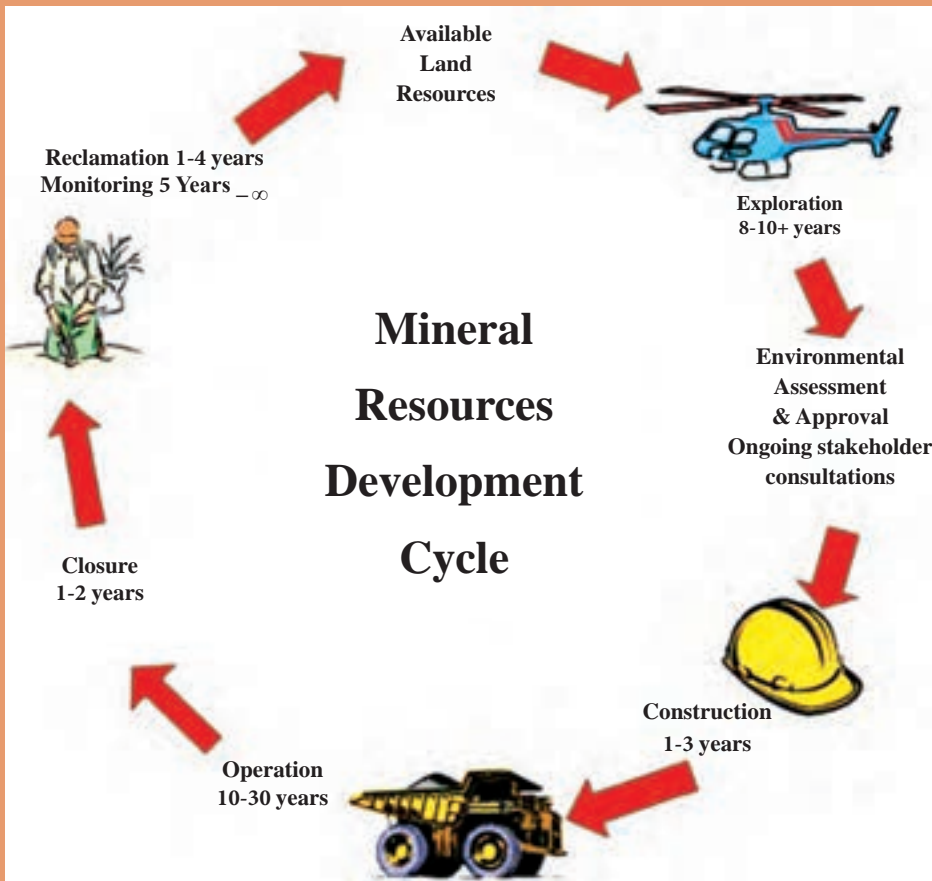


# پودمان ۵

## کسب اطلاعات فنی



## سرآغاز پیشنهادی پودمان کسب اطلاعات فنی

با پیشرفت و گسترش و تنوع منابع ضرورت است که برای تحقق اهداف و توسعه شایستگی‌های خود به منابع و مراجع غیرفارسی نیز مراجعه کنیم. در این راستا پودمان حاضر به همین منظور در کتاب دانش فنی تخصصی طراحی و تألیف شده است. پودمان «کسب اطلاعات فنی» با هدف یادگیری مادام‌العمر و توسعه شایستگی‌های هنرجویان بعد از دنیای آموزش و ورود به بازار کار، سازماندهی محتوایی شده است. این امر با آموزش چگونگی استخراج اطلاعات فنی مورد نیاز از متون فنی غیر فارسی و جداول، راهنمای ماشین‌آلات و تجهیزات صنعتی، دستگاه‌های اداری، خانگی و تجاری و درک مطلب آنها در راستای توسعه شایستگی‌های حرفه‌ای محقق خواهد شد.

در این پودمان اطلاعات فنی راجع به لغات و اصطلاحات معدنی، تجهیزات ایمنی در معدن، مشخصات فنی ماشین‌آلات استخراجی و تجهیزات نقشه‌برداری، آتش‌باری، قسمت‌های مختلف سنگ‌شکن‌ها و آسیاها، اصطلاحات نمونه‌برداری، ماشین‌آلات پرعیارسازی و .. گردآوری شده است تا بتوان از طریق بروشورها، کاتالوگ‌ها و کتاب‌های راهنمایی با نحوه انتخاب و یا کار با دستگاه‌های مختلف معدنی آشنا شد. بدیهی است هدف از ارائه این پودمان، تدریس زبان انگلیسی نمی‌باشد بلکه هدف، کسب اطلاعات فنی و تخصصی، حرفه خود می‌باشد. از طریق خواندن منابع ذکر شده می‌توان به این هدف دست یافت. البته برای پشتیبانی این امر در کتاب همراه هنرجو، که خود نیز عملاً یک دانشنامه ویژه بیشتر به خواندن درست لغات، جملات و درک مطالب ارائه شده در کاتالوگ‌ها، بروشور و کتاب‌های راهنمای کاربری تأکید دارد. پودمان ذکر شده حاوی یک لوح فشرده (CD) آموزشی نیز می‌باشد. در این لوح مطالب ارائه شده در درس به زبان اصلی بیان می‌شود تا راهنمایی در خواندن و گفتار باشد.

هنرجویان عزیز شما می‌توانید علاوه بر کتاب همراه هنرجو، فرهنگ تخصصی لغات را در فرایند یادگیری و ارزشیابی به‌همراه داشته باشید.

## Technical words And Expression

<b>Mineral</b>	A homogeneous, inorganic, often crystalline, naturally compounds which are found in the earth.
<b>Gangue</b>	The commercially valueless material in which ore is found.
<b>Mine</b>	excavation in the earth for the purpose of digging out minerals
<b>Mining</b>	process of working mines
<b>Ore</b>	A mixture of minerals and gangue from which at least one of the matals can be extracted.
<b>Deposits</b>	A natural occuring of a useful mineral or ore in sufficient degree of concentration to invite exploitation.
<b>Reserves</b>	ore bodies that may be worked at some future time
<b>Geology</b>	science of the history and development of the Earth
<b>Proven reserves</b>	the reserve that meatured with exploration method with certainly 95%
<b>Probable reserves</b>	the reserve that meatured with exploration method with certainly 75%
<b>Possible reserves</b>	the reserve that meatured with exploration method with certainly 60%
<b>Resources</b>	an ore body which can be used for mining
<b>Zinc</b>	metallic chemical element (Zn)
<b>Copper</b>	metallic chemical element (Cu)
<b>Iron</b>	metallic chemical element (Fe)
<b>Lead</b>	metallic chemical element (Pb)
<b>Chromate</b>	metallic chemical element (Cr)
<b>Manganese</b>	metallic chemical element (Mn)
<b>Coal</b>	A natural carbon compound that use for fuel.
<b>Gold</b>	malleable precious yellow metal (Au)
<b>Silver</b>	precious metal that used to make jewelry (Ag)
<b>Metal</b>	any of several solid mineral elements (such as gold, silver, copper, etc.) that are malleable under heat or pressure and can conduct heat and electricity
<b>Metallic</b>	similar to metal
<b>Grade</b>	assey of element in an ore that measurd with Chemical Analysis
<b>Indications</b>	sign of a ore body
<b>Field</b>	a large area containing valuable ore
<b>Prospect</b>	search an area for valuable mineral

### Part (1): Mine and Mining Industries in Iran

Iran is rich not only in oil and gas, but also in mineral deposits. Iran has the world largest zinc reserves and second-largest reserves of copper. It also has important reserves of iron, lead, chromate, manganese, coal, gold and ...

Economic geology of Iran is one of the best in the world from a mining perspective point of view. Proven & Probable reserves of metallic and non-metallic deposits are > (more than) 55Bt (billion ton), with 62 known types of mineral deposits and >5,500 known ore deposits and indications, a number which are inactive or not yet developed. The mining sector has a main role in Iran's economy. About 30 percent (30%) of the countries investment has been made in the mining field in recent years. Over 200 iron ore deposits (Reserves of >4.5Bt grading 45-60% ~3% of global reserves, 45 manganese ore deposits (e.g. Robat Karim >300Mt Mn) and 500 ore deposits of copper are known in Iran. Presently there are 10 active copper mines in Iran whose reserves amount to 3Bt of ore, containing 30Mt Cu comprising 9% of the worlds known copper reserves.

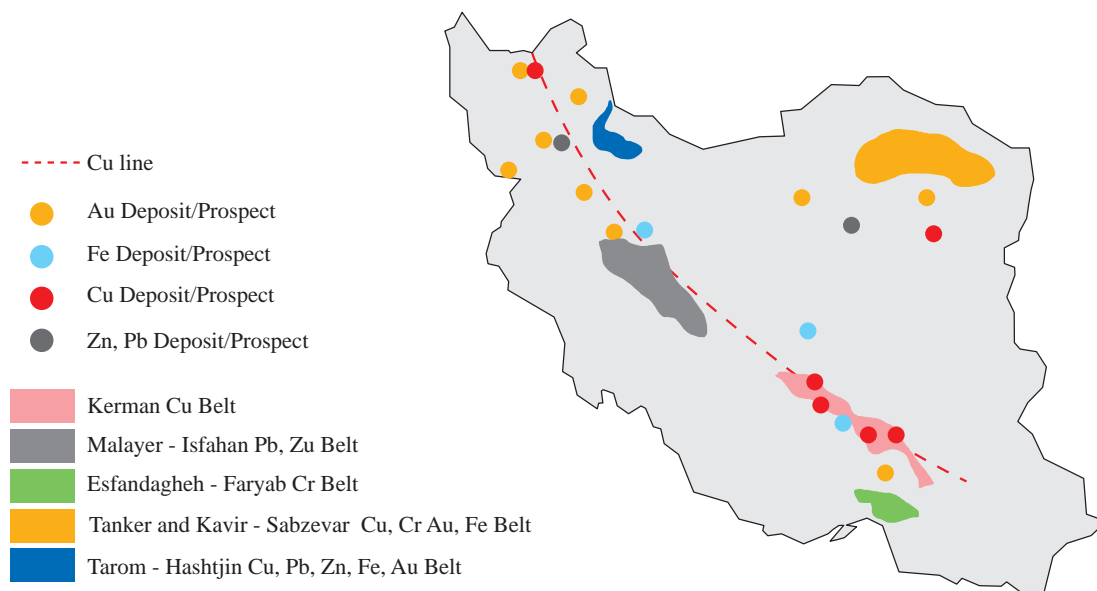


Figure) Areas with the potential of metallic mines

## Technical words And Expression

copper belt	a large continuous stretch area with similar Geological properties that have potential for copper mineralisation
porphyry	a texture of rock that have a disseminated mineral on non-granular background
drilling	act of boring a hole
discovered	a ore body that find with exploration method
fluid inclusion analysis	a method of mineralogy study
mineralization	a location that making into naturally minerals
exploration	examination, checking; searching to unknown regions with geological method for ore
alloys	mixture of metals

### Copper Ore in Iran



Native Copper



Copper Ore



Copper Product

Iran's copper reserves, which account for 4% of the world's total reserves, amount to approximately 2,600 million tons. According to the reviews made, Iran is situated on the global copper belt which stretches from northwest to southeast of this country.

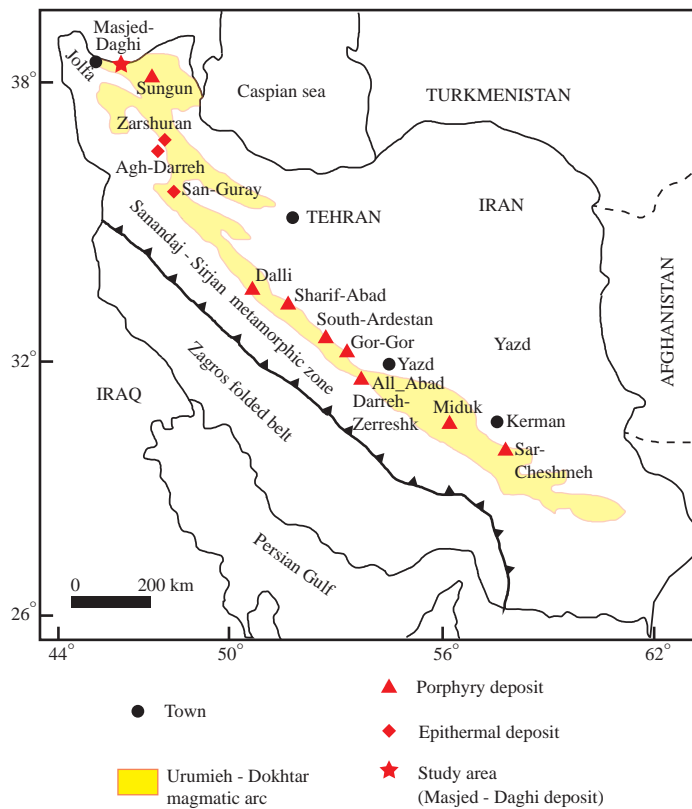


Figure) Iran copper belt

During the 1960s and 1970s, geologic surveys by the Iranian government led to the systematic recording of known deposits, as well as the search for new ones. As a result, about 250 copper occurrences and several potentially viable projects were recognized, including the Darreh-Zerreshk and Ali Abad porphyry systems. At the same time, prospecting and drilling was underway at Sarcheshmeh. Sungun deposit was discovered in the 1970 when fluid inclusion analysis suggested the presence of mineralization similar to that found at other world's large copper deposits.

In 1972, Sarcheshmeh Copper Mine of Kerman was established. By 1977, about half the country had been surveyed from the air, but less than one-fifth had been explored on the ground.

Over the past 10 years, the Exploration Companies had exploration efforts for porphyry copper deposits, particularly in the northwestern Arasbaran and southeastern Kerman regions of the country.

Sarcheshmeh and Meiduk in Kerman Province and Sungun in eastern Azerbaijan Province are the three largest porphyry copper mines in the country.

## Iron Ore in Iran



Iron Ore



pellet



Iron product

Today, iron and steel industries are one of the most basic economic and social foundations of the world and this is because of the essential need of human beings to advance their life.

These Industries product plays important roll in our life; because in addition to its application in the field of construction, bridge, building, shipbuilding and locomotive manufacturing industries and constitutes the foundation of machinery technology in the form of different alloys.

The discovery of an iron axe dating back to 3000 B.C.(Before Christ) inside a Sumerian tomb in south of iron ore extraction and use of iron by man had been common since about 3000 years B.C. and was mainly practiced in Egypt, syria, China, Iran, and India. Some of the works of that period have been discovered in Neyriz, Fars Province, and in Golgohar, Kerman Province. At first, man used natural iron ore with different degrees of purity.

The use of pure iron was made possible in about 1300 years B.C. when presumably pure iron was extracted accidentally as a result of intense heating of mineral rocks by charcoal.



Figure) Ancient iron tools in Iran

The iron ores from which iron is extracted are mainly in the form of iron oxides, such as magnetite or hematite, with 2-20 percent of impurities (such as silicate and aluminates). The impurities are separated from the iron in the furnace.

