ABC CHEMISTRY

Mr. Aniket Bhardwaj · 15+ Years Mentorship

Analytical Chemistry (Inorganic)

Premium CSIR-NET PYQ Book

30 Previous-Year Questions · 24 with verified answers · Distractor Analysis

3-Slide Solutions | Distractor Analysis | Exam Tricks | Revision Sheets

CSIR-NET · GATE · IIT-JAM — 1 Topics · 30 Real PYQs

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Course Contents

1 Topics · 30 PYQs

1	**Analytical Chemistry (Inorganic) – General** 30 Qs E 18 · M 11 · H 1	100%

Legend: **E** Easy **M** Medium **H** Hard · **%** = exam weightage (share of the chapter)

TOPIC 1

Analytical Chemistry (Inorganic) – General

30 questions · Easy 18 | Medium 11 | Hard 1 · PYQ frequency: Very High

Q1

In the atomic absorption spectroscopic estimation of Fe(III) using O_2 / H_2 flame, the absorbance decreases with the addition of

A. CO_3^{2+}

B. SO_4^{2-}

C. EDTA

D. Cl^-

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer B SO_4^{2-}

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Sulfate (like phosphate) forms thermally stable, poorly atomised iron salts in the cooler O_2/H_2 flame — a chemical interference that lowers the absorbance. EDTA and Cl^- give volatile species and do not suppress it.
- Therefore the answer is (B).

FINAL: (B) SO_4^{2-}

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: B

A CO_3^{2+}

Why (B) is the key — Sulfate (like phosphate) forms thermally stable, poorly atomised iron salts in the cooler O_2/H_2 flame — a chemical interference that lowers the absorbance. EDTA and Cl^- give volatile species and do not suppress it.

C EDTA

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D Cl^-

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q2

The gas commonly used in generating plasma in Inductively Coupled Plasma Atomic Emission Spectroscopy (ICPAES) is:

A. Argon

B. Carbon dioxide

C. Nitrous oxide

D. hydrogen

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A Argon

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- For ICP-OES and ICP_MS argon is most suitable gas to generate plasma. A number of gases cane be used to produce plasma, like Ar, Ne, N2, O2, H2 , air and mixture of gases. The physical properties of the gases play a decisive role in this regard. Such important properties are ionization and dissociation energy, thermal conductivity, atomic weight and chemical reactivity. Argon belongs to the group of inert gases. It means that it does not react with the material during production of plasma. Its atomic weight - the highest among all plasma gases and it generates high kinetic energy of the plasma beam. Due to its low ionization potential argon is excellently suitable for generating the plasma beam. However, argon has a low thermal conductivity and a low thermal capacity which limits its application is some specific areas only. Explanation as

FINAL: (A) Argon

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B **Carbon dioxide**

Why (A) is the key — For ICP-OES and ICP_MS argon is most suitable gas to generate plasma. A number of gases cane be used to produce plasma, like Ar, Ne, N2, O2, H2 , air and mixture of gases. The physical properties of the gases play a decisive role in this regard. Such important properties are ionization and dissociation energy, thermal conductivity, atomic weight and chemical reactivity. Argon belongs to the group of inert gases. It means that it does not react with the material during production of plasma. Its atomic weight - the highest among all plasma gases and it generates high kinetic energy of the plasma beam. Due to its low ionization

C **Nitrous oxide**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **hydrogen**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q3 **Correct statement for coulometry is 1. it is based on Faraday's law of electrolysis 2. It is a type of voltammetry 3. it is based on Ohm's law 4. it uses ion selective electrode**
(Numerical answer type — write the value.)

ANSWER: (A)

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
Coulometry measures the quantity of charge consumed (Q = nFN) and relates it to the amount of analyte through Faraday's laws of electrolysis — an absolute method needing no calibration.

Q4 The calibration curve in spectrofluorimetric analysis becomes non-linear when 1. molecular weight of analyte is high 2. intensity of light source is high 3. concentration of analyte is high 4. molar absorptivity of analyte is high
(Numerical answer type — write the value.)

