Most of Porphyry copper deposits has …… morphology

1. Stratabound shape 2. Replacement irregular 3. **Disseminated irregular** 4. Manto- type

Oxidation-reduction reactions change the redox state of elements such as

1. Magnesium 2. Copper 3. Gold 4. **Iron**

All of the following are considered Non metallic Industrial material except

1. Kaolinite 2. Barite 3. Phosphate 4. **Lead**

You expect to find most of the cumulate textures & crystals at …… of the intrusion

1. The roof 2. The middle 3. **The floor** 4. The adjacent rocks

Most hydration hydrothermal reactions are considered as ……. Raection

1. Retograde 2. Irreverible 3. **Prograde** 4. Isochemical

The magmatic process(s) that is mainly responsible for chromite deposits is …….

1. **Magmatic Mixing** 2. Magma Immiscibility 3. Fractional crystallization 4. Assimilation

The felsic porphyry igneous rocks such as granite or Rhyolite would more likely to include

1. Chromite 2. Porphyry Cu – Mo 3. Porphyry Cu 4. **Porphyry Mo**

Order the followings according to the proper accumulated depth & temperature that they are formed at (Oil = O, Gas = G, Tar sand = TS, & oil shale = OS)

1. GS > OS > O > TS 2. O > G > OS > TS 3. TS > OS > O > G 4. **G > O > OS > TS**

The production of organic matter account for the bulk organic material that can be transformed into oil comes from

1. Fish bones 2. Swamps paints 3. **Diatoms** 4. Dinasours

Which of the following rocks in an oil trap will be considered cap layer

1. Fossiliferous L.S 2. **Salt diaper** 3. Sandstone 4. Conglometate

If coal will be metamorphosed, the yielding rock will be ……

1. Graphite 2. **Anthracite** 3. Chromatite 4. Eclogite

The felsic porphyry igneous rocks such as granite or Rhyolite would more likely to include ……

1. **Graphite** 2. Anthracite 3. Chromatite 4. Eclogite

What type of alteration include most of the porphyry copper ore

1. Argillic 2. Phylic 3. **Potassic** 4. Propylitic

To form a source rock for oil , the net accumulation of organic matter in sediments depends on

1. Productivity 2. Biogenic breakdown 3. Oxidation 4. **All of them**

Which of the following represent the best structural trap of Oil

1. Basin 2. **Dome** 3. Lenses 4. Unconformity

Most of Oil Shale exploration/Mining processes in Jordan are focusing on ……. areas

1. North Eastern 2. North Western 3. **Central Western** 4. South western

Which fossil fuel have the highest env. pollution impact on Atmosphere (emit highest Sox & NOx concentration)

1. Wood 2. **Coal** 3. Natural Gas 4. Oil

Most of the porphyry deposits existed in area of ……. Plate boundaries

1. Strike slip 2. Divergent 3. Hot spots 4. **Convergent**

Coal consists of grains that are called

1. Liginite 2. **Macerals** 3. Peat 4. Bitumen

At higher temperature (above oil window), the source rock will produce mostly

1. Kerogen 2. Oil shale 3. **Gas** 4. Petroleum Oil

The main organic material composing the Oil shale is

1. Lignite 2. **Kerogen** 3. Bituminous Cool 4. Anthracite

Most of the rocks in Bushveld Complex in South Africa are

1. Intermediate-Felsic 2. Metamorphic 3. Mafic-Intermediate 4. **Ultramafic-Mafic**

The main driving force for petroleum migration is

1. **Buoyancy** 2. Magnetism 3. Immiscibility 4. Gravity Settling

Which of the following rocks in an oil trap will be considered reservoir

1. **Sandstone** 2. Fossiliferous Shale 3. Salt Diaper 4. Bituemenous Shale

The Oil shale in Jordan is hosted mainly in

1. **Muwaqar Chalk Marl** 2. Kurnub Sandstones 3. Al Hisa Phosphorites 4. Precambrian bazement