Major iron ore producing companies and complexes in Iran are Chadormalu Company, Golgohar Company, Iran Central Iron Ore, Sangan, Sirjan, Jalalabad, Mishdovan and Iran Central Plateau.

Chadormalu, Golgohar and Sangan are considered the largest iron ore mines in Iran and the region. Experts describe Sangan (situated about 300 km southeast of Mashhad, Khorasan Razavi Province, and near Afghanistan border) as the “Mineral Assalouyeh” of Iran believe it has a very high mineral potential.

### Technical words And Expression

<b>Extraction</b>	taking out ore from mine
<b>Furnace</b>	A device which generates heat (for heating homes, melting metals, etc
<b>Impurities</b>	quality of being unclean or contaminated
<b>Limestone</b>	sedimentary rock which contains mainly calcium carbonate
<b>Blastfurnace</b>	tall cylindrical furnace used for melting metal and iron from ore by way of heat intensified by a blast of air
<b>Slag</b>	Waste matter separated from metals during the smelting of ore.
<b>Molten iron</b>	liquefied iron by heat
<b>Coal bricket</b>	the small block of coal
<b>Purity</b>	Freedom from contamination.
<b>Power plant</b>	an installation where electrical power is generated for distribution
<b>Steel Mill</b>	factory that processes prouduct of steel
<b>Coal-rich</b>	concentration of coal
<b>Region</b>	Especially part of a country or the world having definable characteristics but not always fixed boundaries.



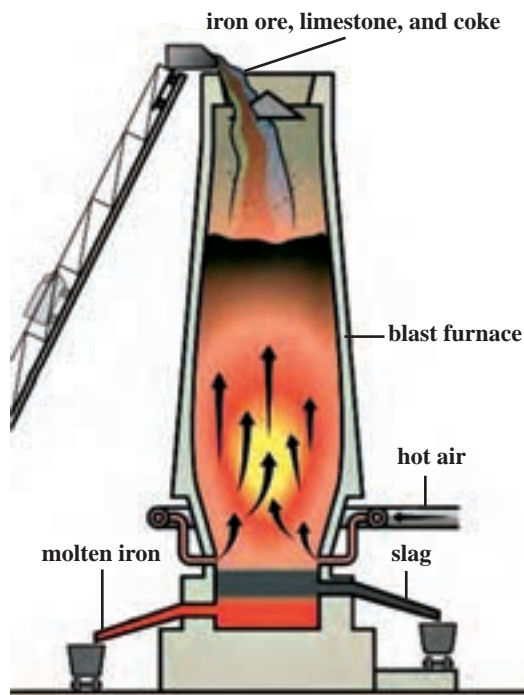
## Coal Reserves in Iran



Coal



Coal briquet



Blast Furnace

Coal is one of the oldest sources of energy supply. At their time, countries that had access to coal resources could make power in the industry and development. The purity of coal and low depth of the mineral in those mines have been one of their advantages and are still very important.

Iran's coal is divided into two groups in terms of consumption market.

- 1 Coke coal which is mainly consumed in the steel industries and
- 2 Thermal coal which is mostly consumed in coal power plants.

The coke coal mainly supplies the demand of steel making factories with blast furnace method and Isfahan Steel Mill is almost its sole customer.

Iran's coke coal reserves are more than 1.1 billion tons. If Iran is divided into four main coal-rich areas, the total coal reserves of the country will be as follows:

- 1 Coal-rich Tabas region
- 2 Coal-rich Central Alborz region
- 3 Coal-rich Kerman region
- 4 Coal-rich East Alborz region
- 5 Other coal-rich regions

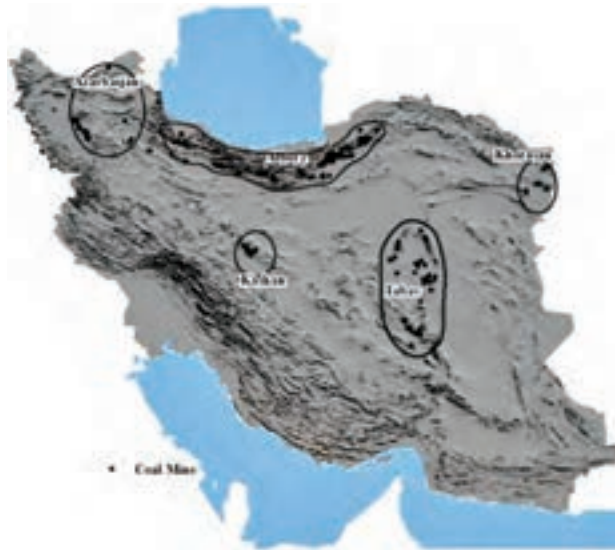


Figure) coal reserve position in Iran

### Lead and Zinc Ore in Iran

Iran by possessing 3% of the total world reserves of lead and zinc is the fourth producer of lead and zinc concentrate in Asia after China, Kazakhstan and India.

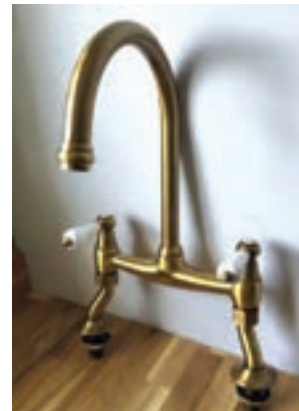
Zinc is a white and bright metal with a bluish gray appearance and is not found in the nature as an element. It has low toxicity and is flammable in powder form. It is used in many industries such as manufacture of kitchen tools, some alloys such as brass and bronze and in battery production.



Zinc Ore



Zinc Alloyes

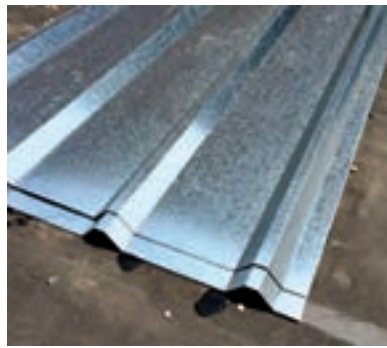


Zinc alloy Product

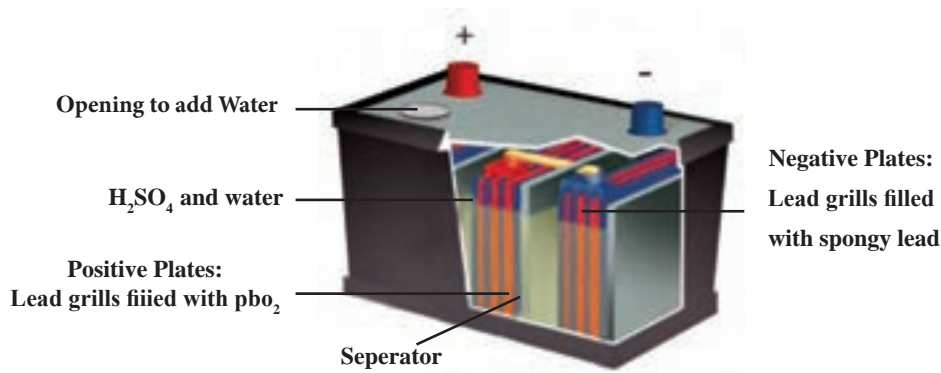
Lead is a gray, soft and heavy metal. It does not catch fire and is toxic in the form of powder or vapor. It has little electric conductivity and absorbs sound waves well. About 50% of the lead in the world is used in production of galvanized metal. Lead is used in production of storage battery (car battery).



lead Ore



galvanized metal



storage battery

Iran in terms of geology and structure has several important lead and zinc mineralization poles such as the zones in Sanandaj, Sirjan, Alborz and central Iran where large mines such as Angooran, Mehdiabad, Haft Emarat, Irankouh, etc. are located.

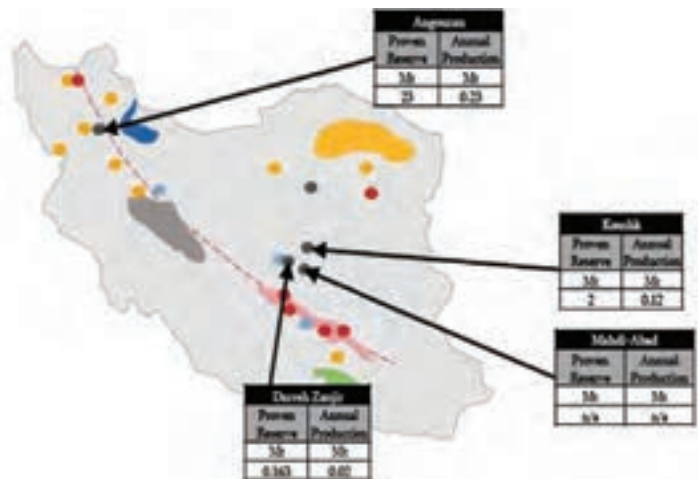
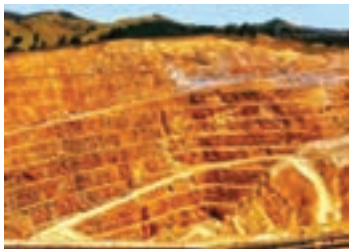


Figure) the biggest Zn-Pb Mine in Iran

The high purity and structure of lead and zinc in Angooran mines (in Zanzan Province) and also volume of lead and zinc mine reserves in Mehdiabad (in Yazd Province) are unique in the world. The amount of lead and zinc reserves in Iran is about 300 million tons which annually an average of about 5.1 million tons are extracted.

## Gold Ore in Iran



Gold mine (Zarshouran)



Gold processing plant



Gold ingut

In Iran you can find also gold and silver mines that were operating in the past, some measure was taken to exploit gold mine. same of the Irans gold mine are:

The **Muteh** gold mine, located near meymeh city.

The **Zarshouran** gold mine, located in West Azarbayjan Provence.

The **Agh Darreh** gold mine, located in West Azarbayjan Provence.

Today, approximately 3 tons of gold is produced annually in Iran, and according to the Twenty Year Economic Perspective document, it is set to reach 5 tons per year by 2025.

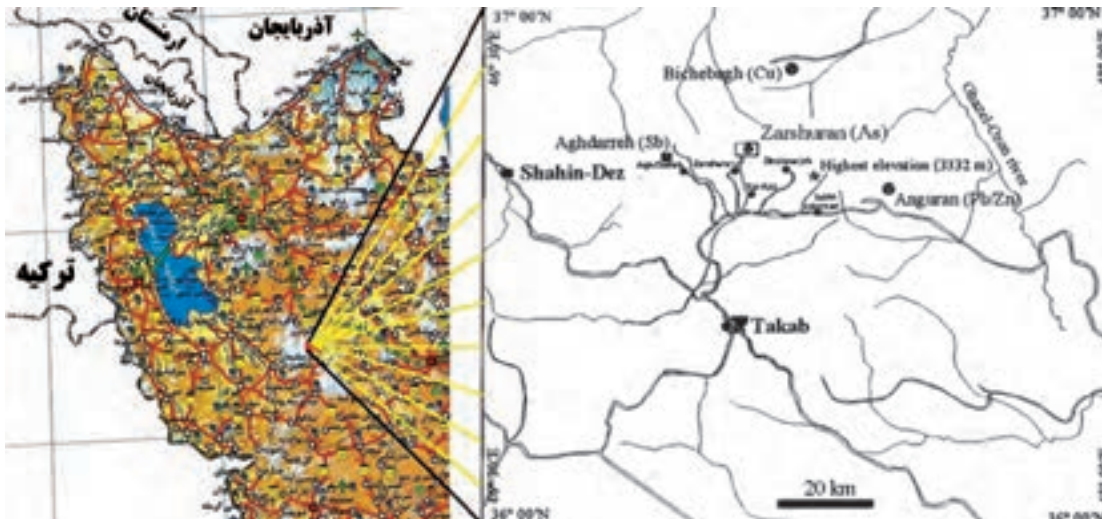
### **Zarshouran Gold:**

A long history of civilization in the Takab region (Takht-e Soleyman) indicates that this mine has been known since the Maad and Sassanid periods. More over, the mining works found during these periods include the use of placers and washing gold-bearing sands.

Zarshouran, the largest gold mine in Iran, is located 35 km from the city of Takab and 15 km from Takht-e Soleyman, a cultural heritage and tourism complex.

The mine is located at Zarshouran village, in geological Map 1:250,000 and geographical coordinates: latitude 36–37 degrees and longitude 46–48 degrees. The area can be accessed via an asphalted road (Shaheen- Dezh-Takab and Zanzan- Dandi-Takab).

Zarshouran reserves evaluated 11.5 million tons with an average grade of 7.9 ppm; as a result, discovered the existence of 88 tons of pure gold in the mine.



(Figure) Zarshuran Location Map

**Please Complete the sentences and answer the questions**

Iran has the world largest ..... reserves and ..... reserves of copper.  
Iran is situated on the global ..... which stretches from ..... to ..... of this country.  
..... and ..... in Kerman Province and ..... in eastern Azerbaijan Province are the three largest ..... copper mines in the Iran.  
Where were the first Iron discoveries in Iran?  
What are the two types of iron Oxides ore?  
Write the name of four Major Iron ore producers companies in Iran.  
What is coal?  
What is the consumption market of coal in Iran?  
..... is a white and bright metal with a bluish gray appearance and is not found in the nature as an element. It has low toxicity and is flammable in powder form.  
Lead is .....  
What is the important used of zinc and lead in industry?  
The high purity and structure of lead and zinc in ..... mines (in ..... Province) and also volume of lead and zinc mine reserves in ..... (In ..... Province) are unique in the world.  
Where are located the important Iran's gold mine?  
What is the zarshouran mine geographical coordinates?  
Zarshouran reserves evaluated ..... million tons with an average grade of ..... ppm;

as a result, discovered the existence of ..... tons of pure gold in the mine.

