Dawson COLLEGE

Department of Chemistry & Chemical Technology
Remedial Activities for Sec V Chemistry (202-001-RE)

PRACTICE FINAL EXAMINATION

This practice examination is intended to reflect the structure and timing of the upcoming Remedial Activities for Secondary V Chemistry (202-001-RE) Final Examination; however, the question style, difficulty level, and exact formatting on the actual exam may differ.

Recommended Preparation Guidelines

- **Simulate Authentic Test Conditions:** Complete this practice exam in a quiet room without distractions. Strictly enforce the **3-hour** time limit to gauge your pacing.
- **Work Closed-Book:** To get the maximum learning benefit, treat this sample exam as a true practice. Attempt all questions without checking textbooks, instructors' notes or solutions mid-exam. Once completed, grade your exam using the answer key attached at the end.

General Examination Instructions

- Non-programmable calculators are permitted.
- A periodic table and important constants are attached to the back of the exam booklet.
- Show all work for calculation questions, ensuring all numerical answers are expressed with the correct number of significant figures and appropriate units.

1. Complete the following table:

Chemical Symbol	**S**	
Number of protons		50
Number of neutrons	27	74
Number of electrons	18	
Atomic number		
Mass number (not the Atomic mass)		
Net charge		+4

2. Which atomic particle determines the chemical behavior of an atom?
   A) proton
   B) electron
   C) neutron
   D) nucleus
   E) none of these

3. Which among the following represent a set of isotopes? Atomic nuclei containing:

   I. 20 protons and 20 neutrons
   II. 21 protons and 19 neutrons
   III. 22 neutrons and 18 protons
   IV. 20 protons and 22 neutrons
   V. 21 protons and 20 neutrons

4. I, II, III
5. III, IV
6. I, V
7. I, IV and II, V
8. No isotopes are indicated.

4. An aqueous solution of HF would be named
   A) hydrogen fluoride
   B) perfluoric acid
   C) hypofluorous acid
   D) hydrofluoric acid
   E) none of these

5. Name the following compounds:

a) KBr

b) FeO

c) N_2O_5

6. Balance the following equation in standard form (using the smallest coefficients possible) and determine the sum of all the coefficients.

$LiA\ell H_4(s) + AlC\ell_3(s) \rightarrow A\ell H_3(s) + LiC\ell(s)$

A) 8
B) 9
C) 10
D) 11
E) 12

7. An aqueous solution of potassium chloride (KCl) is mixed with an aqueous solution of sodium nitrate ($NaNO_3$).

Identify the solid in the balanced equation.

A) KCl (s)
B) $NaNO_3$ (s)
C) KNO_3 (s)
D) NaCl (s)
E) There is no solid formed when the two solutions are mixed.

8. The mineral johnbaumite has the formula $Ca_5(AsO_4)_3(OH)$.
What is the molar mass of this compound ?

What is the mass percent of O (oxygen) ?

What would be the mass of 1000. formula units of this compound, assuming

the sampling represents its natural isotopic distribution?

Molar mass

Mass % of oxygen

Mass of 1000. formula units

9. You want to prepare 500.00 mL of a 0.7500 M solution of $CaC\ell_2$ using $CaC\ell_2 \bullet 2H_2O$.

How many grams of $CaC\ell_2 \bullet 2H_2O$ will be needed to prepare this solution ?

10. An aqueous solution of copper(II) nitrate ($Cu(NO_3)_2$)is mixed with an aqueous solution of sodium hydroxide (NaOH). Identify the solid in the balanced equation.

A) $Cu(NO_3)_2$ (s)
B) NaOH (s)
C) $Cu(OH)_2$ (s)
D) $NaNO_3$ (s)
E) There is no solid formed when the two solutions are mixed.

Use the following to answer questions 11-13:

Aqueous solutions of barium chloride ($BaCl_2$) and silver nitrate ($AgNO_3$) are mixed to form solid silver chloride and aqueous barium nitrate.

