

UIL SCIENCE TESTS

CHEMISTRY

Written by
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UIL Science Practice Packet author, Kenneth Davis, earned his B.S. from Texas A&M University and an M.S. in microbiology from The University of Texas Health Science Center. A science teacher for over 24 years, Davis is currently teaching Medical Microbiology at Austin Community College and Science at Harper High School. He has coached numerous UIL Science teams, winning District and Regional championships, as well as achieving success at the State level.

We are a small company that listens! If you have any questions or if there is an area that you would like fully explored, let us hear from you. We hope you enjoy this product and stay in contact with us throughout your academic journey.

~ President Hexco Inc., Linda Tarrant

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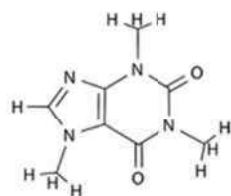
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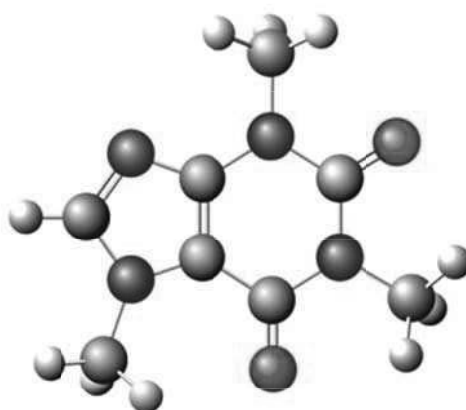
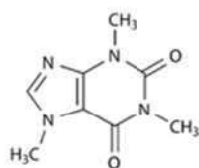
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UIL SCIENCE TESTS – CHEMISTRY



Caffeine



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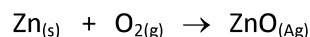
- 1. 5 Sets of 100 Questions**
- 2. Answer Key**
- 3. Answer Sheet**

For official UIL Constitution and Contest Rules for Science,
please review the Section 952 document at:
<http://www.uiltexas.org/academics/science>

59. Your chemistry teacher begins discussing molality with you. She asks you to explain this concept to the class. What would you say?
- Molality is the number of moles per liter of a solution.
 - Molality measures the mass per unit volume of a solution.
 - Molality measures the moles of solute per kilogram of solvent.
 - Molality measures the solubility of a solute in a solvent.
 - None of these is an accurate description of molality.
60. How much energy is necessary to raise the temperature of 355 mL of water from 44.4 degrees Celsius to 67.3 degrees Celsius?
- 3.40×10^1 kJ
 - 3.40×10^4 kJ
 - 9.59×10^1 kJ
 - 8.13×10^3 kJ
 - 2.29×10^1 kJ
61. Put the following in order from least to greatest.
- 1.45×10^4 picograms
 - 2.45×10^7 nanograms
 - 4.56×10^{-4} micrograms
 - 5.67×10^{-10} milligrams
- IV, III, II, I
 - I, II, IV, III
 - II, I, III, IV
 - IV, III, I, II
 - III, II, I, IV
62. In order to complete a chemistry lab, your instructor wants you to prepare your own solutions. You have 6.0 M HCl but need 300 mL of 0.10 M . How much of the stock solution would need to be used to correctly prepare this solution?
- .20 mL
 - 180 mL
 - 5.0 mL
 - 1800 mL
 - .60 mL
63. How many unshared pairs of valance electrons are there in the compound silicon tetrafloride?
- 0
 - 1
 - 2
 - 3
 - 4
64. What is the percent by mass of aluminum in aluminum phosphate?
- 25.40%
 - 22.12%
 - 52.48%
 - 74.60%
 - 16.67%
65. What are the coefficients necessary to balance the following equation?
- $$\text{PbS}_{(s)} + \text{O}_{2(g)} \rightarrow \text{PbO}_{(s)} + \text{SO}_{2(g)}$$
- 2, 3, 2, 2
 - 1, 1, 2, 2
 - 2, 2, 1, 2
 - 1, 1, 1, 1
 - 2, 3, 2, 1
66. Convert 5.67×10^{27} μC to Faradays.
- 5.67×10^{21} Faradays
 - 5.67×10^{24} Faradays
 - 9.65×10^4 Faradays
 - 5.67×10^{14} Faradays
 - 5.88×10^{16} Faradays

