NEET 2026 (3 May, cancelled) — Chemistry Question Paper with Solutions

41 Chemistry questions as set in the paper · answers checked by RankUp

NEET 2026 (3 May, cancelled)

1. Select the reagents that reduce nitriles to primary amines.

A. (i) $LiAlH_4$; (ii) H_2O

B. Sn + HCl

C. H_2/Ni

D. Na(Hg)/C_2H_5OH

E. Br_2/aq. NaOH

Choose the correct answer from the options given below.

(A) B, D and E only

(B) A, C and D only

(C) A, D and E only

(D) A, B and C only

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2. Match List I with List II :

List I (Transition metal/compound/complex) — List II (Catalytic Role)

A. V_2O_5 — I. Preparation of ammonia from N_2/H_2 mixture

B. Fe — II. Polymerisation of alkynes

C. $PdCl_2$ — III. Preparation of H_2SO_4 and SO_2

D. Ni complex — IV. Oxidation of ethyne to ethanal

Choose the correct answer from the options given below.

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

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

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

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

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3. Consider the following reaction :

$2A(g) + B(g) \rightarrow 2D(g)$

$\Delta U^\circ = -10$ kJ mol^{-1} and $\Delta S^\circ = -44$ J K^{-1} at 298 K.

Identify the correct option with ΔG° for the reaction and spontaneity of the reaction at 298 K.

(Given : R = 8.31 J mol^{-1} K^{-1})

(A) -1.635 kJ mol^{-1}, spontaneous

(B) -0.63568 kJ mol^{-1}, spontaneous

(C) $+0.63568$ kJ mol^{-1}, non-spontaneous

(D) $+1.635$ kJ mol^{-1}, non-spontaneous

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4. Match List I with List II :

List I (Quantum Numbers 'n', 'l') — List II (Orbital)

A. n = 2, l = 1 — I. 3d

B. n = 4, l = 0 — II. 2p

C. n = 5, l = 3 — III. 4s

D. n = 3, l = 2 — IV. 5f

Choose the correct answer from the options given below.

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

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

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

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

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5. In a qualitative analysis, Bi^{3+} is detected by appearance of precipitate of BiO(OH)(s). Calculate pH when the following equilibrium exists at 298 K.
$BiO(OH)(s) \rightleftharpoons BiO^{+}(aq) + OH^{-}(aq)$, $K = 4 \times 10^{-10}$
(Given : log 2 = 0.3010)

(A) 8.714
(B) 4.699
(C) 5.286
(D) 9.301

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6. The correct statement with regard to the secondary structure of DNA/RNA is

(A) RNA possesses a single strand helix structure and contains thymine as one of the four bases
(B) DNA possesses a double strand helix structure and contains thymine as one of the four bases
(C) RNA possesses a double strand helix structure and contains uracil as one of the four bases
(D) DNA possesses a single strand helix structure and contains uracil as one of the four bases

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7. The pair of molecules that are metamers among the following is :

(A) $CH_3CH_2CH_2OH$ and $CH_3–CH(OH)–CH_3$
(B) $CH_3CH_2CH_2CH_2CH_3$ and $(CH_3)_2CHCH_2CH_3$
(C) CH_3COCH_3 and CH_3CH_2CHO
(D) $CH_3OCH_2CH_2CH_3$ and $CH_3CH_2OCH_2CH_3$

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8. Match List I with List II :
List-I (Complex) — List-II (Type of isomerism)
A. $[Pt(NH_3)_2Cl_2]$ — I. Optical
B. $[Co(en)_3]^{3+}$ — II. Solvate
C. $[Co(NH_3)_5NO_2]Cl_2$ — III. Geometrical
D. $[Cr(H_2O)_6]Cl_3$ — IV. Linkage
Choose the correct answer from the options given below :

