_3)_2$ (b) $\text{Mg}(\text{HCO}_3)_2$ (c) **CaCl_2** (d) MgCO_3

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- 10) Zeolite used to soften hardness of water is, hydrated
- (a) **Sodium aluminium silicate** (b) Calcium aluminium silicate (c) Zinc aluminium borate
(d) Lithium aluminium hydride
- 11) A commercial sample of hydrogen peroxide marked as 100 volume H_2O_2 , it means that
- (a) **1 ml of H_2O_2 will give 100 ml O_2 at STP** (b) 1 L of H_2O_2 will give 100 ml O_2 at STP
(c) 1 L of H_2O_2 will give 22.4 L O_2 (d) 1 ml of H_2O_2 will give 1 mole of O_2 at STP
- 12) When hydrogen peroxide is shaken with an acidified solution of potassium dichromate in presence of ether, the ethereal layer turns blue due to the formation of
- (a) Cr_2O_3 (b) CrO (c) **$CrO(O_2)_2$** (d) none of these
- 13) For decolorisation of 1 mole of acidified $KMnO_4$, the moles of H_2O_2 required is
- (a) – (b) – (c) – (d) –
- 14) Volume strength of 1.5 N H_2O_2 is
- (a) 1.5 (b) 4.5 (c) 16.8 (d) **8.4**
- 15) The hybridisation of oxygen atom in H_2O and H_2O_2 are, respectively
- (a) sp and sp^3 (b) sp and sp (c) sp and sp^2 (d) **sp^3 and sp^3**
- 16) The reaction $H_3PO_2 + D_2O \rightarrow H_2DPO_2 + HDO$ indicates that hypo-phosphorous acid is
- (a) tribasic acid (b) dibasic acid (c) **mono basic acid** (d) none of these
- 17) In solid ice, oxygen atom is surrounded
- (a) **tetrahedrally by 4 hydrogen atoms** (b) octahedrally by 2 oxygen and 4 hydrogen atoms
(c) tetrahedrally by 2 hydrogen and 2 oxygen atoms (d) octahedrally by 6 hydrogen atoms
- 18) The type of H-bonding present in ortho nitro phenol and p-nitro phenol are respectively
- (a) inter molecular H-bonding and intra molecular H-bonding
(b) **intra molecular H-bonding and inter molecular H-bonding**
(c) intra molecular H - bonding and no H - bonding
(d) intra molecular H - bonding and intra molecular H - bonding
- 19) Heavy water is used as
- (a) moderator in nuclear reactions (b) coolant in nuclear reactions (c) **both (a) and (b)**
(d) none of these
- 20) Water is a
- (a) basic oxide (b) acidic oxide (c) **amphoteric oxide** (d) none of these
- 21) The most abundant element in the universe is_____.
- (a) aluminium (b) mica (c) **dihydrogen** (d) nitrogen
- 22) The number of neutrons in hydrogen atom is_____.
- (a) three (b) two (c) one (d) **zero**
- 23) _____is known as heavy hydrogen.
- (a) protium (b) **deuterium** (c) tritium (d) both a and b

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- 24) Deuterium consist of _____
 (a) one electron, two proton, three neutron (b) **one electron, one proton, one neutron**
 (c) two electron, one proton, one neutron (d) three electron, two proton, one neutron
- 25) The radioactive isotope of hydrogen is _____
 (a) protium (b) deuterium (c) **tritium** (d) nascent hydrogen
- 26) The radioactive isotope used in illumination of wrist watches instead of Radium is _____
 (a) ${}_1\text{T}^3$ (b) ${}_1\text{D}^2$ (c) ${}_{10}\text{Ne}^{21}$ (d) ${}_2\text{He}^3$
- 27) The half life period of Tritium is _____
 (a) 12.33 secs (b) 12.33 mins (c) 12.33 hrs (d) **12.33 years**
- 28) Ammonia is manufactured by _____ process.
 (a) Contact (b) Bergius (c) **Haber's** (d) none of the above
- 29) _____ torches is/are used in cutting and welding of a steel.
 (a) Oxy acetylene (b) Oxy hydrogen (c) **both a and b** (d) neither a nor b
- 30) Hydrogen is used in _____
 (a) hydrogenation of oils (b) fuel cells (c) gas bags for air ships (d) **all the above**
- 31) Match the list I with list II and select the correct answer using the code given below
- | List I | List II |
|------------------|-------------------------|
| A Protium | 1 Radio active |
| B Tritium | 2 Aligned nuclear spins |
| C Ortho hydrogen | 3 Opposed nuclear spins |
| D Para hydrogen | 4 No neutron |
- (a)

A	B	C	D
1	3	2	4

 (b)

A	B	C	D
4	1	2	3

 (c)

A	B	C	D
3	1	4	2

 (d)

A	B	C	D
2	1	4	3
- 32) Which among the following statement/s given below is/ are incorrect regarding hydrogen?
 1. It is diatomic in nature
 2. Has only one electron in the outermost shell
 3. Very good oxidizing agent
 4. Does not form hydrides easily
 (a) 1,2 & 3 (b) only 4 (c) **only 3** (d) only 2
- 33) The conversion of atomic hydrogen to dihydrogen is a _____ change.
 (a) endothermic (b) **exothermic** (c) photochemical (d) nuclear
- 34) $\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{H}_2$ 'X' is
 (a) Nickel (b) Iron (c) **Iron oxide** (d) Vanadium penta oxide
- 35) Hydrogen bomb is based on the principle of _____
 (a) fission (b) fusion (c) **both a and b** (d) neither a nor b

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- 36) Hydrogen can be obtained from water by reaction with
(a) metal oxides (b) non metal oxides (c) **metals** (d) metal hydrides
- 37) Hydrogen burns in air with a - flame.
(a) light bluish (b) **yellow** (c) green (d) none of these
- 38) Which pair are not hydrogen isotopes?
(a) **Ortho and para hydrogen** (b) Protium and deuterium (c) Deuterium and tritium
(d) Tritium and protium
- 39) Ortho and para hydrogen differ in
(a) **proton spin** (b) electron spin (c) nuclear charge (d) both band c
- 40) _____ is considered as the potential alternative fuel of the future.
(a) **hydrogen** (b) gasoline (c) biodiesel (d) propane
- 41) The ionisation energy of hydrogen is higher than alkali metals. Pick out the correct reason for the above statement.
(a) **Because of smaller size of H.** (b) Presence of 1e⁻ in outermost shell
(c) Presence of one proton in its nucleus (d) Absence of neutrons.
- 42) Hydrogen accepts an electron to attain the inert gas configuration. In this way it resembles _____
(a) chalcogens (b) **halogens** (c) transition metals (d) alkali metals
- 43) Hydrogen acts as a reducing agent and thus resembles
(a) halogens (b) chalcogens (c) inert gases (d) **alkali metals**
- 44) Which among of the following reaction produces hydrogen?
(a) $\text{Na}_2\text{O}_2 + \text{HCl}$ (b) $\text{BaO}_2 + \text{HCl}$ (c) $\text{K}_2\text{S}_2\text{O}_8 + \text{H}_2\text{O}$ (d) **Zn + HCl**
- 45) In which of the following compounds does hydrogen has an oxidation state of -1?
(a) CH_4 (b) NH_3 (c) HCl (d) **CaH_2**
- 46) Which properties of hydrogen are responsible for moderation of the climate and body temperature of living beings?
(a) High heat of vapourisation (b) High heat capacity (c) **Both (a) and (b)** (d) None of these
- 47) Consider the following statements
1. Water has high dielectric constant.
2. Water has strong intra molecular hydrogen bonding
3. Water is an Universal solvent
Which of the following statement(s) given above is are not correct
(a) 1 & 3 (b) only 1 (c) 2 & 3 (d) **only 2**

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48) Consider the following statements

1. Hard water forms scum with soap.
2. Hard water lathers easily with soap
3. Hard water is unsuitable for laundry and boilers

Which of the following statement(s) given above is/are correct?

- (a) **1 & 3** (b) only 1 (c) 2 & 3 (d) only 2

49) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A Calcium hydrogen carbonate	1 Permanent hardness
B Calcium chloride	2 Chelating
C Sodium aluminium silicate	3 Temporary hardness
D EDTA	4 Ion exchange method

- (a)

A	B	C	D
1	3	2	4

 (b)

A	B	C	D
4	3	1	2

 (c)

A	B	C	D
3	1	4	2

 (d)

A	B	C	D
2	1	4	3

50) Which of the following compounds is used for water softening?

- (a) $\text{Ca}_3(\text{PO}_4)_2$ (b) Na_3PO_4 (c) **NaAlSiO_4** (d) Na_2HPO_4

51) The structure of water molecule is _____

- (a) **bent.** (b) tetrahedral (c) distorted octahedral (d) trigonal bipyramidal

52) Hardness of water is due to _____ of calcium and magnesium.

- (a) bicarbonates (b) sulphates (c) chlorides (d) **all the above**

53) FeSO_4 contains _____ molecules of water of hydration.

- (a) 5 (b) **7** (c) 10 (d) 12

54) _____ is extensively used as a moderator in nuclear reactors.