SELF-PRACTICE answer on record: (C) — options were not printed in the source.

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Q5

The calibration curve in spectrofluorimetric analysis becomes non-linear when

A. molecular weight of analyte is high

B. intensity of light source is high

C. concentration of analyte is high

D. molar absorptivity of analyte is high

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer C concentration of analyte is high

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- At high analyte concentration the inner-filter effect (self-absorption of excitation/emission light) and self-quenching make F non-linear in c; the linear law holds only for absorbance < ~0.05. (Bank key (a) was wrong — corrected.)
- Therefore the answer is (C).

FINAL: (C) concentration of analyte is high

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: C

A — **molecular weight of analyte is high**

Why (C) is the key — At high analyte concentration the inner-filter effect (self-absorption of excitation/emission light) and self-quenching make F non-linear in c; the linear law holds only for absorbance < ~0.05. (Bank key (a) was wrong — corrected.)

B — **intensity of light source is high**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D — **molar absorptivity of analyte is high**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q6

The primary analytical method (not using a reference) is: 1) inductively coupled plasma emission spectrometry 2) energy dispersive X-ray fluorescence spectrometry 3) anodic stripping voltammetry 4) isotopic dilution mass spectrometry (Numerical answer type — write the value.)

ANSWER: (D)

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
Isotope-dilution mass spectrometry is a primary (definitive) method: the spike of enriched isotope is the internal reference and the result follows from first principles. ICP-OES, XRF and stripping voltammetry need external calibration or standards.

Q7

The primary analytical method (not using a reference) is: (a) inductively coupled plasma emission spectrometry (c) anodic stripping voltammetry (d) isotopic dilution mass spectrometry (b) energy dispersive X-ray fluorescence spectrometry

SELF-PRACTICE answer on record: (D) — options were not printed in the source.

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Q8

To determine the bond parameters at 25Â°C, electron diffraction is generally unsuitable for both

A. O_3 and NO_2

B. Sulfur and dry ice

C. NO_2 and sulphur

D. O_3 and dry ice

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer B Sulfur and dry ice

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Gas-phase electron diffraction needs a vapour; at 25 °C sulfur and dry ice (solid CO_2) are solids, whereas O_3 and NO_2 are gases.
- Therefore the answer is (B).

FINAL: (B) Sulfur and dry ice

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: B

A — **O_3 and NO_2**

Why (B) is the key — Gas-phase electron diffraction needs a vapour; at 25 °C sulfur and dry ice (solid CO_2) are solids, whereas O_3 and NO_2 are gases.

C — **NO_2 and sulphur**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D — **O_3 and dry ice**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q9

The peak area of differential thermal analysis curve is proportional to one or more of the following A. mass loss B. mass of the sample C. heat of decomposition / phase change The correct answer is:

A. A only

B. B only

C. A and C

D. B and C

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer D B and C

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- The DTA peak area is proportional to the mass of the sample and to the enthalpy of the decomposition or phase change (B and C); it does not measure mass loss (that is TGA).
- Therefore the answer is (D).

FINAL: (D) B and C

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: D

A

A only

Why (D) is the key — The DTA peak area is proportional to the mass of the sample and to the enthalpy of the decomposition or phase change (B and C); it does not measure mass loss (that is TGA).

B

B only

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

C

A and C

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q10

In spectrofluorimetric determination in solution

(A) absorbance of analyte solution is kept near to 0.05

(B) oxygen is eradicated from solution

(C) pH of solution is controlled

(D) wavelength of incident light is always above 400 nm Correct from the above is (1)A, B and D (2)B, C and D (3)A, B and C (4)A, C and D

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer C pH of solution is controlled

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- (a) In spectrofluorimetry the wavelength of incident light can range from 200 nm to 900 nm. (b) Intensity and colour of the fluorescence of many substance depends upon the pH of solutions. (c) Since, presence of O2 decreases the fluorescence, thus oxygen is eradicated from the solution. (d) In flourimetry absorbance of analyte solution is generally kept near to 0.05. Explanation as extracted from the printed page; notation may be imperfect.
- Therefore the answer is (C).