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

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9. Match List I with List II :
List-I (Order of reaction) — List-II (Unit of rate constant)
A. Zero order — I. $mol^{-1}\ L\ s^{-1}$
B. First order — II. $mol^{-2}\ L^{2}\ s^{-1}$
C. Second order — III. s^{-1}
D. Third order — IV. $mol\ L^{-1}\ s^{-1}$
Choose the correct answer from the options given below :

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

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10. The correct IUPAC name of the following compound is :
$CH_3–CH_2–CH(CH_2CH_3)–CH_2–CH(CH_3)–CH_2–CH_3$

(A) 3-ethyl-5-methylheptane
(B) 2,4-diethylhexane
(C) 3-methyl-5-ethylheptane
(D) 3,5-diethylhexane

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11. A bulb is rated at 150 watt, converting 8% energy into light. If energy of one photon is 4.42×10^{-19} J, how many photons are emitted by the bulb per second?

(A) 2.71×10^{19}
(B) 4.06×10^{19}
(C) 27.2×10^{19}
(D) 1.35×10^{19}

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12. Methane reacts with steam at 1273 K in the presence of nickel catalyst to form :

(A) CO and H_2O
(B) CO_2 and H_2
(C) CO and H_2
(D) CO_2 and H_2O

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13. Match List I with List II :

List-I — List-II

A. C_2H_4 — I. 3σ bonds, 2π bonds
B. C_2H_2 — II. 3σ bonds, one lone pair
C. CH_4 — III. 4σ bonds
D. NH_3 — IV. 5σ bonds, 1π bond

Choose the correct answer from the options given below :

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

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14. The following two reactions give the same foul smelling product Z.

C_2H_5Cl —X→ Z
$C_2H_5CONH_2$ —Br_2, NaOH→ Y —$CHCl_3$/ethanolic KOH, Δ→ Z

X and Z, respectively, are :

(A) X = AgCN; Z = C_2H_5NC
(B) X = KCN; Z = C_2H_5CN
(C) X = AgCN; Z = C_2H_5CN
(D) X = KCN; Z = C_2H_5NC

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15. The number of hydrogen atoms present in 5.4 g of urea is:
(Given: Molar mass of urea : 60 g mol^{-1}
N_A : 6.022×10^{23} particles mol^{-1})

(A) 1.084×10^{23}
(B) 1.084×10^{22}
(C) 2.168×10^{22}
(D) 2.168×10^{23}

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16. Identify the incorrect statement from the following:

(A) Nitrogen can form pπ–pπ multiple bonds with itself.
(B) $P(C_2H_5)_3$ and $As(C_6H_5)_3$ form dπ–dπ bond with transition metals.
(C) Phosphorus, arsenic and antimony show catenation property.
(D) Nitrogen can form dπ–pπ bond with oxygen.

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17. Which one of the following is an ambidentate ligand?

(A) Ethane-1,2-diamine
(B) Ethylenediaminetetraacetate ion
(C) Thiocyanate
(D) Oxalate

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18. The correct order of increasing metallic character of Na, Be, P, Mg and Si is

(A) P < Si < Be < Mg < Na
(B) P < Si < Na < Mg < Be
(C) P < Mg < Be < Si < Na
(D) Be < Si < P < Mg < Na

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19. Match List I with List II:

List I (Conversion) — List II (Reagents)

A. Cumene, $C_6H_5CH(CH_3)_2$ → Phenol — I. (i) Oleum; (ii) NaOH, Δ; (iii) H^+

B. CH_3COOH → CH_3CH_2OH — II. (i) O_2; (ii) H_3O^+/H^+

C. $CH_3CH_2CH_2OH$ → CH_3–$CH(OH)$–CH_3 — III. (i) CH_3OH, H^+; (ii) H_2, catalyst

D. Benzene → Phenol — IV. (i) conc. H_2SO_4, Δ; (ii) H^+/H_2O

Choose the correct answer from the options given below :

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

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20. Although +3 oxidation state is most common in lanthanoids, cerium still shows +4 oxidation state because:

(A) After losing one more electron, it acquires $4f^{14}$ electronic configuration.
(B) Its nearest inert gas is Radon.
(C) Its atomic number is 61.
(D) After losing one more electron, it acquires $4f^0$ electronic configuration.

