SAMPLE CONTENT

NEET - UG

As per latest syllabus prescribed by NMC

CHEMISTRY TEST SERIES

With Answer Key & Solutions

1700 MCQs

- 22 Topic Tests
- 7 Revision Tests
- 5 Model Test Papers

Target Publications® Pvt. Ltd.

Based on **Latest Paper Pattern** of NEET (UG) prescribed by National Testing Agency (NTA)

NEET (UG)

CHEMISTRY TEST SERIES

With Answers & Solutions

Updated as per latest syllabus prescribed by

NMC on 06^{th} October, 2023

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PREFACE

Target's **'NEET (UG) Chemistry Test Series'** is a complete practice book, extremely handy and a go to tool for the preparation of NEET (UG) examinations.

The core objective of the book is to help students gauge their preparedness to appear for NEET (UG) Examination, as it includes a beautiful assortment of MCQ's in the form of Topic Tests and Revision Tests along with Model Test Papers as per latest paper pattern.

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We are sure that, these question papers would provide ample practice to students in a systematic manner and would boost their confidence to face the challenges posed in examinations.

We welcome your valuable suggestions and feedback towards this book.

We wish the students all the best for their examinations!

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PAPER PATTERN

- **Paper Pattern NEET (UG):**

  The Paper Pattern of NEET (UG) comprises of subjects - Physics, Chemistry and Biology (Botany and Zoology). Each subject will consist of two sections. Section A will consist of 35 Questions and Section B will have 15 questions. Out of these 15 Questions, candidates can choose to attempt any 10 Questions.

  The Paper Pattern for the **NEET (UG)** Examination is as follows:

Sr. No.	Subject(s)	Section(s)	No. of Questions(s)	Mark(s) (Each Question Carries 04 (Four) Marks)	Type of Questions(s)
1.	Physics	Section A	35	140	MCQ (Multiple Choice Questions)
		Section B	*15	40	
2.	Chemistry	Section A	35	140	
		Section B	*15	40	
3.	Botany	Section A	35	140	
		Section B	*15	40	
4.	Zoology	Section A	35	140	
		Section B	*15	40	
		Total Marks		**720**	
***** *Only the first 10 attempted questions from out of 15 will be considered for evaluation.*					

  Important points to note for Section A & B:

  i. Each question carries 04 (four) marks and, for each correct answer candidate will get 04 (four) marks.

  ii. For each incorrect answer, 01(one) mark will be deducted from the total score.

  iii. To answer a question, the candidate has to find, for each question, the correct answer/ best option.

  iv. In case of the challenge of key, if more than one option is found to be correct then all/any one of the multiple correct/best options marked will be given four marks (+4). However, unanswered/unattempted questions will be given no marks.

  v. If a question is found to be incorrect or the Question is dropped then Four marks (+4) will be awarded to all those who have attempted the question. The reason could be due to human error or technical error.

  vi. Candidates are advised to do the calculations with the constants given (if any) in the questions.

- **Mode of Examination:**

  NEET (UG) is a Pen & Paper-based Test, to be answered on the specially designed machine gradable OMR sheet using Ball Point Pen provided at the Centre.

- **Duration of Examination:**

  The duration of the examination would be **three (03) hours and 20 minutes**.

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Some Basic Concepts of Chemistry

Topic Test 01

Time: 1 Hour | Total Marks: 200

1. 0.6 g of carbon was burnt in air to form CO_2. The number of molecules of CO_2 introduced into the air will be _______.
(A) 6.02×10^{22} (B) 3.01×10^{22}
(C) 6.02×10^{23} (D) 3.01×10^{23}

2. The time taken (in hours) to distribute one Avogadro number of wheat grains if 10^{20} grains are distributed each second?
(A) 0.1673 (B) 1.673
(C) 16.73 (D) 167.3

3. The amount of HCl in gastric juice is about 3.0 g per litre. If a person produces 2.5 litre of gastric juice per day then the number of antacid tablets each containing 300 mg of $Al(OH)_3$ needed to neutralize the HCl produced in one day is approximately _______.
(Atomic mass of Al = 27, Cl = 35.5, O = 16, H = 1)
(A) 12 (B) 15 (C) 18 (D) 25

4. In the reaction,
$2Al_{(s)} + 6HCl_{(aq)} \longrightarrow 2Al^{3+}_{(aq)} + 6Cl^{-}_{(aq)} + 3H_{2(g)}$,
_______.
(A) 6 L $HCl_{(aq)}$ is consumed for every 3L $H_{2(g)}$ produced
(B) 33.6 L $H_{2(g)}$ is produced regardless of temperature and pressure for every mole of Al that reacts
(C) 67.2 L $H_{2(g)}$ at STP is produced for every mole of Al that reacts
(D) 11.2 L $H_{2(g)}$ at STP is produced for every mole of $HCl_{(aq)}$ consumed

5. A sample of hydrated barium chloride weighing 61 g was heated until all the water of hydration is removed. The weight of dried sample was found to be 52 g. What is the formula of the hydrated salt? (Atomic mass of Ba = 137, Cl = 35.5)
(A) $BaCl_2.H_2O$ (B) $BaCl_2.2H_2O$
(C) $BaCl_2.3H_2O$ (D) $BaCl_2.4H_2O$

6. Which of the following statements about a compound is INCORRECT?
(A) A molecule of a compound has atoms of different elements.
(B) A compound cannot be separated into its constituent elements by physical methods of separation.
(C) A compound retains the physical properties of its constituent elements.
(D) The ratio of atoms of different elements in a compound is fixed.

7. If 1.5 moles of oxygen combine with Al to form Al_2O_3, the mass of Al used in the reaction is _______ g. [Atomic mass of Al = 27]
(A) 2.7 (B) 54
(C) 27 (D) 108

8. Match **List - I** with **List - II**:

List - I		List - II	
i.	Number of molecules	a.	$\frac{\text{Molarity}}{\text{Valency}}$
ii.	Molecular formula	b.	Valency $\times$ molarity
iii.	Normality	c.	n $\times$ Empirical formula
		d.	n $\times$ Avogadro number (N_A)

Choose the CORRECT answer from the options given below:
(A) i – a, ii – c, iii – d
(B) i – d, ii – c, iii – b
(C) i – b, ii – d, iii – a
(D) i – b, ii – c, iii – a

9. If temperature (X°) of a substance is same when expressed in °F and °C, then the value of X° will be _______.
(A) 180° (B) – 273°
(C) – 40° (D) – 32°

10. An organic compound made up of C, H and N contains 20% nitrogen. What will be its molar mass in gram if it contains only one nitrogen atom per molecule of the compound?
(A) 70 (B) 140 (C) 100 (D) 65

11. The amount of sodium sulphate formed when 1 L of 0.1 M sulphuric acid is allowed to react with 1 L of 0.1 M sodium hydroxide is _______.
(A) 7.10 g (B) 3.55 g
(C) 28.4 g (D) 142 g

12. The volume occupied by 2 g of the gas at STP having vapour density 11.2 is_______.
(A) 2 L (B) 4 L
(C) 11.2 L (D) 22.4 L

13. Excess of carbon dioxide is passed through 50 mL of 0.5 M calcium hydroxide solution. After the completion of the reaction, the solution was evaporated to dryness. The solid calcium carbonate was completely neutralized with 0.1 M hydrochloric acid. What will be the volume of hydrochloric acid required for complete neutralization of $CaCO_3$?
(Atomic mass of Ca = 40)
(A) 200 mL (B) 300 mL
(C) 400 mL (D) 500 mL

14. One mole of any substance contains 6.022×10^{23} atoms/molecules. Number of molecules of H_2SO_4 present in 100 mL of 0.02 M H_2SO_4 solution is _______.
(A) 12.044×10^{20} (B) 6.022×10^{23}
(C) 1×10^{23} (D) 12.044×10^{23}

15. The number of hydrogen atoms present in 8.5 g of NH_3 is _______.
(A) 6.022×10^{23} (B) 5.31×10^{-23}
(C) 9.033×10^{23} (D) 3×10^{23}

16. What volume of hydrogen gas at 273 K and 1 atm pressure will be consumed in obtaining 21.6 g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen?
(A) 67.2 L (B) 44.8 L
(C) 22.4 L (D) 89.6 L

17. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R:**
Assertion A: Law of multiple proportion cannot be applied to Al_2O_3.
Reason R: Law of multiple proportion is only applied on binary compounds.
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.
(B) **A** is true but **R** is false.
(C) A is false but **R** is true.
(D) Both **A** and **R** are true and **R** is the correct explanation of **A**.

