Secondary Cycle 2, Year Two

(grade 10)

January 2015

(Sec. 4)

Science and Technology Theory Examination

Question Booklet

Answer all 20 multiple questions and all 10 Section 2 questions in the answer booklet.

Name: _____

Group and Teacher: _____

Time: 2.0 hours

<u>SECTION 1 Multiple Choice QUESTIONS:</u> (3 marks each) Choose the best answer and indicate the letter corresponding to it on the answer sheet provided.

1. Which of the following observations is considered a *characteristic* property?

   (A) Oxygen is a colorless, odorless gas at room temperature.

   (B) Oxygen gas reacts with metals.

   (C) Oxygen gas and water are both found on Earth

   (D) Oxygen's density is 1.428 g/L at 0 ^{o}C.

2. Which of the following is **<u>NOT</u>** a physical change?

   (A) Water evaporates slowly at room temperature.

   (B) A pencil breaks into two pieces.

   (C) After a few years of being left outside, a copper roof turns green.

   (D) Oxygen gas can turn into liquid at a cold enough temperature.

3. After the following equation is balanced, what will be the sum of the numbers represented by *a, b, c and d*?

   a CH_4O + *b* O_2 → c CO_2 + *d* H_2O

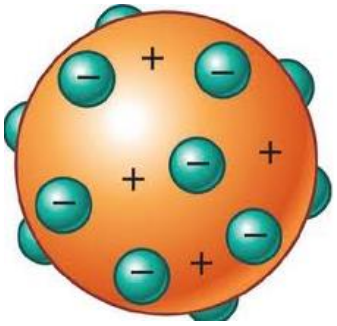
   (A) 6

   (B) 7

   (C) 10

   (D) 11

4. Historically, what was new about this model of the atom (Thomson) compared to previous models of the atom?



(A) a nucleus

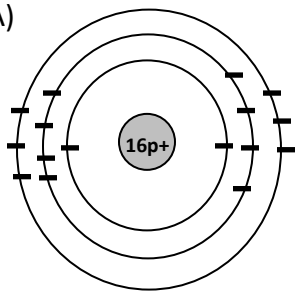
(B) negative charges

(C) spherical shape

(D) mass

5. Which of the following is the correct Bohr model for neutral sulfur(S)?

(A)



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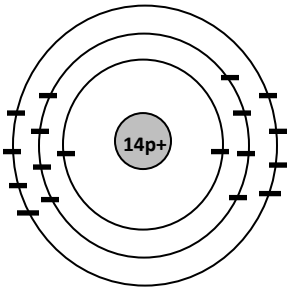

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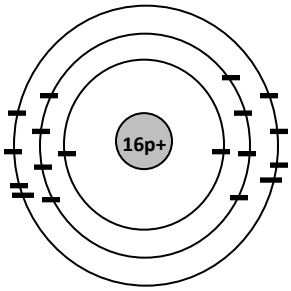

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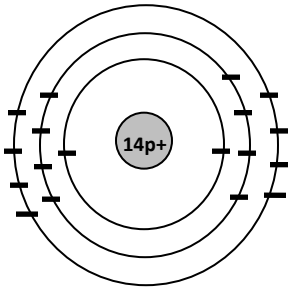


6. Which element has 1 valence electron in the third energy level?

(A) Na

(B) Be

(C) Mg

(D) Ca

7. What do elements in the **same group(family) always have in common?**

(A) They have the same number of electron shells

(B) They have the same number of valence electrons

(C) They are all metals

(D) They are all non-metals

8. This family's elements are poor conductors of electricity and are very reactive towards many elements. The family being described is the _____family.

(A) alkali metals

(B) alkaline earth metals

(C) halogens

(D) noble gases

9. If the concentration of glucose in a certain urine sample is 50 ppm, how many **grams** of glucose would be found in 100 ml of that sample?

(A) 0.005

(B) 0.05

(C) 0.5

(D) 5

10. How many electrons does the fluoride ion have?

(A) 9

(B) 10

(C) 19

(D) 20

11. What is responsible for the fact that sugar in water does not conduct electricity while a KBr aqueous solution does conduct?

