

NEET 2016 Phase 2 — Chemistry Question Paper with Solutions

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

NEET 2016 Phase 2 · Q47

1. The molar conductivity of a 0.5 mol/dm^3 solution of AgNO_3 with electrolytic conductivity of $5.76 \times 10^{-3} \text{ S cm}^{-1}$ at 298 K is

- (A) $2.88 \text{ S cm}^2/\text{mol}$
- (B) $11.52 \text{ S cm}^2/\text{mol}$
- (C) $0.086 \text{ S cm}^2/\text{mol}$
- (D) $28.8 \text{ S cm}^2/\text{mol}$

NEET 2016 Phase 2 · Q48

2. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

- (A) rate is proportional to the surface coverage
- (B) rate is inversely proportional to the surface coverage
- (C) rate is independent of the surface coverage
- (D) rate of decomposition is very slow

NEET 2016 Phase 2 · Q49

3. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below: I. (NaCl) = 52, II. (BaCl_2) = 0.69, III. (MgSO_4) = 0.22. The correct order of their coagulating power is

- (A) $\text{I} > \text{II} > \text{III}$
- (B) $\text{II} > \text{I} > \text{III}$
- (C) $\text{III} > \text{II} > \text{I}$
- (D) $\text{III} > \text{I} > \text{II}$

NEET 2016 Phase 2 · Q52

4. For a sample of perfect gas when its pressure is changed isothermally from p_i to p_f , the entropy change is given by

- (A) $\Delta S = nR \ln(p_f/p_i)$
- (B) $\Delta S = nR \ln(p_i/p_f)$
- (C) $\Delta S = nRT \ln(p_f/p_i)$
- (D) $\Delta S = RT \ln(p_i/p_f)$

NEET 2016 Phase 2 · Q53

5. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

- (A) 0
- (B) 1
- (C) 2
- (D) 3

NEET 2016 Phase 2 · Q54

6. The percentage of pyridine ($\text{C}_5\text{H}_5\text{N}$) that forms pyridinium ion ($\text{C}_5\text{H}_5\text{N}^+\text{H}$) in a 0.10 M aqueous pyridine solution (K_b for $\text{C}_5\text{H}_5\text{N} = 1.7 \times 10^{-9}$) is

- (A) 0.0060%
- (B) 0.013%
- (C) 0.77%
- (D) 1.6%

NEET 2016 Phase 2 · Q55

7. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are

- (A) 4 and 2
- (B) 6 and 6
- (C) 8 and 4
- (D) 4 and 8

NEET 2016 Phase 2 · Q56

8. If the E°_{cell} for a given reaction has a negative value, which of the following gives the correct relationships for the values of ΔG° and K_{eq} ?

- (A) $\Delta G^\circ > 0$; $K_{\text{eq}} < 1$
- (B) $\Delta G^\circ > 0$; $K_{\text{eq}} > 1$
- (C) $\Delta G^\circ < 0$; $K_{\text{eq}} > 1$
- (D) $\Delta G^\circ < 0$; $K_{\text{eq}} < 1$

NEET 2016 Phase 2 · Q57

9. Which one of the following is incorrect for ideal solution?

- (A) $\Delta H_{\text{mix}} = 0$
- (B) $\Delta U_{\text{mix}} = 0$
- (C) $\Delta P = P_{\text{obs}} - P_{\text{calculated by Raoult's law}} = 0$
- (D) $\Delta G_{\text{mix}} = 0$

NEET 2016 Phase 2 · Q58

10. The solubility of AgCl(s) with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be

- (A) $1.26 \times 10^{-5} \text{ M}$
- (B) $1.6 \times 10^{-9} \text{ M}$
- (C) $1.6 \times 10^{-11} \text{ M}$
- (D) zero

NEET 2016 Phase 2 · Q59

11. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2 . When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are

- (A) 40, 30
- (B) 60, 40
- (C) 20, 30
- (D) 30, 20

NEET 2016 Phase 2 · Q60

12. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charge on electron = $1.60 \times 10^{-19} \text{ C}$)

- (A) 6×10^{23}
- (B) 6×10^{20}
- (C) 3.75×10^{20}
- (D) 7.48×10^{23}

NEET 2016 Phase 2 · Q61

13. Boric acid is an acid because its molecule

- (A) contains replaceable H^+ ion
- (B) gives up a proton
- (C) accepts OH^- from water releasing proton
- (D) combines with proton from water molecule

