SECTION A

1 A given number of atoms of calcium weigh 120 g, then what will be the mass of the same number of atoms for sulphur?
(If sulphur is monoatomic)
1. 120 g
2. 60 g
3. 96 g
4. 48 g

2 Methane, on combustion, gives 81 g of water. How many moles of methane are required for this combustion process?
1. 2.25 mole
2. 4.5 mole
3. 9 mole
4. 1.125 mole

3 The statement, "If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element are in the ratio of small whole numbers," was given by:
1. Gay Lussac
2. Dalton
3. Antoine Lavoisier
4. Joseph Proust

4 How many hydrogen atoms are there in 0.420 g of cyclohexane?
$[\text{Atomic mass}: \ H = 1; \ C = 12]$
(Avogadro constant is 6.0×10^{23} mol^{-1})
1. 1.8×10^{23}
2. 3.6×10^{22}
3. 3.0×10^{21}
4. 1.8×10^{22}

5 The total number of protons in 10 g of $CaCO_3$ is:
($N_0 = 6.023 \times 10^{23}$)
1. 3.01×10^{24}
2. 6.02×10^{24}
3. 2.01×10^{25}
4. 3.02×10^{25}

6 When 22.4 litres of $H_2(g)$ is mixed with 11.2 litres of $Cl_2(g)$, both at STP, the moles of HCl(g) formed is equal to :
1. 1 mol of HCl(g)
2. 2 mol of HCl(g)
3. 0.5 mol of HCl(g)
4. 1.5 mol of HCl(g)

7 A compound contain C, H and O. If C = 40% and H = 6.67% and rest is oxygen, then the empirical formula of the compound will be :
1. CH_2O
2. CH_4O
3. CH_4O_2
4. CHO

8 In the Haber process, 30 litres of dihydrogen and 30 litres of dinitrogen were taken for the reaction which yielded only 50% of the expected product. What will be the composition of a gaseous mixture under the above condition in the end :

1.	20 litres ammonia, 20 litres nitrogen, 20 litres hydrogen
2.	10 litres ammonia, 25 litres nitrogen, 15 litres hydrogen
3.	20 litres ammonia, 10 litres nitrogen, 30 litres hydrogen
4.	20 litres ammonia, 25 litres nitrogen, 15 litres hydrogen

9 The highest number of atoms is present in -
1. 52 moles of Ar
2. 52 u of He
3. 52 g of He.
4. All of the above have the same number of atoms

10 Percentage of Se in peroxidase anhydrous enzyme is 0.5% by weight (at. wt = 78.4) then minimum molecular weight of peroxidase anhydrous enzymes is : -
1. 1.568×10^4
2. 1.568×10^3
3. 15.68
4. 2.136×10^4

11 How many chlorine atoms are in 1.00 mL of CCl_4 (M=153.8, density=1.59 g mL^{-1})?

1. 1.56×10^{21}
2. 6.23×10^{21}
3. 1.57×10^{22}
4. 2.49×10^{22}

12 Consider the two statements:

Statement I:	Scientific notation for 0.00016 is 1.6×10^{-3}.
Statement II:	The volume of water to be added to change the molarity of 200 mL 0.5 M aqueous solution to 0.1 M is 800 mL.

1.	Statement I is correct, Statement II is correct
2.	Statement I is incorrect, Statement II is correct
3.	Statement I is correct, Statement II is incorrect
4.	Statement I is incorrect, Statement II is incorrect

13 Two solutions of a substance (non electrolyte) are mixed in the following manner.
480 ml of 1.5 M first solution + 520 mL of 1.2 M second solution. What is the molarity of the final mixture?
1. 1.20 M
2. 1.50 M
3. 1.344 M
4. 2.70 M

**14** Which of the following statements about a compound is incorrect?

1.	A molecule of a compound has atoms of different elements.
2.	A compound cannot be separated into its constituent elements by the physical method of separation.
3.	A compound retains the physical properties of its constituent elements.
4.	The ratio of atoms of different elements in a compound is fixed.

15 Consider the two statements:

Statement I:	Two electrons occupying the same orbital are distinguished by magnetic quantum number.
Statement II:	The energy of the electron in the 3p orbital is less than that in the 4s orbital in the hydrogen.

1.	Statement I is correct, and statement II is correct.
2.	Statement I is incorrect, and statement II is correct.
3.	Statement I is correct, and statement II is incorrect.
4.	Statement I is incorrect, and statement II is incorrect.

