**Atomic Concepts Regents Review**

1. The mass of a proton is approximately equal to

6. The atomic masses and the natural abundances of the two naturally occurring isotopes of lithium are shown in the table below.



Which numerical setup can be used to determine

the atomic mass of lithium?

(1) (0.075)(6.02 u) \_ (0.925)(7.02 u)

(2) (0.925)(6.02 u) \_ (0.075)(7.02 u)

(3) (7.5)(6.02 u) \_ (92.5)(7.02 u)

(4) (92.5)(6.02 u) \_ (7.5)(7.02 u)

7. Which Lewis electron-dot diagram represents a nitrogen atom in the ground state?



the mass of

(1) an alpha particle (3) a positron

(2) a beta particle (4) a neutron

2. An orbital of an atom is defined as the most

probable location of

(1) an electron (3) a positron

(2) a neutron (4) a proton

3. What must occur when an electron in an atom

returns from a higher energy state to a lower

energy state?

(1) A specific amount of energy is released.

(2) A random amount of energy is released.

(3) The atom undergoes transmutation.

(4) The atom spontaneously decays.

4. An atom in the ground state has two electrons in

its first shell and six electrons in its second shell.

What is the total number of protons in the

nucleus of this atom?

(1) 5 (3) 7

(2) 2 (4) 8

5. A bromine atom in an excited state could have

an electron configuration of

(1) 2-8-18-6 (3) 2-8-17-7

(2) 2-8-18-7 (4) 2-8-17-8

13. Which subatomic particles are located in the

nucleus of a carbon atom?

(1) protons, only

(2) neutrons, only

(3) protons and neutrons

(4) protons and electrons

14. Which part of a helium atom is positively

charged?

(1) electron (3) nucleus

(2) neutron (4) orbital

15. The mass of a proton is approximately equal to

the mass of

(1) an alpha particle (3) a neutron

(2) an electron (4) a positron

8. A neutron has a charge of

(1) +1 (3) 0

(2) +2 (4) −1

9. Which particle has the *least* mass?

(1) alpha particle (3) neutron

(2) beta particle (4) proton

10. A sample of matter must be copper if

(1) each atom in the sample has 29 protons

(2) atoms in the sample react with oxygen

(3) the sample melts at 1768 K

(4) the sample can conduct electricity

11. In the electron cloud model of the atom, an

orbital is defined as the most probable

(1) charge of an electron

(2) conductivity of an electron

(3) location of an electron

(4) mass of an electron

12. The gold foil experiment led to the conclusion that each atom in the foil was composed mostly of empty space because most alpha particles directed at the foil

(1) passed through the foil

(2) remained trapped in the foil

(3) were deflected by the nuclei in gold atoms

(4) were deflected by the electrons in gold atoms

16. The total number of protons, electrons, and neutrons in each of four different atoms are shown in the table below.



Which two atoms are isotopes of the same element?

(1) *A* and *D* (3) *X* and *D*

(2) *A* and *Z* (4) *X* and *Z*

17. Which Lewis electron-dot diagram represents an

atom in the ground state for a Group 13 element?



18. An atom of argon in the ground state tends *not*

to bond with an atom of a different element

because the argon atom has

(1) more protons than neutrons

(2) more neutrons than protons

(3) a total of two valence electrons

(4) a total of eight valence electrons

**Answer question 19-21 based on the information below:**

John Dalton, an early scientist, sketched the structure of compounds using his own

symbols for the elements known at the time. Dalton’s symbols for four elements and

his drawing of potassium aluminum sulfate are represented by the diagram below.



Today, it is known that the chemical formula for potassium aluminum sulfate is

KAl(SO4)2•12H2O. It is a hydrated compound because water molecules are included

within its crystal structure. There are 12 moles of H2O for every 1 mole of KAl(SO4)2.

The compound contains two different positive ions. The gram-formula mass of

KAl(SO4)2•12H2O is 474 grams per mole.

19. Identify *one* positive ion in the hydrated compound. Your response must include *both* the chemical symbol and charge of the ion. [1]

20. Describe, in terms of composition, *one* way in which Dalton’s perception of potassium aluminum sulfate differs from what is known today about the compound. [1]

21. Show a numerical setup for calculating the percent composition by mass of water in KAl(SO4)2•12H2O. [1]

22. Explain, in terms of protons and neutrons, why U-235 and U-238 are different isotopes of uranium. [1]

The bright-line spectra for three elements and a mixture of elements are shown below.



23. Explain, in terms of *both* electrons and energy, how the bright-line spectrum of an

element is produced. [1]

24. Identify *all* the elements in the mixture. [1]

25. State the total number of valence electrons in a cadmium atom in the ground state. [1]

**Base your answers to questions 26 and 27 on the information below.**

An atom in an excited state has an electron configuration of 2-7-2.

26. Explain, in terms of subatomic particles, why this excited atom is electrically neutral. [1]

27. Write the electron configuration of this atom in the ground state. [1]

28. What is the total number of electron pairs shared between the carbon atom and one of the oxygen atoms in a carbon dioxide molecule? [1]

29. Explain, in terms of subatomic particles, why the radius of a chloride ion is larger than the radius of a chlorine atom. [1]

30. Explain, in terms of valence electrons, why the bonding in magnesium oxide, MgO, is similar to the bonding in barium chloride, BaCl2.