The mode of occurrence (shape) of the Bushveld Chromite deposits is typically

1. Irregular veinlets 2. **Stratabound** 3. Dissiminated 4. Replacement

Most Rare Earth Elements (RRE) ores are extracted from this rock

1. Gabbro 2. **Carbonatites** 3. Granite 4. Carbonates

In the oil & gas Tertiary Production (Enhanced Oil Recovery, EOR) the following procedures are taking place, except

1. Injection of CO_2 2. Injection of alkalines 3. **Water flooding** 4. Combustion at margins

In Jordan, Oil shale projects usually suffer & have some barriers due to

1. **All is true** 2. Flocculation in oil prices 3. Env. problems 4. Huge water consumption

Why heavy oil & Tar sands are not widely used for generating oil

1. They can't be converted to gasoline easily 2. They have high Sulfur & Nitrogen compounds
3. They contain high metal concentration (Ni , V , Cr) 4. **All of them**

Oil generation may start at one the following temperature (in Celsius)

1. 60 2. **80** 3. 120 4. 250

Coal deposits are abundant within the following geologic times except

1. Jurrasic 2. Carboniferous 3. Permian 4. **Ordovician**

The morphology of "stockwork" Deposits is considered as

1. Tabular 2. **Irregular** 3. Stratiform 4. All of them

Changes concentration of trace elements or the amount of isotopes of an element included in the mineral is known as

1. Paragensis 2. Mineral assemblages 3. Time relationships 4. **Zoning**

The best geophysical technique that is used in Oil exploration is

1. Gravity 2. Aeromagnetics 3. **Seismic** 4. Satellite Images

Can we use gold as a pathfinder?

1. **Yes** 2. No 3. Maybe 4. In some cases

Which of the following could be considered as a cap rock

1. Limestone 2. Sandstone 3. **Salt rock** 4. Basalt

Which of the following could be considered as a reservoir rock

1. Shale 2. **Limestone** 3. Salt rock 4. Basalt

A location in Jordan that might include chromite deposits (magmatic ore deposits)

1. Ajloune 2. Central Jordan 3. **Aqaba** 4. Mafraq

The principal magmatic (differentiation) process that is directly responsible for chromite deposition in Bushveld

1. Filter Pressing 2. Magma Assimilaton 3. Magma Immiscibility 4. **Magma Mixing**

The most common method that is used to extract the phosphate deposits in Jordan is

1. **Strip Mining** 2. Dredge Mining 3. Contour Mining 4. Magma Mixing

Most of oil generation occurs during this process

1. Diagenesis 2. Catagenesis 3. Metagenesis 4. Coalification

Ore form (shape) of the Chromite deposits in Bushveld is mainly

1. Dissiminated 2. Vein type 3. **Parallel Stratiforms** 4. Irregular stockwork

In Bushveld complex the significant Fe-Ti oxides (magnetite) are restricted to the _____ of clayered intrusion complex

1. Basal zone 2. Lower Critical Zones 3. Middle zone 4. **Upper critical zone**

Most of the oil shale in Jordan is hosted in the _____ Formation

1. **Wadi Alshallaha** 2. Wadi Al-Sir 3. Kurnub 4. All of them

The largest Oil Field in the World is _____ & is found in _____

1. **Ghawar, Saudi Arabia** 2. Urengoy, Russia 3. Burgan, Qatar 4. Zakum, UAE

When bituminous coal is exposed to high burial T-P then it will be converted into a rock that is called

1. Oil Shale 2. Liginite 3. Diamond 4. **Anthracite**

Oil is recovered from Oil shale of Jordan by a metallogenic process that is called

1. Smelting 2. Flotation 3. **Pyrolysis** 4. Beneficiation

If Chalcopyrite (ore mineral for Cu) what is the chemical compounds that will be added in order to separate Cu

1. **O_2 (Oxygen)** 2. CO_2 (Carbon dioxide) 3. CO (carbon Monoxide) 4. SO_3 (Sulfur trioxide)

The main method of Underground mining for Coal deposits is

1. **Room and Pillars** 2. Contour mining 3. Shrinkage stoping 4. Cut & fill stoping