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21. In the following reaction sequence, X and Z respectively are :

$CH_3CH_2CH_2$–OH + PCl_5 → $CH_3CH_2CH_2Cl$ + X + HCl

$CH_3CH_2CH_2Cl$ —alc. KOH, Δ→ Y

Y —HBr, $(C_6H_5CO)_2O_2$→ Z

(A) X = $POCl_3$; Z = CH_3–$CH(Br)$–CH_3
(B) X = $POCl_3$; Z = $CH_3CH_2CH_2$–Br
(C) X = H_3PO_3; Z = CH_3–$CH(Br)$–CH_3
(D) X = H_3PO_3; Z = $CH_3CH_2CH_2$–Br

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22. Match List I with List II :

List I (Complex/ion) — List II (Shape/geometry)

A. $[Pt(Cl_2)(NH_3)_2]$ — I. Octahedral

B. $[Co(NH_3)_6]Cl_3$ — II. Trigonal bipyramidal

C. $[NiCl_4]^{2-}$ — III. Square planar

D. $[Fe(CO)_5]$ — IV. Tetrahedral

Choose the correct answer from the options given below :

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

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23. The functional group that can be identified through phthalein dye test is :

(A) Aldehyde
(B) Phenolic
(C) Carboxylic acid
(D) Alcohol

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24. Two products X and Y are formed in the following reaction sequence.
Benzene + CH_3Cl —Anhydr. $AlCl_3$→ W —dil. HNO_3 + dil. H_2SO_4, warm→ X + Y
The suitable method that can be used for the separation of products X and Y is :

(A) Fractional distillation
(B) Sublimation
(C) Differential extraction
(D) Continuous extraction

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25. Identify the correct statements :
(A) The molality of 2.5 g of ethanoic acid (Molar mass : 60 g mol^{-1}) in 75 g of benzene solution is 0.556 m.
(B) The molarity of a solution containing 5 g of NaOH (molar mass : 40 g mol^{-1}) in 450 mL of solution is 0.278 M at 298 K.
(C) Aquatic species are more comfortable in cold water.
(D) The solubility of gas increases with decrease in pressure.
(E) For a binary mixture of A and B, the number of moles of A and B are n_A and n_B respectively. The mole fraction of B will be x_B = n_A/(n_A + n_B).
Choose the correct answer from the options given below :

(A) A, B and C only
(B) A and B only
(C) A and C only
(D) A, D and E only

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26. During Lassaigne's test, the elements present in an organic compound are converted from :

(A) Ionic form to ionic form
(B) Covalent form to ionic form
(C) Covalent form to covalent form
(D) Ionic form to covalent form

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27. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5 amperes. The mass of copper deposited at cathode is :
(Given : Molar mass of Cu = 63 g mol^{-1}; 1 F = 96487 C mol^{-1})

(A) 1.7018 g
(B) 0.2938 g
(C) 2.4036 g
(D) 0.5876 g

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28. At a certain temperature, T(K), during a process, 500 J is absorbed by the system and work of 200 J is done by the system. Then change in internal energy of the system is :

(A) 400 J
(B) 300 J
(C) 700 J
(D) 500 J

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29. Identify the correct statement about ClF_3 from the following options :

(A) It has T-shaped geometry with two lone pairs on Cl atom.
(B) It has T-shaped geometry with three lone pairs on Cl atom.
(C) It has a trigonal pyramidal geometry with two lone pairs on Cl atom.
(D) It has a planar trigonal geometry with two lone pairs on Cl atom.

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30. In a test tube containing a salt, a few drops of dilute H_2SO_4 was added, which gave colourless vapours having the smell of vinegar. The vapours turned the blue litmus paper red.
Identify the correct anion from the following :

(A) Sulphide, S^{2-}
(B) Sulphate, SO_4^{2-}
(C) Acetate, CH_3COO^-
(D) Carbonate, CO_3^{2-}

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31. At 298 K, a certain buffer solution contains equal concentrations of X^- and HX. K_b for X^- is 10^{-10}. What is the pH of this buffer solution?