## **PART (2): Safty in mine**

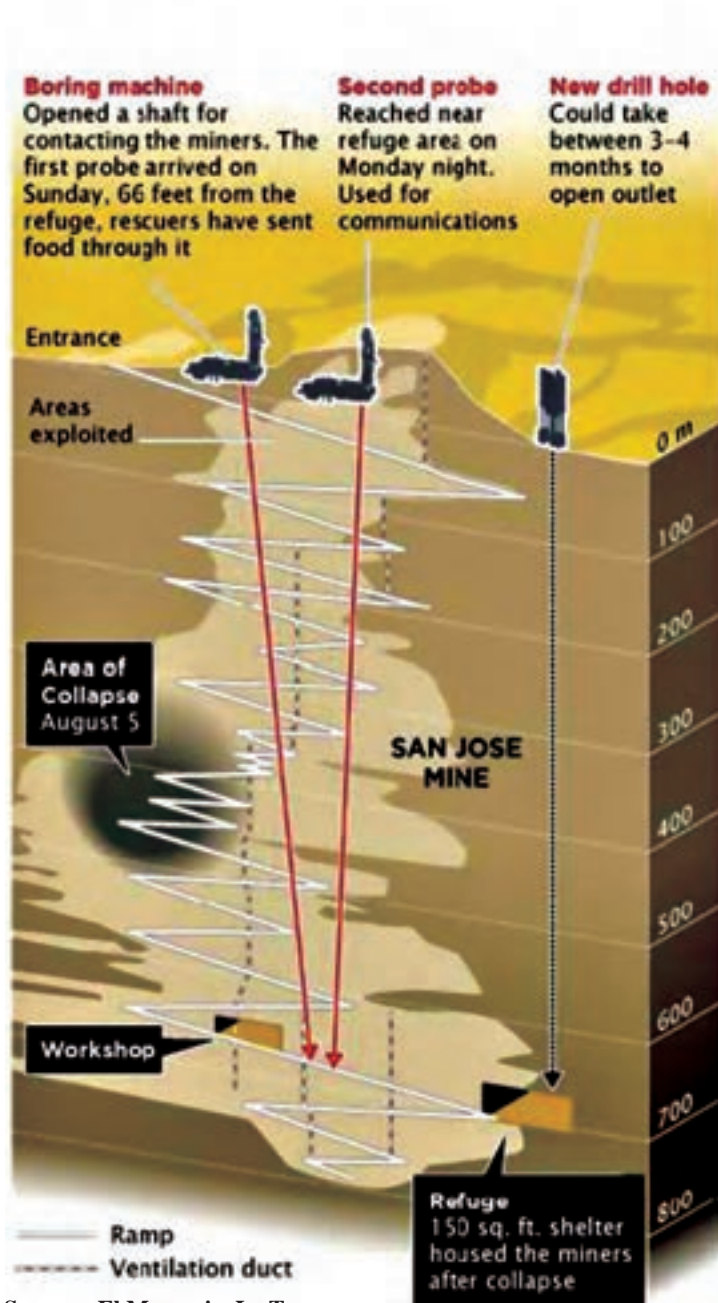
### **Technical words And Expression**

<b>Exploitation</b>	the process of mining and removal of mineral from a mine
<b>Borehole</b>	hole drilled in the Earth
<b>Ramp</b>	a slope or inclined plane for joining two different levels
<b>Shaft</b>	any vertical passage way on underground mining method
<b>Miner</b>	one who works in a mine
<b>Ventilation</b>	the provide of fresh air to aunderground mine
<b>Collapse</b>	fall apart
<b>Helmet</b>	a hard or padded protective hat
<b>Soil</b>	uppermost part of the earth's crust which consists of humus mixed with rocks and minerals
<b>Assembly</b>	gathering; act of putting together parts
<b>Wireless</b>	a communications without wires

This picture shows how rescue the miners Trapped in the mine

### CHILEAN MINERS RESCUE

Rescue workers began mounting a large drilling machine on Tuesday that will allow them to rescue 33 miners trapped for 19 days underground



### DRILLING AN ESCAPE SHAFT

Raise Borer Strata 950

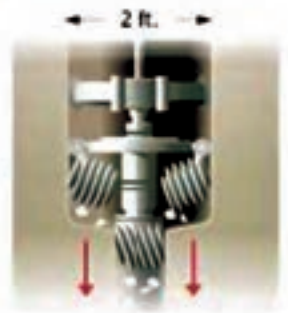
1 Equipment weighs 44 tons and utilizes concrete slabs. Assembly has been started and should be ready to start drilling by next week



2 Will first drill a vertical pilot shaft through solid rock, all the way down to the depth required



3 When it reaches the desired depth, additional drills are used to make the hole wide enough to accommodate the passage of a person



4 Miners are lifted up to the surface in a capsule which passes through the widened shaft



Note: Diagrams not to scale

Sources: El Mercurio, La Tercera

Estudio R. carrera for Reuters

Look at the picture, and learn the Safty rules and use them in mining activities



Look at the picture and write the name of each equipments



No.	Equipments Name
1	
2	
3	
4	
5	
6	
7	
8	
9	

Warning signs

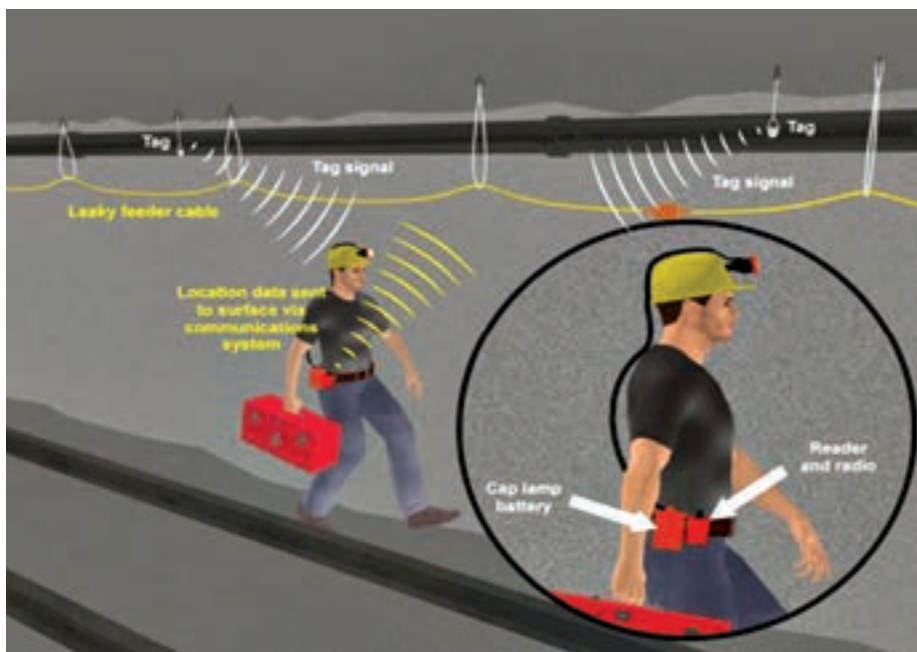
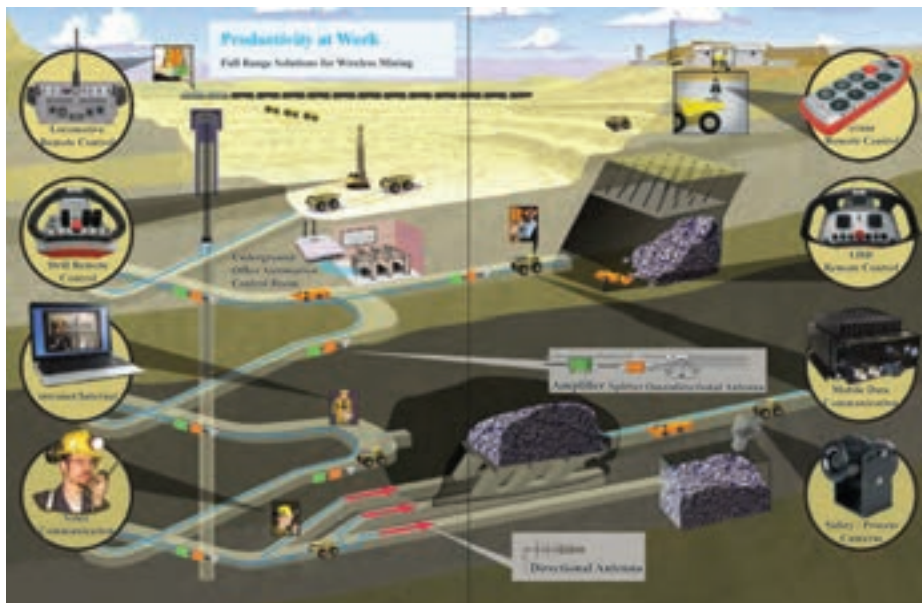
Look at the pictures, do you know meaning, Explaine each of them





### Mine communications Equipments

Communication systems have important role in the mine. With this system one can has access to the different part of the mine very short time; in the following picture you see the wireless communication mine system



Vocabulary practice:

What is exploitation?

What is ramp?

What is wireless?

Who is a miner?

List the mine communications equipment?

## PART (3): Drilling and Sampling

### Technical words And Expression

<b>Feed Frame</b>	a strong pieces that give feed, force or Ore to the another part
<b>Wireline</b>	a kind of drilling method
<b>Mast</b>	long pole above the drilling rig
<b>Rod</b>	a type of pipe that use in drilling
<b>Pump</b>	machine used to move liquids by suction
<b>Core</b>	the column of rock that take out with drilling from the earth
<b>Bit</b>	the cutting edge of a drill
<b>Drilling rig</b>	drilling machin
<b>Mud</b>	soft, sticky matter resulting from the mixing of earth and water

A multitude of features  
that make the difference



### The mast and feed frame

The mast is carrying the full weight of the drill string. The feed frame is over 3 m long and use for rod changes.

### **Main hoist and wire–line system**

Main hoist has chosen to use for removal of drilling rigs parts. The main wire hoist is used as the wire–line system for core removal.

### **Hydraulic jacks and mast dump**

Hydraulic jacks and mast dump getting a rig into position ready for drilling can be time consuming. Once in place the inte- grated hydraulic jacks are lowered to stabilise the rig. Then the mast is raised into position while the mast dump slides the feed frame into place.

### **Rod holder**

Rod holder Placed at the base of the feed frame. This safety measure means the rod is always clamped in place when the drilling rig is shutdown.

### **Rotation unit**

Rotation units are the muscles of a drilling rig. The rotation units give an extremely wide range of speeds and torque.

### **Flush pumps**

Flush pumps make sure the right amount of water is pumped into the hole at the right pressure. It also facilitates cuttings and mud removal, cooling and stabilization of the hole.

### **Diesel engines**

Diesel engine provides the mine force for drilling rig.

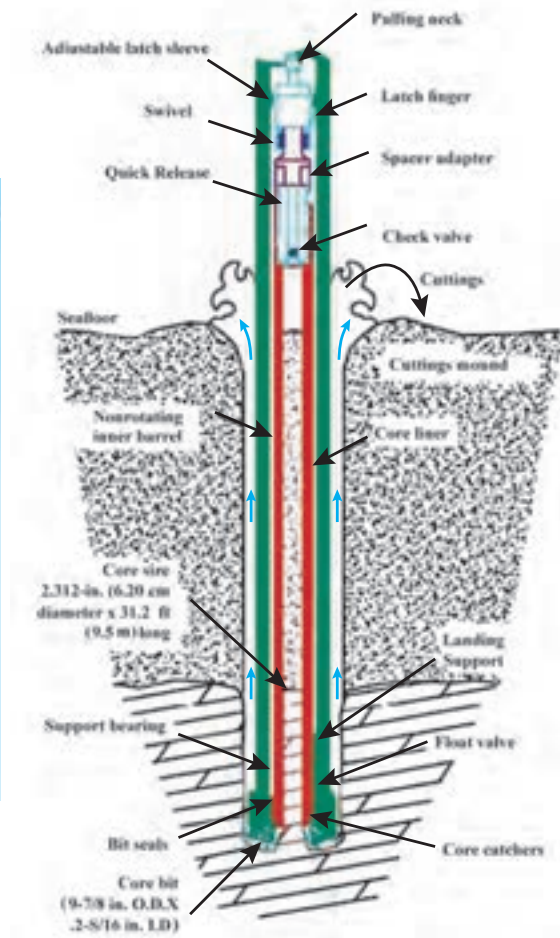
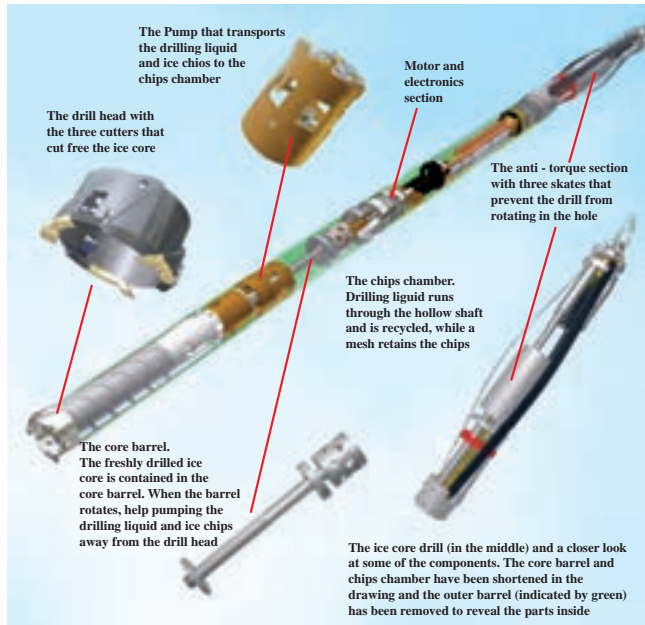
### **Separate hydraulic oil cooler**

Separate hydraulic oil cooler Keeping cool is not easy when you're drilling for core samples at temperatures of 50°C. This unique feature is mounted away from the engine and facilitates efficient cooling of the hydraulic oil.

### **Control panel**

Control panel, controls work perfectly. The control panel is mounted on a platform that facilitates an excellent overview of the drill and work site.

## Inner bore hole component of a Core drilling rig



### Vocabulary and expression practice

Describe the following drilling equipments:

**Mast**

**Rod**

**Bit**

**Wireline**

**mud**

List the important inner borehole component of a core drilling rig.

## Sampling

<b>Sample</b>	take a small part of something for determine the quality by expermental methodes
<b>Soil</b>	uppermost part of the earth's crust which consists of humus mixed with rocks and minerals
<b>analysis</b>	detailed examination of the elements or structure of something
<b>geochemical</b>	an exploration method for taking sample and do processing the analysis chemical result
<b>stream sediment</b>	matter that settles to the bottom of a river
<b>Sieve</b>	a instrument consisting of a wire or plastic mesh held in a frame, used for separating coarser from finer particles
<b>shovel</b>	tool with a handle and a broad scoop used for digging or lifting and removing material
<b>outcrop</b>	part of a large rock which exposed to the surface
<b>chisel</b>	tool with a sharp metal edge that is used to shape and cut wood and stone
<b>libration</b>	the process of setting somethings free from attached materials

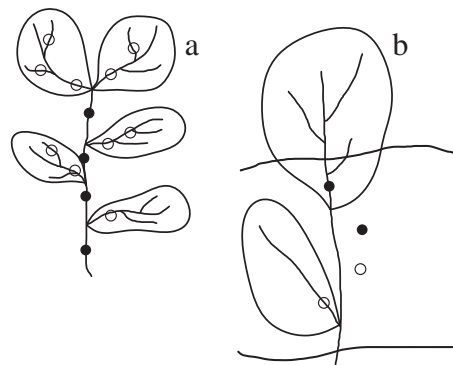
Take a part of things like Rock, Soil, and water and ... that shows the properties of them. In mining and geology sampling is used for geochemical analysis or microscopy. Some of the important sampeling methods are:

### **I** stream Sediment sampling

One of the most widely used methods in regional geochemical approaches is the stream sediments sampling. For taking sample, digging and remove the 15-20 cm top soil and then sampling. The tools are used Sieve and shovel.