What is the main ore mineral for producing Copper in the world

1. Hematite 2. Pyrite 3. **Chalcopyrite** 4. Malachite

Calculate the ore reserve of a copper ore that is extended within an area of 200m² & the thickness of the ore bearing layers is 4m & the specific Gravity of the ore is 8g/cm³ while the grade of 10%

R = Area x Specific Gravity x Thickness x Grade (Weigh Percent)

$$\boldsymbol{R = AxSxTxwt\% = \frac{(200m^2x4mx8gx10)}{(100xcm^3)} = 6.4x10^{11}g = 640\ Mkg}$$

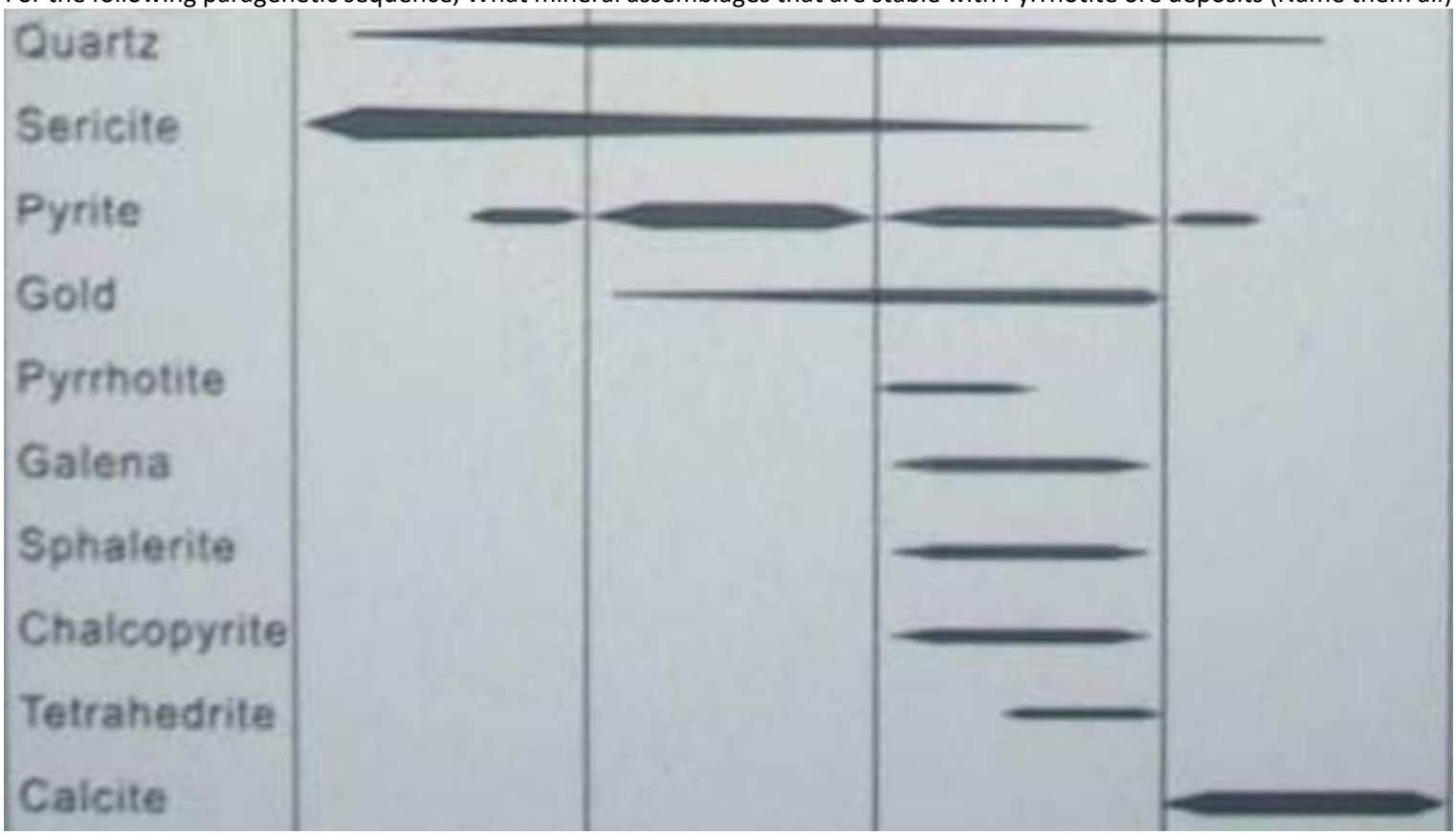
If the ore thickness 100m in a working open pit mine, overburden thickness would be accepted up to _____m to maintain profit