(A) 2
(B) 4
(C) 6
(D) 10

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32. The calculated 'spin-only' magnetic moment of Ti^{2+} ($3d^2$) is :

(A) 5.92 BM
(B) 3.87 BM
(C) 2.84 BM
(D) 4.90 BM

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33. Identify the incorrect statement from the following:

(A) Carbon has the ability to form pπ–pπ multiple bond with itself.
(B) ECl_3 (E = B and Al) is a monomer when E = B and a dimer when E = Al.
(C) The order of catenation property of Group 14 elements is C ≫ Si > Ge ≈ Sn.
(D) Oxygen exhibits only -2 oxidation state.

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34. Phenolphthalein is used as an indicator for the titration of sodium hydroxide solution against a standard solution of oxalic acid. The colour change that is observed at an alkaline pH close to the equivalence point during this titration is:

(A) pinkish red to yellow
(B) yellow to pinkish red
(C) pink to colourless
(D) colourless to pink

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35. When 1 dm^3 of CO_2 gas is passed over hot coke the volume of gaseous mixture after complete reaction at STP becomes 1.4 dm^3. The composition of the gaseous mixture at STP is :

(A) 0.8 dm^3 of CO, 0.8 dm^3 of CO_2
(B) 0.8 dm^3 of CO, 0.6 dm^3 of CO_2
(C) 0.6 dm^3 of CO, 0.8 dm^3 of CO_2
(D) 0.6 dm^3 of CO, 0.4 dm^3 of CO_2

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36. The major product Z formed in the following sequence of reactions is
C_2H_6 —Cl_2, UV light→ X (monochlorinated product) —NH_3→ Y —(i) $NaNO_2$, HCl; (ii) H_2O→ Z

(A) $C_2H_5NO_2$
(B) C_2H_5–N=N–OH
(C) C_2H_5OH
(D) $C_2H_5NH_2$

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37. Given below is an expression for the rate constant of a first-order reaction occurring at a certain temperature, T(K).
$\ln k = 14.34 - (1.25 \times 10^4)/T$
The energy of activation in kcal mol^{-1} for the reaction is :
(Given: k in s^{-1}, R = 1.987 cal mol^{-1} K^{-1})

(A) 24.84
(B) 14.34
(C) 18.63
(D) 12.42

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38. Given below are certain reactions. Identify the reaction for which $K_P \neq K_C$.

(A) $H_2O(g) + CO(g) \rightleftharpoons H_2(g) + CO_2(g)$
(B) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(C) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(D) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

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39. Identify the incorrect statement from the following :

(A) The largest and the smallest species among Mg, Mg^{2+}, Al and Al^{3+} are Al and Mg^{2+} respectively.
(B) The IUPAC name of the element with atomic number 107 is Unnilseptium.
(C) The similarity in behaviour of Li with Mg is referred to as 'diagonal relationship'
(D) The oxidation state and covalency of Al in $[AlCl(H_2O)_5]^{2+}$ are 3 and 6, respectively.

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40. Mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law due to :

(A) Increase in escaping tendency of molecules of each component.
(B) Formation of hydrogen bonding between acetone and chloroform
(C) Stronger intermolecular forces between chloroform molecules than those between chloroform and acetone molecules.
(D) Repulsive forces.

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41. The number of chlorine atoms present in the organic products X and Y of the following reactions, respectively, are :
Benzene + $6Cl_2$ —Anhydr. $AlCl_3$, dark, cold→ X
Benzene + $3Cl_2$ —UV, 500 K→ Y

(A) 3 and 3
(B) 6 and 3
(C) 6 and 6
(D) 3 and 6

Answer key and explanations

1. Answer: (B) A, C and D only

Nitriles are reduced to primary amines by $LiAlH_4$ followed by hydrolysis, by catalytic hydrogenation with H_2/Ni, and by sodium amalgam in ethanol (Mendius reduction). Sn + HCl is the reagent for reducing nitro compounds, and Br_2/aq. NaOH brings about the Hofmann degradation of amides, so neither of these belongs in the set.