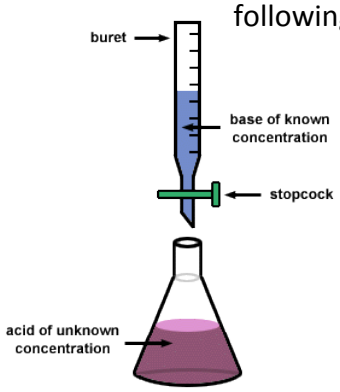
(A) Sugar is a bigger molecule than KBr.
(B) Sugar is a smaller molecule than KBr.
(C) Sugar in water forms ions; KBr does not.
(D) Sugar in water doesn't forms ions; KBr does.

12. Two solutions were mixed and we obtained the following:

$$MgSO_{4(aq)} + 2\ H_2O_{(aq)}$$

What were the *reactants* of the reaction?

(A) An acid and a salt
(B) A base and water
(C) Salt and a base
(D) Acid and a base



13. Which of the following is a neutralization reaction?

(A) a base is added to fat to make soap
(B) an acid is added to a lake whose pH is too high
(C) water is added to a soil that is too basic
(D) water is added to a soil that is too acidic

14. The amount of heat contained by an object depends on _____

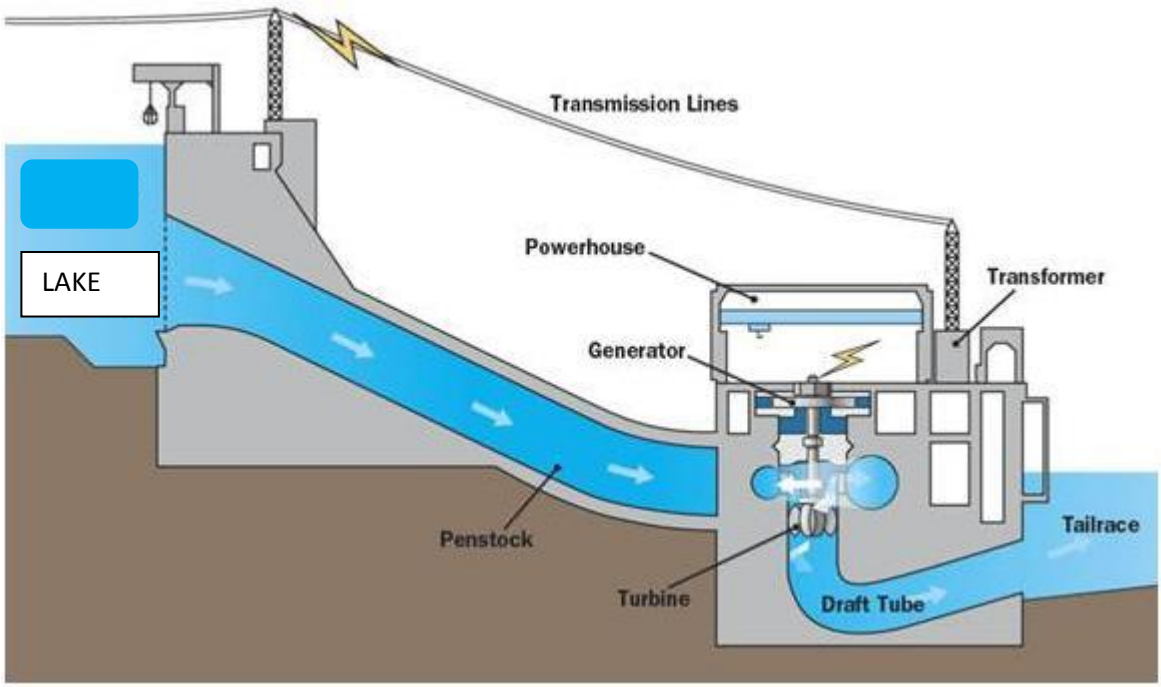
(A) its volume and speed of its molecules.
(B) its volume and temperature.
(C) its mass and speed of its molecules.
(D) the number of particles and density.