FINAL: (C) pH of solution is controlled

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: C

A — **absorbance of analyte solution is kept near to 0.05**

Why (C) is the key — (a) In spectrofluorimetry the wavelength of incident light can range from 200 nm to 900 nm. (b) Intensity and colour of the fluorescence of many substance depends upon the pH of solutions. (c) Since, presence of O2 decreases the fluorescence, thus oxygen is eradicated from the solution. (d) In flourimetry absorbance of analyte solution is generally kept near to 0.05. Explanation as extracted from the printed page; notation may be imperfect.

B — **oxygen is eradicated from solution**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D — **wavelength of incident light is always above 400 nm Correct from the above is (1)A, B and D (2)B, C and D (3)A, B and C (4)A, C and D**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q11

The pair of light source and atomizer resulting highest sensitivity to atomic absorption spectrometric measurement is:

A. Hg lamp, nitric oxide flame

B. Hg lamp, graphite furnace

C. Hollow cathode lamp, graphite furnace

D. Hollow cathode lamp; acetylene-nitric oxide flame

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer C Hollow cathode lamp, graphite furnace

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- A hollow-cathode lamp with a graphite furnace gives the highest AAS sensitivity (c).
- Therefore the answer is (C).

FINAL: (C) Hollow cathode lamp, graphite furnace

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: C

A **Hg lamp, nitric oxide flame**

Why (C) is the key — A hollow-cathode lamp with a graphite furnace gives the highest AAS sensitivity (c).

B **Hg lamp, graphite furnace**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **Hollow cathode lamp; acetylene-nitric oxide flame**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q12

Inspectrofluorimetric determination in solution A. absorbance of analyte solution is kept near to 0.05 B. oxygen is eradicated from solution C. pH of solution is controlled D. wavelength of incident light is always above 400 nm

A. A, B and D

B. B, C and D

C. A, B and C

D. A, C and D

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer C A, B and C

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- For spectrofluorimetry, absorbance is kept low (0.05) to avoid inner-filter effects, quenching O_2 is removed, and pH is controlled. The excitation λ is chosen at the absorption band, not necessarily above 400 nm. A, B and C (c).
- Therefore the answer is (C).

FINAL: (C) A, B and C

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: C

A

A, B and D

Why (C) is the key — For spectrofluorimetry, absorbance is kept low (0.05) to avoid inner-filter effects, quenching O_2 is removed, and pH is controlled. The excitation λ is chosen at the absorption band, not necessarily above 400 nm. A, B and C (c).

B

B, C and D

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D

A, C and D

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q13 **Thermometric titration gives best results when A. |Δ H| is high B. Δ G<0 C. Heat of mixing of titrant with titrant is high D. Titrant is used as dilute solution The answer is**

A. A and B

B. B and C

C. C and D

D. A and D

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A A and B

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Thermometric titration follows the temperature change of the reaction, so it works best when the reaction enthalpy is large (|ΔH| high).
- Therefore the answer is (A).

FINAL: (A) A and B

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B

B and C

Why (A) is the key — Thermometric titration follows the temperature change of the reaction, so it works best when the reaction enthalpy is large (|ΔH| high).

C

C and D

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D

A and D

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q14

The FALSE statement for a polarographic measurement procedure is:

A. O_2 is removed

B. Dropping mercury electrode is working electrode

C. Id is proportional to concentration of electro active species

D. Residual current is made zero by adding supporting electrolyte

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer D Residual current is made zero by adding supporting electrolyte

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- The supporting electrolyte suppresses the migration current, not the residual current; the residual (charging) current remains and is corrected for. The other statements are true.
- Therefore the answer is (D).

FINAL: (D) Residual current is made zero by adding supporting electrolyte

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: D

A **O_2 is removed**

Why (D) is the key — The supporting electrolyte suppresses the migration current, not the residual current; the residual (charging) current remains and is corrected for. The other statements are true.