2. Answer: (D) A-III, B-I, C-IV, D-II

V_2O_5 is the catalyst of the contact process for sulphuric acid, finely divided iron catalyses the Haber synthesis of ammonia, $PdCl_2$ is the Wacker-process catalyst for oxidation to ethanal, and nickel complexes catalyse the polymerisation of alkynes. Pairing iron with the ethanal oxidation is the common slip.

3. Answer: (C) +0.63568 kJ mol^{-1}, non-spontaneous

$\Delta n(g) = 2 - 3 = -1$, so $\Delta H^\circ = \Delta U^\circ + \Delta n(g)RT = -10000 - 8.31 \times 298 = -12476$ J. Then $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ = -12476 - 298 \times (-44) = -12476 + 13112 = +636$ J $\approx +0.636$ kJ mol^{-1}; a positive ΔG° means non-spontaneous. Using ΔU° directly in place of ΔH° gives the wrong value of about +3.1 kJ, and forgetting the sign of $T\Delta S^\circ$ gives the negative values.

4. Answer: (C) A-II, B-III, C-IV, D-I

l = 0, 1, 2, 3 correspond to s, p, d, f, and n gives the shell number. So (2, 1) is 2p, (4, 0) is 4s, (5, 3) is 5f and (3, 2) is 3d. The other combinations mismatch either the shell or the subshell letter.

5. Answer: (D) 9.301

$K = [BiO^+][OH^-] = x^2 = 4 \times 10^{-10}$, so $[OH^-] = 2 \times 10^{-5}$ M. pOH = 5 − log 2 = 4.699 and pH = 14 − 4.699 = 9.301. Reporting 4.699 mistakes pOH for pH.

6. Answer: (B) DNA possesses a double strand helix structure and contains thymine as one of the four bases

DNA is a double helix whose bases are adenine, guanine, cytosine and thymine. RNA is single-stranded and has uracil in place of thymine, so the statements giving RNA thymine or a double strand, or DNA uracil or a single strand, are wrong.

7. Answer: (D) $CH_3OCH_2CH_2CH_3$ and $CH_3CH_2OCH_2CH_3$

Metamers have the same functional group but different alkyl groups on either side of it. Methyl propyl ether and diethyl ether are both $C_4H_{10}O$ ethers differing only in the groups on oxygen. The two propanols are position isomers, the pentanes are chain isomers, and propanone/propanal are functional isomers.

8. Answer: (D) A-III, B-I, C-IV, D-II

Square planar $[Pt(NH_3)_2Cl_2]$ exists as cis and trans forms (geometrical); $[Co(en)_3]^{3+}$ has non-superimposable mirror images (optical); NO_2^- can bind through N or O (linkage); and $[Cr(H_2O)_6]Cl_3$ has hydrate (solvate) isomers such as $[Cr(H_2O)_5Cl]Cl_2{\cdot}H_2O$. Swapping the linkage and solvate pairings is the main trap.

9. Answer: (B) A-IV, B-III, C-I, D-II

The unit of k is $(\text{mol L}^{-1})^{1-n}\ \text{s}^{-1}$. For n = 0 this is mol L^{-1} s^{-1}, for n = 1 it is s^{-1}, for n = 2 it is mol^{-1} L s^{-1} and for n = 3 it is mol^{-2} L^2 s^{-1}. Interchanging the second- and third-order units is the usual error.

10. Answer: (A) 3-ethyl-5-methylheptane

The longest chain has seven carbons, with an ethyl group and a methyl group on C-3 and C-5 whichever end is chosen. With a tie in locants, the substituent first in alphabetical order (ethyl) gets the lower number, giving 3-ethyl-5-methylheptane. The hexane names use a chain that is not the longest, and '3-methyl-5-ethyl' breaks the alphabetical rule.

