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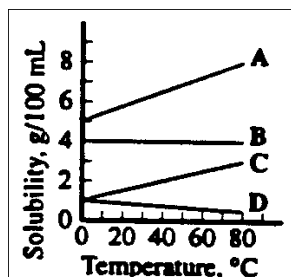
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Directions: Show all work and/or annotate with an AP Chem level explanation for non-math answers.

1999 NChO Exam

6. The aqueous solubilities of several compounds between temperatures of 0 °C and 80 °C are shown in this diagram. Which compound can be recovered with the highest percent yield by dissolving a sample in water at 80 °C and cooling to 0 °C?

- (A) A
(B) B
(C) C
(D) D



13. What is the molarity of the chloride ion in 250 mL of a solution containing 1.90 g of MgCl₂? (The molar mass of MgCl₂ is 95.2 g mol⁻¹)

- (A) 0.020 M
(B) 0.040 M
(C) 0.080 M
(D) 0.16 M

15. What is the molarity of an H₂SO₄ solution if 25.00 mL is exactly neutralized by 32.63 mL of 0.164 M NaOH?

- (A) 0.107 M
(B) 0.126 M
(C) 0.214 M
(D) 0.428 M

1998 NChO Exam

1. Which gas is most soluble in water?

- (A) ammonia
(B) hydrogen
(C) methane
(D) nitrogen

11. What volume of 0.15 M HCl can be made from 7.5 mL of concentrated HCl (12M)?

- (A) 0.060 L
(B) 0.60 L
(C) 6.0 L
(D) 6.0 x 10² L

13. How many moles of Mg(OH)₂ can be precipitated when 15 mL of 0.20 M MgCl₂ solution is mixed with 25 mL of 0.18 M KOH?

- (A) 0.0015 mol
(B) 0.0022 mol
(C) 0.0030 mol
(D) 0.0045 mol

15. A student wants to prepare 250. mL of 0.10M NaCl solution. Which procedure is most appropriate? (The molar mass of NaCl is 58.4 g mol⁻¹)

- (A) Add 5.84 g of NaCl to 250.mL of H₂O
(B) Add 1.46 g of NaCl to 250.mL of H₂O
(C) Dissolve 5.84 g of NaCl in 50mL of H₂O and dilute to 250. mL.
(D) Dissolve 1.46 g of NaCl in 50mL of H₂O and dilute to 250. mL.

34. Which species dissociates most completely in water solution?

- (A) NH₄⁺
(B) H₂CO₃
(C) HNO₃
(D) HSO₄⁻

35. When one mole of $(\text{NH}_4)_2\text{HPO}_4(\text{s})$ dissolves in water, the number of moles of ions present is closest to which value?

- (A) 16
- (B) 8
- (C) 4
- (D) 3

60. Which compound is most soluble in water?

- (A) ethylamine
- (B) chlorobenzene
- (C) methyl acetate
- (D) pentane

1997 NChO Exam

1. Which gas is least soluble in water?

- (A) H_2
- (B) CO_2
- (C) NH_3
- (D) SO_2

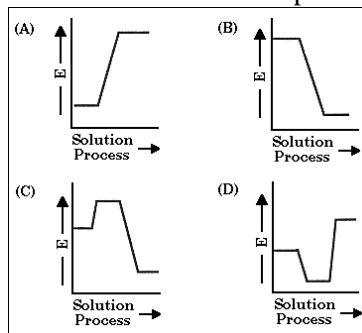
13. What mass of calcium chloride hexahydrate must be dissolved in sufficient water to prepare 200 mL of a solution with a chloride ion concentration of 0.50M? The molar mass of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ is 219 g mol^{-1}

- (A) 5.6 g
- (B) 11 g
- (C) 22 g
- (D) 44 g

14. The major commercial source for bromine is deep brine wells in Arkansas where the concentration of bromide ion can be as high as 5000 parts per million by mass. What is this concentration when expressed as a mass percentage?

- (A) 0.005%
- (B) 0.05%
- (C) 0.5%
- (D) 5%

25. When $\text{Na}_2\text{S}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ dissolve in water, the solution gets cold. Which energy diagram best represents the behavior of this solution process?



Answers

| 1999 | 1998 | 1997 |
|-------|-------|-------|
| 6) C | 1) A | 1) A |
| 13) D | 11) B | 13) B |
| 15) A | 13) B | 14) C |
| | 15) D | 25) A |
| | 34) C | |
| | 35) D | |
| | 60) A | |

Other non-NChO Questions

- 1) List the "always soluble" ions from solubility chart.
- 2) For *most* solids, the solubility increases as temperature goes which direction, up or down?
- 3) For gases, the solubility increases as temperature goes which direction, up or down?
- 4) The rate at which solids dissolves increases or decreases with increasing surface area?
- 5) The solubility of gases increases or decreases as the pressure above the solution is increased?
- 6) List three electrolytes, and three non-electrolytes.
- 7) How can you test whether something is an electrolyte or not?
- 8) Define saturated, unsaturated and super saturated.
- 9) Identify the following points on the graph as saturated, unsaturated, or supersaturated

A =
B =
C =