18. 25 cm^3 of 0.2 M solution of a metal chloride (MCl_x) react completely with 150 cm^3 of 0.1 M $AgNO_3$ solution to form the precipitate of AgCl. What is the formula of the metal chloride?
(A) MCl (B) MCl_2
(C) MCl_3 (D) MCl_4

19. If isotopic distribution of C–12 and C–14 are 98% and 2% respectively, then what will be the number of C–14 atoms in 12 g of carbon?
(A) 1.032×10^{22} (B) 3.01×10^{22}
(C) 5.88×10^{23} (D) 6.022×10^{23}

20. 84 g of a gas occupies the same volume as 96 g of oxygen under similar conditions of temperature and pressure. The molecular weight of the gas is _______.
(A) 36.5 g (B) 28 g
(C) 14 g (D) 18.2 g

21. Select the CORRECT statements from the following:
I. A molecule of a compound has atoms of different elements.
II. A compound cannot be separated into its constituent elements by physical methods of separation.
III. The ratio of atoms of different elements in a compound is fixed.
IV. A compound retains the physical properties of its constituent elements.
V. Compounds have definite, constant, elemental composition
Choose the CORRECT answer from the options given below:
(A) III, IV and V only
(B) I and V only
(C) I, II, III and V only
(D) I, II and III only

22. Select the CORRECT statements from the following:
I. Molarity of a solution depends on temperature.
II. Molality of a solution depends on temperature.
III. Mole fraction of a solution cannot be more than 1.
Choose the CORRECT answer from the options given below:
(A) I and II only (B) II and III only
(C) I and III only (D) I, II and III

23. How many molecules are present in one gram of dihydrogen?
(A) 6.023×10^{23} (B) 3.011×10^{23}
(C) 2.512×10^{23} (D) 1.512×10^{23}

24. Volume of CO_2 obtained on complete decomposition of 19.73 g of $BaCO_3$ at STP is_______.
(Atomic mass: Ba = 137.3, C = 12, O =16)
(A) 2.24 L (B) 1.12 L
(C) 0.84 L (D) 0.56 L

25. The molecular mass and empirical formula of a compound are 180 g and CH_2O respectively. What will be the molecular formula of the compound?
(A) $C_9H_{18}O_9$ (B) CH_2O
(C) $C_6H_{12}O_6$ (D) $C_2H_4O_2$

26. The number of grams of oxygen in 0.10 mole of $Na_2CO_3.10H_2O$ is_______.
(A) 13 g (B) 20.8 g
(C) 18 g (D) 208 g

27. A compound with molar mass 159 g mol^{-1} contains 39.62% of copper, 40.25% of oxygen and x% of an unknown element Y. If one molecule of the compound contains only one atom of Y, then the chemical symbol and the atomic mass of the element Y are _______ respectively.
(A) Si, 28.0 u (B) S, 32.0 u
(C) Cl, 35.5 u (D) C, 12.0 u

28. If 25 g of XCl_4 contains 0.5 mole of chlorine, then its molecular mass is_______ g mol^{-1}.
(A) 1000 (B) 200
(C) 150 (D) 400

29. The maximum volume of 0.25 M HCl which can be made by using one litre of 0.15 M HCl and one litre of 0.40 M HCl without adding water is ______. [Assume that volumes are additive.]
(A) 2 L (B) 2.2 L
(C) 1.667 L (D) 0.55 L

30. What is the mass of carbon dioxide which contains the same number of molecules as are present in 40 g of oxygen?
(A) 40 g (B) 55 g
(C) 32 g (D) 44 g

31. If an iodized salt contains 1% KI and a person consumes 2 g of the salt everyday, then number of iodide ions going into his body everyday would be _______ . (Atomic mass of K = 39, I = 127)
(A) 3.6×10^{21} (B) 7.2×10^{19}
(C) 7.2×10^{21} (D) 9.5×10^{19}

32. Amount of $NO_{(g)}$ formed in grams by oxidation of 1 mole of $NH_{3(g)}$ by 1 mole of $O_{2(g)}$ is _______.
(A) 30.0 g (B) 54.0 g
(C) 60.0 g (D) 24.0 g

33. A mixture of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w). What is the molar ratio of the H_2 and O_2 gases in the mixture?
(A) 16 : 1 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1

34. Given below are two statements:
Statement I: Dalton assumed that molecules are the smallest particles of a compound.
Statement II: According to Dalton's Atomic theory, atoms are indivisible, due to transformation, it cannot be created or destroyed but Uranium ($_{92}U^{235}$) can be converted into Plutonium ($_{94}Pu^{239}$) through interaction with neutrons
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **Statement I** and **Statement II** are false.
(B) **Statement I** is correct but **Statement II** is false.
(C) **Statement I** is incorrect but **Statement II** is true.
(D) Both **Statement I** and **Statement II** are true.

35. A mixture of NaI and NaCl on reaction with H_2SO_4 gave Na_2SO_4 equal to the weight of original mixture taken. The mass percentage of NaI in the original mixture is _______ . (Atomic weight of Na = 23, I = 127, S = 32, Cl = 35.5, O = 16)
(A) 15.38 (B) 28.38
(C) 62.38 (D) 82.38

36. The number of molecules in 8.96 L of a gas at 0°C and 1 atmospheric pressure is approximately _______.
(A) 6.022×10^{23} (B) 12.04×10^{23}
(C) 18.06×10^{23} (D) 24.09×10^{22}

37. Two samples of a compound of hydrogen and oxygen obtained by two different processes were analysed. One sample contained 0.2 g of hydrogen and 3.2 g of oxygen. The other sample contained 5.88 % hydrogen and 94.12 % oxygen. The experimental data obtained _______.
(A) supports law of conservation of mass
(B) supports law of definite proportions
(C) does not support law of definite proportions
(D) shows that the composition of elements present are different for both the samples

38. A gaseous hydrocarbon upon combustion gives 0.72 g of water and 3.08 g of CO_2. The empirical formula of the hydrocarbon is _______.
(A) C_2H_4 (B) C_7H_4 (C) C_6H_5 (D) C_7H_8

39. Given below are two statements:
Statement I: Empirical formula tells about percentage of various elements in a compound.
Statement II: Molar mass can be determined from empirical formula.
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **Statement I** and **Statement II** are false.
(B) **Statement I** is correct but **Statement II** is false.
(C) **Statement I** is incorrect but **Statement II** is true.
(D) Both **Statement I** and **Statement II** are true.

40. The element whose atom has mass of 10.86×10^{-26} kg is _______.
(A) boron (B) calcium
(C) silver (D) zinc

41. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason R** :
Assertion (A) : The law of definite composition is true for only those compounds which are obtained from one type of isotope.
Reason R : Isotopic composition varies from place to place.
In the light of the above statements, choose the CORRECT answer from the options given below.
(A) Both **A** & **R** are true but **R** is not the correct explanation of A.
(B) **A** is true but **R** is false.
(C) **A** is false but **R** is true.
(D) Both **A** & **R** are true and **R** is the correct explanation of **A**.

42. Match **List - I** with **List - II:**

	List - I		List - II
i.	CO & CO_2	a.	Law of constrant composition.
ii.	NaH, HCl, NaCl	b.	Law of conservation of mass.
iii.	27.27% of Carbon & 72.73% of Oxygen.	c.	Law of multiple proportions.
iv.	12 g of C + 32 g of O $\rightarrow$ 44 g of CO_2	d.	Law of reciprocal proportions.

Choose the CORRECT answer from the options given below :

(A) i – c, ii – d, iii – a, iv - b
(B) i – d, ii – c, iii – b, iv - a
(C) i – a, ii – c, iii – d, iv - b
(D) i – b, ii – a, iii – d, iv - c

43. 81.4 g sample of ethyl alcohol contains 0.002 g of water. The amount of pure ethyl alcohol present in the sample upto the proper number of significant figures is_______.

(A) 81.4 g (B) 71.40 g
(C) 81.398 g (D) 81 g

44. Total number of electrons in 1 mole of CO_2 (in terms of N_A) is _______.

(A) $3N_A$ (B) N_A
(C) $16N_A$ (D) $22N_A$

45. The average molar mass of a mixture of methane and ethene present in the ratio of a:b is found to be 20 g mol^{-1}. What would be the average molar mass of the mixture if ratio were reversed?

(A) 24 g mol^{-1} (B) 26 g mol^{-1}
(C) 28 g mol^{-1} (D) 30 g mol^{-1}

46. Equal masses of H_2, O_2 and CH_4 have been taken in a container of volume (V) at temperature 27 °C in identical conditions. The ratio of the volumes of gases $H_2 : O_2 : CH_4$ would be _______.

(A) 8 : 16 : 1 (B) 16 : 8 : 1
(C) 16 : 1 : 2 (D) 8 : 1 : 2

47. The amount of $NH_{3(g)}$ formed on mixing 20.0 kg of $N_{2(g)}$ and 3.0 kg of $H_{2(g)}$ is _______.

(A) 17 kg (B) 34 kg
(C) 20 kg (D) 23 kg

48. Two oxides of a metal 'M' contain 36.4% and 53.4% of oxygen by mass respectively. If formula of first oxide is M_2O, then what will be the formula of second oxide?

(A) MO (B) M_2O_3
(C) MO_2 (D) M_2O_5

49. If Avogadro number N_A is changed from 6.022×10^{23} mol^{-1} to 6.022×10^{20} mol^{-1}, then this would change _______.

(A) the definition of mass in units of grams
(B) the mass of one mole of carbon
(C) the ratio of chemical species to each other in balanced equation
(D) the ratio of elements to each other in a compound

50. Which of the following contains maximum number of molecules?

(A) 34 g of water (B) 28 g of CO_2
(C) 46 g of CH_3OH (D) 54 g of N_2O_5

Page no. **5** to 17 are purposely left blank.