16 The shortest wavelength will be there for which of the following transition?
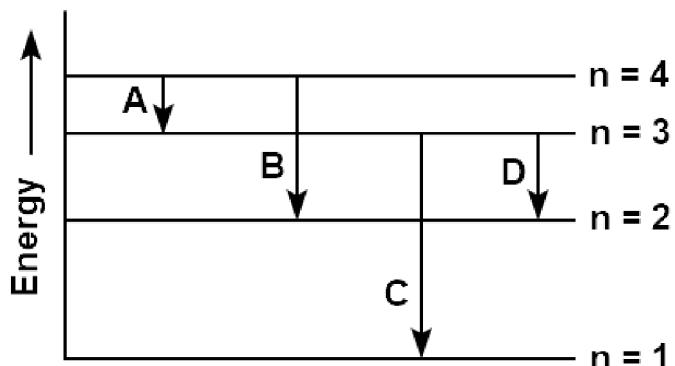
1. Transition A
2. Transition B
3. Transition C
4. Transition D

17 Which of the following is not permissible arrangement of electrons in an atom ?
1. n=4, l=0, m=0, s=-1/2
2. n=5, l=3, m=0, s=+1/2
3. n=3, l=2,m=-3, s=-1/2
4. n=3, l=2, m=-2, s=-1/2

18 The ratio of the wavelengths of the last lines of the Balmer and Lyman series is-
1. 4:1
2. 27:5
3. 3:1
4. 9:4

19 The change in orbit angular momentum corresponding to an electron transition from 4th excited state to the ground state of a hydrogen atom can be given by:

1. $\frac{h}{\pi}$
2. $\frac{3h}{2\pi}$
3. $\frac{h}{2\pi}$
4. $\frac{2h}{\pi}$

20 A 0.66 kg ball is moving with a speed of 100 m/s. The associated wavelength will be
$\left(h = 6.6 \times 10^{-34}\ Js\right)$

1. $6.6 \times 10^{-34} m$
2. $1.0 \times 10^{-35}\ m$
3. $1.0 \times 10^{-32} m$
4. $6.6 \times 10^{-32}\ m$

21 The possible correct set of quantum numbers for the unpaired electron of Cl atom is:

1. $2,\ 0,\ 0,\ +\frac{1}{2}$
2. $2,\ 1,\ -1,\ +\frac{1}{2}$
3. $3,\ 1,\ +1,\ +\frac{1}{2}$
4. $3,\ 0,\ +2,\ \frac{1}{2}$

22 A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368 kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is : [speed of light, $c = 3.0 \times 10^8\ ms^{-1}$]

1. 2192 m
2. 21.92 cm
3. 219.3 m
4. 219.2 m

23 If the threshold wavelength (λ_0) for the ejection of an electron from metal is 330 nm, then the work function for the photoelectric emission is:

1. 1.2×10^{-18} J
2. 1.2×10^{-20} J
3. 6×10^{-19} J
4. 6×10^{-12} J

24 Given below are two statements:

Assertion (A):	The ground state electronic configuration of nitrogen is ⇅ ⇅ ↑ ↑ ↑
Reason (R):	Electrons are filled in orbitals as per the Aufbau principle, Hund's rule of maximum spin multiplicity, and Pauli's principle.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	**(A)** is false but **(R)** is true.

25 Which of the following could be the electronic configuration of an excited oxygen atom?

1. $1s^2 2s^2 2p^4$
2. $1s^2 2s^2 2p^5$
3. $1s^2 2s^2 2p^3 3s^1$
4. $1s^2 2s^2 2p^4 3s^1$

26 What is the value of electron gain enthalpy of Na^+ if IE_1 of Na = 5.1 eV?

1. + 10.2 eV
2. –5.1 eV
3. –10.2 eV
4. + 2.55 eV

27 If an atom has electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$, you will place it in which group?

1. Fifth
2. Fifteenth
3. Second
4. Third

28 According to the periodic law of elements, the variation in properties of elements is related to their :

1. Atomic masses
2. Nuclear mass
3. Atomic numbers
4. Nuclear neutron-proton number ratio

29 The electronegativity of the following elements increases in the order :
1. C, N, Si, P
2. N, Si, C, P
3. Si, P, C, N
4. P, Si, N, C

30 Which of the following is not representative element?
1. Tellurium
2. Tantalum
3. Thallium
4. Astatine

31 Which of the following processes involves absorption of energy?
1. $S(g) + e^- \rightarrow S^-(g)$
2. $S^- + e^- \rightarrow S^{2-}(g)$
3. $Cl(g) + e^- \rightarrow Cl^-(g)$
4. None of the above

32 Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$ the simplest formula for this compound is:
1. Mg_2X_3
2. MgX_2
3. Mg_2X
4. Mg_3X_2

33 Which of the following order is correct as indicated?

1.	$I^- > I > I^+$ (Radii)
2.	$I^- > I > I^+$ (Ionisation energy)
3.	Li^+(aqueous) $< Na^+$(aqueous) $< K^+$(aqueous) (Radii)
4.	$F > Cl > Br > I$ (Electron Affinity)