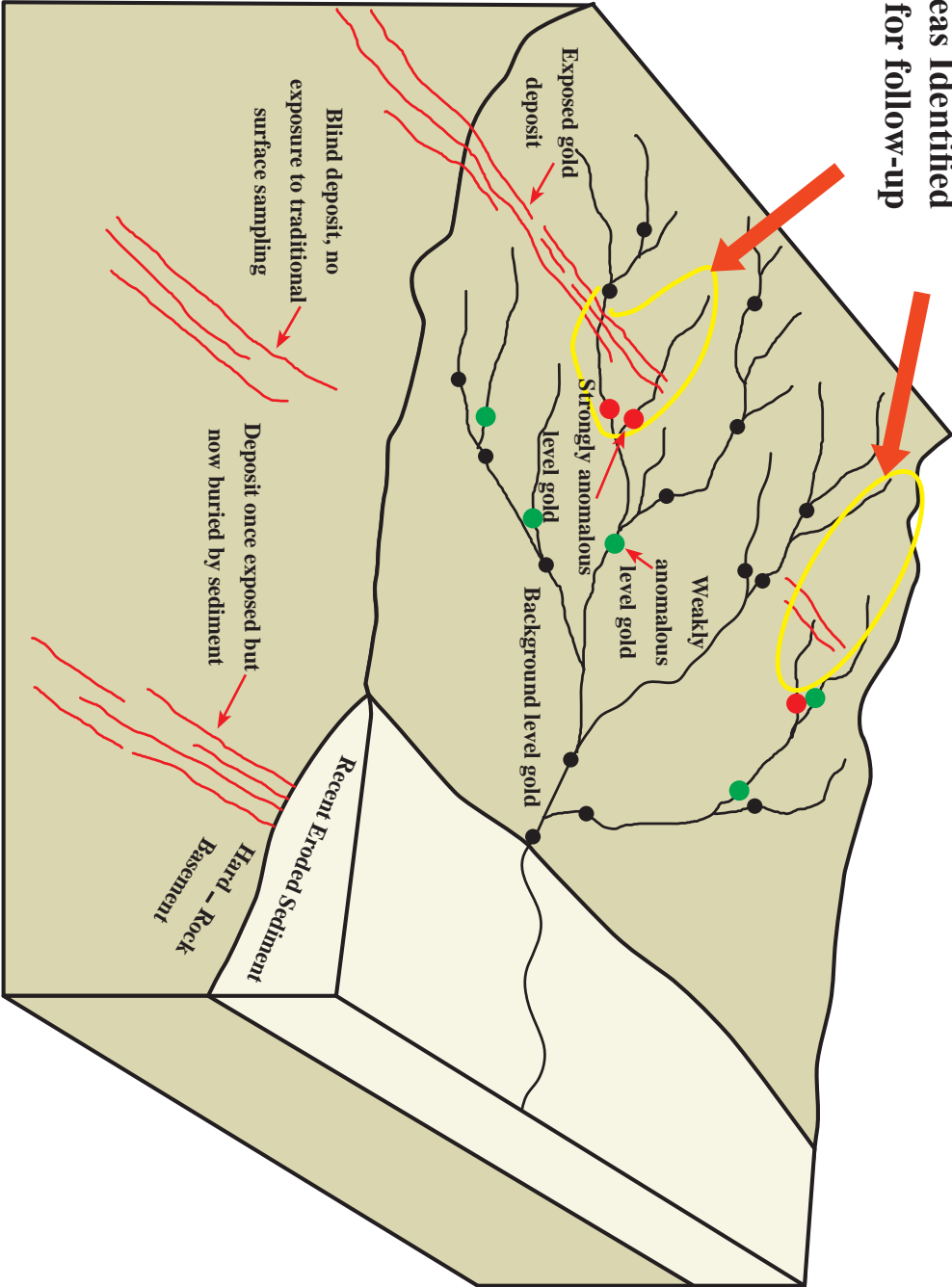


- Sample collected from high stream order
- Sample collected from low srream order



- Sample including different geological unit
- Sample including on geological unit geological limit

**Areas Identified  
for follow-up**



**2** chip sampling

This method is used to take samples from an outcrop. The tools are used hammer and chisel. Samples are taken at the surface fresh and clean.



**3** channel sampling

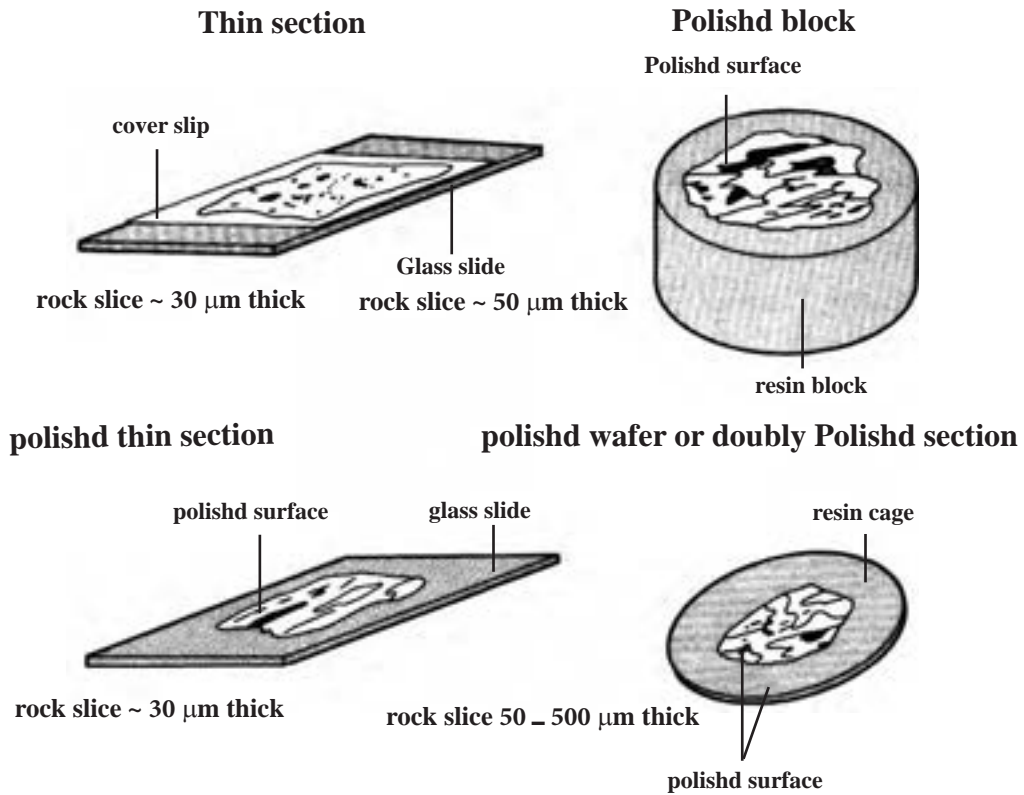
This method can be used for continuous sampling in the surface and also in an underground mine. The tools are used cutting stone machine, hammer and chisel.





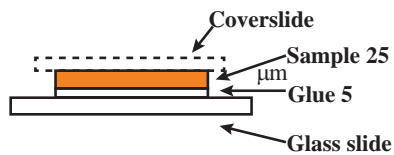
**4** Thin and Polished section

The following pictures shows different part of thin section, Polished block and polished thin section sampels

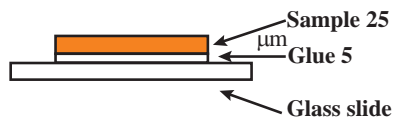


**Types Of Thin Sections**

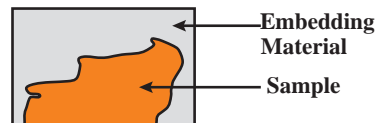
**1) Thin Sections (+ cover glass)**  
For transmitted light



**2) Polished Thin Sections**  
For transmitted & reflected light

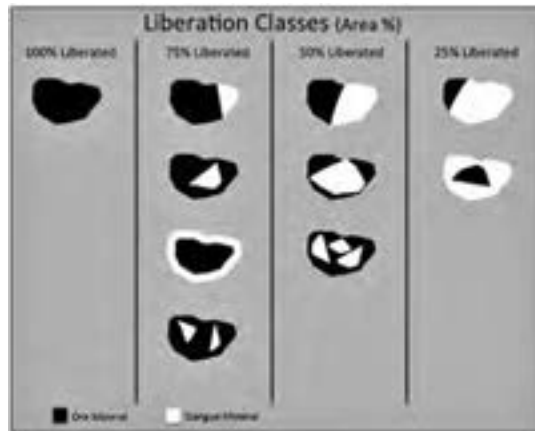


**3) Polished Sample**  
For reflected light only



Liberation:

Liberation is crushing and or milling the Rock for liberate the ore minerales from gangue mineral



**Please Complete the table and answer the question**

Explain sampling and list the differents type of sampling?

Complete the blank cell in the table

	Thin section	Polish section
parts		

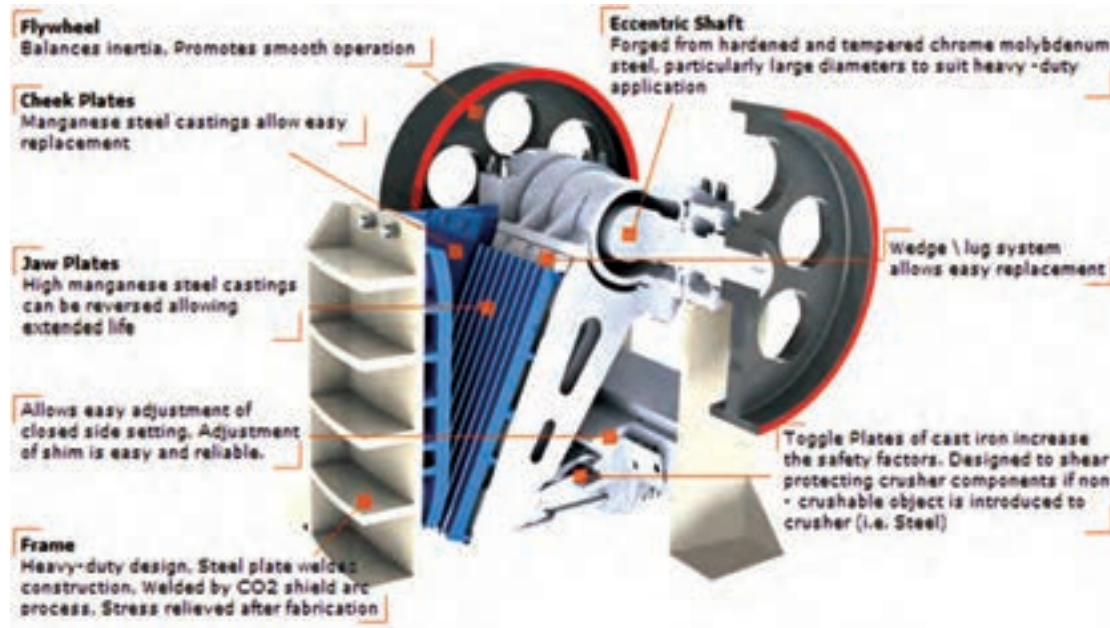
**PART (4): Crushing and milling**

**Technical words And Expression**

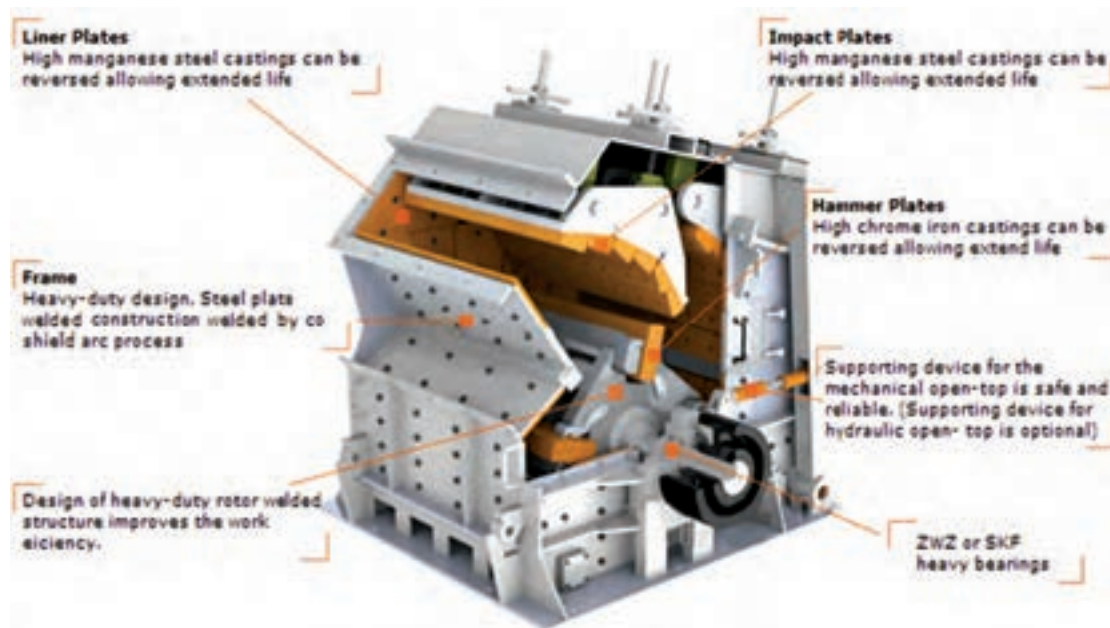
<b>Crusher</b>	the machine that use for brocking rockes
<b>mill</b>	A machin for grinding the product of crusher to the finer particels
<b>Screen</b>	a instrument consisting of a wire or plastic mesh held in a frame, used for separating coarser from finer particles
<b>Rock</b>	hard material on the outer crust of the earth
<b>Shell</b>	hard outer cover
<b>Frame</b>	a structure that surrounds something such as a door or window
<b>Feed</b>	an act of giving ore to mineral processing instrument like Jaw crusher
<b>Discharger</b>	a device that do all things is required to allow (a liquid, gas, or other substance) to flow out.
<b>Hammer</b>	tool with a hard solid head