11. Answer: (A) 2.71×10^{19}

Light power = 8% of 150 W = 12 J s^{-1}. Photons per second = 12 / $(4.42 \times 10^{-19}) = 2.71 \times 10^{19}$. Using the full 150 W would give about 3.4×10^{20}, ten times larger than any sensible choice.

12. Answer: (C) CO and H_2

Steam reforming: $CH_4 + H_2O \rightarrow CO + 3H_2$ over Ni at about 1270 K, giving water gas (syngas). CO_2 and H_2 arise only in the later water-gas shift step with more steam, and $CO_2 + H_2O$ are combustion products.

13. Answer: (B) A-IV, B-I, C-III, D-II

Ethene has four C–H and one C–C σ bond plus one π bond (5σ, 1π); ethyne has two C–H and one C–C σ bond plus two π bonds (3σ, 2π); methane has 4σ bonds; ammonia has 3σ bonds and one lone pair on N. Swapping the ethene and ethyne counts is the main trap.

14. Answer: (A) X = AgCN; Z = C_2H_5NC

Hofmann bromamide degradation of propanamide gives ethylamine (Y), and the carbylamine reaction converts it into ethyl isocyanide, C_2H_5NC, the foul-smelling product. Ethyl chloride gives the isocyanide with the covalent AgCN (attack through N), whereas ionic KCN gives the nitrile C_2H_5CN.

15. Answer: (D) 2.168×10^{23}

Moles of urea = 5.4/60 = 0.09 mol; each NH_2CONH_2 has 4 H atoms, so H = 0.36 mol = $0.36 \times 6.022 \times 10^{23} = 2.168 \times 10^{23}$ atoms. Counting only 2 H per molecule gives 1.084×10^{23}.

16. Answer: (D) Nitrogen can form dπ–pπ bond with oxygen.

Nitrogen has no d orbitals in its valence shell, so it cannot form dπ–pπ bonds; its multiple bonds are pπ–pπ, as in N≡N. The heavier group 15 elements can use d orbitals (dπ–dπ bonding of phosphines/arsines with metals) and do show some catenation, so those statements are correct.

17. Answer: (C) Thiocyanate

An ambidentate ligand has two different donor atoms but binds through only one at a time; SCN^- can bind through S (thiocyanato) or N (isothiocyanato). Ethane-1,2-diamine and oxalate are bidentate and EDTA is hexadentate, all binding through several atoms at once.

18. Answer: (A) P < Si < Be < Mg < Na

Metallic character decreases across a period and increases down a group. In period 3, P < Si < Mg < Na, and Be lies above Mg so it is less metallic than Mg but more metallic than the metalloid Si: P < Si < Be < Mg < Na. Placing Be as the most metallic reverses the group trend.

19. Answer: (B) A-II, B-III, C-IV, D-I

Cumene is oxidised by air to its hydroperoxide, which acid cleaves to phenol. Acetic acid is esterified with methanol and the ester is hydrogenated to ethanol. Propan-1-ol is dehydrated by hot conc. H_2SO_4 to propene, and acid-catalysed hydration (Markovnikov) gives propan-2-ol. Benzene is sulphonated with oleum and the sulphonate fused with NaOH, then acidified, to give phenol.

20. Answer: (D) After losing one more electron, it acquires $4f^0$ electronic configuration.

Ce^{3+} is $4f^1$; losing one more electron gives Ce^{4+} with the empty $4f^0$ configuration (noble gas core of xenon), which is especially stable. Cerium's atomic number is 58, not 61, and its noble-gas core is xenon, not radon; $4f^{14}$ applies to Yb^{2+}/Lu^{3+}.

