Answer key

Chapter 5 : Review
Science 10

Name : _____
Block : ___ Date : _____

True or false

Indicate if the phrase is true or false. If its false, correct it!

F 1. Adding HCl (acid) to a sample of distilled water will increase the concentration of H^+, decrease the concentration of OH- and an increase in pH. it will decrease the pH

F 2. A solution of sodium hydroxide (base) will cause methyl orange to turn yellow, litmus to turn blue and will have a pH equal to that of pure water. the pH will be higher than pure water

F 3. When the pH of a solution changes from 7 to 1, the concentration of hydroxide ions is ~~multiplied~~ divided by a factor of a million. a separation of 6 points corresponds to a difference of $10^6 = 1\,000\,000$

F 4. Aqueous solution that contain HCl, H_2SO_4, et CH_3COOH will have a pH ~~higher~~ lower than pure water. all acids

T 5. Aqueous solutions that contain sodium hydroxide and potassium oxide will each have a pH higher than 7. base; metal oxide forms a basic solution } bases have high pH

T 6. Chemical formulas for sulfurous acid, nitric acid, chloric acid and phosphorous acid all have the same number of oxygen atoms. H_2SO_3 HNO_3 $HClO_3$ HPO_3

F 7. A pH-meter is placed in each of 3 beakers of pure water. NO_2 gas is added to the first beaker, CO_2 is added to the second and SO_2 is added to the third. The indicated pH will increase on all three meters. NO_2 & CO_2 & SO_2 are all non-metallic oxides that form acidic solutions. Acid solutions have low pH's

T 8. Aqueous solutions of MgO and CaO will have pH values higher than that of pure water, and aqueous solutions of NO_2 and SO_2 will have pH values lower than pure water.
MgO & CaO form basic solutions → higher pH
NO_2 & SO_2 form acidic solutions → lower pH

F 9. Each compound which contains carbon is considered an organic compound.
Carbonates, carbon oxides & carbides are not considered organic

T 10. Natural gas, alcohol and fossil fuels are considered organic compounds.

Multiple Choice
Identify the best choice.

A 1. Which data list is accurate for a concentrated solution of hydrochloric acid? HCl

	pH value	H^+ Concentration	OH^- Concentration	Colour of Methylorange
a.	Low	High	Low	Red
b.	Low	Low	High	Red
c.	High	Low	High	Yellow
d.	High	High	Low	Yellow

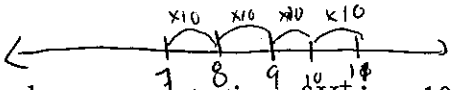
a. a b. b c. c d. d

D 2. Which of the following solutions will probably have the highest pH?
a. HCl (aq) Acid
b. CH_3COOH (aq) Acid
c. H_2O (l) water
d. KOH (aq) Base

D 3. A student notes the pH values of two different solutions and finds that they are separated by 3 pH points. Which is reasonable? 3 points = 10×10×10 = 1000 times difference of concentration of H^+ or OH^- ions

	pH of Solution A	pH of Solution B	Concentration of H^+ ions in Solution A
a.	2	5	Three times higher than that of solution B X
b.	5	2	1000 times higher than solution B X
c.	5	2	Three times higher than solution B X
d.	2	5	1000 times higher than solution B ✓

a. a b. b c. c d. d



A 4. It is discovered that a solution has a concentration of H^+ ions 10 000 fois lower than that of distilled water. Which conclusion is correct?
(a) It is a basic solution of pH 11
b. It is an acidic solution of pH 3.
c. It is an acid solution of pH 11.
d. It is a basic solution of pH 3.

D 5. Which is not a property of sulfuric acid?
a. Conducts electricity ✓
b. A low pH ✓
c. Corrodes metal ✓
d. High concentration of OH- ×

A 6. Which acid has a formula with only two different elements?

a. Hydroiodic acid HI
b. Sulfuric acid H_2SO_4
c. Perchloric acid $HClO_4$
d. Nitric acid HNO_2

D 7. What substance is most likely to have the hydroxide ion in its formula?

a. Milk
b. Orange juice
c. Vinegar
d. (Oven cleaner)

This is the only base

C 8. Which acid contains a 1- anion in its chemical formula?

I.	Phosphoric acid	H^+ PO_4^{3-}
II.	Sulfuric acid	H^+ SO_4^{2-}
III.	Chloric acid	H^+ ClO_3^{1-}
IV.	Nitric acid	H^+ NO_3^{1-}

a. III.
b. II. et III.
(c.) III. et IV.
d. I., II., et IV.

D 9. Each of the following substances is dissolved in water. Which will change the pH the least?

I.	KNO_3	→ salt - neutral
II.	HNO_3	→ acid
III.	$Sr(OH)_2$	→ base
IV.	$SrCl_2$	→ salt - neutral

a. I. and II.
b. I. and III.
c. III. and IV.
(d.) I. and IV.

D 10. Which compounds are the products of neutralization?

→ salt + water

I.	HCl	acid
II.	$Sr(OH)_2$	base
III.	KNO_3	salt
IV.	H_2O	water

a. I. and II.
b. II. and III.
c. II. and IV.
d. III. and IV.

C 11. Which of the following represents the ionic compound formed in a neutralization reaction?

a. acid
b. base
(c.) salt
d. water

water is covalent

a salt is ionic

acid + base

D 12. Which compounds can react to form $Al_2(SO_4)_3$?