NEET 2016 Phase 2 · Q62

14. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of

- (A) $\text{K}_3[\text{AlF}_3\text{H}_3]$
- (B) $\text{K}_3[\text{AlF}_6]$
- (C) AlH_3
- (D) $\text{K}[\text{AlF}_3\text{H}]$

NEET 2016 Phase 2 · Q63

15. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because

- (A) zinc is lighter than iron
- (B) zinc has lower melting point than iron
- (C) zinc has lower negative electrode potential than iron
- (D) zinc has higher negative electrode potential than iron

NEET 2016 Phase 2 · Q64

16. The suspension of slaked lime in water is known as

- (A) limewater
- (B) quicklime
- (C) milk of lime
- (D) aqueous solution of slaked lime

NEET 2016 Phase 2 · Q65

17. The hybridizations of atomic orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ respectively are

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

NEET 2016 Phase 2 · Q66

18. Which of the following fluoro-compounds is most likely to behave as a Lewis base?

- (A) BF_3
- (B) PF_3
- (C) CF_4
- (D) SiF_4

NEET 2016 Phase 2 · Q68

19. In context with beryllium, which one of the following statements is incorrect?

- (A) It is rendered passive by nitric acid.
- (B) It forms Be_2C .
- (C) Its salts rarely hydrolyze.
- (D) Its hydride is electron-deficient and polymeric.

NEET 2016 Phase 2 · Q69

20. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidizing behaviour?

- (A) $\text{Cu} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
- (B) $3\text{S} + 2\text{H}_2\text{SO}_4 \rightarrow 3\text{SO}_2 + 2\text{H}_2\text{O}$
- (C) $\text{C} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + 2\text{SO}_2 + 2\text{H}_2\text{O}$
- (D) $\text{CaF}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{HF}$

NEET 2016 Phase 2 · Q70

21. Which of the following pairs of d-orbitals will have electron density along the axes?

- (A) d_{z^2} , d_{xz}
- (B) d_{xz} , d_{yz}
- (C) d_{z^2} , $d_{x^2-y^2}$
- (D) d_{xy} , $d_{x^2-y^2}$

NEET 2016 Phase 2 · Q71

22. The correct geometry and hybridization for XeF_4 are

- (A) octahedral, sp^3d^2
- (B) trigonal bipyramidal, sp^3d
- (C) planar triangle, sp^3d^3
- (D) square planar, sp^3d^2

NEET 2016 Phase 2 · Q72

23. Among the following, which one is a wrong statement?

- (A) PH_5 and BiCl_5 do not exist.
- (B) $p\pi-d\pi$ bonds are present in SO_2 .
- (C) SeF_4 and CH_4 have same shape.
- (D) I_3^+ has bent geometry.

NEET 2016 Phase 2 · Q75

24. Jahn-Teller effect is not observed in high spin complexes of

- (A) d^7
- (B) d^8
- (C) d^4
- (D) d^9

NEET 2016 Phase 2 · Q76

25. Which of the following can be used as the halide component for Friedel-Crafts reaction?

- (A) Chlorobenzene
- (B) Bromobenzene
- (C) Chloroethene
- (D) Isopropyl chloride

NEET 2016 Phase 2 · Q78

26. Which one of the following structures represents nylon 6,6 polymer?

- (A) $-\text{[CH}_2\text{-CH(NH}_2\text{)-CH}_2\text{-CH(CH}_3\text{)]}_{66}\text{-}$
- (B) $-\text{[CH}_2\text{-CH(NH}_2\text{)-CH}_2\text{-CH(NH}_2\text{)]}_{66}\text{-}$
- (C) $-\text{[CH}_2\text{-CH(NH}_2\text{)-CH}_2\text{-CH(Cl)]}_6\text{-[CH}_2\text{-CH(CH}_3\text{)-CH}_2\text{-CH(COOH)]}_6\text{-}$
- (D) $-\text{[CO-(CH}_2\text{)}_4\text{-CO-NH-(CH}_2\text{)}_6\text{-NH]}_n\text{-}$

NEET 2016 Phase 2 · Q80

27. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination or direct only elimination reaction?

