Name

CP Physical Science
Final Exam Review Sheet

Final Exam Format
Your final exam will be __________________________.
It consists of _____ multiple choice questions.
Bring a pencil and a calculator!!!
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Atoms, Periodic Table, Bonding & Chemical Reactions

1. Define the words below.
   - Atom: Smallest unit of an element
   - Element: Simplest form of matter that cannot be broken down
   - Compound: Chemical union of 2 or more elements
   - Ion: Atoms of the same element with different numbers of electrons
   - Octet rule: Attraction of an element toward having 8 valence electrons
   - Valence electrons: Electrons in the outermost energy shell

2. In the space below, draw a diagram of an atom. Label where protons, neutrons and electrons are located.

   ![Diagram of an atom]

   A. Proton(s)
   B. Neutron(s)
   C. Electron(s)

3. A The positively charged particles in an atom
4. C The negatively charged particles in an atom
5. B The particles in an atom that are neutral
6. A+B These 2 particles are located in the nucleus
7. A The atomic number is the number of....
8. A+B The atomic mass of an atom comes from these 2 particles
9. What is the difference between periods and groups on the periodic table?

- Periods run side to side
- Groups are up and down

10. What is unique about the group on the periodic table known as the noble gases?

   It does not react

11. Elements in the same ________ have similar properties and react in similar ways.

12. Elements in the same ________ have the same number of outermost electrons, known as ________ electrons.

13. Look at the diagram below.

   - The number 5 refers to the element’s atomic number, the number of ________
   - The number 10.81 refers to the elements’ atomic ________

   ![Boron Table]

14. Below is a list of compounds that may be in your sludge at the end of the semester. For each compound, identify the number of elements and number of atoms present.

   - HCl 2 + 2
   - H₂SO₄ 3 + 7
   - MgCO₃ 3 + 5
   - NaHCO₃ (baking soda) 4 + 6

15. Read each description below. Determine the charge on each atom.

   - A phosphorus atom (P) gains 3 electrons. ________
   - Sodium atoms (Na) lose 1 electron. ________
   - A fluorine atom (F) gains 1 electron. ________

16. What is the difference between ionic and covalent bonds?

   Ionic bonds ________ - between metals and nonmetals
   Covalent ________ - electrons are shared - between nonmetals
17. Look at the chemical reactions below. Draw a circle around the reactants and a triangle around the products. How many of each are there?

- $\text{H}_2\text{O} \rightarrow \text{H}_2 + \text{O}_2$
  1 reactant 2 products
- $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
  2 reactants 2 products

18. Identify the type of chemical reaction listed below.

A. Synthesis  B. Decomposition  C. Single-Replacement

D. Double Replacement  E. Combustion

\[ \text{A} \quad \text{Fe} + \text{O}_2 \rightarrow \text{FeO} \]
\[ \text{D} \quad \text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB} \]
\[ \text{B} \quad \text{H}_2\text{O}_2 \rightarrow \text{H}_2 + \text{O}_2 \]
\[ \text{C} \quad \text{NiCl}_2 + \text{Fe} \rightarrow \text{FeCl}_2 + \text{Ni} \]
\[ \text{C} \quad \text{Zn} + \text{CuCl}_2 \rightarrow \text{ZnCl}_2 + \text{Cu} \]
\[ \text{D} \quad \text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3 \]
\[ \text{NaClO}_3 \rightarrow \text{NaCl} + \text{O}_2 \]

19. What occurs during a chemical reaction? The mass of the products and the mass of the reactants should be the same- why?

The law of conservation of mass - mass is not created or destroyed

20. How can you tell that a chemical reaction is happening?
17. Which piston has the most pressure? C

18. In which piston are the particles closer together? C

19. Does having more pressure increase or decrease the volume of the particles? decrease

20. If the particles have a large volume how quickly will they react?

21. If the particles have a small volume how quickly will they react?

22. Will a compound that is unreactive react when using reaction rate methods?

23. Discuss one time during copper lab we used reaction rate ideas to help our reactions.

24. Discuss one time during sludge we applied the same reaction rate ideas using amount of substance for testing or separation.
Measurement & Scientific Method

Define the words below.

- Variable
- Hypothesis - educated guess
- Data - information gathered during an experiment
- Inference - a guess based on an observation
- Objective - what you are trying to learn when conducting an experiment
- Independent variable - the one the experimenter can change
- Dependent variable - variable that changes as a result of a change in the TV
- Mass - measure of the amount of matter
- Volume - amount of space an object takes up
- Weight - measure of gravity on an object
- Meniscus - curve of liquid on top of a liquid

The formula for volume is \[ V = l \times w \times h \].

Mass is measured in ______ gram or ______ kg ______ and can be determined using a ______ balance ______.

Volume is measured in ______ cm^3 ______ and can be determined using a ______ ruler ______ or ______ graduated cylinder ______.