34 Given below are two statements:

Assertion (A):	Beryllium has more first ionization potential than Boron.
Reason (R):	Boron has a lower electron affinity than beryllium.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

35 Diamagnetic species are those which contain no unpaired electrons. Among the following, diamagnetic species are
(a) N_2
(b) N_2^{2-}
(c) O_2
(d) O_2^{2-}
Choose the correct option
1. (a), (d)
2. (b), (c)
3. (c), (d)
4. (b), (d)

SECTION B

36 The shape of covalent molecule AX_3 is :

1.	Triangular
2.	T-shape
3.	Pyramidal
4.	Any of the above three depending upon the number of lone pairs present in A

37 Favourable conditions for electrovalency are:

1.	Low charge on ions, large cation, small anion.
2.	High charge on ions, small cation, large anion.
3.	High charge on ions, large cation, small anion.
4.	Low charge on ions, small cation, large anion

38 Which of the following is **not** a correct statement?

1.	The electron deficient molecules can act as Lewis acids.
2.	The canonical structures have no real existance.
3.	Every AB_5 molecule does in fact have square pyramidal structure.
4.	Multiple bonds are always shorter than corresponding single bonds.

39 Predict the correct order of repulsions among the following.

1.	lone pair-lone pair > bond pair-bond pair >lone pair-bond pair
2.	bond pair-bond pair> lone pair-bond pair>lone pair-lone pair
3.	lone pair-bond pair > bond pair-bond pair >lone pair-lone pair
4.	lone pair-lone pair> lone pair-bond pair>bond pair-bond pair

40

Assertion (A):	An atomic orbital is monocentric while a molecular orbital is polycentric.
Reason (R):	An electron in an atomic orbital is influenced by one nucleus whereas in a molecular orbital, it is influenced by to or more nuclei depending upon the number of atoms in a molecule.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

41

Assertion (A):	The hybrid orbitals are more effective in forming stable bonds than pure atomic orbitals.
Reason (R):	The number of hybrid orbitals is equal to the number of atomic orbitals that get hybridized.
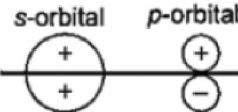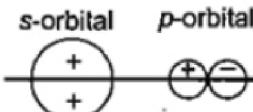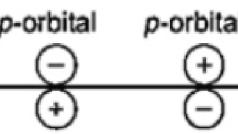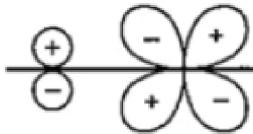
1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

**42** Which of the following leads to bonding orbital?

43 The compound that has zero dipole moment is:

1. NH_3
2. H_2O
3. Benzene
4. NO

44 The pair of species that has identical shapes among the following is:

1. CF_4 , SF_4
2. XeF_2 , CO_2
3. BF_3 , PCl_3
4. PF_5 , IF_5

45 In the following reaction, which of the following most accurately describes the type of bond formed?
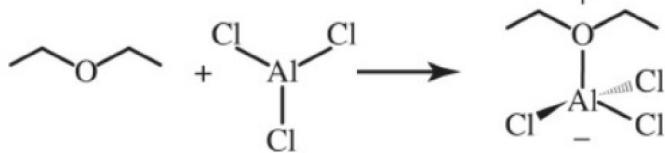
1. Covalent
2. Electrostatic
3. Metallic
4. Coordinate covalent

46 Which of the following gas is least polarizable?

1. He
2. Ne
3. Kr
4. Xe

47 The bond order for a species with the configuration $\sigma 1s^2 \ \sigma * 1s^2 \ \sigma 2s^2 \ \sigma * 2s^2 \ \sigma \rho^1{}_x$ will be:

1. 1
2. $\frac{1}{2}$
3. Zero
4. $\frac{3}{2}$

48 The formal charge on nitrogen in NO_3^- is

1. -1
2. +1
3. +5
4. -3

49 In the anion HCOO⁻ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it?

1.	Electronic orbits of the carbon atom are hybridized
2.	The C = O bond is weaker than the C - O bond
3.	The anion HCOO⁻ has two resonating structures
4.	The anion is obtained by removal of a proton from the acid molecule

50 Identify the correct statement regarding SF$_4$:

1.	It has one lone pair at the equatorial position with two lone pair-bond pair repulsion at 90°.
2.	It has one lone pair at the axial position with two lone pair-bond pair repulsion at 90°.
3.	It has one lone pair at the equatorial position with three lone pair-bond pair repulsion at 90°
4.	It has one lone pair at the axial position with three lone pair-bond pair repulsion at 90°

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