

PERCUSSION L.UA9.A

Percussion instruments produce sound when struck, scraped, or rubbed by hand or a beater, or when shaken. They provide rhythm, as well as melody and harmony.

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DJ. 411, 2061, DL D24Pe. 4.5,

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TRACK NO. I Drums

Going back to 6000 BCE, drums have been used to communicate, celebrate culture, accompany ceremonies, and prepare for battle.

Drums around the world are made from various materials such as clay, terracotta or various alloys.

The voice of the Creator to North America's Indigenous peoples, the drum is comprised of wood and animal hide, clay, or metal pots.

Drum kits, featured in orchestral, rock, and jazz music, have shells constructed of wood or metal, including steel, brass, bronze, and aluminum.

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TRACK no.10 Phonograph

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TRACK NO.11 Amplifier

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The Audion, a vacuum tube

that amplified electrical signals,

The phonograph, invented in 1877 by Thomas Edison, played tin foil wrapped or

played flat disks, or records, made from zinc, hard rubber, or a shellac compound.

The gramophone stylus, once steel, now a diamond or corundum needle, rides a

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wax cylinders. Ten years later, Emile Berliner patented the gramophone, which

record's grooves, picking up the vibrations to be reconverted to sound.

was invented in 1906. It revolutionized electrical technologies, contributing to

telephone, television, movie, and radio innovations. The tube is composed

of a combination of glass (quartz sand), tungsten, nickel, barium, strontium,

semiconductors like germanium and silicon, replaced tube amplifiers.

platinum, and /or molybdenum. Starting in the 1960s, transistors, which included

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TRACK NO.2 Gongs and Bells

Originating in Asia, a gong is a suspended bronze disc that is struck with a mallet. Ancient uses included healing, communication, and calls to meditation and ceremonies. Gongs are now used in orchestras worldwide.

Zhong, or Chinese bells, first made of clay, then bronze, were originally hand struck with a mallet. Suspended bells later evolved. Handbells, usually brass or bronze, come in tuned sets ranging from 25 to 97 bells.

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TRACK no.3 Cymbals

Originating in Central Asia, cymbals are thin, plateshaped brass or bronze discs. Long used in religious rituals and to accompany dancers, different cymbals have different sounds, depending on the copper to tin

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REROPHONES b >CLPAL

Aerophones are instruments in which air is the primary vibrating medium used to produce sound.

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TRACK NO.4 Brass

Brass instruments, or horns, include the buale, trumpet, trombone, French horn, and tuba. Made of brass, or sometimes silver, they are played by pressing the lips to a mouthpiece and blowing, creating a vibration. Valves or slides produce different pitches.

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TRACK NO.7 Harps

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TRACK NO.8 LYTES

or steel strings.

Today's triangular frame harp originated in medieval

strings could include bronze, steel, nylon, and silver.

Europe, with strings made of copper and brass. Modern

ocdc·Δ° 7 - b σ C·<\ Porb°

POLPPQ. T-dL ·A.P. 4PL bLPL, 4<C™4<5.*

TRACK no.5 Woodwinds

Woodwind instruments, originally wood, now use brass and silver, they are played by blowing across or into a mouthpiece. Opening and closing the holes changes the pitch. Woodwinds include the flute, oboe, clarinet, and bassoon.

Among North American Indigenous peoples, flutes and whistles were instruments made from reeds, clay, wood, or bone.

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CHORDOPHONES PAJCA ANAVAGA 9

Chordophones produce sound through the vibration of chords, or strings, tightly stretched over a soundboard. Vibration occurs with bowing, plucking, striking, strumming, or blowing the strings.

POPOLE & PAPOLO APPLAS A S. DATELO 496 σσρ₀ Δυνι Υςναλρ βρι <νους·βb*

TRACK NO.6 Lutes

Lutes feature strings stretched along a neck and over an enclosed sound chamber, or resonator.

The guitar uses strings of bronze, nickel, nickel-plated steel, or stainless steel wound over a core of steel.

The violin family—including the violin, viola, cello, and bass—use a variety of strings, a metal, gut, or synthetic core wrapped with metals such as aluminum, chrome steel, tungsten, and silver.

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A strummed instrument, it was important in ancient Babylonia, Egypt, and

Greece, and is still played widely in east Africa. Today's lyres feature nylon

[∞]C9C·V₂ 8 - P LJJ·4VJ₂ bJLP₃

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TRACK no.9 Zithers

Zithers are stringed instruments that can be plucked or struck. The zheng, a plucked zither, is one of China's oldest instruments and the precursor to other Asian instruments.