- (A) Cyclopropane
- (B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- (C) $\text{H}_2\text{C=C=O}$
- (D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$

NEET 2016 Phase 2 · Q81

28. Which one of the following nitro-compounds does not react with nitrous acid?

- (A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NO}_2$
- (B) $(\text{CH}_3)_2\text{CH-CH}_2\text{NO}_2$
- (C) $(\text{CH}_3)_3\text{C-NO}_2$
- (D) $\text{CH}_3\text{CO-CH(CH}_3\text{)-NO}_2$

29. The central dogma of molecular genetics states that the genetic information flows from

- (A) Amino acids → Proteins → DNA
- (B) DNA → Carbohydrates → Proteins
- (C) DNA → RNA → Proteins
- (D) DNA → RNA → Carbohydrates

30. In the given reaction, benzene + cyclohexene $\xrightarrow{\text{HF, } 0^\circ\text{C}}$ P, the product P is

- (A) (2-Fluorocyclohexyl)benzene
- (B) (1-Fluorocyclohexyl)benzene
- (C) Cyclohexylbenzene
- (D) 1,2-Diphenylcyclohexane

31. A given nitrogen-containing aromatic compound A reacts with Sn/HCl , followed by HNO_2 to give an unstable compound B. B, on treatment with phenol, forms a beautiful coloured compound C with the molecular formula $\text{C}_{12}\text{H}_{10}\text{N}_2\text{O}$. The structure of compound A is

- (A) Aniline ($\text{C}_6\text{H}_5\text{NH}_2$)
- (B) Nitrobenzene ($\text{C}_6\text{H}_5\text{NO}_2$)
- (C) Benzonitrile ($\text{C}_6\text{H}_5\text{CN}$)
- (D) Benzamide ($\text{C}_6\text{H}_5\text{CONH}_2$)

32. Consider the reaction $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{NaCN} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CN} + \text{NaBr}$. This reaction will be the fastest in

- (A) ethanol
- (B) methanol
- (C) N,N'-dimethylformamide (DMF)
- (D) water

33. The correct structure of the product A formed in the reaction cyclohex-2-en-1-one $\xrightarrow{\text{H}_2 \text{ (gas, 1 atmosphere), Pd/carbon, ethanol}}$ A is

- (A) Cyclohex-2-en-1-ol
- (B) Cyclohexanone
- (C) Cyclohex-3-en-1-ol
- (D) 2-Hydroxycyclohexyl carbocation

Answer key and explanations

1. Answer: (B) $11.52 \text{ S cm}^2/\text{mol}$

$\Lambda_m = \kappa \times 1000/M = 5.76 \times 10^{-3} \times 1000/0.5 = 11.52 \text{ S cm}^2 \text{ mol}^{-1}$. Multiplying by the concentration instead of dividing gives $2.88 \text{ S cm}^2/\text{mol}$.

2. Answer: (A) rate is proportional to the surface coverage

At low pressure only a small part of the metal surface is covered, and the coverage is proportional to the pressure of PH_3 . The rate depends on the coverage, so it is proportional to pressure: first order. At high pressure the surface is saturated and the rate becomes independent of coverage (zero order).

3. Answer: (C) $\text{III} > \text{II} > \text{I}$

Coagulating power is inversely proportional to the coagulation value: the smaller the amount needed, the stronger the electrolyte. So MgSO_4 (0.22) > BaCl_2 (0.69) > NaCl (52). Reading the larger number as greater power reverses the order.

4. Answer: (B) $\Delta S = nR \ln(p_i/p_f)$

For an isothermal reversible change $\Delta S = q_{\text{rev}}/T = nR \ln(V_f/V_i)$, and at constant T, $V_f/V_i = p_i/p_f$, so $\Delta S = nR \ln(p_i/p_f)$. Expressions containing T have units of energy, not entropy, and the ratio p_f/p_i has the wrong sign.

5. Answer: (D) 3

Ba(OH)₂ dissociates completely in dilute solution: Ba(OH)₂ → Ba²⁺ + 2OH⁻, giving three ions per formula unit, so $i = 3$. $i = 2$ would apply to a 1:1 electrolyte like NaCl.

6. Answer: (B) 0.013%

For a weak base $\alpha = \sqrt{K_b/C} = \sqrt{(1.7 \times 10^{-9})/0.10} = \sqrt{1.7 \times 10^{-8}} \approx 1.3 \times 10^{-4}$. As a percentage this is 0.013%. Forgetting to convert the fraction to a percentage, or not taking the square root, gives the other values.

7. Answer: (C) 8 and 4

In fluorite Ca²⁺ ions form a face-centred cubic array and F⁻ ions occupy all the tetrahedral voids. Each F⁻ is surrounded by 4 Ca²⁺ and each Ca²⁺ by 8 F⁻, so the coordination numbers are 8 and 4 (in the 1:2 ratio). Swapping them gives 4 and 8.