$$\boldsymbol{Stripping\ Ratio = \frac{X_{overburden}}{X_{ore}} < 5 \rightarrow \frac{X}{100m} < 5 \rightarrow\ X < 500m}$$

Write a balanced chemical reaction of prograde metasomatic hydrothermal alteration

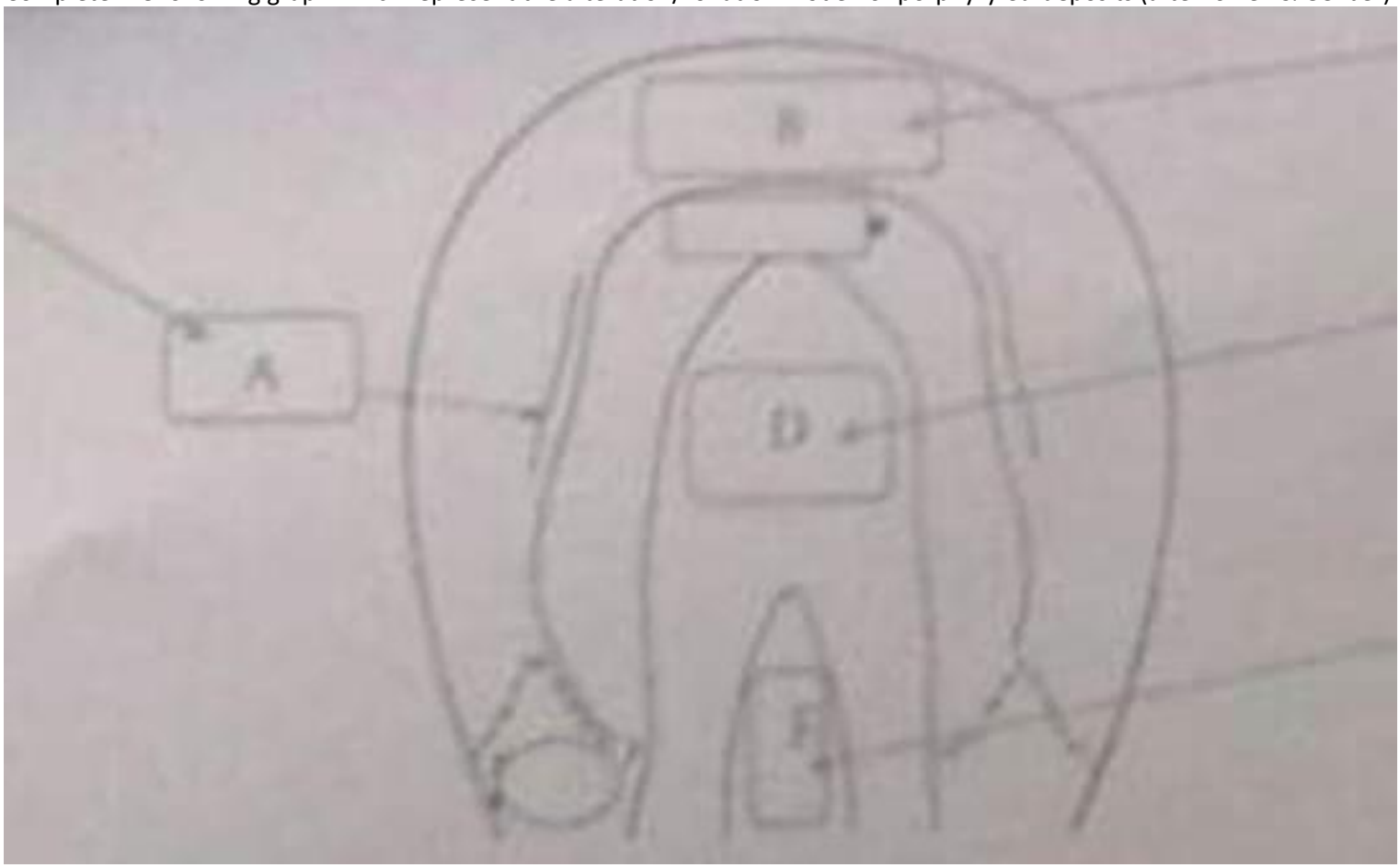
One example is Silicification of carbonates: $CaCO_3 + SiO_2 \rightarrow CaSiO_3 + CO_2$

