

# Gold and other precious metals



# Gold

- **Crystal system:** Cubic  
**Chemical Formula/composition:** gold is a native element, symbol is Au (from the Greek word for gold)  
**Crystal habit:** Crystals are rare, found as leaf, plate, nuggets, and electrum  
**Hardness:** 2-2.5 on Moh's scale in its pure state (softer than a fingernail).  
**Specific gravity:** 19.33  
**Luster:** Metallic  
**Toughness:** not tough, but extremely malleable and ductile.  
**Cleavage:** None  
**Optics:** opaque  
**Color:** shades of yellow or amalgamated with other substance may even be a black color  
**Other:** Melting point of 1945 degrees Fahrenheit (1063 degrees C)  
**Localities:**  
**Common simulants:** Gold plate, plastics, Pinchbeck (a type of brass)  
**Synthetics:** None, though alchemist tried for centuries. The elusive philosopher's stone was supposed to turn lead into gold.



# Why Gold?

- It never tarnishes
- It is DUCTILE (A ductile substance is easily pulled or stretched into a thin wire. Gold is the most ductile metal.)
- It is rare
- Everyone likes it

# Gold Purity

<b>Karat Gold</b>	<b>Parts Gold</b>	<b>Percentage Gold</b>	<b>Normal European Stamping</b>
9 K	9 in 24	37.50%	375
10 K	10 in 24	41.67%	416
12 K	12 in 24	50%	500
14 K	14 in 24	58.33%	583 or 585
Fill in __ kt?	_ ?in 24	75%	750 (see question above)
22 K	22 in 24	91.67%	917
24 K	24 in 24	99.99%	999 or .99999

# Gold Weight

The Troy ounce is the most popular weight

<b>1 gram (g)</b>	= 0.643 dwt = 0.0032 oz t = 0.035 oz av
<b>1 pennyweight (dwt)</b>	= 1.555 g = 0.05 oz t = 0.055 oz av
<b>1 troy ounce (oz t)</b>	= 31.103 g = 20 dwt = 1.097 oz av
<b>1 ounce avoirdupois (oz av)</b>	= 28.3495 g = 18.229 dwt = 0.911 oz t

# Gold coins



# The Federal Trade Commission Guidelines

- 23.4 Misrepresentation as to gold content.
- (9) Use of the word "Gold" or any abbreviation, or of a quality mark implying gold content (e.g., 9 karat), to describe all or part of an industry product that is composed throughout of an alloy of gold of less than 10 karat fineness.



# Tests

- **AQUA REGIA**

Aqua regia is a 3:1 mixture of hydrochloric acid and nitric acid. Aqua regia is used to test gold and platinum; it is one of the few substances that can dissolve gold and platinum.

# Test (cont...)

## ASSAY

- An assay is a test of the purity of metal. A tiny piece of metal is scraped from the piece and the percentage of gold or silver is determined.

# Gold Tester



- How does the M24 work?
- To use the tester, first clean a testing point of the item with the included Gray Eraser to remove any oxidation.
- Attach the Alligator clip to a different area of the Test Gold.
- Press either the Test Yellow Gold or the Test White Gold button to match the type of gold that you are testing - a Karat value lights up.
- Within 2 seconds, add 3 drops of Test Solution into the Test Well at the lower right corner of the instrument (where the ring is located in the photo).
- After the Karat value light goes out (within 1 second), immerse enough of the Test Gold into the liquid to start the "Testing" light.
- Hold the Test Gold in the immersion liquid until the Testing light goes off, about 2 to 15 seconds, depending on the Karat value of the Test Gold.
- Read the LED display that lights up to discover the Karat value of your item.

**RS MIZAR**

- ≥ 24
- ≥ 22
- ≥ 20
- ≥ 18
- ≥ 16
- ≥ 14
- ≥ 12
- ≥ 10
- ≥ 9

TEST  
YELLOW  
GOLD

OFF

TEST  
WHITE  
GOLD

NOT  
GOLD

TESTING

LOW  
BATTERY

GOLD IN  
CARATS

**M24**  
PROFESSIONAL  
GOLD TESTER



# Alloys

Alloys gold come in many colors:

- Colored Gold Alloy Metal(s) added to the gold
- Yellow gold 50% silver and 50% copper
- White gold nickel, zinc, copper, tin and manganese
- Pink (rose) gold 90% copper and 10% silver
- Green gold High proportion of silver or cadmium
- Blue gold Some iron
- Grey gold 15-20% iron