15. Which are examples of the conservation of energy principle?

1. The total energy of gasoline equals what goes into powering, heating and polluting the environment.
2. The sum of the mass of the products is the same as the mass of the products.
3. Part of the energy from the food you eat becomes a part of fat cells.
4. None of the energy-content of an apple is destroyed when it is eaten.

(A) 1, 2
(B) 2, 3
(C) 1, 4
(D) 3, 4

16. What is being used to generate electricity in the following diagram?



(A) Tidal energy
(B) Gravity and water
(C) Solar energy
(D) Fossil fuels

17. Which of the following will have the poorest conductance and highest resistance?

(A) a very thin, short wire made of copper at 35 ^{o}C.
(B) a long, thick wire made of aluminum at 5^{o}C.
(C) a long, thin wire made of aluminum at 35^{o}C.
(D) a thick, short wire made of copper at 5^{o}C.

18. Which is *not* an electrolyte?

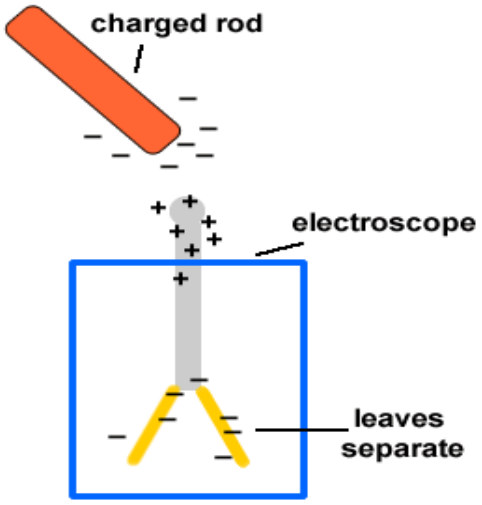
(A) alcohol
(B) vinegar
(C) sodium hydroxide (NaOH)
(D) ocean water

19. Which is **NOT** caused by static electricity?

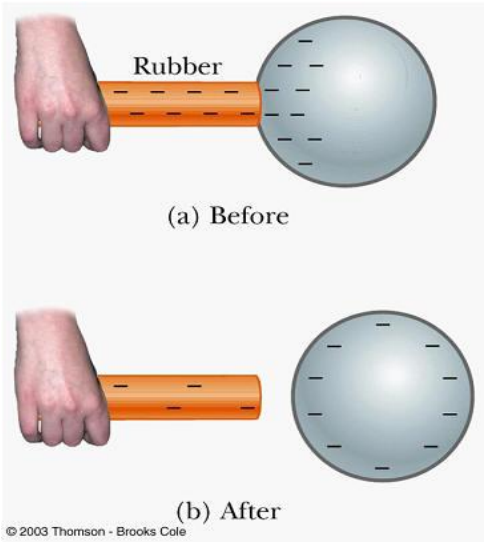
(A) the sparks from bed sheets in a dryer
(B) the conversion of energy to heat in a toaster
(C) the formation and discharge of lightning
(D) a kid's hair standing on its ends after she slid down on a plastic park slide

20. In which of the following are electrons being transferred from one object to another?

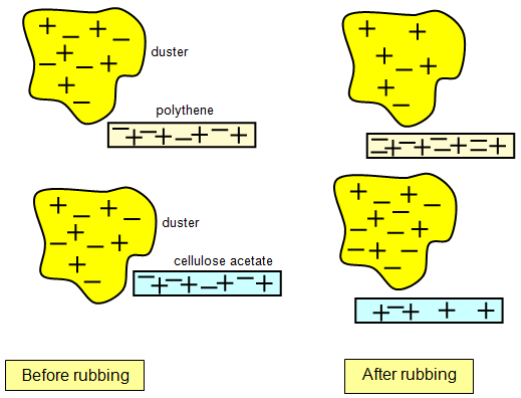
(A)



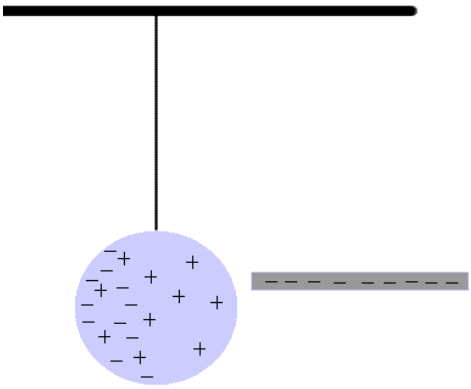
(C)



(B)



(D)



Section 2 **Show all your work and answers on the answer sheet provided. (4 marks each)**

21. When in use, 30% of a toy electric motor's input energy turns into heat .

If that represents 45 000 kJ , calculate the amount of useful energy produced by the car.