I.	Aluminium sulfide	salt ✗ (Al_2S_3)
II.	Sulfuric acid	acid (H_2SO_4)
III.	Aluminum hydroxide	base ($Al(OH)_3$)
IV.	Hydrosulfuric acid	acid (H_2S)

a. I. and II.
b. II. and IV.
c. I. and III.
(d.) II. and III.

C 13. Which substance will lower the pH when added to pure water? (make more acidic)
a. CaO → forms basic sol'n
b. KCl → salt (neutral)
c. NO_2 → forms acidic sol'n
d. NaOH → base

D 14. Which substance will produce a basic solution when added to pure water?
a. KI → salt
b. NO_2 → non-met oxide → acidic sol'n
c. SO_3 → non-met oxide
d. SrO → metallic oxide → basic sol'n

D 15. Oxides of which elements contribute to acid rain? NON-metal oxides

I.	sodium	✗
II.	~~soufre~~	sulfur
III.	nickel	✗
IV.	~~azote~~	nitrogen

a. I. and II.
b. I., III., and IV
c. I. and III.
d. II. and IV.

D 16. Which substance will react with magnesium metal to produce hydrogen gas?
An acid

I.	H_2SO_4	✓
II.	$Al(OH)_3$	
III.	HCl	✓
IV.	H_2O	

a. I.
b. I. and IV.
c. II. and IV.
d. I. and III.

A 17. Which of these substances will raise the pH when it is added to water?
a. MgO → metal oxides form basic sol'n
b. NO_2
c. HCl
d. NaCl

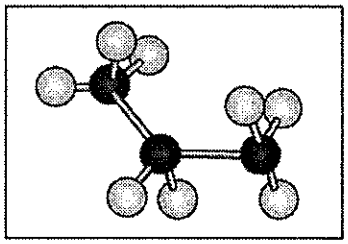
A 18. When sulfur is burned in air an oxide gas is formed. If this gas is dissolved in water that contains litmus, the result will be: → acid soln

(a) A red acid solution
b. A red basic solution
c. A blue basic solution
d. A blue acid solution

C 19. An organic compound must contain:

a. nitrogen
b. hydrogen
c. carbon
d. oxygen

C 20. Which formula is shown in the illustration?



a. C_4H_8
b. CH_3CH_3
(c) C_3H_8
d. $CH_3CH_2CH_2CH_3$

A 21. Consider the following balanced equation that represents the combustion of methane.

(CH4) + 2 O2 → CO2 + 2 H2O

oxides of carbon are not organic

Of the four different substances, how many are organic?

(a) one organic, three inorganic
b. two organic, two inorganic
c. three organic, one inorganic
d. four inorganic, zero organic

Written answer

1. Explain how you can identify the chemical formula of an acid, a base, and a salt. Give an example of each.

   acids contain the H^+ ion ex. HCl
   bases contain the OH^- ion ex. NaOH
   Salts are ionic compounds that are the result of an acid / base neutralization. They contain a positive & a negative ion (They are not oxides) ex. NaCl

2. Write the word equation for the reaction of sulfuric acid and calcium hydroxide. Write the balanced equation.

   word equation: sulfuric acid + calcium hydroxide → calcium sulfate + water

   Balanced: $H_2SO_4 + Ca(OH)_2 \rightarrow CaSO_4 + 2H_2O$

3. Identify four properties of the element carbon that are responsible for the huge variety of organic compounds that exist.

   - 4 valence electrons
   - forms chains
   - forms rings
   - can have multiple bonds

4. Name two groups of inorganic compounds that contain carbon and give examples of each.

   organic
   1. hydrocarbons ex. methane [CH_4]
   2. alcohols ex. ethanol

   inorganic
   1. oxides of carbon ex. carbon dioxide
   2. carbonates ex. $CaCO_3$
   3. carbides ex. Mg_2C

5. Complete the table:

Name of the anion present in the acid	Chemical formula of the acid	Name of the acid
sulfite	H_2SO_3	sulfurous acid
perchlorate	$HClO_4$	perchloric acid
nitrate	HNO_3	nitric acid
iodide	HI	hydroiodic acid
chromate	H_2CrO_4	chromic acid
hypochlorite	$HClO$	hypochlorous acid

6. Complete the word equations for the following neutralization reactions (name of the acid + name of the base → name of salt + water):

a) sulfuric acid + aluminium hydroxide → ? + water
aluminum sulfate

b) chlorous acid + tin IV hydroxide → ? + water
tin IV chlorite

7. Write balanced equations for each of the following neutralization reactions:
a) $H_2SO_4 + Ca(OH)_2 \rightarrow ?$ $CaSO_4 + 2H_2O$

b) $H_3PO_4 + LiOH \rightarrow ?$ $Li_3PO_4 + H_2O$

$\rightarrow H_3PO_4 + 3LiOH \rightarrow Li_3PO_4 + 3H_2O$

8. Certain oxides are dissolved in water. Complete the table that describes the results.

Formula of oxide	pH of solution (higher or lower than 7)	Colour of bromothymol blue in the aqueous oxide solution
K_2O	higher than 7	blue
NO_2	lower than 7	yellow
SrO	higher than 7	blue
SO_3	lower than 7	yellow

9. Each salt in the table below was produce from a neutralization reaction. Identify the acid and the base that reacted to form each salt.

Formula of salt	Formula of acid	Formula of base
$CaSO_4$	H_2SO_4	$Ca(OH)_2$
$AlCl_3$	HCl	$Al(OH)_3$

10. Write the balanced equation when potassium carbonate reacts with hydrochloric acid.

$K_2CO_3 + 2HCl \rightarrow 2KCl + CO_2 + H_2O$