11. The balanced molecular equation contains which one of the following terms?
a) AgCl (*s*)
b) 2AgCl (*s*)
c) $2Ba(NO_3)_2$ (*aq*)
d) $BaNO_3$ (*aq*)
e) 3AgCl (*aq*)

12. The balanced complete ionic equation contains which of the following terms?
a) $2Ba^{2+}$(*aq*)
b) Cl^-(*aq*)
c) $2Ag^+$(*aq*)
d) NO_3^- (*aq*)
e) AgCl(*aq*)

13. The net ionic equation contains which of the following terms?
a) Ag^+(*aq*)
b) Ba^{2+}(*aq*)
c) NO_3^- (*aq*)
d) H^+ (*aq*)
e) AgCl(*aq*)

14. The oxidation state of manganese in MnO_4^- is

A) 0
B) +3
C) +4
D) +7
E) +8

Answer the questions that refer to the following reaction:
$TiCl_4(l) + O_2(g) \rightarrow TiO_2(s) + 2Cl_2(g)$

15. Which species is oxidized?

A) Ti
B) Cl
C) O
D) TiO_2
E) O_2

16. A compound contains 39.993% carbon, 6.727% hydrogen, and 53.280% oxygen (by mass). Calculate the empirical formula.

17. You have two aqueous solutions of sugar.
Solution 1 has a concentration of 1.269 M and a volume of 823.5 mL.
Solution 2 has a concentration of 2.663 M and a volume of 332.0 mL.
You mix the two solution together.
What will be the concentration (M) of the resulting solution?

18. How many g of NaOH (s) are needed to prepare 1.500 L of a 0.7500 M solution.

19. For the reaction

$$2\ Ca_3(PO_4)_2 + 6\ SiO_2 + 10\ C \rightarrow 6\ CaSiO_3 + P_4 + 10\ CO$$

365.00 g of $Ca_3(PO_4)_2$ is reacted with 150.00 g of SiO_2 and 80.00 g of C.
Assuming the reaction goes to completion, how many grams of $CaSiO_3$ are produced?

20. What is the volume of a helium balloon that contains 3.456 moles helium at 27.00°C and 1.500 atm?

21. This is an acid-base titration problem.

You are pipetting 10.00 mL of a HCℓ (acid) solution of unknown concentration from a vial labeled "**Unknown A"** .
You deliver this 10.00 mL volume of HCℓ into an Erlenmeyer flask,
and you add 50.00 mL of water
and 3 drops of phenolphthalein indicator also into the Erlenmeyer.

You titrate this HCℓ acid with a solution of NaOH (base) 0.1500 M,

To get to the endpoint (when the solution turns the slightest color of pink),
you add 11.56 mL of NaOH.

What is the concentration of the original unknown solution of HCℓ from the vial labeled "**Unknown A"**, in mole/L ?

22. How much heat is required to raise the temperature of a 4.480 g sample of iron (specific heat = 0.4500 J/g°C) from 25.00°C to 89.80°C?

23. In a coffee-cup calorimeter,

50.00 mL of 2.000 M $HC\ell$ and 50.00 mL of 1.650 M NaOH are mixed.
The reaction that occurs is:

$H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$ ($C\ell^-$ and Na^+ are spectator ions)

Both solutions were initially at room temperature (21.60°C),
and the final temperature of the mixture is 32.55°C.

Assume: density of the solution = 1.000 g/ml ,
the specific heat capacity of the solution = 4.184 J/(g °C) (same as water),
and that no heat between the calorimeter and the surrounding is being exchanged.

Calculate ΔH of the reaction in $kJ \cdot mol^{-1}$.

24. Consider the following processes:

$2A \rightarrow (1/2)B + C$ $\Delta H_1 = 5$ kJ/mol

$(3/2)B + 4C \rightarrow 2A + C + 3D$ $\Delta H_2 = -15$ kJ/mol

$E + 4A \rightarrow C$ $\Delta H_3 = 10$ kJ/mol

Calculate ΔH for: $C \rightarrow E + 3D$

a) 0 kJ/mol
b) 10 kJ/mol
c) –10 kJ/mol
d) –20 kJ/mol
e) 20 kJ/mol

25. Consider the following system at equilibrium: $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + 92.94$ kJ
Which of the following changes will shift the equilibrium to the right?