To see complete chapter buy **Target Notes** or **Target E-Notes**

Based on:
Topics – 01, 02, 03, 04

Revision Test
01

Time: 1 Hour

Total Marks: 200

1. The ionization energy of a single electron species is 217.6 eV. The number of proton in the species is _______.
(A) 3
(B) 4
(C) 5
(D) 16

2. The density of a liquid is 1.2 g/mL. If there are 35 drops in 2 mL of liquid, then the number of molecules in 1 drop of liquid is _______. (Molecular weight of liquid = 70 g mol^{-1})
(A) $\frac{1.2}{35} \times 6.022 \times 10^{23}$
(B) $\left(\frac{1.2}{35}\right)^2 \times 6.022 \times 10^{23}$
(C) $\frac{1.2}{(35)^2} \times 6.022 \times 10^{23}$
(D) $1.2 \times 6.022 \times 10^{23}$

3. The circumference of second Bohr's orbit of hydrogen atom is _______ the circumference of second Bohr's orbit of He^+.
(A) twice
(B) half
(C) thrice
(D) equal to

4. For which of the following element, the value of principal quantum number (n) for the valence shell is 5?
(A) Si (Z = 14)
(B) S (Z = 16)
(C) Cs (Z = 55)
(D) Sr (Z = 38)

5. The average vapour density of a mixture of NO_2 and N_2O_4 is 38.3 at 300 K. The number of moles of NO_2 in 100 g of the mixture is _______.
(A) 0.218
(B) 0.437
(C) 1.736
(D) 0.868

6. If the energy of an electron of hydrogen atom in the second Bohr's orbit is –3.4 eV. What will be the energy of an electron in the fourth Bohr's orbit?
(A) –0.85 eV
(B) –13.6 eV
(C) –6.8 eV
(D) –54.4 eV

7. $C_8H_7SO_3Na$ (Molecular weight = 206 g mol^{-1}) is the commercial resin used for exchanging ions in water softening. The maximum uptake of Ca^{2+} ions by the resin expressed in mole per gram resin is _______.
(A) $\frac{1}{103}$
(B) $\frac{1}{206}$
(C) $\frac{2}{309}$
(D) $\frac{1}{412}$

8. In a hydrogen atom, the energy emitted by an electron when it jumps from n = 2 to n = 1 is _______ the energy emitted when it jumps from n = 3 to n = 2.
(A) 0.18 times
(B) 5.4 times
(C) equal to
(D) twice

9. The radii of the anions (in Å) N^{3-}, O^{2-} and F^- respectively are _______.
(A) 1.36, 1.40 and 1.71
(B) 1.36, 1.71 and 1.40
(C) 1.71, 1.40 and 1.36
(D) 1.71, 1.36 and 1.40

10. In the reaction, $4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(l)}$ when 1 mole of ammonia and 1 mole of O_2 are made to react to completion, then it will lead to _______.
(A) consumption of all the oxygen
(B) formation of 1.0 mole of NO
(C) formation of 1.0 mole of H_2O
(D) consumption of all ammonia

11. If uncertainty in momentum and position are equal, then the uncertainty in velocity will be greater than or equal to _______.
(A) $\frac{1}{2}\sqrt{\frac{h}{\pi}}$
(B) $\frac{1}{2}\sqrt{\frac{h}{m\pi}}$
(C) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$
(D) $\sqrt{\frac{h}{\pi}}$

12. The empirical formula of an organic compound containing only carbon and hydrogen is CH_2. Under identical conditions of temperature and pressure, the mass of one litre of this organic gas is exactly equal to that of one litre of N_2. Therefore, the molecular formula of the organic gas will be _______.
(A) C_2H_4
(B) C_3H_6
(C) C_6H_{12}
(D) C_4H_8

13. Which of the following particles will have the longest wavelength if the velocity of all the given particles is equal?
(A) Electron
(B) Proton
(C) Neutron
(D) Alpha particle

14. An unknown chlorohydrocarbon contains 3.55% of chlorine. If each molecule of the hydrocarbon contains only one chlorine atom, then the number of chlorine atoms present in 1 g of chlorohydrocarbon are _______.
(Atomic weight of Cl = 35.5 g)
(A) 6.022×10^9
(B) 6.022×10^{20}
(C) 6.022×10^{21}
(D) 6.022×10^{23}

15. Which among the following elements have lowest value of first ionization enthalpy (IE_1)?
(A) Pb (B) Sn
(C) Si (D) C

16. A 5.82 g silver coin is dissolved in nitric acid. When sodium chloride is added to the solution, all the silver is precipitated as AgCl. The AgCl precipitate weighs 7.20 g. The mass percentage of silver in the coin is _______.
(A) 60.3% (B) 80.4%
(C) 93.1% (D) 70%

17. The INCORRECT statement is _______.
(A) Each element has a unique line emission spectrum.
(B) The Paschen series of lines in the hydrogen spectrum appear in the visible region of the electromagnetic spectrum.
(C) Bohr's theory could not explain the splitting of spectral lines in the presence of magnetic or electric field.
(D) The emission spectra of atoms in the gas phase show bright lines of specific wavelengths with dark spaces between them.

18. 25 cm^3 of oxalic acid completely neutralises 0.064 g of sodium hydroxide. Molarity of oxalic acid solution is _______.
(A) 0.064 M (B) 0.045 M
(C) 0.015 M (D) 0.032 M

19. In which of the following sets, the first element has higher value of electronegativity than the second element?

Set	First element	Second element
I	Potassium	Lithium
II	Lithium	Boron
III	Oxygen	Carbon
IV	Sulphur	Silicon

(A) I and II (B) I and III
(C) III and IV (D) I, II and IV

20. Which of the following gases will occupy least volume if 20 g of each gas is taken at same temperature and pressure?
(A) CO_2 (B) N_2
(C) CH_4 (D) HCl

21. 30 mL of a gaseous hydrocarbon requires 90 mL of oxygen for complete combustion at STP. In the process, 60 mL of CO_2 is formed. The molecular formula of the hydrocarbon is _______.
(A) CH_4 (B) C_2H_2
(C) C_2H_4 (D) C_2H_6

22. The four sets of quantum number for an electron in the outermost shell of sodium is given as _______.
(A) $n = 4, l = 0, m = 0, s = \pm\frac{1}{2}$
(B) $n = 3, l = 1, m = +1, s = \pm\frac{1}{2}$
(C) $n = 4, l = 0, m = +1, s = \pm\frac{1}{2}$
(D) $n = 3, l = 0, m = 0, s = \pm\frac{1}{2}$

23. Dot mark (.) made by lead pencil on the paper is 10^{-18} g. The number of atoms of the element (by which pencil is made) present in one dot mark is _______.
(A) 2.92×10^7 (B) 5.02×10^4
(C) 6.02×10^6 (D) 6.02×10^{23}

24. Which of the following is the ion with the smallest ionic radius?
(A) K^+ (B) Ca^{2+}
(C) Ti^{3+} (D) Ti^{4+}

25. The density of 29.2 % (W/W) HCl stock solution is 1.25 g mL^{-1}. The volume (mL) of stock solution required to prepare a 200 mL solution of 0.4 M HCl is _______.
(The molecular weight of HCl = 36.5 g mol^{-1})
(A) 5 mL (B) 8 mL
(C) 10 mL (D) 15 mL

26. Select the CORRECT statements from the following:
I. Be_2 does not exist.
II. O_2, O_2^-, O_2^+ are all paramagnetic
III. N_2^+ is diamagnetic
IV. Bond strength of N_2 is maximum amongst the homonuclear diatomic molecules belonging to the second period.

Choose the CORRECT answer from the options given below:
(A) III and IV only
(B) II and IV only
(C) I, II, and III only
(D) I, II and IV only

27. The ionization energy of gaseous sodium is 495.80 kJ mol^{-1}. The minimum frequency which can ionize sodium is _______.
$Na_{(g)} \longrightarrow Na^+_{(g)} + e^-$
(A) 7.48×10^{-30} Hz
(B) 1.24×10^{15} Hz
(C) 1.24×10^{18} Hz
(D) 8.23×10^{-19} Hz

28. Match **List - I** with **List - II**:

List - I		List - II	
i.	B_2	a.	Diamagnetic
ii.	SO_2	b.	Angular/Bent
iii.	No resonance	c.	N_2H_4
iv.	C_2	d.	Paramagnetic

Choose the CORRECT answer from the options given below:
(A) i – b, ii – d, iii – a, iv - c
(B) i – d, ii – b, iii – c, iv - a
(C) i – a, ii – c, iii – d, iv - b
(D) i – b, ii – a, iii – d, iv - c

29. In Bohr's model of hydrogen atom, if the radius of first orbit is X, then the wavelength of an electron in the second orbit will be _______.
(A) $2\pi X$ (B) $4\pi X$
(C) $6\pi X$ (D) $9\pi X$

30. Match **List - I** with **List - II**:

Molecule		Bond order	
i.	F_2 and O_2^{2-}	a.	3
ii.	N_2, CO and NO^+	b.	2
iii.	O_2	c.	1
		d.	2.5

Choose the CORRECT answer from the options given below:
(A) i – b, ii – d, iii – a
(B) i – c, ii – a, iii – b
(C) i – a, ii – c, iii – d
(D) i – b, ii – a, iii – d

31. The atomic number of an element is 31. Which of the following statements is INCORRECT with respect to this element?
(A) It has one electron in its 4p orbital.
(B) It is a metal.
(C) It is a d-block element.
(D) It belongs to period 4.

