2015 Fall Midterm Practice Test

Matching
You will need your own calculator for the midterm. Question about the midterm will not be answered on the midterm day. You need to start studying early.

Match each item with the correct statement below.

a. mixture
b. product
c. phase

d. reactant
e. heterogeneous mixture
f. vapor

_____ 1. gaseous state of substance that is a liquid or solid at room temperature
_____ 2. a physical blend of two or more components
_____ 3. not uniform in composition
_____ 4. a substance formed in a chemical reaction
_____ 5. starting substance in a chemical reaction

Match each item with the correct statement below.

a. distillation
b. mass
c. chemical reaction

d. compound
e. element
f. homogeneous

_____ 6. amount of matter an object contains
_____ 7. describes mixture with a uniform composition
_____ 8. substance that cannot be changed into simpler substances by chemical means
_____ 9. composed of two or more substances chemically combined in a fixed proportion
_____ 10. process in which substances are changed into different substances

Match each item with the correct statement below.

a. proton
b. nucleus
c. atom

d. electron
e. neutron

_____ 11. the smallest particle of an element that retains the properties of that element
_____ 12. a positively charged subatomic particle
_____ 13. a negatively charged subatomic particle
_____ 14. a subatomic particle with no charge
_____ 15. the central part of an atom, containing protons and neutrons

Match each item with the correct statement below.

a. mass number
b. atomic mass unit
c. atomic number

d. atomic mass
e. isotope

_____ 16. atoms with the same number of protons, but different numbers of neutrons in the nucleus of an atom
_____ 17. the total number of protons and neutrons in the nucleus of an atom
_____ 18. the number of protons in the nucleus of an element
_____ 19. the weighted average of the masses of the isotopes of an element

____ 20. one-twelfth the mass of a carbon atom having six protons and six neutrons

Match each item with the correct statement below.

a.	positron	d.	transuranium element
b.	alpha particle	e.	gamma radiation
c.	beta particle	f.	transmutation

____ 21. emitted helium nucleus
____ 22. high-energy photons emitted by a radioisotope
____ 23. particle of charge +1 and mass equal to that of an electron

Match each item with the correct statement below.

a.	atomic orbital	d.	ground state
b.	aufbau principle	e.	Pauli exclusion principle
c.	electron configuration	f.	Heisenberg uncertainty principle

____ 24. region of high probability of finding an electron
____ 25. states the impossibility of knowing both velocity and position of a moving particle at the same time
____ 26. lowest energy level
____ 27. tendency of electrons to enter orbitals of lowest energy first
____ 28. arrangement of electrons around atomic nucleus
____ 29. each orbital has at most two electrons

Match each item with the correct statement below.

a.	atomic emission spectrum	d.	photon
b.	frequency	e.	quantum
c.	wavelength	f.	spectrum

____ 30. discrete bundle of electromagnetic energy
____ 31. energy needed to move an electron from one energy level to another
____ 32. number of wave cycles passing a point per unit of time
____ 33. distance between wave crests
____ 34. separation of light into different wavelengths
____ 35. frequencies of light emitted by an element

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 36. A theory is a ____.
     a. proposed explanation for an observation
     b. well-tested explanation for a broad set of observations
     c. summary of the results of many observations
     d. procedure used to test a proposed explanation

____ 37. The variable that is observed during an experiment is called what type of variable?

a.	independent	c.	controlling
b.	manipulated	d.	responding

____ 38. Which of the following is NOT an example of matter?

a.	air	c.	smoke
b.	heat	d.	water vapor

____ 39. An example of an extensive property of matter is ____.

      a. temperature   c. mass
      b. pressure   d. hardness

____ 40. All of the following are physical properties of matter EXCEPT ____.
      a. mass   c. melting point
      b. color   d. ability to rust

____ 41. A vapor is which state of matter?
      a. solid   c. gas
      b. liquid   d. all of the above

____ 42. Which of the following is a physical change?
      a. corrosion   c. evaporation
      b. explosion   d. rotting of food

____ 43. Which of the following CANNOT be classified as a substance?
      a. table salt   c. nitrogen
      b. air   d. gold

____ 44. Which of the following is a homogeneous mixture?
      a. salt water   c. sand and water
      b. beef stew   d. soil

____ 45. Separating a solid from a liquid by evaporating the liquid is called ____.
      a. filtration   c. solution
      b. condensation   d. distillation

____ 46. What distinguishes a substance from a mixture?
      a. Substances are compounds, and mixtures are not.
      b. Mixtures are groupings of elements, and compounds are not.
      c. Samples of the same substance can have different intensive properties.
      d. Mixtures can be separated physically, while compounds cannot.

____ 47. Which of the following represents a compound?
      a. H   c. H_2O
      b. *H-3*   d. O-16

____ 48. Which of the following is NOT a physical change?
      a. grating cheese   c. fermenting of cheese
      b. melting cheese   d. mixing two cheeses in a bowl

____ 49. Which of the following processes does NOT involve a change in chemical properties?
      a. rusting   c. boiling
      b. fermenting   d. burning

____ 50. A chemical change occurs when a piece of wood ____.
      a. is split   c. decays
      b. is painted   d. is cut

____ 51. Which of the following is a chemical property of water at 4°C?
      a. its color
      b. its state
      c. its temperature
      d. its ability to decompose into hydrogen and oxygen

____ 52. Which of the following indicates that a chemical change has happened during cooking?
 a. The food darkens.
 b. Bubbles form in boiling water.
 c. Butter melts.
 d. Energy is transferred from the stove to a pan.