- (a) H_2O (b) H_2O_2 (c) **D_2O** (d) D_2O_2

55) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A H_2O_2	1 SiH_4
B D_2O	2 PdH
C Metallic hydride	3 Bleach
D Molecular hydride	4 Study of reaction mechanism

- (a)

A	B	C	D
1	3	2	4

 (b)

A	B	C	D
4	3	1	2

 (c)

A	B	C	D
3	4	2	1

 (d)

A	B	C	D
2	1	4	3

56) The H-O-H angle in water molecule is about

- (a) 90° (b) **104.5°** (c) $109^\circ 28'$ (d) 180°

57) Hardness of water cannot be removed by

- (a) treating with washing soda (b) adding calgon (c) boiling (d) **addition of chlorine**

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- 58) The chemical that is added to water in order to remove temporary hardness is _____
- (a) Ca(OH)_2 (b) CaCO_3 (c) HCl (d) CaSO_4
- 59) Name the anions responsible for permanent hardness of water
- (a) sulphate (b) chloride (c) nitrate (d) **both (a) and (b)**
- 60) Presence of which cation makes the water hard in nature?
- (a) **Ca & Mg** (b) Na & Mg (c) Ca & Na (d) Mg & F
- 61) Heavy water is _____
- (a) De-mineralized water (b) De-ionized water
(c) ordinary water containing dissolved salts of heavy metals.
(d) **The compound of heavier isotope of hydrogen with oxygen.**
- 62) The velocity of neutrons in nuclear reactor is slowed down by
- (a) H_2O (b) D_2O (c) Zinc rods (d) Copper rods
- 63) The maximum density of water is observed at _____
- (a) 0°C (b) 4°C (c) 11.6°C (d) 273°C
- 64) Hydrogen peroxide was discovered by _____
- (a) Chadwick (b) J.J Thomson (c) Urey (d) **J.L. Thenard**
- 65) Metal hydrides are ionic, covalent or molecular in nature. Among LiH, NaH, KH, RbH, CsH, the correct order of increasing ionic character is
- (a) $\text{LiH} > \text{NaH} > \text{CsH} > \text{KH} > \text{RbH}$ (b) **$\text{LiH} < \text{NaH} < \text{KH} < \text{RbH} < \text{CsH}$**
(c) $\text{RbH} > \text{CsH} > \text{NaH} > \text{KH} > \text{LiH}$ (d) $\text{NaH} > \text{CsH} > \text{RbH} > \text{LiH} > \text{KH}$
- 66) H_2O_2 acts as a _____ agent.
- (a) oxidizing (b) reducing (c) **both reducing and oxidizing** (d) neither reducing nor oxidizing
- 67) H_2O_2 is a _____ acid.
- (a) mono basic (b) **di basic** (c) tri basic (d) none
- 68) LiH is an example of _____ hydride.
- (a) ionic (b) saline (c) covalent (d) **both a and b**
- 69) An example of covalent hydride is _____
- (a) CaH_2 (b) **CH_4** (c) TiH (d) all the above
- 70) _____ is an example of intra molecular hydrogen bonding.
- (a) **salicylaldehyde** (b) hydrogen fluoride (c) para nitro phenol (d) both a and c
- 71) HF has _____ hydrogen bond.
- (a) intramolecular (b) **intermolecular** (c) intrastellar (d) interstellar
- 72) Acetic acid exists as a _____
- (a) monomer (b) **dimer** (c) trimer (d) octamer
- 73) What is the dihedral angle of H_2O_2 in gas and solid phase?
- (a) **111.5° and 90.2°** (b) 115.1° and 92° (c) 92° and 115.1° (d) 902° and 111.5°

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- 74) H_2O_2 acts as
(a) oxidising agent (b) reducing agent (c) bleaching agent (d) **All of these**
- 75) The reaction $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$ represents,
(a) Oxidation of H_2O_2 (b) reduction of H_2O (c) **disproportionation of oxygen**
(d) acidic nature of H_2O_2
- 76) H_2O and H_2O_2 resemble in
(a) Bond angle (b) **Hybridization of oxygen** (c) Structure (d) Oxidation state of oxygen
- 77) Statement I : The O-O bond length in H_2O_2 is shorter than that of O_2F_2 .
Statement II : H_2O_2 is an ionic compound.
(a) Both statement I and II are true and statement II explains statement I
(b) Both statement I and II are true but statement II does not explain statement I
(c) Statement I is true but statement II is false (d) **Both the statements are false.**
- 78) Ionic hydrides are usually
(a) good conductors of electricity in solid state (b) volatile (c) non-crystalline
(d) **stoichiometric compounds**
- 79) Intermolecular H-bonding is present in _____
(a) HF (b) H_2O (c) $\text{C}_2\text{H}_5\text{OH}$ (d) **All of these**
- 80) The intramolecular hydrogen bonding in molecules lead to _____
(a) high melting point (b) **low boiling point** (c) high boiling point (d) high solubility in water
- 81) Which one of the following bond is stronger?
(a) **Covalent** (b) H-bond (c) Vanderwaal's force (d) All of these
- 82) Intramolecular H-bonding is present in _____
(a) o-nitrophenol (b) salicylic acid (c) salicylaldehyde (d) **all of these**

LESSON 5ALKALI METALS AND ALKALINE EARTH METALS

- 1) For alkali metals, which one of the following trends is incorrect?
 (a) Hydration energy: $\text{Li} > \text{Na} > \text{K} > \text{Rb}$ (b) Ionisation energy: $\text{Li} > \text{Na} > \text{K} > \text{Rb}$
 (c) **Density: $\text{Li} < \text{Na} < \text{K} < \text{Rb}$** (d) Atomic size: $\text{Li} < \text{Na} < \text{K} < \text{Rb}$
- 2) Which of the following statements is in correct?
 (a) **Li^+ has minimum degree of hydration among alkali metal cations**
 (b) The oxidation state of K in KO_2 is +1 (c) Sodium is used to make Na / Pb alloy
 (d) MgSO_4 is readily soluble in water
- 3) Which of the following compounds will not evolve H_2 gas on reaction with alkali metals?
 (a) ethanoic acid (b) ethanol (c) phenol (d) **none of these**
- 4) Which of the following has the highest tendency to give the reaction $\text{M} \longrightarrow \text{M}^+$
 (a) Na (b) **Li** (c) Rb (d) K
- 5) sodium is stored in
 (a) alcohol (b) water (c) **kerosene** (d) none of these
- 6) RbO_2 is
 (a) **superoxide and paramagnetic** (b) peroxide and diamagnetic
 (c) superoxide and diamagnetic (d) peroxide and paramagnetic
- 7) Find the wrong statement
 (a) sodium metal is used in organic qualitative analysis
 (b) sodium carbonate is soluble in water and it is used in inorganic qualitative analysis
 (c) **potassium carbonate can be prepared by solvay process**
 (d) potassium bicarbonate is acidic salt
- 8) Lithium shows diagonal relationship with
 (a) sodium (b) **magnesium** (c) calcium (d) aluminium
- 9) In case of alkali metal halides, the ionic character increases in the order
 (a) $\text{MF} < \text{MCl} < \text{MBr} < \text{MI}$ (b) **$\text{MI} < \text{MBr} < \text{MCl} < \text{MF}$** (c) $\text{MI} < \text{MBr} < \text{MF} < \text{MCl}$ (d) none of these

- 10) In which process, fused sodium hydroxide is electro lysed for extraction of sodium
 (a) **Castner's process** (b) Cyanide process (c) Down process (d) All of these
- 11) The product obtained as a result of a reaction of nitrogen with CaC_2 is
 (a) $\text{Ca}(\text{CN})_3$ (b) CaN_2 (c) **CaCN_2** (d) Ca_3N_2
- 12) Which of the following has highest hydration energy
 (a) **MgCl_2** (b) CaCl_2 (c) BaCl_2 (d) SrCl_2

- 13) Match the flame colours of the alkali and alkaline earth metal salts in the bunsen burner

(P) Sodium	(1) Brick red
(q) Calcium	(2) Yellow
(r) Barium	(3) Violet
(s) Strontium	(4) Apple green
(t) Cesium	(5) Crimsonred
(u) Potassium	(6) Blue

- (a) **p-2, q-1, r-4, s-5, t-6, u-3** (b) p-1, q-2, r-4, s-5, t-6, u-3 (c) p-4, q-1, r-2, s-3, t-5, u-6 (d) p-6, q-1, r-2, s-3, t-5, u-4
- 14) Assertion Generally alkali and alkaline earth metals form superoxides
 Reason There is a single bond between O and O in superoxides
 (a) both assertion and reason are true and reason the correct explanation of assertion
 (b) both assertion and reason are true but reason is not the correct explanation of assertion
 (c) assertion is true but reason is false (d) **both assertion and reason are false**
- 15) Assertion : BeSO_4 is soluble in water while BaSO_4 is not
 Reason : Hydration energy decreases down the group from Be to Ba and lattice energy remains almost constant.
 (a) **both assertion and reason are true and reason is the correct explanation of assertion**
 (b) both assertion and reason are true but reason is not the correct explanation of assertion
 (c) assertion is true but reason is false (d) both assertion and reason are false.
- 16) Which is the correct sequence of solubility of carbonates of alkaline earth metals?
 (a) $\text{BaCO}_3 > \text{SrCO}_3 > \text{CaCO}_3 > \text{MgCO}_3$ (b) **$\text{MgCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$**
 (c) $\text{CaCO}_3 > \text{BaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$ (d) $\text{BaCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{MaCO}_3$
- 17) In context with beryllium, which one of the following statements is incorrect?
 (a) It is rendered passive by nitric acid (b) It forms Be_2C (c) **Its salts are rarely hydrolysed**
 (d) Its hydride is electron deficient and polymeric
- 18) The suspension of slaked lime in water is known as
 (a) lime water (b) quick lime (c) **milk of lime** (d) aqueous solution of slaked lime
- 19) A colourless solid substance (A) on heating evolved CO_2 and also gave a white residue, soluble in water. Residue also gave CO_2 when treated with dilute HCl
 (a) Na_2CO_3 (b) **NaHCO_3** (c) CaCO_3 (d) $\text{Ca}(\text{HCO}_3)_2$

