Chapter 5 Test Format: 25 multiple choice, 5 vocabulary matching, 5 scientist matching, 5 p, n, e chart, 2 average atomic weight, and 3 nuclear reactions.

Complete the following multiple choice questions.

A 1. How many protons, neutrons, and electrons are in a neutral atom of sodium?
  (A) 11 p^+, 12 n^0, 11e^-
  B 11 p^+, 11 n^0, 12e^-
  C 12 p^+, 11 n^0, 12e^-
  D 12 p^+, 11 n^0, 11e^-

neutral means p^+ and e^- must be equal
# of p^+ = atomic #

B 2. Which of the following describes what takes place when iron (Fe^0) becomes Fe^{2+} ions?
  A A gain of two electrons
  (B) A loss of two electrons
  C A gain of two protons
  D A loss of two protons

to become 2+ two negative particles (electrons) must be lost

D 3. Which scientist was the first to conclude through experimentation that atoms have positive charges in their nuclei?
 **A** Bohr
  B Dalton
  C Mosley
  (D) Rutherford

D 4. Three elements, X, Y, and Z, have consecutive increasing atomic numbers. If element X is a noble gas, what will be the symbol for the ion of element Z in its compounds?
  A Z^{2-}
  B Z^-
  C Z^+
  (D) Z^{2+}

noble gases
periodic table
IIA elements form 2+ ions

A 5. From left to right across a period, what change is occurring within the atomic nuclei?
  (A) A proton is gained.
  B An electron is gained.
  C A neutron is lost.
  D The electron cloud size is decreasing.

B 6. Radioactive iodine-131 has a half-life of eight days. The amount of a 200.0 gram sample left after 32 days would be —
  A 6.25 g
  (B) 12.5 g
  C 25.0 g
  D 50.0 g

Time	Mass
0	200.0g
8	100.0g
16	50.0g
24	25.0g
32	12.5g
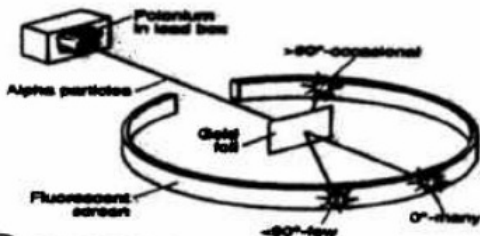
D 7. Which of these conclusions can be drawn from Rutherford's experiment?
A Each atom contains electrons.
B The nucleus of an atom can be split.
C Each atom contains protons.
D Atoms are mostly empty space.

C 8. How does the radioactive isotope C-14 differ from its stable counterpart C-12?
A It has a different number of protons and two less neutrons than C-12.
B It has the same number of protons and two more electrons than C-12.
C It has the same number of protons but two more neutrons than C-12.
D It has a different number of protons and two more neutrons than C-12.

Isotopes = Same # protons different # of neutrons

C 9. Atoms of the same element must —
A contain the same number of neutrons
B have the same mass number
C contain the same number of protons
D have equal numbers of protons and neutrons

MUST, MUST, MUST —— ALWAYS
# of protons = identity of element

D 10. Chlorine forms a 1– ion. How many electrons does a chloride ion have?
A 1
B 16
C 17
D 18

neutral chlorine = 17 e⁻
1– ion has gained an e⁻ so 18 e⁻

B 11. Isotopes of an element have different —
A atomic numbers
B atomic masses
C numbers of protons
D numbers of outer-shell electrons

when the # of neutrons change it changes the masses

	Protons	Neutrons	Electrons
1	11	12	10
2	1	0	2
3	18	18	18
4	20	20	18

A 12. Which of these is an ion with a charge of 1+? — *means one more proton than electrons*
A 1
B 2
C 3
D 4

C 13. Which of these elements contains four valence electrons?
A Helium
B Beryllium
C Carbon
D Oxygen

remember you can use periodic table to find
IA IIA   IIIA (IVA) VA VIA VIIA VIIIA

C 14. A neutral atom of aluminum-27 contains — *mass #*
A 13 protons and 27 electrons
B 14 protons and 13 neutrons
C 13 electrons, 13 protons, and 14 neutrons
D 13 electrons, 14 protons, and 13 neutrons

$p^+ + e^-$ *must be same*
$p^+ + n° = mass$

A 15. Cations are formed when neutral atoms lose —
A electrons
B protons
C neutrons
D positrons

cation = positive ion
↑ see positive sign
to be positive there are more p^+ than e^-

A 16. The atomic number corresponds to an atom's number of —
A protons
B neutrons
C electrons
D positrons

B 17. How many valence electrons does a neutral atom of silicon have?
A 3
B 4
C 5
D 6

find silicon on periodic table — its a
IVA so vale⁻ = 4

Element	Protons	Neutrons	Electrons
1	20	20	20
2	40	40	40
3	20	10	10
4	20	20	40

A 18. Which represents an atom of calcium?
A 1
B 2
C 3
D 4

Atomic # = # of protons
$p^+ = e^-$ *if neutral*
$mass\# = p^+ + n°$

B 19. A scientist has found the following isotope of oxygen:

$$^{19}_{8}O$$

How many neutrons are present in this isotope?
A 8
B 11
C 19
D 27

19 ← *mass #*
8 O   *subtract to find neutrons*
8 ← *Atomic #*

D 20. The net charge on an aluminum ion is 3 because there are —
 A 10 protons and 13 electrons in the atom
 B 13 protons and 10 neutrons in the nucleus
 C 10 neutrons and 13 electrons in the atom
 (D) 13 protons and 10 electrons in the atom

$$Charge = \#p - \#e$$
$$3+ = 13 - \#e \qquad \#e = 10$$

D 21. One indicator that electrons in atoms are limited to specific energy levels is that —
 A atoms move faster when heated
 B the light given off by atoms is all at the same wavelength
 C the Doppler effect shows a shift in wavelength for H-atom light
 (D) light emitted from excited atoms gives off specific amounts of energy ← remember
Bohr's studies

