Atoms, Ions, Molecules, Nomenclature

Chapter 2

I am always looking for good wrong answers for future use. So if the answer you really wanted wasn't among the choices, please tell me (or at the very least, write down the slide # and submit your suggestion.)

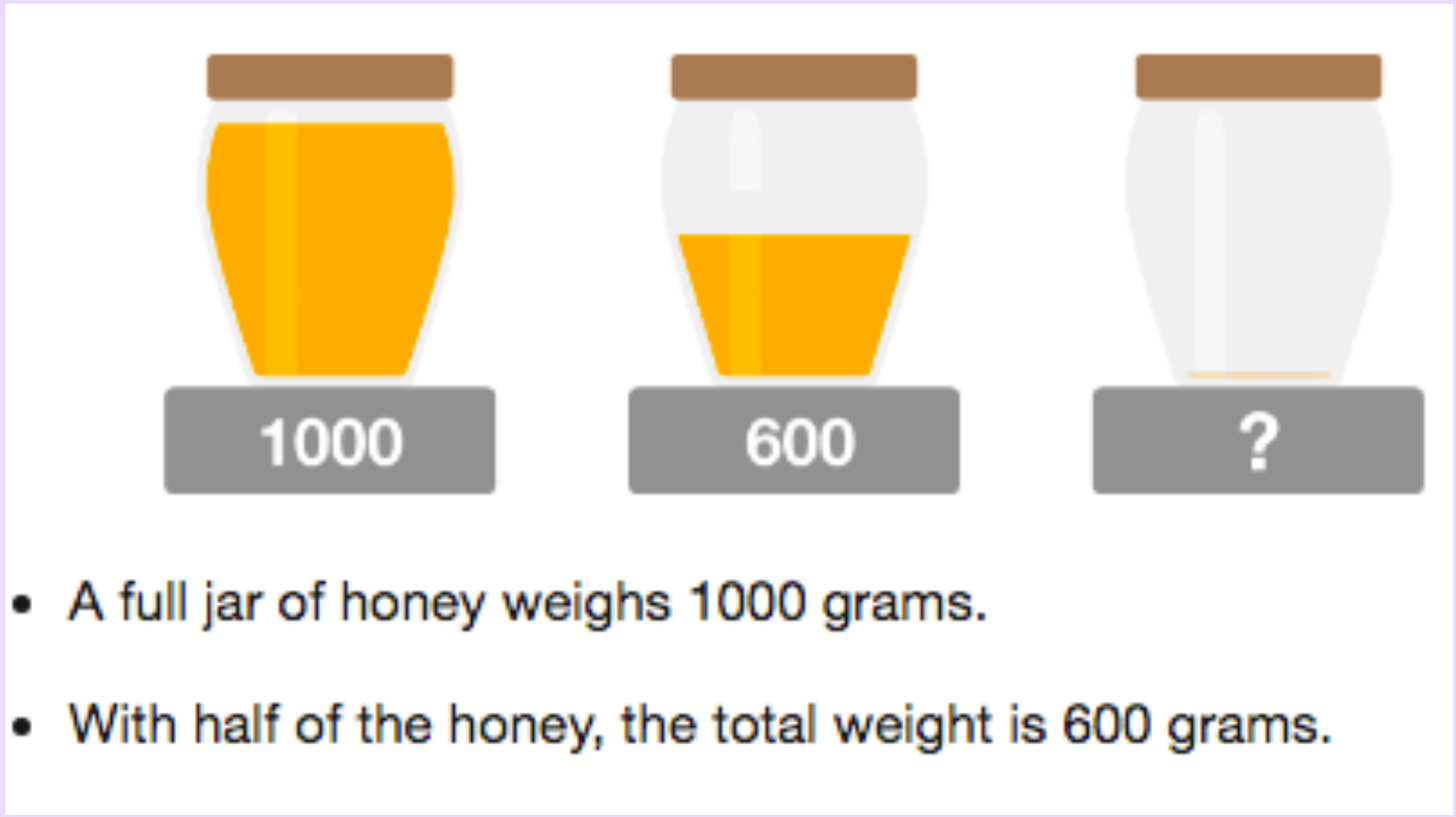
What is the weight of the empty jar in grams?

A. 200

B. 300

C. 400

D. 600



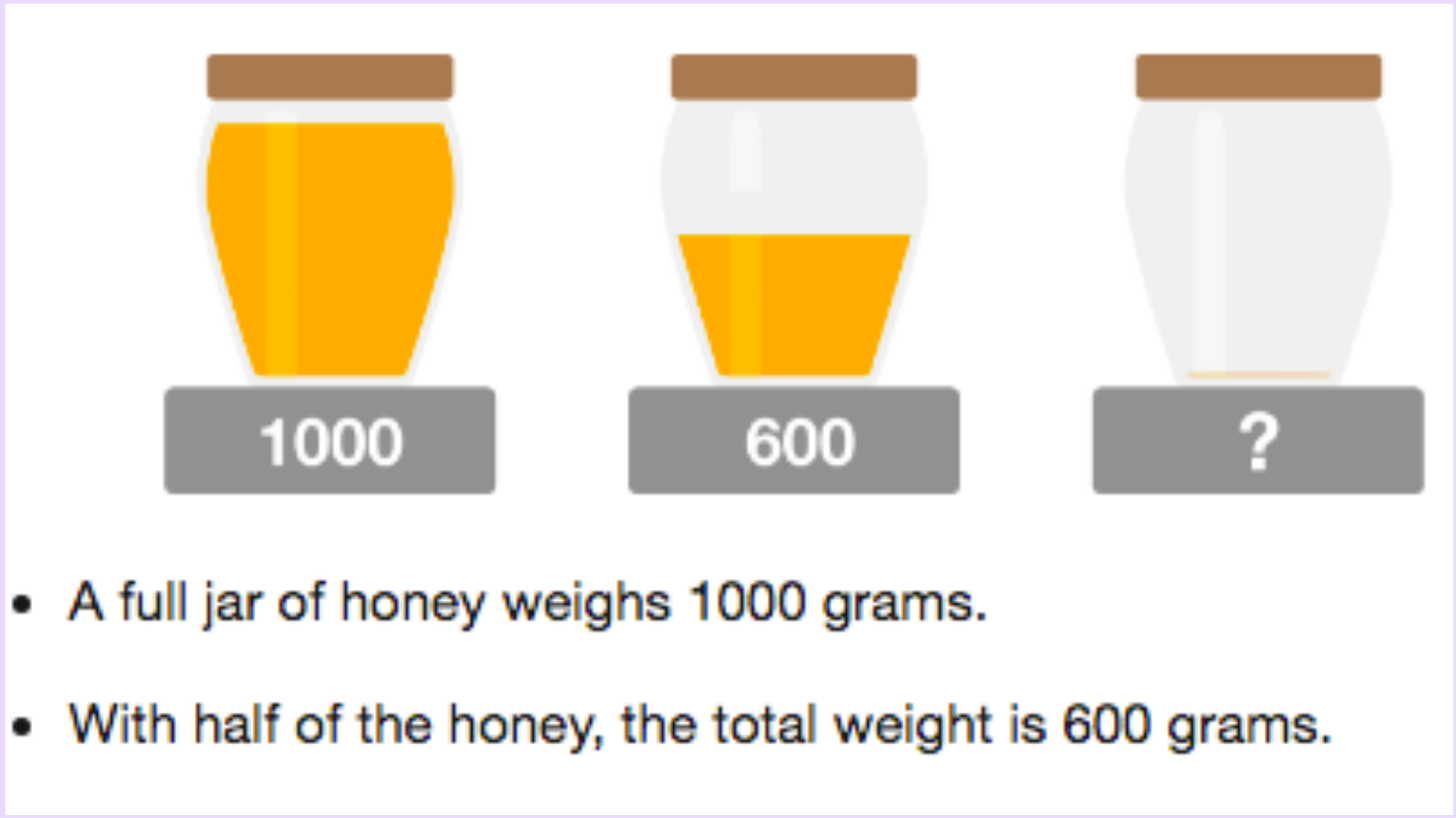
What is the weight of the empty jar in grams?

A. 200

B. 300

C. 400

D. 600



On your whiteboard, write the following symbol and indicate the information that each number provides.

$$^{64}_{30}Zn$$

On your whiteboard, write the following symbol and indicate the information that each number provides.

$$^{64}_{30}Zn$$

- 64 is the mass number, of this zinc isotope, it is the sum of the protons + neutrons
- 30 is the atomic number of this zinc atom, it is redundant, as all zinc has a mass number of 30, which means 30 protons and 30 electrons in a zinc atom.

On your whiteboard, write the following symbols and indicate the information that the number provides.

