**Topics In Chemistry Midterm Answer Sheet 2023-24**

NOTE: THIS IS NOT YOUR MIDTERM FOR THIS YEAR. IT IS AN OLD MIDTERM YOU CAN USE TO STUDY!

1. How many electrons does oxygen-16 have?
2. 8
3. 16.999
4. 16
5. 24
6. How many neutrons are present in plutonium-245?
7. 94
8. 150
9. 151
10. 244
11. What is an isotope?
12. It is one of the forms of an element, differing from the others by the number of neutrons.
13. It is one of the forms of an element, differing from the others by atomic mass.
14. It is one of the forms of an element, differing from the others by the number of protons.
15. More than one of the above is correct.
16. What is a line spectrum?
17. The spectrum of sunlight.
18. A spectrum that consists only of certain energies of light.
19. A pattern of light given off by a Bunsen burner.
20. A set of orbitals that are given off by an element.
21. What is an orbital?
22. It’s another word for an electron
23. It’s where the electrons exist in the plum pudding model of the atom.
24. It’s where neutrons can be found in the atom.
25. It’s where electrons can be found in the atom.
26. What do we mean when we say that an electron is in an “excited state”?
27. It is in a low energy orbital.
28. It is in a high energy orbital.
29. It is jumping between orbitals.
30. It is giving off light.
31. What is spectroscopy?
32. It’s a way of heating elements.
33. It’s how you can tell if an atom has electrons.
34. It’s a way of identifying an unknown element from its protons.
35. It’s a way of identifying an unknown element from the light it emits.
36. Which of the following is characteristic of the Bohr model of the atom?
37. Orbitals near the nucleus have lower energy than those farther away.
38. Electrons can be found in circular orbits around the nucleus.
39. The energies of electrons can be determined by the variable n.
40. All of the above.
41. Which of the following is the best definition of the “scientific method”?
42. It is a method that’s used when graphing scientific data.
43. It’s a systematic stepwise method for approaching scientific problems.
44. It’s a systematic method for determining the independent variable in an experiment.
45. It’s an approach to doing science that involves a “guess and check” way of solving problems.
46. What is a hypothesis?
47. It’s a statement in which a prediction is made about what will happen when the independent variable in an experiment is changed.
48. It’s a statement in which a prediction is made about what will happen when the dependent variable in an experiment is changed.
49. It’s a statement that explains the purpose of an experiment.
50. It’s a summary of the data collected in an experiment.
51. What piece of lab equipment should *always* be worn by students?
52. Beaker
53. Safety hat
54. Goggles
55. Rubber gloves
56. Which of the following is NOT an SI base unit?
57. Meter
58. Second
59. Yard
60. All of the above are SI base units.
61. What does the prefix “milli-“ mean?
62. One thousandth (0.001)
63. One millionth (0.000001)
64. One thousand (1,000)
65. One million (1,000,000)
66. Explain why metals conduct electricity.
67. The electron sea theory, in which delocalized bonds hold the metal atoms together.
68. Bonding occurs when cations and anions are attracted to each other.
69. Bonding occurs when cations and anions share electrons.
70. Bonding occurs because of the electronegativity differences between atoms.
71. Which of the following is a good definition for accuracy?
72. It’s a measure of how often a measurement can be repeated.
73. It’s a measure of how close a measurement is to the actual value of the thing being measured.
74. It’s a measure of the precision of the measurement that’s being taken.
75. It indicates how many significant figures should be used when recording a measurement.
76. John Dalton had an atomic theory with five major points. Which of these is not a characteristic of his model of the atom?
77. Atoms are spherical
78. Atoms obey the law of conservation of mass
79. Atoms are indestructible
80. Atoms are very small
81. Which of these is not true of the plum pudding model of the atom?
82. The positive charge in the atom has negatively-charged electrons embedded in it.
83. Electrons can be easily pulled from the atom, while the positively-charged portion of the atoms cannot.
84. There is a positively-charged nucleus in the middle of the atom.
85. Electrons have negative charge, as shown by Thomson’s cathode ray experiment.
86. Which of these phenomena convinced Rutherford that the positive charge in an atom is concentrated in the nucleus?
87. His cathode ray experiment showed that anode rays move toward the negative pole of a magnet.
88. His gold foil experiment showed that the positively-charged radioactive particles he fired at a target were deflected by positively-charged nuclei.