B **Dropping mercury electrode is working electrode**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

C **Id is proportional to concentration of electro active species**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q15 **The use of dynamic inert atmosphere in thermogravimetric analysis (TGA): (1) decreases decomposition temperature (2) decrease weight loss (3) reduces rate of decomposition (4) increases weight loss**

A. decreases decomposition temperature

B. decrease weight loss

C. reduces rate of decomposition

D. increases weight loss

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer D increases weight loss

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- In thermogravimetric analysis (TGA) use of dynamic innert atmosphere is decrease with respect to temperature. Explanation as extracted from the printed page; notation may be imperfect.
- Therefore the answer is (D).

FINAL: (D) increases weight loss

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: D

A **decreases decomposition temperature**

Why (D) is the key — In thermogravimetric analysis (TGA) use of dynamic innert atmosphere is decrease with respect to temperature. Explanation as extracted from the printed page; notation may be imperfect.

B **decrease weight loss**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

C **reduces rate of decomposition**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q16

The correct statements for hollow cathode lamp (HCL) from the following are: (A) HCL is suitable for atomic absorption spectroscopy (AAS) (B) lines emitted from HCL are very narrow (C) the hardening of lamp makes it unsuitable for AAS (D) transition elements used in lamps have short life

- **A** A, B and C
- **B** B, C and D
- **C** C, D and A
- **D** D, A and B

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A A, B and C

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- The HCL is the standard AAS source and emits very narrow lines. Hardening (gas clean-up) degrades a lamp. Chapter key (a).
- Therefore the answer is (A).

FINAL: (A) A, B and C

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B **B, C and D**

Why (A) is the key — The HCL is the standard AAS source and emits very narrow lines. Hardening (gas clean-up) degrades a lamp. Chapter key (a).

C **C, D and A**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **D, A and B**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q17 **The pair of light source and atomizer resulting highest sensitivity to atomic absorption spectrometric measurement is: (1) Hg lamp, nitric oxide flame (2) Hg lamp, graphite furnace (3) Hollow cathode lamp, graphite furnace (4)Hollow cathode lamp; acetylene-nitric oxide flame**

A 1 and 2

B 2 and 3

C 1 and 3

D 3 only

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer C 1 and 3

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Increase of intensity of light used increases fluorescence as the fluorescence life-time increases. Molar absorptivity increases absorbance which further enhances fluorescence. CSIR DEC 2014 Explanation as extracted from the printed page; notation may be imperfect.
- Therefore the answer is (C).

FINAL: (C) 1 and 3

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: C

A **1 and 2**

Why (C) is the key — Increase of intensity of light used increases fluorescence as the fluorescence life-time increases. Molar absorptivity increases absorbance which further enhances fluorescence. CSIR DEC 2014 Explanation as extracted from the printed page; notation may be imperfect.

B **2 and 3**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **3 only**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q18

Considering the following parameters with reference to the fluorescence of a solution: 1. Molar absorptivity of fluorescent molecule 2. Intensity of light source used for excitation 3. Dissolved oxygen The correct answer for the enhancement of fluorescence with the increase in these parameters is/are

A. 1 and 2

B. 2 and 3

C. 1 and 3

D. 3 only

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A 1 and 2

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Fluorescence intensity $F = 2.303\ \varphi\ I_0\ \varepsilon\ b\ c$ for dilute solutions: it rises with the molar absorptivity (1) and the source intensity (2). Dissolved O_2 (3) is a quencher and lowers fluorescence.
- Therefore the answer is (A).

FINAL: (A) 1 and 2

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B **2 and 3**

Why (A) is the key — Fluorescence intensity $F = 2.303\ \varphi\ I_0\ \varepsilon\ b\ c$ for dilute solutions: it rises with the molar absorptivity (1) and the source intensity (2). Dissolved O_2 (3) is a quencher and lowers fluorescence.