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- 20) The compound (X) on heating gives a colourless gas and a residue that is dissolved in water to obtain (B). Excess of CO_2 is bubbled through aqueous solution of B, C is formed. Solid (C) on heating gives back X. (B) is
(a) CaCO_3 (b) **Ca(OH)_2** (c) Na_2CO_3 (d) NaHCO_3
- 21) Which of the following statement is false?
(a) **Ca^{2+} ions are not important in maintaining the regular beating of the heart**
(b) Mg^{2+} ions are important in the green parts of the plants (c) Mg^{2+} ions form a complex with ATP
(d) Ca^{2+} ions are important in blood clotting
- 22) The name 'Blue John' is given to which of the following compounds?
(a) CaH_2 (b) **CaF_2** (c) $\text{Ca}_2(\text{PO}_4)_2$ (d) CaO
- 23) Formula of Gypsum is
(a) **$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$** (b) $\text{CaSO}_4 \cdot 1/2 \text{H}_2\text{O}$ (c) $3\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (d) $2\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- 24) When CaC_2 is heated in atmospheric nitrogen in an electric furnace the compound formed is
(a) Ca(CN)_2 (b) **CaNCN** (c) CaC_2N_2 (d) CaNC_2
- 25) Among the following the least thermally stable is
(a) K_2CO_3 (b) Na_2CO_3 (c) BaCO_3 (d) **Li_2CO_3**
- 26) Potassium chloride is used as
(a) **fertilizer** (b) so soap (c) electrochemical cells (d) all the above
- 27) The elements that belong to group 1 of the periodic table are called as _____
(a) **alkali metals** (b) alkaline earth metals (c) chalcogens (d) rare gases
- 28) Rubidium belongs to _____ group of metals
(a) transition (b) inner transition (c) **alkali** (d) alkaline earth
- 29) The radioactive element of group 1 is _____
(a) rubidium (b) cesium (c) **francium** (d) radium
- 30) Half life of francium is _____
(a) 12.3 years (b) 12.3 mins (c) 21 years (d) **21 mins**
- 31) Electronic configuration of 1s block of elements is _____
(a) ns^2 (b) **ns^1** (c) ns^2np^1 (d) ns^2np^2
- 32) The atomic and ionic radii of alkali metals _____ on moving down the group
(a) **increases** (b) decreases (c) does not vary (d) decreases and then increases
- 33) The hydration enthalpies of alkali metal ions decreases in _____ order.
(a) **$\text{Li}^+ > \text{Na}^+ > \text{K}^+ > \text{Rb}^+ > \text{Cs}^+$** (b) $\text{Cs}^+ > \text{Rb}^+ > \text{K}^+ > \text{Na}^+ > \text{Li}^+$ (c) $\text{Li}^+ > \text{Rb}^+ > \text{K}^+ > \text{Na}^+ > \text{Cs}^+$
(d) $\text{Rb}^+ > \text{Cs}^+ > \text{K}^+ > \text{Na}^+ > \text{Li}^+$
- 34) The most electro positive element of the periodic table is _____
(a) Gold (b) Platinum (c) **Cesium** (d) Calcium
- 35) Alkali elements exhibit an oxidation state of _____
(a) **+1** (b) +2 (c) +3 (d) +4

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36) Consider the following statements

1. Alkali metals are so .
2. Alkali metals show high reactivity
3. I.E of alkali metal decreases down the group

Which of the following statement(s) given above is/ are correct?

- (a) 1 & 3 (b) only I (c) 2 & 3 (d) **1, 2 & 3**

37) Match the list I with List II and select the correct answer using the code given below the lists

Liast I	List
A High enthalpy of hydration	1 Cs
B Most electropositive element	2 Li
C Golden yellow flame	3 Fr
D Radioactive	4 Na

- (a) (b) (c) (d)

ABCD	ABCD	ABCD	ABCD
1324	4312	3142	2143

38) The alkali metals have low melting point. Which of the following alkali metal is expected to melt if the room temperature rises to 30°C?

- (a) Na (b) K (c) Rb (d) **Cs**

39) The reducing power of a metal depends on various factors. Suggest the factor, which makes Li, the strongest reducing agent in aqueous solution

- (a) Sublimation enthalpy (b) Ionisation enthalpy (c) **Hydration enthalpy**
(d) Electron-gain enthalpy

40) The order of decreasing ionisation enthalpy in alkali metals is

- (a) Na > Li > K > Rb (b) Rb < Na < K < L (c) **Li > Na > K > Rb** (d) K < Li < Na < Rb

41) Which of the following is used in photoelectric cells?

- (a) Na (b) **K** (c) Li (d) **Cs**

42) Metallic elements are described by their standard electrode potential, fusion enthalpy, atomic size, etc. The alkali metals are characterised by which of the following properties?

- (i) High boiling point
- (ii) High density
- (iii) Large atomic size

- (a) i & ii (b) i & iii (c) only ii (d) **only iii**

43) Which of the following are the correct reasons for anomalous behaviour of lithium?

- (a) Exceptionally small size of its atom (b) Its high polarising power
(c) Exceptionally low ionisation enthalpy (d) **both a and b**

44) _____ ions are found in large proportions in biological fluids,

- (a) Na⁺ & Cl⁻ (b) K⁺ & Cl⁻ (c) **Na⁺ & K⁺** (d) Cl⁻ & Br⁻

45) _____ is responsible for the transmission of nerve signals.

- (a) Lithium (b) **Sodium** (c) Potassium (d) Magnesium

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- 46) Spodumene is the silicate mineral of _____
(a) **lithium** (b) sodium (c) cesium (d) francium
- 47) Which of the following metals is most commonly used in photochemical cells?
(a) Lithium (b) Calcium (c) **Caesium** (d) Francium
- 48) Which among the following is the strongest reducing agent?
(a) Na (b) **K** (c) Ac (d) Mg
- 49) Why Cs and K are used as electrodes in photoelectric cells
(a) **Due to their less ionisation energy** (b) Due to high ionisation energy
(c) Due to diagonal relationship (d) None of these
- 50) The correct increasing order of density of alkali metal is
(a) **Li < K < Na < Rb < Cs** (b) Li < Na > K < Rb < Cs (c) K < Li < Rb < Na (d) Cs < Rb < K < Na < Li
- 51) Which among the following alkali metals exhibit the most metallic character?
(a) Na (b) Li (c) **Cs** (d) K
- 52) The metallic lusture exhibited by sodium is due to,
(a) Excitation of free protons (b) Existence of body centered cubic lattice (c) Division of Na⁺ ions.
(d) **Vibration of loose electrons**
- 53) NaCl gives a golden yellow colour to the Bunsen flame which is due to.
(a) Sublimation of metallic Na to give yellow vapour
(b) **Emission of excess energy absorbed as a radiation in the visible region**
(c) Low ionization potential of Na. (d) Photosensitivity of Na.
- 54) Assertion : Lithium is in diagonal relationship with magnesium
Reason : Li⁺ has same size as Mg²⁺
(a) **Both assertion and reason are true and reason is the correct explanation for assertion.**
(b) Both assertion and reason are true but reason is not the correct explanation for assertion
(c) Assertion is true but reason are false (d) Both assertion and reason are false.
- 55) _____ occurs in large amounts in sea water
(a) NaCl (b) KCl (c) **both a and b** (d) neither a nor b
- 56) Which of the following oxides is the most basic in nature?
(a) **Na₂O** (b) BeO (c) Li₂O (d) H₂O
- 57) Identify the most stable hydride among the following
(a) NaH (b) **LiH** (c) KH (d) CsH
- 58) Which hydroxide decomposes on heating?
(a) NaOH (b) RbOH (c) KOH (d) **LiOH.**
- 59) Which of the following halides has the highest melting point?
(a) **NaF** (b) NaCl (c) NaBr (d) NaI

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- 60) Find out the correct statement with respect to alkali metals.
- (a) They react with oxygen to give mainly the oxide MO_2
(b) They react with halogen to give halides MX
 (c) Their nitrates decompose on heating to give NO_2 and O_2
 (d) Their carbonates decompose on heating to give CO_2 and MO
- 61) Assertion: Na_2SO_4 is soluble in water but $BaSO_4$ is insoluble
 Reason : Lattice energy of barium sulphate exceeds its hydration energy.
- (a) **Both assertion and reason are true and reason is the correct explanation for assertion**
 (b) Both assertion and reason are true but reason is not the correct explanation for assertion
 (c) Assertion is true but reason are false (d) Both assertion and reason are false.
- 62) Alkaline earth metals belong to _____ group of the periodic table
 (a) 1 **(b) 2** (c) 17 (d) 18
- 63) Electronic configuration of 2s block of elements is
 (a) ns^2 (b) ns^1 (c) ns^2np^1 (d) ns^2np^2
- 64) The radioactive element of group 2 element is _____
 (a) Strontium **(b) Radium** (c) Beryllium (d) Francium
- 65) Alkaline earth metals exhibit _____ oxidation state in their compounds
 (a) +1 **(b) +2** (c) +4 (d) +6
- 66) Match the list I with List II and select the correct answer using the code given below the lists.
- | List I | List II |
|--------|---------------|
| A Ba | 1 Crimson red |
| B Ca | 2 Lilac |
| C Sr | 3 Apple green |
| D K | 4 Brick red |
- (a)

A	B	C	D
1	3	2	4

 (b)

A	B	C	D
4	3	1	2

 (c)

A	B	C	D
3	4	1	2

 (d)

A	B	C	D
2	1	4	3
- 67) _____ is a group 2 element which shows diagonal relationship with aluminium
 (a) **Be** (b) Mg (c) Ca (d) Ba
- 68) Alkaline earth metals form basic hydroxides. The metal hydroxide which is most basic is _____
 (a) $Mg(OH)_2$ (b) $Ca(OH)_2$ (c) $Sr(OH)_2$ **(d) $Ba(OH)_2$**
- 69) Some of the Group 2 metal halides are covalent and soluble in organic solvents. Among the following metal halides, the one which is soluble in ethanol is _____
(a) $BeCl_2$ (b) $MgCl_2$ (c) $CaCl_2$ (d) $SrCl_2$
- 70) _____ is unstable in air and is kept in CO_2 atmosphere to avoid decomposition.
(a) $BeCO_3$ (b) $MgCO_3$ (c) $CaCO_3$ (d) $BaCO_3$
- 71) Which one of the following alkaline earth metal carbonates is thermally most stable?
 (a) $MgCO_3$ (b) $CaCO_3$ (c) $SrCO_3$ **(d) $BaCO_3$**

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72) _____ is the cofactor of all enzymes that utilize ATP in phosphate transfer and energy release.

- (a) Be (b) **Mg** (c) Ca (d) Ba

73) The polarising power of Mg is almost same as

- (a) **Li** (b) Na (c) K (d) Rb

74) Alkaline earth metals are

- (a) Monovalent (b) **Divalent** (c) Trivalent (d) Zerovalent

75) Name the alkaline earth metal hydroxide which is amphoteric in nature.

