

PART (B) : CHEMISTRY**SECTION-I : (SINGLE CHOICE QUESTIONS)**

This section contains **05 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

19. The electrons identified by quantum numbers 'n' and 'l':
 (I) $n = 5, l = 1$ (II) $n = 5, l = 0$ (III) $n = 4, l = 2$ (IV) $n = 4, l = 1$
 Can be placed in order of increasing energy as:
 (A) III < IV < II < I (B) IV < II < III < I
 (C) II < IV < I < III (D) I < III < II < IV
19. **(B)**
 Using $(n + l)$ Rule.
20. Dissolving 180 g of glucose (Mol. Wt. = 180) in 1000g of water gave a solution of density 1.15 g/mL. The molarity of the solution is:
 (A) 1.78 M (B) 2.00 M (C) 0.97 M (D) 1.11M
20. **(C)**
21. In which of the following pair, both the species are isoelectronic but the first one is large in size than the second?
 (A) S^{2-}, O^{2-} (B) Cl^-, S^{2-} (C) F^-, Na^+ (D) N^{3-}, P^{3-}
21. **(C)**
 Among the isoelectronic species higher the atomic number smaller the size.
22. There are 201 equidistance rows of spectators sitting in a hall. A magician releases laughing gas, N_2O from the front and tear gas (Mol wt = 176) from the rear of the hall simultaneously. The distance of magician from front row is equal to distance between rows. Which row spectators will have a tendency to smile and weep simultaneously? (Assume the last row is touching the wall).
 (A) 130 (B) 120 (C) 160 (D) 134
22. **(D)**
23. C_3^{4-} has
 (A) two σ and two π bond (B) three σ and one π bond
 (C) two σ and one π bond (D) two σ and three π bond
23. **(A)**

SECTION-II : (MULTIPLE CHOICE QUESTIONS)

This section contains **08 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE than one is/are correct**.

24. Dalton's law of partial pressure will apply to which of the following mixture of gases at room temperature
 (A) H_2 and O_2 (B) NH_3 and HCl (C) H_2 and CO_2 (D) N_2 and H_2
24. **(ACD)**

NH₃ and HCl directly react to form NH₄Cl.

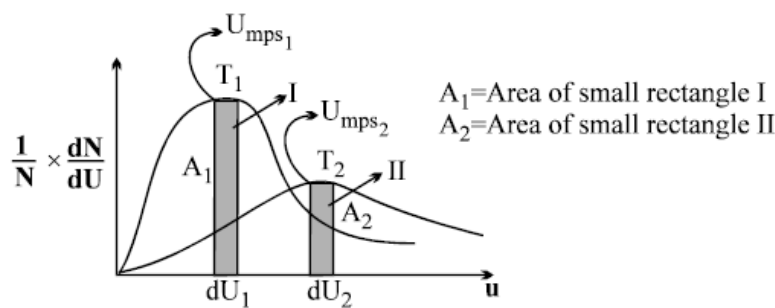
25. A gas expands such that its initial and final temperature is equal. Also, the process followed by the gas traces a straight line on the P-V diagram:
- (A) The temperature of the gas remains constant throughout.
 (B) The temperature of the gas first increases and then decreases
 (C) The temperature of the gas first decreases and then increases
 (D) The straight line has a negative slope.

25. **(BD)**

If in a P-V curve temperature is throughout constant then a rectangular hyperbola is formed. Since it'

26. Following represents the Maxwell distribution curve for an ideal gas at two temperatures T₁ & T₂. Which of the following option(s) are true?

$$\frac{1}{N} \times \frac{dN}{dU} = 4\pi \left[\frac{M}{2\pi RT} \right]^{\frac{3}{2}} U^2 e^{\left[\frac{-MU^2}{2RT} \right]}$$



- (A) Total area under the two curves is independent of moles of gas
 (B) If $dU_1 = f U_{mps1}$ & $dU_2 = f U_{mps2}$ then $A_1 = A_2$
 (C) $T_1 > T_2$ and hence higher the temperature, sharper the curve
 (D) The fraction of molecules having speed = U_{mps} decreases as temperature increases

26. **(ABD)**

27. Which is/are in linear shape?

(A) NO₂⁺ (B) XeF₂ (C) I₃⁻ (D) I₃⁺

27. **(ABC)**

NO₂⁺ = sp hybridized

XeF₂ = sp³d hybridized (Bond.p. =2, l.p =3)

I₃⁻ = sp³d hybridized (Bond.p. =2, l.p =3)