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Physical and Chemical Changes

Determine the type of change described below. Be sure that you can support your choice.

a) Melting candle wax ______ physical
b) Burning paper _______ chemical
c) Burning coal ________ chemical
d) Dissolving salt in water ______ physical
e) Grinding salt crystals _______ physical
f) Placing food coloring in water ________ physical
g) Cooking an egg _________ chemical
h) Sculpting a block of marble into a statue ______ physical

Challenge Questions:
1. Provide an example of a color change that is not a chemical change.

2. Describe when a gas is produced that is not a chemical change.
   
   boiling

SPECIAL PROPERTIES

Define Special Property.

List 2 requirements for a special property.

1. never changes
2. does not depend on amount
Density

25. What is the unit for density? What do you write after the number when you find the density?
\[ \frac{g}{ml} \text{ or } \frac{g}{cm^3} \]

26. What is the equation you use to find the density of an object?
\[ d = \frac{m}{V} \]

27. What is the density of water?
\[ 1 \frac{g}{ml} \]

28. What do you know about the density of an object if it will float in water?
That it is less than \[ 1 \frac{g}{cm^3} \]

29. What do you know about the density of an object if it sinks in water?
Greater than \[ 1 \frac{g}{cm^3} \]

30. Find the density in the problems listed below:

   a. If the volume of an object is 4ml and the mass of the object is 12g, how much mass would 1ml of the object have?
   \[ d = \frac{m}{V} = \frac{12g}{4ml} = 3g/ml \]

   b. What is the density of this object? Volume = 22ml, Mass = 46g
   \[ d = \frac{m}{V} = \frac{46g}{22ml} = 2.09 \frac{g}{ml} \]

   c. Find the density of this object? Length = 10mm, Width = 2cm, Height = 2cm, Mass = 120g
   \[ d = \frac{m}{V} = \frac{120g}{1cm \cdot 2cm \cdot 2cm} = 30 \frac{g}{cm^3} \]

31. How much mass does 20ml of alcohol have (density = .79 g/ml)
\[ m = d \cdot V = .79 \frac{g}{ml} \cdot 20 ml = 15.8 g \]
32. **OBJECT A**
   - Mass = 500g
   - Volume = 100cm³
   - Density = 5 g/cm³

**OBJECT B**
   - Mass = 650g
   - Volume = 100cm³
   - Density = 6.5 g/cm³

- Which object feels heavier? Explain how you know this.
  
  **B** - greater mass

- Which object is more dense? Explain how you know this.

  **B** - greater \( \frac{\text{g}}{\text{cm}^3} \)

- Which object is larger? Explain how you know this.

  *same both 100 cm³*

Sketch the graphs showing how the volume, mass and density relate.

![Graphs](image)

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**True or False** – Write the word on the line in front of the number.

True 1. Density can be used to identify matter.

False 2. If you know the volume of the liquid and the mass of the liquid, then you know its density.

True 3. Two solid pieces of pure gold will have the same densities.

False 4. If one object has a mass of 2 grams and another object has a mass of 5 grams, the objects must be made of different matter.

True 5. If one liquid has a volume of 10 ml. and another liquid has a volume of 15 ml, they must be made of different matter.
Gas Laws

Who were the three scientists we learned about that dealt with Gas Laws?

Boyle’s Pressure and Volume

Charles’s Temperature and Volume

Gay-Lussac’s Pressure and Temperature

Which Gas Law(s) are directly proportional and what is their equation look like? What would their graph look like?

\[ \frac{T_1}{V_1} = \frac{T_2}{V_2} \]

Which Gas Law(s) are inversely proportional and what is their equation look like? What would their graph look like?

Boyle’s

\[ T_1 V_1 = T_2 V_2 \]

You notice that tire pressure on your car is different when stationary versus when it’s moving. Which law is in effect? Explain the change on gas molecules.

Charles

You notice that a spongy pool toy get smaller when you take it to the bottom of your pool. Which law is in effect? Explain the change on gas molecules.

Boyle’s

Throwing a pressurized aerosol can into the fireplace causes it to explode. Which law is in effect? Explain the change on gas molecules.

G - L

*extra*
Solubility

34. Define the following words

- solution
- solute - substance that dissolves
- solvent - substance that does the dissolving
- saturated solution - cannot hold any more solute
- concentrated solution - has a lot of solute in an amount of solvent
- dilute solution - little solute in an amount of solvent
- insoluble - will not dissolve
- soluble - substance will dissolve

- adhesive forces
- cohesive forces - force of attraction between the same substances
- solubility - concentration of a saturated solution
- concentration - amount of solute in a solvent

35. If the concentration of the ocean is 35g/100ml of water, what does that mean?

There are 35 grams dissolved in 100 ml of water.