- (a) $\text{Be}(\text{OH})_2$ (b) **KOH** (c) NaOH (d) All of these

76) Why alkaline earth metals have higher tendency to form complexes than alkali metals?

- (a) Smaller size (b) Greater nuclear charge (c) **Both (a) & (b)** (d) neither (a) nor (b)

77) Ca is a good reducing agent, because

- (a) Due to its small size (b) **It has negative reduction potential.**
(c) It is the first member of group 2 (d) It has one electron in outermost shell

78) What is the trend of formation of ionic compound in alkaline earth metals?

- (a) **Increases down the group** (b) Decreases down the group (c) Decreases across the period
(d) Remains same in the periodic table

79) The element that does not answer the flame test is

- (a) Ba (b) **Mg** (c) Ca (d) Sr

80) Assertion : Alkaline earth metals are harder than alkali metals

Reason : Atomic radii of alkaline earth metals are smaller than corresponding alkali metals "in the same periods of periodic table"

- (a) Both assertion and reason are true and reason is the correct explanation for assertion.
(b) **Both assertion and reason are true but reason is not the correct explanation for assertion**
(c) Assertion is true but reason are false (d) Both assertion and reason are false

81) Assertion : Beryllium compounds are covalent in nature

Reason : The size of Be^{2+} ion is larger in comparison to the radii of the other divalent ions of alkaline earth metals.

- (a) Both assertion and reason are true and reason is the correct explanation for assertion
(b) Both assertion and reason are true but reason is not the correct explanation for assertion
(c) **Assertion is true but reason are false** (d) Both assertion and reason are false.

82) Identify the correct statements about barium.

- (i) It shows photoelectric effect
(ii) It is silvery white metal
(iii) It forms $\text{Ba}(\text{NO}_3)_2$ which is used in preparation of green tire
(a) Both (i) and (iii) (b) **(ii) and (iii)** (c) Only (ii) (d) (i),(ii),(iii)

83) Which element of group 2 is not considered as alkaline earth metal

- (a) **Beryllium** (b) Calcium (c) Strontium (d) Barium

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- 84) Compounds of alkaline earth metals are less soluble in water than the corresponding alkali metals salts due to :
- (a) **their increased covalent character** (b) high lattice energy (c) their high ionization energy
(d) none of the above
- 85) Quicklime is _____
- (a) CaC_3 (b) **CaO** (c) Ca(OH)_2 (d) CaSiO_3
- 86) Ca(OH)_2 is _____
- (a) gypsum (b) milk of lime (c) **slaked lime** (d) lime water
- 87) _____ is used in purification and refining of sugar.
- (a) Ca(OH)_2 (b) **CaO** (c) CaCl_2 (d) CaCO_3
- 88) Lime water turning milky is due to the formation of _____
- (a) **calcium carbonate** (b) calcium hydroxide (c) calcium hydroxide (d) calcium chloride
- 89) Gypsum is _____
- (a) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (b) $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ (c) $\text{CaSO}_4 \cdot 1/4\text{H}_2\text{O}$ (d) **$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$**
- 90) Gypsum is used in _____
- (a) plaster board (b) surgical splints (c) soil additive (d) **all the above**
- 91) Plaster of Paris is _____
- (a) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (b) **$\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$** (c) $\text{CaSO}_4 \cdot 1/4\text{H}_2\text{O}$ (d) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- 92) Plaster of Paris is obtained by heating gypsum to _____
- (a) 293K (b) 100 K (c) **393 K** (d) 273K
- 93) A substance which gives brick red flame and breaks down on heating to give oxygen and a brown gas is _____
- (a) Magnesium nitrate (b) **Calcium nitrate** (c) Barium nitrate (d) Strontium nitrate
- 94) Match the list I with List II and select the correct answer using the code given below the lists.

List I	List II
A Gypsum	1 Bleaching Powder
B Plaster of paris	2 Chlorophyll
C Slaked lime	3 Statues
D Magnesium	4 Satin spar

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1324	4312	3412	2143

- 95) Consider the following statements
- Gypsum is calcium sulphate hemihydrate
 - Retrograde solubility is striking feature of gypsum
 - Alabaster is a variety of gypsum
- Which of the following statement(s) given above is/ are incorrect?
- (a) 1 & 3 (b) **only** (c) 2 & 3 (d) 1, 2 & 3

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96) Which of the following statements is true about Ca(OH)_2 ?

- (a) **It is used in the preparation of bleaching powder** (b) It is a light blue solid
(c) It is a light blue solid (d) It is used in the manufacture of cement

97) A chemical A is used for the preparation of washing soda. When CO_2 is bubbled through an aqueous solution of A, the solution turns milky. It is used in white washing due to disinfectant nature. What is the chemical formula of A?

- (a) $\text{Ca(HCO}_3)_2$ (b) CaO (c) **Ca(OH)_2** (d) CaCO_3

98) Suspension of slaked lime in water is known as _____

- (a) lime water (b) quick lime (c) **milk of lime** (d) aqueous solution of slaked lime

99) Dead burnt plaster is _____

- (a) **CaSO_4** (b) $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ (c) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (d) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

100) By adding gypsum to cement

- (a) setting time of cement becomes less (b) **setting time Of cement increases**
(c) colour of cement becomes light (d) shining surface is obtained

101) Bleaching powder is _____

- (a) CaOCl (b) CaOCl_2 (c) **CaO_2C_2** (d) CaOCl_3

102) Give the correct order of thermal stability of alkaline earth metal carbonates.

- (a) **$\text{BaCO}_3 > \text{SrCO}_3 > \text{CaCO}_3 > \text{MgCO}_3 > \text{BeCO}_3$** (b) $\text{SrCO}_3 > \text{CaCO}_3 > \text{BaCO}_3 > \text{BeCO}_3 > \text{MgCO}_3$
(c) $\text{BaCO}_3 > \text{BeCO}_3 > \text{MgCO}_3 > \text{SrCO}_3 > \text{CaCO}_3$ (d) $\text{CaCO}_3 > \text{MgCO}_3 > \text{SrCO}_3 > \text{BaCO}_3 > \text{BeCO}_3$

103) $\text{M} + 2\text{H}_2\text{O} \rightarrow \text{M(OH)}_2 + \text{H}_2$

which among the following metals does not undergo the above reaction at high temperature?

- (a) **Be** (b) Ba (c) Ca (d) Sr

104) Assertion : The fluorides of alkaline earth metals are almost insoluble in water.

Reason : The lattice energies of the fluorides of alkaline earth metal are very high.

- (a) **Both assertion and reason are true and reason is the correct explanation for assertion.**
(b) Both assertion and reason are true but reason is not the correct explanation for assertion
(c) Assertion is true but reason are false. (d) Both assertion and reason are false.

105) The correct statements is / are :

- (i) BeCl_2 is a covalent compound
(ii) BeCl_2 can form dimer
(iii) BeCl_2 is an electron deficient molecule
(iv) The hybridisation of Be in BeCl_2 is Sp^2
(a) (i) and (iii) (b) **(i), (ii) and (iii)** (c) (i) and (iv) (d) (ii), (iii) and (iv)

106) In which of the following reactions, MgO is Dot formed

- (a) $\text{Mg} + \text{CO}_2 \rightarrow$ (b) $\text{Mg} + \text{NO} \rightarrow$ (c) **$\text{Mg} + \text{dil.HNO}_3 \rightarrow$** (d) $\text{Mg} + \text{B}_2\text{O}_3 \rightarrow$

107) The metals X and Y that form oxide and nitride when burnt in air are

- (a) Li and Na (b) **Mg and Ca** (c) Cs and K (d) K and Mg

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- 108) Several blocks of magnesium are fixed to the bottom of a ship to
(a) Keep away the sharks (b) **prevent of rusting of iron ships** (c) make the ship lighter
(d) prevent puncturing by under sea rocks
- 109) Which is insoluble in water?
(a) **CaF₂** (b) CaCl (c) HgCl₂ (d) Ca(NO₃)₂
- 110) Which of the following dissolves in water with a hissing sound?
(a) bleaching powder (b) marble (c) **quick lime** (d) slaked lime
- 111) Identify the correct statement
(a) Gypsum is obtained by heating plaster of paris
(b) Plaster of paris can be obtained by hydration of gypsum
(c) **Plaster of paris contains higher percentage of calcium than that of gypsum**
(d) Plaster of paris is obtained from gypsum by oxidation

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LESSON-6
STATES OF MATTER

- 1) Gases deviate from ideal behavior at high pressure. Which of the following statement(s) is correct for non-ideality?
 - (a) at high pressure the collision between the gas molecule become enormous
 - (b) at high pressure the gas molecules move only in one direction
 - (c) at high pressure, the volume of gas become insignificant
 - (d) at high pressure the intermolecular interactions become significant**
- 2) Rate of diffusion of a gas is
 - (a) directly proportional to its density
 - (b) directly proportional to its molecular weight
 - (c) directly proportional to its square root of its molecular weight
 - (d) inversely proportional to the square root of its molecular weight**
- 3) Which of the following is the correct expression for the equation of state of van der Waals gas?
 - (a) $(P + \frac{a}{V^2})(V - nb) = nRT$
 - (b) $(P + \frac{a}{V})(V - nb) = nRT$
 - (c) $(P + \frac{a}{V})(V - nb) = nRT$
 - (d) $(P + \frac{a}{V^2})(V - ab) = nRT$
- 4) When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules
 - (a) are above inversion temperature
 - (b) exert no attractive forces on each other**
 - (c) do work equal to the loss in kinetic energy
 - (d) collide without loss of energy
- 5) Equal weights of methane and oxygen are mixed in an empty container at 298 K. The fraction of total pressure exerted by oxygen is
 - (a) $\frac{1}{3}$
 - (b) $\frac{2}{3}$
 - (c) $\frac{1}{2}$
 - (d) $\frac{2}{3} \times \frac{273}{298}$
- 6) The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called
 - (a) Critical temperature
 - (b) Boyle temperature**
 - (c) Inversion temperature
 - (d) Reduced temperature
- 7) In a closed room of 1000 m³ a perfume bottle is opened up. The room develops a smell. This is due to which property of gases?
 - (a) Viscosity
 - (b) Density
 - (c) Diffusion**
 - (d) None