C **1 and 3**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **3 only**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q19

Decomposition temperature of $CaCO_3$ in thermogravimetric analysis will be highest in dynamic atmosphere of:

A. nitrogen

B. synthesis gas

C. 1: 1 mixture of O_2 and CO

D. water gas

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer C 1: 1 mixture of O_2 and CO

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- An O_2/CO mixture burns to CO_2; a CO_2-rich atmosphere suppresses $CaCO_3 \rightleftharpoons CaO + CO_2$ and raises the decomposition temperature most (c).
- Therefore the answer is (C).

FINAL: (C) 1: 1 mixture of O_2 and CO

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: C

A **nitrogen**

Why (C) is the key — An O_2/CO mixture burns to CO_2; a CO_2-rich atmosphere suppresses $CaCO_3 \rightleftharpoons CaO + CO_2$ and raises the decomposition temperature most (c).

B **synthesis gas**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **water gas**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q20 **Identify the correct statement(s) for phosphorimetric measurement from the following: A. It is done after a time delay when fluorescence, if present becomes negligible B. Immobilization of analyte increases phosphorescence. C. Phosphorescence decreases in the presence of heavy atoms**

(A) A only

(B) A and B

(C) A and C

(D) B and C

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer B A and B

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Phosphorescence is read after a delay when fluorescence has died (A true); immobilising the analyte (frozen matrix, adsorption) suppresses non-radiative decay and raises it (B true); heavy atoms increase intersystem crossing and enhance, not decrease, phosphorescence (C false). A and B.
- Therefore the answer is (B).

FINAL: (B) A and B

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: B

A

A only

Why (B) is the key — Phosphorescence is read after a delay when fluorescence has died (A true); immobilising the analyte (frozen matrix, adsorption) suppresses non-radiative decay and raises it (B true); heavy atoms increase intersystem crossing and enhance, not decrease, phosphorescence (C false). A and B.

C

A and C

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D

B and C

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q21

Identify correct statements from the following: A. Area of differential thermal analysis peak is proportional to amount of sample. B. Area of differential thermogravimetric analysis curve is proportional to mass loss. C. Phase transition cannot be studied, with differential scanning calorimetry. D. Simultaneous determination of two metal ions is possible with thermogravimetric analysis.

A. A, B and C

B. A, B and D

C. B, C and D

D. A, C and D

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer B A, B and D

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- The DTA peak area is proportional to the amount of sample, the DTG curve area to the mass lost, and TGA can determine two metals (e.g. Ca/Mg oxalates) at once. DSC is routinely used for phase transitions, so C is false. A, B and D (b).
- Therefore the answer is (B).

FINAL: (B) A, B and D

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: B

A

A, B and C

Why (B) is the key — The DTA peak area is proportional to the amount of sample, the DTG curve area to the mass lost, and TGA can determine two metals (e.g. Ca/Mg oxalates) at once. DSC is routinely used for phase transitions, so C is false. A, B and D (b).

C

B, C and D

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D

A, C and D

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q22 **Height equivalent to theoretical plate (HETP) in gas liquid chromatography depends Significantly on which of the following? (A) Temperature of column (B) Velocity of carrier gas (C) Packing of column (D) Column material**

A. A, B and C

B. C and D

C. B, C and D

D. A and C

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A A, B and C

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- By the van Deemter equation, HETP depends on carrier-gas velocity, column packing (particle size, eddy diffusion) and temperature (diffusion coefficients, mass transfer). A, B and C (a).
- Therefore the answer is (A).

FINAL: (A) A, B and C

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B **C and D**

Why (A) is the key — By the van Deemter equation, HETP depends on carrier-gas velocity, column packing (particle size, eddy diffusion) and temperature (diffusion coefficients, mass transfer). A, B and C (a).

