

## Review for solution, electrolyte and pH test

### Solutions questions

1. To reduce tooth decay, some cities add fluoride to their drinking water. An employee in charge of drinking water fluoridation in a big city dissolved 48 g of fluoride in 50 000 L of water. What is the fluoride concentration of the water in ppm?
2. Public pools usually contain about 7 ppm of chlorine to control bacterial growth. If your pool can hold 300 L of water how much chlorine should there be?
3. You test the quality of drinking water in your house by taking 170 mL sample and you find it contains 850 mg of contaminant. What is the concentration of the contaminant in %?
4. In a pond, the lethal concentration of mercury is 0.0003 mg/L. This means if the concentration of mercury is over the value given, certain types of aquatic organisms will die. You take a sample of the water and find the mercury concentration to be 3.3 ppm, is this a lethal dose?
5. In a pond, the lethal concentration of nitrate ( $\text{NO}_3^-$ ) is 0.04 g/L and phosphate's ( $\text{PO}_4^{3-}$ ) lethal concentration is 0.3 mg/L. This means if the concentrations of nitrate or phosphate are over the values given, certain types of aquatic organisms will die.

You test the water and get the following values:

Nitrate has a concentration of 45 ppm

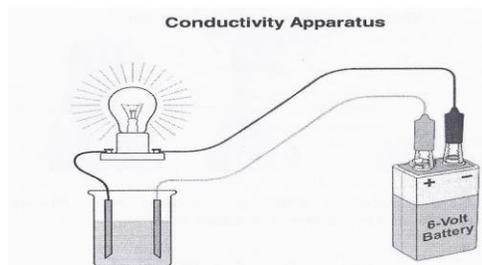
Phosphate has a concentration of 0.15 ppm

Determine if the pond contains any lethal doses.

6. A pharmacist wants to prepare 500 mL of an antibiotic solution. The concentration of the solution must be 6%. What mass of the antibiotic must she use?  
A) 1.2 g                      B) 3 g                      C) 6 g                      D) 30 g



12. You want to neutralize something with a pH of 4, what would you use?  
 A) water                      B) An acid            C) something with a pH of 7                      D)  $\text{Mg}(\text{OH})_2$
13. Which of the following substances would you use to clean greasy dishes?  
 A) KCl                              B) HCl                      C) KOH                      D)  $\text{C}_2\text{H}_5\text{OH}$
14. Why will salt grains not conduct electricity? Alice frequently uses a white cleaning powder in her home. She wants to know whether this substance is acidic, basic or neutral. In order to determine the pH of this substance, what is the first thing she must do?  
 A) Put a piece of blue litmus paper on the solid.  
 B) Put a piece of red litmus paper on the solid.  
 C) Verify whether the solid conducts electricity.  
 D) Dissolve a small amount of the solid in water.
15. Some common substances are listed below.  
 1. vinegar                              4. soft drinks  
 2. distilled water                      5. tomato juice  
 3. seawater  
 Which of the substances have a pH that is less than 7?  
 A) 1, 2, and 3                      B) 1, 3, and 4                      C) 1, 4, and 5                      D) 2, 3, and 5
16. The electrical conductivity of several aqueous solutions was tested in the laboratory using the apparatus below.



**Tested solutions**

$\text{CaCl}_2$	$\text{N}_2\text{O}_4$	HBr	$\text{N}_2$	$\text{H}_2\text{O}$	LiF
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Which of the following lists the aqueous solutions that would allow the current to flow?

- A)  $\text{N}_2\text{O}_4$ ,  $\text{N}_2$ , LiF                                      C)  $\text{N}_2\text{O}_4$ ,  $\text{N}_2$ ,  $\text{H}_2\text{O}$   
 B)  $\text{CaCl}_2$ , HBr, LiF                                      D)  $\text{CaCl}_2$ , HBr,  $\text{H}_2\text{O}$
17. A student is testing the conductivity of a solution. She observes that the solution conducts electricity. Which of the following combinations includes ONLY substances that will cause the solution to conduct electricity?  
 A) HF, LiOH, KBr                                      C)  $\text{BeF}_2$ ,  $\text{CCl}_4$ ,  $\text{C}_2\text{H}_5\text{OH}$   
 B)  $\text{C}_2\text{H}_6$ ,  $\text{CCl}_4$ ,  $\text{C}_6\text{H}_{12}\text{O}_6$                                       D) LiOH, NaCl,  $\text{C}_6\text{H}_{12}\text{O}_6$

18. The incomplete table gives information on three aqueous solutions.

Information on Different Aqueous Solutions

Solution	Chemical formula of solute	pH	Electrical conductivity
1		2	
2			weak
3	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>		

Using the information in the table above, which of the following statements is true?

- A) Only solution 1 conducts an electric current.
- B) Solutions 1 and 2 conduct an electric current.
- C) Solutions 2 and 3 conduct an electric current.
- D) Solutions 1, 2 and 3 conduct an electric current

19. To check the electrical conductivity of certain liquids, a student used a conductivity apparatus equipped with a light bulb. Using the table of information, determine which substances are electrolytes.

