

5. The number of unpaired electrons present in an element with atomic number 24 is

(A) 6
 (B) 4
 (C) 0
 (D) 5

24 → Chromium
 $3d^5 4s^2$

↑	↑	↑	↑	↑	↑↓
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6. Total number of atoms present in 1 mole of $(NH_4)_2Cr_2O_7$ is

(A) 6.022×10^{23}
 (B) 114.47×10^{23}
 (C) 84×10^{23}
 (D) 19

7. Which prefix is used in SI system for coefficient 10^6 ?

(A) Micro
 (B) Tera
 (C) Mega
 (D) Femto

10^6
 $\epsilon = \frac{h}{\lambda}$

8. In the oxides of Nitrogen, if the proportion of Oxygen combining with 14 gram Nitrogen is in the proportion 1:2:3, the proof of which law is obtained?

(A) Law of combining weights.
 (B) Law of multiple proportion.
 (C) Law of conservation of mass.
 (D) Law of constant proportion.

14
 (1:2:3)

9. The total no. of electrons in a sub-shell designated by Azimuthal quantum number l is

(A) l^2
 (B) $4l + 2$
 (C) $2l + 1$
 (D) $2l + 2$

for, $n=2$
 $l=1$
 $2(2)^2 = 8$
 $4(1+1) = 8$

10. The elements with highest ionization enthalpy in a period are 1

(A) Halogens
 (B) Noble gases.
(C) Lanthanides.
(D) Alkaline earth metals.

11. How many electrons are present in P^{3-} ion having 15 protons? 1

(A) 15
(B) 16
 (C) 18
(D) 12

P^{3-}
 $Z = 15$
 $P^+ = 15$

12. Which of the following series of lines in the atomic spectrum of Hydrogen appears in the visible region? 1

(A) Balmer
(B) Brackett
 (C) Lyman
(D) Paschen

Balmer.
Lyman
paschen

13. Isobars have 1

(A) same number of neutrons.
 (B) same number of nucleons.
(C) same number of electrons.
(D) same number of protons.

14. Which of the following electronic configuration is not possible? 1

(A) $4d^6$
 (B) $3f^{14}$
(C) $3s^1$
(D) $2p^6$

15. Which order is true with reference to size of species ?

(A) $M^{4+} < M^{2+} < M$

(B) $M > M^{2+} > M^{4+}$

(C) $M^{2+} < M < M^{4+}$

(D) $M < M^{2+} < M^{4+}$

16. How many nodes are present in 3s orbital ?

(A) 2

(B) 1

(C) 0

(D) 3

17. Which graph of Moseley suggests that properties of elements depend upon atomic number ?

(A) $\sqrt{\nu} \rightarrow Z$

(B) $\nu^2 \rightarrow A$

(C) $\sqrt{\nu} \rightarrow A$

(D) $\nu^2 \rightarrow Z$

18. Mention the shape of orbital with value of $l = 1, m = 0$.

(A) Trigonal planar

(B) Dumb-bell

(C) Square planar

(D) Spherical

19. In Modern Periodic Table, if an element has electronic configuration $1s^2, 2s^2, 2p^6, 3s^2, 3p^4$; then what will be the atomic number of element which is just below this element in its group ?

(A) 18

(B) 34

(C) 48

(D) 24

Handwritten notes and diagrams:

- For Q15: A box containing "Correct Answer" and a diagonal line pointing to option B.
- For Q16: Calculation: $n - l = (3 - 0) = 3$.
- For Q18: Diagrams of p-orbitals. One shows a p-orbital with $l=1, m=0$ labeled as a dumb-bell shape. Another shows a p-orbital with $l=1, m=1$ labeled as a dumb-bell shape.

20. Which is the reducing agent in the reaction given below ?

$$2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + \text{Al}_2\text{O}_3$$

(A) O_2
 (B) Fe
 (C) Al_2O_3
 (D) Al

Handwritten notes for Q20:
 Fe_2O_3
 $2x - 6 = 0$
 $2x = +6$
 $x = +3$
 $2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + \text{Al}_2\text{O}_3$
 (0) (3) (0) (3)
 Reducing agent

21. Electro-negativity of which element is one ?

(A) H
 (B) F $\rightarrow 4$
 (C) O $\rightarrow 3.95$
 (D) Li $\rightarrow 1$

Handwritten notes for Q21:
 Li 1
 Be 1.5
 B 2
 C 2.5
 N 3
 O 3.5

22. Chemical reactivity is very low for elements of Group 18, because

(A) they do not gain or lose electrons.
 (B) all the orbitals of outer-most orbit are completely filled.
 (C) All the given three options.
 (D) they have stable electronic configuration in outer-most shell.

