

## THE PERIODIC TABLE

|         |                                       |                                       |                                        |                                            |                                                  |                                         |                                         |                                        |                                         |                                          |                                          |                                      |                                       |                                       |                                       |                                        |                                      |                                     |
|---------|---------------------------------------|---------------------------------------|----------------------------------------|--------------------------------------------|--------------------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------------------|-----------------------------------------|------------------------------------------|------------------------------------------|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------------------------------------|--------------------------------------|-------------------------------------|
| 1<br>IA | <b>H</b><br>1<br>1.008<br>Hydrogen    | 2<br>IIA                              |                                        |                                            |                                                  |                                         |                                         |                                        |                                         |                                          |                                          |                                      |                                       |                                       |                                       |                                        | 18<br>VIIIA                          | <b>He</b><br>2<br>4.00<br>Helium    |
| 2       | <b>Li</b><br>3<br>6.94<br>Lithium     | <b>Be</b><br>4<br>9.01<br>Beryllium   |                                        | <b>H</b><br>1<br>1.008<br>Hydrogen         | SYMBOL<br>ATOMIC NUMBER<br>ATOMIC WEIGHT<br>NAME |                                         |                                         |                                        |                                         |                                          |                                          |                                      |                                       |                                       |                                       |                                        |                                      |                                     |
| 3       | <b>Na</b><br>11<br>22.99<br>Sodium    | <b>Mg</b><br>12<br>24.31<br>Magnesium |                                        |                                            |                                                  |                                         |                                         |                                        |                                         |                                          |                                          |                                      |                                       |                                       |                                       |                                        |                                      |                                     |
| 4       | <b>K</b><br>19<br>39.10<br>Potassium  | <b>Ca</b><br>20<br>40.08<br>Calcium   | <b>Sc</b><br>21<br>44.96<br>Scandium   | <b>Ti</b><br>22<br>47.88<br>Titanium       | <b>V</b><br>23<br>50.94<br>Vanadium              | <b>Cr</b><br>24<br>52.00<br>Chromium    | <b>Mn</b><br>25<br>54.94<br>Manganese   | <b>Fe</b><br>26<br>55.85<br>Iron       | <b>Co</b><br>27<br>58.93<br>Cobalt      | <b>Ni</b><br>28<br>58.69<br>Nickel       | <b>Cu</b><br>29<br>63.55<br>Copper       | <b>Zn</b><br>30<br>65.39<br>Zinc     | <b>Ga</b><br>31<br>69.72<br>Gallium   | <b>Ge</b><br>32<br>72.61<br>Germanium | <b>As</b><br>33<br>74.92<br>Arsenic   | <b>Se</b><br>34<br>78.96<br>Selenium   | <b>Br</b><br>35<br>79.90<br>Bromine  | <b>Kr</b><br>36<br>83.80<br>Krypton |
| 5       | <b>Rb</b><br>37<br>85.47<br>Rubidium  | <b>Sr</b><br>38<br>87.62<br>Strontium | <b>Y</b><br>39<br>88.91<br>Yttrium     | <b>Zr</b><br>40<br>91.22<br>Zirconium      | <b>Nb</b><br>41<br>92.91<br>Niobium              | <b>Mo</b><br>42<br>95.94<br>Molybdenum  | <b>Tc</b><br>43<br>(97.9)<br>Technetium | <b>Ru</b><br>44<br>101.07<br>Ruthenium | <b>Rh</b><br>45<br>102.91<br>Rhodium    | <b>Pd</b><br>46<br>106.42<br>Palladium   | <b>Ag</b><br>47<br>107.87<br>Silver      | <b>Cd</b><br>48<br>112.41<br>Cadmium | <b>In</b><br>49<br>114.82<br>Indium   | <b>Sn</b><br>50<br>118.71<br>Tin      | <b>Sb</b><br>51<br>121.75<br>Antimony | <b>Te</b><br>52<br>127.60<br>Tellurium | <b>I</b><br>53<br>126.90<br>Iodine   | <b>Xe</b><br>54<br>131.29<br>Xenon  |
| 6       | <b>Cs</b><br>55<br>132.91<br>Cesium   | <b>Ba</b><br>56<br>137.33<br>Barium   | <b>La</b><br>57<br>138.91<br>Lanthanum | <b>Hf</b><br>72<br>178.48<br>Hafnium       | <b>Ta</b><br>73<br>180.95<br>Tantalum            | <b>W</b><br>74<br>183.85<br>Tungsten    | <b>Re</b><br>75<br>186.21<br>Rhenium    | <b>Os</b><br>76<br>190.2<br>Osmium     | <b>Ir</b><br>77<br>192.22<br>Iridium    | <b>Pt</b><br>78<br>195.08<br>Platinum    | <b>Au</b><br>79<br>196.97<br>Gold        | <b>Hg</b><br>80<br>200.59<br>Mercury | <b>Tl</b><br>81<br>204.38<br>Thallium | <b>Pb</b><br>82<br>207.2<br>Lead      | <b>Bi</b><br>83<br>208.98<br>Bismuth  | <b>Po</b><br>84<br>(209)<br>Polonium   | <b>At</b><br>85<br>(210)<br>Astatine | <b>Rn</b><br>86<br>(222)<br>Radon   |
| 7       | <b>Fr</b><br>87<br>223.02<br>Francium | <b>Ra</b><br>88<br>226.03<br>Radium   | <b>Ac</b><br>89<br>227.03<br>Actinium  | <b>Rf</b><br>104<br>(261)<br>Rutherfordium | <b>Db</b><br>105<br>(262)<br>Dubnium             | <b>Sg</b><br>106<br>(263)<br>Seaborgium | <b>Bh</b><br>107<br>(262)<br>Bohrium    | <b>Hs</b><br>108<br>(265)<br>Hassium   | <b>Mt</b><br>109<br>(266)<br>Meitnerium | Unnamed<br>Discovery<br>110<br>Nov. 1994 | Unnamed<br>Discovery<br>111<br>Rev. 1994 | Unnamed<br>Discovery<br>112<br>1995  |                                       | Unnamed<br>Discovery<br>114<br>1995   |                                       | Unnamed<br>Discovery<br>116<br>1995    |                                      | Unnamed<br>Discovery<br>118<br>1995 |