32. Suppose elements X and Y combine to form two compounds, XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are respectively _______.
(A) 30, 20 (B) 40, 30
(C) 60, 40 (D) 20, 30

33. For which of the following orbitals the number of spherical nodes is NOT equal to zero?
(A) 4f (B) 3d
(C) 3s (D) 2p

34. Consider proton and electron, both moving with equal velocity. The wavelength ratio of proton to electron is _______.
(A) 1 : 2 (B) 2 : 1
(C) 1836 : 1 (D) 1 : 1836

35. The ground state electronic configuration and the atomic number of an element placed in group 10 and period 4 of modern periodic table are ______ respectively.
(A) $[Ar]\ 4s^2\ 3d^8$; 28
(B) $[Ar]\ 4s^2\ 3d^7$; 27
(C) $[Ar]\ 4s^1\ 3d^{10}$; 29
(D) $[Ar]\ 4s^2\ 3d^{10}$; 30

36. The amount of arsenic pentasulphide (As_2S_5) that can be obtained when 35.5 g of arsenic acid (H_3AsO_4) is treated with excess H_2S in the presence of conc. HCl (assuming 100% conversion) is _______ .
(Atomic mass of As = 75, S = 32, O = 16)
(A) 0.25 mol (B) 0.50 mol
(C) 0.125 mol (D) 0.333 mol

37. Which of the following is the CORRECT set of quantum numbers for the electron occupying the highest energy orbital in Ar atom in first excited state?
(A) $n = 4, l = 1, m = 1, s = \pm\frac{1}{2}$
(B) $n = 3, l = 1, m = 1, s = \pm\frac{1}{2}$
(C) $n = 4, l = 0, m = 0, s = \pm\frac{1}{2}$
(D) $n = 3, l = 2, m = 2, s = \pm\frac{1}{2}$

38. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:
Assertion A: Dipole moment of NF_3 is less than that of NH_3.
Reason R: In NH_3, the orbital dipole due to the lone pair is in the same direction as the resultant dipole moment of N–H bonds, whereas in NF_3 the orbital dipole is in the direction opposite to the resultant dipole moment of three N–F bonds.
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.
(B) **A** is true but **R** is false.
(C) **A** is false but **R** is true.
(D) Both **A** and **R** are true and **R** is the correct explanation of **A**.

39. Select the CORRECT option.
(A) Ionic radius of Na^+ > Atomic radius of Na
(B) Atomic radius of Mg > Ionic radius of Mg^{2+}
(C) Atomic radius of F > Ionic radius of F^-
(D) Ionic radius of Al^{3+} > Atomic radius of Al

40. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**:
Assertion: In PCl_5 molecule, axial bonds have been found to be slightly longer than the equatorial bonds.
Reason: Axial bond pairs suffer more repulsive interaction from the equatorial bond pairs.
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **A** and **R** are true but **R** is **NOT** the correct explanation of **A**.
(B) **A** is true but **R** is false.
(C) **A** is false but **R** is true.
(D) Both **A** and **R** are true and **R** is the correct explanation of **A**.

41. Select the CORRECT statements from the following:
I. Orbitals having almost equal energy undergoes hybridization.
II. Only half filled orbitals can participate in hybridization.
III. Hybridized orbitals possess lower energy and lower stability.
IV. Hybrid orbitals form σ bonds.
V. Unhybridized orbitals form π bonds.
Choose the CORRECT answer from the options given below:
(A) IV and V only
(B) III and IV only
(C) I, II, and III only
(D) I, IV and V only

42. If 10^{21} molecules are removed from 200 mg of CO_2, then the number of moles of CO_2 left are _______.
(A) 2.89×10^{-3} (B) 28.8×10^{-3}
(C) 0.288×10^{-3} (D) 1.68×10^{-2}

43. The ratio of wavelengths of electron in two Bohr's orbits is 2 : 3. The ratio of their kinetic energy is _______.
(A) 9 : 4 (B) 4 : 9
(C) 2 : 3 (D) 3 : 2

44. Given below are two statements:
Statement I: Greater is the decrease in energy in the formation of a bond, greater is the strength of the bond.
Statement II: Covalent bond is not formed, if the magnitude of repulsive forces is less than the magnitude of attractive forces.
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **Statement I** and **Statement II** are false.
(B) **Statement I** is correct but **Statement II** is false.
(C) **Statement I** is incorrect but **Statement II** is true.
(D) Both **Statement I** and **Statement II** are true.

45. According to Bohr's atomic model for hydrogen, which of the following is TRUE?
(A) Frequency of revolution in orbit $\propto \frac{Z}{n^2}$
(B) Radius of n^{th} orbit $\propto \frac{Z^2}{n}$
(C) Frequency of revolution in orbit $\propto \frac{Z^2}{n^3}$
(D) Radius of n^{th} orbit $\propto \frac{Z^2}{n^2}$

46. Given below are two statements:
Statement I: Molecular geometry of ICl_5 is square pyramidal while that of ICl_4^- is square planar.
Statement II: ICl_5 and ICl_4^- are isostructural
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **Statement I** and **Statement II** are false.
(B) **Statement I** is correct but **Statement II** is false.
(C) **Statement I** is incorrect but **Statement II** is true.
(D) Both **Statement I** and **Statement II** are true.

47. In photoelectric effect for a particular metal, the square of velocity of ejected electron is directly proportional to _______.
(A) intensity of incident beam
(B) frequency of incident beam
(C) wavelength of incident beam
(D) none of these

48. Which of the following metals requires radiation of highest frequency to cause emission of electron?
(A) Na (B) Mg
(C) K (D) Ca

49. The quantum numbers for electrons are given as,
i. n = 4, l = 1 ii. n = 4, l = 0
iii. n = 3, l = 2 iv. n = 3, l = 1
The CORRECT order of increasing energy is _______.
(A) iii < i < iv < ii (B) iv < ii < iii < i
(C) iv < iii < ii < i (D) ii < iv < i < iii

50. Which of the following electronic transitions emits energy in the form of electromagnetic radiation?
(A) n = 3 to n = 4 (B) n = 5 to n = ∞
(C) n = 1 to n = ∞ (D) n = 2 to n = 1

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To see complete chapter buy **Target Notes** or **Target E-Notes**

Model Test Paper - 01

Time: 45 min Total Marks: 180

Note: *In section A, all questions are compulsory.*
*In section B, student needs to attend any **10** questions out of **15** questions.*

Section A

1. 1.0 M aqueous solution of urea is isotonic with _______.
(A) 0.5 M NaCl aqueous solution
(B) 0.5 M sugar aqueous solution
(C) 0.5 M $BaCl_2$ aqueous solution
(D) 1.0 M solution benzoic acid in benzene

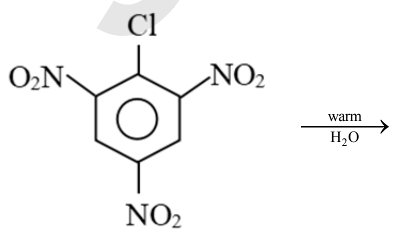
2. Match **List - I** with **List - II**:

	List - I		List - II
i.	n-Butane and 2-Methylpropane	a.	Functional group isomerism
ii.	2-Hydroxypropanal and 3-Hydroxypropanal	b.	Metamerism
iii.	Methyl cyanide and Methyl isocyanide	c.	Chain isomerism
iv.	Dimethylpropylamine and Diethylmethylamine	d.	Position isomerism

Choose the CORRECT answer from the options given below:
(A) i – d, ii – a, iii – b, iv – c
(B) i – c, ii – a, iii – d, iv – b
(C) i – c, ii – d, iii – a, iv – b
(D) i – b, ii – d, iii – a, iv – c

3. The cell constant of 0.02 M NaCl solution at 298 K is 2 cm^{-1} and its resistance is 400 Ω. The equivalent conductance is _______.
(A) $5\times10^{2}\Omega^{-1}cm^{2}eq^{-1}$ (B) $25\times10^{2}\Omega^{-1}cm^{2}eq^{-1}$
(C) $2.5\times10^{2}\Omega^{-1}cm^{2}eq^{-1}$ (D) $8\times10^{4}\Omega^{-1}cm^{2}eq^{-1}$

4. What is product of the following reaction?



(A) Picric acid
(B) p-Nitrophenol
(C) 2,4-Dinitrophenol
(D) 1-Chloro-2-nitrobenzene

5. Order and molecularity are determined_______.
(A) experimentally and theoretically, respectively
(B) theoretically and experimentally, respectively
(C) experimentally only
(D) theoretically only

6. Which of the following statements regarding chemical equilibrium is INCORRECT?
(A) An equilibrium can be shifted by altering the temperature or pressure.
(B) At equilibrium, the concentrations of reactants and products reach constant values.
(C) The same state of equilibrium is reached whether one starts with the reactants or the products.
(D) The forward reaction is favoured by the addition of a catalyst.