23. What is the oxidation number of Carbon in Diamond ?

(A) +2
 (B) +3
 (C) +4
 (D) 0

24. Identify the molecular formula of Caro's acid.

(A) H_2SO_3
 (B) H_2SO_5
 (C) $\text{H}_2\text{S}_2\text{O}_8$
 (D) H_2SO_4

Handwritten notes for Q24:
 H_2SO_5
 H_2SO_5
 $\text{H}-\text{O}-\text{S}$

25. What is the name of TiO_2 , according to stock notation nomenclature?

(A) Titanium oxide (IV).
 (B) Titanium (IV) oxide.
 (C) Titanium (V) oxide.
 (D) Titanium (II) oxide.

TiO_2
 $x - 4 = 0$
 $x = 4$
 Tita

I
 II
 III
 IV
 Tita

26. How many electrons are required for the reduction of 1 mole of MnO_4^- to Mn^{2+} ?

(A) 3.011×10^{24}
 (B) 6.022×10^{24}
 (C) 1.2044×10^{24}
 (D) 1.8066×10^{24}

$\text{MnO}_4^- + 8e^- \xrightarrow{+2} \text{Mn}^{2+}$
 $2\text{MnO}_4^- + 10e^- \xrightarrow{+2} 2\text{Mn}^{2+}$
 $8 \times 10 = 80$

27. Among the elements In, Ti, Tl and Ca, which elements do not form hydride?

(A) In, Tl
 (B) In, Tl, Ca
 (C) In, Ca
 (D) In, Ti

Indium $\rightarrow 849$
 Thallium \rightarrow

28. What is the $-\text{O}-\text{O}-\text{H}$ bond angle in solid form of H_2O_2 ?

(A) 94.8°
 (B) 111.5°
 (C) 92.2°
 (D) 101.9°

101.9°

29. The number of peroxy rings in CrO_5 is

(A) 2
 (B) 3
 (C) 4
 (D) 1

CrO_5

30. Which colour is shown by Rubidium salts on flame test ?

(A) Red violet

(B) Violet

(C) Blue violet

(D) Dark red

Handwritten notes: Li Na K Rb Cs
yellow violet red blue violet

31. Which instrument is used to determine amount of K ?

(A) Potentiometer

(B) pH meter

(C) Spectrometer

(D) Flame photometer

Handwritten notes: H_2 group 1 Na_2 K_2 Li_2

32. Dihydrogen and alkali metals resemble in which of the following properties ?

(A) Both are powerful oxidising agents.

(B) Both have low ionization enthalpy.

(C) Both are diatomic.

(D) Both are powerful reducing agents.

33. Which ion is displaced by Na^+ ions, when hard water is passed over Zeolite ?

(A) OH^-

(B) Ca^{2+}

(C) K^+

(D) H^+

34. is added as stabilizer to aqueous solution of H_2O_2 .

(A) Phosphoric acid. H_3PO_4

(B) Phosphinic acid.

(C) Pyrophosphoric acid.

(D) Phosphorous acid.

35. Chloride of which metal possess -Cl bridge in vapour state? 1

(A) Mg
(B) Sr
(C) Pb
(D) Al

↓
Al, Be
↓
Al, Be

36. What is added to increase the setting velocity of Plaster of Paris? 1

(A) Alum
(B) Limestone
(C) Common salt
(D) Borax

37. Which is more basic - Na_2CO_3 OR NaHCO_3 ? 1

(A) NaHCO_3
(B) Both Na_2CO_3 and NaHCO_3
(C) Neither Na_2CO_3 nor NaHCO_3
(D) Na_2CO_3