- 8) A bottle of ammonia and a bottle of HCl connected through a long tube are opened simultaneously at both ends. The white ammonium chloride ring first formed will be
 (a) At the center of the tube (b) **Near the hydrogen chloride bottle** (c) Near the ammonia bottle
 (d) Throughout the length of the tube
- 9) The value of universal gas constant depends upon
 (a) Temperature of the gas (b) Volume of the gas (c) Number of moles of the gas
 (d) **units of Pressure and volume.**
- 10) The value of the gas constant R is
 (a) $0.082 \text{ dm}^3 \text{ atm. mol}^{-1} \text{ K}^{-1}$ (b) $0.987 \text{ cal mol}^{-1} \text{ K}^{-1}$ (c) **$8.3 \text{ J mol}^{-1} \text{ K}^{-1}$** (d) $8 \text{ erg mol}^{-1} \text{ K}^{-1}$
- 11) Use of hot air balloon in sports at meteorological observation is an application of
 (a) **Boyle's law** (b) Newton's law (c) Kelvin's law (d) Brown's law
- 12) The table indicates the value of van der Waals constant 'a' in $(\text{dm}^3)^2 \text{ atm. mol}^{-2}$.
- | Gas | O ₂ | N ₂ | NH ₃ | CH ₄ |
|-----|----------------|----------------|-----------------|-----------------|
| a | 1.360 | 1.390 | 4.170 | 2.253 |
- The gas which can be most easily liquefied is
 (a) O₂ (b) N₂ (c) **NH₃** (d) CH₄
- 13) Consider the following statements
 i) Atmospheric pressure is less at the top of a mountain than at sea level
 ii) Gases are much more compressible than solids or liquids
 iii) When the atmospheric pressure increases the height of the mercury column rises.
 Select the correct statement
 (a) I and II (b) II and III (c) I and III (d) **I, II and III**
- 14) Compressibility factor for CO₂ at 400 K and 71.0 bar is 0.8697. The molar volume of CO₂ under these conditions is
 (a) 22.04 dm³ (b) 2.24 dm³ (c) **0.41 dm³** (d) 19.5 dm³
- 15) If temperature and volume of an ideal gas is increased to twice its values, the initial pressure P becomes
 (a) 4P (b) 2P (c) **P** (d) 3P
- 16) At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n?
 (a) **8** (b) 4 (c) 3 (d) 1
- 17) Equal moles of hydrogen and oxygen gases are placed in a container, with a pin-hole through which both can escape what fraction of oxygen escapes in the time required for one-half of the hydrogen to escape.
 (a) - (b) - (c) - (d) -
- 18) The variation of volume V, with temperature T, keeping pressure constant is called the coefficient of thermal expansion i.e. $\alpha = \frac{1}{V} \left(\frac{\partial V}{\partial T} \right)_P$. For an ideal gas α is equal to

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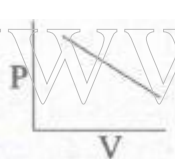
(a) T (b) 1/T (c) P (d) none of these

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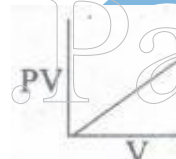
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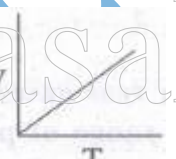
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- 19) Four gases P, Q, R and S have almost same values of 'b' but their 'a' values (a, b are Vander Waals Constants) are in the order $Q < R < S < P$. At a particular temperature, among the four gases the most easily liquefiable one is
 (a) **P** (b) Q (c) R (d) S
- 20) Maximum deviation from ideal gas is expected from
 (a) $\text{CH}_4(\text{g})$ (b) **$\text{NH}_3(\text{g})$** (c) $\text{H}_2(\text{g})$ (d) $\text{N}_2(\text{g})$
- 21) The units of Vander Waals constants 'b' and 'a' respectively
 (a) mol L^{-1} and $\text{L atm}^2 \text{mol}^{-1}$ (b) mol L and L atm mol^2 (c) **mol^{-1}L and $\text{L}^2 \text{atm mol}^{-2}$**
 (d) none of these
- 22) Assertion: Critical temperature of CO_2 is 304K, it can be liquefied above 304K.
 Reason : For a given mass of gas, volume is to directly proportional to pressure at constant temperature
 (a) both assertion and reason are true and reason is the correct explanation of assertion
 (b) both assertion and reason are true but reason is not the correct explanation of assertion
 (c) assertion is true but reason is false (d) **both assertion and reason are false**
- 23) What is the density of N_2 gas at 227°C and 5.00 atm pressure? ($R=0.082 \text{ L atm K}^{-1} \text{mol}^{-1}$)
 (a) 1.40 g/L (b) 2.81 g/L (c) **3.41 g/L** (d) 0.29 g/L
- 24) Which of the following diagrams correctly describes the behaviour of a fixed mass of an ideal gas? (T is measured in K)
- 

(a)



(b)



(c)

(d) All of these
- 25) 25g of each of the following gases are taken at 27°C and 600 mm Hg pressure. Which of these will have the least volume?
 (a) HBr (b) HCl (c) HF (d) **HI**
- 26) Use of hot air balloon in sports at meteorological observation is an application of
 (a) Boyle's law (b) Newton's law (c) Kelvin's law (d) **Charles law**
- 27) Value of gas constant R is
 (a) $0.082 \text{ dm}^3 \text{atm}$ (b) $0.987 \text{ cal mol}^{-1} \text{K}^{-1}$ (c) **$8.3 \text{ J mol}^{-1} \text{K}^{-1}$** (d) $8 \text{ er mol}^{-1} \text{K}^{-1}$
- 28) Consider the following statements
 1. Gases are the most compressible state of matter.
 2. Gases take the shape of the container.
 3. The density of gases is higher than that of liquids
 Which of the following statement(s) given above is/ are correct?
 (a) 1 & 3 (b) only 1 (c) 2 & 3 (d) **1 & 2**
- 29) Pressure is _____
 (a) **Force/ area** (b) force x Area (c) Area/ force (d) Force / area \times volume

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30) Match the list I with List II and select the correct answer using the code given below the lists.

List-I	List-II
A. Pressure	1. Inert
B. Xe	2. Charles law
C. PV=Constant	3. Pascal
D. Hot air balloon	4. Boyle's law

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
1324	4312	3142	2143

31) The unit of pressure is _____

(a) Pascal (b) Torr (c) Bar (d) **all the above**

32) The instrument used for measuring atmospheric pressure is _____

(a) Beckmann thermometer (b) Galvanometer (c) **Barometer** (d) all the above

33) The standard atmospheric pressure is the pressure that supports a column of mercury exactly _____ high at 0° C at sea level.

(a) 760mm (b) 76 cm (c) **both a & b** (d) 760 cm

34) If the volume of a fixed mass of a gas is reduced to half at constant temperature, the gas pressure _____

(a) remains constant (b) **doubles** (c) reduces to half (d) becomes zero

35) Density of a gas is _____

(a) **directly proportional to pressure** (b) indirectly proportional to pressure
(c) directly proportional to volume (d) both band c

36) The hydrogen balloon was invented by _____

(a) Robert Boyle (b) **J.A.C. Charles** (c) Maxwell (d) Gay Lussac37) $V/T = \text{constant}$ is _____ law.(a) Gay Lussac (b) Boyle's (c) Dalton's (d) **Charles**

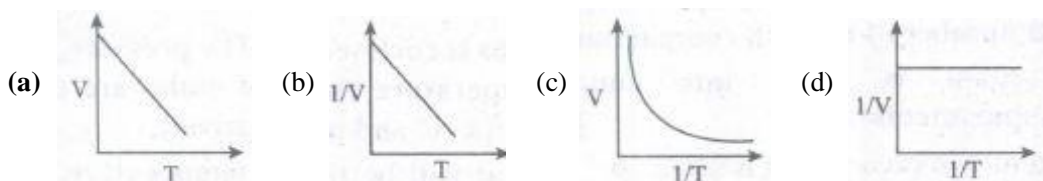
38) 273K is equal to _____ degree centigrade.

(a) **0** (b) 100 (c) 373 (d) 1

39) The absolute zero is _____

(a) -273°C (b) 273°C (c) OK (d) **both a and c**40) The mathematical expression $V \propto n$ relates to _____(a) Boyle's law (b) Charles law (c) **Avogadro's hypothesis** (d) Gay Lussac's law

41) Which curve shows Charles's law?



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- 42) The law that relates the pressure and volume of gases is
 (a) **Boyle's** (b) Charles (c) Dalton (d) none of the above
- 43) The partial pressure of dry gas is
 (a) greater than that of wet gas (b) **lesser than that of wet gas** (c) equal to that of wet gas
 (d) none of these
- 44) The parameters that describe the gaseous state are _____
 (a) volume (b) pressure (c) temperature (d) **all of these**
- 45) Absolute zero is,
 (a) -273°C (b) 0 K (c) temperature at which no substance exists in gaseous state
 (d) **all of these**
- 46) Passenger aeroplane cabins is artificially pressurised since
 (a) **pressure decreases with the increase in altitude**
 (b) pressure increases with the increase in altitude
 (c) temperature increases with the increase in altitude (d) none of the above
- 47) Match the list - I with List - II and select the correct answer using the code given below the lists.

