Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Ham radio operators often broadcast on the 6-meter band. The frequency of this electromagnetic radiation is _____ MHz.
   A) 200
   B) 2.0
   C) 20
   D) 500
   E) 50

2) What is the frequency of light (s^{-1}) that has a wavelength of 3.12×10^{-3} cm?
   A) 2.44×10^{16}
   B) 9.62×10^{12}
   C) 3.69
   D) 4.10×10^{-17}
   E) 1.04×10^{-13}

3) The photoelectric effect is _____.
   A) the darkening of photographic film when exposed to an electric field
   B) the total reflection of light by metals giving them their typical luster
   C) the production of current by silicon solar cells when exposed to sunlight
   D) the ejection of electrons by a metal when struck by light
   E) a relativistic effect

4) The energy of a photon that has a wavelength of 12.3 nm is _____ J.
   A) 2.72×10^{-50}
   B) 1.51×10^{-17}
   C) 1.99×10^{-25}
   D) 4.42×10^{-23}
   E) 1.62×10^{-17}

5) What is the frequency (s^{-1}) of a photon that has an energy of 4.38×10^{-18} J?
   A) 2.30×10^{7}
   B) 1.45×10^{-16}
   C) 6.61×10^{15}
   D) 436
   E) 1.31×10^{-9}

6) Of the following transitions in the Bohr hydrogen atom, the _____ transition results in the emission of the highest-energy photon.
   A) $n = 1 \rightarrow n = 4$
   B) $n = 6 \rightarrow n = 1$
   C) $n = 6 \rightarrow n = 3$
   D) $n = 3 \rightarrow n = 6$
   E) $n = 1 \rightarrow n = 6$

7) In the Bohr model of the atom, _____.
   A) electrons travel in circular paths called orbitals
   B) electron energies are quantized
   C) electrons can have any energy
   D) electron paths are controlled by probability
   E) both A and C

8) The lines in the emission spectrum of hydrogen result from _____.
   A) protons given off when hydrogen burns
   B) electrons given off by hydrogen as it cools
   C) decomposing hydrogen atoms
   D) electrons given off by hydrogen when it burns
   E) energy given off in the form of visible light when an electron moves from a higher energy state to a lower energy state

9) The n = 5 to n = 3 transition in the Bohr hydrogen atom corresponds to the _____ of a photon with a wavelength of _____ nm.
   A) emission, 657
   B) emission, 1280
   C) absorption, 1280
   D) absorption, 657
   E) emission, 389

10) According to the Heisenberg Uncertainty Principle, it is impossible to know precisely both the position and the _____ of an electron.
   A) velocity
   B) momentum
   C) mass
   D) color
   E) shape

11) The uncertainty principle states that _____.
   A) it is impossible to know the exact position and momentum of an electron
   B) it is impossible to know how many electrons there are in an atom
   C) it is impossible to know anything with certainty
   D) matter and energy are really the same thing
   E) there can only be one uncertain digit in a reported number

12) The _____ subshell contains only one orbital.
   A) 6f
   B) 4s
   C) 3d
   D) 1p
   E) 5d

13) Which of the subshells below do <u>not</u> exist due to the constraints upon the azimuthal quantum number?
   A) 2s
   B) 2p
   C) 2d
   D) all of the above
   E) none of the above

14) There are _____ orbitals in the second shell.
   A) 1
   B) 2
   C) 4
   D) 8
   E) 9

15) Which one of the following is an incorrect subshell notation?
   A) 4f
   B) 3d
   C) 3s
   D) 2d
   E) 2p

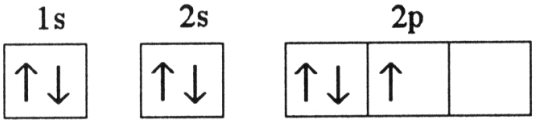
16) Which quantum numbers must be the same for the orbitals that they designate to be degenerate in a one-electron system (such as hydrogen)?
   A) n only
   B) n and l only
   C) l and m_l
   D) n, l, and m_l
   E) m_l only

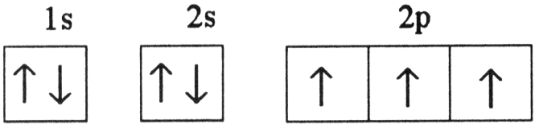
17) Electrons that are in degenerate orbitals have the same _____.
   A) energy
   B) value of n
   C) shape
   D) spatial orientation
   E) size

18) At maximum, an f-subshell can hold _____ electrons, a d-subshell can hold _____ electrons, and a p-subshell can hold _____ electrons.
   A) 14, 10, 6
   B) 2, 6, 10
   C) 2, 8, 18
   D) 2, 12, 21
   E) 18, 8, 2