A 22. Which of the following describes a proton?
 (A) charge of 1+ and a mass of 1 amu
 B charge of 1+ and no mass
 C No charge and a mass of 1 amu
 D No charge and no mass

	mass	charge
P	1	+
n	1	0
e	0	1-

B 23. Which of the following would represent an isotope of:

$$\underset{(30)}{\overset{56}{}} X \underline{\hspace{2cm}}$$ isotopes must have same atomic #

A $\underset{29}{\overset{52}{}} X$ B $\underset{(30)}{\overset{57}{}} X$ C $\underset{31}{\overset{59}{}} X$ D $\underset{29}{\overset{56}{}} X$

Fill in the following chart for the scientists that discovered the atom and its parts.

Scientist	What he found.	His Experiment	How you are going to remember it.
24. Bohr *Solar system*	energy levels	Spectrum analysis	Bohr-ring
25. Millikan	Size of the electron	oil drops	oil not milk
26. Rutherford *planetary*	atom is mostly space & pos. nucleus	Gold Foil	Au can't afford Gold
27. J Thompson	named electron	Cathode Ray Tubes	Thompson Tubes
28. Dalton	Atomic theory of matter	———	Daddy Dalton

Protons = Atomic #

Neutrons = Mass # − #p

Mass # = #p + #N

Electrons = Atomic # if neutral

Charge = #P − #E   #E = #P − Charge

Carbon − 13 $^{13}_{6}C$

mass#

Ions = have lost or gained e^- and now have a charge
     lose e^- become positive   gain e^- become negative

Isotopes = change in the number of neutrons

Complete the following "p, n, e" chart.

	Name	Symbol	Atomic Number	Mass Number	Protons	Neutrons	Electrons
29.	Carbon-13	$^{13}_{6}C$	6	13	6	7	6
30.	Chlorine-35	$^{35}_{17}Cl^{1-}$	17	35	17	18	18
31.	Zinc-67	$^{67}_{30}Zn$	30	67	30	37	30
32.	Oxygen-17 2- ion	$^{17}_{8}O^{2-}$	8	17	8	9	10
33.	Sulfur-34	$^{34}_{16}S$	16	34	16	18	16

Determine the average atomic weight of the following elements.

34. Zinc:

→ $^{64}_{30}Zn$ (48.89%)
$^{66}_{30}Zn$ 27.81%
$^{67}_{30}Zn$ 4.11%
$^{68}_{30}Zn$ 18.57%
$^{70}_{30}Zn$ 0.62%

35. Sulfur:

→ $^{32}_{16}S$ (95.002%)
$^{33}_{16}S$ 0.76%
$^{34}_{16}S$ 4.22%
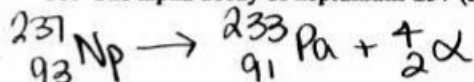$^{36}_{16}S$ 0.014%

65.46 ave atomic mass

(34)

$$\frac{(64 \times 48.89\%) + (66 \times 27.81\%) + (67 \times 4.11\%) + (68 \times 18.57\%) + (70 \times 0.62\%)}{100} =$$

(35)
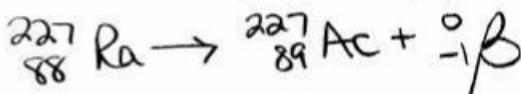
$$\frac{(32 \times 95.002\%) + (33 \times 0.76\%) + (34 \times 4.22\%) + (36 \times 0.014\%)}{100} = 32.09$$

ave. atomic mass

Write the nuclear reaction equations for the following elements.

35. The alpha decay of neptunium-237 (Np).

$$^{237}_{93}Np \longrightarrow ^{233}_{91}Pa + ^{4}_{2}\alpha$$

36. The beta decay of radium-227 (Ra).

$$^{227}_{88}Ra \longrightarrow ^{227}_{89}Ac + ^{0}_{-1}\beta$$

ave. atomic mass $= \dfrac{(mass\#_1 \times \%) + (mass\#_2 \times \%) + (mass\#_3 \times \%)}{100}$

Ch5 P.T.

1 B	10 A
2 A	11 B (same group)
3 C	12 B
4 C	13 B
5 D	14 B
6 A	15 B
7 B	16 A
	17 A
8 A	18 C
9 A	19 B
	20 A

AR = distance from nucleus to outer e^-

22. IE = energy required to lose most losely held e^-

EN = atom's relative attraction for e^- in a covalent bond

24 BD   25 BE   26 AD
27 AD   28 CD   29 BD

30 d
31 e
32 b
33 a
34 c

35. metals = shiny, luster
good conductors of heat
and e^-
malleable & ductile
generally solid at RT

nonmetals = mostly gases @ RT
non-conductors
brittle when solid

Semi-metals = (metalloids)
mix of both m & nm characteristics
good conductors at high temp.

38. Hg & Br