____ 53. Which of the following does NOT indicate that a chemical change may have taken place?
 a. fracture formation   c. precipitate formation
 b. gas production   d. energy transfer

____ 54. Who was the man who lived from 460B.C.–370B.C. and was among the first to suggest the idea of atoms?
 a. Atomos   c. Democritus
 b. Dalton   d. Thomson

____ 55. The smallest particle of an element that retains the properties of that element is a(n) ____.
 a. atom   c. proton
 b. electron   d. neutron

____ 56. Dalton's atomic theory included which idea?
 a. All atoms of all elements are the same size.
 b. Atoms of different elements always combine in one-to-one ratios.
 c. Atoms of the same element are always identical.
 d. Individual atoms can be seen with a microscope.

____ 57. Why did J. J. Thomson reason that electrons must be a part of the atoms of all elements?
 a. Cathode rays are negatively-charged particles.
 b. Cathode rays can be deflected by magnets.
 c. An electron is 2000 times lighter than a hydrogen atom.
 d. Charge-to-mass ratio of electrons was the same, regardless of the gas used.

____ 58. Which of the following is true about subatomic particles?
 a. Electrons are negatively charged and are the heaviest subatomic particle.
 b. Protons are positively charged and the lightest subatomic particle.
 c. Neutrons have no charge and are the lightest subatomic particle.
 d. The mass of a neutron nearly equals the mass of a proton.

____ 59. All atoms are ____.
 a. positively charged, with the number of protons exceeding the number of electrons
 b. negatively charged, with the number of electrons exceeding the number of protons
 c. neutral, with the number of protons equaling the number of electrons
 d. neutral, with the number of protons equaling the number of electrons, which is equal to the number of neutrons

____ 60. As a consequence of the discovery of the nucleus by Rutherford, which model of the atom is thought to be true?
 a. Protons, electrons, and neutrons are evenly distributed throughout the volume of the atom.
 b. The nucleus is made of protons, electrons, and neutrons.
 c. Electrons are distributed around the nucleus and occupy almost all the volume of the atom.
 d. The nucleus is made of electrons and protons.

____ 61. The nucleus of an atom is ____.
 a. the central core and is composed of protons and neutrons
 b. positively charged and has more protons than neutrons
 c. negatively charged and has a high density
 d. negatively charged and has a low density

____ 62. An element has an atomic number of 76. The number of protons and electrons in a neutral atom of the element are ____.
   a. 152 protons and 76 electrons   c. 38 protons and 38 electrons
   b. 76 protons and 0 electrons   d. 76 protons and 76 electrons

____ 63. What does the number 84 in the name krypton-84 represent?
   a. the atomic number   c. the sum of the protons and electrons
   b. the mass number   d. twice the number of protons

____ 64. Isotopes of the same element have different ____.
   a. positions on the periodic table   c. atomic numbers
   b. chemical behavior   d. mass numbers

____ 65. In which of the following sets is the symbol of the element, the number of protons, and the number of electrons given correctly?
   a. In, 49 protons, 49 electrons   c. Cs, 55 protons, 132.9 electrons
   b. Zn, 30 protons, 60 electrons   d. F, 19 protons, 19 electrons

____ 66. Using the periodic table, determine the number of neutrons in ^{16}O.
   a. 4   c. 16
   b. 8   d. 24

____ 67. Which of the following equals one atomic mass unit?
   a. the mass of one electron
   b. the mass of one helium-4 atom
   c. the mass of one carbon-12 atom
   d. one-twelfth the mass of one carbon-12 atom

____ 68. Which of the following statements is NOT true?
   a. Protons have a positive charge.
   b. Electrons are negatively charged and have a mass of 1 amu.
   c. The nucleus of an atom is positively charged.
   d. Neutrons are located in the nucleus of an atom.

____ 69. When Group 2A elements form ions, they ____.
   a. lose two protons   c. lose two electrons
   b. gain two protons   d. gain two electrons

____ 70. What is the correct name for the N^{3-} ion?
   a. nitrate ion   c. nitride ion
   b. nitrogen ion   d. nitrite ion

____ 71. Which of the following compounds contains the Mn^{3+} ion?
   a. MnS   c. Mn_2O_3
   b. $MnBr_2$ d. MnO

____ 72. Which of the following formulas represents an ionic compound?
   a. CS_2 c. N_2O_4
   b. BaI_2 d. PCl_3

____ 73. Which of the following correctly represents an ion pair and the ionic compound the ions form?
   a. Ca^{2-}, F^-; CaF_2 c. Ba^{2+}, O^{2-}; Ba_2O_2
   b. Na^+, Cl^-; $NaCl_2$ d. Pb^{4+}, O^{2-}; Pb_2O_4

____ 74. Which of the following compounds contains the lead(II) ion?
     a.   PbO   c. Pb_2O
     b. $PbCl_4$ d. Pb_2S

____ 75. Which set of chemical name and chemical formula for the same compound is correct?
     a.   iron(II) oxide, Fe_2O_3 c.   tin(IV) bromide, $SnBr_4$
     b.   aluminum fluorate, AlF_3 d.   potassium chloride, K_2Cl_2

____ 76. What is the correct formula for potassium sulfite?
     a. $KHSO_3$ c. K_2SO_3
     b. $KHSO_4$ d. K_2SO_4

____ 77. Which set of chemical name and chemical formula for the same compound is correct?
     a.   ammonium sulfite, $(NH_4)_2S$ c.   lithium carbonate, $LiCO_3$
     b.   iron(III) phosphate, $FePO_4$ d.   magnesium dichromate, $MgCrO_4$

____ 78. Molecular compounds are usually ____.
     a.   composed of two or more transition elements
     b.   composed of positive and negative ions
     c.   composed of two or more nonmetallic elements
     d.   exceptions to the law of definite proportions

____ 79. Consider a mystery compound having the formula M_xT_y. If the compound is not an acid, if it contains only

     two elements, and if M is not a metal, which of the following is true about the compound?
     a.   It contains a polyatomic ion.   c.   Its name ends in -*ic*.
     b.   Its name ends in -*ite* or -*ate*.   d.   It is a binary molecular compound.