19) A tin atom has 50 electrons. Electrons in the _____ subshell experience the lowest effective nuclear charge.
A) 3p
B) 1s
C) 5s
D) 3d
E) 5p

20) Which of the following is not a valid set of four quantum numbers? (n, l, m_l, m_s)
A) 2, 1, 0, -1/2
B) 1, 0, 0, +1/2
C) 2, 0, 0, +1/2
D) 1, 1, 0, +1/2
E) 3, 1, -1, -1/2

21) Which one of the following is the correct electron configuration for a ground-state nitrogen atom?
A)


B)


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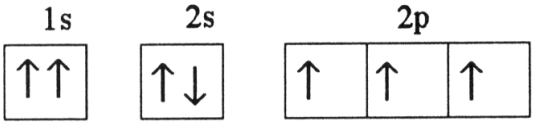

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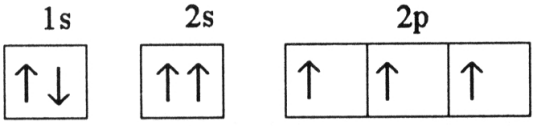
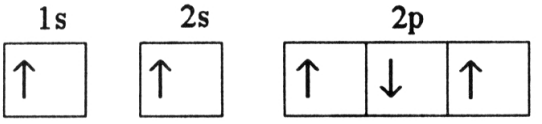
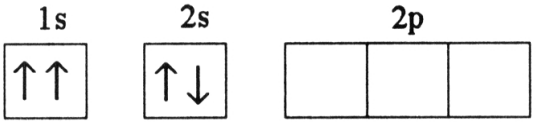


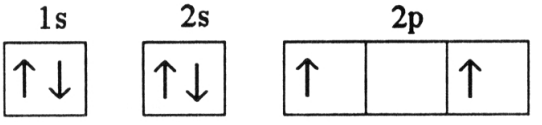
E) None of the above is correct.

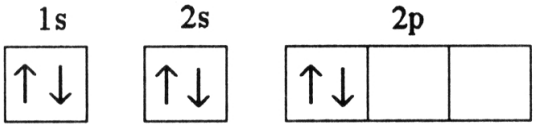
22) The 4d subshell in the ground state of atomic xenon contains _____ electrons.
A) 2
B) 6
C) 8
D) 10
E) 36

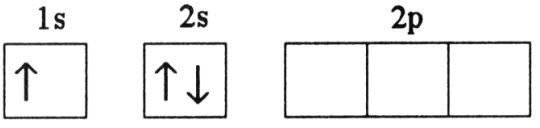
23) The electron configuration of a ground-state Ag atom is _____.
A) $[Ar]4s^24d^9$
B) $[Kr]5s^23d^9$
C) $[Ar]4s^14d^{10}$
D) $[Kr]5s^14d^{10}$
E) $[Kr]5s^24d^{10}$

24) Which electron configuration denotes an atom in its ground state?
A)


B)


C)


D)


E)


25) The ground state electron configuration for Zn is _____.
A) $[Ar]4s^23d^{10}$
B) $[Ar]3s^23d^{10}$
C) $[Kr]4s^23d^{10}$
D) $[Ar]4s^13d^{10}$
E) $[Kr]3s^23d^{10}$

26) Which one of the following configurations depicts an excited oxygen atom?
A) $1s^2 2s^2 2p^2$
B) $1s^2 2s^2 2p^4$
C) $1s^2 2s^2 2p^1$
D) $1s^2 2s^2 2p^2 3s^2$
E) $[He] 2s^2 2p^4$

27) There are _____ unpaired electrons in a ground state phosphorus atom.
A) 0
B) 1
C) 2
D) 3
E) 4

Consider the following electron configurations to answer the questions that follow:

(i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2$
(ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
(iii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^{10}$
(iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^3$
(v) $1s^2\ 2s^2\ 2p^4\ 3s^3$

28) Which electron configuration belongs to group IIA (2) metal?
A) (i)
B) (ii)
C) (iii)
D) (iv)
E) (v)

29) An electron configuration of a noble gas is _____.
A) (i)
B) (ii)
C) (iii)
D) (iv)
E) (v)

30) Elements in group _____ have a np^6 electron configuration in the outer shell.
A) 7A
B) 4A
C) 5A
D) 6A
E) 8A

31) The condensed electron configuration of silicon, element 14, is _____.
A) $[Ne] 3s^2 3p^2$
B) $[He] 2s^4$
C) $[He] 2s^6 2p^2$
D) $[He] 2s^4 2p^6$
E) $[Ne] 2p^{10}$