89. All of the positively-charged particles he shot at his gold foil target went right through the foil without being deflected at all.
90. When positively-charged particles were fired at a gold foil target, a beam of electrons was formed.
91. What family of the periodic table contains elements that would be best suited to use as fuel in nuclear power plants?
92. Lanthanides
93. Actinides
94. Transition metals
95. Main block elements
96. Which elements on the periodic table consist of hard, relatively unreactive metals?
97. Transition metals
98. Noble gases
99. Alkali metals
100. Lanthanides
101. If a neutral atom gains an electron, which of the following is formed?
102. Proton
103. Electron
104. Cation
105. Anion
106. Which of the following is a general property of ionic compounds?
107. They conduct electricity as solids.
108. They conduct electricity when melted.
109. They have low melting and boiling points.
110. They are softer than the elements that make them up.
111. Why do ionic compounds generally have high melting and boiling points?
112. Cations are very hard
113. Anions are very hard
114. The attraction between anions and cations is strong
115. There is a lot of energy in the space around cation-cation interactions.
116. Which of these is a good definition of a “period” in the periodic table?
117. A collection of elements with similar properties.
118. A collection of elements with similar electron configurations.
119. It is another word for “group”.
120. A collection of elements in a row of the periodic table.
121. Which of the following is a demonstration of the octet rule?
122. Lithium gaining an electron to form a +1 ion.
123. Lithium gaining an electron to form a -1 ion.
124. Helium losing an electron to form a +1
125. Chlorine gaining an electron to form a -1 ion.
126. Why do salts conduct electricity when melted or dissolved in water?
127. Electricity is formed when water is melted.
128. Electricity can be caused by the movement of ions.
129. Stationary ions have electronegativity deficits.
130. The ions attach to water molecules and form ionic liquids.
131. Why are ionic compounds hard?
132. Metals are hard, so metal ions are also hard.
133. Ionic crystals are extremely stable and the ions are locked in place.
134. Covalent bonding causes the ions to repel outside forces.
135. Metallic bonding causes the ions to have a strong attraction toward each other.
136. What is spectroscopy?
137. It’s a method for identifying ionic compounds using their mass.
138. It’s a method for identifying elements using their line spectra.
139. It’s a method for identifying elements using their continuous spectra.
140. It’s a method for determining whether something is a metal, nonmetal, or metalloid.
141. Which of the following can easily conduct electricity?
142. Metals
143. Iron
144. Metalloids, but only if they’re heated or subjected to high voltage.
145. All of the above.
146. How are ionic compounds formed?
147. An element that wants to gain electrons gives electrons to one that doesn’t – this happens because of the octet rule.
148. An element that wants to lose electrons gives electrons to one that wants to gain electrons – this happens because of the octet rule.
149. Two elements that both want to gain electrons do so, causing them to form molecules according to the octet rule.
150. Something not involving the octet rule.
151. Which of these is **not** a property of the alkali metals?
152. They are reactive
153. They want to lose electrons to be like the nearest noble gas.
154. They have the smallest atomic radii of the elements in their periods.
155. They have low melting and boiling points.
156. Which is true of isotopes?
157. They are radioactive
158. They are not radioactive
159. Some are radioactive, some are not
160. Isotopes have nothing to do with radioactivity.
161. Which of these atomic particles weighs the least?
162. Protons
163. Neutrons
164. Electrons
165. Nucleons
166. I did an experiment in which I tested the conductivity of a material. When I did this, I found that it did conduct electricity. This material is most likely:
167. Metallic
168. Ionic
169. Nonmetallic
170. It is impossible to tell from this information

**Practice Midterm:**