C **B, C and D**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **A and C**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q23

Incorrect statement for amperometric titration is

A. it is based on measurement of diffusion current

B. its sensitivity is always higher than those of spectrophotometric titrations

C. it does not generally require an indicator

D. it requires inert atmosphere (N_2/Ar)

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer B its sensitivity is always higher than those of spectrophotometric titrations

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Amperometric titrations monitor the limiting (diffusion) current, need no indicator, and often need deaeration when reductions are followed. The false (absolute) claim is that their sensitivity is always higher than spectrophotometric titrations. (Bank key (d) — verify; dead-stop/biamperometric titrations do not need inert atmosphere.)
- Therefore the answer is (B).

FINAL: (B) its sensitivity is always higher than those of spectrophotometric titrations

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: B

A **it is based on measurement of diffusion current**

Why (B) is the key — Amperometric titrations monitor the limiting (diffusion) current, need no indicator, and often need deaeration when reductions are followed. The false (absolute) claim is that their sensitivity is always higher than spectrophotometric titrations. (Bank key (d) — verify; dead-stop/biamperometric titrations do not need inert atmosphere.)

C **it does not generally require an indicator**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **it requires inert atmosphere (N_2/Ar)**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q24

In atomic absorption spectroscopy, the atomization process utilizes

A. flame

B. electric field

C. magnetic field

D. electron beam

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A flame

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- AAS requires free ground-state atoms: the sample is aspirated into an air–acetylene or N_2O–acetylene flame (or a graphite furnace) where it is desolvated, vaporised and atomised.
- Therefore the answer is (A).

FINAL: (A) flame

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B **electric field**

Why (A) is the key — AAS requires free ground-state atoms: the sample is aspirated into an air–acetylene or N_2O–acetylene flame (or a graphite furnace) where it is desolvated, vaporised and atomised.

C **magnetic field**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **electron beam**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q25

On heating a sample of 25 mg hydrated compound (molecular weight = 250 g/mol) in thermogravimetric analysis, 16 mg of dehydrated compound remains. The number of water molecules lost per molecule of hydrated compound is ___. (Molecular weight of water = 18 g/mol)
(Numerical answer type — write the value.)

ANSWER: 5

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
Mass lost = 25 − 16 = 9 mg water = 0.5 mmol. Compound = 25/250 = 0.1 mmol → 0.5/0.1 = 5 H_2O per formula unit.

Q26

The quantity of the cobalt ore [$Co_3(AsO_4)_2 \cdot H_2O$] required to obtain 1 kg of cobalt (rounded off to two decimal places) is ____ kg. [Atomic Wt. of Co = 59, As = 75, O = 16, H = 1]
(Numerical answer type — write the value.)

ANSWER: 2.67 kg

QUESTION INSIGHTS

ESTIMATED TIME
3–5 min

DIFFICULTY
Hard

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★★

EXPECTED LEVEL
Part C (high merit)

MEMORY HOOK
$M[Co_3(AsO_4)_2 \cdot H_2O]$ = 3(59) + 2(75 + 64) + 18 = 473. Co content = 177/473 = 37.4 % → ore needed = 1/0.374 = 2.67 kg.

Q27

The indicator phenolphthalein changes colour at pH sim 9. This indicator is NOT suitable for accurate determination of the end point in the titration of

A. CH_3 COOH with NaOH

B. HCl with NH_4 OH

C. HCl with NaOH

D. HCl with KOH

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer B HCl with NH_4 OH

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- HCl vs NH_4OH (weak base) has its equivalence point near pH 5; phenolphthalein changes at pH ≈ 9 and would give a late, indistinct end point. The other three titrations pass through pH 9 at the steep part of the curve. Chapter list · Next in chapter →
- Therefore the answer is (B).

FINAL: (B) HCl with NH_4 OH

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: B

A **CH_3 COOH with NaOH**

Why (B) is the key — HCl vs NH_4OH (weak base) has its equivalence point near pH 5; phenolphthalein changes at pH ≈ 9 and would give a late, indistinct end point. The other three titrations pass through pH 9 at the steep part of the curve. Chapter list · Next in chapter →

C **HCl with NaOH**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **HCl with KOH**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q28

In ammonical buffer, oxine (8-hydroxyquinoline) forms yellow precipitate with

A. Mg(II)

B. Ca(II)

C. Ba(II)

D. Sr(II)

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer A Mg(II)

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- In ammoniacal buffer oxine precipitates Mg(II) as yellow $Mg(oxinate)_2$; Ca, Sr, Ba are not precipitated (a).
- Therefore the answer is (A).