The piano is a "keved zither." Both a percussion and string instrument, with 220 to 250 copperwound strings, a piano produces sound through keys that cause hammers to strike the strings.

PCOCY 9 - NSPOVA POLPS VPP=V·4, PT LJLP,* Δ·PªT ΛΑ, ·Δ.Ρ.

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TRACK no. 14 Cassette Player

TRACK no. 15 CD Player In 1982, compact discs (CDs) and CD players came on the market. CDs are made of

polycarbonate plastic coated with reflective aluminum and protective acrylic. A CD player rotates the CD, which is read by an optical pick-up assembly and reproduces the content. The optical pick-up assembly is generally made from germanium and silicon. Electronic circuit boards incorporate copper components and silicon microchips.

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The MP3 player, offering compressed digital music files, came out in 1998. MP3 players

first combined around 2003. High-powered rare earth elements

praseodymium, and dysprosium, along with iron and boron, make speakers vibrate to create sound.

_∞CdC·Δ³ 16 - ∇^C Λ ′**൩ PϽΓϧσ**^C

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TRACK no. 13 Radio

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A radio is comprised of an antenna, a diode, a tuning coil, amplifiers, and speakers. A radio antenna can be made from copper and iron or aluminum. Early radios used lead crystal or vacuum tube diodes. Modern radio diodes typically use silicon or selenium.

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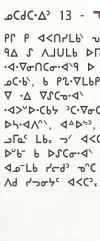
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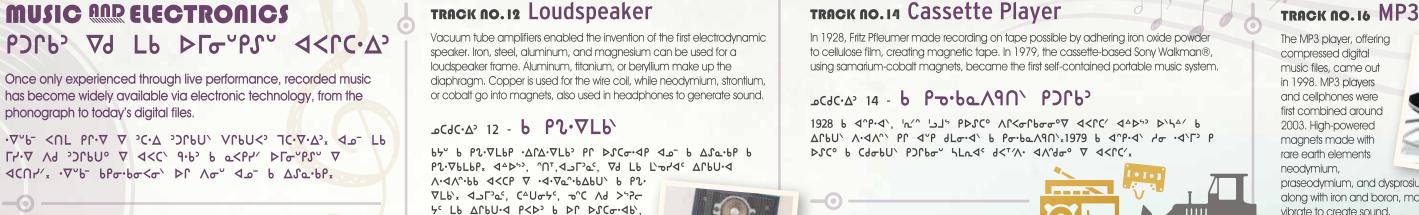
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lithium (Li) Atomic Number: 3

Extracted from the minerals spodumene and lepidolite, lithium is a highly reactive element that efficiently conducts heat and electricity. Lithium is used in rechargeable lithium-ion batteries that power portable electronics.



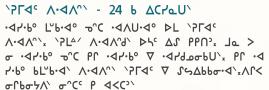
PUGPAG PT CUP, V·4V, ™ Lo<e, $PYP^{\Delta} = P^{\Delta} P P^$ $\cdot \nabla \Gamma$ $\triangleright S \Delta \Gamma'$ $\vdash b \Delta \Gamma \cap P \Gamma \cap$ 4<0.7 P 4<0.



Chromium (Cr) Atomic Number 24

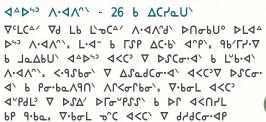
Chromium, a lustrous, hard, steel-grey metal, occurs primarily in the mineral chromite. It is tarnish resistant and takes a high polish. Chromium plating gives a hard, polished finish to steel. Audiotapes made with chromium dioxide were the first high fidelity cassettes.

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Iron (Fe) Atomic Number 26

Iron, extracted from the minerals hematite and magnetite, is one of the most abundant elements on Earth. Nearly all mined iron is used to manufacture steel. Iron oxide powder on cellulose film made up the first magnetic tapes for recording. High-powered permanent magnets used in electronics are made with iron. Some pianos have a cast iron frame to anchor the strings.





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Copper, the oldest known metal, occurs in elemental form but is most often extracted from ores like chalcopyrite and chalcocite. Brass and bronze, with high copper content, are used for multiple instruments such as horns, cymbals, gongs, bells, and windings on strings. Copper is used in circuit boards and wire coils in various music electronics.

