



Exam scope

Covers knowledge of

GCSE & ALevel: G2, A1, A2

IB/AP/Chinese public schools: Grade 10-12

Inclusive, but not limited to:

- **Atoms:** Atomic structure, Atoms and Elements, Relative atomic mass, The mole and Avagadros number
- **Chemical Reactions and Stoichiometry:** The World of Molecules, The Mole, Chemical Reactions -- How Molecules are Formed, Broken down and Reformed, Stoichiometry, Thermodynamics
- **Electron Configurations and Radioactivity:** Orbitals, Electron Configurations, Radioactivity and Half-Lives
- **The Periodic Table and Bonding:** The Periodic Table, Some Important Periodic Trends, Chemical Bonding, Molecular Shapes, Ionic bonding, Covalent bonding
- **Phases:** (Gases, Liquids, and Solids) Gases, Intermolecular Forces, Phase Changes, Energy and Phase Changes
- **Solutions:** Measuring Concentrations, Boiling Point Elevation and Freezing Point Depression, Precipitation Reactions
- **Acids and Bases:** The Autoionization of H₂O, Acids and Bases, Acid-Base Titrations
- **Redox and Electrochemistry:** Oxidation and Reduction, Redox Reactions, Electrochemistry
- **Substitution, Addition reaction, Elimination, Hydrolysis**
- **Organic Chemistry and Environmental Chemistry:** Organic Chemistry, Environmental Chemistry (Aliphatic Compounds, Reducing properties of aldehydes, Nature of the carbonyl group....)
- **Acids and Alkalis:** Properties of acids, Properties of alkalis, Properties of neutral substances, The pH scale
- **Laboratory:** Safety Rules, Accuracy, Significant Figures, Lab Procedures, Laboratory Equipment



Samples:

Easy:

Example 1: Which statement about the triple point of a substance is correct?

- (A) The triple point for a substance varies with the pressure.
- (B) The three phases (solid, liquid, gas) have the same density.
- (C) The three phases (solid, liquid, gas) are in equilibrium.
- (D) The three phases (solid, liquid, gas) are indistinguishable in appearance.

Answer: C

Example 2: Which substance is the primary component in stalactites and stalagmites in caves?

- (A) CaO
- (B) CaCO₃
- (C) Ca(OH)₂
- (D) CaSO₄

Answer: B

Medium:

Example 1: The standard reduction potential of Cd²⁺(aq) is -0.402 V. A voltaic cell described by Cd(s) + 2 H⁺(aq) → Cd²⁺(aq) + H₂(aq) has [Cd²⁺] = 0.900 M and a hydrogen pressure of 0.975 atm. Its cell potential at 25 °C is measured as E = +0.192 V. What is the pH in the H⁺ | H₂ half-cell?

- (A) 3.28
- (B) 3.58
- (C) 6.54
- (D) 7.15

Answer: B

Example 2: For which pair of species are the radii most similar?

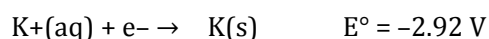
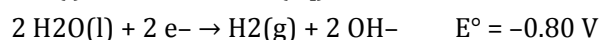
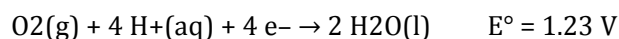
- (A) Li and Na
- (B) Na and Mg
- (C) Mn and Fe
- (D) Fe²⁺ and Fe³⁺

Answer: C

Difficult:

Example 1: Use the standard reduction potentials to determine what is observed at the cathode during the electrolysis of a 1.0 M solution of KBr that contains phenolphthalein.

What observation(s) is(are) made?

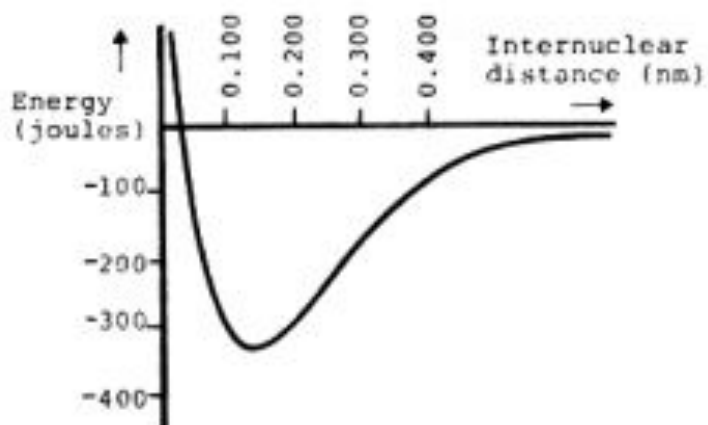


- (A) Solid metal forms.
- (B) Bubbles form and a pink color appears.

- (C) Dark red $\text{Br}_2(\text{aq})$ forms.
 (D) Bubbles form and the solution remains colorless.

Answer: B

Example 2: As two atoms approach one another in space, the potential energy decreases then increases as shown in the diagram below



To what are these two changes attributed?

[NOTE: p^+ = proton, e^- = electron]

decrease

increase

(from 0.40 to 0.15 nm)

(from 0.15 to 0 nm)

- | | |
|------------------------------------|-------------------------------|
| (A) increased $p^+ e^-$ attraction | increased $p^+ p^+$ repulsion |
| (B) increased $p^+ e^-$ attraction | increased $e^- e^-$ repulsion |
| (C) decreased $p^+ p^+$ attraction | increased $e^- e^-$ repulsion |
| (D) decreased $p^+ e^-$ attraction | increased $p^+ p^+$ repulsion |

Answer: A