____ 80. Which of the following shows both the correct formula and correct name of an acid?
     a. $HClO_2$, chloric acid   c. H_3PO_4, phosphoric acid
     b. HNO_2, hydronitrous acid   d.   HI, iodic acid

____ 81. What is the name of H_2SO_3?

     a.   hyposulfuric acid   c.   sulfuric acid
     b.   hydrosulfuric acid   d.   sulfurous acid

____ 82. What is the formula for phosphoric acid?
     a. H_2PO_3 c. HPO_2
     b. H_3PO_4 d. HPO_4

____ 83. What is the correct name for the compound $CoCl_2$?

     a.   cobalt(I) chlorate   c.   cobalt(II) chlorate
     b.   cobalt(I) chloride   d.   cobalt(II) chloride

____ 84. What is the correct formula for calcium dihydrogen phosphate?
     a. CaH_2PO_4 c. $Ca(H_2PO_4)_2$
     b. $Ca_2H_2PO_4$ d. $Ca(H_2HPO_4)_2$

____ 85. Which of the following is the correct name for N_2O_5?

     a.   nitrous oxide   c.   nitrogen dioxide
     b.   dinitrogen pentoxide   d.   nitrate oxide

____ 86. What particle is emitted in alpha radiation?
     a.   electron   c.   helium nucleus
     b.   photon   d.   hydrogen nucleus

_____ 87. A beta particle is a(n) ____.
   a. photon   c. helium nucleus
   b. electron   d. hydrogen nucleus

_____ 88. The least penetrating form of radiation is ____.
   a. beta radiation   c. alpha radiation
   b. gamma radiation   d. X rays

_____ 89. Which of the following materials is necessary to stop an alpha particle?
   a. three feet of concrete   c. single sheet of aluminum foil
   b. three inches of lead   d. single sheet of paper

_____ 90. What particle decomposes to produce the electron of beta radiation?
   a. proton   c. electron
   b. neutron   d. positron

_____ 91. What symbol is used for beta radiation?
   a. $_0^0e$ c. $_0^{-1}e$

   b. $_{-1}^0e$ d. $_{-1}^{-1}e$

_____ 92. Which of the following materials is necessary to stop a beta particle?
   a. three feet of concrete   c. thin pieces of wood
   b. three inches of lead   d. single sheet of paper

_____ 93. When radium-226 (atomic number 88) decays by emitting an alpha particle, it becomes ____.
   a. polonium-222   c. radium-222
   b. polonium-224   d. radon-222

_____ 94. What particle is needed to complete the following nuclear equation?

   $_{25}^{56}Mn \rightarrow$ ____ $+ _{-1}^0e$

   a. $_{27}^{56}Co$ c. $_{26}^{56}Fe$

   b. $_{25}^{27}Mn$ d. $_{24}^{58}Cr$

_____ 95. A reaction in which small nuclei combine to form a heavier nucleus is called ____.
   a. fission   c. background radiation
   b. a chemical reaction   d. fusion

_____ 96. Nuclear fusion ____.
   a. takes place in the sun   c. can be controlled in the laboratory
   b. occurs at low temperatures   d. is used in medicine

_____ 97. A reaction that results in the combining of smaller atomic nuclei is ____.
   a. chemical   c. fusion
   b. fission   d. ionization

_____ 98. In Bohr's model of the atom, where are the electrons and protons located?
   a. The electrons move around the protons, which are at the center of the atom.
   b. The electrons and protons move throughout the atom.
   c. The electrons occupy fixed positions around the protons, which are at the center of the
      atom.
   d. The electrons and protons are located throughout the atom, but they are not free to move.

_____ 99. The principal quantum number indicates what property of an electron?
   a. position   c. energy level
   b. speed   d. electron cloud shape

____ 100. How many energy sublevels are in the second principal energy level?
   a. 1   c. 3
   b. 2   d. 4
____ 101. What is the maximum number of *f* orbitals in any single energy level in an atom?
   a. 1   c. 5
   b. 3   d. 7
____ 102. What is the maximum number of electrons in the second principal energy level?
   a. 2   c. 18
   b. 8   d. 32
____ 103. When an electron moves from a lower to a higher energy level, the electron _____.
   a. always doubles its energy
   b. absorbs a continuously variable amount of energy
   c. absorbs a quantum of energy
   d. moves closer to the nucleus
____ 104. If the spin of one electron in an orbital is clockwise, what is the spin of the other electron in that orbital?
   a. zero   c. counterclockwise
   b. clockwise   d. both clockwise and counterclockwise
____ 105. What types of atomic orbitals are in the third principal energy level?
   a. *s* and *p* only   c. *s*, *p*, and *d* only
   b. *p* and *d* only   d. *s*, *p*, *d*, and *f*
____ 106. What is the electron configuration of potassium?
   a. $1s^2 2s^2 2p^2 3s^2 3p^2 4s^1$ c. $1s^2 2s^2 3s^2 3p^6 3d^1$
   b. $1s^2 2s^2 2p^{10} 3s^2 3p^3$ d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
____ 107. If three electrons are available to fill three empty 2*p* atomic orbitals, how will the electrons be distributed in the three orbitals?
   a. one electron in each orbital
   b. two electrons in one orbital, one in another, none in the third
   c. three in one orbital, none in the other two
   d. Three electrons cannot fill three empty 2*p* atomic orbitals.
____ 108. How many unpaired electrons are in a sulfur atom (atomic number 16)?
   a. 0   c. 2
   b. 1   d. 3
____ 109. How many half-filled orbitals are in a bromine atom?
   a. 1   c. 3
   b. 2   d. 4
____ 110. How does the speed of visible light compare with the speed of gamma rays, when both speeds are measured in a vacuum?
   a. The speed of visible light is greater.
   b. The speed of gamma rays is greater.
   c. The speeds are the same.
   d. No answer can be determined from the information given.
____ 111. Which color of visible light has the shortest wavelength?
   a. yellow   c. blue
   b. green   d. violet
____ 112. Which of the following electromagnetic waves have the highest frequencies?
   a. ultraviolet light waves   c. microwaves
   b. X-rays   d. gamma rays

_____ 113. Which type of electromagnetic radiation includes the wavelength 10^{-7} m?
    a.   gamma ray   c.   radio wave
    b.   microwave   d.   visible light

_____ 114. How are the frequency and wavelength of light related?
    a.   They are inversely proportional to each other.
    b.   Frequency equals wavelength divided by the speed of light.
    c.   Wavelength is determined by dividing frequency by the speed of light.
    d.   They are directly proportional to each other.