7. In a process, 238 J of work is done on the system and 54 J of heat is evolved. The internal energy of the system during the process_______.
(A) increases by 54 J
(B) decreases by 184 J
(C) increases by 184 J
(D) increases by 292 J

8. What is the correct increasing order of energy of the orbitals of hydrogen atom ?
(A) 1s < 2s < 3s< 2p <4p = 4d = 4f
(B) 1s < 2s = 2p < 3s = 3p = 3d < 4s = 4p = 4d = 4f
(C) 1s < 2s < 2p < 3s = 3p = 3d < 4s < 4p < 4d < 4f
(D) 1s < 2s < 2p < 3s < 3p < 3d < 4s <4p < 4d < 4f

9. For the following three reactions (i), (ii) and (iii), equilibrium constants are given as K_1, K_2 and K_3 respectively.
i. $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$; K_1
ii. $CH_{4(g)} + H_2O_{(g)} \rightleftharpoons CO_{(g)} + 3H_{2(g)}$; K_2
iii. $CH_{4(g)} + 2H_2O_{(g)} \rightleftharpoons CO_{2(g)} + 4H_{2(g)}$; K_3
Which of the following relations is CORRECT?
(A) $K_3K_2^3 = K_1^2$ (B) $K_1\sqrt{K_2} = K_3$
(C) $K_2K_3 = K_1$ (D) $K_3 = K_1K_2$

10. The polarising power of the anions, N^{3-}, O^{2-} and F^{-}, follows the order_______.
(A) $N^{3-} > F^{-} > O^{2-}$ (B) $O^{2-} > N^{3-} > F^{-}$
(C) $O^{2-} > F^{-} > N^{3-}$ (D) $N^{3-} > O^{2-} > F^{-}$

11. For a spontaneous reaction, Gibbs free energy change (ΔG) and equilibrium constant (K) will be_______, respectively.
(A) negative, > 1 (B) positive, > 1
(C) positive, < 1 (D) negative, = 1

12. Match **List - I** with **List - II:**

	List - I		List - II
i.	Rate= $K[A]^{\frac{1}{2}}[B]^{\frac{3}{2}}$	a.	Pseudo first order reactions
ii.	Hydrogenation of ethene	b.	Second order reaction
iii.	Hydrolysis of ester	c.	Zero order reaction
iv.	Thermal decomposition of HI on gold surface.	d.	First order reaction

Choose the CORRECT answer from the options given below:
(A) i – d, ii – a, iii – b, iv – c
(B) i – c, ii – a, iii – d, iv – b
(C) i – c, ii – d, iii – a, iv – b
(D) i – b, ii – d, iii – a, iv – c

13. Which of the following statements is (are) INCORRECT for the modern periodic table.
i. Periods are horizontal rows and groups are vertical columns.
ii. Transition elements are placed in periods 4 to 7.
iii. Inner-transition elements are placed in 6 and 7 periods
iv. Elements with atomic numbers from 58 to 71 are called actinides and elements with atomic numbers from 90 to 103 are called lanthanides.
(A) Both iii and iv (B) Both i and ii
(C) Only iii (D) Only iv

14. Which statement is INCORRECT about LCAO?
(A) Atomic orbitals of nearly same energy combine to form molecular orbitals.
(B) Addition of atomic orbitals results in bonding molecular orbitals.
(C) Antibonding molecular orbital has lower energy than combining atomic orbitals.
(D) Each molecular orbital can accommodates maximum number of two electrons.

15. The velocity of an electron in Bohr's orbit is _______.
(A) $\frac{2\pi mr}{nh}$ (B) $\frac{nh}{2\pi mr}$
(C) $\frac{2\pi r}{n}$ (D) $\frac{Ze^2}{r}$

16. Which of the following statements is INCORRECT?
(A) 1 mole is equal to 6.022×10^{23} particles.
(B) The mass of 1 mole element is equal to its atomic mass in grams.
(C) Molar mass is mass of one molecule.
(D) None of these

17. The pressure of ethane over a saturated solution containing 7.85×10^{-2} mol L^{-1} of ethane is 1 atm. If the solution contains 5×10^{-2} mol L^{-1} of ethane, then what will be the partial pressure of the gas?
(A) 0.234 atm (B) 0.387 atm
(C) 0.437 atm (D) 0.637 atm

18. Given below are two statements:
Statement I: Colour produced in phthalein dye test by Resorcinol is violet/blue.
Statement II: Presence of carbonyl group is usually detected by
2,4 dinitrophenylhydrazine (2,4-DNP) test.
In the light of the above statements, choose the CORRECT answer from the options given below:
(A) Both **Statement I** and **Statement II** are false.
(B) **Statement I** is correct but **Statement II** is false.
(C) **Statement I** is incorrect but **Statement II** is true.
(D) Both **Statement I** and **Statement II** are true.

19. The negative inductive effect of the groups $-NH_2$, $-CN$, $-C_6H_5$ and $-NO_2$ follow the order:
(A) $-NH_2 > -CN > -C_6H_5 > -NO_2$
(B) $-NO_2 > -CN > -NH_2 > -C_6H_5$
(C) $-CN > -NH_2 > -C_6H_5 > -NO_2$
(D) $-CN > -NO_2 > -NH_2 > -C_6H_5$

20. The total number of ions present in 1 ml of 0.1M $CaSO_4$ solution is
(A) 6×10^{23} (B) 1.2×10^{19}
(C) 1.2×10^{20} (D) 1.8×10^{20}

21. 0.3 g of an organic compound on complete combustion gave 0.54 g of water and 0.88 g of carbon dioxide. Find the percentages of carbon and hydrogen in the compound.
(A) C = 20 %, H = 80 %
(B) C = 80 %, H = 20 %
(C) C = 75 %, H = 25 %
(D) C = 25 %, H = 75 %

22. Find the CORRECT statement(s) regarding thin layer chromatography.
i. Stationary phase is solid.
ii. Mobile phase is liquid.
iii. It is an example of adsorption chromatography.
iv. It is partition chromatography.
(A) (i), (ii), (iii) (B) (ii), (iii)
(C) (iii) (D) (iv)

23. The CORRECT statement regarding electrophile is _______.

(A) Electrophile is a negatively charged species and can from a bond by accepting a pair of electrons from another electrophile

(B) Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile

(C) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

(D) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile

24. Which of the following reagents react with ethane?

(i) alkaline $KMnO_4$

(ii) Bromine in presence of light

(iii) Nitric acid at 400 °C

(iv) $H_2SO_4 + SO_3$ prolonged heating

(A) (i) (ii) (B) (ii) (iii)

(C) (iii) (iv) (D) (i) (iv)

25. Sulphonation of compound A followed by fusion with NaOH gives mixture of o-cresol and p-cresol. Compound A is _______.

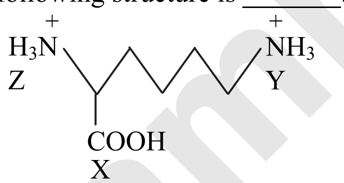
(A) benzene

(B) toluene

(C) phenol

(D) benzene sulphonic acid

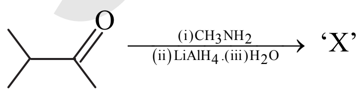
26. The CORRECT decreasing order of acid strength of functional groups 'X' 'Y' and 'Z' in the following structure is _______.

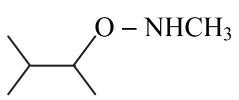


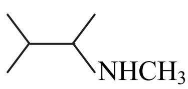
(A) X > Z > Y (B) Z > X > Y

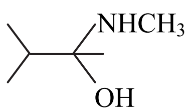
(C) X > Y > Z (D) Y > X > Z

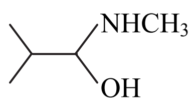
27. The 'X' in the following reaction sequence is _______.



(A) 

(B) 

(C) 

(D) 

28. Identify product 'X' in the following.

Cyclohexene $\xrightarrow[\Delta]{KMnO_4/\text{dil. } H_2SO_4}$ X

(A) Salicylic acid (B) Adipic acid

(C) Glutaric acid (D) Succinic acid

29. For the given complex $[CoCl_2(en)(NH_3)_2]^+$, the total number of isomers of all possible types is _______.

(A) 4 (B) 3 (C) 2 (D) 6

30. Which is the correct order of basicity of aliphatic amines in gas phase?

(A) 3° amines > 2° amines > 1° amines > ammonia

(B) 3° amines > 2°amines > ammonia > 1° amines

(C) 2° amines >3°amines > 1° amines > ammonia

(D) 2° amines > 1° amines >ammonia > 3° amines

31. An excess of $AgNO_3$ was added to 100 mL of 0.01M solution of dichlorotetraaquachromium(III) chloride. The number of moles of AgCl precipitated would be _______.

(A) 0.001 mol (B) 0.002 mol

(C) 0.003 mol (D) 0.01 mol

32. The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω. What is the cell constant if conductivity of 0.001 M KCl solution at 298 K is 0.146×10^{-3} S cm^{-1}?

(A) 0.219 cm^{-1} (B) 2.19 cm^{-1}

(C) 1.46 cm^{-1} (D) 3.24 cm^{-1}

33. Arrange the following compounds in increasing order of their reactivity towards nucleophilic addition reactions.

Ethanal,	Propanal,	Propanone,	Butanone
(I)	(II)	(III)	(IV)

(A) III < II < I < IV (B) II < I < III < IV

(C) IV < III < II < I (D) I < II < III < IV

34. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R:**

Assertion A: Noble elements have large positive values of electron gain enthalpy.