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LANTHANIDES

ACTINIDES

|                                      |                                           |                                        |                                        |                                       |                                        |                                         |                                       |                                         |                                          |                                       |                                          |                                        |                                          |
|--------------------------------------|-------------------------------------------|----------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|-----------------------------------------|---------------------------------------|-----------------------------------------|------------------------------------------|---------------------------------------|------------------------------------------|----------------------------------------|------------------------------------------|
| <b>Ce</b><br>58<br>140.12<br>Cerium  | <b>Pr</b><br>59<br>140.91<br>Praseodymium | <b>Nd</b><br>60<br>144.24<br>Neodymium | <b>Pm</b><br>61<br>(145)<br>Promethium | <b>Sm</b><br>62<br>150.36<br>Samarium | <b>Eu</b><br>63<br>152.07<br>Europium  | <b>Gd</b><br>64<br>157.25<br>Gadolinium | <b>Tb</b><br>65<br>158.93<br>Terbium  | <b>Dy</b><br>66<br>162.50<br>Dysprosium | <b>Ho</b><br>67<br>164.93<br>Holmium     | <b>Er</b><br>68<br>167.26<br>Erbium   | <b>Tm</b><br>69<br>168.93<br>Thulium     | <b>Yb</b><br>70<br>173.04<br>Ytterbium | <b>Lu</b><br>71<br>174.97<br>Lutetium    |
| <b>Th</b><br>90<br>232.04<br>Thorium | <b>Pa</b><br>91<br>231.04<br>Protactinium | <b>U</b><br>92<br>238.03<br>Uranium    | <b>Np</b><br>93<br>237.06<br>Neptunium | <b>Pu</b><br>94<br>(244)<br>Plutonium | <b>Am</b><br>95<br>243.06<br>Americium | <b>Cm</b><br>96<br>(247)<br>Curium      | <b>Bk</b><br>97<br>(248)<br>Berkelium | <b>Cf</b><br>98<br>(251)<br>Californium | <b>Es</b><br>99<br>252.08<br>Einsteinium | <b>Fm</b><br>100<br>257.10<br>Fermium | <b>Md</b><br>101<br>(261)<br>Mendelevium | <b>No</b><br>102<br>259.10<br>Nobelium | <b>Lr</b><br>103<br>262.11<br>Lawrencium |

**THE PERIODIC TABLE**

**Legend:**

- H** — SYMBOL
- 1** — ATOMIC NUMBER
- 1.008** — ATOMIC WEIGHT
- Hydrogen** — NAME
- ( )** — ESTIMATES

**Groups:**

- 1 IA** (Alkali Metals)
- 2 IIA** (Alkaline Earth Metals)
- 3 IIIB** to **10 VIIIB** (Transition Metals)
- 11 IB** to **12 IIB** (Post-Transition Metals)
- 13 IIIA** to **18 VIIIA** (Main Group Elements)

**Periods:**

- 1** to **7** (Main Periods)
- 8** to **10** (Lanthanides and Actinides)