_____ 115. Emission of light from an atom occurs when an electron _____.
    a.   drops from a higher to a lower energy level
    b.   jumps from a lower to a higher energy level
    c.   moves within its atomic orbital
    d.   falls into the nucleus

_____ 116. As changes in energy levels of electrons increase, the frequencies of atomic line spectra they emit _____.
    a.   increase   c.   remain the same
    b.   decrease   d.   cannot be determined

_____ 117. The atomic emission spectra of a sodium atom on Earth and of a sodium atom in the sun would be _____.
    a.   the same
    b.   different from each other
    c.   the same as those of several other elements
    d.   the same as each other only in the ultraviolet range

_____ 118. Which of the following quantum leaps would be associated with the greatest energy of emitted light?
    a.   n = 5 to n = 1   c.   n = 2 to n = 5
    b.   n = 4 to n = 5   d.   n = 5 to n = 4

_____ 119. Which variable is directly proportional to frequency?
    a.   wavelength   c.   position
    b.   velocity   d.   energy

_____ 120. How do the energy differences between the higher energy levels of an atom compare with the energy differences between the lower energy levels of the atom?
    a.   They are greater in magnitude than those between lower energy levels.
    b.   They are smaller in magnitude than those between lower energy levels.
    c.   There is no significant difference in the magnitudes of these differences.
    d.   No answer can be determined from the information given.

_____ 121. What are quanta of light called?
    a.   charms   c.   muons
    b.   excitons   d.   photons

_____ 122. Which scientist developed the quantum mechanical model of the atom?
    a.   Albert Einstein   c.   Niels Bohr
    b.   Erwin Schrodinger   d.   Ernest Rutherford

_____ 123. Bohr's model could only explain the spectra of which type of atoms?
    a.   single atoms with one electron
    b.   bonded atoms with one electron
    c.   single atoms with more than one electron
    d.   bonded atoms with more than one electron

____ 124. The quantum mechanical model of the atom ____.
    a. defines the exact path of an electron around the nucleus
    b. was proposed by Niels Bohr
    c. involves the probability of finding an electron in a certain position
    d. has many analogies in the visible world

____ 125. Who predicted that all matter can behave as waves as well as particles?
    a. Albert Einstein   c. Max Planck
    b. Erwin Schrodinger   d. Louis de Broglie

____ 126. According to the Heisenberg uncertainty principle, if the position of a moving particle is known, what other quantity CANNOT be known?
    a. mass   c. spin
    b. charge   d. velocity

____ 127. Which one of the following is has the longest wavelength?
    a. visible light
    b. radio waves
    c. X-rays
    d. microwaves
    e. infrared radiation

____ 128. Which electron configuration denotes an atom in its ground state?

____ 129. The ground state electron configuration of Ga is ____.
    a. $1s^2 2s^2 3s^2 3p^6 4s^2 3d^{10} 4p^1$
    b. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^1$
    c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
    d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4d^1$
    e. $[Ar]4s^2 3d^{11}$

_____ 130. The ground-state electron configuration of _____ is $[Ar]4s^23d^4$.
   a. V
   b. Mn
   c. Fe
   d. Cr
   e. K

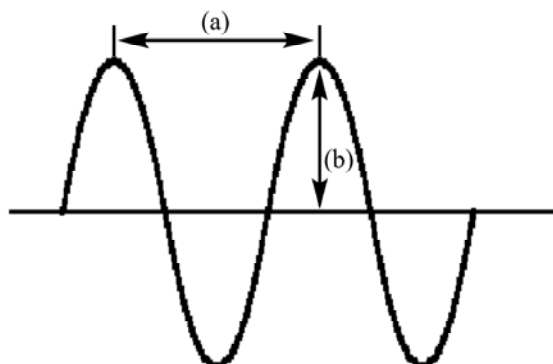_____ 131. Which electron configuration represents a violation of Hund's rule for an atom in its ground state?

a.

1s	2s	2p		
↑↓	↑↓	↑	↑	

b.

1s	2s	2p		
↑↓	↑↓	↑	↑↓	

c.

1s	2s	2p		
↑↓	↑↓	↑↑	↑	↑

d.

1s	2s	2p		
↑↓	↑			

e.

1s	2s	2p		
↑	↑	↑	↑	↑
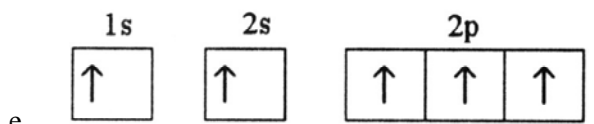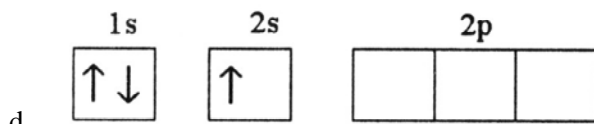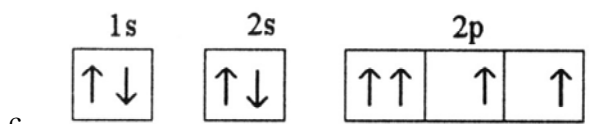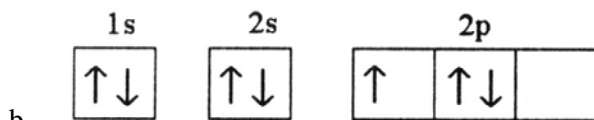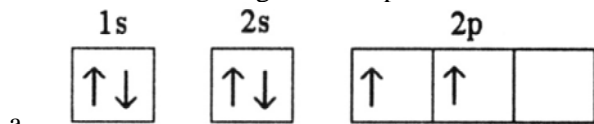
_____ 132. The noble gas electron configuration of argon, element 18, is _____.
   a. $[Ne]3s^4$
   b. $[Ar]3s^23p^2$
   c. $[Ne]3s^23p^6$
   d. $[He]2s^42p^{10}$
   e. $[He]3s^4$