38. Which metal is used in the preparation of Grignard reagent? 1

(A) Na
(B) Mg
(C) Li
(D) Ca

39. Which metals are present in Crinite ore? 1

(A) K, Ba
(B) Be, Al
(C) K, Mg
(D) Mg, Ca

~~Crinite, Mg, KCl~~
Crinite $\rightarrow \text{Mg}_2\text{Si}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$
Crinite $\rightarrow \text{Mg}$

40. Which of the following compound does not undergo addition reaction?

~~(A) Ethyne~~ $\text{CH}_3 - \text{CH}_3$
(B) Ethane
~~(C) Ethanal~~
~~(D) Ethene~~

41. Which type of hybridizations are shown by Carbon atoms present in but-1-ene?

(A) sp^2
(B) sp^3 and sp^2
 (C) sp and sp
 (D) sp^3

42. Which among the following compounds do not contain π bond?

(A) CH_3CHO
 (B) CH_3COOH
 (C) CH_3CONH_2
(D) $\text{CH}_3\text{CH}_2\text{OH}$

43. Which of the following is not an electrophile?

(A) SO_3
(B) NH_3
 (C) $^+\text{CH}_3$
 (D) BF_3

44. What is the structural formula of 4-methyl-hex-5-yne-2-one?

(A) $\text{CH}_3 - \overset{1}{\text{C}} - \overset{2}{\text{C}} = \overset{3}{\text{C}} - \overset{4}{\text{C}} - \overset{5}{\text{C}} - \overset{6}{\text{C}} \equiv \text{CH}$
(B) $\text{CH} = \overset{1}{\text{C}} - \overset{2}{\text{C}} - \overset{3}{\text{C}} - \overset{4}{\text{C}} - \overset{5}{\text{C}} - \overset{6}{\text{C}} \equiv \text{CH}$
 (C) $\text{CH} = \overset{1}{\text{C}} - \overset{2}{\text{C}} - \overset{3}{\text{C}} - \overset{4}{\text{C}} - \overset{5}{\text{C}} - \overset{6}{\text{C}} \equiv \text{CH}$
 (D) $\text{CH}_3 - \text{CH}_2 - \text{CO} - \text{CH} - \text{C} \equiv \text{CH}$

45. The percentage composition of C, H and N in an organic compound is 62.07, 10.34 and 14. What will be its empirical formula?
[Atomic weight of C = 12; H = 1; N = 14; O = 16] 2

(A) C_2H_5NO
 (B) $C_5H_{10}NO_2$
 (C) $C_2H_5NO_2$
 ✓ (D) $C_5H_{10}NO$

C	62.07	12	5.17
H	10.34	1	10.34
N	14	1	14
			100

doubtful

46. The energy of one mole of Photon having frequency 4×10^{14} Hz is

(A) 159 KJ mol^{-1}
 (B) 145 KJ mol^{-1}
 (C) 212 KJ mol^{-1}
 (D) 129 KJ mol^{-1}

one mole of photon \Rightarrow
 $6.022 \times 10^{23} \times 4 \times 10^{14} \times 1.6 \times 10^{-19} = 3.94 \times 10^5 \text{ J} = 394 \text{ KJ}$

Hydrogen
 Assertion [A]: F-atom has less negative electron gain enthalpy than Cl atom.
 Reason [R]: Additional electrons are attracted more effectively by 3p electrons in Cl atom than by 2p electrons in F-atom.

(A) Both [A] and [R] are correct and [R] is not the correct explanation of [A].
 ✓ (B) [A] is correct and [R] is incorrect.
 (C) Both [A] and [R] are incorrect.
 (D) Both [A] and [R] are correct and [R] is the correct explanation of [A].

48. Which of the following will contain least number of molecules?

✓ (A) 0.1 mole CO_2 gas. $\rightarrow 6.022 \times 10^{22}$
 (B) 22 g of CO_2 gas. $\rightarrow 3.011 \times 10^{23}$
 (C) 11200 ml of CO_2 at STP. $\rightarrow 3.011 \times 10^{23}$
 (D) 22.4 litre of CO_2 at STP. $\rightarrow 6.022 \times 10^{23}$

49. Match the oxidation number of O-atoms of compounds given in column-I with the oxidation number values given in column-II and select the correct option.