Reason R: Stable electronic configuration of ns^2np^6

In the light of the above statements, choose the CORRECT answer from the options given below:

(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) **A** is false but **R** is true.

35. The charge on 1 mole N^{3-} ion is _______.

(A) 6.00×10^6 C (B) 2.89×10^5 C

(C) 3.98×10^4 C (D) 4.86×10^7 C

Section B

36. Vitamin that contains long chains of aromatic compounds is ________.

(A) vitamin C (B) vitamin K

(C) vitamin B_5 (D) vitamin B_6

37. Given below are two statements:

Statement I: The equilibrium constant is independent of the presence of catalyst.

Statement II: If ΔH= +ve, value of equilibrium constant is higher at higher temperature.

In the light of the above statements, choose the CORRECT answer from the options given below:

(A) Both **Statement I** and **Statement II** are false.

(B) **Statement I** is correct but **Statement II** is false.

(C) **Statement I** is incorrect but **Statement II** is true.

(D) Both **Statement I** and **Statement II** are true.

38. ______is a bleaching agent used in paper industry and water purification plant.

(A) ClO_2 (B) Cl_2O

(C) Cl_2O_6 (D) Cl_2O_7

39. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R:**

Assertion A: Ionisation enthalpy of group 15 elements is much greater than the group 14 elements .

Reason R: Half -filled p-orbitals are more stable.

In the light of the above statements, choose the CORRECT answer from the options given below:

(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) **A** is false but **R** is true.

40. Which one of the following does NOT represent the CORRECT order for the property indicated against it?

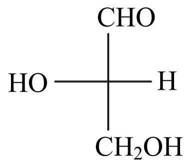
(A) Ti < V < Cr < Mn : increasing melting points

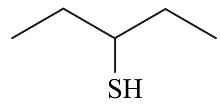
(B) Ti < V < Mn < Cr : increasing 2nd ionization enthalpy

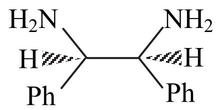
(C) Ti < V < Cr < Mn : increasing number of oxidation states

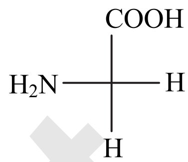
(D) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

41. Which of the following molecules is expected to rotate the plane of polarised light?

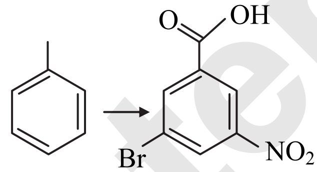
(A) 

(B) 

(C) 

(D) 

42. The following conversion can be carried out using the given reagents in the order of ______.



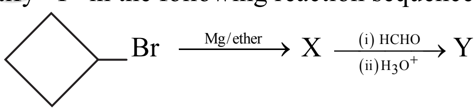
(A) $Br_2/FeBr_3$, HNO_3/H_2SO_4, $K_2Cr_2O_7/H_2SO_4$, Δ

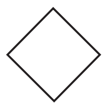
(B) $K_2Cr_2O_7/H_2SO_4$, Δ, $Br_2/FeBr_3$, HNO_3/H_2SO_4

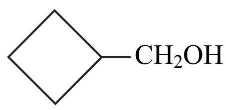
(C) $K_2Cr_2O_7/H_2SO_4$, Δ, HNO_3/H_2SO_4, $Br_2/FeBr_3$

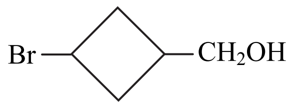
(D) HNO_3/H_2SO_4, $Br_2/FeBr_3$, $K_2Cr_2O_7/H_2SO_4$, Δ

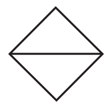
43. Identify 'Y' in the following reaction sequence.



(A) 

(B) 

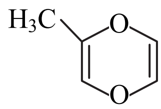
(C) 

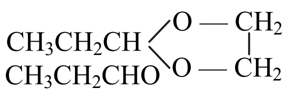
(D) 

44. In the reaction sequence,

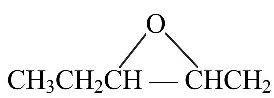
$CH_3CH_2COOH \xrightarrow{SOCl_2} A \xrightarrow{LiAlH_4} B \xrightarrow{HOCH_2CH_2OH} C.$

'C' is most likely to be _______.

(A) 

(B) 

(C) CH_3CH_2CHO

(D) 

45. Which of the following statements is INCORRECT?

(A) For a cyclic process, $\Delta U = 0$.

(B) In an adiabatic process , $q = 0$

(C) $\Delta H = \Delta U - \Delta nRT$

(D) $C_v = \frac{3}{2}R$ (for monoatomic gas)

46. Reduction of $(CH_3)_2$ C = NOH by Na and C_2H_5OH yields _______.

(A) propan-2-amine

(B) propan-1-amine

(C) ethane-1, 2-diamine

(D) propane-1, 3-diamine

47. Which of the following qualifies to be a first order reaction's rate law?

(A) Rate = $K[A]^{\frac{3}{2}}[B]^{\frac{-1}{2}}[C]^{\frac{1}{2}}$

(B) Rate = $K[A]^{\frac{3}{2}}[B]^{\frac{-1}{2}}$

(C) Rate = $K[A]^{\frac{3}{2}}[B]^{-1}[C]^{\frac{-1}{2}}$

(D) Rate = $K[A]^2 [B]^1 [C]^0$

48. In diatomic molecule of period two, if the z-axis is the internuclear axis, then the antibonding effect of electrons is $\pi^* 2p_x$ orbital is less than _______.

(A) $\sigma 2p_z$ (B) $\pi^* 2p_y$

(C) $\sigma^* 2p_z$ (D) $\pi 2p_y$

49. The equilibrium constant for the reaction: $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$ is 4×10^{-4} at 2000 K. In presence of a catalyst, the equilibrium is attained ten times faster. Therefore, the equilibrium constant in presence of catalyst of 2000 K is _______.

(A) 4×10^{-5} (B) 4×10^{-2}

(C) 4×10^{-3} (D) 4×10^{-4}

50. $3NaSCN + FeCl_3 \rightarrow x$

What is x in the following reaction ?

(A) $Fe(SCN)_3$

(B) $[Fe(CN)_5NOS]^{4-}$

(C) FeCN

(D) $Fe(CN)_3$

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To see complete chapter buy **Target Notes** or **Target E-Notes**

Answers & Solutions

Topic Test – 01 Some Basic Concepts of Chemistry

1. **(B)**

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$

12 g of C gives CO_2 = 44 g

$\therefore$ 0.6 g of C will give $CO_2 = \frac{44}{12} \times 0.6 = 2.2$ g

Moles of $CO_2 = \frac{2.2}{44} = 0.05$

Number of molecules $= 0.05 \times 6.022 \times 10^{23}$
$= 3.01 \times 10^{22}$

2. **(B)**

Time taken to distribute 10^{20} grains = 1 second

$\therefore$ Time taken to distribute 6.022×10^{23} grains

$= \frac{6.022 \times 10^{23}}{10^{20}}$

$= 6.022 \times 10^3$ seconds = 1.673 hours

3. **(C)**

$\underset{109.5\text{ g}}{3HCl} + \underset{78\text{ g}}{Al(OH)_3} \longrightarrow AlCl_3 + 3H_2O$

Amount of HCl produced in one day $= 2.5 \times 3$
$= 7.5$ g

109.5 g of HCl requires 78 g of $Al(OH)_3$.

$\therefore$ 7.5 g of HCl will require $\frac{78 \times 7.5}{109.5}$ g of $Al(OH)_3$
$= 5.34$ g of $Al(OH)_3$

$\therefore$ Number of tablets required $= \frac{5.34}{0.300}$
$= 17.8 \approx 18$ tablets

4. **(D)**

$\because$ 6 moles of HCl give 3 moles of hydrogen gas.

$\therefore$ 1 mole of HCl will give 0.5 mole of hydrogen gas.

Volume occupied by 1 mole of hydrogen gas at STP = 22.4 L

Volume occupied by 0.5 mole of hydrogen gas = 11.2 L at STP

5. **(B)**

$BaCl_2.xH_2O \longrightarrow BaCl_2 + xH_2O$

According to law of conservation of mass,

Total mass of reactants = Total mass of products

Mass of $BaCl_2.xH_2O$ = Mass of $BaCl_2$
+ Mass of H_2O

61 = 52 + Mass of H_2O

Mass of H_2O = 9 g

Number of moles of $H_2O = \frac{9}{18} = \frac{1}{2}$

Number of moles of $BaCl_2 = \frac{52}{208} = \frac{1}{4}$

$\therefore$ The ratio of number of moles of $BaCl_2$ to H_2O is, $n_{(BaCl_2)} : n_{(H_2O)} = \frac{1}{4} : \frac{1}{2} = \frac{1}{2}$

$\therefore$ The formula of the hydrated salt is $BaCl_2.2H_2O$.

