

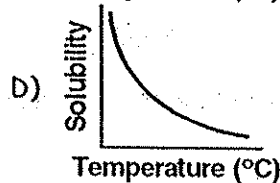
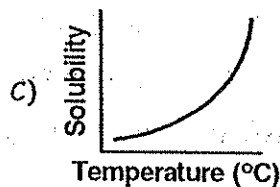
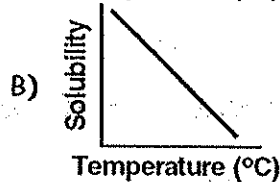
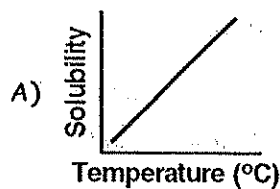
# SOLUTIONS EXAM

Name: \_\_\_\_\_

- In an aqueous solution of potassium chloride, the solute is
  - $H_2O$
  - Cl
  - KCl
  - K
- When calcium chloride is dissolved in water, to which end of the adjacent water molecules will a calcium ion be attracted?
  - the oxygen end, which is the negative pole
  - the oxygen end, which is the positive pole
  - the hydrogen end, which is the positive pole
  - the hydrogen end, which is the negative pole
- Which substance is *most* likely to dissolve in a nonpolar solvent such as hexane?
  - KCl(s)
  - $NH_4Cl(s)$
  - $C_6H_4Cl_2(s)$
  - $CaCl_2(s)$
- Solubility data for salt X is shown in the table below.

Temperature (°C)	Solubility ( $\frac{g \text{ salt X}}{100g \text{ H}_2O}$ )
10	5
20	10
30	15
40	20
50	30
60	35

Which graph *most* closely represents the data shown in the table?



- The molarity ( $M$ ) of a solution is equal to the
  - $\frac{\text{number of moles of solute}}{\text{liter of solution}}$
  - $\frac{\text{number of grams of solute}}{\text{liter of solvent}}$
  - $\frac{\text{number of moles of solute}}{\text{liter of solvent}}$
  - $\frac{\text{number of grams of solute}}{\text{liter of solution}}$
- What is the molarity of a solution that contains 112 grams of KOH in 2.00 liters of solution?
  - 1.00 M
  - 2.00 M
  - 3.00 M
  - 4.00 M

- 7) Which solution is the *most* concentrated?
- A) 2 moles of solute dissolved in 3 liters of solution.
  - B) 4 moles of solute dissolved in 8 liters of solution
  - C) 1 mole of solute dissolved in 1 liter of solution
  - D) 6 moles of solute dissolved in 4 liters of solution
- 8) A 200. gram sample of a salt solution contains 0.050 grams of NaCl. What is the concentration of the solution in parts per million (ppm)?
- A)  $2.5 \times 10^{-4}$  ppm
  - B)  $5.0 \times 10^4$  ppm
  - C) 250. ppm
  - D) 50. ppm
- 9) How do the freezing and boiling points of a sample of water change when 1 mole of NaCl is dissolved in it?
- A) The freezing point increases and the boiling point increases.
  - B) The freezing point increases and the boiling point decreases.
  - C) The freezing point decreases and the boiling point increases.
  - D) The freezing point decreases and the boiling point decreases.
- 10) A solution containing 55 grams of  $\text{NH}_4\text{Cl}$  in 100. grams of water is saturated at a temperature of
- A)  $57^\circ\text{C}$
  - B)  $47^\circ\text{C}$
  - C)  $77^\circ\text{C}$
  - D)  $67^\circ\text{C}$
- 11) According to the *Solubility Curves* chemistry reference table, approximately how many grams of  $\text{KClO}_3$  are needed to saturate 100 grams of  $\text{H}_2\text{O}$  at  $40^\circ\text{C}$ ?
- A) 16 g
  - B) 6 g
  - C) 47 g
  - D) 38 g
- 12) According to the *Solubility Curves* chemistry reference table, what is the maximum number of grams of  $\text{NH}_4\text{Cl}$  that will dissolve in 200 grams of water at  $70^\circ\text{C}$ ?
- A) 100 g
  - B) 62 g
  - C) 85 g
  - D) 124 g
- 13) How many grams of  $\text{NaNO}_3$  per 100 grams of  $\text{H}_2\text{O}$  would produce a supersaturated solution?
- A) 110 g at  $40^\circ\text{C}$
  - B) 90 g at  $30^\circ\text{C}$
  - C) 60 g at  $10^\circ\text{C}$
  - D) 80 g at  $20^\circ\text{C}$
- 14) A solution contains 90 grams of a salt dissolved in 100 grams of water at  $40^\circ\text{C}$ . The solution could be an unsaturated solution of
- A) NaCl
  - B)  $\text{KNO}_3$
  - C)  $\text{NaNO}_3$
  - D) KCl
- 15) Based on the *Solubility Curves* chemistry reference table, what change will cause the solubility of  $\text{KNO}_3(\text{s})$  to increase?
- A) increasing the temperature
  - B) decreasing the temperature
  - C) increasing the pressure
  - D) decreasing the pressure
- 16) Based on the *Solubility Guidelines* chemistry reference table, a saturated solution of which salt would be *most* concentrated?
- A) AgCl
  - B)  $\text{ZnCl}_2$
  - C)  $\text{PbCrO}_4$
  - D)  $\text{BaSO}_4$
- 17) Solutions of  $\text{AgNO}_3(\text{aq})$  and  $\text{KCl}(\text{aq})$  are mixed. Will a visible reaction occur?
- A) No, because  $\text{KNO}_3$  is soluble in water.
  - B) Yes, because  $\text{KNO}_3$  will precipitate out of solution.
  - C) Yes, because AgCl will precipitate out of solution.
  - D) No, because AgCl is soluble in water.