List-I	List-II
A. $\frac{1}{r} = \sqrt{\frac{M}{r}}$	1. Boyle's law
B. $PV = \text{constant}$	2. Graham's law
C. $\frac{1}{r} = \text{constant}$	3. Ideal gas
D. $PV = nRt$	4. Charle's law

(a) (b) (c) (d)

ABCD	ABCD	ABCD	ABCD
1234	4321	2143	1342

- 48) The rate of diffusion of gas is _____ to square root of their molecular mass.
 (a) **inversely proportional** (b) directly proportional (c) equal (d) twice
- 49) Partial pressure is given as _____
 (a) _____ (b) **mole fraction \times total pressure** _____
 _____ (c) (d)
- 50) Temperature at which gas behave ideally over a wide range of pressure is called as
 (a) Inversion temperature (b) **Boyle's temperature** (c) Critical temperature (d) None of these
- 51) Identify the correct mathematical expression of Graham's law of diffusion.
 (a) $\frac{1}{r} = \sqrt{\frac{M}{r}}$ (b) $r \propto \sqrt{\frac{M}{r}}$ (c) $\frac{1}{r} = \sqrt{\frac{M}{r}}$ (d) $\frac{1}{r} = \left[\frac{M}{r} \right]$
- 52) Pick the equation that gives you the relationship between molecular mass and density.
 (a) $M = \frac{d}{P}$ (b) $PV = nRT$ (c) both (a) & (b) (d) neither (a) nor (b)
- 53) A gas such as carbon monoxide would be most likely to obey the ideal gas law at
 (a) High temperature and high pressure (b) **High temperature and low pressure**
 (c) Low temperature and high pressure (d) Low temperature and high pressure

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- 54) If a gas expands at constant temperature, it indicates that
 (a) no. of molecules of gas increases (b) kinetic energy of molecules decreases.
 (c) pressure of the gas increases. (d) **kinetic energy of molecules remains the same.**
- 55) The rice is cooked earlier in pressure cooker because
 (a) **boiling point increases with increasing pressure**
 (b) boiling point decreases with increasing pressure
 (c) Internal energy is not lost while cooking in pressure cooker
 (d) Extra pressure of pressure cooker so ens the rice
- 56) Compression factor Z is given by _____
 (a) **PV/nRT** (b) P/nRT (c) PV/R (d) PV/T
- 57) What is the dominant intermolecular force or bond that must be overcome in converting liquid methanol to a gas?
 (a) London dispersion force (b) **Hydrogen bonding** (c) Dipole-dipole interaction
 (d) Covalent bonds

- 58) The table indicates the value of vander Waal's constant 'a' in $(\text{dm}^3)^2 \text{ atm. mol}^2$.

Gas	O ₂	N ₂	NH ₃	CH ₄
a	1.360	1.390	4.170	2.253

The gas which can most easily liquefield is

- (a) O₂ (b) N₂ (c) **NH₃** (d) CH₄
- 59) Consider the following statements
 I. Atmospheric pressure is less at top of a mountain than at sea level.
 II. Gases are much more compressible than solids or liquids
 III. Gaseous state is described by four measurable properties P,V,T and n Select the correct statement
 (a) I and II (b) II and III (c) I and III (d) **I, II and III**
- 60) Compressibility factor for CO₂ at 400 K and 71.0 bar is 0.8697 the molar volume of CO₂ under these conditions
 (a) 22.04dm³ (b) 2.24dm³ (c) **0.41 dm³** (d) 19.5 dm³
- 61) When the gas behaves ideally, the compression factor Z is
 (a) > 1 (b) < 1 (c) = 0 (d) **= 1**
- 62) Gases deviate from ideal behavior at high pressure which of the following is correct for non-ideality?
 (a) At high pressure the collision between the gas molecule become enormous
 (b) At high pressure the gas molecules move only in one direction
 (c) At high pressure, the volume of gas become in significant
 (d) **At high pressure the intermolecular interactions become significant**

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- 63) Rate of diffusion of a gas is
 (a) Directly proportional to its density (b) Directly proportional to its molecular weight
 (c) Directly proportional to its square root of its molecular weight
(d) Inversely proportional to the square root of its molecular weight
- 64) Which of the following is the correct expression for the equation of state of Vander Waal's gas?
 (a) $(P + \frac{a}{V^2})(V - nb) = nRT$ (b) $(P + \frac{a}{V})(V - nb) = nRT$
 (c) $(P + \frac{a}{V})(V - nb) = nRT$ (d) $(P + \frac{a}{V^2})(V - nb) = nRT$
- 65) When an ideal gas undergoes unrestrained expansion no cooling occurs because the molecules
 (a) Are above inversion temperature (b) **Exert no attractive forces on each other**
 (c) Do work equal to the loss in kinetic energy (d) Collide without loss of energy
- 66) Equal weights of methane and oxygen are mixed in an empty container at 298 K. the fraction of total pressure exerted by oxygen is
 (a) **1/3** (b) 1/2 (c) 2/3 (d) $\frac{1}{3} \times 273 \times 298$
- 67) _____ is the gas constant.
 (a) a (b) V_c (c) **R** (d) T_c
- 68) In a closed room of 1000 m³ a perfume bottle is opened up. The room develops smell. This is due to which property of gases
 (a) Viscosity (b) Density (c) **Diffusion** (d) None
- 69) Which mixture of gases at room temperature does not obey Dalton's law of partial pressure?
 (a) NO₂ and O₂ (b) SO₂ and SO₃ (c) CO and CO₂ (d) **NH₃ and HCl**
- 70) A bottle of ammonia and a bottle of HCl connected through a long tube are opened simultaneously at both ends the white ammonium chloride ring first formed will be
 (a) At the center of the tube (b) **Near the hydrogen chloride bottle** (c) Near the ammonia bottle
 (d) Throughout the length of the tube
- 71) Vanderwaal's constant 'a' has the dimensions of
 (a) mol lit⁻¹ (b) **atm litre² mol⁻²** (c) lit mol⁻¹ (d) atm litre mol⁻²
- 72) Pick out the correct relation for 1 mole of real gas.
 (a) $(P + \frac{a}{V})(V - b) = RT$ (b) $P = \frac{RT}{V} + \frac{a}{V^2}$ (c) $(P + \frac{a}{V})(V - b) = RT$
 (d) $(P - \frac{a}{V})(V + b) = RT$
- 73) The compressibility factor is given by
 (a) $Z = PV/nRT$ (b) $Z = nRT/PV$ (c) $Z = \frac{PV}{nRT}$ (d) $Z = \frac{nRT}{PV}$
- 74) Which of the following gas(es) always show positive deviation from ideal behaviour?
 (a) CH₄ (b) CO (c) NH₃ (d) **H₂**
- 75) What is the correct increasing order of liquefiability of the gas?
 (a) H₂ < CO₂ < CH₄ < N₂ (c) CO₂ < CH₄ < H₂ < N₂
(b) H₂ < N₂ < CH₄ < CO₂ (d) CO₂ < CH₄ < N₂ < H₂

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- 76) Vanderwaal's constant a and b are related with _____ respectively
- (a) **attractive force and volume of molecules.** (b) repulsive force and volume of molecules
(c) attractive force and bond energy of molecules. (d) shape and repulsive force of molecules
- 77) An ideal gas, obeying kinetic theory of gases cannot be liquefied, because
- (a) its critical temperature is above 0°C . (b) **force acting between its molecules are negligible.**
(c) its molecules are relatively small in size. (d) it solidifies before becoming a liquid
- 78) The measure of attractive forces of molecules is called _____
- (a) internal pressure (b) cohesion pressure (c) **both (a) and (b)** (d) neither (a) nor (b)
- 79) Statement I: H_2 when allowed to expand at room temperature it causes heating effect.
Statement II: H_2 has inversion temperature much below room temperature.
- (a) **Both statement I and statement II are true and statement II explains statement I.**
(b) Both statement I and statement II are true but statement II does not explain statement I.
(c) Statement I is true but statement II is false. (d) Both the statements are false
- 80) Statement I: At very high pressures, compressibility factor is greater than 1.
Statement II: At very high pressure, 'b' can be neglected in vanderwaal's gas equation.
- (a) Both statement I and statement II are true and statement II explains statement I.
(b) Both statement I and statement II are true but statement II does not explain statement I
(c) **Statement I is true but statement II is false.** (d) Both the statements are false.
- 81) The inversion temperature for a gas is given by _____
- (a) — (b) — (c) — (d) —
- 82) The liquefaction behaviour of temporary gases like CO_2 approaches that of N_2 , O_2 (permanent gases) as we go,
- (a) below critical temperature (b) **above critical temperature** (c) below absolute zero
(d) above absolute zero
- 83) Statement I: Greater is the critical temperature, more difficult is to liquefy the gas.
Statement II: Stronger the intermolecular forces, lower would be the critical temperature of that gas.
- (a) Both statement I and statement II are true and statement II explains statement I.
(b) Both statement I and statement II are true but statement II does not explain statement I.
(c) Statement I is true but statement II is false. (d) **Both the statements are false**

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84) Match the list I with list II and select the correct answer using the code given below.