**Metals** (indicated by red box and arrow)

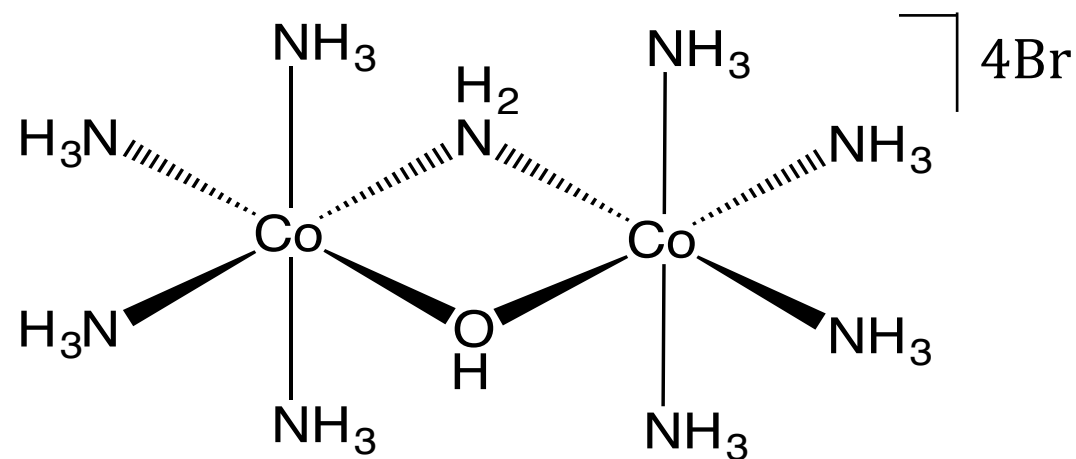
**Metals** (indicated by red box and arrow)

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Is this a coordination compound?

Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

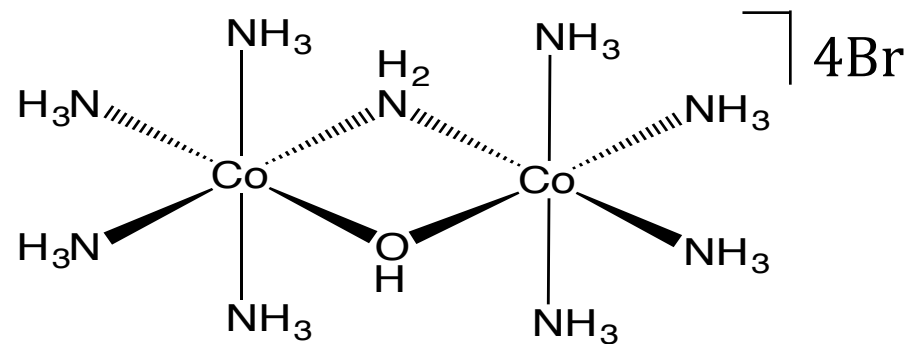


Rank

Responses

Which are the ligands?

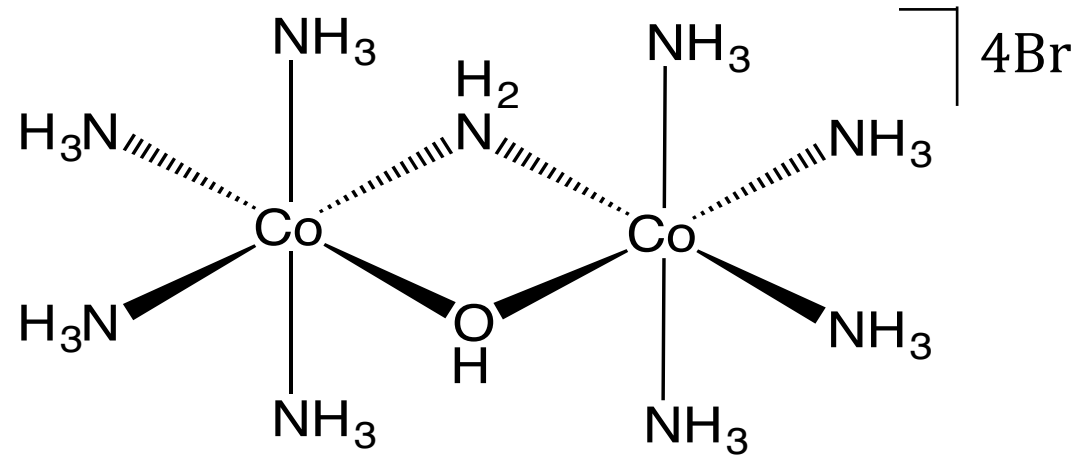
Access: ttpoll.eu  
Access ID: CH222



- A. NH<sub>3</sub>
- B. NH<sub>3</sub><sup>+</sup>
- C. OH
- D. NH<sub>2</sub><sup>+</sup>
- E. NH<sub>2</sub><sup>-</sup>
- F. OH<sup>-</sup>

What is the coordination number for each Co center?

Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

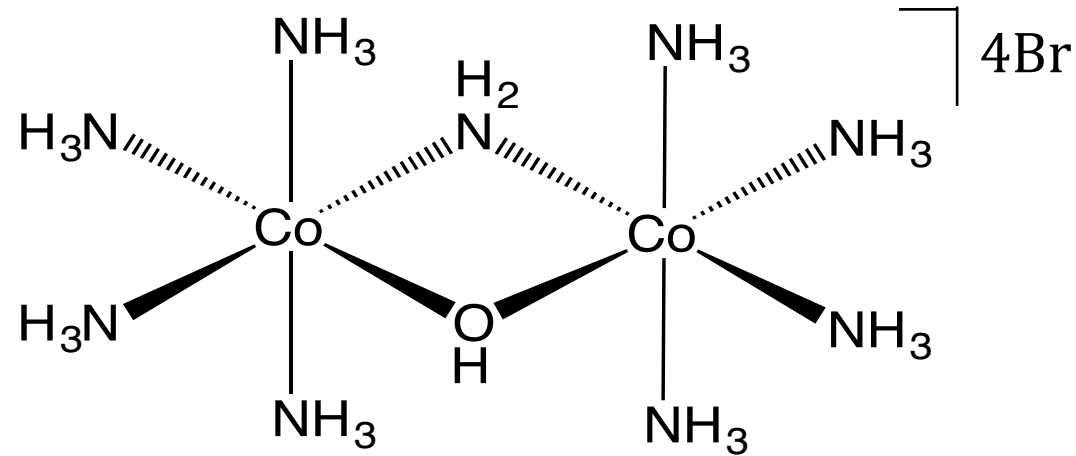


Rank

Responses

# What is the charge of the coordination sphere?

Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222



Rank

Responses

1

+4

2

4+

3

Keyword: 4, 4+, +4, f.2.