Cl^{1-}

On your whiteboard, write the following symbols and indicate the information that the number provides.

$$Cl^{1-}$$

- 1- is the charge of this chlorine ion. Chlorine atoms have 17 protons and 17 electrons, thus this anion has 18 electrons.

On your whiteboard, write the following symbols and indicate the information that the number provides.

$3H_2$

On your whiteboard, write the following symbols and indicate the information that the number provides.

$3H_2$

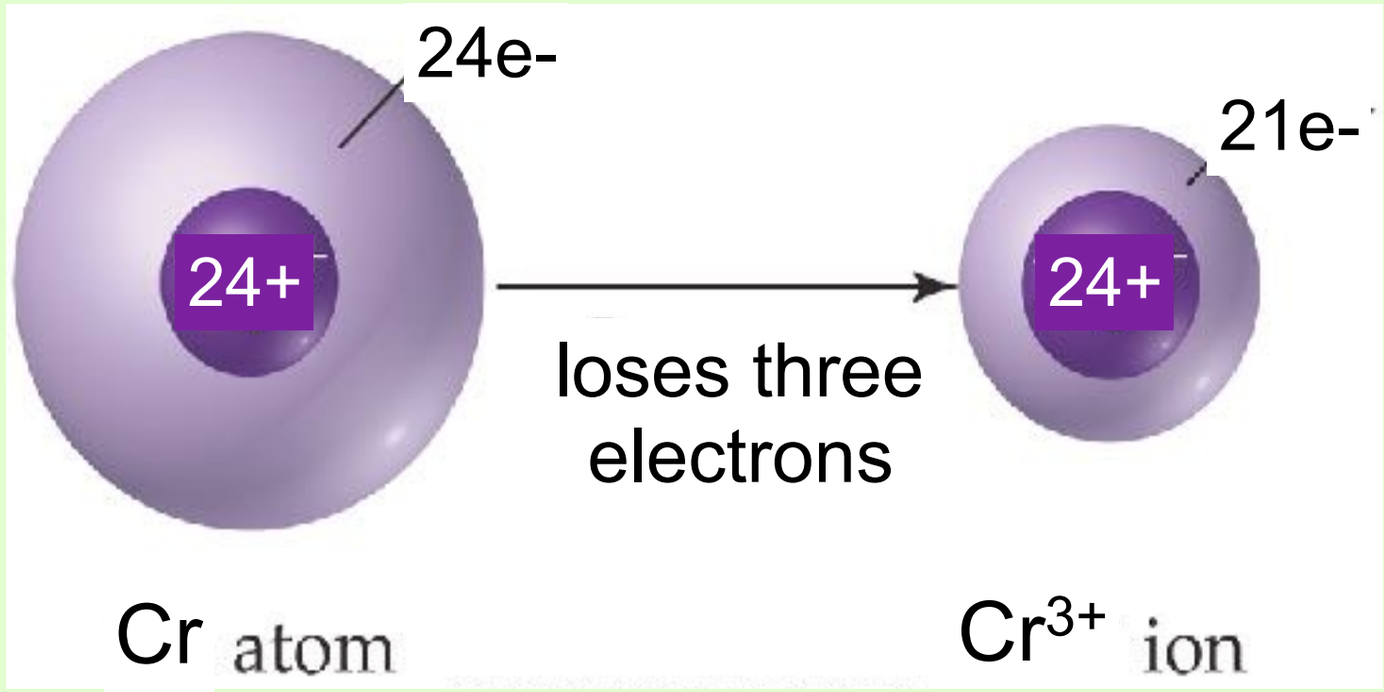
- 2 is the number of hydrogen atoms bonded to one another. This is a diatomic molecule of the element hydrogen.
- 3 is the coefficient in front of this hydrogen atom, which refers to the number of hydrogen molecules NOT bonded to each other. This would most likely be used while balancing a chemical equation.

How many electrons does a Cr^{3+} ion contain?

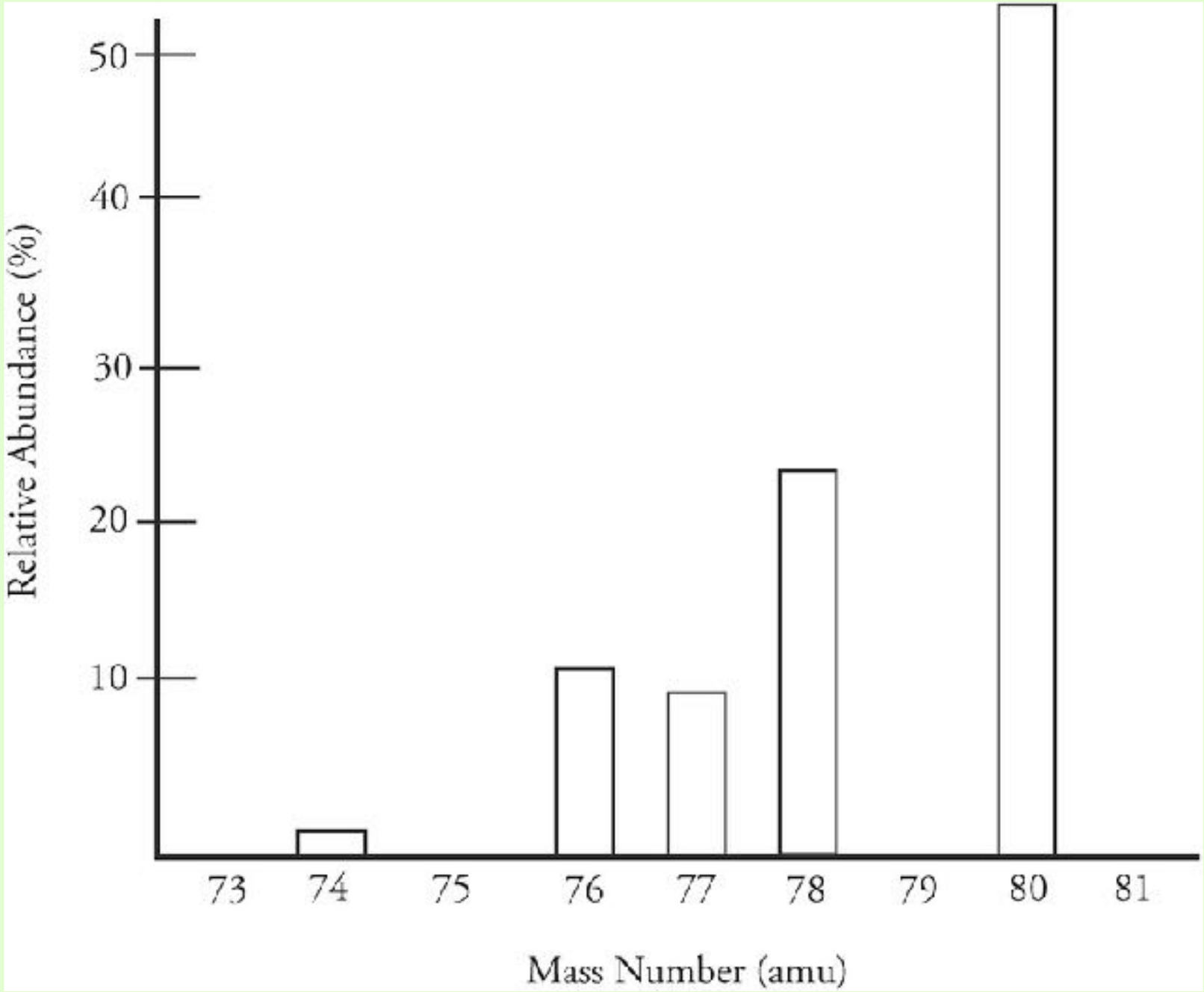
1. 3
2. 21
3. 24
4. 28
5. not enough information to determine

How many electrons does a Cr^{3+} ion contain?