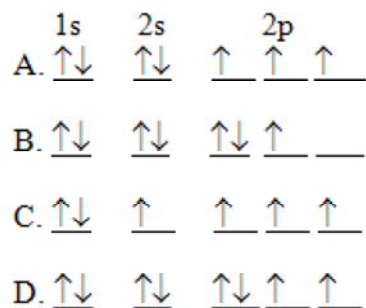____ 133. In the following diagram of a wave

- a. (a) is amplitude and (b) is wavelength
- b. (a) is frequency and (b) is amplitude
- c. (a) is wavelength and (b) is frequency
- d. (a) is wavelength and (b) is amplitude

____ 134. Using the figure below, which radiation has the longest wavelength?
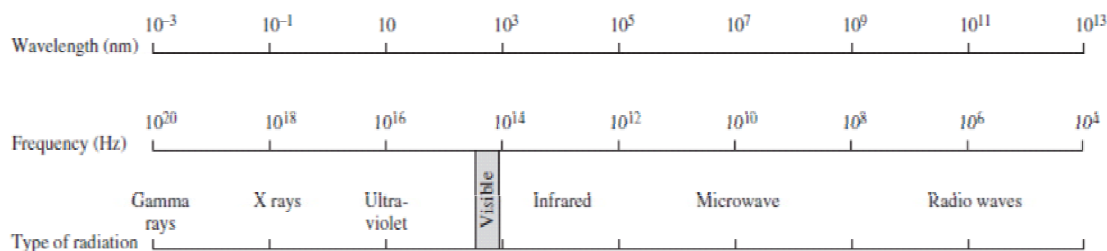
- a. Gamma rays
- b. X rays
- c. Ultraviolet
- d. Microwave

____ 135. The orbital diagram for a ground-state nitrogen atom is

- a. A
- b. B
- c. C
- d. D

Short Answer

136. Give the electron configuration for a neutral atom of beryllium.

137. Give the electron configuration for a neutral atom of chlorine.

138. Give the electron configuration for a neutral atom of selenium.

139. Write the electron configuration for chromium.

140. What wavelengths correspond to the visible region of the electromagnetic spectrum?

141. A spectrum containing radiation of specific wavelengths is called a(n) _____.

142. Rank the following types of electromagnetic radiation from lowest energy to highest energy: infrared, microwave, radio waves, gamma rays, visible, and ultraviolet.

143. The colors of the visible spectrum are blue, green, orange, red, violet, and yellow. Of these colors, _____ has the most energy.

144. The colors of the visible spectrum are blue, green, orange, red, violet, and yellow. Of these colors, _____ has the longest wavelength.

145. The colors of the visible spectrum are blue, green, orange, red, violet, and yellow. Of these colors, _____ has the shortest wavelength.

2015 Fall Midterm Practice Test
Answer Section

MATCHING

1. ANS: F   PTS: 1   DIF: L1   REF: p. 42
    OBJ: 2.1.3
2. ANS: A   PTS: 1   DIF: L1   REF: p. 44
    OBJ: 2.2.1   STA: Ch.6
3. ANS: E   PTS: 1   DIF: L1   REF: p. 45
    OBJ: 2.2.2
4. ANS: B   PTS: 1   DIF: L1   REF: p. 53
    OBJ: 2.4.1   STA: Ch.8
5. ANS: D   PTS: 1   DIF: L1   REF: p. 53
    OBJ: 2.4.1   STA: Ch.8

6. ANS: B   PTS: 1   DIF: L1   REF: p. 39
    OBJ: 2.1.1
7. ANS: F   PTS: 1   DIF: L1   REF: p. 45
    OBJ: 2.2.2   STA: Ch.6
8. ANS: E   PTS: 1   DIF: L1   REF: p. 48
    OBJ: 2.3.1
9. ANS: D   PTS: 1   DIF: L1   REF: p. 48
    OBJ: 2.3.1
10. ANS: C   PTS: 1   DIF: L1   REF: p. 53
    OBJ: 2.4.1

11. ANS: C   PTS: 1   DIF: L1   REF: p. 101 | p. 102
    OBJ: 4.1.1 | 4.1.2   STA: Ch.1
12. ANS: A   PTS: 1   DIF: L1   REF: p. 106
    OBJ: 4.2.1   STA: Ch.1 | Ch.11
13. ANS: D   PTS: 1   DIF: L1   REF: p. 104
    OBJ: 4.2.1   STA: Ch.1 | Ch.11
14. ANS: E   PTS: 1   DIF: L1   REF: p. 106
    OBJ: 4.2.1   STA: Ch.1 | Ch.11
15. ANS: B   PTS: 1   DIF: L1   REF: p. 106 | p. 107
    OBJ: 4.2.1 | 4.2.2   STA: Ch.1 | Ch.11

16. ANS: E   PTS: 1   DIF: L1   REF: p. 112
    OBJ: 4.3.1   STA: Ch.11.c
17. ANS: A   PTS: 1   DIF: L1   REF: p. 111
    OBJ: 4.3.1   STA: Ch.1.e
18. ANS: C   PTS: 1   DIF: L1   REF: p. 110
    OBJ: 4.3.1   STA: Ch.1.a
19. ANS: D   PTS: 1   DIF: L1   REF: p. 114
    OBJ: 4.3.3   STA: Ch.1.a