22. Classify each reaction using one of these terms: (For each letter, choose only one of these numbers)

(1) acid-base neutralization

Or (2) oxidation

a) An apple turns brown after being cut open_____
b) A green apple's sour taste is eliminated by adding a little baking soda_____
c) A piece of iron starts to rust when left in the rain_____
d) A compound in semen eliminates the acids from a woman's secretions_____

23. Give an example of how an object at a very high temperature can still contain very little heat.

24. Draw **BOTH** the correct **Bohr-Rutherford Model** and **Lewis** notation for potassium (K).

25. B**alance the following** chemical equations.

a) $Ca(OH)_2 + H_3PO_4 \rightarrow Ca_3(PO_4)_2 + H_2O$

b) $S_8 + F_2 \rightarrow SF_6$

26. In a precipitation reaction, 148 g of limewater ($Ca(OH)_2$) will react with 88 g of carbon dioxide (CO_2) to produce 200 g of solid calcium carbonate ($CaCO_3$), and a certain amount of water (H_2O).

a) How many grams of water are produced in this reaction?

b) Does conservation of mass apply to this reaction?_____

27. A current of 23.5 mA flows through a resistor. Its voltage is 6.0 V. What is the value of the resistor?

28. A laboratory technician dissolves 0.80 g of KCl in 75 mL of a solution.

a) What is the concentration of the solution in g/L (show all work and write all units).

b) If 25 mL of water evaporates from this solution, what is the new concentration(g/L) become?

29. Match the energy resource with the right technology.

Energy Resource	Technology(possible answers)
1. Fossil fuel_____	a) Tidal power plant
2. Ocean current_____	b) Nuclear power plant
3. Radioactive substance_____	c) Blades and turbine
4. Wind_____	d) Thermal power plant with turbines

30. A student prepared four solutions with different concentrations. Find the concentration of each in the same units and list them in **decreasing order of concentration**.

Solution A = 100 mg of HCl dissolved in 4 L of water

Solution B = 9025 ppm NaOH

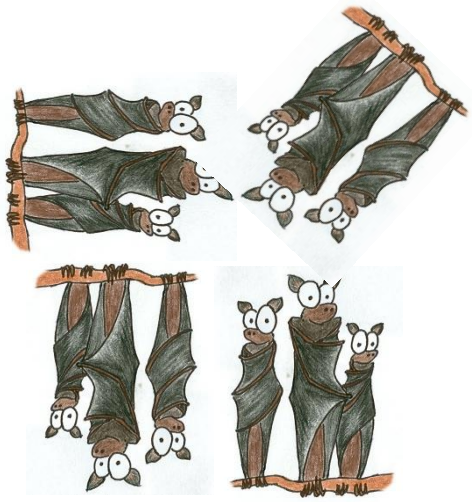
Solution C = 10 g of NaCl dissolved in 200 mL of water

Solution D = 2 kg of KCl in 5000 mL of water

Section 3 (marked separately for the practical competency; 2 marks each)

1. Which two tests in the lab are ***the best*** to use in distinguishing between metals and metalloids?

   (A) Conductivity and luster
   (B) Luster and acid test
   (C) Malleability and acid test
   (D) Malleability and conductivity



