

Physical Science Test - Final Exam

Physical Science Test: 05-26-10 - Final Exam

Name and Nickname: _____

Calculators are allowed.

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Equations

$$\text{Percent Error} = \frac{(\text{observed value} - \text{true value})}{\text{true value}} \times 100 (\%)$$

$$\text{Percent Difference} = \frac{|x_1 - x_2|}{(x_1 + x_2)/2} \times 100 (\%)$$

$$v_f = v_o + at$$

$$\frac{1}{2}(v_o + v_f) = \frac{\Delta x}{t}$$

$$\Delta x = v_o t + \frac{1}{2}at^2$$

$$v_f^2 = v_o^2 + 2a(\Delta x)$$

$$F = ma$$

$$p = mv$$

$$F_w = mg$$

$$F_{w,moon} = mg_{moon}$$

$$\Delta x = v_o t + \frac{1}{2}at^2$$

$$F = G \frac{m_1 m_2}{r^2}$$

$$G = 6.673 \times 10^{-11} \frac{Nm^2}{kg^2}$$

$$p = mv$$

$$K = \frac{1}{2}mv^2$$

$$U_g = mgh$$

$$PV = nRT$$

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I. Metric Prefixes, Defined Units, Derived Units, Conversions, Addition and Subtraction with Units, Multiplication with Units

Derived Units. Fill in the Blank.

1. (2 points) Acceleration is measured in units of _____.
2. (2 points) What is the ratio of the 10 mA (milliAmperes) current in a muscular contraction to the 1mA current in a tingling sensation? (ref: Prof. Huang, Oct. 22, 2009) *Use the correct number of significant digits.*

Conversions - Area and Volume and Time

3. (2 points) Jennifer obtains a meter stick from the lab and measures the width of her square desk to be 10.0 cm. What is the area of Cheryl's desk in cm^2 in scientific notation? *Use significant digits.*

II. Scientific Measurement: Addition and Subtraction with Units, Multiplication and Division with Units , Accuracy, Precision, Percent Error, Percent Difference

Multiplication and Division with Units.

4. (2 points) Marie Curie measured the current obtained with metallic uranium and with different minerals, and examples of the values of her measurements in Amperes are shown in the table below.

Material	Current
Uranium	2.3×10^{-11} Amperes
Chalcolite	5.2×10^{-11} Amperes
Monazite	0.5×10^{-11} Amperes

What is the ratio of the value of the current measurement for Uranium to the value of the current measurement for Chalcolite?

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III. The Analysis of Motion - Kinematics & Gravity

Vectors

5. (2 points) What is the difference between a vector and a scalar? The difference between a vector and a scalar is:

Shapes of trajectories of objects

6. (2 points) Jennifer tosses a ball to Susie in Physical Science, just like we have been doing in class. What is the shape of the trajectory of the ball?

IV. The Analysis of Motion: Dynamics & Gravity

Newton's Three Laws of Motion. Provide an example of each. Know why inertia is important.

7. (2 points) (a) Newton's First Law of Motion states that:

(b) Newton's Second Law of Motion states that:

(c) Newton's Third Law of Motion states that:

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V. Friction

Techniques to reduce Friction between surfaces. Techniques to increase Friction between surfaces.

8. (a) (2 points) Circle the correct answer(s). Sliding friction between two objects that are moving past each other can be increased by:
- a. putting sand between the objects
 - b. putting oil between the objects
 - c. putting ice between the objects
 - d. putting wax between the objects
8. (b) (2 points) Consider two skiers skiing down a ski slope. The mass of the first skier is 30kg, and the mass of the second skier is 60kg. Is the force of friction experienced by the first skier greater than, less than, or equal to the force of friction experienced by the second skier?

VI. Newton's Law of Universal Gravitation: The Inverse Square Law

Newton's Law of Universal Gravitation: The Inverse Square Law.

9. (a) (1 point) Two objects experience a 25N gravitational force. If the mass of one of the objects is increased by a factor of two, determine the new gravitational force.
9. (b) (1 point) Two objects experience a 5000N gravitational force. If the distance between the two objects is increased by a factor of 10, determine the new gravitational force.

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VII. Momentum

Momentum, Velocity, Mass

10. (2 points) A tennis ball with a mass of 2.0 kg is traveling with a velocity of $3.5 \frac{m}{s}$ EASTWARD. What is the momentum of the tennis ball?

VIII. Energy

Fill in the blank.

11. (2 points) Energy is a _____ (vector or scalar?).
12. (2 points) Energy is measured in units of _____.

Momentum and Energy and Power

13. (2 points) A tennis ball with a mass of 10.1 kg is traveling with a velocity of $2.2 \frac{m}{s}$ NORTHWARD. What is the kinetic energy of the tennis ball?

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IX. Basic Descriptions of Matter

14. (2 points) For these questions, assume that the temperature T is room temperature (T = 293 Kelvin).

Substance	Is it an atom?	Is it an element?	Is it a molecule?	Is it a compound?	Is it a mixture?
Carbon Dioxide, CO ₂					
Salt, Sodium Chloride, NaCl					
Neon gas, Ne					
Trail mix (raisins, fruit, nuts)					

15. (2 points) Select the appropriate type of change (physical or chemical).

Type of change	Is it a physical change?	Is it a chemical change?
Steel rusting		
Paper being ripped		

X. Chemical Reactions

16. (2 points) What is a chemical reaction?

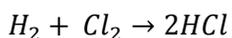
17. (2 points) The number of particles in one mole is (give the number):

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18. (2 points) The number of particles in mole is known as (give the name of the person for whom this number is named): _____

Consider the Oxidation-Reduction Reaction (also called a "Redox Reaction").