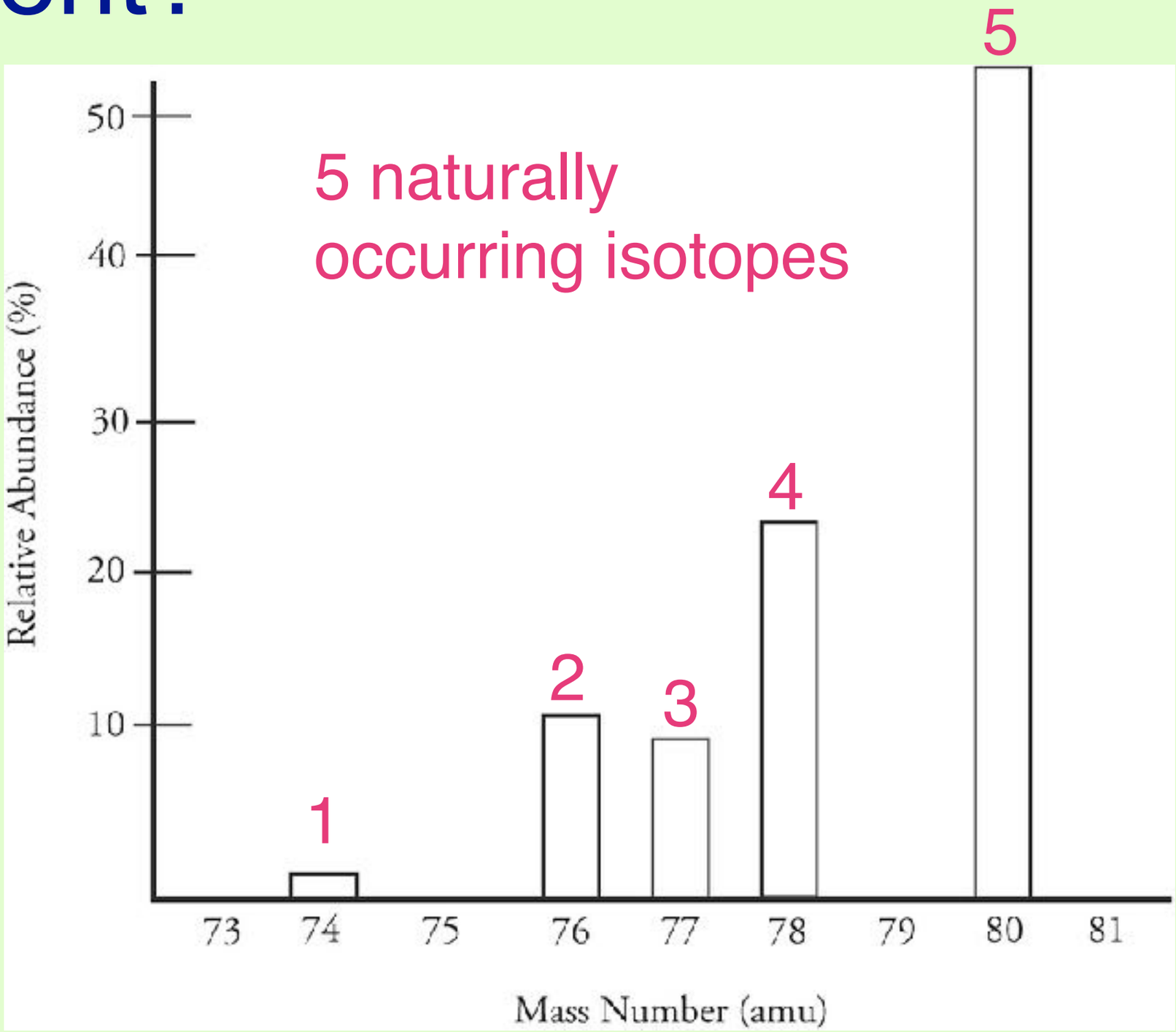
1. 3
2. 21
3. 24
4. 28
5. not enough information to determine



How many different isotopes exist for this element?

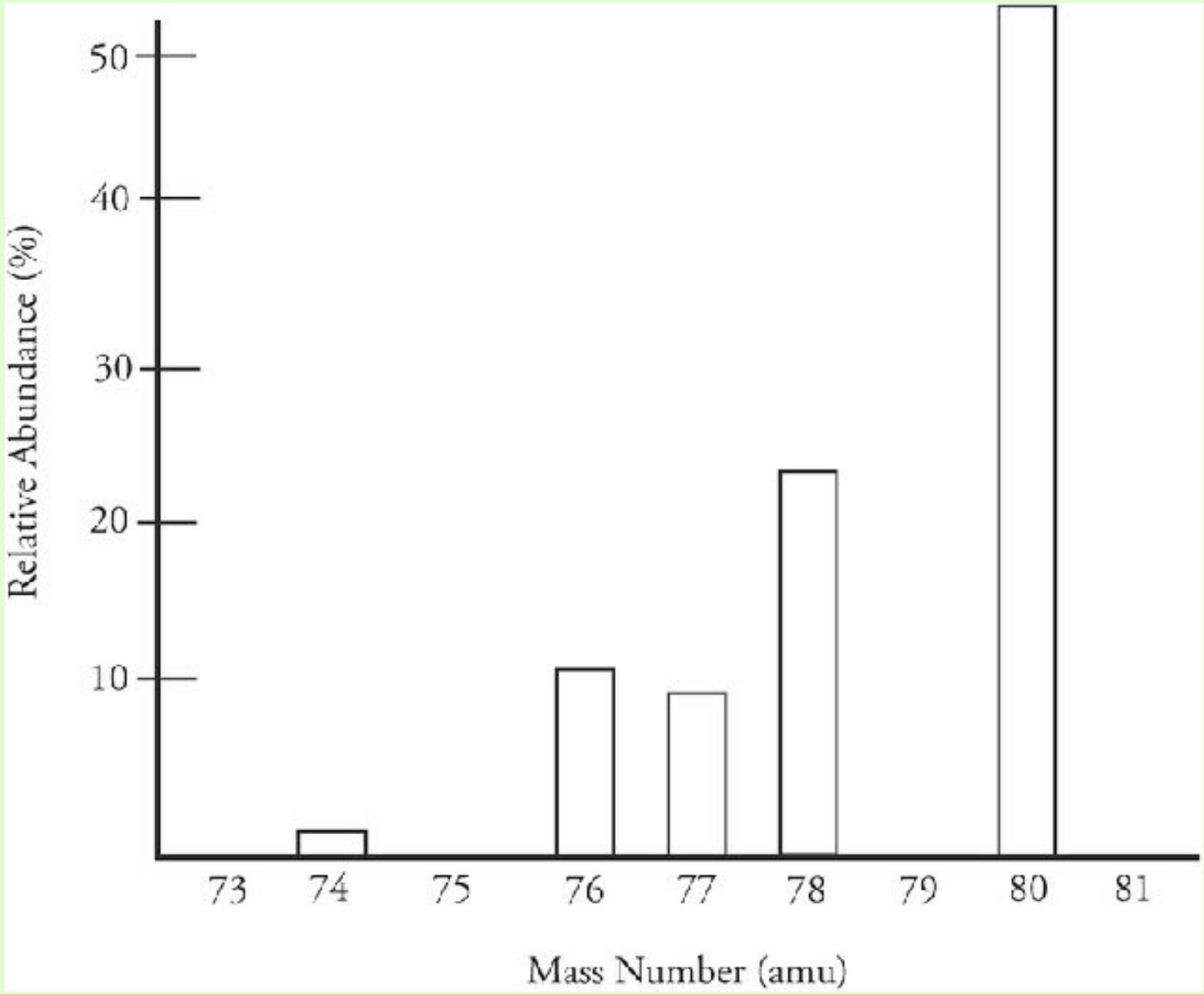


How many different isotopes exist for this element?