List-I	List-II
A. Permanent Gas	1. $2a/Rb$
B. Temporary Gas	2. N_2
C. T_i	3. low
D. Joule Thomson Effect	4. NH_3

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
2341	4123	1234	3412

85) The corrected term for pressure in the vanderwaal's equation of state is _____

- (a) $(V-b)$ (b) $P + \text{---}$ (c) $(b-V)$ (d) $\text{---} \times P$

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LESSON-7
THERMODYNAMICS

- 1) The amount of heat exchanged with surrounding at constant temperature pressure is given by the quantity
(a) ΔE (b) ΔH (c) ΔS (d) ΔG
- 2) All the naturally occurring processes proceed spontaneously in a direction which leads to
(a) decrease in entropy (b) increase in enthalpy (c) increase in free energy
(d) **decrease in free energy**
- 3) In an adiabatic process, which of the following is true?
(a) $q = w$ (b) **$q = 0$** (c) $\Delta E = q$ (d) $P\Delta V = 0$
- 4) In a reversible process, the change in entropy of the universe is
(a) > 0 (b) > 0 (c) < 0 (d) **$= 0$**
- 5) In an adiabatic expansion of an ideal gas
(a) **$w = -\Delta U$** (b) $w = \Delta U + \Delta H$ (c) $\Delta U = 0$ (d) $w = 0$
- 6) The intensive property among the quantities below is
(a) mass (b) volume (c) enthalpy (d) **_____**
- 7) An ideal gas expands from the volume of $1 \times 10^{-3} \text{ m}^3$ to $1 \times 10^{-2} \text{ m}^3$ at 300 K against a constant pressure at $1 \times 10^5 \text{ Nm}^{-2}$. The work done is
(a) **- 900 J** (b) 900 kJ (c) 270 kJ (d) -900 kJ
- 8) Heat of combustion is always
(a) positive (b) **negative** (c) zero (d) either positive or negative
- 9) The heat of formation of CO and CO₂ are - 26.4 kcal and - 94 kcal, respectively. Heat of combustion of carbon monoxide will be
(a) + 26.4 kcal (b) **- 67.6 kcal** (c) - 120.6 kcal (d) + 52.8 kcal
- 10) $\text{C}(\text{diamond}) \rightarrow \text{C}(\text{graphite})$, $\Delta H = -ve$, this indicates that
(a) **graphite is more stable than diamond** (b) graphite has more energy than diamond
(c) both are equally stable (d) stability cannot be predicted

- 11) The enthalpies of formation of Al_2O_3 and Cr_2O_3 are -1596 kJ and -1134 kJ , respectively. ΔH for the reaction $2\text{Al} + \text{Cr}_2\text{O}_3 \rightarrow 2\text{Cr} + \text{Al}_2\text{O}_3$ is
 (a) -1365 kJ (b) 2730 kJ (c) -2730 kJ (d) **-462 kJ**
- 12) Which of the following is not a thermodynamic function?
 (a) internal energy (b) enthalpy (c) entropy (d) **frictional energy**
- 13) If one mole of ammonia and one mole of hydrogen chloride are mixed in a closed container to form ammonium chloride gas, then
 (a) $\Delta H > \Delta U$ (b) $\Delta H - \Delta U = 0$ (c) $\Delta H + \Delta U = 0$ (d) **$\Delta H < \Delta U$**
- 14) Change in internal energy, when 4 kJ of work is done on the system and 1 kJ of heat is given out by the system is
 (a) $+1 \text{ kJ}$ (b) -5 kJ (c) **$+3 \text{ kJ}$** (d) -3 kJ
- 15) The work done by the liberated gas when 55.85 g of iron (molar mass 55.85 g mol^{-1}) reacts with hydrochloric acid in an open beaker at 25°C
 (a) **-2.48 kJ** (b) -2.22 kJ (c) $+2.22 \text{ kJ}$ (d) $+2.48 \text{ kJ}$
- 16) The value of ΔH for cooling 2 moles of an ideal monatomic gas from 125°C to 25°C at constant pressure will be [given $C_p = \frac{5}{2}R$]
 (a) $-250R$ (b) **$-500R$** (c) $500R$ (d) $+250R$
- 17) Given that $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) \Delta H^\circ = -a \text{ kJ}$; $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) \Delta H^\circ = -b \text{ kJ}$; Calculate the ΔH° for the reaction $\text{C}(\text{s}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CO}(\text{g})$
 (a) $\frac{a-b}{2}$ (b) $2a-b$ (c) $\frac{a+b}{2}$ (d) $\frac{a-b}{2}$
- 18) When 15.68 litres of a gas mixture of methane and propane are fully combusted at 0°C and 1 atmosphere, 32 litres of oxygen at the same temperature and pressure are consumed. The amount of heat of released from this combustion in KJ is ($\Delta H_c(\text{CH}_4) = -890 \text{ KJ mol}^{-1}$ and $\Delta H_c(\text{C}_3\text{H}_8) = -2220 \text{ KJ mol}^{-1}$)
 (a) -889 KJ mol^{-1} (b) $-1390 \text{ KJ mol}^{-1}$ (c) $-3180 \text{ KJ mol}^{-1}$ (d) **$-635.47 \text{ KJ mol}^{-1}$**
- 19) The bond dissociation energy of methane and ethane are 360 kJ mol^{-1} and 620 kJ mol^{-1} respectively. Then, the bond dissociation energy of C-C bond is
 (a) 170 kJ mol^{-1} (b) 50 kJ mol^{-1} (c) **80 kJ mol^{-1}** (d) 220 kJ mol^{-1}
- 20) The correct thermodynamic conditions for the spontaneous reaction at all temperature is
 (a) **$\Delta H < 0$ and $\Delta S > 0$** (b) $\Delta H < 0$ and $\Delta S < 0$ (c) $\Delta H > 0$ and $\Delta S = 0$ (d) $\Delta H > 0$ and $\Delta S > 0$
- 21) The temperature of the system, decreases in an -----
 (a) Isothermal expansion (b) Isothermal Compression (c) **adiabatic expansion**
 (d) adiabatic compression
- 22) In an isothermal reversible compression of an ideal gas the sign of q , ΔS and w are respectively
 (a) $+, -, -$ (b) $-, +, -$ (c) $+, -, +$ (d) **$-, -, +$**

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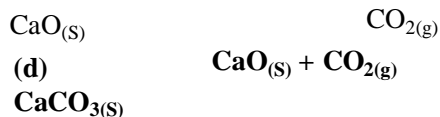
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23) Molar heat of vapourization of a liquid is 4.8 kJ mol^{-1} . If the entropy change is $16 \text{ J mol}^{-1} \text{ K}^{-1}$, the boiling point of the liquid is

- (a) 323 K (b) **27° C** (c) 164 K (d) 0.3 K

24) ΔS is expected to be maximum for the reaction

- (a) $\text{Ca}_{(s)} + 1/2\text{O}_{2(g)} \rightarrow \text{CaO}_{(s)}$ (b) $\text{C}_{(s)} + \text{O}_{2(g)} \rightarrow \text{CO}_{2(g)}$ (c) $\text{N}_{2(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{(g)}$



25) The values of ΔH and ΔS for a reaction are respectively 30 kJ mol^{-1} and $100 \text{ JK}^{-1} \text{ mol}^{-1}$. Then the temperature above which the reaction will become spontaneous is

- (a) **300 K** (b) 30 K (c) 100 K (d) 200 C

26) The branch of science which deals the relation between energy, heat, work and accompanying changes around us is 'called' -----

- (a) **Thermodynamics** (b) Chemical kinetics (c) Calorimetry (d) Potentiometer

27) A fundamental goal of thermodynamics is the prediction of ----- of the process.

- (a) reversibility (b) rate (c) **spontaneity** (d) none of these

28) A portion of matter under consideration, which is separated from rest of universe by real or imaginary boundaries is called-----

- (a) surroundings (b) **system** (c) boundary (d) Universe

29) ----- is an example for closed system.

- (a) Solution of CuSO_4 in a beaker (b) **A gas contained in a cylinder fitted with piston**
(c) Hot water contained in a thermos flask (d) Tea in a cup

30) Match the list I with list II and select the answer using the code given below the list.

List-I	List-II
A.Pressure	1.intensive property
B.Number of moles	2.Path function
C.Density	3.Extensive property
D.Work	4.State function

- (a) (b) (c) (d)

ABCD	ABCD	ABCD	ABCD
1234	4312	4321	3412

31) Which among the following is not an extensive property?

- (a) Volume (b) internal energy (c) Mass (d) **temperature**

32) For an adiabatic process

- (a) $q = 0$ (b) $dP = 0$ (c) $dT = 0$ (d) **$dP = 0$**

33) Which among the following is an intensive property?

- (a) free energy (b) heat capacity (c) volume (d) **molar volume**

34) All naturally occurring processes are ----- process

- (a) reversible (b) **irreversible** (c) cyclic process (d) isochoric process

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- 35) The process in which no heat can flow into or out of the system are called ----- process.
 (a) isothermal (b) isobaric (c) isochoric (d) **adiabatic**
- 36) The process in which temperature of the system remains constant is called ----- process
 (a) isobaric (b) **isothermal** (c) adiabatic (d) isochoric
- 37) For an isothermal process.
 (a) $q = 0$ (b) $dV = 0$ (c) **$dT = 0$** (d) $dP = 0$
- 38) The process in which volume of the system remains constant is called ----- process
 (a) isobaric (b) cyclic (c) isothermal (d) **isochoric**
- 39) Which among the following is not a state function?
 (a) Pressure (b) Volume (c) Temperature (d) **Work**
- 40) Internal energy is denoted by the symbol-----
 (a) H (b) S (c) G (d) **U**
- 41) For an isochoric process, $\Delta U =$ -----
 (a) w (b) $q + w$ (c) **q_v** (d) 0
- 42) Match the list I with list II and select the correct answer using the code given below the list.

List-I	List-II
A. isochoric	1. $dE = 0, dV = 0, dH = 0,$
B. cyclic	2. $dT = 0$
C. adiabatic	3. $dV = 0$
D. isothermal	4. $q = 0$

(a)	(b)	(c)	(d)
ABCD	ABCD	ABCD	ABCD
3142	1342	3124	1234

- 43) Which among the following is a state function?
 (a) Pressure (b) Enthalpy (c) Heat (d) **Both (a) and (b)**
- 44) Which among the following is a path function?
 (a) Enthalpy (b) Free energy (c) Internal energy (d) **Work**
- 45) For a cyclic process the value of ΔU is
 (a) maximum (b) minimum (c) **zero** (d) does not change
- 46) The SI unit of heat is-----
 (a) **Joule** (b) Calorie (c) mole (d) $J \text{ mol}^{-1}$
- 47) If the heat flows out of the system into the surrounding, the q value becomes -----
 (a) +Ve (b) **-Ve** (c) equal to zero (d) maximum
- 48) $1 \text{ KJ} =$ -----J
 (a) **1000** (b) 100 (c) 50 (d) 20
- 49) The gravitational work done by an object is -----
 (a) Q_v (b) f_x (c) PV (d) **mgh**