8. Answer: (A) $\Delta G^\circ > 0$; $K_{eq} < 1$

$\Delta G^\circ = -nFE^\circ_{cell}$, so a negative E° gives a positive ΔG° . Also $\Delta G^\circ = -RT \ln K$, so a positive ΔG° means $\ln K < 0$, i.e. $K < 1$. A negative ΔG° and $K > 1$ belong to a positive E° .

9. Answer: (D) $\Delta G_{mix} = 0$

For an ideal solution ΔH_{mix} and ΔU_{mix} are zero and the vapour pressure follows Raoult's law exactly. Mixing is still spontaneous because $\Delta S_{mix} > 0$, so $\Delta G_{mix} = -T\Delta S_{mix}$ is negative, not zero.

10. Answer: (B) $1.6 \times 10^{-9} \text{ M}$

Because of the common ion, $[Cl^-] \approx 0.1 \text{ M}$, so $s = K_{sp}/[Cl^-] = 1.6 \times 10^{-10}/0.1 = 1.6 \times 10^{-9} \text{ M}$. $1.26 \times 10^{-5} \text{ M}$ is the solubility in pure water, which ignores the common-ion effect.

11. Answer: (A) 40, 30

Molar masses: $XY_2 = 10/0.1 = 100$ and $X_3Y_2 = 9/0.05 = 180$. So $X + 2Y = 100$ and $3X + 2Y = 180$; subtracting gives $2X = 80$, $X = 40$ and $Y = 30$. The pair 30, 20 fails the first equation ($30 + 40 = 70$).

12. Answer: (C) 3.75×10^{20}

Charge passed $Q = It = 1 \times 60 = 60 \text{ C}$. Number of electrons = $60/(1.60 \times 10^{-19}) = 3.75 \times 10^{20}$. 6×10^{23} is close to Avogadro's number and would need about one faraday of charge.

13. Answer: (C) accepts OH⁻ from water releasing proton

B(OH)₃ is not a protonic acid; the electron-deficient boron accepts OH⁻ from water: B(OH)₃ + 2H₂O → [B(OH)₄]⁻ + H₃O⁺. So it behaves as a Lewis acid, and the proton released comes from water, not from boric acid itself.

14. Answer: (B) K₃[AlF₆]

AlF₃ is insoluble in anhydrous HF because HF is too weakly ionised to supply F⁻. KF provides fluoride ions that form the soluble complex: AlF₃ + 3KF → K₃[AlF₆]. Hydride species such as AlH₃ are not formed in this medium.

15. Answer: (D) zinc has higher negative electrode potential than iron

$E^\circ(\text{Zn}^{2+}/\text{Zn}) = -0.76 \text{ V}$ is more negative than $E^\circ(\text{Fe}^{2+}/\text{Fe}) = -0.44 \text{ V}$, so zinc is oxidised in preference and protects iron sacrificially. An iron coating on zinc would not protect the zinc, since iron is less easily oxidised. Melting point and density are not the reason.

16. Answer: (C) milk of lime

A suspension of Ca(OH)₂ in water is called milk of lime. Limewater is the clear filtered solution of Ca(OH)₂, and quicklime is CaO.

17. Answer: (C) sp, sp² and sp³

NO₂⁺ is linear with two σ bonds and no lone pair on N (sp). NO₃⁻ is trigonal planar with three σ bonds (sp²). NH₄⁺ is tetrahedral with four σ bonds (sp³). So the sequence is sp, sp², sp³.

18. Answer: (B) PF₃

PF₃ has a lone pair on phosphorus that it can donate, so it acts as a Lewis base (a ligand). BF₃ is electron deficient (a Lewis acid), SiF₄ can accept electron pairs into vacant orbitals, and CF₄ has neither a lone pair on C nor vacant orbitals.

19. Answer: (C) Its salts rarely hydrolyze.

Be²⁺ is very small with a high charge density, so beryllium salts are extensively hydrolysed; saying they rarely hydrolyse is wrong. Beryllium is made passive by nitric acid, forms the carbide Be₂C, and BeH₂ is an electron-deficient, polymeric hydride.

20. Answer: (D) CaF₂ + H₂SO₄ → CaSO₄ + 2HF

In the reaction with CaF₂ sulphur stays at +6 (H₂SO₄ → CaSO₄); it is only an acid-base (double decomposition) reaction that releases HF. In the reactions with Cu, S and C, sulphuric acid is reduced to SO₂ (S from +6 to +4), which is oxidising behaviour.

21. Answer: (C) d_{z^2} , $d_{x^2-y^2}$

The lobes of $d_{x^2-y^2}$ lie along the x and y axes and the main lobes of d_{z^2} lie along the z axis. d_{xy} , d_{yz} and d_{xz} have their lobes between the axes, so any pair containing them is wrong.

