Name:

Physical Science 4012 Pretest

1. Indicate whether each of the following statements is true (T) or false (F):

a) The ratio of a proton's mass to an electron's mass is 1840. ____

b) The ratio of a neutron's mass to a proton's mass is 1. ____

c) The mass of an electron is 1840 times less than that of a neutron. ____

d) The nucleus of a neutral atom contains the same number of protons and electrons. ____

e) The number of protons in an atom is always equal to the number of neutrons. ____

2. Identify the type of subatomic particle that helps to hold the nucleus together. _____

3. In one sentence, describe the distribution of electrons within the atom.

_____

4. Comment on the volume of the nucleus as it compares to the volume of the atom.

_____

5. Indicate the charge (positive, negative, or neutral) of each of the following:

a) proton _____

b) neutron _____

c) electron _____

6. List the alkali metals.

7. Circle the characteristics below that apply to metals:

a) shiny

b) ductile

c) malleable

d) conductors of electricity

e) all solid at room temperature

f) found to the right of the staircase on the periodic table.

8. Indicate whether each of the following statements is true (T) or false (F).

a) Alkali metals react readily with oxygen and halogens. ____

b) The chemical properties of alkali metals are different from those of alkaline earth metals. ____

c) Nonmetals are poor conductors of electricity. ____

9. Complete the following table:

electron configuration	family name	period number
2e8e7e		
2e8e4e		
	Alkaline Earth Metal	3
	Noble Gas	2

10. Complete the table below indicating the name or chemical formula of each compound.

Chemical formula	New nomenclature	Traditional nomenclature
AsI_5		
Ni_2S_3		
		Lithium sulphate
		Sodium bicarbonate

11. a) Referring to the periodic table, identify which of the following elements are chlorine isotopes.

Element	Number of protons	Number of neutrons	Number of electrons
A	18	18	18
B	17	17	18
C	16	17	18
D	18	17	17
E	17	18	17
F	17	16	16

Answer: _____

b) Classify the six elements listed above as either neutral atoms, anions, or cations. Write the appropriate letters in the spaces provided.

Neutral atoms	Anions	Cations

12. Match each of the substances below with the appropriate category of matter, by writing the letter corresponding to your answer in the space provided.

Categories:
A - Homogeneous mixture
B - Element
C - Suspension
D - Heterogeneous mixture
E - Compound

Substance:

1. 100% pure sugar ($C_{12}H_{22}O_{11}$) _____

2. 100% pure aluminum _____

3. orange juice _____

4. stainless steel (alloy) _____

5. filtered air _____

6. filtered sea water _____

7. blueberry milkshake _____

8. dirt _____

13. Give the chemical formula of the binary compounds formed by the combination of elements A, D, E, and G from the families indicated below:

Element A: IVA **Element D: VA**
Element E: IIIA **Element G: IIA**

Compound formed by G and A:

Compound formed by D and E:

14. Indicate whether each of the following is an acid, base or salt. Explain your answer referring to the substance's dissociation in water.

a) CH_3COOH : _____

b) RbCl: _____

c) $Ca(OH)_2$: _____

d) H_2SO_4 : _____

15. Place the following four substances in increasing order of acidity, i.e. from the least acidic to the most acidic.

A) Stomach acid: pH of 3.4

B) Salt water: neutral

C) Acetic acid: H^+ concentration of approximately 1×10^{-3} mol/L

D) Bleach: H^+ concentration of approximately 1×10^{-13} mol/L

Answer: _____

16. You obtained the following lab results from tests using litmus paper and an electric conductivity detector:

Test	A	B	C	D	E
Conducts current	+++	+++	+	+++	no
Red litmus paper	red	red	red	blue	red
Blue litmus paper	red	blue	red	blue	blue

Based on these results:

a) Which liquid is a salt solution? _____

b) Which liquid is a nonelectrolyte? _____

c) Which liquid is a strong base? _____

d) Which liquids are strong electrolytes? _____

17. Hydrogen peroxide (H_2O_2) must be kept in an opaque container because when it is exposed to light, it decomposes to form water (H_2O) and oxygen gas (O_2). Give the balanced equation representing this decomposition.

18. Consider potassium (K) and fluorine (F).

a) What type of chemical bond exists between these two elements?

_____

b) Referring to electronegativity values, explain how you reached your conclusion.

_____

c) Draw the Lewis diagram for each of these elements.