Column-I	Column-II
(i) BaO_2 (+1)	(p) $-\frac{1}{2}$
(ii) SiO_2 (-2)	(q) +1
(iii) KO_2 ($\frac{1}{2}$)	(r) -2
(iv) F_2O_2 (+1)	(s) -1
	(t) +2

Handwritten notes: $\frac{0-0}{x-2=0} \Rightarrow x=2$, $\frac{0-0}{x-4=0} \Rightarrow x=4$, KOL

(A) (i) \rightarrow s, (ii) \rightarrow t, (iii) \rightarrow p, (iv) \rightarrow t
 (B) (i) \rightarrow r, (ii) \rightarrow t, (iii) \rightarrow s, (iv) \rightarrow p
 (C) (i) \rightarrow s, (ii) \rightarrow r, (iii) \rightarrow t, (iv) \rightarrow q
 (D) (i) \rightarrow s, (ii) \rightarrow r, (iii) \rightarrow p, (iv) \rightarrow q

50. $2\text{KMnO}_4 + 16\text{HCl} \rightarrow 2\text{MnCl}_2 + 2\text{KCl} + 5\text{Cl}_2 + 8\text{H}_2\text{O}$
 How many moles of HCl undergo oxidation in the above reaction?
 (A) 14 (B) 10
 (C) 5 (D) 16

51. Choose the correct option.
 T stands for True ; F stands for False.

(i) d-block elements are known as transition metals. **T**
 (ii) Ionization enthalpy of Be > B. **T**
 (iii) Elements of Group-I exhibit only +1 oxidation state. **T**
 (iv) Group 17 contains only gaseous elements. **F**

(A) TFTF (B) TTFF
 (C) TTTT (D) TTF

52. Which of the following represents the correct set of quantum numbers for the unpaired electron of an element having atomic number 21?
 (A) $n = 3, l = 2, m = 1, s = +\frac{1}{2}$
 (B) $n = 3, l = 2, m = 0, s = +\frac{1}{2}$
 (C) $n = 3, l = 3, m = 2, s = +\frac{1}{2}$
 (D) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

Handwritten notes: $21 \rightarrow 3d^5 4s^2$, $3d^1 4s^2$

53. Which of the following is correct matching of column A with column B.

Column A	Column B
(i) Ionic hydride	(p) LaH_2
(ii) Metallic hydride	(q) LiH
(iii) Molecular hydride	(r) TiH
(iv) Interstitial hydride	(s) HF

- (A) (i) \rightarrow q ; (ii) \rightarrow p ; (iii) \rightarrow r ; (iv) \rightarrow s
 (B) (i) \rightarrow q ; (ii) \rightarrow p, r ; (iii) \rightarrow s ; (iv) \rightarrow s, q
 (C) (i) \rightarrow s ; (ii) \rightarrow p ; (iii) \rightarrow r ; (iv) \rightarrow q
 (D) (i) \rightarrow q ; (ii) \rightarrow p, r ; (iii) \rightarrow s ; (iv) \rightarrow p, r

54. Which among the following method is the best for the preparation of BeF_2 ?

- (A) $(\text{NH}_4)_2\text{BeF}_4 \xrightarrow{\Delta}$
 (B) $\text{Be} + \text{F}_2 \rightarrow \text{BeF}_2$
 (C) $\text{BeO} + \text{C} + \text{F}_2 \xrightleftharpoons{\Delta} \text{BeF}_2 + \text{CO}$
 (D) $\text{Be}(\text{OH})_2(s) + 2\text{HF}_{(aq)} \rightarrow \text{BeF}_2 + 2\text{H}_2\text{O}$

55. How many moles of CO_2 is produced by the thermal decomposition of 25 g of CaCO_3 ?

- (A) 1
 (B) 2
 (C) 1.5
 (D) 0.25
- $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
 $100 \text{ g} \rightarrow 56$
 $25 \text{ g} \rightarrow ?$

56. In which of the following reactions, H_2O_2 does not act as a reducing agent?

- (A) $\text{I}_2 + \text{H}_2\text{O}_2 + 2\text{OH}^- \rightarrow 2\text{I}^- + 2\text{H}_2\text{O} + \text{O}_2$
 (B) $\text{PbS} + 4\text{H}_2\text{O}_2 \rightarrow \text{PbSO}_4 + 4\text{H}_2\text{O}$
 (C) $2\text{KMnO}_4 + 3\text{H}_2\text{O}_2 + 2\text{KOH} + 2\text{H}_2\text{O} + 3\text{O}_2$
 (D) $\text{HOCl} + \text{H}_2\text{O}_2 \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^- + \text{O}_2$

57. Choose the correct option. T stands for True and F stands for False.

(i) Tritium can be obtained from natural sources. 3

(ii) In ionic hydrides, the oxidation state of Hydrogen is +1.

