**Chemistry 112 Practice Midterm 2017 - Answer Section**

**MULTIPLE CHOICE**

1. ANS: B PTS: 1 DIF: L1 REF: p. 39

OBJ: 2.1.1 Identify the properties of matter as extensive or intensive.

2. ANS: B PTS: 1 DIF: L1 REF: p. 41

OBJ: 2.1.3 Differentiate among the three states of matter.

3. ANS: C PTS: 1 DIF: L2 REF: p. 42

OBJ: 2.1.4 Describe a physical change.

4. ANS: B PTS: 1 DIF: L2 REF: p. 40

OBJ: 2.2.1 Categorize a sample of matter as a substance or a mixture.

5. ANS: B PTS: 1 DIF: L2 REF: p. 45

OBJ: 2.2.2 Distinguish between homogeneous and heterogeneous samples of matter. | 2.2.3 Describe two ways that components of mixtures can be separated.

6. ANS: D PTS: 1 DIF: L2 REF: p. 53

OBJ: 2.4.1 Describe what happens during a chemical change.

7. ANS: D PTS: 1 DIF: L1 REF: p. 55

OBJ: 2.4.3 Apply the law of conservation of mass to chemical reactions.

8. ANS: C PTS: 1 DIF: L2 REF: p. 102

OBJ: 4.1.2 Explain Dalton's atomic theory.

9. ANS: B PTS: 1 DIF: L1 REF: p. 110

OBJ: 4.3.1 Explain what makes elements and isotopes different from each other.

10. ANS: B PTS: 1 DIF: L2 REF: p. 111

OBJ: 4.3.1 Explain what makes elements and isotopes different from each other. | 4.3.4 Explain why chemists use the periodic table.

11. ANS: A PTS: 1 DIF: L2 REF: p. 111

OBJ: 4.3.1 Explain what makes elements and isotopes different from each other.

12. ANS: B PTS: 1 DIF: L2 REF: p. 131 | p. 132

OBJ: 5.1.3 Describe the energies and positions of electrons according to the quantum mechanical model.

13. ANS: C PTS: 1 DIF: L3 REF: p. 128

OBJ: 5.1.3 Describe the energies and positions of electrons according to the quantum mechanical model.

14. ANS: C PTS: 1 DIF: L2 REF: p. 131

OBJ: 5.2.1 Describe how to write the electron configuration for an atom.

15. ANS: A PTS: 1 DIF: L3 REF: p. 134

OBJ: 5.2.1 Describe how to write the electron configuration for an atom.

16. ANS: C PTS: 1 DIF: L2 REF: p. 145

OBJ: 5.3.4 Distinguish between quantum mechanics and classical mechanics.

17. ANS: B PTS: 1 DIF: L2 REF: p. 164

OBJ: 6.2.2 Classify elements based on electron configuration.

18. ANS: A PTS: 1 DIF: L2 REF: p. 164

OBJ: 6.2.3 Distinguish representative elements and transition metals.

19. ANS: C PTS: 1 DIF: L1 REF: p. 192

OBJ: 7.1.4 Explain how anions form.

20. ANS: A PTS: 1 DIF: L2 REF: p. 192

OBJ: 7.1.4 Explain how anions form.

21. ANS: A PTS: 1 DIF: L2 REF: p. 194

OBJ: 7.2.1 Explain the electrical charge of an ionic compound.

22. ANS: A PTS: 1 DIF: L1 REF: p. 196

OBJ: 7.2.2 Describe three properties of ionic compounds.

23. ANS: A PTS: 1 DIF: L1 REF: p. 201

OBJ: 7.3.1 Model the valence electrons of metal atoms.

24. ANS: D PTS: 1 DIF: L2 REF: p. 244

OBJ: 8.1.1 Distinguish between the melting points and boiling points of molecular compounds and ionic compounds.

25. ANS: A PTS: 1 DIF: L1 REF: p. 217

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule.

26. ANS: B PTS: 1 DIF: L2 REF: p. 217

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule.

27. ANS: B PTS: 1 DIF: L2 REF: p. 222

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule. | 8.2.4 Distinguish between a covalent bond and a coordinate covalent bond and describe how the strength of a covalent bond is related to its bond dissociation energy.

28. ANS: A PTS: 1 DIF: L1 REF: p. 164

OBJ: 6.1.1 Explain how elements are organized in a periodic table.

29. ANS: C PTS: 1 DIF: L1 REF: p. 166

OBJ: 6.1.1 Explain how elements are organized in a periodic table.

30. ANS: A PTS: 1 DIF: L1 REF: p. 215

OBJ: 8.1.2 Describe the information a molecular formula provides.

31. ANS: C PTS: 1 DIF: L2 REF: p. 217

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule.

32. ANS: A PTS: 1 DIF: L2 REF: p. 217

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule.

**SHORT ANSWER**

34. ANS:

1*s*2*s*2*p*3*s*3*p*4*s*3*d*4*p*

PTS: 1 DIF: L2 REF: p. 133 | p. 134

OBJ: 5.2.1 Describe how to write the electron configuration for an atom.

35. ANS:

8A

PTS: 1 DIF: L1 REF: p. 164

OBJ: 6.1.1 Explain how elements are organized in a periodic table.

36. ANS:

5*s*

PTS: 1 DIF: L2 REF: p. 164 | p. 172

OBJ: 6.3.2 Explain how ions form.