K F

d) Draw the Lewis diagram for the compound formed by these two elements.

e) Can this bond be represented using a structural formula? _____

If so, what would it look like?

19. Consider arsenic (As) and bromine (Br).

a) What type of chemical bond exists between these two elements?

_____

b) Referring to electronegativity values, explain how you reached your conclusion.

_____

c) Draw the Lewis diagram for each of these elements.

As **Br**

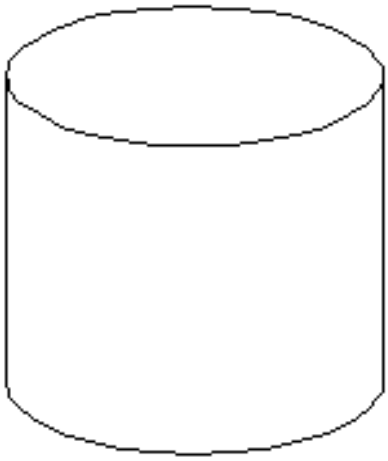
d) Draw the Lewis diagram for the compound formed by these two elements.

e) Can this bond be represented using a structural formula? _____

If so, what would it look like?

20. An alcohol solution will not conduct electricity.

a) In the tank below, illustrate what happens when alcohol (CH_3CH_2OH) dissolves in water.



b) Explain your illustration.

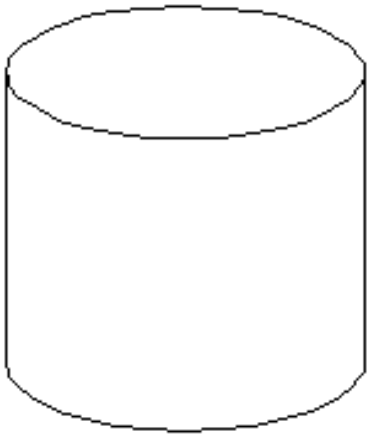
_____

_____

c) Specify the type of dissolution that occurs. _____

21. A chloric acid solution ($HClO_3$) is a good conductor of electricity.

a) In the tank below, illustrate what happens when chloric acid dissolves in water.



b) Explain your illustration.

_____

_____

c) Specify the type of dissolution that occurs. _____

22. You are given three solutions:

Solution 1: 75 g of $SrBr_2$ in 0.25 L of solution
Solution 2: 0.24 mol of $SrBr_2$ in 200 mL of solution
Solution 3: 0.2 kg of $SrBr_2$ in 0.45 L of solution

Which of the above solutions has the highest concentration of $SrBr_2$? Your answer must include all calculations and clearly show all the units of measure and formulas used.

23. You want to spray your lawn with a liquid fertilizer. You own a 20-L sprayer and you want to fill it to capacity. The concentration on the 750-mL bottle of fertilizer is 14 mol/L. Your lawn requires a 0.2 mol/L solution.

How much undiluted fertilizer must you pour into the sprayer?

Your answer must include all calculations and clearly show all the units of measure and formulas used.

24. The following table provides the turning points of four different indicators:

Indicator	Colour change	Turning point
A	red to yellow	4.4 to 6.2
B	colourless to fuchsia	8.2 to 10
C	yellow to violet	3.0 to 4.6
D	yellow to blue	6.0 to 7.6

Adding indicator A to an unknown solution will turn the solution yellow. Indicator B will turn the solution colourless. Indicator C will turn the solution violet, while indicator D will turn the solution blue.

Based on these results and the data in the above table, determine the pH range of the unknown solution. Your answer must include the possible pH values of the solution for each indicator.

Answer:

Unknown solution

Indicator	Colour of solution	Possible pH values
A	yellow	
B	colourless	
C	violet	
D	blue	

pH range of the unknown solution: _____

25. Write the neutralization equations for:

a) the reaction between acetic acid (CH_3COOH) and KOH.

b) the reaction between HBr and $Ca(OH)_2$.

Why are the above reactions considered to be neutralization reactions?

26. How many grams of pyrite (FeS_2) are needed to manufacture 3.5 mol of iron sulphite (Fe_2SO_3)? The following chemical equation illustrates this transformation:

$$FeS_2 + O_2 \rightarrow Fe_2SO_3 + SO_2$$

27. How many moles of carbon dioxide (CO_2) would be produced if 2 350 g of acetylene gas (C_2H_2) are combusted?

The following chemical equation illustrates this combustion:

$$C_2H_2 + O_2 \text{ ----> } CO_2 + H_2O$$