Interactive Practice & Step-by-Step Solutions: Click any question to solve it with timer & full explanation on The Crucible.

Open on The Crucible ↗

Successive Ionization Energies · JEE Main 2020 · Shift-II — View Solution on Crucible ↗

1. The first and second ionisation enthalpies of a metal are 496 and $4560\,\text{kJ mol}^{-1}$, respectively. How many moles of HCl and H_2SO_4, respectively, will be needed to react completely with 1 mole of the metal hydroxide?

(A) 1 and 1

(B) 2 and 0.5

(C) 1 and 2

(D) 1 and 0.5

Properties of Ionic Compounds · JEE Main 2023 · Shift-II — View Solution on Crucible ↗

2. Identify the correct order of standard enthalpy of formation of sodium halides.

(A) $\text{NaI} < \text{NaBr} < \text{NaF} < \text{NaCl}$

(B) $\text{NaI} < \text{NaBr} < \text{NaCl} < \text{NaF}$

(C) $\text{NaF} < \text{NaCl} < \text{NaBr} < \text{NaI}$

(D) $\text{NaCl} < \text{NaF} < \text{NaBr} < \text{NaI}$

Lanthanoid Contraction · JEE Main 2019 · Shift-II — View Solution on Crucible ↗

3. The correct order of atomic radii is:

(A) $\text{Ce} > \text{Eu} > \text{Ho} > \text{N}$

(B) $\text{N} > \text{Ce} > \text{Eu} > \text{Ho}$

(C) $\text{Ho} > \text{N} > \text{Eu} > \text{Ce}$

(D) $\text{Eu} > \text{Ce} > \text{Ho} > \text{N}$

Allotropes of Carbon · JEE Main 2019 · Shift-II — View Solution on Crucible ↗

4. The C–C bond length is maximum in:

(A) C_{70}

(B) C_{60}

(C) graphite

(D) diamond

Trends in Nitrogen Family · JEE Main 2024 · Shift-II — View Solution on Crucible ↗

5. The strongest reducing agent among the following is:

(A) NH_3

(B) SbH_3

(C) BiH_3

(D) PH_3

Zero Group (NH_4^+) · JEE Main 2023 · Shift-II View Solution on Crucible ↗

6. Formula for Nessler's reagent is:

(A) KHg_2I_2
(B) $KHgI_3$
(C) K_2HgI_4
(D) HgI_2

Predicting Colour from Wavelength/Δ · JEE Main 2024 View Solution on Crucible ↗

7. The correct order of A, B, C and D in terms of wavenumber of light absorbed is: (A) $[CoCl(NH_3)_5]^{2+}$ (B) $[Co(CN)_6]^{3-}$ (C) $[Co(NH_3)_5(H_2O)]^{3+}$ (D) $[Cu(H_2O)_4]^{2+}$

(A) C < D < A < B
(B) B < C < A < D
(C) A < C < B < D
(D) D < A < C < B

Modern Periodic Law & Mendeleev's Law · JEE Main 2023 · Shift-II View Solution on Crucible ↗

8. Henry Moseley studied characteristic X-ray spectra of elements. The graph which represents his observation correctly is: (Given: v = Frequency of X-ray emitted, Z = Atomic number)

(A) Option (1): $\sqrt{Z}$ vs v — straight line
(B) Option (2): $\sqrt{v}$ vs Z — straight line
(C) Option (3): v^2 vs Z — straight line
(D) Option (4): v vs Z — straight line

Strength of H-Bonds · JEE Main 2023 · Shift-I View Solution on Crucible ↗

9. Decreasing order of the **hydrogen bonding** in following forms of water is correctly represented by: **A.** Liquid water **B.** Ice **C.** Impure water

(A) A = B > C
(B) B > A > C
(C) C > B > A
(D) A > B > C

Preparation of $KMnO_4$ · JEE Main 2024 · Shift-I View Solution on Crucible ↗

10. $KMnO_4$ decomposes on heating at 513 K to form O_2 along with

(A) MnO_2 & K_2O_2
(B) K_2MnO_4 & Mn
(C) Mn & KO_2
(D) K_2MnO_4 & MnO_2

Tin & Lead Chemistry · JEE Main 2020 · Shift-I
View Solution on Crucible ↗

11. On heating compound (A) gives a gas (B) which is constituent of air. This gas when treated with H_2 in the presence of a catalyst gives another gas (C) which is basic in nature. (A) should not be:

(A) NaN_3
(B) $Pb(NO_3)_2$
(C) $(NH_4)_2Cr_2O_7$
(D) NH_4NO_2

Nitrogen Oxides · JEE Main 2019 · Shift-I
View Solution on Crucible ↗

12. The correct order of the oxidation states of nitrogen in NO, N_2O, NO_2 and N_2O_3 is

(A) $N_2O < NO < N_2O_3 < NO_2$
(B) $NO_2 < N_2O_3 < NO < N_2O$
(C) $NO_2 < NO < N_2O_3 < N_2O$
(D) $N_2O < N_2O_3 < NO < NO_2$

Zero Group (NH_4^+) · JEE Main 2025 · Shift-I
View Solution on Crucible ↗

13. When a salt is treated with sodium hydroxide solution it gives gas X. On passing gas X through reagent Y a brown coloured precipitate is formed. X and Y respectively, are

(A) $X = NH_3$ and $Y = HgO$
(B) $X = NH_3$ and $Y = K_2HgI_4 + KOH$
(C) $X = NH_4Cl$ and $Y = KOH$
(D) $X = HCl$ and $Y = NH_4Cl$

Inner vs Outer Orbital Complexes · JEE Main 2024
View Solution on Crucible ↗

14. $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3-}$ are respectively known as:

(A) Spin free Complex, Spin paired Complex
(B) Spin paired Complex, Spin free Complex
(C) Outer orbital Complex, Inner orbital Complex
(D) Inner orbital Complex, Spin paired Complex

Ionization Energy Trends & Factors · JEE Main 2023 · Shift-I
View Solution on Crucible ↗

15. For elements B, C, N, Li, Be, O and F, the correct order of first ionisation enthalpy is:

(A) Li < Be < B < C < O < N < F
(B) B < Li < Be < C < N < O < F
(C) Li < Be < B < C < N < O < F
(D) Li < B < Be < C < O < N < F

Predicting shape of molecules/ions · JEE Main 2024 · Shift-II View Solution on Crucible ↗

16. The shape of carbocation is:

(A) Diagonal pyramidal
(B) Trigonal planar
(C) Tetrahedral
(D) Diagonal

Standard Reduction Potential (E°) · JEE Main 2022 · Shift-II View Solution on Crucible ↗

17. In 3d series, the metal having the highest M^{2+}/M standard electrode potential is

(A) Cr
(B) Fe
(C) Cu
(D) Zn

Borax ($Na_2B_4O_7$) · JEE Main 2022 · Shift-II View Solution on Crucible ↗

18. Aqueous solution of which of the following boron compounds will be strongly basic in nature?

(A) $NaBH_4$
(B) $LiBH_4$
(C) B_2H_6
(D) $Na_2B_4O_7$

Anomalous Behavior of First Element · JEE Main 2022 · Shift-II View Solution on Crucible ↗

19. PCl_5 is well known but NCl_5 is not. Because,

(A) N does not have vacant d-orbital
(B) P does not have 2 d orbitals
(C) Back bonding in NCl_5 is not possible
(D) N atom is more electronegative so does not form 5 bonds

Group IV (Zn, Mn, Ni, Co) · JEE Main 2024 · Shift-II View Solution on Crucible ↗

20. A reagent which gives brilliant red precipitate with Nickel ions in basic medium is

(A) sodium nitroprusside
(B) neutral $FeCl_3$
(C) meta-dinitrobenzene
(D) dimethyl glyoxime

Geometrical Isomerism · JEE Main 2021 View Solution on Crucible ↗

21. Indicate the complex/complex ion which did NOT show any geometrical isomerism:

(A) $[Co(NH_3)_4Cl_2]^+$
(B) $[Co(NH_3)_3(NO_2)_3]$
(C) $[Co(CN)_5(NC)]^{3-}$
(D) $[CoCl_2(en)_2]$

Physical Property Trends (MP, BP, Density) · JEE Main 2022 · Shift-II View Solution on Crucible ↗