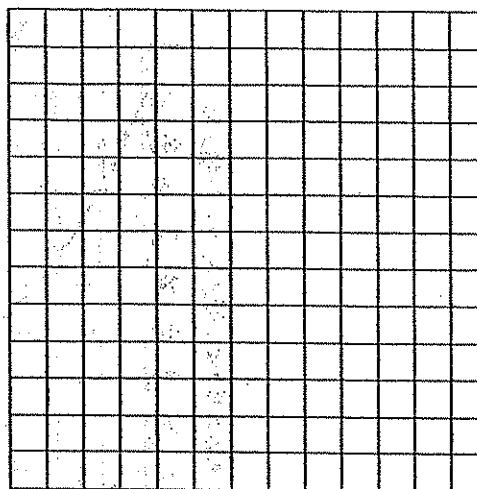
- 18) The number of grams of solute *A* that would dissolve in 100. grams of water was measured at several temperatures. The following data was collected:

DATA TABLE

Temperature (°C)	Mass of Solute (per 100 grams H <sub>2</sub> O)
10	2.5
20	5.0
30	10.0
40	20.0
50	35.0
60	47.0

Mass of Solute (per 100 grams H<sub>2</sub>O)

Title: \_\_\_\_\_

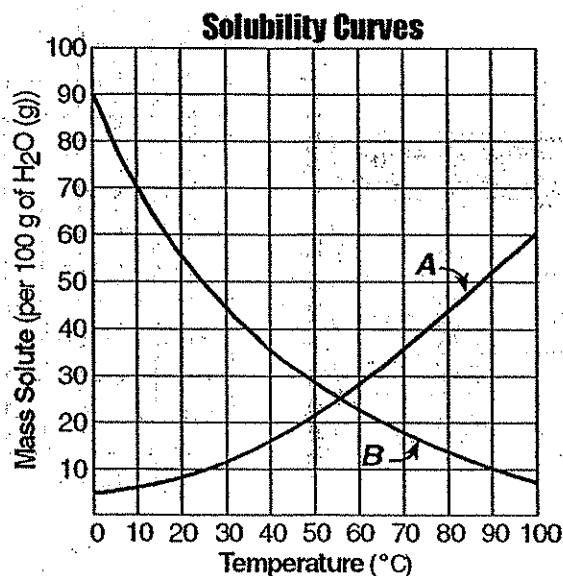


Temperature (°C)