1. How many electrons does aluminum have?
2. 13
3. 26.982
4. 27
5. None of these
6. How many neutrons are present in plutonium-243?
7. 94
8. 149
9. 243
10. 244
11. What is the atomic mass of the isotope of ruthenium with 56 neutrons?
12. 44
13. 100
14. 101
15. 112
16. Which of these best explains why elements have different isotopes?
17. Different numbers of neutrons can stabilize the positive charges in the nucleus
18. Different numbers of protons can stabilize the positive charges in the nucleus
19. Different numbers of protons can stabilize the negative charges in the nucleus
20. Different numbers of electrons can stabilize the negative charges in the nucleus
21. The atomic mass of an element is equal to which of these?
22. The number of protons in the atom
23. The number of neutrons in the atom
24. The number of protons + the number of neutrons in the atom
25. The number of protons + the number of electrons in the atom
26. The average atomic mass of an element is equal to which of these?
27. The number of protons in an atom.
28. The average of the atomic masses of all the isotopes
29. The average of the number of neutrons of all the isotopes
30. A weighted average of the atomic masses of all the isotopes
31. What is a continuous spectrum?
32. It’s a pattern of lines given off when an element is heated
33. It’s a pattern of lines given off when electrons fall from an excited state back down to the ground state.
34. It’s a series of colors given off by atoms when they gain energy
35. It’s a rainbow of colors given off when substances are heated.
36. What is an orbital?
37. It’s where electrons live
38. It’s where protons and neutrons live
39. It’s when atoms lose electrons due to the addition of energy
40. More than one of the above is correct.
41. What do we mean when we say that an electron is in a “ground state”?
42. It is in a low energy orbital
43. It is in a medium energy orbital
44. It is in a high energy orbital
45. It has jumped off of the atom to another atom.
46. Which of the following would NOT take place during the flame test?
47. The generation of a line spectrum
48. An excited state orbital is forced to hold three electrons.
49. The colors of light given off correspond to the energy difference between the ground state and excited state.
50. Electrons will fall from excited states back down to their ground states.
51. Which of the following is not characteristic of the Bohr model of the atom?
52. Electrons can be found in orbitals around the nucleus.
53. A maximum of two electrons can be found in an orbital.
54. Orbitals increase in energy as their distance increases from the nucleus.
55. All of the above are characteristic of the Bohr model of the atom.
56. Which of the following is the best definition of “quantitative data”?
57. Data that involves numerical data.
58. Data that involves any observational data.
59. Data that doesn’t involve numerical data.
60. Data that doesn’t use numbers.
61. Which of these is an example of a good hypothesis?
62. If I eat a sandwich, then I have probably been sitting in the sun.
63. If I eat a sandwich, then I will no longer be hungry.
64. If I eat a sandwich containing old mayonnaise, then I will become sick.
65. More than one of the above is an example of a good hypothesis.
66. What piece of lab equipment should always be worn by students?
67. Gloves
68. Apron
69. Dosimeter
70. Goggles
71. Which of the following is NOT an SI base unit?
72. Degree Fahrenheit
73. Kelvin
74. Meter
75. Gram
76. What does the prefix “centi-“ mean?
77. One-millionth
78. One-hundredth
79. One hundred
80. One million
81. If I have 8.7 centigrams, how many kilograms is this?
82. 87 kg
83. 0.87 kg
84. 0.087 kg
85. 0.0087 kg
86. Which of the following is a good definition for precision?
87. How close a measured value is to the actual value of the thing it’s measuring
88. How often a measurement is taken during an experiment.
89. How accurate the significant figures of an experiment are.
90. How often a measured value can be reproduced.
91. Which of these is an example of the law of conservation of mass:
92. When I hit my son with a water balloon, the weight of my wet son was the same as the weight of my dry son plus the weight of the water in the balloon.
93. When I rear ended somebody else’s car with mine, the original weight of my car was equal to the weight of my crashed car and the bumper that fell from it.
94. When I washed my cat, the weight of the water that was originally in the tub was equal to the weight of the final weight of the water in the tub plus the weight of the water that my cat had splashed around.
95. All of these are examples of the law of conservation of mass.
96. John Dalton had an atomic theory with five major points. Which of these is not a characteristic of his model of the atom?