I. increasing the temperature
II. decreasing the temperature
III. increasing the volume
IV. decreasing the volume
V. removing some NH_3
VI. adding some NH_3
VII. removing some N_2
VIII. adding some N_2

a) I, IV, VI, VII
b) II, III, V, VIII
c) I, VI, VIII
d) I, III, V, VII
e) II, IV, V, VIII

26. Consider the following equilibrium:

$$2NOCl(g) \rightleftharpoons 2NO(g) + Cl_2(g)$$

with $K = 1.600 \bullet 10^{-5}$. 1.000 mole of pure NOCl and 0.9440 mole of pure Cl_2 are placed in a 0.2500 L container. Calculate the equilibrium concentration of NO(*g*).

27. The following questions refer to the reaction between nitric oxide and hydrogen

$2NO + H_2 \rightarrow N_2O + H_2O$

Experiment	Initial [NO], *M*	Initial [H_2], *M*	Initial Rate of Disappearance of NO (mol/L sec)
1	$6.40 \bullet 10^{-3}$	$2.20 \bullet 10^{-3}$	$2.70 \bullet 10^{-5}$
2	$12.91 \bullet 10^{-3}$	$2.20 \bullet 10^{-3}$	$1.10 \bullet 10^{-4}$

Give the order of the reaction with respect to [NO] ,
and determine the numerical value of the rate constant and units,
knowing that the order of the reaction with respect to [H_2] is 1.0.
(In other words, find the values of *m* and *k* for the rate law of this reaction,
knowing that: *Initial Rate* = $k[NO]^m [H_2]^1$)

Order of the reaction with respect to [NO], m =

Rate constant, k= with units

28. For the following reaction:

$2\ NOC\ell \rightarrow 2NO + C\ell_2$

The following data was obtained.

Temperature (°C)	Rate constant (k) L / (mole · s)
31.00	$3.646 \cdot 10^{-8}$
74.00	$1.345 \cdot 10^{-6}$

Calculate the Energy of activation for this reaction (in kJ/ mole).

29. You are making a NaOH solution by dissolving 26.45 g of NaOH in a 500.00 mL volumetric flask with water (that is, the final volume of the basic solution is 500.00 mL).
What would be the pH of this solution ?

30.

Using the following bond energies:

Bond	Bond Energy (kJ/mol)
H–H	432
H–F	565
F–F	154

estimate Δ*H* for the reaction $H_2 + F_2 \rightarrow 2\ HF$.

31. Consider the following standard heats of formation:

$P_4O_{10}(s) = -3110$ kJ/mol

$H_2O(l) = -286$ kJ/mol

$H_3PO_4(s) = -1279$ kJ/mol

Calculate the change in enthalpy for the following process:

$P_4O_{10(s)} + 6\ H_2O_{(l)} \rightarrow 4\ H_3PO_{4(s)}$

32.

The equilibrium system

$2A \rightleftharpoons 2B + C$, has a very small equilibrium constant: $K = 2.560 \times 10^{-9}$.

Initially , only A is present, at a concentration of 2.321M.

Determine the concentration of C at equilibrium.

Periodic Table of the Elements

	1A												3A	4A	5A	6A	7A	8A
1	1 H 1.008	2A																2 He 4.003
2	3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31	3B	4B	5B	6B	7B	8B	9B	10B	1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc 98.00	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
6	55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 181.0	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	89 Ac[a] (227)	104 Rf (267)	105 Db (268)	106 Sg (269)	107 Bh (270)	108 Hs (269)	109 Mt (278)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (289)	116 Lv (293)	117 Ts (294)	118 Og (294)