## Crusher

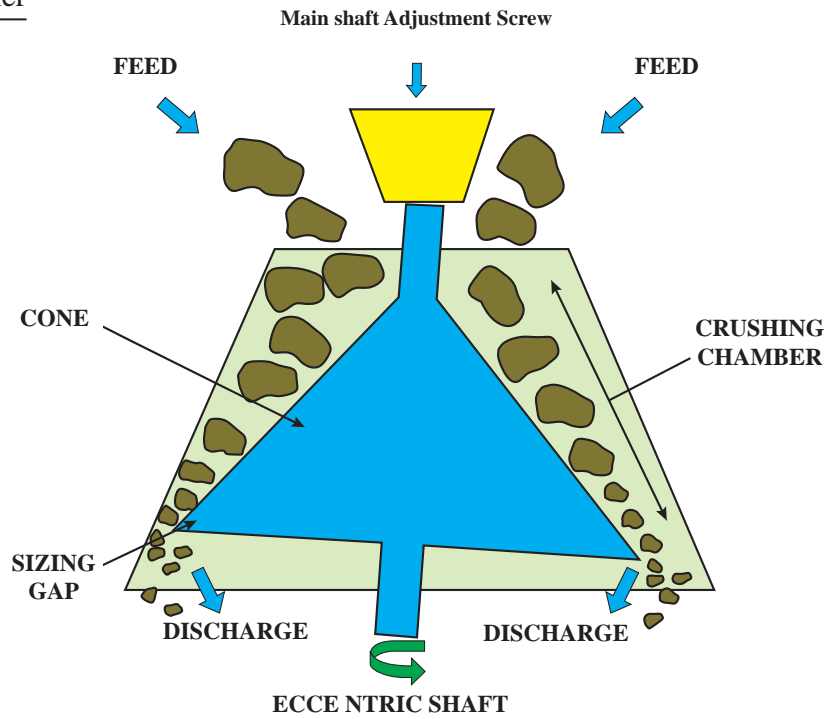
### Jaw Crusher



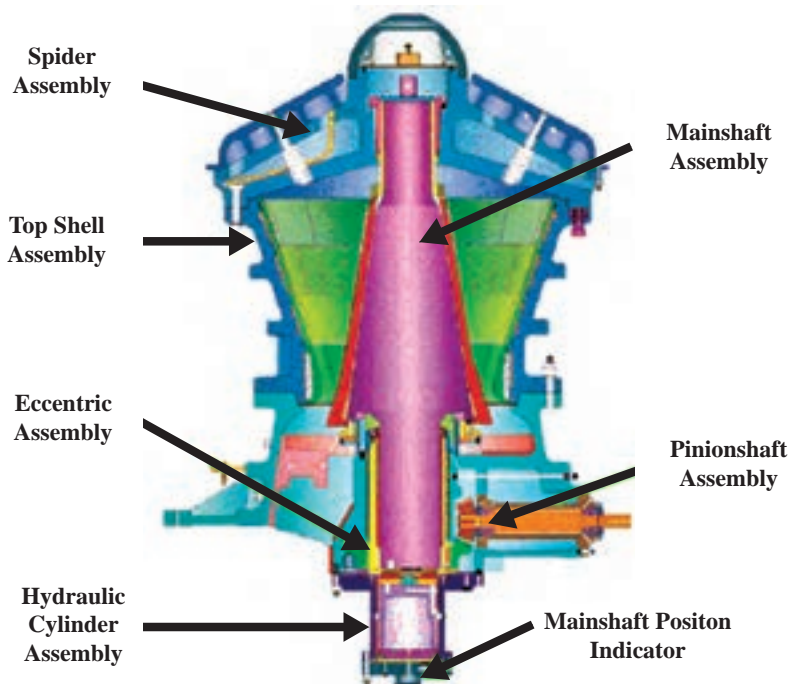
### Hammer Crusher

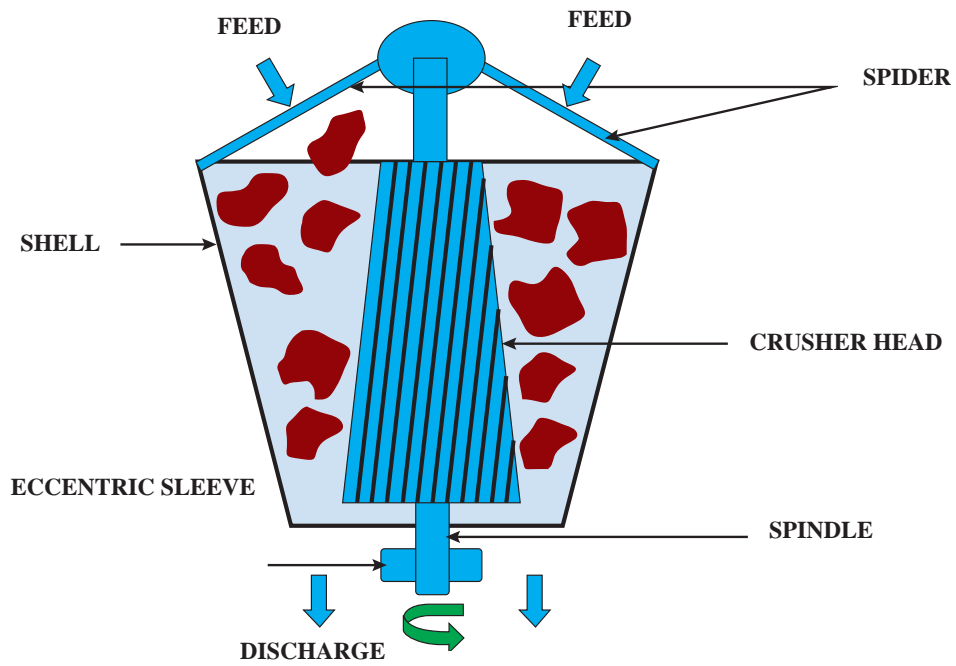


## Cone Crusher

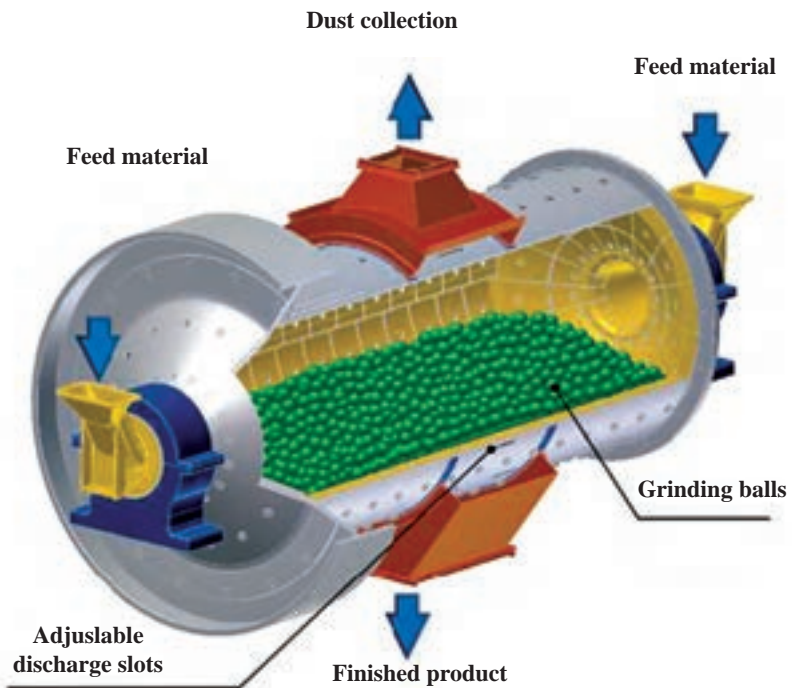


## Gyratoiry Crusher





Ball mill



**Please answer the question**

What is feed?

Write the name of first level crushing machine.

List the different part of a cone crusher machine?

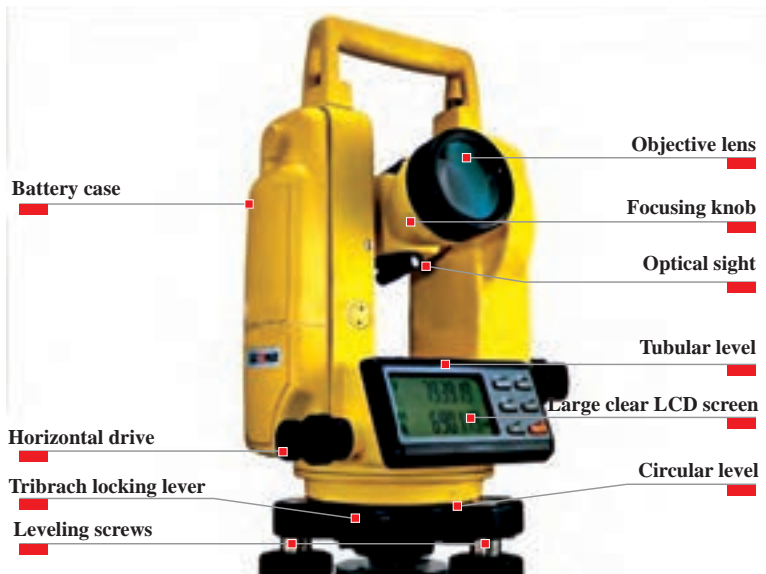
What is mill?

**PART (5): Survaying and blasting**

**Technical words And Expression**

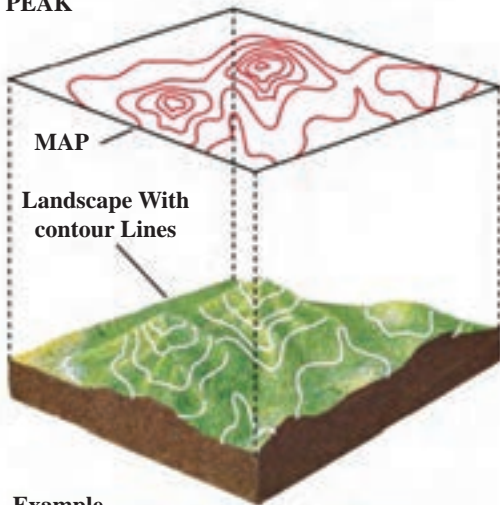
<b>Surveying</b>	measure and record the characteristics of a plot of land
<b>level</b>	device used to determine if a surface is horizontal
<b>leveling</b>	changing the ground level to a flat or softly sloping surface
<b>screws</b>	metal fastener with a spiral grooved shaft
<b>valley</b>	low area of land located between hills or mountains
<b>peak</b>	reach the highest point
<b>landscape</b>	all the visible features of an area of land
<b>contourline</b>	a line on a map joining points of equal height above or below sea level.

**Surveying Equipment**

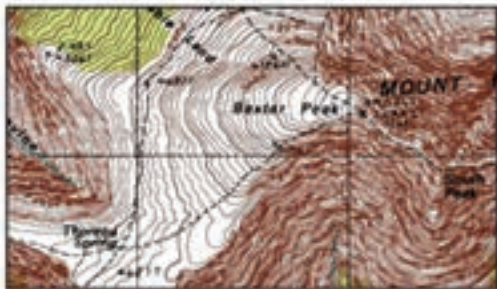




**PEAK**

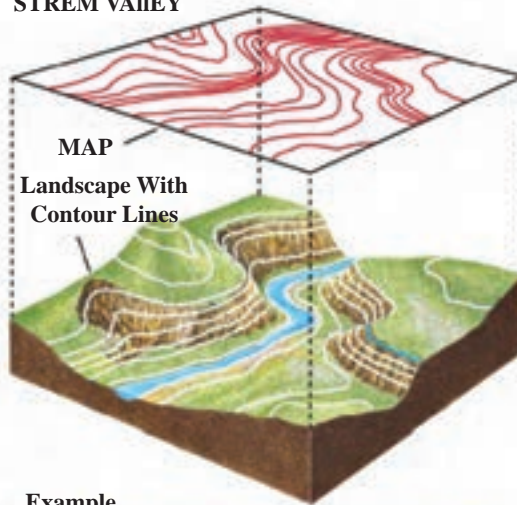


**Example**

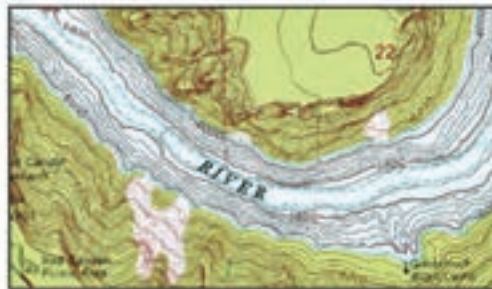


**Mt. Katahdin, Maine**

**STREM VALLEY**



**Example**



**Flaming Gorge, Wyoming**

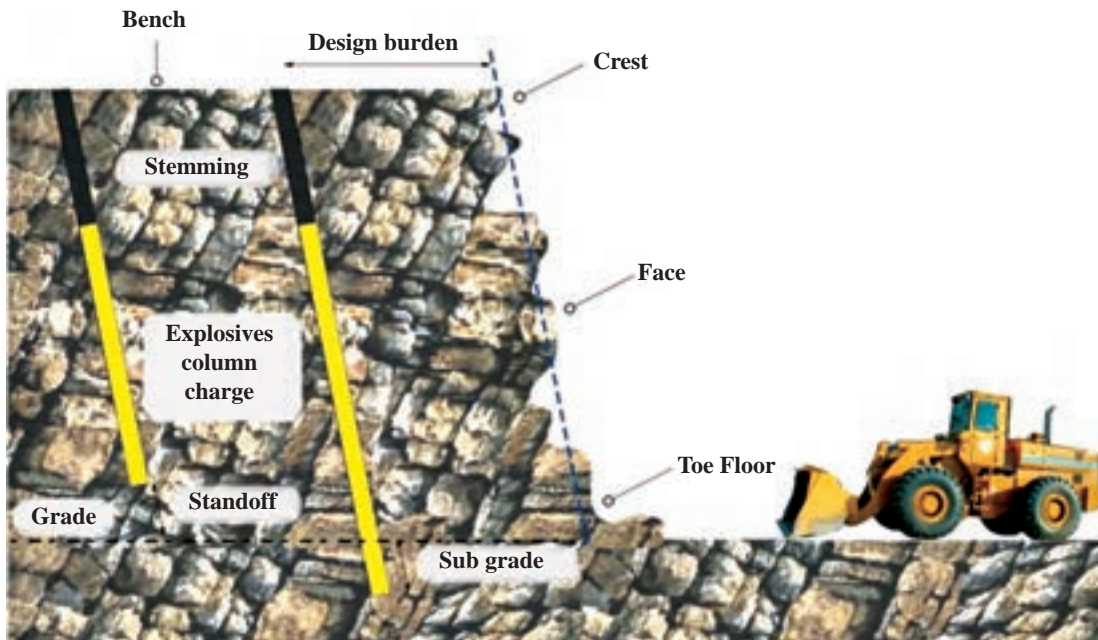
**Please answer the question**

What is leveling screws?