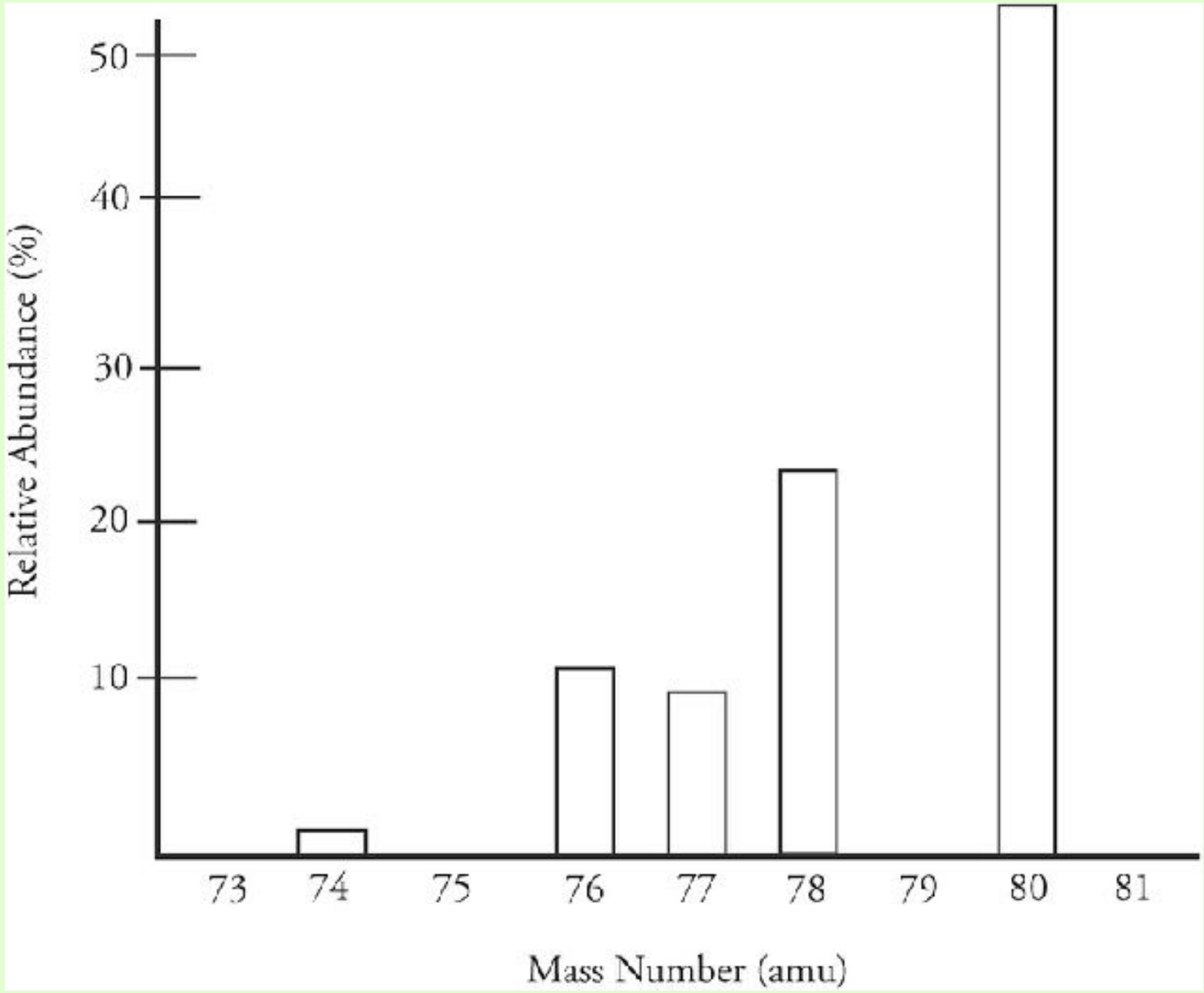
What is the likely identity of this element?

1. Hg
2. Pt
3. Br
4. Se
5. As

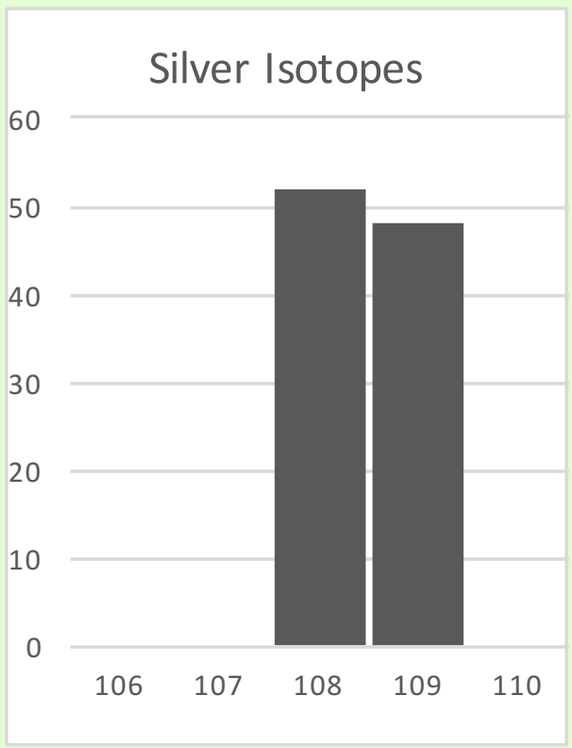


What is the likely identity of this element?

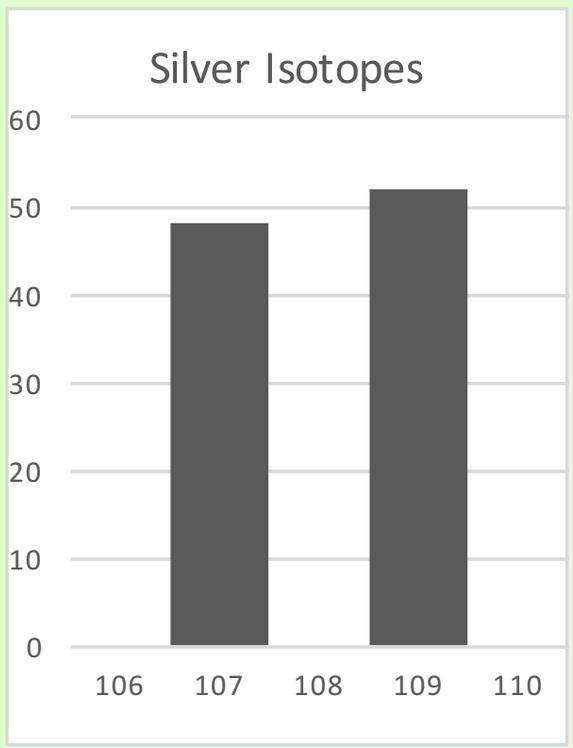
1. Hg
2. Pt
3. Br
4. Se
5. As



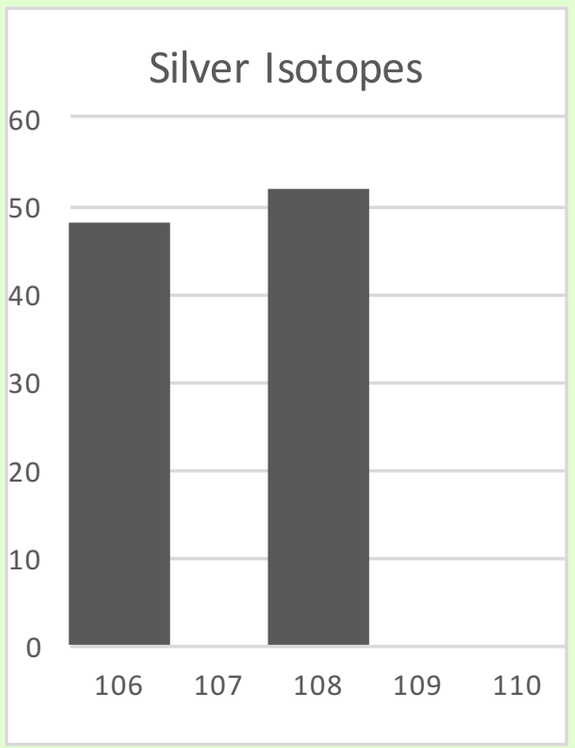
Silver exists as two naturally occurring isotopes. Which mass spectrum is the correct one for silver?