227. Select the one pair that is **correct**.
- iron (II) sulfide; Fe_2SO_4
 - potassium sulfide; KS_2
 - zinc chloride; ZnCl
 - dihydrogen oxide; H_2O_2
 - aluminum phosphate; AlPO_4
228. Calculate the gram formula mass of acetic acid.
- 16.0 g
 - 45.0 g
 - 57.0 g
 - 60.1 g
 - none of these
229. At constant temperature, the volume occupied by a definite mass of an unknown gas is ____.
- equal to the pressure of that sample of gas
 - inversely proportional to the pressure applied
 - directly proportional to the molar volume
 - inversely proportional to the gram formula mass of the unknown gas
 - directly proportional to the covalent bond strength of the unknown gas
230. The triple bond between the carbon atoms in acetylene (C_2H_2) consists of ____.
- three pi bonds
 - three sigma bonds
 - two pi bonds and one sigma bond
 - one sigma bond and two pi bonds
 - none of these
231. Lithium's atomic weight is 6.941 amu. There are two naturally occurring isotopes with masses of 6.01512 amu for ^6Li and 7.0160 amu for ^7Li . Calculate the percent composition of each isotope.
- 6.01%, 7.02%
 - 60.15%, 39.85%
 - 39.85%, 60.15%
 - 7.49%, 92.51%
 - 29.84%, 70.16%
232. A certain compound contains 54.5% carbon, 9.10% hydrogen, and 36.4% oxygen by mass. Given these values, calculate the compound's empirical formula.
- $\text{C}_5\text{H}_9\text{O}_2$
 - $\text{C}_2\text{H}_4\text{O}$
 - CHO
 - CH_2O
 - $\text{C}_{12}\text{HO}_{16}$
233. The molar mass of the compound in question number 32 is 88.0 amu. Given what you know, what is its molecular formula?
- $\text{C}_4\text{H}_8\text{O}_2$
 - $\text{C}_{10}\text{H}_{18}\text{O}_4$
 - CH_8O
 - $\text{C}_2\text{H}_2\text{O}_2$
 - $\text{C}_{12}\text{HO}_{15}$
234. Calculate the molarity of H_2SO_4 if 55.0 mL of it neutralizes 0.556 g of NaCO_3 .
- $5.2 \times 10^{-3} \text{ M}$
 - $1.0 \times 10^{-2} \text{ M}$
 - $9.5 \times 10^{-3} \text{ M}$
 - $5.2 \times 10^{-1} \text{ M}$
 - $9.5 \times 10^{-4} \text{ M}$
235. What is the percent by mass of aluminum in aluminum phosphate?
- 25.40%
 - 22.12%
 - 52.48%
 - 74.60%
 - 16.67%
236. Which compound would probably **not** be soluble?
- Na_2SO_4
 - AgCl
 - NH_4NO_3
 - KBr
 - KCl

418. Which, if any, of the following element/compounds in the equation below would be considered to be oxidized in a redox reaction?