- (a) Using the information in the data table, construct a line graph on the grid provided according to the following directions.
- (1) Mark an appropriate scale on each axis.
  - (2) Plot the data from the data table. Surround each point with a small circle and draw a best-fit curve for the solubility of solute *A*.
- (b) Write an appropriate title on the graph.
- (c) State the relationship between temperature and solubility of solute *A*.
- (d) During which interval is there the *greatest* increase in solubility?
- (1) 10°C to 20°C    (3) 40°C to 50°C
  - (2) 30°C to 40°C    (4) 50°C to 60°C
- (e) Using your graph, predict the solubility of solute *A* at 45°C.

Questions 19 through 21 refer to the following:

The graph below represents the solubility curves for solute *A* and solute *B*.



- 19) At what temperature are solute *A* and solute *B* equally soluble in 100. grams of water?
- 20) Which solute, *A* or *B*, is most likely a gas? [Explain why.]
- 21) State the relationship between temperature and solubility of solute *B*.
- 22) A sample of drinking water was found to contain .0015 grams of chlorine in 500 grams of water. What is the concentration of chlorine in the water sample in parts per million (ppm)? [Write the correct formula. Show all work.]

- 23)  $\text{KNO}_3(\text{s})$  is added to a beaker containing 100 grams of water at room temperature ( $25^\circ\text{C}$ ) until a saturated solution is created.
- Calculate the gram formula mass of  $\text{KNO}_3$ . [Round atomic masses from the Periodic Table to the nearest tenth. Show all work. Indicate the correct answer with an appropriate unit.]
  - Using the *Solubility Curves* chemistry reference table, determine the number of grams of  $\text{KNO}_3$  that should dissolve in 100 grams of water at  $25^\circ\text{C}$ .
  - Calculate the number of moles of  $\text{KNO}_3$  that should dissolve in 100 grams of water at  $25^\circ\text{C}$ . [Show all work. Indicate the correct answer with an appropriate unit.]
  - Determine the molarity of the saturated  $\text{KNO}_3$  solution at  $25^\circ\text{C}$ . [Write the correct formula. Show all work. Indicate the correct answer with an appropriate unit.]

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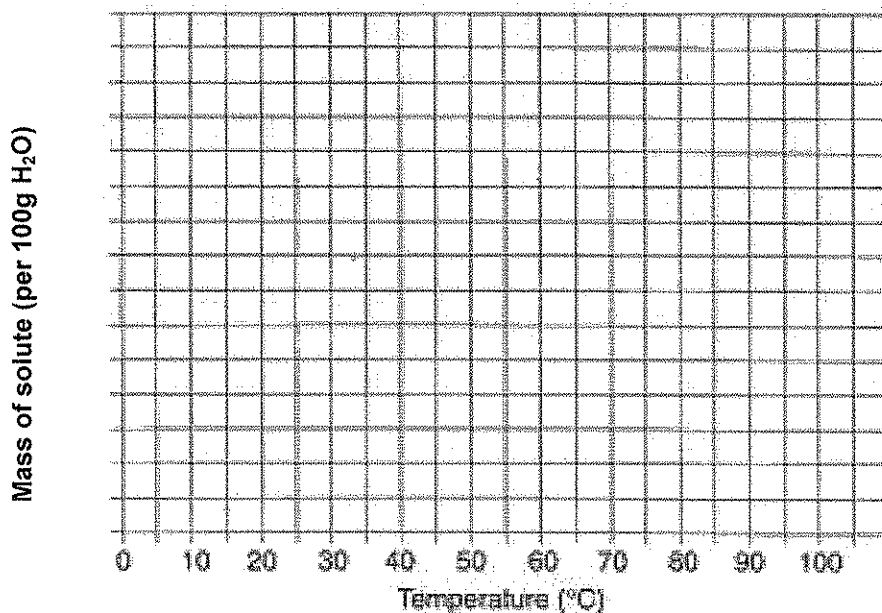
- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_
- 6. \_\_\_\_\_
- 7. \_\_\_\_\_
- 8. \_\_\_\_\_
- 9. \_\_\_\_\_
- 10. \_\_\_\_\_
- 11. \_\_\_\_\_
- 12. \_\_\_\_\_
- 13. \_\_\_\_\_
- 14. \_\_\_\_\_
- 15. \_\_\_\_\_
- 16. \_\_\_\_\_
- 17. \_\_\_\_\_