22. Metals generally melt at very high temperatures. Among the following which one has the highest melting point?

(A) Ga
(B) Ag
(C) Hg
(D) Cs

Octet Rule Exceptions · JEE Main 2022 · Shift-I View Solution on Crucible ↗

23. Number of **electron deficient** molecules among the following PH_3, B_2H_6, CCl_4, NH_3, LiH and BCl_3 is

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

Magnetic Moment Calculation · JEE Main 2022 · Shift-II View Solution on Crucible ↗

24. The metal ion (in gaseous state) with lowest spin-only magnetic moment value is:

(A) V^{2+}
(B) Ni^{2+}
(C) Cr^{2+}
(D) Fe^{2+}

Hydrides of Group 14 · JEE Main 2019 · Shift-II View Solution on Crucible ↗

25. The hydride that is NOT electron deficient is:

(A) SiH_4
(B) B_2H_6
(C) GaH_3
(D) AlH_3

Nitrogen Oxides · JEE Main 2022 · Shift-II
View Solution on Crucible ↗

26. The number of bridged oxygen atoms present in compound B formed from the following reactions is

$Pb(NO_3)_2 \xrightarrow{673\,K} A + PbO + O_2 \qquad A \xrightarrow{\text{Dimerise}} B$

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

Group Separation & General Scheme · JEE Main 2024 · Shift-I
View Solution on Crucible ↗

27. In the precipitation of the iron group (III) in qualitative analysis, ammonium chloride is added before adding ammonium hydroxide to:

(A) prevent interference by phosphate ions
(B) decrease concentration of OH^- ions
(C) increase concentration of Cl^- ions
(D) increase concentration of NH_4^+ ions

Counting Stereoisomers · JEE Main 2021
View Solution on Crucible ↗

28. The number of geometrical isomers found in the metal complexes $[PtCl_2(NH_3)_2]$, $[Ni(CO)_4]$, $[Ru(H_2O)_3Cl_3]$ and $[CoCl_2(NH_3)_4]^+$ respectively, are:

(A) 1, 1, 1, 1
(B) 2, 0, 2, 2
(C) 2, 1, 2, 2
(D) 2, 1, 2, 1

JEE Main 2021 · Shift-II
View Solution on Crucible ↗

29. Which pair of oxides is acidic in nature?

(A) B_2O_3, CaO
(B) N_2O, BaO
(C) CaO, SiO_2
(D) B_2O_3, SiO_2

Calculation of Hybridization · JEE Main 2024 · Shift-I
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30. Number of molecules/ions from the following in which the central atom is involved in sp^3 hybridization is

NO_3^-, BCl_3, ClO_2^-, ClO_3^-

(A) 4
(B) 3
(C) 2
(D) 1

Answer Key (Q1 to Q30)

Click any question number below to open its exact step-by-step solution on The Crucible ↗

1: (D)	2: (B)	3: (D)	4: (D)	5: (C)	6: (C)	7: (D)	8: (B)	9: (B)	10: (D)
11: (B)	12: (A)	13: (B)	14: (B)	15: (D)	16: (B)	17: (C)	18: (D)	19: (A)	20: (D)
21: (C)	22: (B)	23: (C)	24: (B)	25: (A)	26: (A)	27: (B)	28: (B)	29: (D)	30: (C)

Sample Solution — Question 6 (Correct Option: C)

Open Full Solution on Crucible ↗

Q6. Formula for Nessler's reagent is:

Nessler's reagent is an alkaline solution of potassium tetraiodomercurate(II).

It is made in two steps:

$$HgCl_2 + 2\,KI \longrightarrow HgI_2 \downarrow + 2\,KCl$$

$$HgI_2 + 2\,KI \longrightarrow K_2[HgI_4]$$

Excess iodide first precipitates the scarlet HgI_2 and then redissolves it as the soluble complex, K_2HgI_4.

Checking the charge: Hg^{2+} with four I^- gives $[HgI_4]^{2-}$, needing two K^+ ✓

• **Watch out:** the reagent must also be **alkaline**. Without KOH the ammonia would exist as NH_4^+ and give no brown precipitate.

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