- A. O_2
 - B. Zn
 - C. ZnO
 - D. both Zn and ZnO
 - E. none of these
419. In alpha decay a He particle is emitted. This type of decay on a material has what effect on the original element?
- A. The atomic number of the parent material increases by one.
 - B. There is no change in the parent material.
 - C. The atomic number decreases by one.
 - D. The mass number decreases by four, and the atomic number increases by two.
 - E. None of these describes the changes that occur during alpha decay.
420. The electronic geometry of methane (CH_4) happens to be _____, and its molecular geometry is _____ as well.
- A. tetrahedral, pyramidal
 - B. octahedral, octahedral
 - C. trigonal planar, trigonal planar
 - D. tetrahedral, tetrahedral
 - E. tetrahedral, trigonal planar
421. A piece of metal with a mass of 127.6 g is immersed in water. The water level of the cylinder with the metal rises from 25.0 mL to 37.6 mL. The density of the metal could be calculated by which of the following equations?
- A. $D = m/v$
 - B. $D = m/\Delta v$
 - C. $(m)(v) = D$
 - D. $D/m = v$
 - E. $D = v/m$

422. The major difference between accuracy and precision in chemistry is _____.

- A. Accuracy refers to how close to each other several measurements are. Precision is how accurate your instruments of measure are.
- B. Accuracy depends on the ability to replicate a measure; precision does not.
- C. Accuracy relies on how close a measured value is to accepted value; precision depends on validity of measuring instrument.
- D. Accuracy depends on how close a number of measures are to one another. Precision is how close a measure is to accepted value.
- E. Accuracy is how close your measure is to the accepted value. Precision relates to how close a series of measures are to one another.

423. Calculate the percent by mass of hydrogen in barium hydroxide octahydrate.

- A. 1.124%
- B. 5.752%
- C. 3.377%
- D. 18.14%
- E. 25.26%

424. Which of the following scientists and their discoveries is/are correct?

- I. Thomson; proton discovery
 - II. Millikan; electron charge
 - III. Rutherford; nucleus discovery
 - IV. Rutherford; neutron discovery
 - V. Chadwick; proton discovery
- A. I, III, IV
 - B. II, III, IV
 - C. II, V
 - D. II, III
 - E. II, III, V

425. The element whose electron configuration is $[\text{Ne}] 3s^2 3p^6$ is ____ .

- A. He
- B. Kr
- C. Al
- D. F
- E. Ar

426. Electronegativity in elements on the periodic table ____ .

- A. tends to increase from left to right and top to bottom.
- B. tends to decrease from left to right and top to bottom
- C. tends to increase from left to right and decreases from top to bottom
- D. tends to only decrease from left to right with no real trend from top to bottom.
- E. tends to only decrease from top to bottom with no real trend from left to right.

427. ____ are forms of particular elements that, when in the same physical state, can be found having different chemical structures with completely different properties. An example of such would be graphite and diamonds.

- A. Isotopes
- B. Isomers
- C. Antoisomers
- D. Allotropes
- E. Ions

428. How many pairs of unshared valence electrons would one find in one molecule of carbon disulfide?

- A. zero
- B. one
- C. two
- D. three
- E. four

429. Which of the pairs of compounds is/are correct?

- I. copper (I) sulfite : CuSO_3
 - II. sodium chlorate : NaClO_3
 - III. silver nitrate : $\text{Ag}(\text{NO}_3)_2$
 - IV. zinc sulfate : $\text{Zn}_2(\text{SO}_4)_3$
 - V. lead (II) sulfide : PbS
- A. I, II, V
 - B. II, V
 - C. I, III, V
 - D. II, III, IV
 - E. III, IV, V

430. How many moles of potassium ions are there in 357 g of potassium permanganate?

- A. 39.1 mol
- B. 3.57 mol
- C. 2.26 mol
- D. 3.24 mol
- E. none of these

431. The compound XeF_2 has an electric geometry of ____ and a molecular geometry of ____ .

- A. octahedral; square pyramidal
- B. octahedral; square planar
- C. trigonal planar; angular
- D. trigonal bipyramidal; linear
- E. tetrahedral; trigonal pyramidal

432. The mole fraction of hydrogen gas in a container is .0176. What is the partial pressure of hydrogen gas when the pressure in the container is 820 torr and the temperature is 276 K?

- A. 14 torr
- B. 4.7×10^4 torr
- C. 4.0×10^3 torr
- D. 6.0×10^{-3} torr
- E. insufficient information