2. When testing for hydrogen, how should the test tube be held to prevent the gas from escaping?

   (A) Sideways
   (B) Upside down
   (C) Right sight up
   (D) At an angle

3. In the electrolysis of water of lab, what is the expected ratio of hydrogen to oxygen that is collected?

   (A) 1:1
   (B) 1:2
   (C) 2:1
   (D) 3:1

4. In the electrolysis of water of lab, how was the identity of the gases at each electrode experimentally verified?

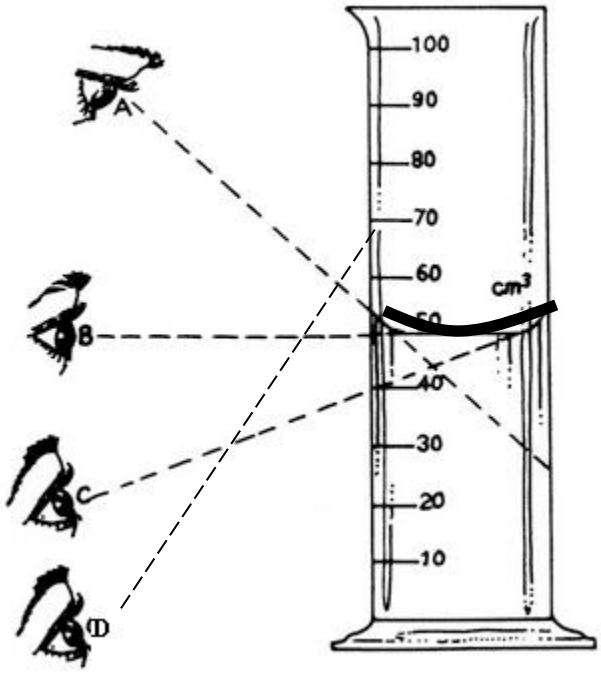
   (A) From what we expected
   (B) From the flaming and glowing splint tests
   (C) From getting the gases to react to see if they created water
   (D) From how fast they bubbled at each electrode

5. To prepare 100.0 ml of a 3.0 g/L solution of sugar in water, which of the following statements are TRUE?

   1. We need 0.3 g of sugar.
   2. We need 3.0 g of sugar.
   3. We need a volumetric flask to measure 100.0 ml .
   4. We need a beaker to measure 100.0 ml .

   (A) 1 and 3
   (B) 1 and 4
   (C) 2 and 3
   (D) 2 and 4

6. Where should the viewer's eye be when reading the volume?



7. In the reduction of copper oxide lab, we weighed leftover carbon and copper and noticed that it weighed less than the original sum of reactants. Where did the rest of the mass go?

   (A) It was destroyed.
   (B) Most escaped into the atmosphere.
   (C) It went into the limewater's cloudy product.
   (D) It went into the newly created copper.

8. In the reduction of copper oxide lab, what helped the copper oxide react with carbon?

(A) The limewater
(B) The copper
(C) The Bunsen burner's heat
(D) The oxygen in the air

9. What compound did not directly take part in the neutralization reaction between HCl and NaOH?

(A) NaOH
(B) HCl
(C) NaOH and HCl
(D) Phenolphthalein indicator

10. When neutralizing an acidic solution with base in the presence of a phenolphthalein indicator, when did students have to stop adding base?

(A) When the mixture turned clear.
(B) When the mixture went light pink but disappeared soon after.
(C) When the mixture went light pink and persisted for several minutes.
(D) When the mixture turned deep pink.