4

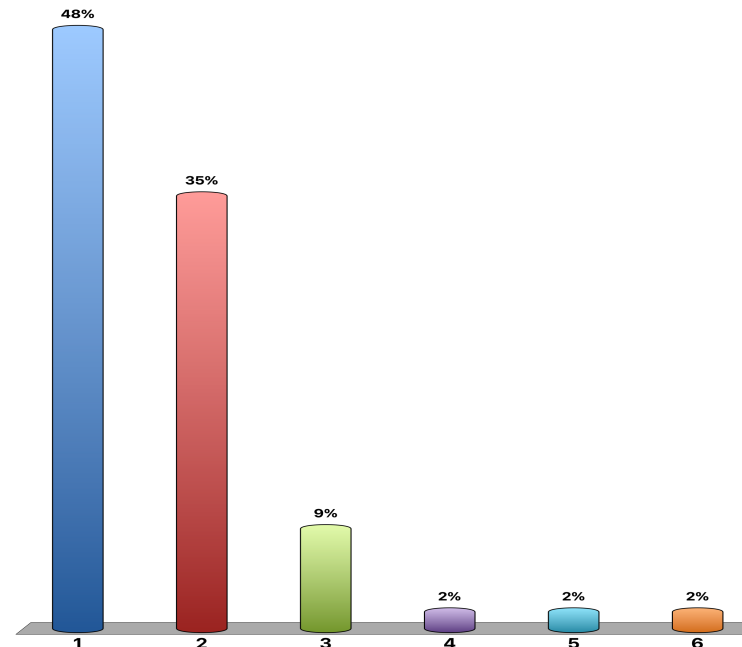
Keyword Matches: 38

5

-

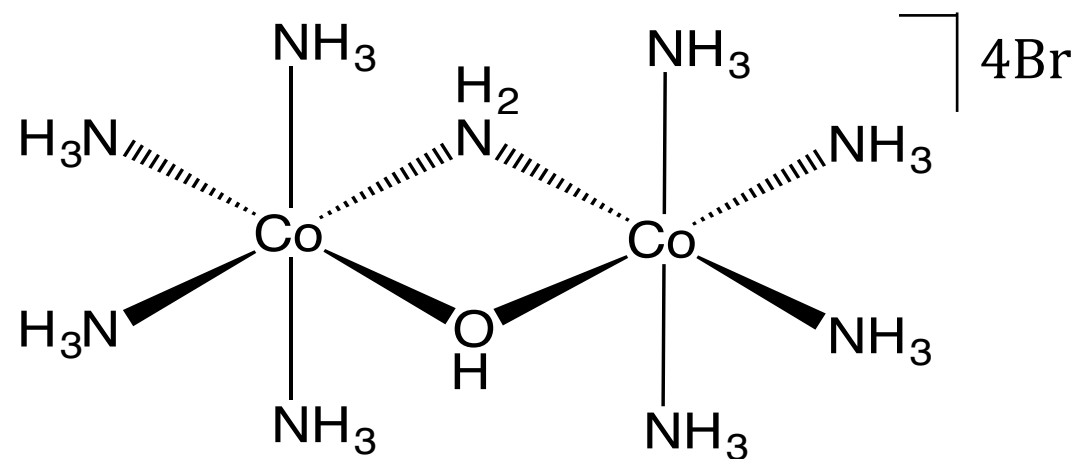
6

12



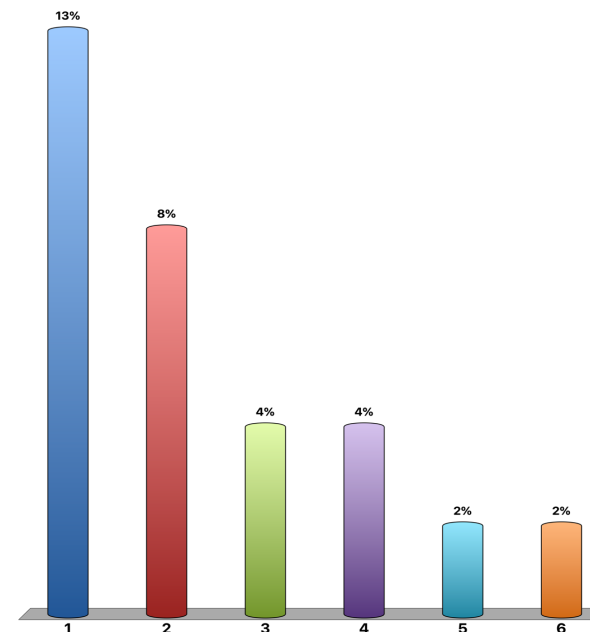
# What is the chemical formula of the coordination sphere ?

Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

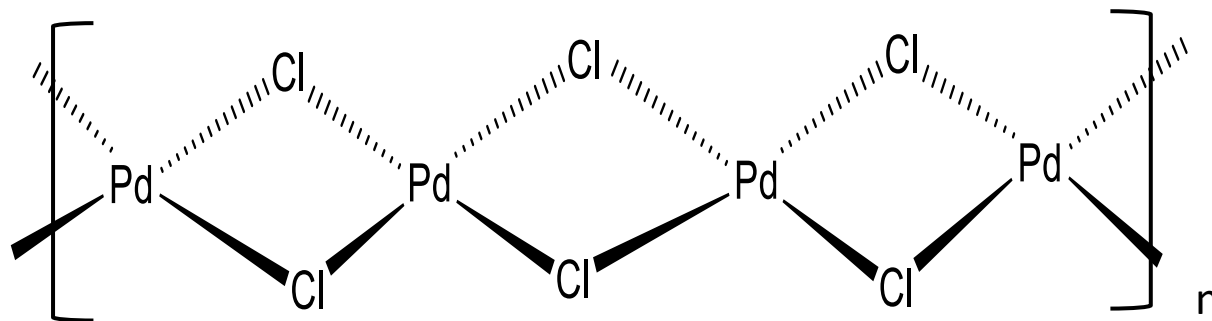


| Rank | Responses                   |
|------|-----------------------------|
| 1    | CO2(NH3)8NH2OH              |
| 2    | [CO2(NH3)8NH...             |
| 3    | (CO2(NH3)8NH...             |
| 4    | Keyword: [Co2(NH3)8(NH2OH)] |
| 5    | ((CO)(NH3)4)...             |
| 6    | (CO(NH3)4)2N...             |

Keyword Matches: 1



Is this a coordination compound?



**Rank Responses**

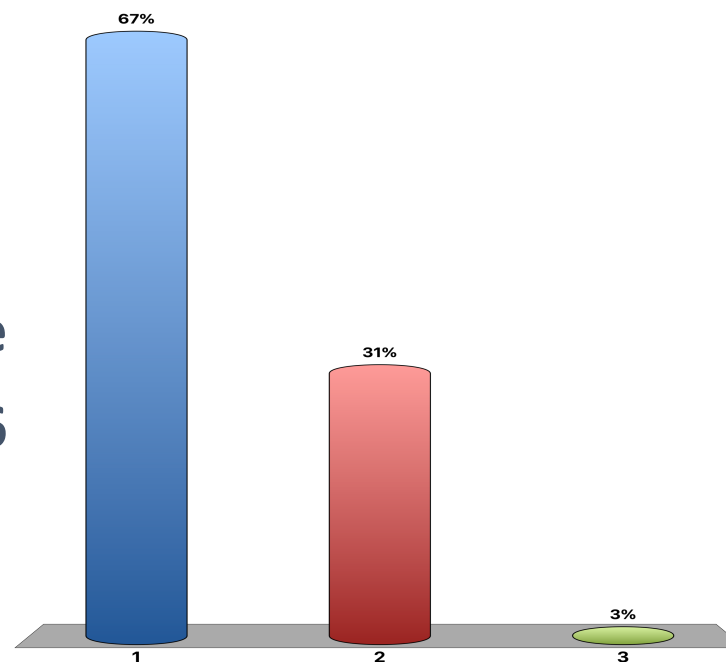
1 YES

2 NO

3 OTHER

**Keyword: Yes, true**

**Keyword Matches: 26**



# Metals Oxidation States & d electron counting

# What is the electronic configuration of $V^{2+}$ ? (shorthand)

Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

Legend for Hydrogen (H):  
SYMBOL: H  
ATOMIC NUMBER: 1  
ATOMIC WEIGHT: 1.008  
NAME: Hydrogen

|          |          |
|----------|----------|
| 23       | <b>V</b> |
| Vanadium |          |
| 50.942   |          |

Rank Responses

1 [AR]4S23D1

2 [AR] 4S2 3D1

Keyword: [Ar]4s03d3, ...