18. (c) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(d) During which interval is there the *greatest* increases in solubility?  
(1) 10°C to 20°C  
(2) 30°C to 40°C  
(3) 40°C to 50°C  
(4) 50°C to 60°C

(e) \_\_\_\_\_

Title: \_\_\_\_\_



19) \_\_\_\_\_

20) \_\_\_\_\_

21) \_\_\_\_\_  
\_\_\_\_\_

22) \_\_\_\_\_

23) (a)

(b)

(c)

(d)



1. C
2. A
3. C
4. A
5. A
6. A
7. D
8. C
9. C
10. A
11. A
12. D
13. A
14. C
15. A
16. B
17. C

(1)

18. (c) As temp ↑, sol. ↑

(1)

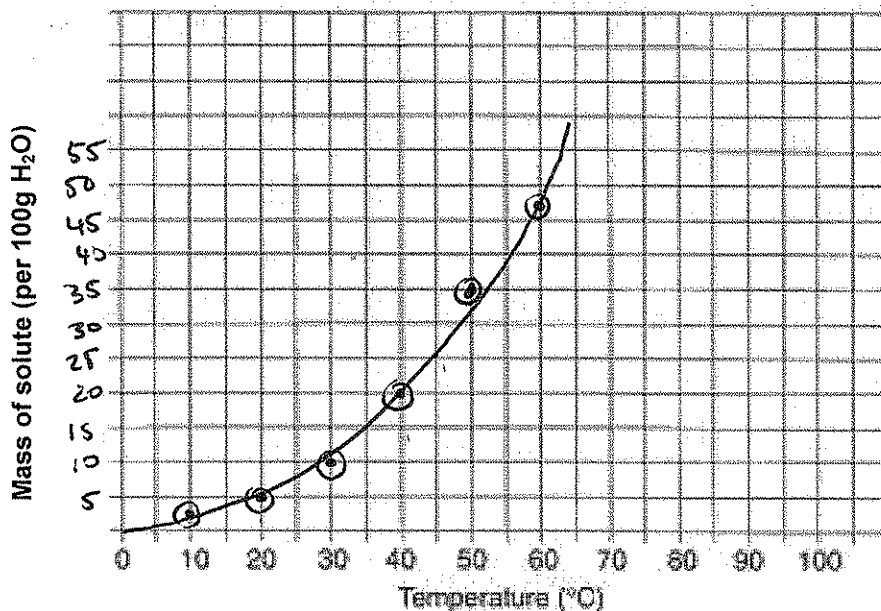
(d) During which interval is there the *greatest* increases in solubility?

- (1) 10°C to 20°C
- (2) 30°C to 40°C
- (3) 40°C to 50°C
- (4) 50°C to 60°C

(1)

(e) from graph (25g) @ 45°

Title: Sol. Curve for Sol. A



(3)

(36/36)

(1) 19) 55-56°C

(2) 20) B b/c sol. ↓ as temp ↑ & gases are less sol. @ ↑ temps.

(1) 21) As temp ↑, sol ↓

(2) 22)

$$\frac{.0015}{500.0015} \times 1 \times 10^6 = \boxed{3.0 \text{ ppm}}$$

(2) 23) (a)  $K = 39.1$   
 $N = 14.0$   
 $O = 3 \times 16.0 = 48$

$101.1 \text{ g/mol}$

(1) (b)  $40 \text{ g}$

(2) (c)  $\frac{40 \text{ g KNO}_3}{101.1 \text{ g KNO}_3} \times 1 \text{ mol KNO}_3 = .3956 = .4 \text{ mol}$

(d)  $100 \text{ g} = .100 \text{ L}$

(2)  $\frac{.4}{.1} = 4 \text{ M or mol/L}$