20. ANS: B   PTS: 1   DIF: L1   REF: p. 114
    OBJ: 4.3.3

21. ANS: B   PTS: 1   DIF: L1   REF: p. 800
    OBJ: 25.1.2   STA: Ch.11.d
22. ANS: E   PTS: 1   DIF: L1   REF: p. 802
    OBJ: 25.1.2   STA: Ch.11.d
23. ANS: A   PTS: 1   DIF: L1   REF: p. 804
    OBJ: 25.1.2   STA: Ch.11.d

24. ANS: A   PTS: 1   DIF: L1   REF: p. 130 | p. 131
    OBJ: 5.1.2   STA: Ch.1.e
25. ANS: F   PTS: 1   DIF: L1   REF: p. 145
    OBJ: 5.1.3   STA: Ch.1.e
26. ANS: D   PTS: 1   DIF: L1   REF: p. 142
    OBJ: 5.1.3   STA: Ch.1.j
27. ANS: B   PTS: 1   DIF: L1   REF: p. 133
    OBJ: 5.1.3 | 5.2.1 STA: Ch.1.j
28. ANS: C   PTS: 1   DIF: L1   REF: p. 133
    OBJ: 5.2.1   STA: Ch.1.e
29. ANS: E   PTS: 1   DIF: L1   REF: p. 134
    OBJ: 5.2.1   STA: Ch.1.e

30. ANS: D   PTS: 1   DIF: L1   REF: p. 128
    OBJ: 5.1.3   STA: Ch.1.j
31. ANS: E   PTS: 1   DIF: L1   REF: p. 128
    OBJ: 5.1.3   STA: Ch.1.j
32. ANS: B   PTS: 1   DIF: L1   REF: p. 138
    OBJ: 5.3.1   STA: Ch.1.j
33. ANS: C   PTS: 1   DIF: L1   REF: p. 138
    OBJ: 5.3.1   STA: Ch.1.j
34. ANS: F   PTS: 1   DIF: L1   REF: p. 139
    OBJ: 5.3.1   STA: Ch.1.j
35. ANS: A   PTS: 1   DIF: L1   REF: p. 141
    OBJ: 5.3.2   STA: Ch.1.j

MULTIPLE CHOICE

36. ANS: B   PTS: 1   DIF: L1   REF: p. 23
    OBJ: 1.3.2
37. ANS: D   PTS: 1   DIF: L2   REF: p. 22
    OBJ: 1.3.2
38. ANS: B   PTS: 1   DIF: L1   REF: p. 39
    OBJ: 2.1.1
39. ANS: C   PTS: 1   DIF: L1   REF: p. 39
    OBJ: 2.1.1
40. ANS: D   PTS: 1   DIF: L1   REF: p. 40
    OBJ: 2.1.2

41. ANS: C　　　PTS: 1　　　DIF: L1　　　REF: p. 42
　　OBJ: 2.1.3
42. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 42
　　OBJ: 2.1.4
43. ANS: B　　　PTS: 1　　　DIF: L2　　　REF: p. 40
　　OBJ: 2.2.1　　　STA: Ch.6
44. ANS: A　　　PTS: 1　　　DIF: L2　　　REF: p. 45
　　OBJ: 2.2.2　　　STA: Ch.6
45. ANS: D　　　PTS: 1　　　DIF: L2　　　REF: p. 46
　　OBJ: 2.2.3
46. ANS: D　　　PTS: 1　　　DIF: L3　　　REF: p. 50 | p. 51
　　OBJ: 2.3.2
47. ANS: C　　　PTS: 1　　　DIF: L1　　　REF: p. 51
　　OBJ: 2.3.3
48. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 53
　　OBJ: 2.4.1
49. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 53
　　OBJ: 2.4.1
50. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 53
　　OBJ: 2.4.1
51. ANS: D　　　PTS: 1　　　DIF: L2　　　REF: p. 53
　　OBJ: 2.4.1
52. ANS: A　　　PTS: 1　　　DIF: L2　　　REF: p. 54
　　OBJ: 2.1.4 | 2.4.1 | 2.4.2
53. ANS: A　　　PTS: 1　　　DIF: L2　　　REF: p. 54
　　OBJ: 2.1.4 | 2.4.2
54. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 101
　　OBJ: 4.1.1
55. ANS: A　　　PTS: 1　　　DIF: L1　　　REF: p. 101 | p. 102
　　OBJ: 4.1.1 | 4.1.2
56. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 102
　　OBJ: 4.1.2
57. ANS: D　　　PTS: 1　　　DIF: L2　　　REF: p. 105
　　OBJ: 4.2.1　　　STA: Ch.1.h
58. ANS: D　　　PTS: 1　　　DIF: L2　　　REF: p. 104 | p. 105 | p. 106
　　OBJ: 4.2.1　　　STA: Ch.1.a
59. ANS: C　　　PTS: 1　　　DIF: L3　　　REF: p. 106
　　OBJ: 4.2.1　　　STA: Ch.1
60. ANS: C　　　PTS: 1　　　DIF: L2　　　REF: p. 108
　　OBJ: 4.2.2　　　STA: Ch.1.h
61. ANS: A　　　PTS: 1　　　DIF: L2　　　REF: p. 107 | p. 108
　　OBJ: 4.2.2　　　STA: Ch.1.e
62. ANS: D　　　PTS: 1　　　DIF: L1　　　REF: p. 110
　　OBJ: 4.3.1　　　STA: Ch.1.a
63. ANS: B　　　PTS: 1　　　DIF: L1　　　REF: p. 111
　　OBJ: 4.3.1　　　STA: Ch.1.a | Ch.11.c
64. ANS: D　　　PTS: 1　　　DIF: L1　　　REF: p. 112 | p. 113
　　OBJ: 4.3.1　　　STA: Ch.11.c