21. Answer: (B) X = $POCl_3$; Z = $CH_3CH_2CH_2$–Br

PCl_5 converts an alcohol to the chloride with $POCl_3$ and HCl as by-products (H_3PO_3 comes from PCl_3). Alcoholic KOH dehydrohalogenates 1-chloropropane to propene, and HBr in the presence of benzoyl peroxide adds anti-Markovnikov (peroxide effect), giving 1-bromopropane rather than 2-bromopropane.

22. Answer: (B) A-III, B-I, C-IV, D-II

Pt(II) (d^8) complexes are dsp^2 square planar; $[Co(NH_3)_6]^{3+}$ is d^2sp^3 octahedral; with the weak-field Cl^- ligand, $[NiCl_4]^{2-}$ is sp^3 tetrahedral; $Fe(CO)_5$ is dsp^3 trigonal bipyramidal. Making $[NiCl_4]^{2-}$ square planar confuses it with $[Ni(CN)_4]^{2-}$.

23. Answer: (B) Phenolic

In the phthalein dye test the compound is heated with phthalic anhydride and conc. H_2SO_4 and the melt is poured into dilute NaOH; phenols condense to give coloured phthalein dyes (phenol itself gives phenolphthalein, pink in alkali). Alcohols, aldehydes and acids do not form such dyes.

24. Answer: (A) Fractional distillation

Friedel–Crafts methylation gives toluene (W), and nitration gives the ortho- and para-nitrotoluenes, liquids/low-melting solids whose boiling points differ (about 222 °C and 238 °C) but are fairly close, so fractional distillation separates them. Sublimation and the extraction methods rely on properties these isomers do not differ in usefully.

25. Answer: (A) A, B and C only

Molality = (2.5/60) mol / 0.075 kg = 0.0417/0.075 = 0.556 m, and molarity = (5/40) mol / 0.450 L = 0.278 M, so the first two statements hold. Gases such as O_2 are more soluble in cold water, so aquatic life is more comfortable there. Gas solubility rises with increasing pressure (Henry's law), not decreasing, and the mole fraction of B is n_B/(n_A + n_B), so the last two statements are false.

26. Answer: (B) Covalent form to ionic form

Fusion with sodium converts N, S and halogens, which are covalently bonded in the organic compound, into ionic NaCN, Na_2S and NaX, which can then be detected by ionic tests in the sodium fusion extract. The elements are not ionic to begin with, so the other choices fail.

27. Answer: (B) 0.2938 g

Q = It = 1.5 × 600 = 900 C. $Cu^{2+} + 2e^- \rightarrow Cu$, so mass = (63 × 900)/(2 × 96487) = 56700/192974 = 0.2938 g. Taking one electron per Cu gives double, 0.5876 g.

28. Answer: (B) 300 J

ΔU = q + w with q = +500 J (absorbed) and w = −200 J (work done by the system), so ΔU = +300 J. Adding the two magnitudes to get 700 J ignores the sign of work done by the system.

29. Answer: (A) It has T-shaped geometry with two lone pairs on Cl atom.

Cl has 7 valence electrons; three are used in bonds to F, leaving 4 electrons = 2 lone pairs, so 5 electron pairs (sp^3d, trigonal bipyramidal arrangement). The two lone pairs occupy equatorial positions, leaving a T-shaped molecule. Three lone pairs would make it linear, and the trigonal shapes ignore the lone pairs' positions.

30. Answer: (C) Acetate, CH_3COO^-

Dilute H_2SO_4 liberates acetic acid from an acetate; its vapour smells of vinegar and is acidic, turning blue litmus red. A sulphide gives H_2S with a rotten-egg smell, a carbonate gives odourless CO_2 with effervescence, and a sulphate gives no gas with dilute acid.

31. Answer: (B) 4

Ka of HX = Kw/Kb = $10^{-14}/10^{-10} = 10^{-4}$, so pKa = 4. With $[X^-] = [HX]$, Henderson's equation gives pH = pKa + log 1 = 4. Taking pH = pKb = 10 confuses the base constant with the acid constant.

