1. All phosphorus atoms have the same

   A) atomic number
   B) mass number
   C) number of neutrons plus the number of electrons
   D) number of neutrons plus the number of protons

2. Which quantity represents the number of protons in an atom?

   A) atomic number
   B) oxidation number
   C) number of neutrons
   D) number of valence electrons

3. Every chlorine atom has

   A) 7 electrons
   B) 17 neutrons
   C) a mass number of 35
   D) an atomic number of 17

4. A sample of matter must be copper if

   A) each atom in the sample has 29 protons
   B) atoms in the sample react with oxygen
   C) the sample melts at 1768 K
   D) the sample can conduct electricity

5. What can be determined if only the atomic number of an atom is known?

   A) the total number of neutrons in the atom, only
   B) the total number of protons in the atom, only
   C) the total number of protons and the total number of neutrons in the atom
   D) the total number of protons and the total number of electrons in the atom

6. An atom is electrically neutral because the

   A) number of protons equals the number of electrons
   B) number of protons equals the number of neutrons
   C) ratio of the number of neutrons to the number of electrons is 1:1
   D) ratio of the number of neutrons to the number of protons is 2:1

7. What is the total charge of the nucleus of a nitrogen atom?

   A) +5 B) +2 C) +7 D) +1

8. What is the total charge of the nucleus of a carbon atom?

   A) –6 B) 0 C) +6 D) +12

9. Compared to a proton, an electron has

   A) a greater quantity of charge and the same sign
   B) a greater quantity of charge and the opposite sign
   C) the same quantity of charge and the same sign
   D) the same quantity of charge and the opposite sign

10. What is the charge of the nucleus in an atom of oxygen-17?

    A) 0 B) –2 C) +8 D) +17

11. A neutral atom contains 12 neutrons and 11 electrons. The number of protons in this atom is

    A) 1 B) 11 C) 12 D) 23

12. What is the atomic number of an element that has six protons and eight neutrons?

    A) 6 B) 2 C) 8 D) 14

13. What is the nuclear charge of an iron atom (Fe)?

    A) +26 B) +30 C) +56 D) +82

14. Two atoms will always have the same atomic number if they have the same

    A) mass number
    B) number of protons
    C) number of neutrons
    D) number of nucleons

15. According to the modern model of the atom, the nucleus of an atom is surrounded by one or more

    A) electrons B) neutrons
    C) positrons D) protons

16. Compared to the charge of a proton, the charge of an electron has

    A) a greater magnitude and the same sign
    B) a greater magnitude and the opposite sign
    C) the same magnitude and the same sign
    D) the same magnitude and the opposite sign

17. Which particle has *no* charge?

A) electron B) neutron
C) positron D) proton

18. What is the approximate mass of a proton?

A) 1 u B) 0.0005 u
C) 1 g D) 0.0005 g

19. Which particles have approximately the same mass?

A) an electron and an alpha particle
B) an electron and a proton
C) a neutron and an alpha particle
D) a neutron and a proton

20. An atom of lithium-7 has an equal number of

A) electrons and neutrons
B) electrons and protons
C) positrons and neutrons
D) positrons and protons

21. Which particles have approximately the same mass?

A) alpha particle and beta particle
B) alpha particle and proton
C) neutron and positron
D) neutron and proton

22. The mass of a proton is approximately equal to the mass of

A) an alpha particle B) a beta particle
C) a positron D) a neutron

23. What is the number of electrons in an atom that has 3 protons and 4 neutrons?

A) 1 B) 7 C) 3 D) 4

24. A neutron has a charge of

A) +1 B) +2 C) 0 D) –1

25. In the late 1800s, experiments using cathode ray tubes led to the discovery of the

A) electron B) neutron
C) positron D) proton

26. Which two particles have opposite charges?

A) an electron and a neutron
B) an electron and a proton
C) a proton and a neutron
D) a proton and a positron

27. Which subatomic particles are located in the nucleus of a carbon atom?

A) protons, only
B) neutrons, only
C) protons and neutrons
D) protons and electron

28. Which part of a helium atom is positively charged?

A) electron B) neutron
C) nucleus D) orbital

29. Which subatomic particle is negatively charged?

A) electron B) neutron
C) positron D) proton

30. Which two particles each have a mass approximately equal to one atomic mass unit?

A) electron and neutron
B) electron and positron
C) proton and electron
D) proton and neutron

31. Which subatomic particle will be attracted by a positively charged object?

A) proton B) neutron
C) electron D) positron

32. An electron has a charge of

A) –1 and the same mass as a proton
B) +1 and the same mass as a proton
C) –1 and a smaller mass than a proton
D) +1 and a smaller mass than a proton

33. Which statement best describes electrons?

A) They are positive subatomic particles and are found in the nucleus.
B) They are positive subatomic particles and are found surrounding the nucleus.
C) They are negative subatomic particles and are found in the nucleus.
D) They are negative subatomic particles and are found surrounding the nucleus.

34. What are the characteristics of a neutron?

A) It has no charge and no mass.
B) It has no charge and a mass of 1 amu.
C) It has a charge of +1 and no mass.
D) It has a charge of +l and a mass of 1 amu.

35. What is the charge and mass of a proton?

A) charge of +1 and mass of 1 amu
B) charge of +1 and mass of $\frac{1}{1836}$ amu
C) charge of –1 and mass of 1 amu
D) charge of –1 and mass of $\frac{1}{1836}$ amu

36. The mass of an electron is approximately equal to $\frac{1}{1836}$ of the mass of

A) a positron
B) a proton
C) an alpha particle
D) a beta particle

37. Which of the following particles has the *smallest* mass?

A) neutron
B) electron
C) proton
D) hydrogen atom

38. Which subatomic particles are paired with their charges?

A) electron-positive, neutron-negative, proton-neutral
B) electron-negative, neutron-neutral, proton-positive
C) electron-negative, neutron-positive, proton-neutral
D) electron-neutral, neutron-positive, proton-negative

39. Which particle has approximately the same mass as a proton?

A) alpha
B) beta
C) electron
D) neutron

40. As the number of neutrons in the nucleus of an atom increases, the nuclear charge of the atom

A) decreases
B) increases
C) remains the same