6 C 12.01 — Atomic number / symbol / mass (amu or g/mol)

metalloid

*Lanthanides	58 Ce 140	59 Pr 141	60 Nd 144	61 Pm 145	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175
[a]Actinides	90 Th 232	91 Pa 231	92 U 238	93 Np 237.1	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 252	100 Fm 257	101 Md 258	102 No 259	103 Lr 260

constants
R = 8.31451 J.K^{-1}.mol^{-1}
R = 8.31451 L.kPa.K^{-1}.mol^{-1}
R = 0.08206 L.atm.K^{-1}.mol^{-1}
Avogadro (N_A) = 6.022 x 10^{23} mole^{-1}

p = 10^{-12}	k = 10^{3}
n = 10^{-9}	M = 10^{6}
μ = 10^{-6}	G = 10^{9}
m = 10^{-3}	T = 10^{12}

conversions
Cal ≡ 4.184 J
Pa = N.m^{-2}
J = kg.m^{2}.s^{-2}
Å = 10^{-10} m
273.15 K = 0°C
101.325 kPa = 1 atm
101.325 kPa = 760 mm Hg
101.325 kPa = 760 torr
101.325 kPa = 1.01325 bar

PRACTICE FINAL EXAMINATION 202-001-RE — ANSWER KEY

Question 1:

Property	Column 1 (Sulfur)	Column 2 (Tin)
Chemical Symbol	S	Sn
Number of Protons	16	50
Number of Neutrons	27	74
Number of Electrons	18	46
Atomic Number	16	50
Mass Number	43	124
Net Charge	-2	+4

Question 2: Answer - B) electron

Electrons, specifically valence electrons, determine how an atom interacts and bonds with other atoms during chemical reactions.

Question 3: Answer - d)

Isotopes are atoms of the same element that contain the exact same number of protons but different numbers of neutrons.

- Set 1 (Calcium isotopes): I (20 p, 20 n) and IV (20 p, 22 n)
- Set 2 (Scandium isotopes): II (21 p, 19 n) and V (21 p, 20 n)

Question 4: Answer - D) hydrofluoric acid

Question 5: Answer -

a) KBr: Potassium bromide

b) FeO: Iron(II) oxide

c) N_2O_5: Dinitrogen pentoxide

Question 6: Answer - D) 11

Reaction: $LiAlH_4(s) + AlCl_3(s) \rightarrow AlH_3(s) + LiCl(s)$

Balanced Equation: $3\ LiAlH_4(s) + 1\ AlCl_3(s) \rightarrow 4\ AlH_3(s) + 3\ LiCl(s)$

Sum of coefficients: 3 + 1 + 4 + 3 = 11

Question 7: Answer - E) There is no solid formed when the two solutions are mixed.

Both prospective double-displacement products—KNO_3 and NaCl—are soluble ionic compounds in water according to solubility rules. Thus, no precipitate forms.

Question 8: Answer -

- Molar Mass: 634.17 g/mol

  Calculation: 5(40.08) + 3(74.922) + 13(16.00) + 1(1.008) = 634.17 g/mol
- Mass % of Oxygen: 32.80%

  Calculation: (13 × 16.00 g/mol / 634.17 g/mol) × 100 = 32.80%
- Mass of 1000. Formula Units: 1.053×10^{-18} g

Calculation: (1000 units / 6.022×10^{23} units/mol) × 634.17 g/mol = 1.053×10^{-18} g

Question 9: Answer - 55.13 g of $CaCl_2 \cdot 2H_2O$

1. Required moles of $CaCl_2$: 0.50000 L × 0.7500 mol/L = 0.3750 moles
2. Molar mass of $CaCl_2 \cdot 2H_2O$: 40.08 + 2(35.45) + 2(18.015) = 147.01 g/mol
3. Mass required: 0.3750 mol × 147.01 g/mol = 55.13 g

Question 10: Answer - C) $Cu(OH)_2(s)$

Copper(II) hydroxide is insoluble in water and forms a precipitate, while sodium nitrate remains in aqueous solution.