36. If 22g of a substance dissolves in 50ml of water, how much of the substance could dissolve in 200ml of water so that the solutions are equivalent?

\[
\frac{22g}{50ml} = \frac{x}{200ml} \quad \frac{88g}{200ml}
\]
37. What is the concentration of a solution where 10g of solute is dissolved in 75ml of water?

\[
\frac{10 \text{g}}{75 \text{ml}} = \frac{X}{100 \text{ml}}
\]

\[
\frac{13.3 \text{g}}{100 \text{ml}}  \quad \text{50 ml}
\]

38. If 25g of citric acid dissolves in 20ml of water, how much water is needed to dissolve 62.5g of citric acid?

\[
\frac{25 \text{g}}{20 \text{ml}} = \frac{62.5 \text{g}}{X}
\]

For the questions below, use the solubility curve attached to the back of this packet.

39. At 10 C, how much potassium nitrate will dissolve in 100 ml of water? \[20 \text{g}\]

40. At 10 C, how much sodium nitrate will dissolve in 100 ml of water? \[78 \text{g}\]

41. At 40 C, how much sodium chloride will dissolve in 100 ml of water? \[38 \text{g}\]

42. At 100 C, how much potassium nitrate will dissolve in 100 ml of water? \[240 \text{g}\]

43. What temperature is necessary to dissolve 170 g of potassium nitrate in 100 ml of water? \[80^\circ \text{C}\]

44. What temperature is necessary to dissolve 90 g of sodium nitrate in 100 ml of water? \[25^\circ \text{C}\]

45. What temperature is required to dissolve 40 g of sodium chloride in 100 ml of water? \[100^\circ \text{C}\]

46. If I heat 100 ml of water with 100 grams of sodium nitrate up to 50 C, will the solution be saturated? Explain your answer.

\[
\text{No, it can still hold 5-10 more grams}
\]

47. If I heat 100 ml of water with 80 grams of potassium nitrate up to 40 C, will there be any solid left on the bottom of the test tube? Explain your answer.

\[
\text{Yes, there will be about 20g on the bottom}
\]

48. A mass of 30 grams of potassium nitrate is dissolved in 100 ml of water at 20 C. The solution is heated to 100 C. How many more grams of potassium nitrate must be added to saturate the solution? Explain your answer.

\[
\text{About 210g}
\]
Phases of Matter & Heat

49. List and define the 3 phases of matter.
   a. solid -
   b. liquid -
   c. gas -

50. List and define the 5 phase changes of matter.
   a. vaporization - liquid to gas
   b. condensation - gas to liquid
   c. freezing - liquid to solid
   d. melting - solid to liquid
   e. sublimation - solid to gas

51. Which phase changes absorbs or gains heat energy in order for them to occur?

   vaporization + melting + sublimation

52. Which phase changes give off or loses heat energy in order for them to occur?

   freezing + condensation

Explain (make a hypothesis) as to what you think happened to the substance based on the information on the graph. They all start as a liquid except for graph D, which starts as a solid.
A. Liquid is heated

B. Liquid is allowed to cool

C. Liquid is boiling

D. Solid is heated, melts, liquid is heated, boils, gas is heated

E. Liquid cools to the freezing point

F. Liquid cools, freezes, solid cools
53. Complete the chart for each phase of matter

<table>
<thead>
<tr>
<th>Phase of Matter</th>
<th>Speed of Molecules</th>
<th>Cohesive Forces</th>
<th>Freedom of Motion</th>
<th>Space between Molecules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>slow/vibrate</td>
<td>strong</td>
<td>none</td>
<td>little/nome</td>
</tr>
<tr>
<td>Liquid</td>
<td>slow</td>
<td>weak</td>
<td>some</td>
<td>very little</td>
</tr>
<tr>
<td>Gas</td>
<td>fast</td>
<td>none</td>
<td>very free</td>
<td>large</td>
</tr>
</tbody>
</table>

54. Define

- heat – form of energy that changes the motion of molecules – Total Energy
- temperature – average motion of the molecules in a substance
- thermometer
- calorie
- Conductor
- Insulator
- Absolute zero
- Specific Heat
- Thermal Expansion

Complete the chart relating temperature scales.

<table>
<thead>
<tr>
<th>Temperature Scale</th>
<th>FP of water</th>
<th>BP of Water</th>
<th>Body Temp.</th>
<th>Room Temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fahrenheit °F</td>
<td>0</td>
<td>100</td>
<td>36</td>
<td>20</td>
</tr>
<tr>
<td>Celsius °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Separation Techniques

61. What is the purpose of Distillation? How does it work? When would you use it?

To separate dissolved liquids by boiling them and removing the one boiling.

62. Sketch what the graph would look like if you were separating 2 liquids by fractional distillation. Indicate on the graph where you would switch test tubes. Explain your answer. Where on the graph are you collecting pure liquids?

Liquid #1 boiling point = 75 °C
Liquid #2 boiling point = 100 °C

62. Write a procedure to explain how you separate insoluble solids from a liquid.

Filter paper

63. Write a procedure to explain how you separate soluble solids from a liquid.

evaporating dish