**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

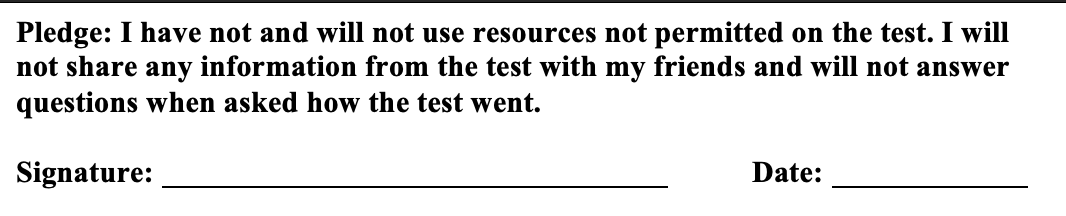
**Period:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Mr. Guch

General Chemistry Midterm

**Instructions:**

**For each question, write the letter of the correct answer next to each problem on the test (for example, if the answer to question 1 is “A”, write “A” next to the “1”). Staple all pages together – the test questions, your answers, the periodic table, and any scratch paper - when you turn in the midterm with your name on both this page and on the answer sheet.**

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1) The SI base unit that best corresponds to length is the:

a) meter

b) centimeter

c) millimeter

d) kilometer

2) What is the maximum number of electrons that can fit into an orbital?

a) one

b) two

c) eight

d) eighteen

3) An atom of copper that has 36 neutrons has a mass of:

a) 29 amu

b) 35 amu

c) 64 amu

d) 65 amu

4) An independent variable is:

a) The variable that stays the same in an experiment

b) The variable that changes in an experiment

c) The variable that the experimenter directly manipulates in an experiment

d) The variable that changes as a result of changing another variable

e) More than one of the above is true

5) The nucleus of an atom has all of the following properties EXCEPT:

a) It is positively charged

b) It contains most of the mass of the atom

c) It contains most of the volume of the atom

d) It contains both protons and neutrons

6) An element with ten protons, eleven neutrons, and ten electrons has an atomic number of:

a) ten

b) eleven

c) twenty-one

d) It is impossible to say from the information given

7) Which of the following is a qualitative observation?

a) The shirt is red

b) The shirt has a mass of 250 grams

c) The shirt has 1,250 stitches in it

d) None of these is a qualitative observation.

8) A property of matter that depends on the amount of matter present would be considered:

a) a chemical property

b) an intensive property

c) an extensive property

d) None of this answers is correct

9) How many valence electrons does an atom of aluminum typically have?

a) 2

b) 3

c) 13

d) 27

10) What is the octet rule?

a) All elements want the same number of protons as the nearest noble gas

b) All elements want the same number of neutrons as the nearest noble gas

c) All elements want the same number of electrons as the nearest noble gas.

d) The number of protons in a neutral atom is equal to its number of electrons.

11) The nucleus of isotope A has a larger mass than that of isotope B of the same element. This means that the number of neutrons in isotope B is:

a) less than the number of neutrons in isotope A

b) greater than the number of neutrons in isotope A

c) equal to the number of neutrons in isotope A

d) it is impossible to see how the number of neutrons between isotopes A and B are related.

12) Which of the following laws did Dalton NOT suggest was true?

a) Atoms have different shapes and sizes

b) Atoms follow the law of conservation of mass

c) Atoms are indestructible

d) Atoms follow the law of multiple proportions

13) Which of the following groups of elements would most likely have the greatest electronegativity?

a) halogens

b) alkali metals

c) alkaline earth metals

d) transition metals

14) Which of the following elements would you expect to have the largest atomic radius?

a) sodium

b) aluminum

c) sulfur

d) argon

15) Which of the following is true about anions?

a) They have positive charge

b) They have negative charge

c) Their charge depends on the compound in which they are present

16) The energy required to remove one electron from a neutral atom of an element is known as:

a) Its electronegativity

b) Its ionization energy

c) Its reactivity

d) Its quantum energy

17) Which of the following statements best describes an ionic bond?

a) a bond formed when electrons are shared between atoms

b) a bond formed by the transfer of electrons from one atom to another

c) a bond formed by the overlapping of d- or p-orbitals

d) a bond formed when the electronegativities of two elements are very similar

18) What should always be worn in the lab, no matter what?

a) lab coat

b) goggles

c) gloves

d) sandals

19) What piece of equipment is best for measuring the volume of a liquid?

a) graduated cylinder

b) beaker

c) Erlenmeyer flask

d) indicated beaker

20) What is the first step in the scientific method?

a) formulating a hypothesis

b) conducting an experiment

c) finding a problem that needs solving

d) writing an if \_\_\_\_\_, then \_\_\_\_\_ statement to describe the experiment.

21) What group of the periodic table contains the halogens?

a) Group 1

b) Group 17

c) Group 14

d) Group 2

22) What is the name of the compound Fe2O3?

a) iron oxide

b) iron(II) oxide

c) iron(III) oxide

d) iron hydroxide

23) The formula for copper(II) sulfate is:

a) CuSO4

b) Cu2SO3

c) Cu2SO4

d) CuS

24) How does electronegativity change as you move left to right across the periodic table?

a) increases

b) decreases

c) remains constant

d) changes randomly

25) Which of the following statements is true for ionic compounds?