Hydrogen + Chlorine -> Hydrogen Chloride



19. (2 points) What are the reactants? _____

20. (2 points) What are the products? _____

21. (2 points) What happens to the electrons in this redox reaction?

22. (2 points) Write a sentence that describes this reaction:

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23. (2 points) Which species is oxidized in this reaction? _____

24. (2 points) Which species is reduced in this reaction? _____

XI. Basic Atomic Theory

25. (2 points) Who discovered radioactivity?

26. (2 points) Sketch J. J. Thomson's Raisin Cake Model of the Atom (Also known as the Plum Pudding Model).

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27. (2 points) Sketch Ernest Rutherford's Model of the Atom (Also known as the Planetary Atomic Model).

28. (2 points) What is the name of the experiment that Ernest Rutherford did that allowed him to discover the nucleus of an atom of one of the elements?

29. (2 points) Sketch the Bohr Model of the Atom.

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30. (2 points) Complete the Table.

Element	Symbol	Z (Protons)	A (Atomic Mass Number)	N (Neutron Number)	Number of Atomic Mass Units (u)
Nitrogen					
Potassium					
Polonium					
Radium					

XII. Chemical Periodicity

The Periodic Table

31. (2 points) Who invented the Periodic Table? _____

32. (2 points) What does the Periodic Table show? _____

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33. (2 points) In describing the electronic configuration of an element, the principal quantum number is represented with the letter _____.

34. (2 points) In describing the electronic configuration of an element, the angular momentum quantum number is represented with the letter _____.

35. (a) (2 points) Ununseptium, an element with $Z = 117$ discovered in 2010, is expected to have similar chemical properties as other elements in the Periodic Table. List at least three of these elements:

- 1.
- 2.
- 3.

35. (b) (2 points) Ununseptium, an element with $Z = 117$, is a member of which group or family in the Periodic Table?

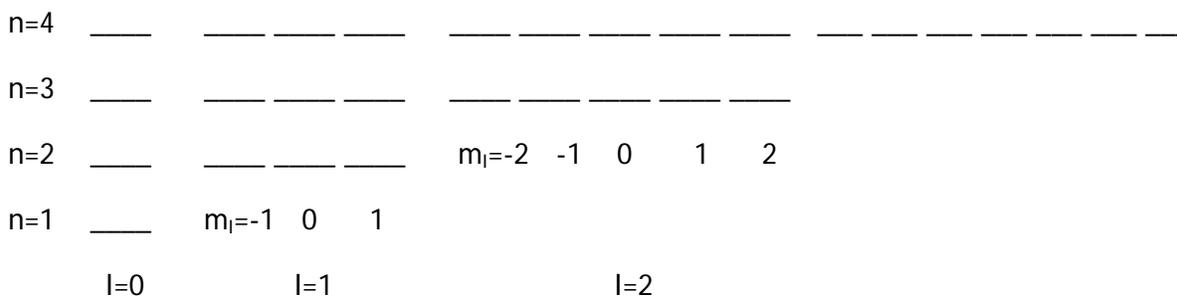
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Explanation for the Periodic Table with the Quantum Mechanical Model of the Atom

36. (2 points) What is the electronic configuration of the ground state of the Silicon atom?

The ground state of Silicon is written as: _____.

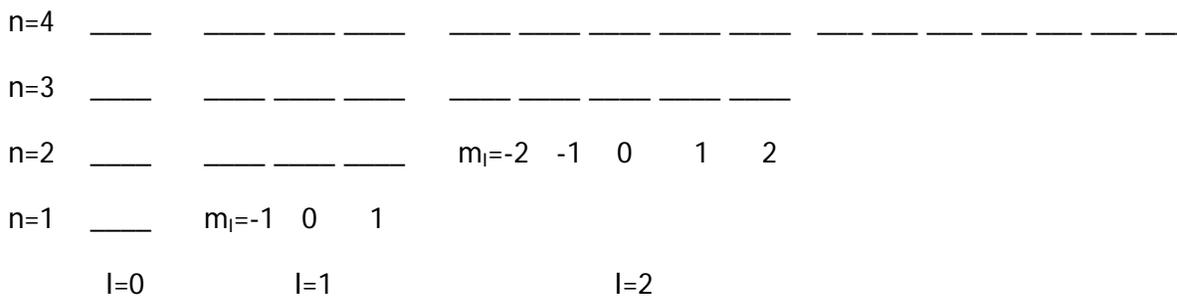
Pictorially:



37. (2 points) What is the electronic configuration of the ground state of the Carbon atom?

The ground state of Carbon is written as: _____.

Pictorially:



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38. (a) (1 point) What is the name of another element in the Periodic Table that is expected to have chemical properties that are similar to the chemical properties of Argon?

38. (b) (1 point) Why is this element in (a) expected to have chemical properties that are similar to the chemical properties of Argon?

39. (2 points) Look at the Periodic Table. List here one of the alkali metals: _____

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Properties of Elements in the Periodic Table: Ionic Charge, Oxidation Number, Ionization Energy, Electronegativity, Atomic Radius, Ionic Radius, Ionic Bonding, Covalent Bonding, Electron Affinity

40. (3 points) An atom of Potassium loses one electron.

(a) Is the Potassium ion now negatively charged or positively charged?

(b) What is the value of the charge on the ion?

(c) What is the symbol for the Potassium ion described in (a)?

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41(a). (5 points) What group of elements is the least reactive?

- (a) Halogens (b) Alkali metals (c) Noble gases (d) Semiconductors

41(b). (5 points) Why is this group of elements the least reactive?

42. (5 points) Look at the Periodic Table. Circle the pair(s) of elements that would most likely have a similar arrangement of outer electrons and have similar chemical behaviors.

(a) Lithium and Potassium

(b) Helium and Fluorine

(c) Chlorine and Fluorine

(d) Neon and Krypton