PLUS ONE BOARD EXAM 2026-
CHEMISTRY Answer key (Preliminary version)

Section 1: 1 Score Each (Answer any 4 from 1–5)

1. **Significant Figures:** 0.04597 g has **4** significant figures.
2. **Electronegativity:** The element with the highest electronegativity is **Fluorine (F)**.
3. **Lewis Structure:** The incorrect structure is **(c)**; N_2 requires a triple bond (: $N \equiv N$:).
4. **Equilibrium Constant (K_c):** Depends only on **(a) temperature**.
5. **Structural Formula:** But-2-en-1-ol is $CH_3 - CH = CH - CH_2OH$.

Section 2: 2 Scores Each (Answer any 8 from 6–15)

6. **Combustion Calculation:** 16 g of CH_4 produces 44 g of CO_2. For 96 g of CH_4, the mass of CO_2 produced is $(\frac{44}{16}) \times 96 = \mathbf{264}$ g.
7. **Bohr Radius:** $r_n = a_0 \times n^2$. For $n = 3$: $52.9 \times 3^2 = 52.9 \times 9 = \mathbf{476.1}$ pm.
8. **(i)** The correct configuration for Carbon is **(b)** $1s^2 2s^2 2p_x^1 2p_y^1$. **(ii)** The P_x orbital has a **dumbbell shape** oriented along the x-axis.
9. **H-Bonding: Intermolecular** (between different molecules, e.g., H_2O) and **Intramolecular** (within the same molecule, e.g., o-nitrophenol).
10. **Functions: State functions:** Internal energy, Gibbs energy. **Path functions:** Heat, work.
11. **Common Ion Effect:** The suppression of the degree of dissociation of a weak electrolyte by the addition of a strong electrolyte containing a common ion.
12. **Disproportionation:** A redox reaction where the same element is simultaneously oxidized and reduced, such as $2H_2O_2 \rightarrow 2H_2O + O_2$.
13. **Sulphur Detection:** Sodium fusion extract is treated with sodium nitroprusside; a **violet coloration** confirms the presence of sulphur.
14. **Aromaticity:** According to Huckel's rule, **I (Benzene)** and **II (Naphthalene)** are aromatic.
15. **Organic Reactions: (a)** Toluene ($C_6H_5CH_3$). **(b)** n-Butane (C_4H_{10}).

Section 3: 3 Scores Each (Answer any 8 from 16–26)

16. **Definitions: (i) amu:** $1/12$th the mass of a C-12 atom. **(ii) Limiting reagent:** The reactant consumed first in a reaction. **(iii) Molarity:** Moles of solute per litre of solution.
17. **Photoelectric Effect:** Kinetic energy of emitted electrons depends on light frequency; the number of electrons emitted depends on light intensity.
18. **Ionization Enthalpy: (i)** Decreases down a group as atomic size increases. **(ii) (a) Be** has the highest 1st IE; **(b) Ca** has the most metallic character.

19. **Electron Gain Enthalpy: (i)** Enthalpy change when an electron is added to a gaseous atom. **(ii) Cl** is more negative than F because F's small size leads to inter-electronic repulsions.
20. N_2 **Molecule:** Configuration: $[\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 (\pi 2p_x^2 = \pi 2p_y^2) \sigma 2p_z^2]$. **Bond Order = 3**; **Diamagnetic**.
21. **Enthalpy of Formation (CH_4):** Using Hess's Law: $\Delta_f H = \Delta H(CO_2) + 2\Delta H(H_2O) - \Delta H(\text{combustion})$. Calculation: $-393 + 2(-286) - (-890) = \mathbf{-75}\ \text{kJ/mol}$.
22. **Buffers:** Solutions that resist pH change. **Acidic:** $CH_3COOH + CH_3COONa$. **Basic:** $NH_4OH + NH_4Cl$.
23. **Redox Balance:** $2MnO_4^- + I^- + H_2O \rightarrow 2MnO_2 + IO_3^- + 2OH^-$ (in basic medium).
24. **Metamers ($C_4H_{10}O$):** Ethoxyethane ($C_2H_5OC_2H_5$) and 1-Methoxypropane ($CH_3OCH_2CH_2CH_3$).
25. **Ethane Conformations: Staggered** is more stable than eclipsed because it has minimum torsional strain.
26. **Propene Reactions: (i)** Propane ($CH_3CH_2CH_3$). **(ii)** Ethanal (CH_3CHO) and Methanal ($HCHO$).

Section 4: 4 Scores Each (Answer any 4 from 27–31)

27. **Quantum Numbers:** n (shell size/energy), l (orbital shape), m_l (orientation), m_s (electron spin).
28. **VSEPR Theory: Postulates:** Shape depends on electron pairs; lone pair repulsions are stronger than bond pair repulsions. **Shapes:** BF_3 (Trigonal Planar), NH_3 (Pyramidal), H_2O (Bent).
29. **Thermodynamics: (i) (a) Enthalpy (H):** Heat content; **(b) Entropy (S):** Randomness. **(ii)** Spontaneous processes occur without external aid; for these, $\Delta G < 0$.
30. **Equilibrium: (i)** High pressure and low temperature favor NH_3 formation (forward reaction). **(ii)** $pH = -\log[0.02] = \mathbf{1.699}$.
31. **Organic Effects: (a) Electromeric:** Temporary displacement of π-electrons. **(b) Inductive:** Permanent displacement of σ-electrons. **(ii)** Homolytic fission forms free radicals; heterolytic fission forms ions.