Question 11: Answer - b) 2AgCl (s)

Balanced molecular equation: $BaCl_2(aq) + 2\ AgNO_3(aq) \rightarrow 2\ AgCl(s) + Ba(NO_3)_2(aq)$

Question 12: Answer - c) $2Ag^+(aq)$

Complete ionic equation: $Ba^{2+}(aq) + 2\ Cl^-(aq) + 2\ Ag^+(aq) + 2\ NO_3^-(aq) \rightarrow 2\ AgCl(s) + Ba^{2+}(aq) + 2\ NO_3^-(aq)$

Question 13: Answer - a) $Ag^+(aq)$

Net ionic equation: $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$

Question 14: Answer - D) +7

Calculation: x + 4(-2) = -1 => x - 8 = -1 => x = +7

Question 15: Answer - B) Cl

Reaction: $TiCl_4(l) + O_2(g) \rightarrow TiO_2(s) + 2\ Cl_2(g)$

Chlorine increases in oxidation state from -1 in $TiCl_4$ to 0 in elemental Cl_2, indicating oxidation.

Question 16: Answer - CH_2O

1. Moles in 100 g sample: C: 39.993/12.011 = 3.3297 mol | H: 6.727/1.008 = 6.6736 mol | O: 53.280/16.00 = 3.3300 mol
2. Divide by smallest (3.3297): C = 1.00, H = 2.00, O = 1.00
3. Empirical Formula: CH_2O

Question 17: Answer - 1.669 M

1. Moles in Solution 1: 1.269 mol/L × 0.8235 L = 1.0450 moles
2. Moles in Solution 2: 2.663 mol/L × 0.3320 L = 0.8841 moles
3. Total Moles & Volume: Total Moles = 1.9291 mol | Total Volume = 1.1555 L
4. Final Concentration: 1.9291 mol / 1.1555 L = 1.669 M

Question 18: Answer - 45.00 g

Calculation: 1.500 L × 0.7500 mol/L = 1.125 moles NaOH

Mass: 1.125 mol × 39.997 g/mol = 45.00 g

Question 19: Answer - 290.0 g of $CaSiO_3$

1. Reactant moles available: $Ca_3(PO_4)_2$: 1.1767 mol | SiO_2: 2.4967 mol | C: 6.660 mol
2. Identify Limiting Reactant: SiO_2 is limiting (2.4967 / 6 = 0.4161)
3. Product yield: Moles of $CaSiO_3$ = Moles of SiO_2 = 2.4967 mol
4. Mass produced: 2.4967 mol × 116.16 g/mol = 290.0 g

Question 20: Answer - 56.78 L

1. Given parameters: n = 3.456 mol, T = 27.00°C = 300.15 K, P = 1.500 atm
2. Formula (PV = nRT): V = (nRT) / P = (3.456 × 0.08206 × 300.15) / 1.500 = 56.75 L

Question 21: Answer - 0.1734 M

1. Reaction: $HCl + NaOH \rightarrow NaCl + H_2O$
2. At end point: $mol_{HCl} = mol_{NaOH}$ = 0.01156 L x 0.1500 mol/L = 0.001734 mol
3. Molarity of HCl: 0.001734 / 0.01000 L = 0.1734 M

Question 22: Answer - 130.6 J

1. Formula: $q = m \times C \times \Delta T$
2. Temperature change: ΔT = 89.80°C - 25.00°C = 64.80°C
3. Calculation: q = 4.480 g × 0.4500 J/(g·°C) × 64.80°C = 130.6 J

Question 23: Answer - -55.53 kJ/mol

1. Limiting Reactant Moles (OH^-): 0.05000 L × 1.650 M = 0.0825 moles
2. Heat absorbed by solution: q_{soln} = 100.00 g × 4.184 J/(g·°C) × (32.55 - 21.60)°C = 4581.48 J
3. Enthalpy change: $\Delta H = -q_{rxn}$ / moles = -4.5815 kJ / 0.0825 mol = -55.53 kJ/mol

Question 24: Answer - c) -10 kJ/mol

Target Reaction: $C \rightarrow E + 3D$

Combinations: Reverse Rxn 3, combine with Rxn 2 and Rxn 1 to yield ΔH = -10 kJ/mol.