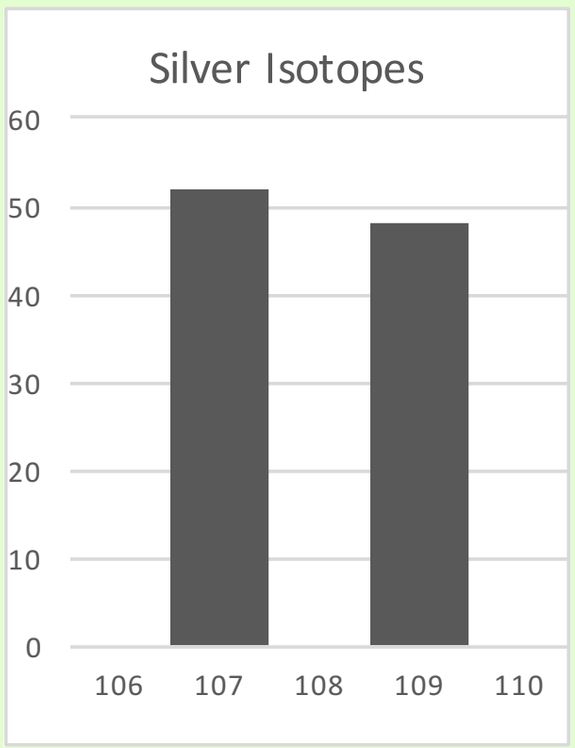
1



2

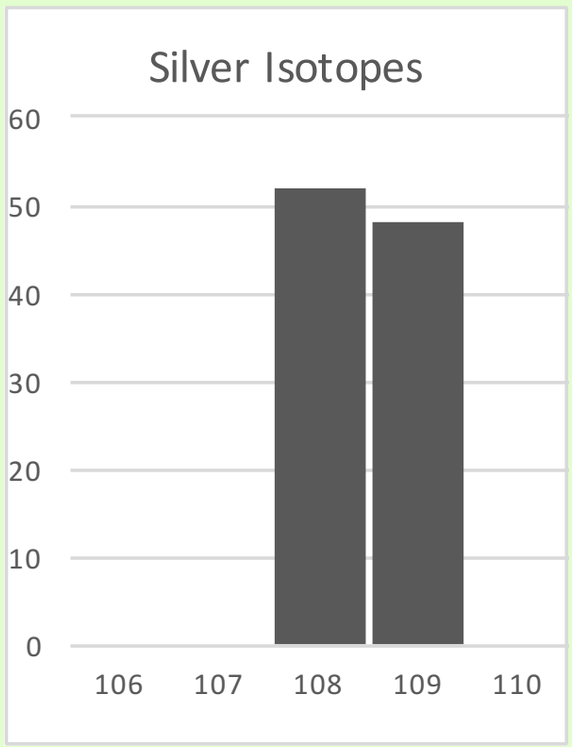


3

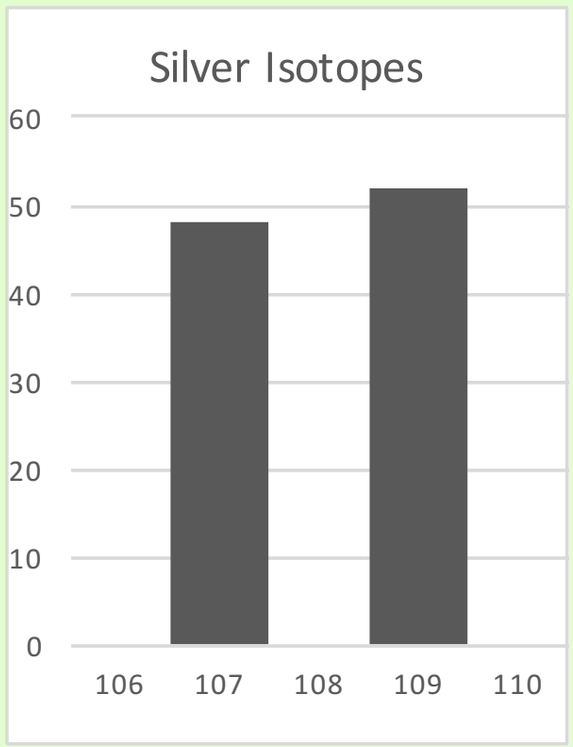


4

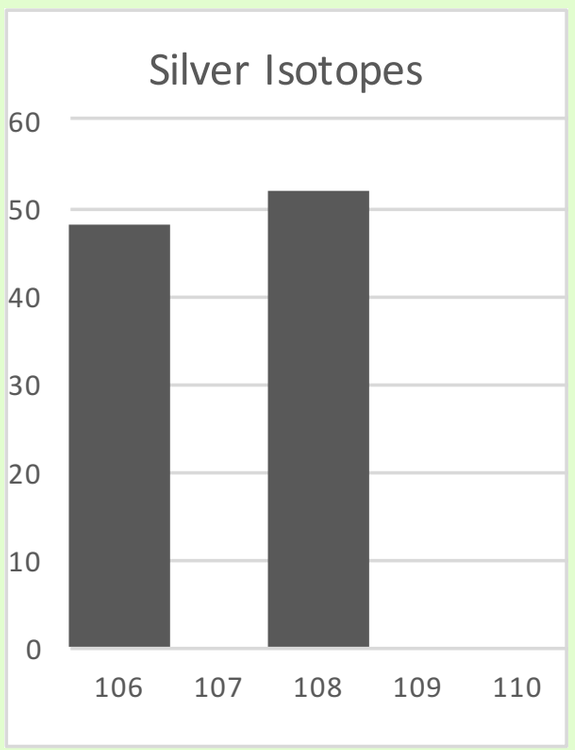
Silver exists as two naturally occurring isotopes. Which mass spectrum is the correct one for silver?



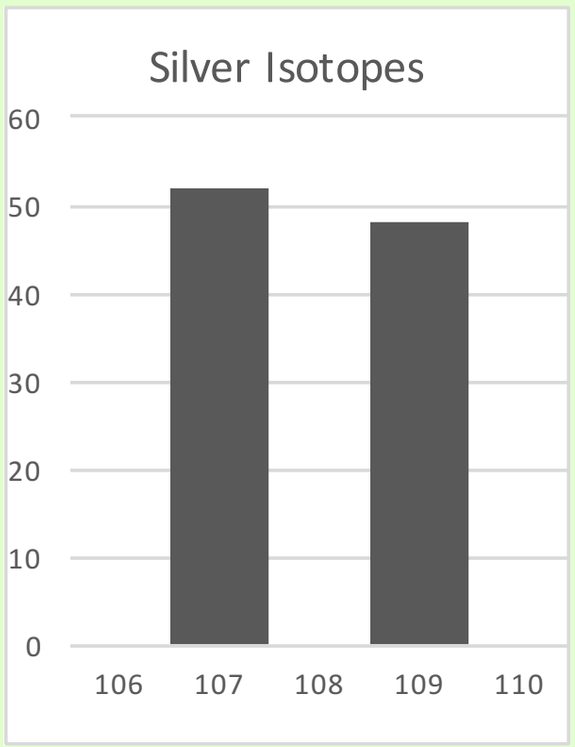
1



2



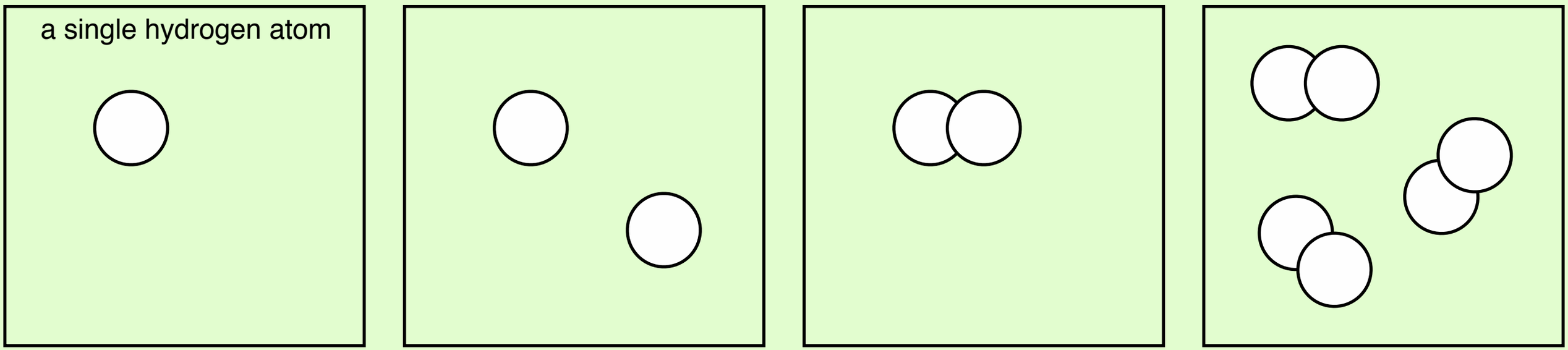
3



4

Representing Molecules

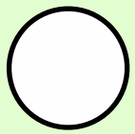
Symbolically (using numbers and letters) represent the items in each box.



H

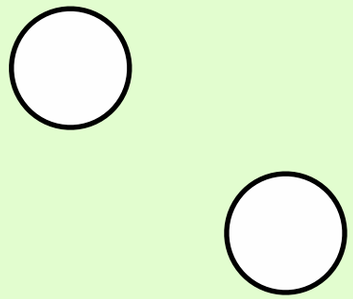
Symbolically (using numbers and letters) represent the items in each box.