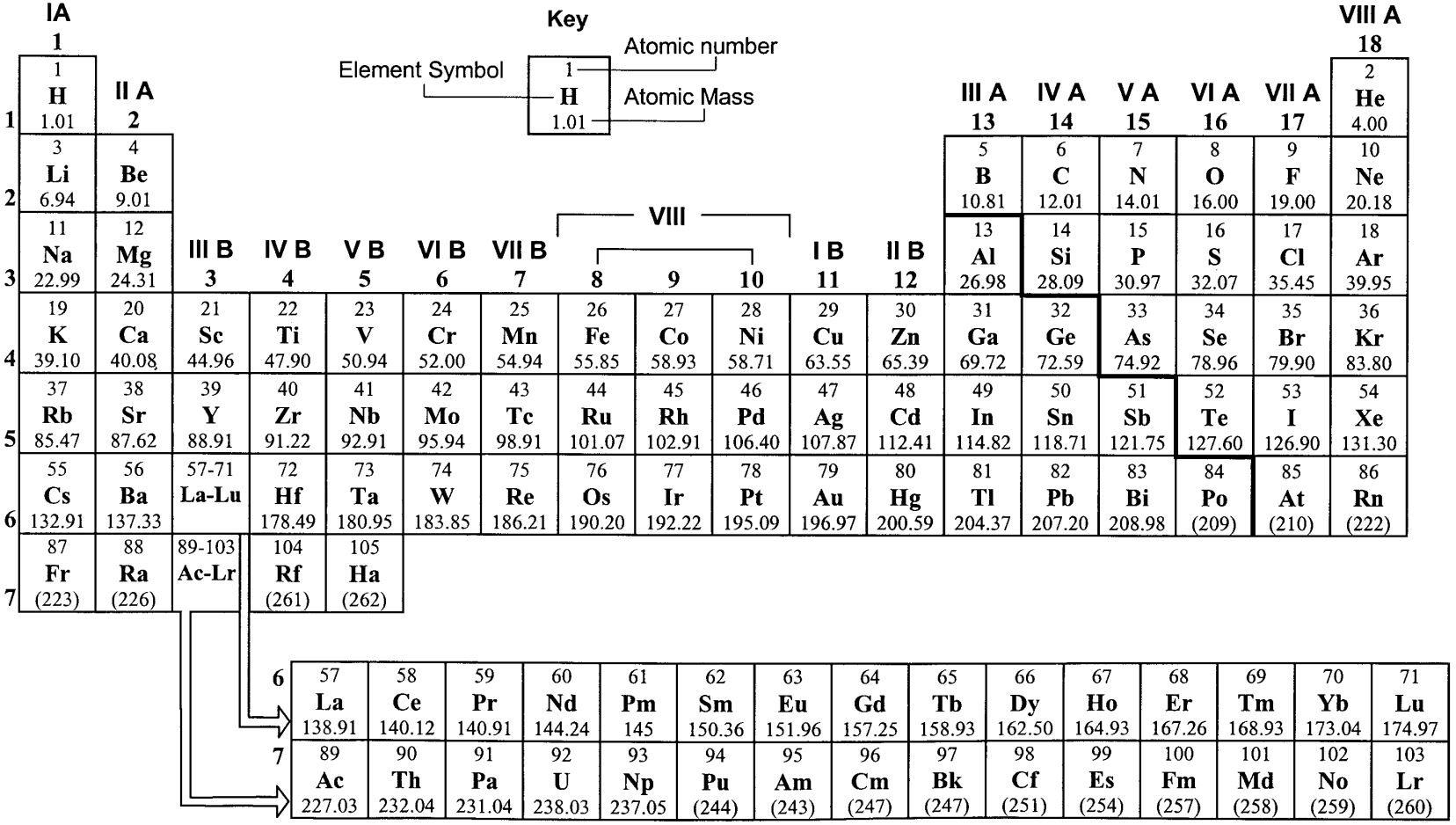
Formulas:

$$\boldsymbol{energy\ efficiency = \frac{amount\ of\ useful\ \ energy}{amt.\ of\ energy\ consumed} \times 100\%}$$

$C = \frac{m}{V}$ **C: concentration; m = mass; V = volume**

V = IR V= voltage; I = current intensity; R = resistance

PERIODIC TABLE OF THE ELEMENTS



	IA 1	II A 2	III B 3	IV B 4	V B 5	VI B 6	VII B 7	VIII 8	VIII 9	VIII 10	I B 11	II B 12	III A 13	IV A 14	V A 15	VI A 16	VII A 17	VIII A 18
1	1 H 1.01																	2 He 4.00
2	3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc 98.91	44 Ru 101.07	45 Rh 102.91	46 Pd 106.40	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
6	55 Cs 132.91	56 Ba 137.33	57-71 La-Lu	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.20	77 Ir 192.22	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	89-103 Ac-Lr	104 Rf (261)	105 Ha (262)													

6	57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm 145	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
7	89 Ac 227.03	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (254)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)