22. Answer: (D) square planar, sp^3d^2

Xe in XeF_4 has 4 bond pairs and 2 lone pairs, six electron pairs in all, so it is sp^3d^2 hybridised. The electron-pair arrangement is octahedral, but with the two lone pairs opposite each other the shape of the molecule is square planar.

23. Answer: (C) SeF_4 and CH_4 have same shape.

SeF_4 has 4 bond pairs and 1 lone pair (sp^3d), so it is see-saw shaped, while CH_4 is tetrahedral; they do not have the same shape. PH_5 and $BiCl_5$ do not exist, SO_2 has $p\pi-d\pi$ bonding, and I_3^+ (2 bond pairs, 2 lone pairs) is bent, so those statements are correct.

24. Answer: (B) d^8

High-spin d^8 in an octahedral field is $t_2g^6e_g^2$, with symmetrically filled degenerate sets, so there is no Jahn-Teller distortion. High-spin d^4 ($t_2g^3e_g^1$) and d^9 ($t_2g^6e_g^3$) have unevenly filled e_g orbitals and show strong distortion; d^7 high spin ($t_2g^5e_g^2$) has an uneven t_2g set.

25. Answer: (D) Isopropyl chloride

Friedel-Crafts alkylation needs a halide that forms a carbocation with $AlCl_3$, and isopropyl chloride readily gives the isopropyl cation. In chlorobenzene, bromobenzene and chloroethene the C-X bond has partial double-bond character (sp^2 carbon), so aryl and vinyl cations are not formed.

26. Answer: (D) $-[CO-(CH_2)_4-CO-NH-(CH_2)_6-NH]_n-$

Nylon 6,6 is a polyamide made by condensing hexamethylenediamine with adipic acid, so each repeat unit is $-CO-(CH_2)_4-CO-NH-(CH_2)_6-NH-$, with six carbons from each monomer. The other structures are vinyl-type chains with no amide links; the subscript 66 in them is a trap.

27. Answer: (C) $H_2C=C=O$

Cyclopropane adds HBr to give 1-bromopropane, which eliminates HBr to give propene; propan-1-ol dehydrates and 1-bromopropane dehydrohalogenates directly to propene. Ketene ($H_2C=C=O$) has only two carbons, so it cannot give a three-carbon alkene.

28. Answer: (C) $(CH_3)_3C-NO_2$

Nitroalkanes react with nitrous acid through the hydrogen on the carbon carrying the nitro group (primary give nitrolic acids, secondary give pseudonitroles). 2-Methyl-2-nitropropane is a tertiary nitro compound with no α -hydrogen, so it does not react. The other compounds all have at least one α -H.

29. Answer: (C) DNA $\rightarrow$ RNA $\rightarrow$ Proteins

Genetic information is copied from DNA into messenger RNA (transcription) and then read to make proteins (translation). Carbohydrates are not products of genetic information transfer, and information does not flow from proteins back to DNA.

30. Answer: (C) Cyclohexylbenzene

HF protonates cyclohexene to give the cyclohexyl carbocation, which alkylates benzene (Friedel-Crafts type): the product is cyclohexylbenzene. Fluoride is not retained in the product, and the low temperature and 1:1 reactants do not give a diphenyl product.

31. Answer: (B) Nitrobenzene ($C_6H_5NO_2$)

Sn/HCl reduces nitrobenzene to aniline; HNO_2 converts aniline to the unstable benzenediazonium salt, which couples with phenol to give p-hydroxyazobenzene, $C_6H_5-N=N-C_6H_4OH$ ($C_{12}H_{10}N_2O$). Aniline needs no reduction, so Sn/HCl would be pointless as the first step.

32. Answer: (C) N,N'-dimethylformamide (DMF)

This is an S_N2 reaction of a primary bromide. Polar aprotic solvents such as DMF solvate Na^+ but leave CN^- free and highly nucleophilic, so the rate is greatest. Protic solvents (water, methanol, ethanol) hydrogen-bond to CN^- and slow the reaction.

33. Answer: (B) Cyclohexanone

H_2 with Pd/C at 1 atm hydrogenates the C=C double bond of the α,β -unsaturated ketone but does not reduce the C=O group under these mild conditions, so cyclohexanone is formed. Reducing the carbonyl to an alcohol while keeping the C=C would need a hydride reagent such as $NaBH_4$ with $CeCl_3$.

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