a single hydrogen atom

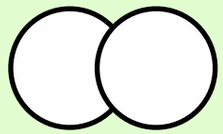


H

two separated hydrogen atoms



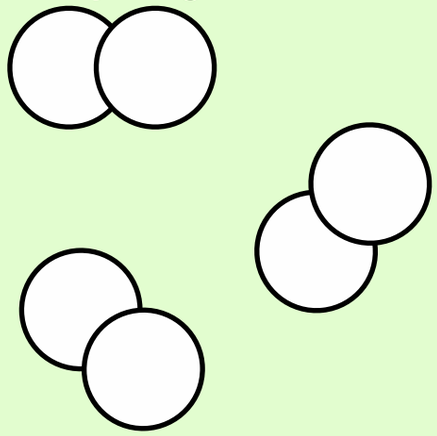
2H



a single hydrogen molecules made of two hydrogen atoms bonded together

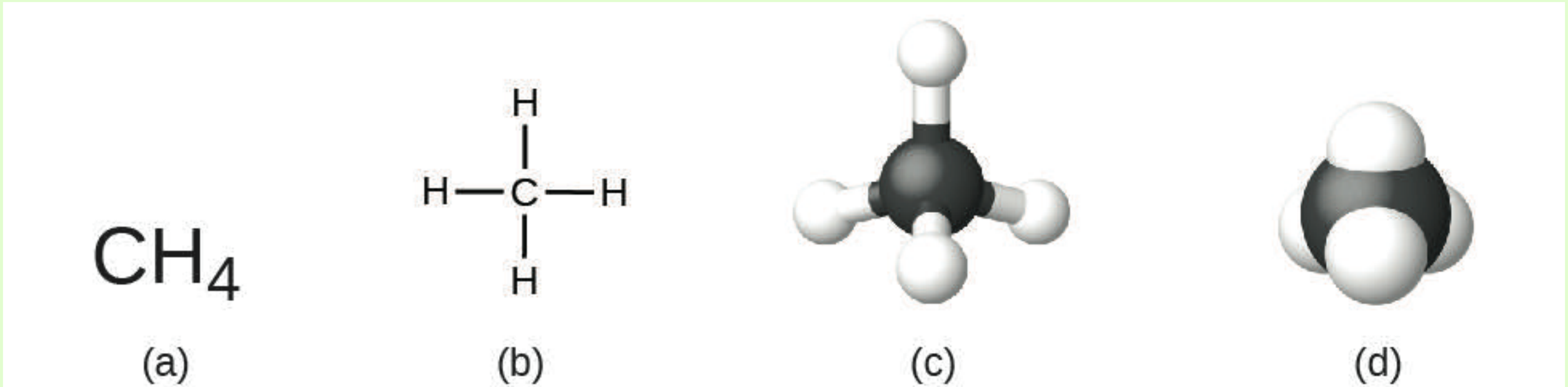
H_2

three hydrogen molecules

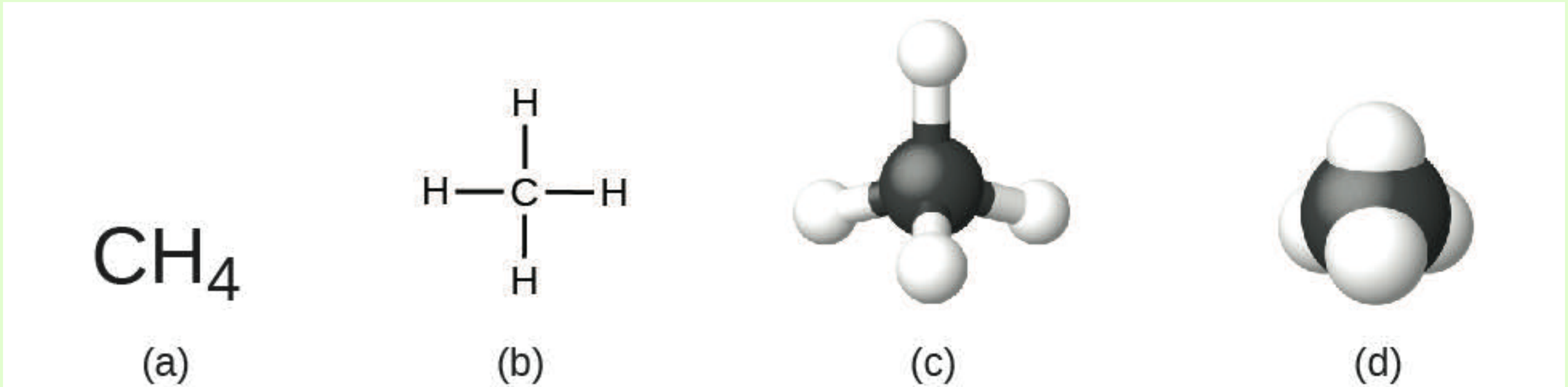


$3H_2$

What would you call each of these different ways to represent a molecule?



What would you call each of these different ways to represent a molecule?



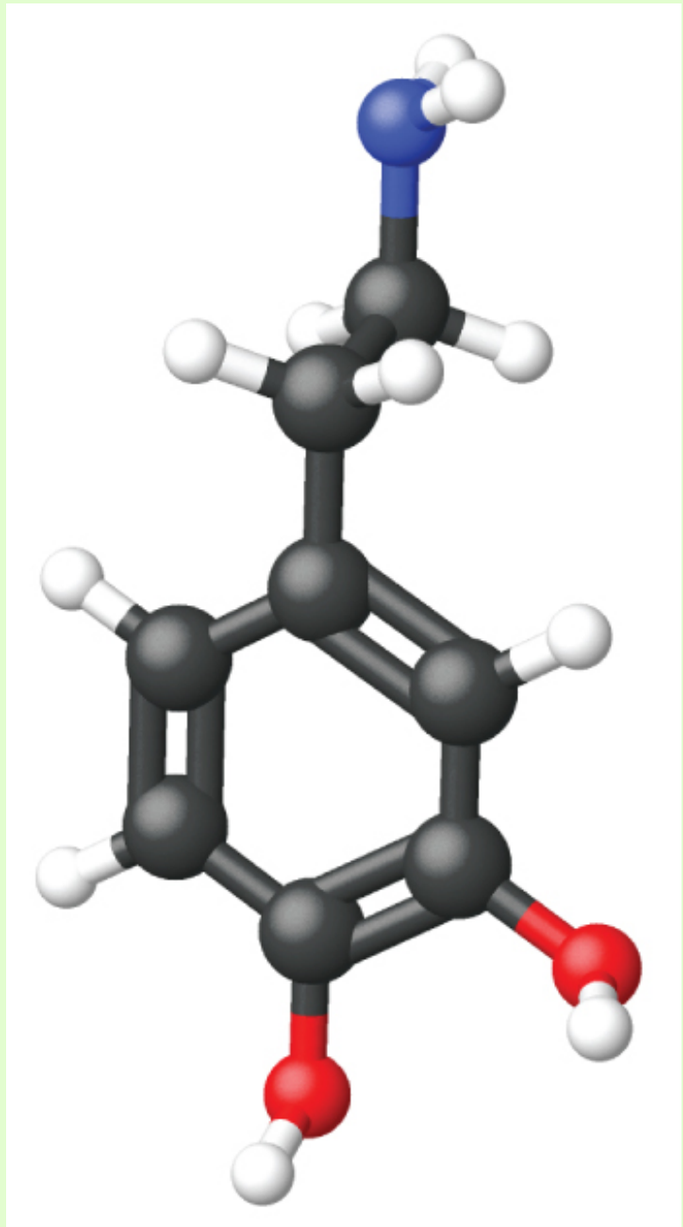
chemical or molecular formula

structural formula

ball and stick model

space filling model

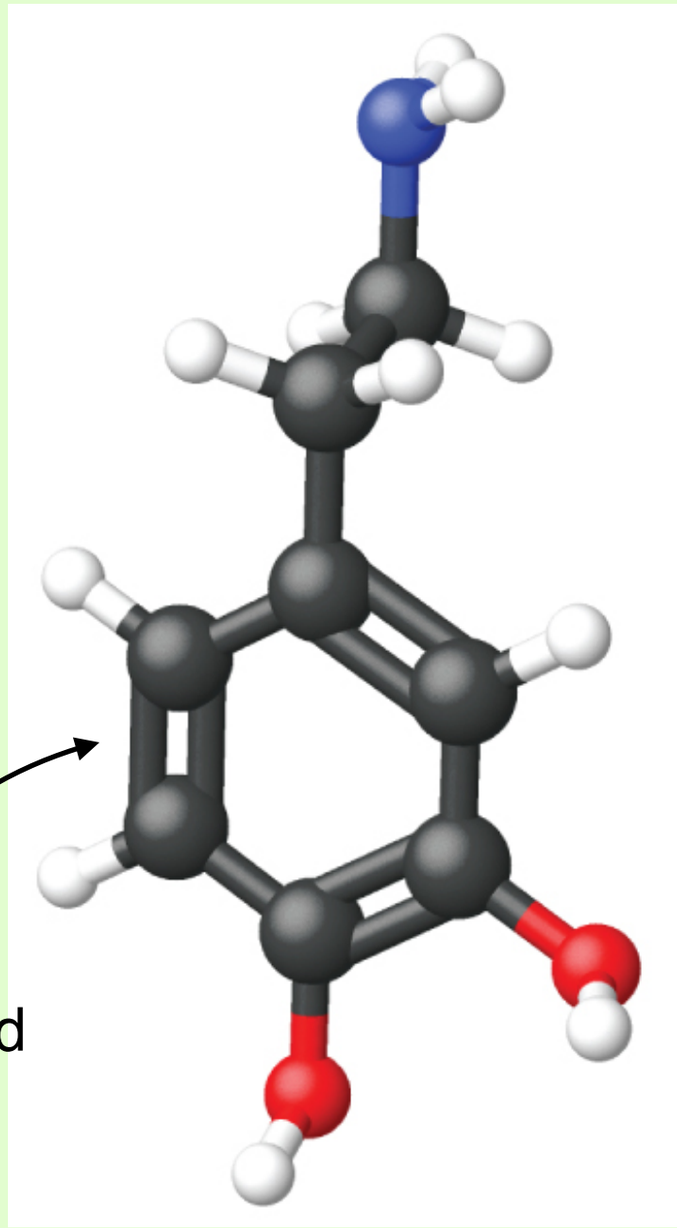
What is the chemical formula of the molecule represented by this ball and stick model?