65. ANS: A   PTS: 1   DIF: L2   REF: p. 110
    OBJ: 4.2.1 | 4.3.1   STA: Ch.1.a
66. ANS: B   PTS: 1   DIF: L2   REF: p. 111
    OBJ: 4.3.1 | 4.3.4   STA: Ch.1.a
67. ANS: D   PTS: 1   DIF: L1   REF: p. 114
    OBJ: 4.3.3
68. ANS: B   PTS: 1   DIF: L2   REF: p. 114
    OBJ: 4.3.3   STA: Ch.1.a
69. ANS: C   PTS: 1   DIF: L1   REF: p. 254
    OBJ: 9.1.1   STA: Ch.1.c | Ch.1.d
70. ANS: C   PTS: 1   DIF: L1   REF: p. 254
    OBJ: 9.1.1   STA: Ch.3
71. ANS: C   PTS: 1   DIF: L1   REF: p. 262 | p. 263
    OBJ: 9.2.1   STA: Ch.2
72. ANS: B   PTS: 1   DIF: L2   REF: p. 262
    OBJ: 9.2.1   STA: Ch.2
73. ANS: A   PTS: 1   DIF: L2   REF: p. 262
    OBJ: 9.2.1   STA: Ch.2
74. ANS: A   PTS: 1   DIF: L2   REF: p. 262 | p. 263
    OBJ: 9.2.1   STA: Ch.2
75. ANS: C   PTS: 1   DIF: L2   REF: p. 261 | p. 262
    OBJ: 9.2.1   STA: Ch.2
76. ANS: C   PTS: 1   DIF: L2   REF: p. 257 | p. 261 | p. 262
    OBJ: 9.2.2   STA: Ch.2
77. ANS: B   PTS: 1   DIF: L2   REF: p. 264 | p. 265 | p. 266
    OBJ: 9.1.3 | 9.2.2   STA: Ch.2
78. ANS: C   PTS: 1   DIF: L1   REF: p. 268
    OBJ: 9.3.1 | 9.3.2   STA: Ch.2.a
79. ANS: D   PTS: 1   DIF: L3   REF: p. 268 | p. 269
    OBJ: 9.3.2   STA: Ch.2
80. ANS: C   PTS: 1   DIF: L2   REF: p. 272
    OBJ: 9.4.1   STA: Ch.5
81. ANS: D   PTS: 1   DIF: L2   REF: p. 272
    OBJ: 9.4.1   STA: Ch.5
82. ANS: B   PTS: 1   DIF: L2   REF: p. 272
    OBJ: 9.4.2   STA: Ch.5
83. ANS: D   PTS: 1   DIF: L2   REF: p. 261 | p. 262 | p. 277
    OBJ: 9.2.1 | 9.5.2   STA: Ch.5
84. ANS: C   PTS: 1   DIF: L3   REF: p. 257 | p. 264
    OBJ: 9.2.2 | 9.5.2   STA: Ch.5
85. ANS: B   PTS: 1   DIF: L2   REF: p. 269 | p. 277
    OBJ: 9.3.2 | 9.5.3   STA: Ch.2.b | Ch.5
86. ANS: C   PTS: 1   DIF: L1   REF: p. 800
    OBJ: 25.1.2   STA: Ch.11.d
87. ANS: B   PTS: 1   DIF: L1   REF: p. 801
    OBJ: 25.1.2   STA: Ch.11.d
88. ANS: C   PTS: 1   DIF: L1   REF: p. 802
    OBJ: 25.1.2   STA: Ch.11.e

89. ANS: D   PTS: 1   DIF: L2   REF: p. 800
     OBJ: 25.1.2   STA: Ch.11.e
90. ANS: B   PTS: 1   DIF: L2   REF: p. 801
     OBJ: 25.1.2   STA: Ch.11.d
91. ANS: B   PTS: 1   DIF: L2   REF: p. 801
     OBJ: 25.1.2   STA: Ch.11.d
92. ANS: C   PTS: 1   DIF: L2   REF: p. 802
     OBJ: 25.1.2   STA: Ch.11.e
93. ANS: D   PTS: 1   DIF: L2   REF: p. 800 | p. 804
     OBJ: 25.1.2 | 25.2.1   STA: Ch.11.d
94. ANS: C   PTS: 1   DIF: L3   REF: p. 803 | p. 804
     OBJ: 25.2.1   STA: Ch.11.d
95. ANS: D   PTS: 1   DIF: L1   REF: p. 813
     OBJ: 25.3.3   STA: Ch.11.b
96. ANS: A   PTS: 1   DIF: L1   REF: p. 813
     OBJ: 25.3.3
97. ANS: C   PTS: 1   DIF: L1   REF: p. 810
     OBJ: 25.3.3   STA: Ch.11.b
98. ANS: A   PTS: 1   DIF: L2   REF: p. 128
     OBJ: 5.1.2   STA: Ch.1.i
99. ANS: C   PTS: 1   DIF: L2   REF: p. 131
     OBJ: 5.1.3   STA: Ch.1.i
100. ANS: B   PTS: 1   DIF: L2   REF: p. 131
     OBJ: 5.1.3   STA: Ch.1.i
101. ANS: D   PTS: 1   DIF: L2   REF: p. 131 | p. 132
     OBJ: 5.1.3   STA: Ch.1.i
102. ANS: B   PTS: 1   DIF: L3   REF: p. 132
     OBJ: 5.1.3   STA: Ch.1.i
103. ANS: C   PTS: 1   DIF: L3   REF: p. 128
     OBJ: 5.1.3   STA: Ch.1.i
104. ANS: C   PTS: 1   DIF: L1   REF: p. 134
     OBJ: 5.2.1   STA: Ch.1.i
105. ANS: C   PTS: 1   DIF: L2   REF: p. 131
     OBJ: 5.2.1   STA: Ch.1.i
106. ANS: D   PTS: 1   DIF: L2   REF: p. 133 | p. 134 | p. 135
     OBJ: 5.2.1   STA: Ch.1.g
107. ANS: A   PTS: 1   DIF: L3   REF: p. 134
     OBJ: 5.2.1   STA: Ch.1.g | Ch.1.i
108. ANS: C   PTS: 1   DIF: L3   REF: p. 133 | p. 134
     OBJ: 5.2.1   STA: Ch.1.g
109. ANS: A   PTS: 1   DIF: L3   REF: p. 133 | p. 134
     OBJ: 5.2.1   STA: Ch.1.g
110. ANS: C   PTS: 1   DIF: L2   REF: p. 139
     OBJ: 5.3.1   STA: Ch.11.e
111. ANS: D   PTS: 1   DIF: L2   REF: p. 139
     OBJ: 5.3.1   STA: Ch.1.j
112. ANS: D   PTS: 1   DIF: L2   REF: p. 139
     OBJ: 5.3.1   STA: Ch.1.j