Chalcopyrite LTGV8~\ ⊳5·4Λ^\ - 29 b ΔC/_ΦU\

♥ •◀Ძ Ს・◀ー Ს <५∪ჅՐᲮ∪` ∧・◀∧^` •♥゚Ხー ∧Ძ ▷Ր ` U'dΛα^Δ′ ∇d Lb U'dΥ^Δ′ Λ•ΦΛ'd` b ⊳Γ ⊳CΔb $\mathsf{L}_{\mathsf{o}^{\times}}$ is and $\mathsf{L}_{\mathsf{o}^{\times}}$ is an initial value of the i ` ⊳५∙ላለ^`, ∇ᲫርԺ ∙∇Ր ⊳ፓርԺ∙ላዮ ላበ′ የጋՐե⊾ ር Λ'' d- >CCb', PO· ∇ b Λ Cb Δ ba, PO· ∇ Δ b', L·UCCb' a $^{\circ}$ C $b\Lambda \mathcal{J}ba\Lambda \cdot \mathsf{dP_x}$ $b \mathsf{h} \cdot \mathsf{d}\Lambda^{\circ} \setminus \mathsf{d}^{\circ}$ C $\mathsf{d} < \mathsf{C}^{\circ} \mathsf{b} \mathsf{F} \sigma^{\circ} \mathsf{P} \setminus \mathsf{b} \mathsf{b}$ L 4<UYFPb σσρ₀ bolpσ×



Tunasten, mostly from the minerals wolframite and scheelite, has high corrosion resistance and the highest melting point of all metals. Applications of tungsten include metal wires, electrodes, and contacts in electronics and lighting. Tungsten goes into the wire filament cathode in a triode vacuum tube, and some stringed instruments have tungsten-wrapped strings.

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 $PU^{2}P\Pi_{0}^{*}$ $P\Gamma$ $C_{3}U_{0}$ $V^{2}V_{0}$ T^{2} $4^{2}P1^{2}\nabla U_{0}$ ¬°C ·⊲CbΓ ∩PU° Δ°Λ⁻ dCP৮ Λ·⊲Λ°·bx ⊳L C_{3},U_{3} $V\cdot dV_{0}$, $d< C_{3}$ Δ dqPLDb $V\cdot dV_{3}qPV$? 65 LPC, 2,C ·4,DePFe,* 4U, 65LPe+V,



Bauxite

Cassiterite

67USA/

TOP HITS bobo<oP

Platinum (Pt) Atomic Number 78

Platinum, a silver-white metal, occurs in river deposits and is also produced as a by-product of copper and nickel refining. Platinum is used in triode vacuum tubes and in many electronic applications, such cellphones, MP3 players, video recorders, and computer hard disks.

י/ בחבי / יללי - 78 ש בנים שי **Platinum** ▶ ר וערטק עיפעי, יפע יפגיף, שע בעיף, שע בעיף احامد

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Aluminum (Al) Atomic Number 13 Aluminum, extracted primarily from the rock bauxite, is lightweight, easily shaped, easily machined and cast, and has tremendous corrosion resistance and durability. Its uses related to music production are varied, from snare drum shells, lightweight cases for microphones and MP3 players, and CD reflective surfacing, to bronze

alloys, loudspeaker diaphragms, and wrapping for strings.

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P ¬°C Lb ·Δ°·9σbbσ·Φ° P)ΓbσγΛ'x **Indium** (In) Atomic Number 49 Indium, most commonly recovered as a by-product of

zinc ore processing, occurs in the mineral sphalerite. A layer of indium tin oxide works as a transparent electrical conductor on MP3 and cellphone touchscreens.

'A' b A'bu' A.AA' >4 P >Nobu >L Sphalerite 1459⁴/ $\mathsf{O}_{\mathsf{a}^{\mathsf{x}}} \Delta_{\mathsf{c}} \mathsf{V}_{\mathsf{c}} \mathsf{v}_{\mathsf{c}}$ Δl $d < l_0$ Δ $d < l_0$ Δ $d > l_0$ Δ

Tin (Sn) Atomic Number 50 Tin, a silvery-white metal derived from the mineral

cassiterite, is soft, malleable, ductile, and highly crystalline. Alloys of tin are used for soft solder, pewter, and bronze. Bell bronze, used for cymbals, gongs, and bells, has high tin content. A layer of indium tin oxide works as a transparent electrical conductor on MP3 and cellphone touchscreens.