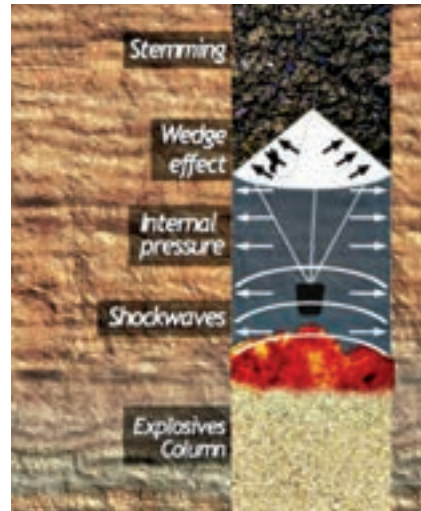
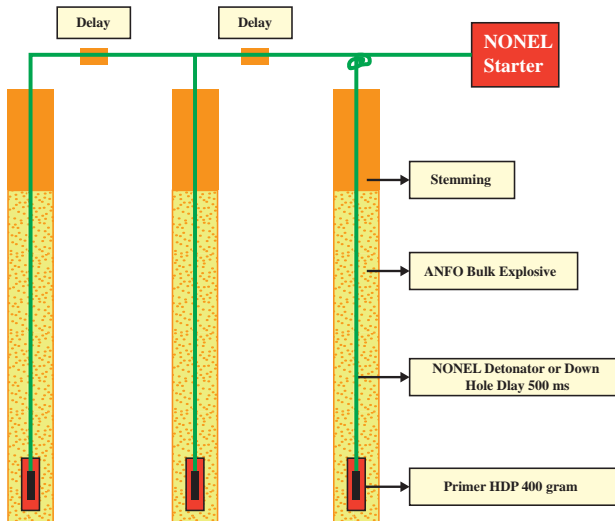
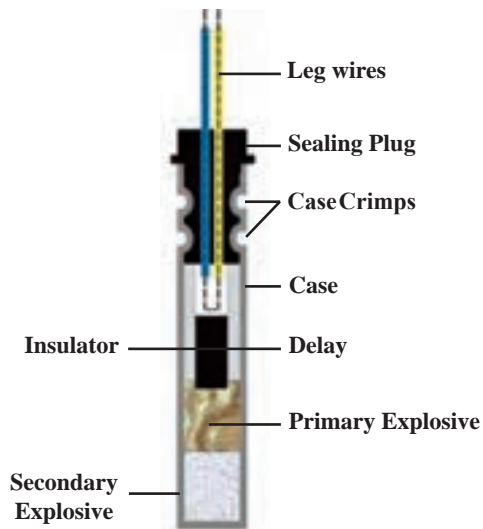
List the parts of a leveling camera.

Blasting

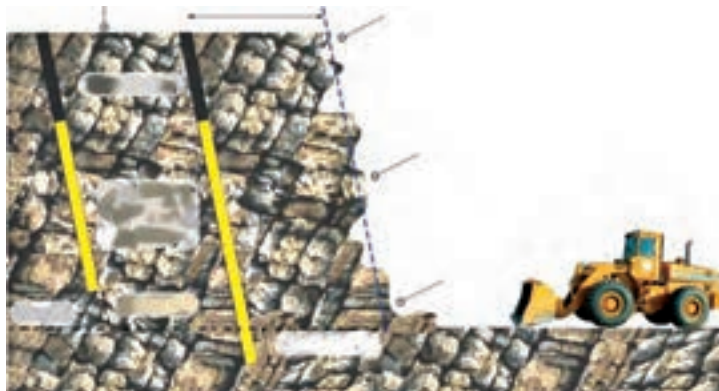
<b>Explosive</b>	chemical compound that when ignited produces a strong blast of energy
<b>Detonator</b>	device for setting off an explosive
<b>bench</b>	a working level in open pit mine
<b>crest</b>	the top of something, especially a mountain or hill.
<b>stemming</b>	to fill in the end of explosive hole with mud
<b>Face</b>	front part of the working area
<b>Toe</b>	the lowest part of the bench
<b>Floor</b>	flat surface at the bottom of the bench
<b>Burden</b>	the distance between first row of hole from the free space







Complete the blank parts in the picture

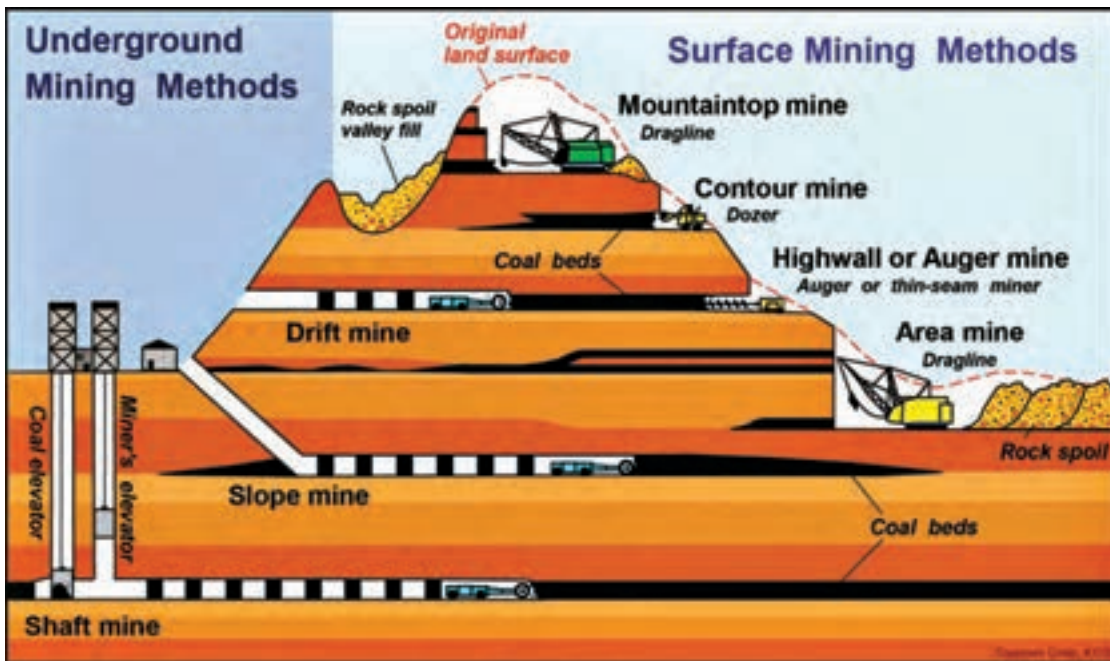


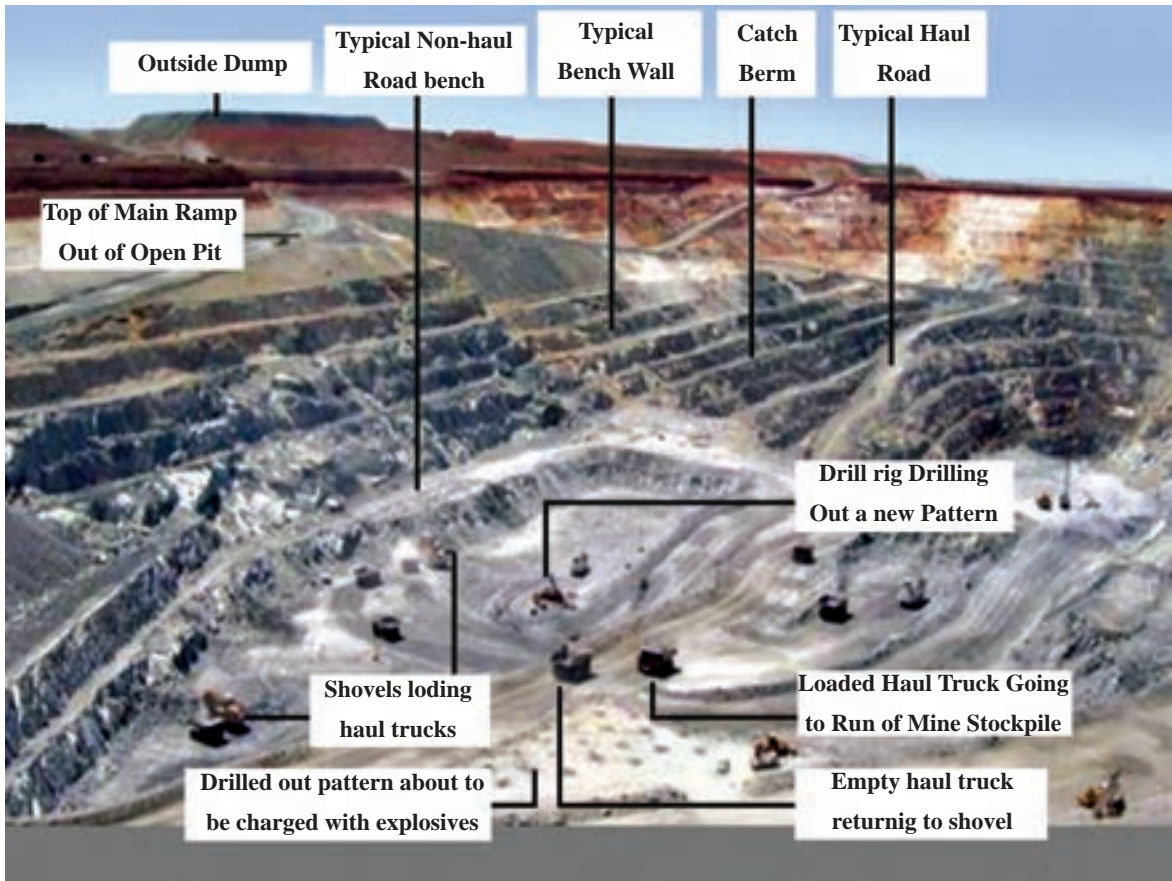
## PART (6): Exploitation

### Technical words And Expression

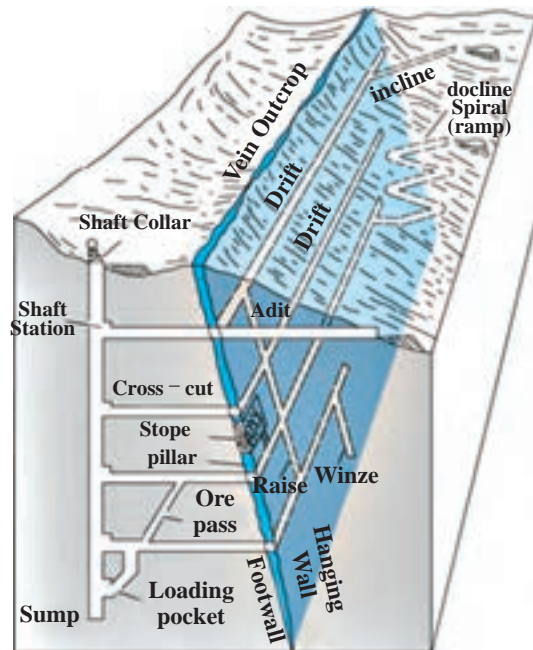
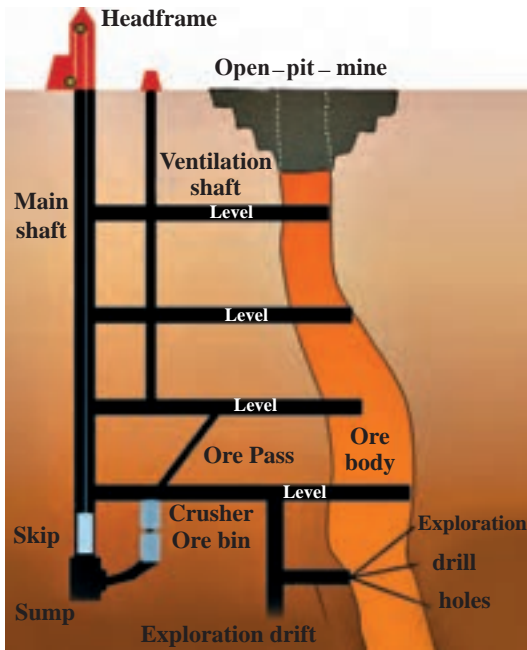
<b>Truck</b>	large vehicle used to carry loads
<b>Underground mining</b>	Excavating mineral deposits by methods that involve shaft or tunnels into the earth
<b>Adit</b>	a horizontal shaft that provides an entrance to a mine
<b>Drift</b>	a horizontal shaft at an under ground working level
<b>Open pit</b>	a surface mine in which working levels like traces
<b>Crosscut</b>	a tunnel connecting drifts
<b>Raise</b>	a shaft driven upward from a drift
<b>Winze</b>	a shaft driven downward from a drift
<b>Stope</b>	the area from which ore is being or has been removed
<b>Sump</b>	a pit where water collects at bottom of a shaft
<b>Slab</b>	flat thick piece of material
<b>Duct</b>	a channel or tube for conveying something like fresh Air
<b>Surface mining</b>	Excavating mineral deposits by methods that do not involve shaft or tunnels into the earth
<b>Shaft</b>	any vertical passage way on underground mining method
<b>Dump</b>	drop something together
<b>Valve</b>	device that controls the flow of a liquid through a pipe
<b>Ventilation</b>	the provide of fresh air to underground mine
<b>Brem</b>	small safety bench in the open pit mine
<b>Dragline</b>	the big excavator machine that used a cable for pull and discharge material
<b>Pillar</b>	narrow vertical structure used as a support in underground mining
<b>Orepass</b>	an incline tunnel that use for fall down ore by gravity
<b>Vein</b>	band of ore between rock layers
<b>Haul track</b>	the very big truck that used in mine
<b>Spiral</b>	curve that twists around a fixed center point

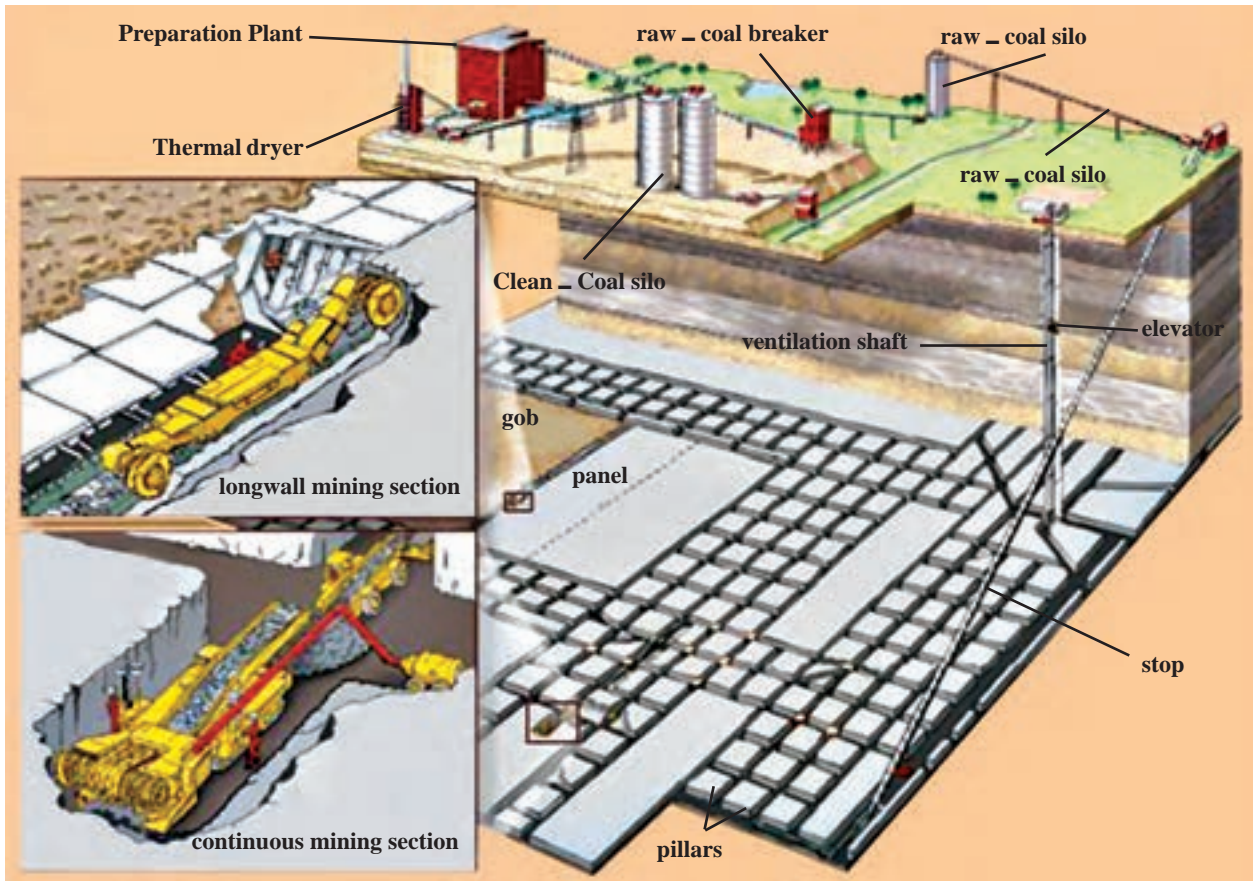
<b>Hanging wall</b>	The block of rock that lies above an inclined fault or an ore body.
<b>Foot wall</b>	The block of rock that lies on the underside of an inclined fault or of a mineral deposit.
<b>Conveyer</b>	mechanical apparatus for carrying material
<b>Shearer</b>	a coal cutter machin that use in long wall mining method
<b>Stockpile</b>	materials that have been accumulated and set aside for future use
<b>Run of mine (ROM)</b>	excavated material from mine