What is the chemical formula of the molecule represented by this ball and stick model?

$C_8H_{11}NO_2$

dopamine, a neurotransmitter



Note that the order of atoms in a chemical formula do not indicate the order of arrangement of atoms.

Navigating the Periodic Table

Apply these words correctly to the periodic table

1. period
2. group
3. column
4. row
5. family

DO NOT DETACH FROM BOOK.

PERIODIC TABLE OF THE ELEMENTS

1																	18
1 H 1.008	2											13	14	15	16	17	2 He 4.00
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
11 Na 22.99	12 Mg 24.30	3	4	5	6	7	8	9	10	11	12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc (97)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 †Ac (227)	104 Rf (267)	105 Db (270)	106 Sg (271)	107 Bh (270)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Uut (285)	114 Fl (289)	115 Uup (288)	116 Lv (293)	117 Uus (294)	118 Uuo (294)

*Lanthanoid Series	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	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 173.05	71 Lu 174.97
†Actinoid Series	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Apply these words correctly to the periodic table

1. period
2. group
3. column
4. row
5. family

DO NOT DETACH FROM BOOK.

PERIODIC TABLE OF THE ELEMENTS

1												13	14	15	16	17	18
1 H 1.008	2																2 He 4.00
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
11 Na 22.99	12 Mg 24.30	3	4	5	6	7	8	9	10	11	12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc (97)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 †Ac (227)	104 Rf (267)	105 Db (270)	106 Sg (271)	107 Bh (270)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Uut (285)	114 Fl (289)	115 Uup (288)	116 Lv (293)	117 Uus (294)	118 Uuo (294)

*Lanthanoid Series	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	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 173.05	71 Lu 174.97
†Actinoid Series	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

Apply these words correctly to the periodic table.

1. metals
2. nonmetals
3. transition metals
4. halogens
5. noble gases
6. alkali metals
7. alkaline earth metals

DO NOT DETACH FROM BOOK.

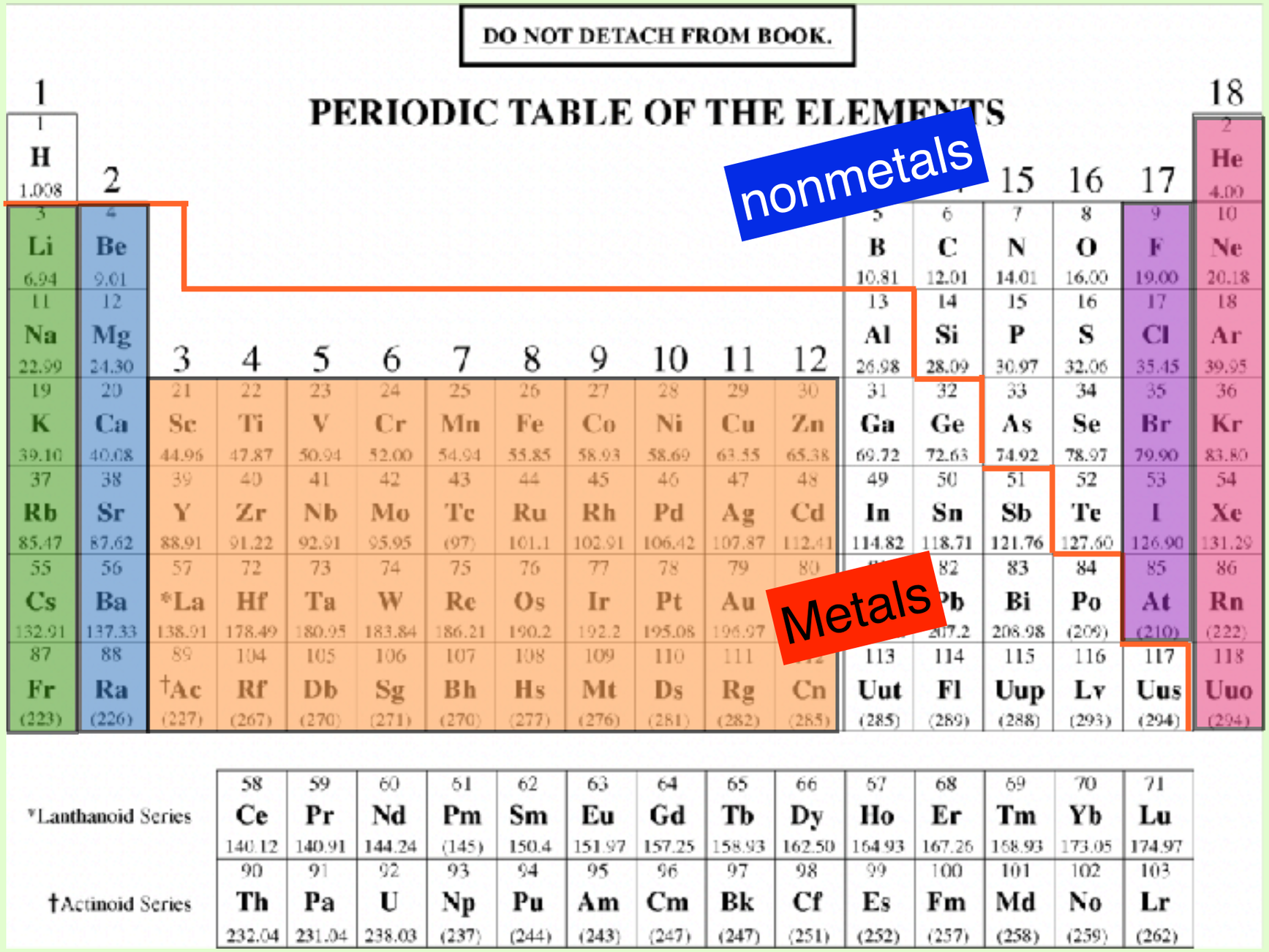
PERIODIC TABLE OF THE ELEMENTS

1																	18
1 H 1.008	2											13	14	15	16	17	2 He 4.00
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
11 Na 22.99	12 Mg 24.30	3	4	5	6	7	8	9	10	11	12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc (97)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 †Ac (227)	104 Rf (267)	105 Db (270)	106 Sg (271)	107 Bh (270)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Uut (285)	114 Fl (289)	115 Uup (288)	116 Lv (293)	117 Uus (294)	118 Uuo (294)

*Lanthanoid Series	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	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 173.05	71 Lu 174.97
†Actinoid Series	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