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- 50) In a compression process, P_{ext} is -----
 (a) ($P_{\text{int}} + dP$) (b) ($P_{\text{int}} - dP$) (c) ($dP - P_{\text{int}}$) (d) ($-P_{\text{int}} + dP$)
- 51) For a cyclic process involving isothermal expansion of an ideal gas.
 (a) $\Delta U = qV$ (b) $\Delta U = w$ (c) $\Delta U = q + w$ (d) $\Delta U = 0$
- 52) The extensive and intensive properties respectively are
 (a) entropy, enthalpy (b) **entropy, temperature** (c) enthalpy, entropy
 (d) temperature, entropy
- 53) Which of the following is a state function?
 (a) q (b) w (c) **$q + w$** (d) All of these
- 54) For the reaction $\text{PCl}_5(\text{g}) \rightarrow 7 \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$
 (a) $\Delta H > \Delta U$ (b) $\Delta H < \Delta U$ (c) $\Delta H = \Delta U$ (d) Un predictable
- 55) Pick out the true statement(s).
 (i) q and w are path functions
 (ii) $q + w$ is a state function
 (a) Only (i) (b) Only (ii) (c) **Both (i) and (ii)** (d) Both are incorrect statements
- 56) Identify the suitable condition(s) which helps the adiabatic process to occur?
 (i) $\Delta T = 0$ (ii) $\Delta P = 0$ (iii) $q = 0$ (iv) $w = 0$
 (a) Only (i) (b) **Only (iii)** (c) (i) and (ii) (d) (i), (ii) and (iv)
- 57) ----- is an intensive property
 (a) internal energy (b) volume (c) **temperature** (d) mass
- 58) First law of thermodynamics does not give any information regarding-----
 (a) spontaneity (b) feasibility (c) **both (a) & (b)** (d) neither (a) nor (b)
- 59) ΔH° of $\text{H}_2\text{O}_{(l)}$ is KJ/mol.
 (a) -74.85 (b) **-242** (c) +242 (d) +74.85
- 60) Heat of combustion of methane is ----- KJ/mol.
 (a) **-87.78** (b) +87.78 (c) -394.55 (d) +394.55
- 61) SI unit of molar heat capacity is-----
 (a) J mol^{-1} (b) KJ mol^{-1} (c) **$\text{JK}^{-1} \text{mol}^{-1}$** (d) JK^{-1}
- 62) Molar heat capacity at constant volume is-----
 (a) (—) (b) (—) (c) (—) (d) (—)
- 63) The relation between C_p and C_v is-----
 (a) $C_p = C_v - R$ (b) $C_p + C_v = R$ (c) **$C_p - C_v = R$** (d) $C_v = C_p - R$
- 64) The branch of science associated with determining the changes in energy of a system by measuring the heat exchanges with the surrounding is called-----
 (a) Mechanics (b) **aerodynamics** (c) Kinetics (d) Thermodynamics

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- 65) Heat absorbed at constant volume is measured in ----- calorimeter.
 (a) Co ee cup (b) Di erential scanning (c) **Bomb** (d) Adiabatic
- 66) For an exothermic reaction, ΔH_r value will be-----
 (a) +Ve (b) **-Ve** (c) Zero (d) infinity
- 67) The heat of neutralisation of strong acid and strong base is -----
 (a) +57.32 KJ (b) +75.32 KJ (c) -75.32 KJ (d) **-57.32 KJ**
- 68) The change in enthalpy when one mole of C_{diamond} to C_{graphite} is called -----
 (a) Molar heat of vaporisation (b) Molar heat of sublimation (c) **Molar heat of transition**
 (d) Molar heat of fusion
- 69) Hess's law can be applied to calculate ----- of reactions.
 (a) **enthalpy** (b) entropy (c) free energy (d) internal energy
- 70) Change in enthalpy is
 (a) **Heat absorbed at constant pressure**
 (b) The total energy change at constant pressure and temperature
 (c) Equal to change in internal energy at constant volume (d) All the above
- 71) The change in enthalpy of $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ is called -----
 (a) Heat of reaction (b) **Heat of neutralization** (c) Heat of formation (d) Heat of liquid
- 72) % e iciency can be calculated using the formula
 (a) ----- (b) ----- $\times 100$ (c) ----- (d) ----- $\times 100$
- 73) If an automobile engine burns petrol at a temperature of 816°C and if surrounding temperature is 21°C , what is its maximum percentage?
 (a) 37% (b) **73%** (c) 83% (d) 33%
- 74) The SI unit of entropy is -----
 (a) JK^{-1} (b) **JK^{-1}** (c) KJ K^{-1} (d) KJ / mole
- 75) Which of the following processes are accompanied by an increase of entropy.
 (i) Dissolution of iodine in solvent
 (ii) HCl added to AgNO_3 solution and precipitate of AgCl is obtained.
 (iii) A partition is removed to allow two gases to mix.
 (a) (i) & (ii) (b) (ii) & (iii) (c) **(i) & (iii)** (d) all the above
- 76) The enthalpies of all elements in their standard states are -----
 (a) 1 (b) **0** (c) <0 (d) di erent for each elements
- 77) A reaction, $\text{A} + \text{B} \rightarrow \text{C} + \text{D} + q$ is found to have a positive entropy change. The reaction will be
 (a) Possible at high temperature (b) Possible only at low temperature
 (c) Not possible at any temperature (d) **Possible at any temperature**
- 78) Thermodynamics does not deal with
 (a) the feasibility of a chemical reaction (b) energy changes involved in chemical reaction
 (c) the extent to which a chemical reaction process (d) **the rate at which a reaction occurs**

79) Which of the following statements is/are correct?

- (i) The presence of reacting species in a covered beaker is an example of open system.
 (ii) There is an exchange of energy as well as matter between system and the surroundings in a closed system.
 (iii) The presence of reactants in a closed vessel is an example of closed system.
 (iv) The presence of reactants in a thermos flask is an example of closed system.
 (a) (ii) & (iii) (b) (ii) alone (c) **(iii) alone** (d) (i), (ii) & (iv)

80) When water freezes in a glass beaker, ΔS of the system _____

- (a) $\Delta S > 0$ (b) **$\Delta S < 0$** (c) $\Delta S = 0$ (d) $\Delta S \geq 0$

81) What is correct about ΔG

- (a) **It is zero for reversible reaction** (b) It is positive for spontaneous reactions
 (c) It is negative for non-spontaneous reaction (d) It is zero for non-spontaneous reaction

82) In an exothermic reaction, heat is evolved and system loses heat to the surroundings. For such system

- (i) q_p will be negative
 (ii) $\Delta_r H$ will be positive
 (iii) q_p will be positive
 (iv) $\Delta_r H$ will be negative
 (a) (i), (ii) (b) (iii), (iv) (c) **(i) & (iv)** (d) (ii) & (iii)

83) In an endothermic reaction, the value of ΔH is always

- (a) =0 (b) **>0** (c) <0 (d) constant

84) Match the list I with list II and select the correct answer using the code given below the list.

List-I	List-II
A $\Delta S < 0$	1 $I_2(s) \rightarrow I_2(g)$
B $\Delta G < 0$	2 $\text{Ice} \rightleftharpoons \text{Water}$
C $\Delta G = 0$	3 $2O_3(g) \rightarrow 3O_2(g)$
D $\Delta S > 0$	4 $H_2O \rightarrow H_2O$

- (a) (b) (c) (d)

ABCD	ABCD	ABCD	ABCD
1234	3412	1243	4321

85) Which is true about cyclic process?

- (a) **$\Delta U = 0; \Delta H = 0$** (b) $\Delta U > 0; \Delta H < 0$ (c) $\Delta H = 0; \Delta U < 0$ (d) $\Delta U = 0; \Delta H < 0$

86) For a given reaction ΔG obtained was having positive sign convention. State whether the reaction was spontaneous or non-spontaneous.

- (a) spontaneous (b) **non-spontaneous** (c) reversible (d) equilibrium

87) The standard free energy change ΔG^0 is related to k (equilibrium constant) as

- (a) $\Delta G^0 = RT \log k$ (b) $\Delta G^0 = -RT \log k$ (c) **$\Delta G^0 = -2.303 RT \log k$** (d) $\Delta G^0 = 2.303 RT \log k$

- 88) Pick out the suitable condition in which a spontaneous endothermic reaction occurs
 (a) $\Delta G > 0$ (b) $\Delta G < 0$ (c) $\Delta G = 0$ (d) ΔG may be +ve or -ve
- 89) The enthalpy and entropy change for a chemical reactions are -5.3×10^3 cal and 4.7 cal K^{-1} respectively. Predict the nature of the reaction at 298 k.
 (a) Non feasible (b) Reversible (c) Non-spontaneous (d) **Spontaneous**
- 90) ΔG^0 of reversible reaction at its equilibrium is
 (a) Positive (b) Negative (c) **Always zero** (d) Both (a) & (b)
- 91) This quantity is the energy associated with a chemical reaction that can be used to do work is
 (a) entropy (b) enthalpy (c) internal energy (d) **free energy**
- 92) Identify the incorrect statement among the following.
 (a) Entropy $ds = dq_{rev}/T$ (b) **ΔS is maximum for a reversible process**
 (c) Entropy is a measure of randomness (d) Entropy of pure crystal is zero
- 93) Which of the following does not result in an increase in the entropy?
 (a) **crystallisation of sucrose from solution** (b) rusting of iron (c) conversion of ice to water
 (d) Vapourisation of camphor
- 94) The condition for standard free energy is _____
 (a) **298 K, 1 atm** (b) 273 K, 1 atm (c) 298°C , 5 atm (d) 25 K, 1atm
- 95) Solve: $\Delta H = 10 \text{ k cal mol}^{-1}$, $\Delta S = 20 \text{ cal deg}^{-1} \text{ mol}^{-1}$ and $T = 300 \text{ k}$. Then $\Delta G = ?$
 (a) $-18,000 \text{ cal mol}^{-1}$ (b) $18,000 \text{ cal mol}^{-1}$ (c) **$-16,000 \text{ cal mol}^{-1}$** (d) $4000 \text{ cal mol}^{-1}$
- 96) Consider the following statement(s) and identify the true statement(s) with respect to entropy.
 (i) The SI unit of entropy is JK^{-1}
 (ii) When solid \rightarrow liquid, the entropy of a process increases.
 (iii) For a reversible process $\Delta S = 0$.
 (a) Only (i) (b) **Only (iii)** (c) Both (i) and (ii) (d) **(i), (ii) and (iii)**



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