97. Atoms are small
98. Atoms contain electrons
99. Atoms obey the law of conservation of mass
100. Atoms cannot be destroyed
101. Which of these is not true of the plum pudding model of the atom?
102. Atoms contain electrons
103. Atoms contain orbitals
104. Electrons are embedded in a ball of positive charge.
105. More than one of the above is not true of the plum pudding model of the atom.
106. Which of the following is true of the alkaline earth metals?
107. They have high melting and boiling points
108. They are hard and brittle
109. They are extremely reactive
110. They form ions with a +1 charge
111. What family of the periodic table contains elements that would be best suited to kill bacteria at a water treatment plant?
112. Halogens
113. Alkali metals
114. Alkaline earth metals
115. Noble gases
116. Which of the following elements has four valence electrons?
117. Copper
118. Silicon
119. Gallium
120. Sulfur
121. Why doesn’t hydrogen have similar properties to the other elements in group 1?
122. It is a nonmetal
123. It is a metal
124. It is extremely electronegative
125. It is smaller than the other elements in group 1
126. If a neutral atom loses an electron, which of the following is formed?
127. Cation
128. Anion
129. Polyatomic ion
130. Neutral atom
131. Which of the following is not a general property of ionic compounds?
132. They have high melting and boiling points
133. They are hard and brittle
134. They form crystals
135. They are flammable.
136. Why are ionic compounds hard?
137. Ionic compounds form crystals where the ions are held tightly to one another.
138. Ionic compounds don’t form crystals, so their amorphous structure makes them inflexible.
139. Ionic compounds have high melting points.
140. Ionic compounds have low boiling points.
141. Generally speaking, why does fluorine form so many ionic compounds?
142. It is a nonmetal
143. It has lots of valence electrons
144. It is extremely electronegative so it’s good at pulling electrons off other atoms.
145. It wants to be like a noble gas, causing it to readily lose electrons.
146. Which of the following is a good definition of a family in the periodic table?
147. It is a column in the periodic table
148. It is a row in the periodic table
149. It contains nonmetals and metalloids
150. It contains only metals.
151. Which of the following is a poor definition of the octet rule?
152. Elements want to gain or lose electrons to get the same electron configurations the nearest noble gas.
153. Elements will become cations if they need to gain electrons to be like the nearest noble gas, and become anions if they need to lose electrons to be like the nearest noble gas.
154. All elements want to be like the nearest noble gas.
155. Because noble gas electron configurations are extremely stable, all elements want to get similar electron configurations to them.
156. Which of the following is a good explanation for why beryllium is less reactive than lithium?
157. It needs to gain more electrons to be like the nearest noble gas.
158. It needs to lose more electrons to be like the nearest noble gas.
159. It is a larger atom, making it harder to lose electrons.
160. It is a smaller atom, making it easier to lose electrons.

32 ½ )Why don’t salts conduct electricity unless they are melted or dissolved in water?

1. Moving ions result in electrical conductivity.
2. Moving ions cause conductivity to increasingly insulate going across a period.
3. Moving ions cause new crystal lattices to form when compounds are melted or dissolved in water.
4. Ions remain stationary, causing charged ions to conduct electricity.
5. Why do ionic compounds have high melting and boiling points?
6. Ionic compounds contain metals, which have high melting and boiling points.
7. Ionic compounds are brittle, causing them to shatter when heated.
8. Ionic compounds conduct electricity, causing the ions to stick together in higher temperatures.
9. The interaction between cations and anions is very strong, requiring a great deal of energy to break.
10. Why are ionic compounds usually formed when a metal bonds with a nonmetal?
11. Metals have high electronegativity, making it easy for them to transfer electrons to nonmetals.
12. Metals have low electronegativity, making it easy for them to transfer electrons to nonmetals.
13. Nonmetals have high electronegativity, making it easy for them to transfer electrons to nonmetals.
14. Nonmetals have low electronegativity, making it easy for them to transfer electrons to nonmetals.
15. Why do ionic compounds have high melting and boiling points?
16. The combination of an anion and cation forms a very stable compound.
17. Anions are always more stable than cations.
18. Because ionic compounds are also hard and brittle.
19. Electronegativities increase as you move across a period.
20. Why do metals usually form cations in ionic compounds?
21. Metals have low electronegativities
22. Metals lose electrons when placed into contact with electronegative elements.
23. Nonmetals have much higher electronegativities than metals.
24. All of the above.