I₃⁺ = sp³ hybridized (bond pair = 2, l.p.= 2, V-shaped)

28. Select the correct statement.

- (A) Perxenate ion is [XeO₆]⁴⁻ with octahedral geometry
 (B) XeF₂ is linear molecule with 3 lone pairs (l.p) on central atom
 (C) XeOF₄, XeF₄, XeO₂F₂ all contains one lone pairs (l.p) on central atom
 (D) None of these

28. **(AB)**

29. The atomic masses of He and Ne are 4 and 20 a.m.u. respectively. The value of de Broglie wavelength of He gas at -73°C is M times that of the Broglie wavelength of Ne at 727°C . M is
- (A) 5 (B) $\frac{1}{5}$ (C) $\sqrt{5}$ (D) $\frac{1}{\sqrt{5}}$

29. (A)

30. Which of the following order is(are) correct for size :
- (A) $\text{Al} \cong \text{Ga}$ (B) $\text{Te}^{-2} > \Gamma > \text{Cs}^+ > \text{Ba}^{+2}$
 (C) $\text{Cr}^{+3} < \text{Cr}^{+6}$ (D) $\text{Pd} \cong \text{Pt}$

30. (ABD)

$\text{Al} \cong \text{Ga}$; because of poor shielding by 3d orbital.

$\text{Te}^{-2} > \Gamma > \text{Cs}^+ > \text{Ba}^{+2}$; (isoelectronic species)

$\text{Pd} \cong \text{Pt}$ (Lanthanide contraction)

31. Number of electrons having $(n + l + m) = 4$ in ${}_{26}\text{Fe}$ may have values:
- (A) 6 (B) 7 (C) 8 (D) 9

31. (BC)

n	l	m	no. of electrons
4	0	0	2
3	1	0	2
3	2	-1	1 or 2
2	1	1	2

Total = 7 or 8

SECTION-III : (INTEGER CORRECT TYPE)

This section contains **05 Questions**. The answer to each question is a **Single digit integer**, ranging from 0 to 9 (both inclusive)

32. An organic compound contains C, H and O atoms. One molecule of the compound contains H-atoms equal to 66.67% of total atoms and mass ratio of C to O is 3:2. If the molecular formula of the compound is $\text{C}_x\text{H}_y\text{O}_z$, what is the value of $x + y + z$. (Given: Vapour density of compound is 23).

32. (9)

Mass ratio of C : O is 3 : 2

Hence, ratio of no of atoms of C and O is 2 : 1.

	C	H	O
No of atoms	2a	b	a (b=6a from given information)
	2a	6a	a

Therefore Empirical Formula is $\text{C}_2\text{H}_6\text{O}$.

Empirical Wt = 46

M. Wt = 46 (since V.D. = 23)

Hence, Empirical Formula is same as molecular formula.

33. In a sample, one H atom is in 1st excited state; two He^+ ions are in IInd excited state and three Li^{2+} ions are in IIIrd excited state. Find the maximum number of spectral lines which can be obtained.

33. (9)

No line is common so simply count no of lines in each case and take sum.

- 34.** Calculate the maximum total number of electrons in Gallium, with spin $+\frac{1}{2}$ and which occupy orbitals having minimum one radial node.

34. (7)

${}_{31}\text{Ga} = 1s^2,$	$2s^2$	$2p^6,$	$3s^2$	$3p^6$	$3d^{10},$	$4s^2$	$4p^1$
R.Node 0	1	0	2	1	0	3	2
No of e -	1	-	1	3	-	1	1

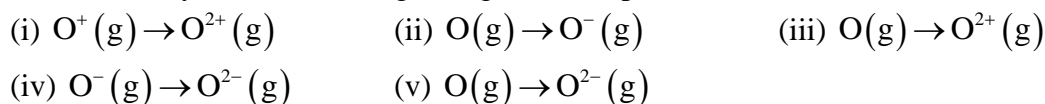
Total no of electrons having $s = +\frac{1}{2}$ and at least one R. Node = 7

- 35.** Among the following how many species have sp^3 hybridized central atom:
 $\text{BeCl}_2(\text{s})$, BF_3 , dimer of AlCl_3 , H_2SO_4 , CF_4 , SF_4 , SOCl_2 , XeF_2 , cation of solid PCl_5 , anion of solid PCl_5 , H_2CO_3 .

35. (6)

$\text{BeCl}_2(\text{s})$, dimer of AlCl_3 , H_2SO_4 , CF_4 , SOCl_2 , cation of solid PCl_5 .

- 36.** For how many of the following changes, ΔH is positive?



36. (4)