Substances	Observations
HCl	Bright light
CH <sub>3</sub> OH	No light
MgCl <sub>2</sub>	Faint light
NaOH	Bright light
Ca(OH) <sub>2</sub>	Faint light
CCl <sub>4</sub>	No light

- A) CH<sub>3</sub>OH and CCl<sub>4</sub>
- B) HCl, MgCl<sub>2</sub> and CCl<sub>4</sub>
- C) CH<sub>3</sub>OH, NaOH and Ca(OH)<sub>2</sub>
- D) HCl, MgCl<sub>2</sub>, NaOH and Ca(OH)<sub>2</sub>

20. Which of the following, when dissolved in water, must be an electrolyte?

- A) CO<sub>2</sub>
- B) HNO<sub>3</sub>
- C) H<sub>2</sub>O
- D) C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>

21. Which of the following, when dissolved in water, will be a non-electrolyte?

- A) KCl
- B) HCl
- C) KOH
- D) C<sub>2</sub>H<sub>5</sub>OH

22. Which of the following is a salt?

- A) KBr
- B) LiOH
- C) HNO<sub>3</sub>
- D) SO<sub>2</sub>

23. Which of the following are characteristic properties of a basic solution?

- 1. Conducts electricity
  - 2. Does not conduct electricity
  - 3. Turns litmus paper blue
  - 4. Turns litmus paper red
  - 5. Does not change the colour of litmus paper
- A) 1 and 3
  - B) 1 and 4
  - C) 2 and 3
  - D) 2 and 5

24. The lab technician stores chemicals according to their type. Classify the following substances as acids, bases or salts.

	A	B	C	D
Acids	H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O	H <sub>2</sub> SO <sub>4</sub> , HCl	KOH, Ca(OH) <sub>2</sub>	H <sub>2</sub> SO <sub>4</sub> , H <sub>2</sub> O
Bases	KOH, Ca(OH) <sub>2</sub>	KOH, Ca(OH) <sub>2</sub>	NaCl, KClO <sub>3</sub>	KOH, Ca(OH) <sub>2</sub>
salts	NaCl, HCl,	NaCl, KClO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub> , Na <sub>2</sub> SO <sub>4</sub>	NaCl, KClO <sub>3</sub>

25. Which of the following procedures can be used to determine whether sugar is an electrolyte or a non-electrolyte?

- A) Check the electrical conductivity of a cube of sugar.
- B) Check the electrical conductivity of powdered sugar.
- C) Check the electrical conductivity of an aqueous sugar solution.
- D) Check the electrical conductivity of a heterogeneous mixture of sugar and alcohol.

### pH questions

26. In order to make apple juice from the apple cider, the cider is filtered and then the following ingredients are added:

- 1 stick of cinnamon
- 6 whole cloves
- 4 strips of orange rind
- Enough brown sugar to have a sugar concentration of 205.71 g/L

The mixture is then heated in a pot at low temperature for 20 minutes.

- A) How much sugar needs to be added to a 1.75 L pitcher of filtered cider?
- B) Often, to make apple juice less acidic, another juice is mixed in with it. Apple juice normally has a pH of 3. Which of the following products can be mixed with the apple juice in order to make it the pH almost neutral?  
 Berry juice pH = 5.6                      Cranberry juice pH = 2.5  
 Goji Berry juice pH = 8.4                  Lemon juice pH = 2.3

27. The following table gives the colours of four different indicators in solutions with pH values ranging from 0 to 14. Use the table to answer the following questions.

pH	----- ----- ----- ----- ----- ----- ----- ----- ----- ----- ----- -----											
	1	3	5	7	9	11	13					
Indicator 1	Red			Orange			Yellow					
Indicator 2	Blue			Green						Yellow		
Indicator 3	Red		Orange			Yellow						
Indicator 4	Colourless				Pink			Red				

- a- What is the pH of an unknown solution if it turns yellow with indicator 1 and green with indicator 2?
- b- What will be the colour for indicator 4 if an unknown solution turned blue with indicator 2 and orange with indicator 3?

28. Corn grows best in soils with a pH of 6. When the soil pH is too low, the corn's growth is stunted. Alicia noticed that her corn crop is not growing well. She tests the pH of the soil and discovers that it has a pH of 4. Which of the following statements describes the change that must occur so that the corn has ideal growing conditions?

- A) Alicia must make the corn 100 times more acidic.
- B) Alicia must make the corn 100 times less acidic.
- C) Alicia must make the corn 2 times more acidic.
- D) Alicia must make the corn 2 times less acidic.

29. Following a chemical spill, the contaminated soil reaches a pH value of 12. After a few days, a neutralization process begins and a second test is conducted. Its results show that the pH of the soil has become 10 times more acidic. What is the pH value after the second test?

- A) pH= 1
- B) pH= 7
- C) pH= 9
- D) pH= 11

30. In the laboratory, you are given two acid-base indicators and a colourless solution with an unknown pH.

The following table gives the colours of the two indicators at different pH values.

pH	1	2	3	4	5	6	7	8	9	10	11	12	13
Indicator 1	Yellow			Green			Blue						
Indicator 2	Violet		Yellow		Red								

When you add a drop of each indicator to the colourless solution, it turns yellow.

What is the pH range of this solution?

- A) Between 1 and 4
- B) Between 1 and 5
- C) Between 3 and 4
- D) Between 3 and 5

31. Place the substances listed below in increasing order of pH.

Distilled water      Soap      Lemon juice      Rainwater

- A) Distilled water – Soap – Lemon juice – Rainwater
- B) Lemon juice – Rainwater – Distilled water – Soap
- C) Soap – Lemon juice – Rainwater – Distilled water
- D) Lemon juice – Distilled water – Soap – Rainwater