FINAL: (A) Mg(II)

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: A

B **Ca(II)**
Why (A) is the key — In ammoniacal buffer oxine precipitates Mg(II) as yellow $Mg(oxinate)_2$; Ca, Sr, Ba are not precipitated (a).

C **Ba(II)**
Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

D **Sr(II)**
Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q29

In the measurement of hardness of water by complexometric titration, identify P and Q in the following equation. $[P]^{-}$ & + & $[H_2Y]^{2-}$ & → & $[Q]^{2-}$ & + & $[HIn]^{2-}$ + H^{+} red & & colourless & & colourless & & blue

A. P=MgY, Q=MgIn

B. $P=MgY_2$, $Q=MgIn_2$

C. $P=MgIn_2$, $Q=MgY_2$

D. P=MgIn, Q=MgY

QUESTION INSIGHTS

ESTIMATED TIME
2–3 min

DIFFICULTY
Medium

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★★☆

EXPECTED LEVEL
Part B / Part C

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer D P=MgIn, Q=MgY

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- With Eriochrome Black T: $[MgIn]^-$ (red) + H_2Y^{2-} → $[MgY]^{2-}$ (colourless) + HIn^{2-} (blue) + H^+ — P = MgIn, Q = MgY (d).
- Therefore the answer is (D).

FINAL: (D) P=MgIn, Q=MgY

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: D

A **P=MgY, Q=MgIn**

Why (D) is the key — With Eriochrome Black T: $[MgIn]^-$ (red) + H_2Y^{2-} → $[MgY]^{2-}$ (colourless) + HIn^{2-} (blue) + H^+ — P = MgIn, Q = MgY (d).

B **P=MgY_2, Q=$MgIn_2$**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

C **P=$MgIn_2$, Q=MgY_2**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

Q30

Indicator used in redox titration is

(A) Eriochrome black T

(B) Methyl orange

(C) Phenolphthalein

(D) Methylene blue

QUESTION INSIGHTS

ESTIMATED TIME
1–1.5 min

DIFFICULTY
Easy

CONCEPT TESTED
Analytical Chemistry (Inorganic) – General

PYQ FREQUENCY
Very High · 15 papers

REVISION PRIORITY
★★★☆☆

EXPECTED LEVEL
Part B

MEMORY HOOK
'A = εcl — Absorbance Equals ε·c·l'.

Correct Answer D Methylene blue

CONCEPT

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

↓

LOGIC / WORKING

- Methylene blue is a redox indicator (blue ⇌ colourless leuco form). Eriochrome black T is a metal-ion indicator; methyl orange and phenolphthalein are acid–base indicators.
- Therefore the answer is (D).

FINAL: (D) Methylene blue

SHORTCUT / EXAM TRICK

Mixtures: measure A at two wavelengths and solve two Beer's-law equations.

COMMON MISTAKE

Using %T in place of absorbance; confusing equivalence point with end point.

EXAM TIP

Isocratic elution = constant mobile phase; gradient = composition changes with time.

MEMORY TRICK

'A = εcl — Absorbance Equals ε·c·l'.

Why the Other Options Are Wrong

Correct answer: D

A **Eriochrome black T**

Why (D) is the key — Methylene blue is a redox indicator (blue ⇌ colourless leuco form). Eriochrome black T is a metal-ion indicator; methyl orange and phenolphthalein are acid–base indicators.

B **Methyl orange**

Ruled out: Using %T in place of absorbance; confusing equivalence point with end point.

C **Phenolphthalein**

Ruled out: Isocratic elution = constant mobile phase; gradient = composition changes with time.