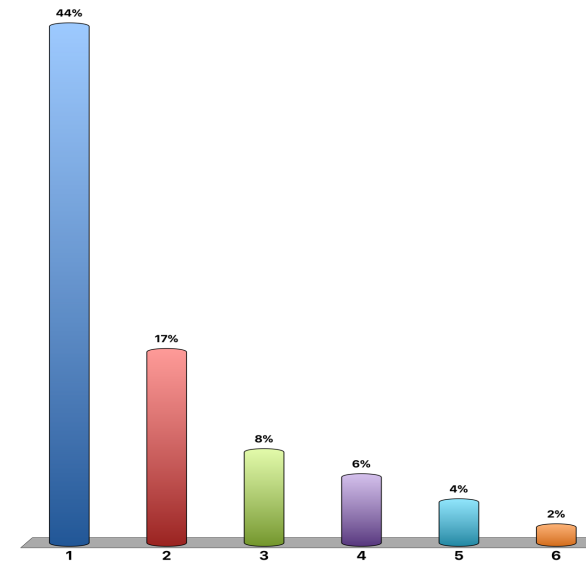
3 [AR]4S2 3D1

Keyword Matches: 3

4 [AR]3D3

5 [AR]4S2 3D3

6 (AR)4S23D3

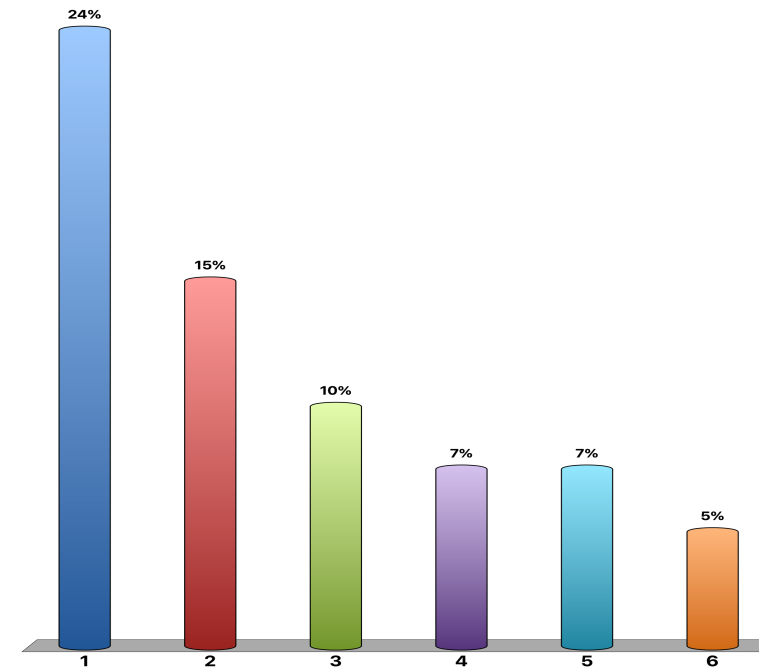


# What is the electronic configuration of $\text{Cu}^{3+}$ ? (shorthand)

Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

|                                    |
|------------------------------------|
| 29<br><b>Cu</b><br>Copper<br>63.55 |
|------------------------------------|

| Rank | Responses                   |
|------|-----------------------------|
| 1    | [AR]4S03D8                  |
| 2    | [AR]3D8                     |
| 3    | Keyword: [Ar]4s03d8, D8.    |
| 4    | Keyword Matches: [Ar]4s03d8 |
| 5    | [AR]4S23D6                  |
| 6    | [AR]4S?3D?                  |



# What is the electron configuration of Mn in $\text{K}[\text{MnO}_4]$ ? (shorthand)

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Access ID: CH222

|           |
|-----------|
| 25        |
| <b>Mn</b> |
| Manganese |
| 54.938    |

Rank

Responses

1 [AR]