For the following paragenetic sequence, What mineral assemblages that are stable with Pyrrhotite ore deposits (Name them all)

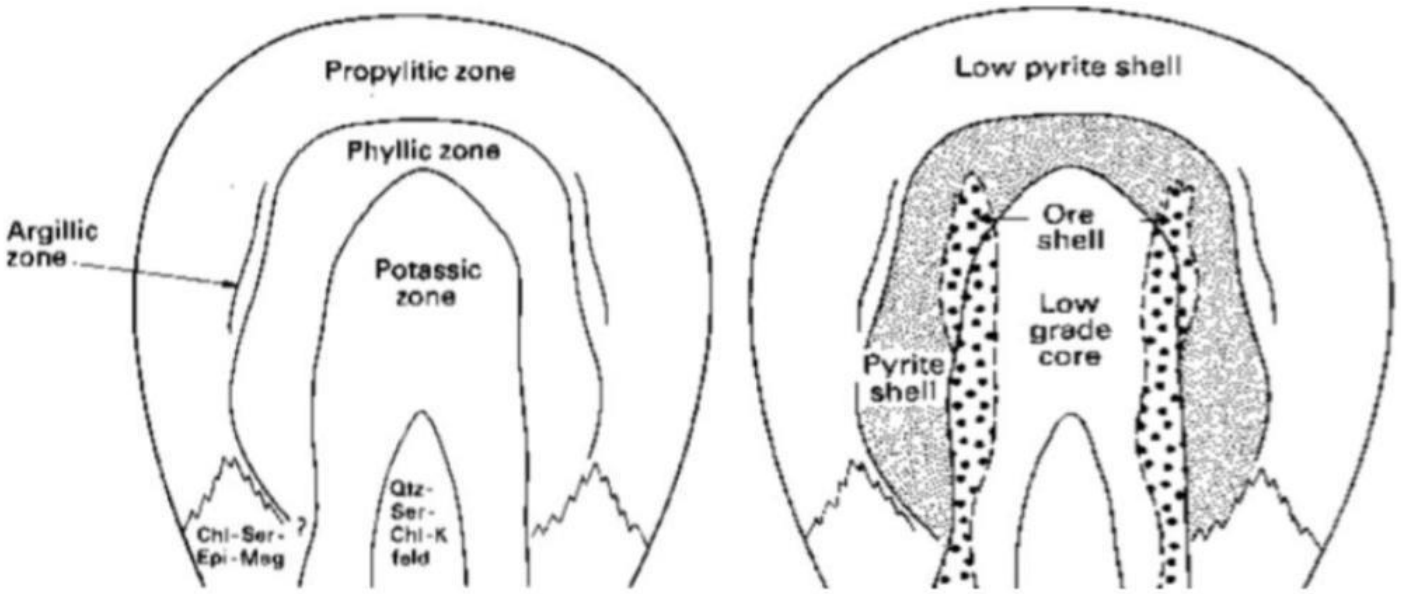


All of them except of calcite (Quartz, Sericite, Pyrite, Gold, Galena, Sphalerite, Chalcopyrite, & Tetrahedrite)

Complete rhe following graph which represent the alteration/zonation model for porphyry Cu-deposits (after lowell & Gellber)