37. ANS:

1*s*2*s*2*p*

PTS: 1 DIF: L2 REF: p. 190 OBJ: 7.1.3 Describe how cations form.

**TRUE/FALSE**

38. ANS: F PTS: 1 DIF: Bloom's Level 2

NAT: UCP.2 | B.1

39. ANS: f PTS: 1 DIF: Bloom's Level 2

NAT: UCP.2 ;B.1

40. ANS: F PTS: 1 DIF: Bloom's Level 2

NAT: UCP.2 | B.1

41. ANS: T PTS: 1 DIF: Bloom's Level 1

NAT: B.1

42. ANS: F PTS: 1 DIF: Bloom's Level 2

NAT: UCP.2 | B.1

43. ANS: F

In a shortened type notation of an element, the mass number and the atomic number are written to the left of the symbol. The mass number is written as a superscript and the atomic number is written as a subscript.

PTS: 1 DIF: 1 REF: Page 100

OBJ: 4.3.2 Define an isotope and explain why atomic masses are not whole numbers.

NAT: B.1 TOP: Define an isotope and explain why atomic masses are not whole numbers.

KEY: Notation of elements MSC: 2

NOT: The atomic number and mass of an element can be represented by shortened notations.

44. ANS: T

A proton has a positive charge of 1+.

PTS: 1 DIF: 1 REF: Page 96

OBJ: 4.2.2 Describe the structure of the nuclear atom, including the locations of the subatomic particles.

NAT: B.1 | G.3

TOP: Describe the structure of the nuclear atom, including the locations of the subatomic particles.

KEY: Proton MSC: 1

NOT: A neutron has a mass nearly equal to that of a proton, but it carries no electrical charge.

**NUMERIC RESPONSE**

45. ANS: 6

PTS: 1 DIF: L1 REF: p. 110

OBJ: 4.3.1 Explain what makes elements and isotopes different from each other. | 4.3.4 Explain why chemists use the periodic table.

46. ANS: 30

PTS: 1 DIF: L1 REF: p. 112

OBJ: 4.3.1 Explain what makes elements and isotopes different from each other.

47. ANS: 7

PTS: 1 DIF: L3 REF: p. 131

OBJ: 5.1.3 Describe the energies and positions of electrons according to the quantum mechanical model. | 5.2.1 Describe how to write the electron configuration for an atom.

48. ANS: 36

PTS: 1 DIF: L2 REF: p. 162 | p. 172

OBJ: 6.3.2 Explain how ions form.

49. ANS: 3

PTS: 1 DIF: L2 REF: p. 190 OBJ: 7.1.3 Describe how cations form.

50. ANS: 7

PTS: 1 DIF: L1 REF: p. 218

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule.

51. ANS: 3 shared pairs

PTS: 1 DIF: L2 REF: p. 217

OBJ: 8.2.1 Describe how electrons are shared to form a covalent bonds and identify exceptions to the octet rule.

52. ANS: 2 shared pairs

PTS: 1 DIF: L2 REF: p. 221

OBJ: 8.2.2 Demonstrate how electron dot structures represent shared electrons.

**ESSAY**

53. ANS:

See answer posted

PTS: 1

54. ANS:

The chemical formula shows the elements that are in the compound and gives the proportions in which elements are found in the compound. The formula for sodium chloride (NaCl), for instance, indicates that the elements in the compound are sodium (Na) and chlorine (Cl). The formula also indicates that the elements are present in a proportion of 1:1 in the compound.

PTS: 1 DIF: L3 REF: p. 52

OBJ: 2.3.3 Identify the chemical symbols of common elements, and name common elements, given their symbols.

55. ANS:

Chemical properties describe the ability of a substance to undergo particular chemical changes. Chemical properties can only be observed when a substance undergoes a change in composition. Physical properties can be observed without altering the composition of a substance. The ability of iron to rust is a chemical property of iron. The fact that iron is a solid at room temperature is a physical property of iron.

PTS: 1 DIF: L2 REF: p. 42 | p. 53

OBJ: 2.1.2 Define physical property and list several common physical properties of substances. | 2.4.1 Describe what happens during a chemical change.

56. ANS:

It is a model that describes subatomic particles and atoms as waves. Schrodinger applied a mathematical model of the wave/particle nature of matter to hydrogen. Solutions to the Schrodinger equation determine the energies an electron can have and how likely it is to find the electron in various locations.

PTS: 1 DIF: L3 REF: p. 130 | p. 145

OBJ: 5.1.4 Describe how the shapes of orbitals at different sublevels differ. | 5.3.4 Distinguish between quantum mechanics and classical mechanics.

57. ANS:

The electron configurations of the noble gases are extremely stable. The octet rule states that, in chemical reactions, elements gain or lose electrons to achieve a noble gas configuration. This stable configuration is called an octet because it consists of 8 valence electrons (*s**p*), 2 from the outermost *s* orbital and 6 from the outermost *p* orbital. Oxygen has the electron configuration 1*s*2*s*2*p*. When oxygen reacts to form ionic compounds, it completes its octet by gaining two electrons from the element it reacts with. These two electrons add to the *p* orbital of oxygen, giving it the electron configuration (1*s*2*s*2*p*) of neon.

PTS: 1 DIF: L3 REF: p. 188

OBJ: 7.1.2 Explain how the octet rule applies to atoms of metallic and nonmetallic elements.

58. ANS:

a

PTS: 1