a) They often have low solubility in water

b) They conduct electricity only as solids

c) They form crystalline solids

d) They have low melting points

1. What is an isotope?
2. It is one of the forms of an element, differing from the others by the number of neutrons.
3. It is one of the forms of an element, differing from the others by atomic mass.
4. It is one of the forms of an element, differing from the others by the number of protons.
5. More than one of the above is correct.
6. What is a line spectrum?
7. The spectrum of sunlight.
8. A spectrum that consists only of certain energies of light.
9. A pattern of light given off by a Bunsen burner.
10. A set of orbitals that are given off by an element.
11. What do we mean when we say that an electron is in an “excited state”?
12. It is in a low energy orbital.
13. It is in a high energy orbital.
14. It is jumping between orbitals.
15. It is giving off light.
16. Which of the following is characteristic of the quantum model of the atom?
17. Electrons are treated as waves.
18. Electrons can be found in circular orbits.
19. Orbitals can hold up to six electrons at a time.
20. None of the above is true of the quantum model of the atom.
21. Which of the following is a good definition for accuracy?
22. It’s a measure of how often a measurement can be repeated.
23. It’s a measure of how close a measurement is to the actual value of the thing being measured.
24. It’s a measure of the precision of the measurement that’s being taken.
25. It indicates how many significant figures should be used when recording a measurement.
26. Which of these numbers has three significant figures?
27. 0.01
28. 0.010
29. 0.0010
30. 0.00100
31. What family of the periodic table contains elements that would be best suited to use as fuel in nuclear power plants?
32. Lanthanides
33. Actinides
34. Transition metals
35. Main block elements
36. Which of the following best describes electronegativity?
37. It is a measurement of the size of the atoms of an element.
38. It is a measurement of how much atoms expand when an electron is added to them.
39. It is a measurement of how much atoms tend to pull electrons away from other atoms they have bonded to.
40. It is a way of measuring the positive charge in the nucleus of an atom
41. Which of the following elements has the smallest ionization energy?
42. Fluorine
43. Lithium
44. Cesium
45. Iodine
46. Why do ionic compounds generally have high melting and boiling points?
47. Cations are very hard
48. Anions are very hard
49. The attraction between anions and cations is strong
50. There is a lot of energy in the space around cation-cation interactions.
51. Which of the following is a demonstration of the octet rule?
52. Lithium gaining an electron to form a +1 ion.
53. Lithium gaining an electron to form a -1 ion.
54. Helium losing an electron to form a +1
55. Chlorine gaining an electron to form a -1 ion.
56. How does the shielding effect cause the ionization energy of elements to decrease as you move from top to bottom down a group in the periodic table?
57. Inner electrons are bigger than the outer electrons, making it harder to remove an electron from an atom.
58. Outer electrons are bigger than inner electrons, making it harder to remove an electron from an atom.
59. Inner electrons have a higher charge than outer electrons, making it easier for an atom to lose electrons.
60. The combined charge of the inner electrons push outer electrons away, making it easier to pull them away from the atom.
61. What is the name of Sr3N2?
62. strontium nitride
63. strontium (II) nitride
64. strontium nitrate
65. strontium (II) nitrate
66. What is spectroscopy?
67. It’s a method for identifying ionic compounds using their mass.
68. It’s a method for identifying elements using their line spectra.
69. It’s a method for identifying elements using their continuous spectra.
70. It’s a method for determining whether something is a metal, nonmetal, or metalloid.
71. Which of these elements is most electronegative?
72. He
73. H
74. F
75. Fr
76. Which of these is **not** a property of the alkali metals?

a) They are reactive

b) They want to lose electrons to be like the nearest noble gas.

c) They have the smallest atomic radii of the elements in their periods.

d) They have low melting and boiling points.

1. Why do ionic compounds have such high melting and boiling points?

a) It takes a lot of energy to pull all of the cations and anions apart

b) The lattice energy is lower than that for covalent compounds

c) They don’t typically contain hydrogen or carbon atoms

**Part 2 Open Response**: *Answer the following questions in their entirety on your test here. If a question has multiple parts, be sure to clearly label each part. Point values are indicated next to each question.* ***I will grade from what you write, if I cannot read it, it will not be graded.***

43. What are two differences between the Bohr model of the atom and the quantum mechanical model of the atom. *(4 pts)*

44-46. Use the information provided and a periodic table to complete this chart. *(12 pts)*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Atomic symbol** | **Atomic Number** | **Atomic**  **Mass** | **Protons** | **Neutrons** | **Electrons** |
|  |  | 14 |  |  | 10 |
|  |  |  | 31 | 38 |  |
| Br |  | 81 |  |  |  |

47. Sketch the Bohr model of the atom, labeling the following: *(5 pt)*

a) electron

b) nucleus

c) ground state

d) excited state

e) orbital

48. Write out the electron configuration for each atom. *(1 pt each)*

A. astatine (At): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B. sulfur (S): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

49. Explain what happens when an atom of rubidium (Rb) combines with an atom of iodine (I) to form a chemical compound. How does this happen? *(5 pt)*

50) Explain how spectroscopy can be used to determine the identity of an unknown compound. *(6 pt)*

51-53. Write the names for the following compounds. *(1 pt each)*

51. SrF2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

52. NH4NO3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

53. Cu(C2H3O2)2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

54-56. Write **t**he formulas for the following compounds. *(1 pt each)*

52. vanadium (III) oxide

53. zinc acetate

54. lithium phosphate

**This or That?** Circle your answer in each question *(1 pt each)*

57) Which has a higher conductivity at room temperature?

metals OR metalloids

58) Which of the following is more useful in spectroscopy?

line spectra OR continuous spectra

59) Which has a larger atomic radius?

iodine OR fluorine

60) Which would be less dangerous if accidentally added to a SCUBA diver’s air tank?

chlorine OR neon

STOP. This is the last question on the midterm exam. You may use the remaining time in the exam to think about the meaning of life, to dream about the opportunities ahead of you in your lives, or to take a nap.