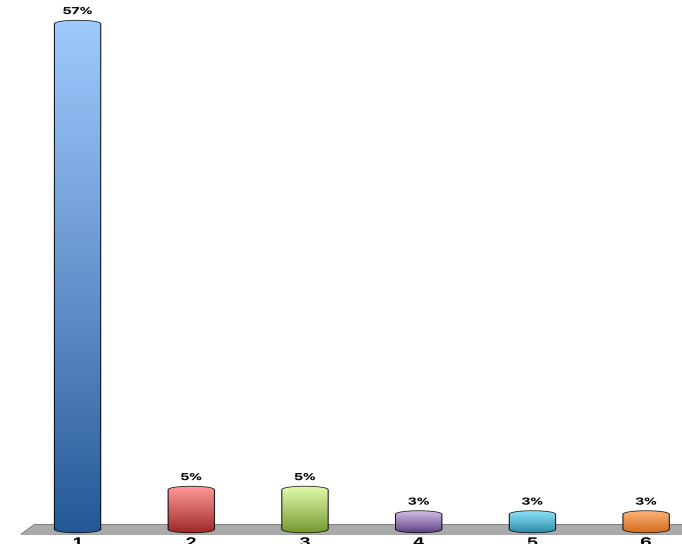
2 +7

3 Keyword: [Ar] 4s0 3d0...  
[AR] 4S0 3D0

4 Keyword Matches: 23  
[AR] 4S2 3D5

5 [AR] 4S0 3D0

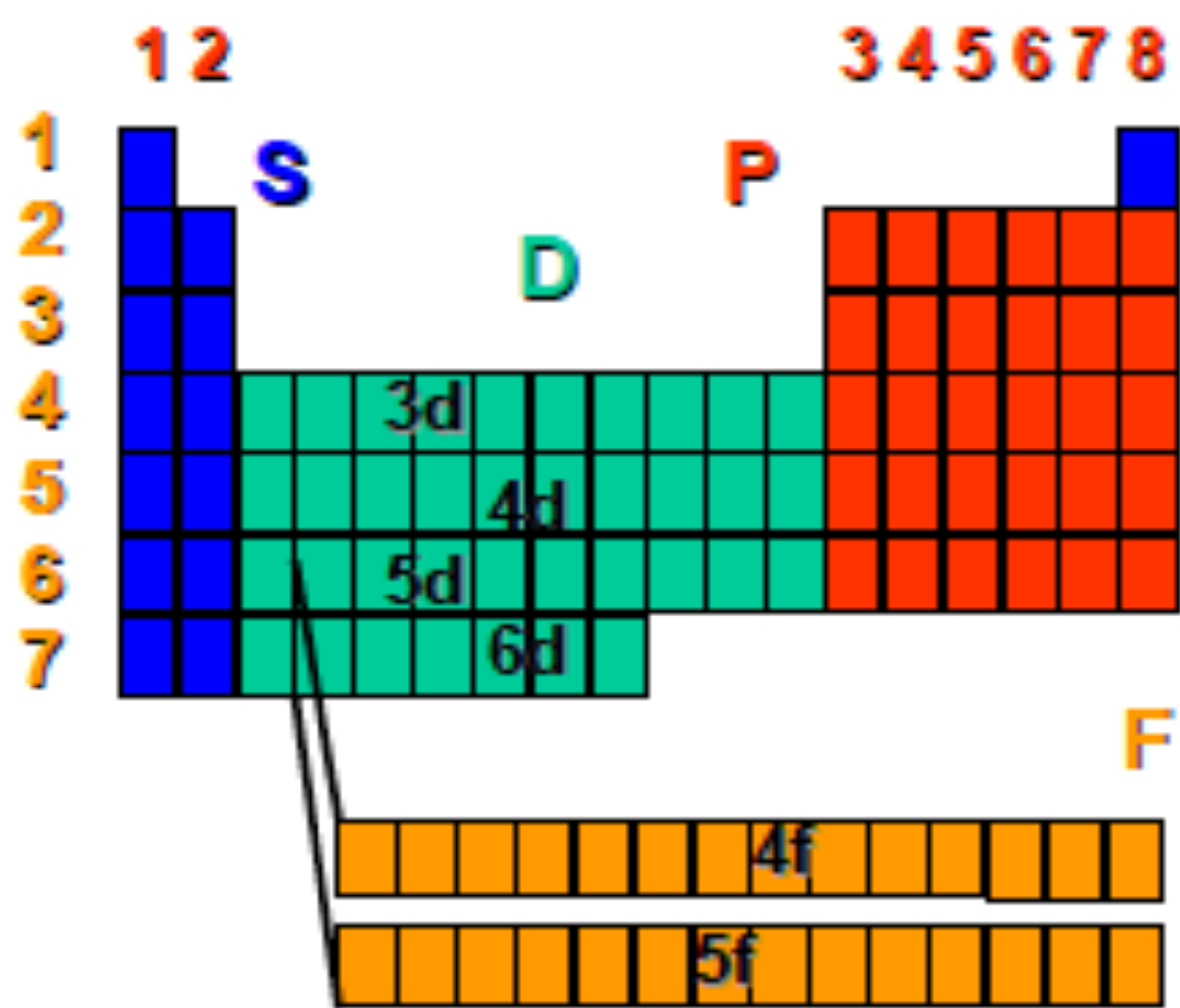
6 [AR] 4S2 3D5



# Oxidation state of first-row transition metals

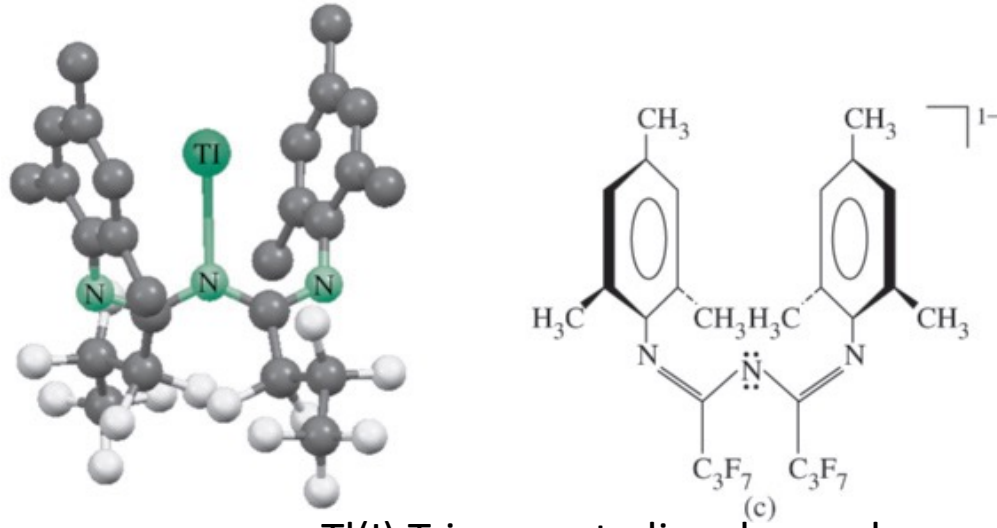
most common and uncommon

| Sc                                  | Ti                                  | V                                   | Cr                                  | Mn                                  | Fe                                  | Co                                  | Ni                                  | Cu                                   | Zn                                   |
|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| [Ar]4s <sup>2</sup> 3d <sup>1</sup> | [Ar]4s <sup>2</sup> 3d <sup>2</sup> | [Ar]4s <sup>2</sup> 3d <sup>3</sup> | [Ar]4s <sup>1</sup> 3d <sup>5</sup> | [Ar]4s <sup>2</sup> 3d <sup>5</sup> | [Ar]4s <sup>2</sup> 3d <sup>6</sup> | [Ar]4s <sup>2</sup> 3d <sup>7</sup> | [Ar]4s <sup>2</sup> 3d <sup>8</sup> | [Ar]4s <sup>1</sup> 3d <sup>10</sup> | [Ar]4s <sup>2</sup> 3d <sup>10</sup> |
|                                     |                                     | +1<br>d <sup>3</sup>                | +1<br>d <sup>5</sup>                | +1<br>d <sup>5</sup>                | +1<br>d <sup>6</sup>                | +1<br>d <sup>7</sup>                | +1<br>d <sup>8</sup>                | +1<br>d <sup>10</sup>                |                                      |
|                                     | +2<br>d <sup>2</sup>                | +2<br>d <sup>3</sup>                | +2<br>d <sup>4</sup>                | +2<br>d <sup>5</sup>                | +2<br>d <sup>6</sup>                | +2<br>d <sup>7</sup>                | +2<br>d <sup>8</sup>                | +2<br>d <sup>9</sup>                 | +2<br>d <sup>10</sup>                |
| +3<br>d <sup>0</sup>                | +3<br>d <sup>1</sup>                | +3<br>d <sup>2</sup>                | +3<br>d <sup>3</sup>                | +3<br>d <sup>4</sup>                | +3<br>d <sup>5</sup>                | +3<br>d <sup>6</sup>                | +3<br>d <sup>7</sup>                | +3<br>d <sup>8</sup>                 |                                      |
|                                     | +4<br>d <sup>0</sup>                | +4<br>d <sup>1</sup>                | +4<br>d <sup>2</sup>                | +4<br>d <sup>3</sup>                | +4<br>d <sup>4</sup>                | +4<br>d <sup>5</sup>                | +4<br>d <sup>6</sup>                |                                      |                                      |
|                                     |                                     | +5<br>d <sup>0</sup>                | +5<br>d <sup>1</sup>                | +5<br>d <sup>2</sup>                | +5<br>d <sup>3</sup>                | +5<br>d <sup>4</sup>                |                                     |                                      |                                      |
|                                     |                                     |                                     | +6<br>d <sup>0</sup>                | +6<br>d <sup>1</sup>                | +6<br>d <sup>2</sup>                | +6<br>d <sup>3</sup>                |                                     |                                      |                                      |
|                                     |                                     |                                     |                                     | +7<br>d <sup>0</sup>                |                                     |                                     |                                     |                                      |                                      |
| Group 3                             | 4                                   | 5                                   | 6                                   | 7                                   | 8                                   | 9                                   | 10                                  | 11                                   | 12                                   |



# Metal Geometries and coordination numbers

## Coordination Number = 1



Tl(I) Triazapentadienyl complex

## Coordination Number = 2