32. Answer: (C) 2.84 BM

$3d^2$ has n = 2 unpaired electrons, so $\mu = \sqrt{(n(n+2))} = \sqrt{8} = 2.83 \approx 2.84$ BM. The values 3.87, 4.90 and 5.92 BM correspond to 3, 4 and 5 unpaired electrons.

33. Answer: (D) Oxygen exhibits only -2 oxidation state.

Oxygen shows −2 in most compounds but also −1 in peroxides, −½ in superoxides and +2 in OF_2, so 'only −2' is false. Carbon's small size allows strong pπ–pπ multiple bonds, BCl_3 is monomeric while $AlCl_3$ dimerises to Al_2Cl_6, and catenation falls in the order C ≫ Si > Ge ≈ Sn, so those statements are correct.

34. Answer: (D) colourless to pink

Phenolphthalein is colourless in acid and turns pink above about pH 8.3. NaOH is added from the burette to the oxalic acid, so at the end point the colourless solution just turns permanently pink. Yellow/red changes belong to methyl orange, and pink to colourless would occur only if acid were added to alkali.

35. Answer: (B) 0.8 dm^3 of CO, 0.6 dm^3 of CO_2

$CO_2 + C \rightarrow 2CO$. If x dm^3 of CO_2 reacts, the mixture contains (1 − x) CO_2 and 2x CO, total 1 + x = 1.4, so x = 0.4: CO = 0.8 dm^3 and CO_2 = 0.6 dm^3. The other pairs do not add up to 1.4 dm^3 or do not conserve carbon.

36. Answer: (C) C_2H_5OH

Free-radical chlorination gives chloroethane (X), ammonolysis gives ethylamine (Y), and nitrous acid converts a primary aliphatic amine into an unstable diazonium salt that loses N_2 and reacts with water to give ethanol. Aliphatic diazonium salts do not survive, so the azo-type product is not obtained, and ethylamine is only the intermediate.

37. Answer: (A) 24.84

Comparing with ln k = ln A − Ea/(RT): Ea/R = 1.25 × 10^4 K, so Ea = 1.25 × 10^4 × 1.987 = 24 838 cal ≈ 24.84 kcal mol^{-1}. 14.34 is ln A, not the activation energy, and using log (÷2.303) wrongly gives other values.

38. Answer: (B) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

K_P = K_C(RT)^Δn, so they differ only when Δn(gas) ≠ 0. For ammonia synthesis Δn = 2 − 4 = −2; the other three reactions have equal moles of gas on both sides (Δn = 0), so K_P = K_C for them.

39. Answer: (A) The largest and the smallest species among Mg, Mg^{2+}, Al and Al^{3+} are Al and Mg^{2+} respectively.

Size falls across a period and cations are smaller than their atoms, and Al^{3+} (higher charge, same electron count as Mg^{2+}) is smaller than Mg^{2+}. So the largest is Mg and the smallest is Al^{3+}, making the 'Al and Mg^{2+}' statement wrong. Element 107 is unnilseptium, Li–Mg is a diagonal pair, and Al in $[AlCl(H_2O)_5]^{2+}$ is +3 with six ligands, so the rest are correct.

40. Answer: (B) Formation of hydrogen bonding between acetone and chloroform

The C–H of chloroform (made acidic by three Cl atoms) hydrogen-bonds to the carbonyl oxygen of acetone, so A–B attractions are stronger than A–A and B–B. This lowers the escaping tendency and the vapour pressure, a negative deviation. Increased escaping tendency or weaker A–B forces would give a positive deviation.

41. Answer: (C) 6 and 6

With a Lewis acid in the dark and excess chlorine, electrophilic substitution replaces all six H atoms to give hexachlorobenzene, C_6Cl_6 (6 Cl). Under UV light at 500 K, three Cl_2 molecules add across the ring to give benzene hexachloride, $C_6H_6Cl_6$ (also 6 Cl). Counting the 3 Cl_2 molecules as 3 atoms is the trap.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.