6. **(C)**

7. **(B)**

$\underset{4 \times 27 = 108\text{ g}}{4Al} + \underset{3\text{ mol}}{3O_2} \longrightarrow 2Al_2O_3$

Amount of Al that combines with 3 moles of O_2 = 108 g

$\therefore$ Amount of Al that combines with 1.5 moles of O_2 = 54 g

8. **(B)**

Number of molecules = n × Avogadro number (N_A)

Molecular formula = n × Empirical formula

Normality $= x \times$ molarity

Where $x = \frac{\text{mol.wt}}{\text{Eq.wt}}$, x = Valency or change in oxidation number

9. **(C)**

$°F = \frac{9}{5}(°C) + 32$

$x = \frac{9x}{5} + 32$

$x - 32 = \frac{9x}{5}$

$5x - 160 = 9x$

$-4x = 160$

$x = -40°$

10. **(A)**

$\% \text{ of N} = \frac{\text{Mass of nitrogen atom}}{\text{Molar mass of compound}} \times 100$

$20 = \frac{14}{M} \times 100$

M = 70 g

11. **(A)**

Moles of H_2SO_4 = 0.1 moles

Moles of NaOH = 0.1 moles

$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$

1 mole of H_2SO_4 reacts with 2 moles of NaOH.

$\therefore$ 0.1 mole of H_2SO_4 will react with 0.2 moles of NaOH.

$\therefore$ NaOH is limiting reactant.

2 moles of NaOH give 1 mole of Na_2SO_4.

$\therefore$ 0.1 mole of NaOH will give 0.05 mole of Na_2SO_4.

Mass of $Na_2SO_4 = 0.05 \times 142 = 7.10$ g

12. (A)

Molar mass = 2 × V.D. = 2 × 11.2

= 22.4 g mol^{-1}

Volume occupied by 1 mole of gas = 22.4 L (at STP)

∴ Volume occupied by 2 g of gas = $\frac{22.4}{22.4} \times 2$

= 2 L

13. (D)

$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

50 mL of 0.5 M $Ca(OH)_2$ = 0.025 mole of $Ca(OH)_2$

1 mole of $Ca(OH)_2$ gives 1 mole of $CaCO_3$.

∴ 0.025 mole of $Ca(OH)_2$ will give 0.025 mole of $CaCO_3$.

$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$

1 mole of $CaCO_3$ is neutralized by 2 moles of HCl.

∴ 0.025 mole of $CaCO_3$ will be neutralized by 0.05 mole of HCl.

For 0.1 M HCl solution,

0.1 mole of HCl is present in 1000 mL of solution.

∴ 0.05 mole of HCl will be present in 500 mL of solution.

14. (A)

Number of moles of H_2SO_4

= Molarity × Volume in L

∴ Number of moles of H_2SO_4 = $0.02 \times \frac{100}{1000}$

= 2×10^{-3} moles

Number of molecules = Number of moles × N_A

= $2 \times 10^{-3} \times 6.022 \times 10^{23}$

= 12.044×10^{20} molecules

15. (C)

Number of hydrogen atoms in one mole or 17 g of NH_3 = $3 \times 6.022 \times 10^{23}$

Number of hydrogen atoms in 8.5 g of NH_3

= $\frac{3}{17} \times 8.5 \times 6.022 \times 10^{23} = 9.033 \times 10^{23}$

16. (A)

$$\underset{\substack{3 \times 22.4 \\ = 67.2\ L}}{2BCl_3 + 3H_2} \longrightarrow \underset{\substack{2 \times 10.8 \\ = 21.6\ g}}{2B} + 6HCl$$

Volume of hydrogen gas consumed = 67.2 L

17. (D)

Solution: Law of multiple proportions is applied only on binary compounds whose constituent particles form more than one compound. Since Al_2O_3 can form only one compound i.e. Al_2O_3, law of multiple proportions is not applied in this case.

18. (C)

$MCl_x + xAgNO_3 \rightarrow xAgCl + M(NO_3)_x$

25 cm^3 of 0.2 M MCl_x = 5×10^{-3} moles

150 cm^3 of 0.1 M $AgNO_3$ = 15×10^{-3} moles

1 mole of MCl_x reacts with x moles of $AgNO_3$.

∴ 5×10^{-3} moles of MCl_x will react with $5x \times 10^{-3}$ moles of $AgNO_3$.

Since the given amount of MCl_x react completely with 15×10^{-3} moles of $AgNO_3$,

$5x \times 10^{-3} = 15 \times 10^{-3}$

∴ x = 3

∴ The formula of the metal chloride will be MCl_3.

19. (A)

Amount of C–14 in 12 g of carbon = $\frac{2}{100} \times 12$

= 0.24 g

Number of C–14 atoms = $\frac{0.24}{14} \times 6.022 \times 10^{23}$

= 1.032×10^{22}

20. (B)

Equal volumes are occupied by equal number of moles of gases under identical conditions of temperature and pressure.

∴ $\frac{84}{M} = \frac{96}{32}$

∴ M = 28 g

21. (C)

Compounds are pure substances formed by the combination of two or more than two elements. The elements are present in fixed proportion by mass and they can be decomposed into their constituent elements by suitable chemical methods. Compounds do not retain the properties of its constituent elements.

22. (C)

Molarity of a solution depends upon temperature because volume of a solution is temperature dependent and molality of a solution is temperature independent since mass remains unaffected with temperature.

23. (B)

2 g of dihydrogen = 6.022×10^{23} molecules

∴ 1 g of dihydrogen = $\frac{6.022 \times 10^{23}}{2}$

= 3.011×10^{23} molecules

24. (A)

$BaCO_3 \rightarrow BaO + CO_2$

1 mole of $BaCO_3$ produces 1 mole of CO_2.

19.73 g of $BaCO_3$ = 0.1 mol of $BaCO_3$

∴ 0.1 mol of $BaCO_3$ will produce 0.1 mol of CO_2

Now, 1 mol of CO_2 ≡ 22.4 L at STP

∴ 0.1 mol of CO_2 = 2.24 L at STP

∴ 19.73 g $BaCO_3$ will produce 2.24 L CO_2 at STP on the complete decomposition.

25. (C)

Empirical formula mass $= 12 + 2 + 16 = 30$

$n = \frac{\text{Molecular formula mass}}{\text{Empirical formula mass}}$

$= \frac{180}{30} = 6$

Molecular formula = n × Empirical formula

$= 6 \times (CH_2O)$

$= C_6H_{12}O_6$

26. (B)

Number of moles of oxygen in 1 mole of $Na_2CO_3.10H_2O = 13$

∴ Oxygen in 0.1 mole of $Na_2CO_3.10H_2O = 1.3$ moles

∴ Mass of oxygen $= 1.3 \times 16 = 20.8$ g.

27. (B)

% of unknown element

$Y = 100 - (39.62 + 40.25)$

$= 100 - 79.87$

$= 20.13$

Now, % of Y = $\frac{\text{Atomic mass of Y}}{\text{Molar mass}} \times 100$

$20.13 = \frac{\text{Atomic mass of Y}}{159} \times 100$

∴ Atomic mass of Y = 32.0

∴ The unknown element is sulphur (S).

28. (B)

1 mole of XCl_4 contains 4 moles of chlorine.

0.5 mole of chlorine is present in 25 g of XCl_4.

∴ 4 moles of chlorine will be present in $\frac{25}{0.5} \times 4$

$= 200$ g of XCl_4.

29. (C)

The maximum volume of 0.25 M HCl cannot be more than 2 litres because there is no addition of water.

Let x litre of 0.40 M HCl be added to 1 litre of 0.15 M HCl.

∴ $M_1V_1 + M_2V_2 = M_3V_3$

$0.15 \times 1 + 0.40 \times x = 0.25\ (1 + x)$

$0.15x = 0.10$

$x = 0.667$

∴ Total volume of 0.25 M HCl solution

$= 1 + x = 1 + 0.667 = 1.667$ L

30. (B)

Molar mass of $O_2 = 32\ g\ mol^{-1}$

32 g of $O_2 = 6.022 \times 10^{23}$ molecules

∴ 40 g of $O_2 = \frac{6.022 \times 10^{23} \times 40}{32}$

$= 7.527 \times 10^{23}$ molecules

Mass of 6.022×10^{23} molecules of $CO_2 = 44$ g

∴ Mass of 7.527×10^{23} molecules of CO_2

$= \frac{44 \times 7.527 \times 10^{23}}{6.022 \times 10^{23}} \approx 55$ g

31. (B)

Amount of KI in 2 g of the salt $= \frac{2}{100} = 0.02$ g

Number of moles of KI $= \frac{0.02}{166}$

$= 1.20 \times 10^{-4}$

1.2×10^{-4} moles of KI will contain 1.2×10^{-4} moles of iodide ions.

1 mole of iodide ions contains 6.022×10^{23} ions of I^-.

∴ 1.2×10^{-4} moles of iodide ions will contain 7.2×10^{19} I^- ions.

32. (D)

$4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NO_{(g)} + 6H_2O_{(l)}$

4 moles of NH_3 give $\longrightarrow$ 4 moles of NO

∴ 1 mole of NH_3 gives $\longrightarrow$ 1 mole of NO

5 moles of O_2 give $\longrightarrow$ 4 moles of NO

∴ 1 mole of O_2 gives $= \frac{4}{5} = 0.8$ mole of NO

Thus, O_2 is the limiting reactant.

∴ Amount of NO formed is decided by amount of O_2.