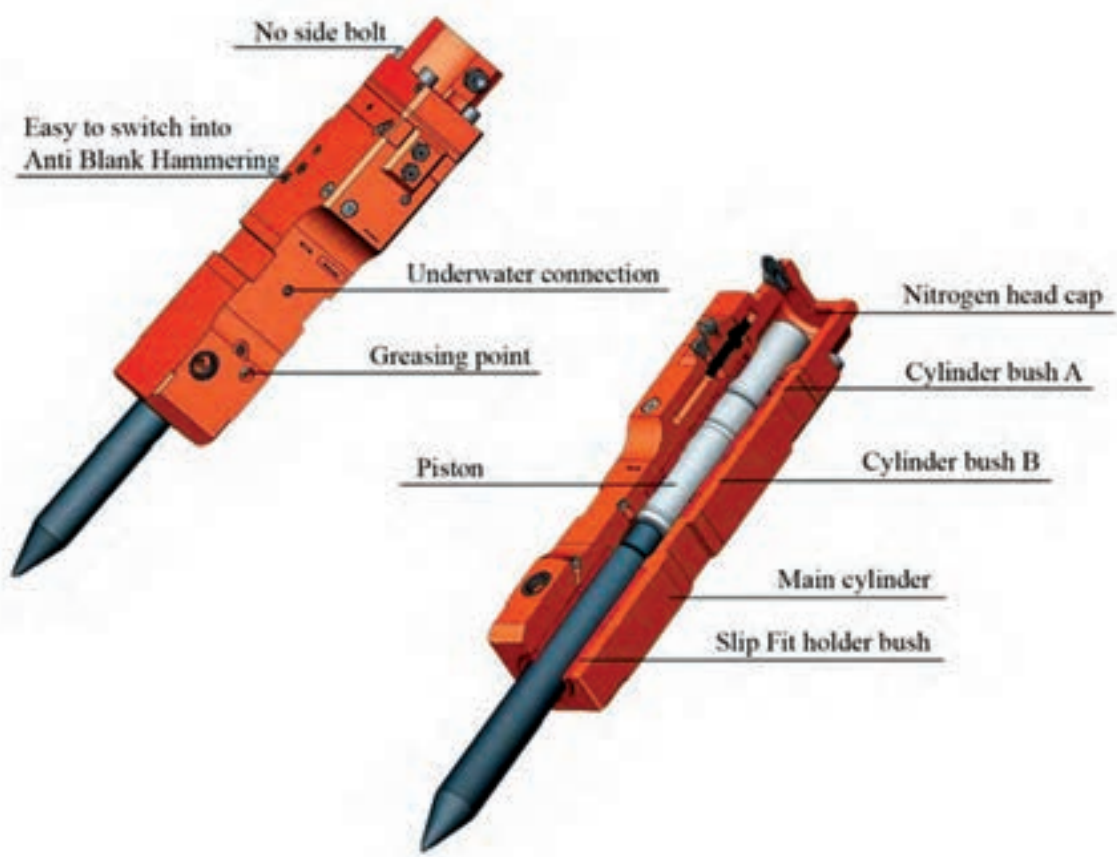




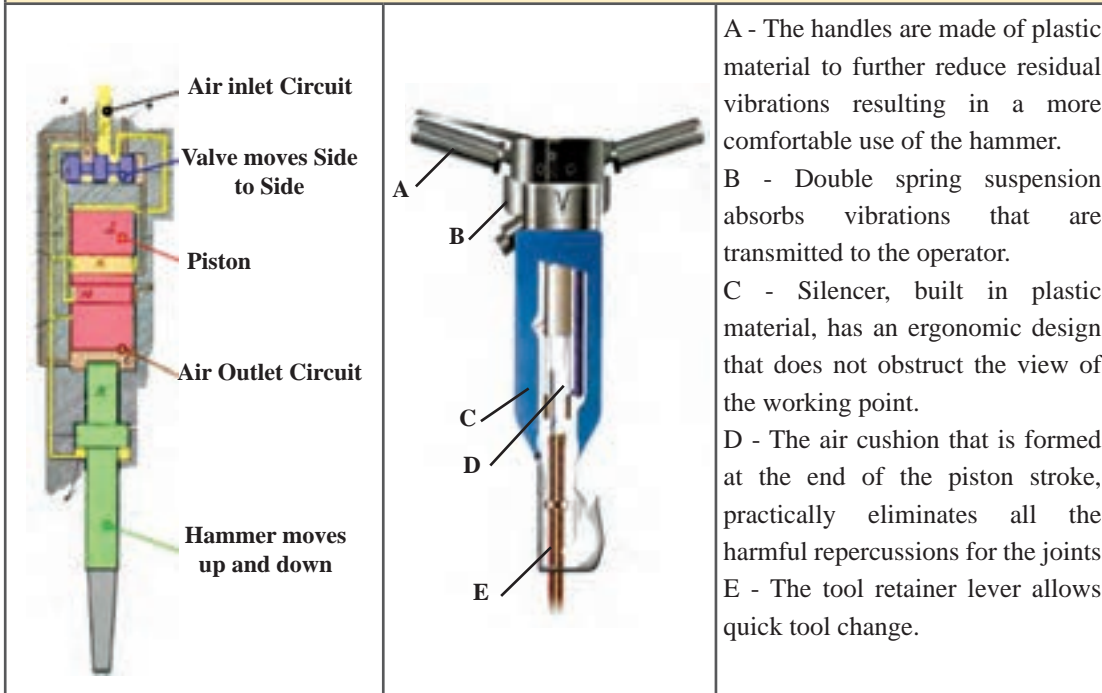
Typical Open Pit mine







The hammers have been designed to deliver the power and efficiency necessary in the mine and construction industry, The part of hammer is shown in the diagram below



A - The handles are made of plastic material to further reduce residual vibrations resulting in a more comfortable use of the hammer.  
 B - Double spring suspension absorbs vibrations that are transmitted to the operator.  
 C - Silencer, built in plastic material, has an ergonomic design that does not obstruct the view of the working point.  
 D - The air cushion that is formed at the end of the piston stroke, practically eliminates all the harmful repercussions for the joints  
 E - The tool retainer lever allows quick tool change.

Please answer the questions:

**What is underground mining?**

**What is the surface mining?**

**Explaion the folowing therms**

Adit	
Drift	
Raise	
Winze	
Ore pass	
Shaft	

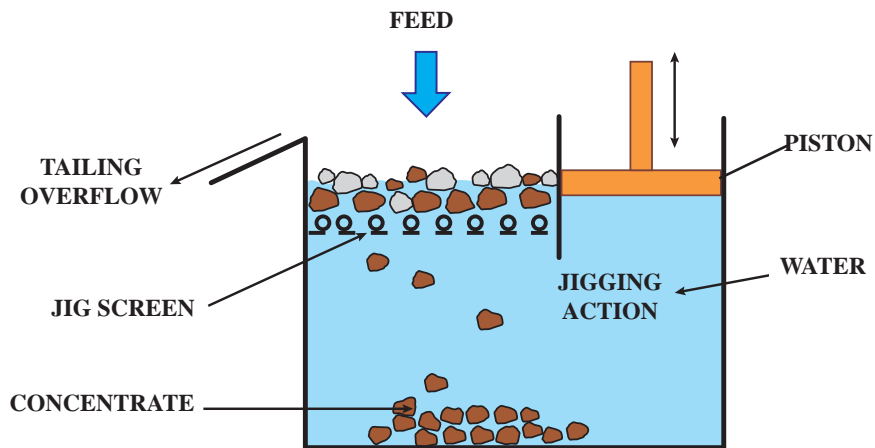
## **PART (7): Ore Processing**

### **Technical words And Expression**

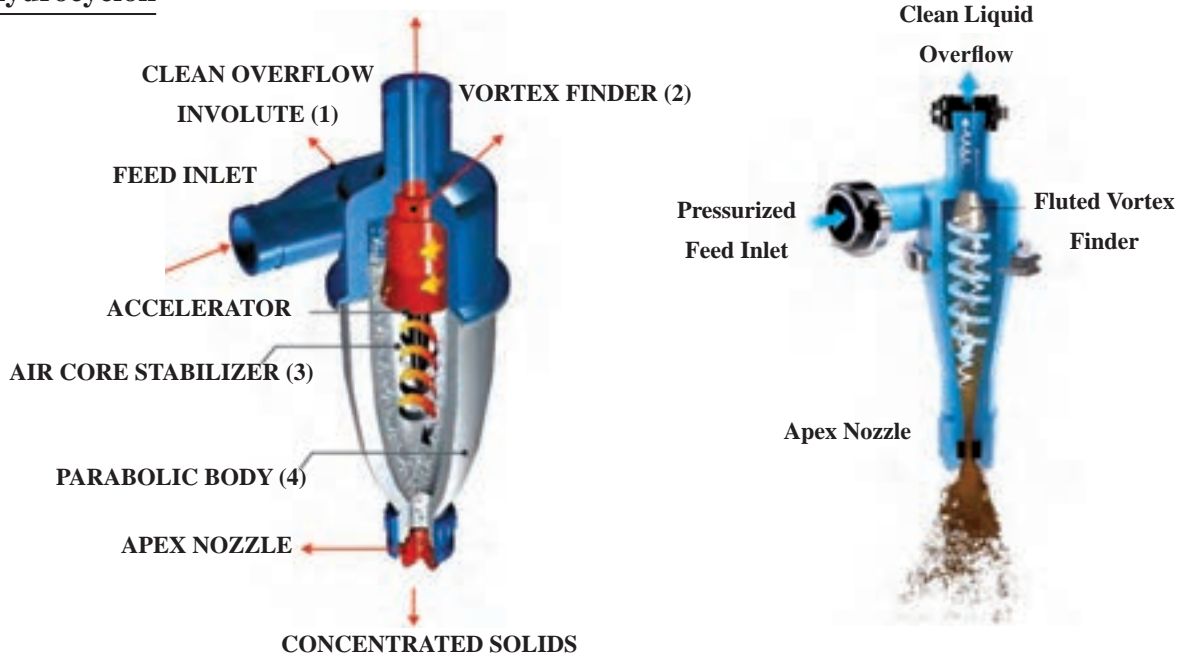
<b>Process</b>	Perform a series of mechanical or chemical operations on something in order to product.
<b>mineral processing</b>	The process of separating valuable minerals from their ores.
<b>Grade</b>	assay of element in an ore that measured with Chemical Analysis
<b>Gangue</b>	The commercially valueless material in which ore is found.
<b>Flowsheet</b>	a diagram which show all part of a process
<b>Bubble</b>	a thin sphere of liquid enclosing air or another gas
<b>Benchmark</b>	A surveyor's mark that used as a reference point in measuring altitudes.
<b>Valve</b>	device that controls the flow of a liquid through a pipe
<b>Underflow</b>	an undercurrent of air or slurry
<b>Agitator</b>	a device for make circular movements in liquid
<b>Dump</b>	drop somting together
<b>Overflow</b>	an overcurrent of air or slurry
<b>Slurry</b>	insoluble particles combined with a liquid
<b>Concentration</b>	a process that separating mineral from gangue in an ore
<b>Froth</b>	a mass of small bubbles in liquid caused by agitation
<b>Gravity</b>	earth attractive force
<b>Apex</b>	discharge down valve in hydrocyclon
<b>Vortex</b>	discharge overflow in hydrocyclon
<b>Tailing</b>	The residue of something, especially ore.
<b>Shaking</b>	move (an object) up and down or from side to side with rapid
<b>distributor</b>	a tools that feed equally
<b>Splitter</b>	a tools that divide things
<b>Tickener</b>	A tools that settle particels from water