113. ANS: D   PTS: 1   DIF: L2   REF: p. 139
     OBJ: 5.3.1   STA: Ch.1.j
114. ANS: A   PTS: 1   DIF: L2   REF: p. 139
     OBJ: 5.3.1   STA: Ch.1.j
115. ANS: A   PTS: 1   DIF: L2   REF: p. 141
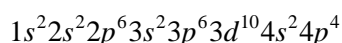   OBJ: 5.3.2   STA: Ch.1.j
116. ANS: A   PTS: 1   DIF: L2   REF: p. 142 | p. 143
     OBJ: 5.3.2   STA: Ch.1.j
117. ANS: A   PTS: 1   DIF: L2   REF: p. 141
     OBJ: 5.3.2 | 5.3.3   STA: Ch.1.j
118. ANS: A   PTS: 1   DIF: L2   REF: p. 143
     OBJ: 5.3.3   STA: Ch.1.j
119. ANS: D   PTS: 1   DIF: L3   REF: p. 142
     OBJ: 5.3.3   STA: Ch.1.j
120. ANS: B   PTS: 1   DIF: L3   REF: p. 143
     OBJ: 5.3.3   STA: Ch.1.j
121. ANS: D   PTS: 1   DIF: L1   REF: p. 144
     OBJ: 5.3.4   STA: Ch.1.j
122. ANS: B   PTS: 1   DIF: L1   REF: p. 130
     OBJ: 5.3.4   STA: Ch.1.i
123. ANS: A   PTS: 1   DIF: L2   REF: p. 143
     OBJ: 5.3.3 | 5.3.4   STA: Ch.1.i
124. ANS: C   PTS: 1   DIF: L2   REF: p. 145
     OBJ: 5.3.4   STA: Ch.1.i
125. ANS: D   PTS: 1   DIF: L2   REF: p. 144
     OBJ: 5.3.4   STA: Ch.1.i
126. ANS: D   PTS: 1   DIF: L2   REF: p. 145
     OBJ: 5.3.4   STA: Ch.1.i
127. ANS: B   PTS: 1   DIF: 1   REF: Page Ref: 6.2
     OBJ: 6.2; G2
128. ANS: D   PTS: 1   DIF: 2   REF: Page Ref: 6.8
     OBJ: 6.8; G2
129. ANS: C   PTS: 1   DIF: 2   REF: Page Ref: 6.8
     OBJ: 6.8; G2
130. ANS: D   PTS: 1   DIF: 2   REF: Page Ref: 6.8
     OBJ: 6.8; G2
131. ANS: B   PTS: 1   DIF: 2   REF: Page Ref: 6.8
     OBJ: 6.8; G2
132. ANS: C   PTS: 1   DIF: 2   REF: Page Ref: 6.8
     OBJ: 6.9; G2
133. ANS: D   PTS: 1   DIF: Easy   REF: Section: 7.1
     OBJ: EK.1.D.3
134. ANS: D   PTS: 1   DIF: Medium   REF: Section: 7.1
     OBJ: EK.1.D.3
135. ANS: A   PTS: 1   DIF: Medium   REF: Section: 7.8
     OBJ: EK.1.B.2

SHORT ANSWER

136. ANS:
$1s^2 2s^2$

PTS: 1   DIF: L1   REF: p. 133 | p. 134
OBJ: 5.2.1   STA: Ch.1.g
137. ANS:
$1s^2 2s^2 2p^6 3s^2 3p^5$
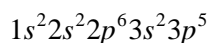
PTS: 1   DIF: L2   REF: p. 133 | p. 134
OBJ: 5.2.1   STA: Ch.1.g
138. ANS:
$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^4$

PTS: 1   DIF: L2   REF: p. 133 | p. 134
OBJ: 5.2.1   STA: Ch.1.g
139. ANS:
$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
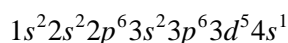
PTS: 1   DIF: L3   REF: p. 134 | p. 135 | p. 136
OBJ: 5.2.2   STA: Ch.1.g
140. ANS:
About 400 to 750 nm.

PTS: 1   DIF: 1   REF: Page Ref: 6.1
OBJ: 6.1; G4
141. ANS:
line spectrum

PTS: 1   DIF: 2   REF: Page Ref: 6.3
OBJ: 6.3; G2
142. ANS:
radio waves < microwaves < infrared < visible < ultraviolet < gamma rays

PTS: 1   DIF: Medium   REF: Section: 7.1   OBJ: EK.1.D.3
143. ANS:
violet

PTS: 1   DIF: Easy   REF: Section: 7.1   OBJ: EK.1.D.3
144. ANS:
red

PTS: 1   DIF: Easy   REF: Section: 7.1   OBJ: EK.1.D.3
145. ANS:
violet

PTS: 1   DIF: Easy   REF: Section: 7.1   OBJ: EK.1.D.3