(iii) The four atoms of Oxygen in H_2O_2 are in the same plane.

(iv) Na_2CO_3 removes temporary and permanent hardness of water.

(A) TFFF (B) TFFT
 (C) TTF (D) TFTT (12)

58. How many structural isomers are possible for C_3H_9N ?

(A) 4 (1) (2)
 (B) 3 (1)
 (C) 2
 (D) 5 (2)

59. Assertion : But-1-ene and 2-methyl prop-1-ene are position isomers. But

Reason : Position isomers have same molecular formula but differ in the position of functional group. -C-

(A) Both Assertion and Reason are true and Reason is not the correct explanation of the Assertion. 2

(B) Assertion is true but Reason is false.

(C) Assertion is false but Reason is true.

(D) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion.

60. The correct order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is

(A) $-COOH > -CHO > -CN > -OH > -OR$ 2

(B) $-COOH > -CN > -CHO > -OR > -OH$

(C) $-CHO > -COOH > -OR > -CN > -OR$

(D) $-COOH > -CHO > -OH > -OR > -CN$

61. Organic reactions are given in column-I and reaction names are given in column-II. Match column-I with column-II and choose the correct answer.

Reactions	Name of reactions
(i) $\text{CH}_3\text{-CH}_2\text{-I} + \text{KOH} \rightarrow$	(p) Elimination
(ii) $\text{CH}_3\text{-CH}_2\text{-Br} + \text{KOH} \xrightarrow{\text{alcohol}}$	(q) Addition
(iii) $\text{CH}_2=\text{CH}_2 + \text{Cl}_2 \rightarrow$	(r) Rearrangement
(iv) $\text{CH}_3\text{-CH}_2\text{-CH}=\text{CH}_2 \xrightarrow[\text{catalyst}]{\text{acid}}$	(s) Substitution

(A) (i) \rightarrow s, (ii) \rightarrow q, (iii) \rightarrow p, (iv) \rightarrow r

(B) (i) \rightarrow q, (ii) \rightarrow s, (iii) \rightarrow q, (iv) \rightarrow r

(C) (i) \rightarrow p, (ii) \rightarrow s, (iii) \rightarrow r, (iv) \rightarrow q

(D) (i) \rightarrow s, (ii) \rightarrow p, (iii) \rightarrow q, (iv) \rightarrow r

62. What is the total number of protons in 4 g of NaOH? 3

(A) 6.022×10^{23}

(B) 12.044×10^{23}

(C) 12.044×10^{24}

(D) 6.022×10^{22}

63. The first line in the Balmer series in the H-atom will have frequency.

$[R_H = 2.18 \times 10^{-18} \text{ J}, h = 6.626 \times 10^{-34} \text{ J s}]$

(A) $3.29 \times 10^{15} \text{ s}^{-1}$

(B) $8.22 \times 10^{15} \text{ s}^{-1}$

(C) $8.05 \times 10^{13} \text{ s}^{-1}$

(D) $4.57 \times 10^{14} \text{ s}^{-1}$

64. Match compounds of column-I with their uses given in column-II and select the correct option.

Column-I Compound	Column-II Uses
(i) CaCO_3	(p) in the preparation of fat and oil.
(ii) NaOH	(q) in the purification of sugar.
(iii) Ca(OH)_2	(r) as a fire extinguisher.
(iv) NaHCO_3	(s) as a filler in cosmetics.

(A) (i) \rightarrow s, (ii) \rightarrow p, (iii) \rightarrow q, (iv) \rightarrow r

(B) (i) \rightarrow q, (ii) \rightarrow p, (iii) \rightarrow s, (iv) \rightarrow r

(C) (i) \rightarrow r, (ii) \rightarrow s, (iii) \rightarrow p, (iv) \rightarrow q

(D) (i) \rightarrow r, (ii) \rightarrow s, (iii) \rightarrow q, (iv) \rightarrow p