NOW LET'S TRY SOME HOMEWORK QUESTIONS:

1. The total number of electrons in a neutral atom of every element is always equal to the atom's
   (1) mass number (3) number of protons
   (2) number of neutrons (4) number of nucleons

2. The mass of an electron is approximately equal to $\frac{1}{1836}$ of the mass of
   (1) a positron (3) a beta particle
   (2) a proton (4) an alpha particle

3. Which particle has a mass of approximately one atomic mass unit and a unit positive charge?
   (1) a neutron (3) a beta particle
   (2) a proton (4) an alpha particle

4. The atomic number of an atom is equal to the number of
   (1) neutrons in the atom
   (2) protons in the atom
   (3) neutrons plus protons in the atom
   (4) protons plus electrons in the atom

5. Compared to the entire atom, the nucleus of the atom is
   (1) smaller and contains most of the atom's mass
   (2) smaller and contains little of the atom's mass
   (3) larger and contains most of the atom's mass
   (4) larger and contains little of the atom's mass

6. The mass number of an atom is always equal to the total number of its
   (1) electrons only (3) electrons plus protons
   (2) protons only (4) protons plus neutrons

7. The nucleus of an atom of $^{127}_{53}\mathrm{I}$ contains
   (1) 53 neutrons and 127 protons
   (2) 53 protons and 127 neutrons
   (3) 53 protons and 74 neutrons
   (4) 53 protons and 74 electrons

8. What is the mass number of an atom which contains 21 electrons, 21 protons and 24 neutrons?
   (1) 21 (2) 42 (3) 45 (4) 66

9. Which of the following particles has the *least* mass?
   (1) an electron (2) a proton (3) a deuteron (4) a neutron

10. An atom of carbon-14 contains
(1) 8 protons, 6 neutrons and 6 electrons
(2) 6 protons, 6 neutrons and 8 electrons
(3) 6 protons, 8 neutrons and 8 electrons
(4) 6 protons, 8 neutrons and 6 electrons

11. The atomic mass of an element is defined as the weighted average mass of that element's
(1) most abundant isotope (3) naturally occurring isotopes
(2) least abundant isotope (4) radioactive isotopes

12. All isotopes of a given element must have the same
(1) atomic mass (3) mass number
(2) atomic number (4) number of neutrons

13. Which symbols represent atoms that are isotopes of each other?
(1) ^{14}C and ^{14}N (3) ^{131}I and ^{131}I
(2) ^{16}O and ^{18}O (4) ^{222}Rn and ^{222}Ra

14. Neutral atoms of the same element can differ in their number of
(1) neutrons (2) positrons (3) protons (4) electrons

15. What is the maximum number of electrons in an energy level with a principal quantum number of 3?
(1) 6 (2) 9 (3) 3 (4) 18

16. What is the maximum number of electrons that may be present in the fourth principal energy level of an atom?
(1) 8 (2) 2 (3) 18 (4) 32

17. An atom contains a total of 29 electrons. When the atom is in the ground state, how many different principal energy levels will contain electrons?
(1) 1 (2) 2 (3) 3 (4) 4

18. What is the total number of principal energy levels or shells in an atom with an atomic number of 30?
(1) 3 (2) 4 (3) 5 (4) 6

19. The electron configuration of an atom in the ground state is 2-4. The total number of occupied principal energy levels in this atom is
(1) 1 (2) 2 (3) 3 (4) 4

20. In an atom that has an electron configuration of 2-7, what is the total number of electrons in its principal energy level of highest energy?
(1) 2 (2) 5 (3) 6 (4) 7

21. What is the total number of occupied principal energy levels in an atom of $_{11}Na$? (Hint: See Periodic Table)
(1) 1 (2) 2 (3) 3 (4) 4

22. An atom with the electron configuration 2-8-11-2 has an incomplete
(1) first principal energy level (3) third principal energy level

(2) second principal energy level (4) fourth principal energy level

23. Which is the electron configuration of an atom in the excited state?
(1) 2-4 (2) 2-3 (3) 2-7-2 (4) 2-8-1

24. Which electron configuration represents an atom in an excited state?
(1) 2-8-2 (2) 2-8-1 (3) 2-8 (4) 2-7-2

25. Which is an electron configuration of a fluorine atom in the excited state?
(Hint: In Table S, find the atomic number (column 1) for fluorine (column 3))
(1) 2-6 (2) 2-7 (3) 2-6-1 (4) 2-7-1

26. Energy is released when an electron changes from a principal energy level of
(1) 1 to 2 (2) 2 to 3 (3) 3 to 2 (4) 3 to 5

27. The characteristic bright-line spectrum of sodium is produced when its electrons
(1) return to lower energy levels
(2) jump to higher energy levels
(3) are lost by the neutral atoms
(4) are gained by the neutral atoms

CONSTRUCTED RESPONSE QUESTIONS: **Parts B-2 and C of NYS Regents Exam**

28. Compare (how is it similar) and contrast (how is it different) mass and charge of a proton, neutron, and electron.

29. A. Explain how isotopes of hydrogen are similar and are different.
B. State, in terms of subatomic particles, how an atom of C-13 is different from an atom of C-12.

30. Compare and contrast the amount of energy and number of electrons in the 4 principal energy levels.

31A. How can you tell whether an electron is in an excited state (What information do you need to know)?
31B. Draw four vertical lines showing the wavelengths of the spectral lines for the Balmer Series of hydrogen: 410.2, 434.4, 486.1, and 656.3 nm.

32. Write the electron configuration and Lewis electron dot structure of $_{2}$He, $_{4}$Be, $_{6}$C, $_{7}$N, $_{9}$F, $_{13}$Al, $_{14}$Si, $_{15}$P, $_{17}$Cl, $_{18}$Ar.

CHAPTER QUESTION: **Parts B-2 and C of NYS Regents Exam**

33. A. In the gold-foil experiment, alpha particles were directed toward the foil. Most of the alpha particles passed directly through the foil with no effect. This result did not agree with the "hard spheres model" for the atom. What conclusion about the internal structure of the atom did this evidence show?
B. In the same experiment, some of the alpha particles returned toward the source. What does this evidence indicate about the charge of the atom's nucleus?

34. Naturally occurring boron is composed of two isotopes. The percent abundance and the mass of each isotope are listed below:

19.9% of the boron atoms have a mass of 10.013 atomic mass units.
80.1% of the boron atoms have a mass of 11.009 atomic mass units.

Calculate the atomic mass of boron. Your response must include *both* a correct numerical setup and the calculated result.