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በ σ bU $^{\ }$ $^{\ }$ $^{\ }$ b $^{\ }$ $^{\circ}$ C $^{\circ}$ $\mathsf{U} \cdot \mathsf{d} \wedge \mathsf{b}^\circ \quad \mathsf{d}^\circ \mathsf{C} \wedge \mathsf{d} \quad \mathsf{D} + \mathsf{d}^\circ \mathsf{d}^\circ \mathsf{b}^\circ \times \quad \mathsf{C}^\circ \mathsf{C} \wedge \mathsf{d}^\circ \mathsf$ $L\cdot U \uparrow \Lambda^{\circ} b \Delta b \alpha$, $L\cdot U \Delta b \alpha$, $\sigma^{\circ} C$ $L\cdot U \Gamma \Gamma b \alpha_{*}$ $\nabla^{c} \Lambda^{\prime} \alpha$ Γ) LPa, auc PP A=>a, <u<> ∇ 0 ∇ 2 ∇ 4<0. Δ <
b' ¬¬°C ∇ 5>2·b' Þſ*



Quartz

Alkali metals | Alkaline earth metals | Transition metals | Basic metals | Metalloids | Non-metals $a^b h^{a_b} / a^b h^{a_b} = a^b h^{a_b} h^{a_b} + a^b h^$

Silicon (Si) Atomic Number 14

Silica (silicon dioxide) in various natural forms, includina quartzite, is used to produce silicon ferroalloys and silicon metal. Silicon is a semiconductor and a metalloid, a chemical element with properties between those of typical metals and non-metals. A CD player optical pick-up assembly includes a photodiode made with silicon, and electronic circuit boards incorporate silicon microchins

$\gamma \leftarrow 9$, $\gamma \leftarrow 0$, $\gamma \leftarrow 14$ $\rho \leftarrow 0$

Carbon (C) Atomic Number 6

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Diamond CVL

Diamond, a crystallized form of carbon, is the hardest natural substance. It has extremely high thermal conductivity and low thermal expansion. Diamond needles are used in record players and diamond is used as a heat sink for integrated circuits in electronics because of its high thermal conductivity.

β₂V₃ V·4V₄/γ - 6 β ∇C5σΩ/ CVT, V·4V, PL PIPP, P.V, V·4V,9,* $\triangle \cdot P^{\perp}\Gamma \cdot \nabla_{-}\Gamma_{\alpha}P \cdot \nabla_{-}\nabla \cdot \nabla \nabla_{-}\nabla \cdot \nabla \Gamma P$, bl $C\Delta L^2 \wedge \Delta \Lambda^2 \wedge \Delta C^2 + \Delta C$



Sapphire 414ADS

Corundum (Al₂O₃)

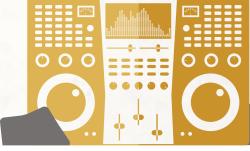
The third-hardest mineral, after diamond and moissanite, corundum occurs naturally in igneous rocks such as svenite, nepheline svenite, and peamatite, and can be synthesized. Typically grey to brown, corundum occurs in other colours; such as red (ruby), and blue (sapphire). Record players often use a corundum stylus. Clear synthetic corundum protects electronic device screens and goes into lasers, used to play CDs and DVDs.

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∆9Γ L^σ Γ·4- Δ Γ₆P·4, V·4V₆, Γ<2, $V \cdot dV_{v} \cdot P^{*}$ S_{d} $Vq \nabla C \cdot Q_{v}$ $\nabla_{a} \Omega_{o}$ $d \cdot Q_{v}$ $CN'd^- \ PT' \ abla^{\wedge}, \ abla^{\wedge} \ PT' \ abla^{\wedge}$ V,ΓC_▽\ P ∇UL, Δ\α-\, Cb ▷\C\α-\d, ₽°C 4FL 45°C° V·4V°, ·4VN·4° Ve_{\wedge} $PP \cdot q_{\wedge}$ $q_{\vee}P_{\wedge}$ ∇P_{\wedge} b_{\vee} b_{\vee} b_{\vee} b_{\vee} (JA 476), JOC AS DS-487' (41405 $4r^{\circ}$ The b forbodon's sobol ΔS ע<ל₀* גע גטורפי, בּער רף עוִעע rp.n<acper, or a<ur>
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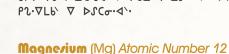


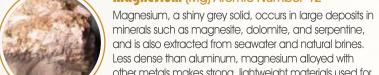
Beryllium (Be) Atomic Number 4

Beryllium occurs in many minerals, the two principal ores being beryl and bertrandite. It conducts sound quickly, which combined with its stiffness and low density, makes it an excellent material for loudspeaker diaphragms.

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minerals such as magnesite, dolomite, and serpentine, and is also extracted from seawater and natural brines. Less dense than aluminum, magnesium alloyed with other metals makes strong, lightweight materials used for loudspeaker frames, cellphones, laptops, and tablets.