# PINCHBECK

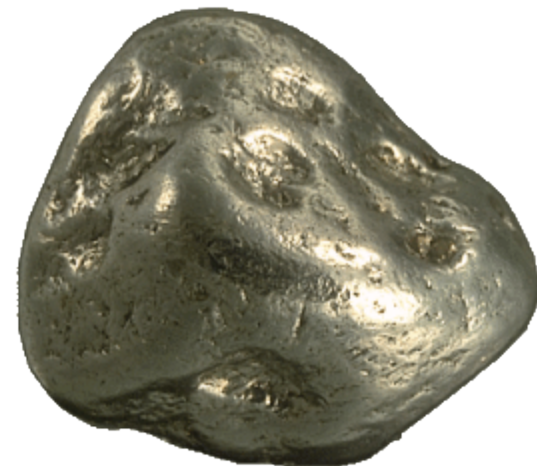
- Pinchbeck (also known as "false gold") is a alloy of copper that looks like gold. Pinchbeck was invented by the British watchmaker Christopher Pinchbeck (1672-1732) in the early 18th century. Pinchbeck consists of 83% copper and 17% zinc. Ironically, there have been many imitations of Pinchbeck (which itself is an imitation).

# Pinchbeck (Cont...)

- Adj. 1. pinchbeck - serving as an imitation or substitute; "pinchbeck heroism"
- counterfeit, imitative - not genuine; imitating something superior; "counterfeit emotion"; "counterfeit money"; "counterfeit works of art"; "a counterfeit prince"



# Platinum



- Platinum is a dense hard silvery metallic element.
- Atomic Number: 78, Atomic Weight: 195.08
- Specific Gravity: 21.45
- Melting Point: 1768.90 °C (very high)
- Hardness (Moh) 4.3

# Platinum (Cont...)

- Sold by “Fineness” out of 1000 parts
- Occurs as nuggets of relatively pure metal
- Is very resistant to chemical attack, just like gold you must use Aqua Regia to dissolve it
- Platinum ring allergies are rarer than white gold, but are reported occasionally.

- 23.7 Misuse of the words "platinum," "iridium," "palladium," "ruthenium," "rhodium," and "osmium."
- (a) It is unfair or deceptive to use the words "platinum," "iridium," "palladium," "ruthenium," "rhodium," and "osmium," or any abbreviation to mark or describe all or part of an industry product if such marking or description misrepresents the product's true composition. The Platinum Group Metals (PGM) are Platinum, Iridium, Palladium, Ruthenium, Rhodium, and Osmium.

- (b) The following ... may be misleading:
- (1) **Use of the word "Platinum" or any abbreviation**, without qualification, to describe all or part of an industry product that is not composed throughout of 950 parts per thousand (ppt) pure Platinum.
- (2) ... accompanied by a number indicating the parts per thousand of pure Platinum contained in the product without mention of the number of parts per thousand of other PGM contained in the product, to describe all or part of an industry product that is not composed throughout of at least 850 parts per thousand pure platinum, for example, "600Plat."
- (3) ... thereof, to mark or describe any product that is not composed throughout of at least 500 ppt pure Platinum.

# Platinum Coins





# Silver



Silver Certificates were authorized by a Congressional Acts on Feb. 28, 1878 and were halted by another Congressional Act on June 4, 1963

You could redeem this bill for silver





# Silver Physical Properties

- Silver is a malleable silvery metallic element.
- Atomic Number: 47, Atomic Weight: 107.87
- Specific Gravity: 10.5
- Melting Point: 961.93 °C
- Hardness (Moh) 2.5-3

# Silver (cont...)

- Most high quality silver items are stamped with a "fineness" or "quality" mark. This mark designates the precious metal content of the jewelry, and under federal law, must be accompanied by a maker's mark or registered trademark.
- 925 is Sterling Silver (92.5% pure fine silver) usually copper added as base metal

# Silver (Cont...)

- Sterling silver is most often used for jewelry and household accessories because of its combination of beauty and durability.
- Quality marks for sterling silver include:
  - sterling
  - sterling silver
  - ster
  - .925

# Hallmarks



# Paul Revere's Ride, April 18, 1775