Amount of NO formed = 0.8 mol = 0.8 × 30 g

= 24 g

33. (D)

Number of moles of $H_2 = \frac{1}{2}$

Number of moles of $O_2 = \frac{4}{32}$

Hence, molar ratio of H_2 and $O_2 = \frac{1}{2} : \frac{4}{32} = 4 : 1$

34. (D)

35. (B)

Let weight of original mixture be 1 g and amount of NaI present in the mixture be x g.

∴ Amount of NaCl present in the mixture

$= (1 - x)$ g

$2NaI + H_2SO_4 \rightarrow Na_2SO_4 + 2HI$

300 g of NaI gives 142 g of Na_2SO_4.

∴ x g of NaI will give $0.47x$ g of Na_2SO_4.

$2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$

117 g of NaCl gives 142 g of Na_2SO_4.

∴ $(1 - x)$ g of NaCl will give $1.21(1 - x)$ g of Na_2SO_4.

Since, amount of Na_2SO_4 produced is equal to the weight of original mixture.

∴ $0.47x + 1.21\ (1 - x) = 1$

$0.47x + 1.21 - 1.21x = 1$

$0.74x = 0.21$

$x = 0.2838$

∴ % of NaI in the original mixture = 28.38%

36. (D)

22.4 L of a gas at STP has number of molecules $= 6.022 \times 10^{23}$

$\therefore$ 8.96 L of a gas at STP has number of molecules

$= \frac{6.022 \times 10^{23} \times 8.96}{22.4}$

$= 2.409 \times 10^{23}$

$= 24.09 \times 10^{22}$

37. (B)

Percentage of hydrogen in sample 1

$= \frac{0.2}{0.2+3.2} \times 100 = 5.88\ \%$

Percentage of oxygen in sample 2

$= \frac{3.2}{0.2+3.2} \times 100 = 94.12\ \%$

The two samples of the compound have same percentage composition.

Hence, it proves the law of definite proportion.

38. (D)

18 g of water contain 2 g of hydrogen.

$\therefore$ 0.72 g of water will contain 0.08 g of hydrogen.

44 g of CO_2 contain 12 g of carbon.

$\therefore$ 3.08 g of CO_2 will contain 0.84 g of carbon.

Number of moles of carbon $= \frac{0.84}{12} = 0.07$

Number of moles of hydrogen $= \frac{0.08}{1} = 0.08$

C : H = 0.07 : 0.08 = 7 : 8

$\therefore$ Empirical formula of hydrocarbon = C_7H_8

39. (B)

Empirical formula mass can be determined from the empirical formula.

40. (D)

Atomic mass of the given element

$= 6.022 \times 10^{23} \times 10.86 \times 10^{-26}$ kg mol^{-1}

$= 65.4 \times 10^{-3}$ kg mol^{-1}

$= 65.4$ g mol^{-1}

$\therefore$ The element whose atom has mass of 10.86×10^{-26} kg is zinc.

41. (D) **42. (A)**

43. (A)

Amount of pure ethyl alcohol $= 81.4 - 0.002$

$= 81.398$ g

44. (D)

1 mole of $CO_2 = N_A$ molecules

Electrons in one molecule of $CO_2 = 6 + 8 \times 2 = 22$

Thus, electrons in N_A molecules = 22 N_A

45. (A)

Molar mass of CH_4 = 16 g mol^{-1}

Molar mass of C_2H_4 = 28 g mol^{-1}

The average molar mass of a mixture when methane and ethene are present in the ratio of a:b is,

Average molar mass $= \frac{a \times 16 + b \times 28}{a+b}$

$20 = \frac{a \times 16 + b \times 28}{a+b}$

20a + 20b = 16a + 28b

4a = 8b

$\frac{a}{b} = \frac{2}{1}$

If the ratio is reversed, then new ratio will be 1:2

Average molar mass $= \frac{1 \times 16 + 2 \times 28}{1+2}$

$= 24$ g mol^{-1}

46. (C)

According to Avogadro's law, ratio of the volumes of gases will be equal to the ratio of their no. of moles.

No. of moles $= \frac{\text{Mass}}{\text{Molar mass}}$

$n_{H_2} = \frac{w}{2}$; $n_{O_2} = \frac{w}{32}$; $n_{CH_4} = \frac{w}{16}$

Hence, the ratio is $\frac{w}{2} : \frac{w}{32} : \frac{w}{16}$ or 16 : 1: 2.

47. (A)

$$\underset{28}{N_2} + \underset{6}{3H_2} \longrightarrow \underset{34}{2NH_3}$$

1 mole of N_2 (28 g) combine with 3 moles of H_2 (6 g).

$\therefore$ 3 kg of H_2 will react with $\frac{28}{6} \times 3 = 14$ kg of N_2

$\therefore$ H_2 is limiting reagent.

6 g of H_2 react to form 34 g of NH_3.

$\therefore$ 3.0 kg of H_2 will react to form $\frac{34 \times 3}{6}$ kg of NH_3

$= 17$ kg of NH_3

48. (A)

Let atomic mass of metal 'M' be x.

% of oxygen in $M_2O = \frac{16}{2x+16} \times 100$

$36.4 = \frac{16}{2x+16} \times 100$

$72.8x + 582.4 = 1600$

$x = 13.978$

In case of MO,

% of oxygen in MO $= \frac{16}{13.978+16} \times 100$

$= 53.4\%$

Therefore, the formula of second oxide will be MO.

49. **(B)**
When Avogadro number is 6.022×10^{23} mol^{-1}, the mass of 1 mole of carbon = 12 g

$\therefore$ Mass of 1 mole of carbon when Avogadro number is 6.022×10^{20} mol^{-1}

$= \frac{12 \times 6.022 \times 10^{20}}{6.022 \times 10^{23}} = 12 \times 10^{-3}$ g

Thus, the mass of 1 mole of carbon is changed.

50. **(A)**
(A) 34 g of water
18 g of H_2O = 6.022×10^{23} molecules

$\therefore$ 34 g of H_2O = $\frac{6.022 \times 10^{23}}{18} \times 34$
$= 11.37 \times 10^{23}$ molecules

(B) 28 g of CO_2
44 g of CO_2 = 6.022×10^{23} molecules

$\therefore$ 28 g of CO_2 = $\frac{6.022 \times 10^{23}}{44} \times 28$
$= 3.8 \times 10^{23}$ molecules

(C) 46 g of CH_3OH
32 g of CH_3OH = 6.022×10^{23} molecules

$\therefore$ 46 g of CH_3OH = $\frac{6.022 \times 10^{23}}{32} \times 46$
$= 8.65 \times 10^{23}$ molecules

(D) 54 g of N_2O_5
108 g of N_2O_5 = 6.022×10^{23} molecules

$\therefore$ 54 g of N_2O_5 = $\frac{6.022 \times 10^{23}}{108} \times 54$
$= 3.011 \times 10^{23}$ molecules.

Topic Test – 02 Structure of Atom

1. **(A)**

$\Delta x . \Delta v = \frac{h}{4\pi m}$

$\Delta v = \frac{h}{4\pi m \Delta x}$

$= \frac{6.626 \times 10^{-34}}{10^{-4} \times 0.25 \times 10^{-3} \times 4 \times 3.14}$

$= 2.11 \times 10^{-27}$ m s^{-1}

2. **(A)**

Ionization energy is the amount of energy required to remove an electron from an isolated gaseous atom in its ground state (n = 1).

$\Delta E = E_\infty - E_1$

$= 0 - \frac{(-13.6)}{1^2}$

$= 13.6$ eV

3. **(A)**

$E = h\nu$

$= \frac{hc}{\lambda} \left(\because \nu = \frac{c}{\lambda}\right)$

$= \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{300 \times 10^{-9}}$ $(\because 1 \text{ nm} = 10^{-9} \text{ m})$

$= 6.626 \times 10^{-19}$ J

4. **(C)**

5. **(D)**

$w = h\nu_o$
$= 6.626 \times 10^{-34} \times 2 \times 10^{15}$
$= 1.325 \times 10^{-18}$
$= 13.25 \times 10^{-19}$ J

6. **(B)**
For n = 1, the possible values of *l* and m can only be 0.

n = 1, *l* = 0, m = 0, s = $+\frac{1}{2}$

7. **(C)**
The energy of an electron in the nth orbit,

$E_n = \frac{-2.18 \times 10^{-18} Z^2}{n^2}$ J

$= \frac{-2.18 \times 10^{-18} \times (3)^2}{(1)^2}$ J

$= -1.96 \times 10^{-17}$ J

8. **(A)**

$\lambda = \frac{h}{mv}$

$= \frac{6.626 \times 10^{-34}}{10^{-3} \times 10} = 6.626 \times 10^{-32}$ m

9. **(A)**

$\Delta E = 2.18 \times 10^{-18} \left[\frac{1}{(3)^2} - \frac{1}{(1)^2}\right]$

$= 2.18 \times 10^{-18} \times (-0.888)$

$\Delta E = -1.935 \times 10^{-18}$ J

It is an emission energy and the frequency of photon can be calculated by taking energy in terms of magnitude.

$\Delta E = h\nu$

$\nu = \frac{\Delta E}{h}$

$= \frac{1.935 \times 10^{-18} \text{ J}}{6.626 \times 10^{-34} \text{ Js}}$

$= 0.292 \times 10^{16}$ s^{-1}

$\nu = 2.92 \times 10^{15}$ Hz