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Strontium (Sr) Atomic Number 38

Strontium, found in the minerals celestine and strontianite, is a soft, yellow-tinged silver-white metal that burns in air and reacts with water. Strontium is used in alloys; strontium ferrite permanent magnets are used in loudspeakers and recording media. In an amplifier's triode vacuum tube, strontium carbonates coat a cathode's wire filaments.

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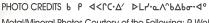
Fifteen lanthanide elements, along with vttrium and scandium. make up the group of rare earth elements (REEs). Generally found together in deposits, REEs are abundant in the Earth's crust but not in large concentrations, so they are difficult to mine. The world's most abundant REE source is bastnäsite, followed by monazite. REEs are usually high-lustre silver, silvery-white, or grey metals.

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Prazeodymium, Neodymium and Samarium are examples of REEs. Many REEs are used to produce strong and permanent magnets that are used in electronic applications such as headphones, microphones, speakers, and high end pickups for guitars and related musical instruments. REE's are also used in lasers.

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Monazite Je54/

Metal/Mineral Photos Courtesy of the Following: R. Weller/Cochise College: Argentite, Barite, Bauxite, Beryl, Chalcopyrite, Chromite, Diamond, Garnierite, Hematite, Lepidolite, Magnesite, Molybdenite, Pendlandite, Platinum, Quartz, Rutile, Sapphire, Scheelite, Smithsonite, Sphalerite, Strontianite Rob Lavinsky/www.iRocks.com/Arkenstone: Bastnäsite, Cassiterite, Monazite Maggie Wilson: Germanite

V'LC^a/, ¬Λ)-c^a/, L'¬h^a/, J-U'a^a/, V'2'C^a/, 'L'na^c, 'b^c/, 'C^a/, 'L'a^a/, 'S^c/, 'C^a/, 'T/a^a/, 'C^a/, 'C <^^a\^^, brus^^, las^^ Maggie Wilson: Jsra^^

EDITOR: Victoria Stratton PROJECT COORDINATOR: Lesley Hymers DESIGN: TWGCommunications.com TRANSLATION BY: Wintranslation L/a Δθ·Δσσ° b a a brc′ 'V`) n d ^·ናበ° d<n t· Δσσ° b a a brc′ bσ^ · Δσσ° · Φ· ∇α/σ Δθ·Δ': TWGCommunications.com b ρ · 9^b ta d`: Wintranslation Compliments of:





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Brass, an alloy of copper and zinc, has a relatively low melting point and is easily cast. Different ratios of copper to zinc result in brasses with differing hardness, along with different acoustic, mechanical, and electrical properties. Because of its workability, durability, and acoustic properties, brass is used for horns and some woodwinds and their components. 'S^ Λ - Λ /\', b P \triangleright PLb\ ∇ Pob- Δ obUP \triangleright 5- Λ /\' ∇ 3Lb Δ 3\ Λ - Λ /\', -<^C- Δ \triangle PU° \Rightarrow 0 CLP $\cdot \Delta C_{\flat} \Delta \to U PPP \cdot A_{\flat} \Delta \nabla A_{\flat} \Delta \nabla A_{\flat} \Delta_{\flat} \Delta_{\flat}$ aab° ∇ Δ CN/Lb′ \Rightarrow L '5° Λ · \triangleleft Λ ^′, ∇ ·b \Rightarrow L \triangleleft <C′ ∇ \Rightarrow JC \Rightarrow · \triangleleft P aab° \Rightarrow >CNbUP PDNbax V·bol on d<c d >scolor b >clabua porba cnd- >clabaa, on l·urrbax

Bronze, an alloy of copper and tin, often includes other metals such as aluminum manganese, nickel, or zinc, or non-metals or metalloids like arsenic and phosphorus, to produce alloys with differing hardness, stiffness, ductility, or machinability.

Bell bronze, with high tin content, is the traditional alloy for fine cymbals, many gongs, and bells. Phosphor bronze is used to wrap steel and nylon strings on stringed instruments and to make some saxophones.

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Brass also goes into percussion instruments such as cymbals, gongs, and bells.

Steel is one of the most common materials used today. An alloy of iron and carbon, it often includes other elements such as manganese, niobium, or vanadium to give it strength and hardness. Adding nickel and chromium creates stainless steel, a corrosion-resistant alloy. Steel serves in multiple ways to make music: it goes into drum and loudspeaker frames, steel pan drums, triangles, glockenspiel steel-tuned bars, steel guitars, and wires for a variety of stringed instruments.

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