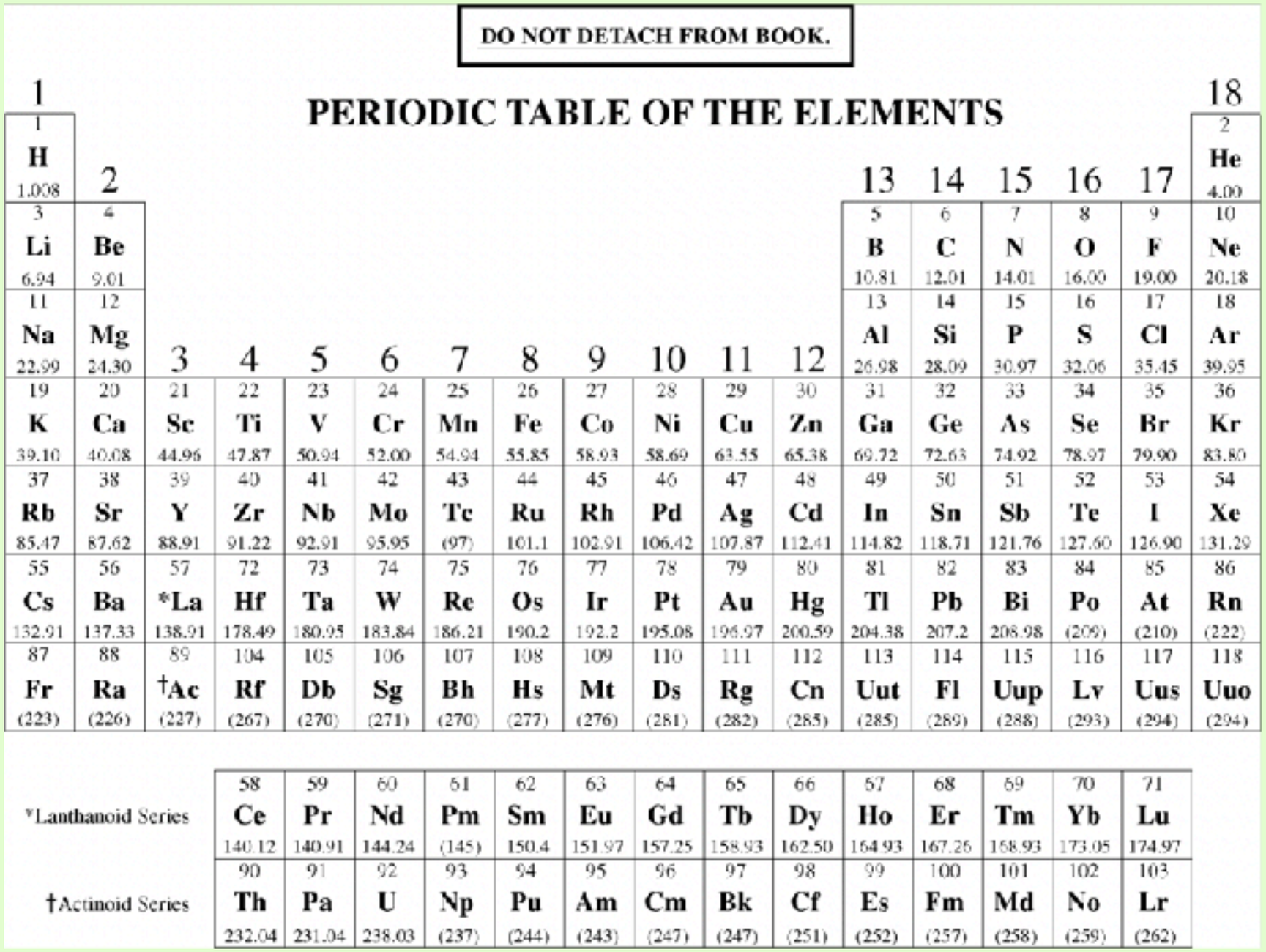
Apply these words correctly to the periodic table.

1. metals
2. nonmetals
3. transition metals
4. halogens
5. noble gases
6. alkali metals
7. alkaline earth metals



How can you tell looking at a chemical formula if the substance is ionic or molecular?

1. $SrCl_2$
2. PF_3
3. Ag_2SO_4
4. CH_3COOH



DO NOT DETACH FROM BOOK.

PERIODIC TABLE OF THE ELEMENTS

1																	18
1 H 1.008	2											13	14	15	16	17	2 He 4.00
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
11 Na 22.99	12 Mg 24.30	3	4	5	6	7	8	9	10	11	12	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.63	33 As 74.92	34 Se 78.97	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.95	43 Tc (97)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 †Ac (227)	104 Rf (267)	105 Db (270)	106 Sg (271)	107 Bh (270)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Uut (285)	114 Fl (289)	115 Uup (288)	116 Lv (293)	117 Uus (294)	118 Uuo (294)

*Lanthanoid Series	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.97	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 173.05	71 Lu 174.97
†Actinoid Series	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

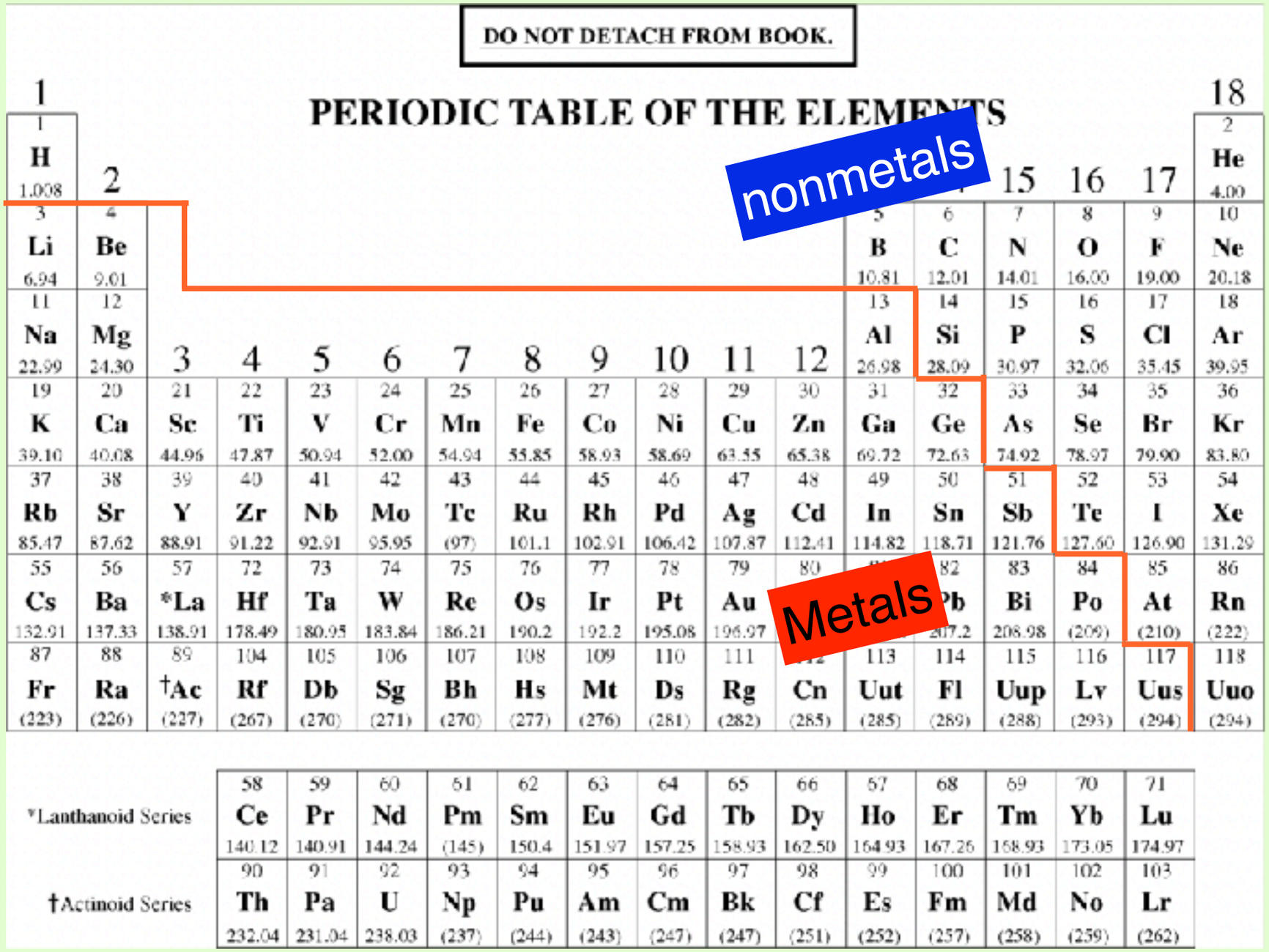
How can you tell looking at a chemical formula if the substance is ionic or molecular?

If a substance is made of metals and nonmetals, we will consider that substance ionic.

If a substance is made of only nonmetals, we will consider that substance molecular.

- metals
- nonmetals

1. $SrCl_2$
2. PF_3
3. Ag_2SO_4
4. CH_3COOH



Nomenclature

Systematic Method - Naming Acids

Does the anion contain oxygen?

No
hydro-(anion root)-ic

Yes
check the ending of the root

-ITE
(anion root)-ous

-ATE
(anion root)-ic

$HClO_3$	chloric
$HClO_4$	perchloric

HF	hydrofluoric
HCl	hydrochloric
HBr	hydrobromic
HI	hydroiodic
H_2S	hydrosulfuric
HCN	hydrocyanic

nitrous	HNO_2
sulfurous	H_2SO_3
phosphorous	H_3PO_3

HNO_3	nitric
H_2SO_4	sulfuric
H_3PO_4	phosphoric
H_2CO_3	carbonic
$HC_2H_3O_2$	acetic

Write the name for H_2SO_3

Compare with

H_2SO_4

H_2S

Write the name for H_2SO_3

sulfurous acid

Compare with

H_2SO_4 sulfuric acid

H_2S hydrosulfuric acid

Write the formula for carbonic acid

Write the formula for carbonic acid

H_2CO_3

Write the name for HIO_3

Write the name for HIO_3

iodic acid

Compare with

HIO_4 periodic acid

HIO_2 iodous acid

HIO hypoiodous acid