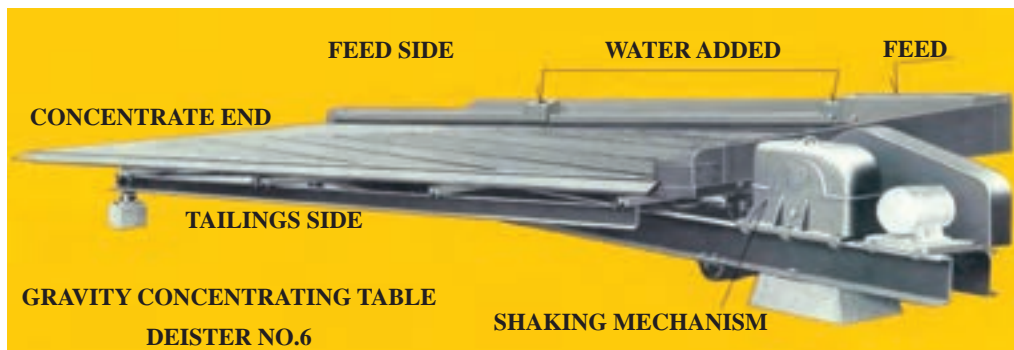
### Jig

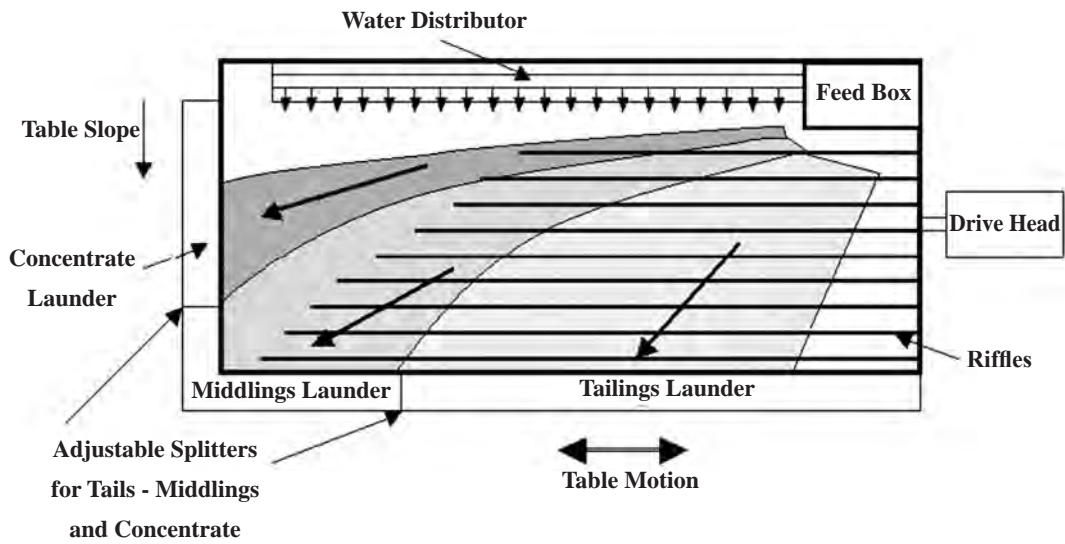


### Hydrocyclon



### Shaking Table





**Humphreys spiral**

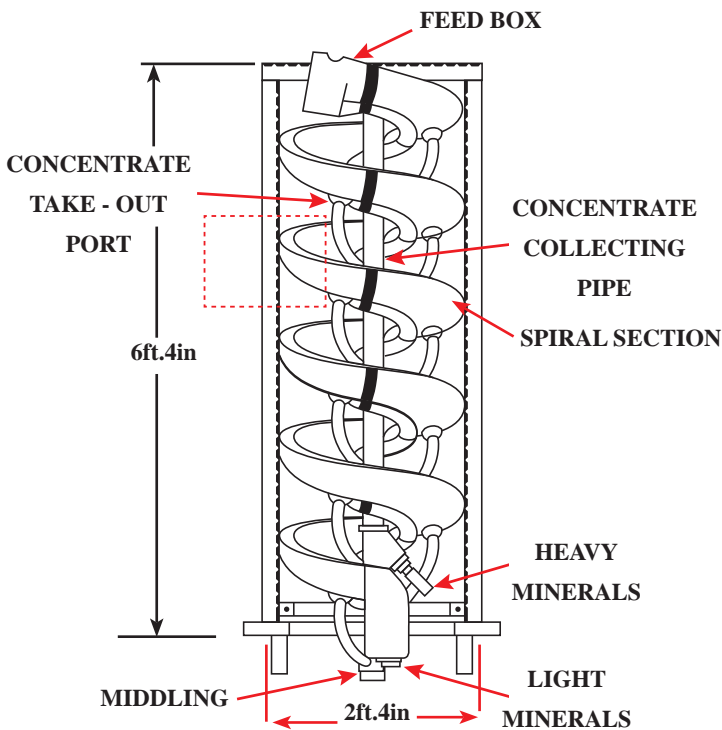


Figure 17 . A modern Humphreys spiral concentrator .  
From Wills , 1984.

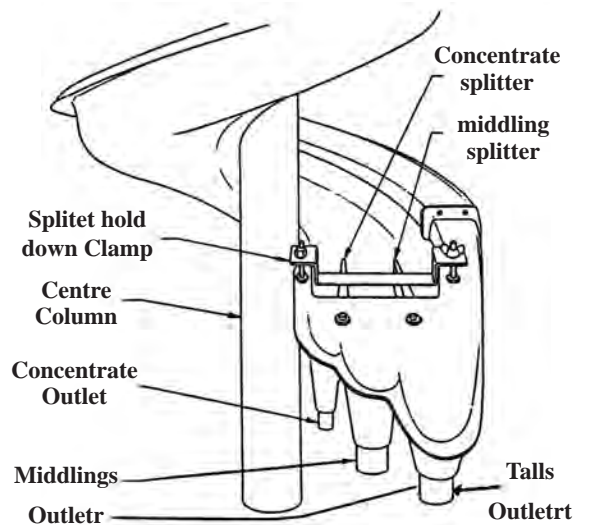


Fig . 7 the Spiral Discharge Splitters

## Spiral classifier

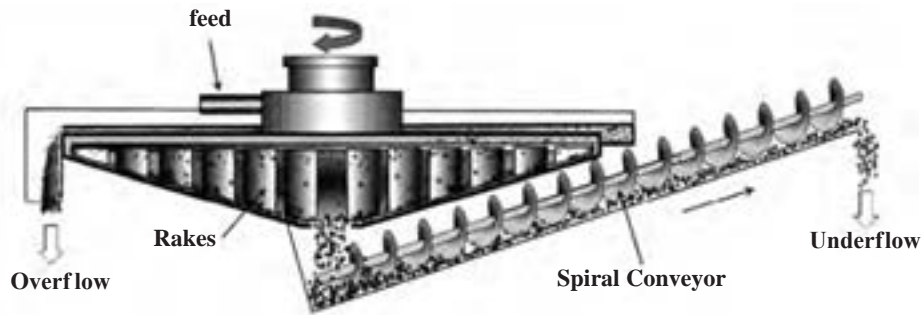
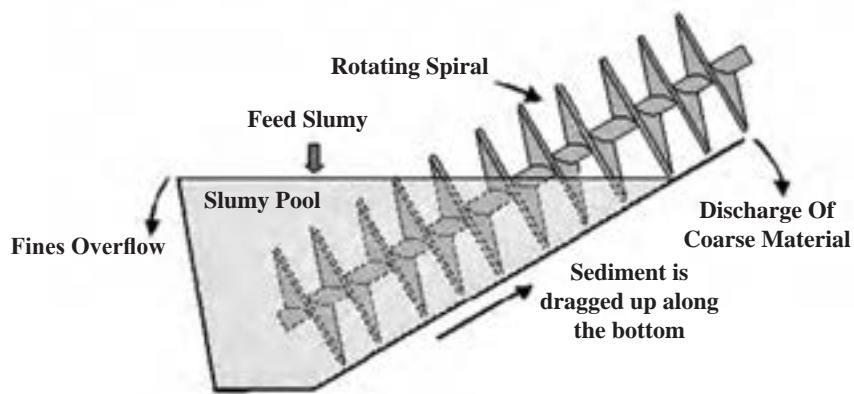
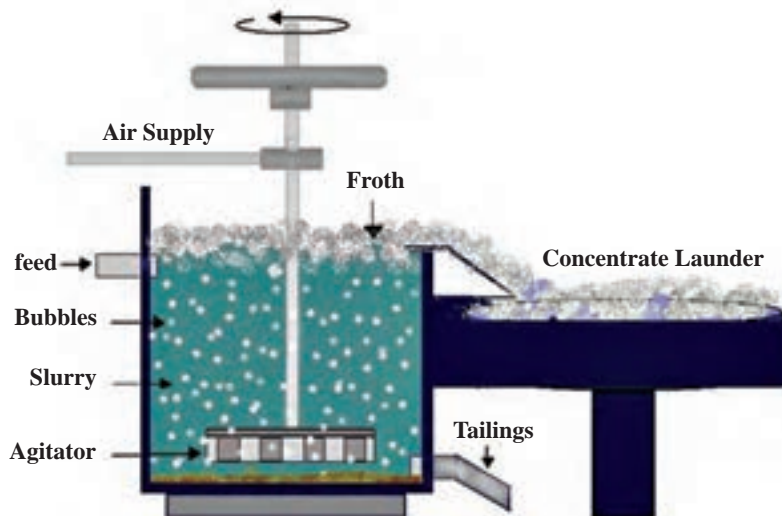


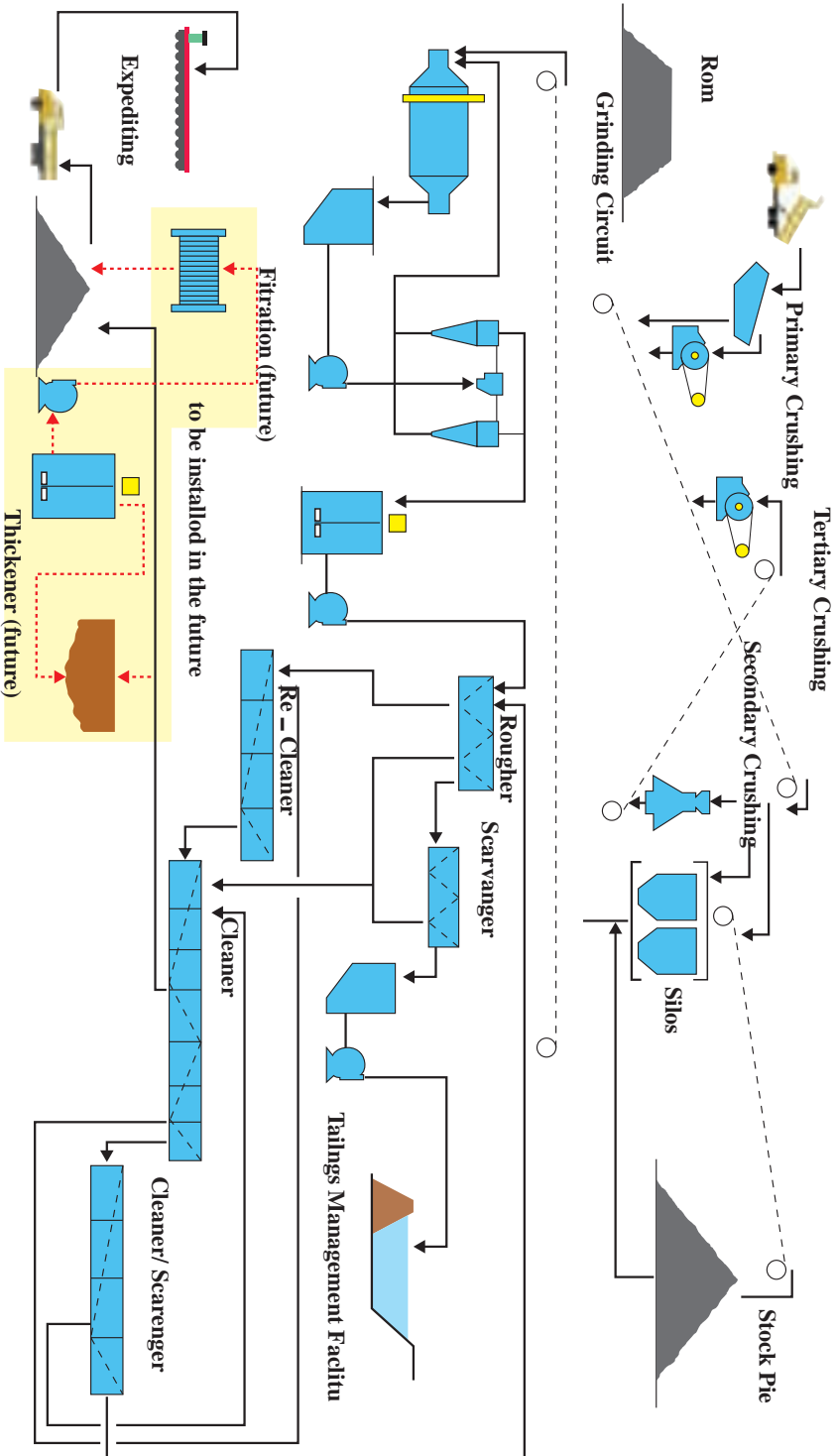
Figure 13.3: Sketch of a Bowl Classifier With Spiral Conveyor For Collecting Sand From The Tank and Discharging to The Launder at The Top End Of The Vessel



## FLOTATION PROCESS



Process Flowsheet – Marayaia Copper Mine



**Please answer the questions:**

What is Flowsheet?

List the parts of a flotation process

What is the meaning of spiral?

List the name of mineral processing machines.

Explain the following terms

Apex	
Vortex	
Agitation	
slurry	
Tail	
Grade	

**ارزشیابی پودمان ۵: کسب اطلاعات فنی**

نمره	استاندارد (شاخص ها، داوری، نمره دهی)	نتایج	استاندارد عملکرد (کیفیت)	تکالیف عملکردی (شایستگی ها)	عنوان پودمان
۳	بیان اطلاعات معادن بزرگ کشور، مطالعه کاتالوگ های تجهیزات معدنی، و تجهیزات ایمنی، تهیه لیست سفارش تجهیزات	بالاتر از حد انتظار	آمارو اطلاعات معادن و صنایع معدنی کشور- کاتالوگ ها و بروشورهای تجهیزات معدنی	تحلیل معادن و صنایع معدنی ایران	کسب اطلاعات فنی با استفاده از منابع، فرهنگ تخصصی و عمومی و کتاب همراه
۲	بیان اطلاعات معادن بزرگ کشور، مطالعه کاتالوگ های تجهیزات معدنی و تجهیزات ایمنی	در حد انتظار		تحلیل نکات ایمنی معادن، معرفی دستگاه ها و تجهیزات معدنی	
۱	بیان اطلاعات معادن بزرگ کشور	پایین تر از حد انتظار			
	نمره مستمر از ۵				
	نمره شایستگی پودمان از ۳				
	نمره پودمان از ۲۰				

- ۱ برنامه درسی رشته معدن، دفتر تألیف کتاب‌های درسی فنی و حرفه‌ای و کاردانش، سال ۱۳۹۳.
- ۲ رضایی، بهرام؛ ۱۳۹۱؛ فراوری مواد معدنی؛ وزارت آموزش و پرورش.
- ۳ نعمت‌اللهی، حسین؛ ۱۳۸۱؛ کانه آرایی؛ انتشارات دانشگاه تهران.
- ۴ خوش‌دست، حمید؛ ۱۳۹۵؛ فلوتاسیون مقدماتی؛ مجتمع آموزش عالی زرنند.
- ۵ معزز لسکو، زرغام؛ ۱۳۸۰؛ کانی شناسی؛ انتشارات دانشگاه فردوسی مشهد.
- ۶ آدابی، حسین؛ کریم پور، محمدحسن؛ ۱۳۸۷؛ نامگذاری و طبقه‌بندی جامع سنگ‌های رسوبی، دگرگونی و آذرین؛ انتشارات دانشگاه فردوسی مشهد.
- ۷ سرابی، فریدون؛ ایران‌پناه، اسد؛ زرعیان، سیروس؛ ۱۳۸۵؛ سنگ شناسی جلد ۱ و ۲؛ انتشارات دانشگاه تهران.
- ۸ رضایی، بهرام؛ ۱۳۷۵؛ فلوتاسیون؛ انتشارات دانشگاه امیرکبیر.
- ۹ کریم پور، محمدحسن؛ ۱۳۸۵؛ کانی‌ها و سنگ‌های صنعتی؛ انتشارات دانشگاه فردوسی مشهد.
- ۱۰ اولیازاده، منوچهر؛ ۱۳۸۵؛ فراوری و کاربرد کانی‌های صنعتی، جهاد دانشگاهی واحد صنعتی امیرکبیر.
- 11 Bulatovic, S.M., Handbook of flotation reagents, 2007, Elsevier.
- 12 Basics in mineral processing, 2015, Metso Corporation.
- 13 Tatiya, R.R., 2013, Surface and underground Excavations, CRC Press.