Question 25: Answer - e) II, IV, V, VIII

Reaction (Exothermic): $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + 92.94$ kJ

Shifts to the right (toward products) occur with: Decreasing T (II), Decreasing volume / Increasing P (IV), Removing NH_3 (V), Adding N_2 (VIII)

Question 26: Answer - 8.23×10^{-3} M

1. Initial concentrations: $[NOCl]_0 = 1.00/0.2500 = 4.00$ M | $[Cl_2]_0 = 0.9440/0.2500 = 3.776$ M
2. Equilibrium Expression: $K = ([NO]^2[Cl_2]) / [NOCl]^2 = 1.600 \times 10^{-5}$
3. Simplification (small K): $1.600 \times 10^{-5} \approx (4x^2 \times 3.776) / (4.00)^2 \Rightarrow x = 0.004117$ M
4. [NO] at equilibrium: $[NO] = 2x = 2(0.004117\ M) = 8.23 \times 10^{-3}$ M

Question 27: Answer - Order (m) = 2 | k = 299.7 $L^2/mol^2 \cdot s$

1. Order with respect to NO (m): Comparing Exp 1 & 2: doubling [NO] quadruples initial rate => m = 2
2. Rate Law: Initial Rate = $k\,[NO]^2\,[H_2]^1$
3. Solve for k (Exp 1): $2.70 \times 10^{-5} = k\,(6.40 \times 10^{-3})^2\,(2.20 \times 10^{-3}) \Rightarrow k = 299.7\ L^2/mol^2 \cdot s$

Question 28: Answer - 73.66 kJ/mol

1. Arrhenius Equation: $\ln(k_2/k_1) = (Ea / R) \times (1/T_1 - 1/T_2)$
2. Temperatures in Kelvin: $T_1 = 304.15$ K, $T_2 = 347.15$ K
3. Substitution: $\ln(1.345\times10^{-6} / 3.646\times10^{-8}) = (Ea / 8.314) \times (1/304.15 - 1/347.15)$
4. Result: $3.606 = (Ea / 8.314) \times 0.0004073 \Rightarrow Ea = 73.66$ kJ/mol

Question 29: Answer - 14.12

1. Moles of NaOH: 26.45 g / 39.997 g/mol = 0.6613 moles
2. Concentration $[OH^-]$: 0.6613 mol / 0.50000 L = 1.3226 M
3. pOH and pH: pOH = -log(1.3226) = -0.1214 => pH = 14.00 - (-0.1214) = 14.12

Question 30: Answer - -544 kJ/mol

1. Reaction: $H_2 + F_2 \rightarrow 2\ HF$
2. Bonds broken: 1(H-H) + 1(F-F) = 432 + 154 = 586 kJ
3. Bonds formed: 2(H-F) = 2 × 565 = 1130 kJ
4. ΔH: 586 - 1130 = -544 kJ/mol

Question 31: Answer - -290 kJ

1. Reaction: $P_4O_{10}(s) + 6\ H_2O(l) \rightarrow 4\ H_3PO_4(s)$
2. Formula: $\Delta H° = \sum \Delta H°f(products) - \sum \Delta H°f(reactants)$
3. Substitution: $\Delta H° = 4(-1279) - [(-3110) + 6(-286)] = -5116 - (-4826) = -290$ kJ

Question 32: Answer - 1.511×10^{-3} M

1. System: $2A \rightleftharpoons 2B + C$ | $K = 2.560 \times 10^{-9}$, $[A]_0 = 2.321$ M

2. ICE setup: [A] ≈ 2.321 M, [B] = 2x, [C] = x
3. Expression: $2.560 \times 10^{-9} = (2x)^2(x) / (2.321)^2 = 4x^3 / 5.387$
4. Solve for x: $x^3 = 3.447 \times 10^{-9}$ => $x = 1.511 \times 10^{-3}$ M => [C] = 1.511×10^{-3} M