TOPIC REVISION

Analytical Chemistry (Inorganic) – General

30 PYQs · Last-minute revision

TOPIC SUMMARY

Quantitative methods: titrimetry (equivalence vs end point, indicators), gravimetry, Beer–Lambert spectrophotometry (A = εcl), chromatography (retention, resolution), electrochemical sensors.

IMPORTANT FORMULA SHEET

- $A = \varepsilon cl = -\log T$
- Resolution $Rs = 2(t_2 - t_1)/(w_1 + w_2)$
- $N = 16(t_R/w)^2$; $H = L/N$
- Standard addition for matrix effects

FREQUENTLY ASKED CONCEPTS

- Beer's law limits
- Chromatographic resolution and plate number
- Choice of indicator
- Detection limit (3σ)

COMMON MISTAKES & QUICK NOTES

Watch out:
Using %T in place of absorbance; confusing equivalence point with end point.
Isocratic elution = constant mobile phase; gradient = composition changes with time.

MOST-REPEATED PYQs & EXPECTED IN EXAM

PYQs in this topic: Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 …

Expect 2 question(s) next session on Analytical Chemistry (Inorganic) – General.

FOR STUDENTS AND EDUCATORS

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FOR EDUCATORS

Teach from the Question Bank, one question at a time

Find the right questions, teach them in class, then take them with you.

1 Find questions

- Browse
- Question search
- Topic packs

2 Teach one by one

Question Bank

Show each question to students on the board, in your own order.

3 Export

PPTX, DOCX, PNG (zip), HTML, Markdown

Take the paper home after class.

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AI question paper generator

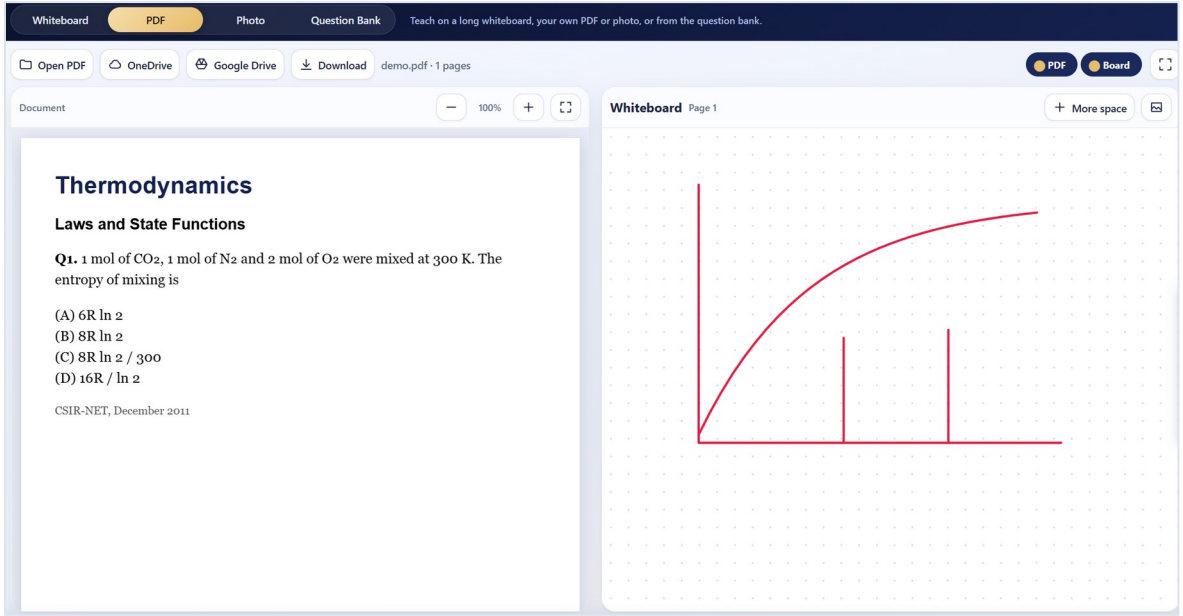
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