A. Argillic Zone
B. Propylitic zone
D. Potassic zone
E. Quartz-Sersite-Chlorite-K-feldspare



The amount of material in the ground that can be extracted at a profit & we are certain of its tonnage & grade is

1. Indicated Resource 2. **Measured Reserve (proven)** 3. Indicated (probable) 4. Inferred (possible)

One of the following is a mineral within the igneous rock that may yield a Cu-rich solution

1. K Feldspar 2. Biotite 3. Quartz 4. **Pyroxene**

Factors that are necessary to form ore deposits are

1. Source & Energy 2. Means of transportation 3. Means of concentration 4. **All of them**

Products of hydrothermal alteration depends on all of the following except

1. Wall rock chemistry 2. T-P at the alteration time 3. HF Chemistry 4. **Price of commodity**

The most dominant fluids on planet Earth is

1. Magmatic 2. Tectonic 3. **Aqueous** 4. Non aqueous

The method of separation metals by concentrates into 2 immiscible phases using pyro-metallurgy is known as

1. Metalogensis 2. Crushing 3. **Smelting** 4. Pulverizing

What is the main ore mineral for producing Copper in the world

1. Hematite 2. Pyrite 3. **Chalcopyrite** 4. Malachite

All of the following are classified as base metals except _____

1. Tin 2. **Iron** 3. Lead 4. Copper

Analysis of ancient hydrothermal solutions could be done using _____

1. XRD 2. XRF 3. **Fluid inclusions** 4. Oroscopy

All of the following are considered Non metallic Industrial material except _____

1. Halite 2. **Lead** 3. Phosphate 4. Barite

The grade that is below which a given metal and rock are sent to waste (are not sent to the mill) _____

1. **Cut-off grade** 2. Mineralogical limit 3. Enrichment factor 4. Ore grade

Elements that generally (preferentially) occur with native sulfur are known as _____

1. Atmophile 2. Siderophile 3. **Chalcophile** 4. Lithophile

A naturally occurring material from which a mineral or minerals of economic value can be extracted at a reasonable profit is

1. Reserve 2. **Ore** 3. Mineral deposits 4. Economic Geology

What is the best geophysical exploration techniques would use for ore body of pyrite (FeS_2) & galena (PbS)

1. Gravity 2. Seismic 3. Magnetic 4. **Induced Polarization**

In order chloride complexes being able to carry significant amounts of metal, the solution should have

1. Metal = Sulfur 2. Metal > Sulfur 3. **Metal < Sulfur** 4. Sulfur has no affect

One of the following is a mineral within the igneous rock that may yield a rich Pb-solution

1. Honblende 2. Olivine 3. Quartz 4. **K-feldspar**

The degree of inrichment of metals of interest is tamed as

1. Cut-off grade 2. **Concentration factor** 3. Enrichment factor 4. Ore grade

The fire assay are used for the ____

1. **Gold** 2. Iron 3. Sulfur 4. Chlorite

Elements that generally (preferentially) occur with native iron are known as _____

1. Atmophile 2. **Siderophile** 3. Chalcophile 4. Lithophile

A concentration of 0.002% is equal to _____ppm

1. 2 2. **20** 3. 200 4. 2000

A concentration of 300ppm is equal to _____%

1. **0.03** 2. 0.3 3. 3.0 4. 30

All of the following are Non-renewable resource except

1. Oil 2. Gravel & Sand 3. **Water** 4. Copper

A concentration of 0.4% of metal = _____ ppm **(0.4% * 10,000 = 4000ppm)**

What is the source of heat for hydrothermal fluids

1. **Magma:** directly (released by mineral crystallization) or indirectly (located near plutonic bodies)
2. **Burial**: shallow burial (heated by G.G), or Metamorphism (heated by burial + tectonism)

Fire Assay is used for _____ metals, & the main limitations for this method is/are _____

Precious metals, the cost is very high (10-50$), depending on finishing methods (the precious metals extracted by melting & the resulting resedual "button" are separated from slage & extracted by AAS, ICPES, & XRF)

Resoonse for changing of metal price over time? (of your metals)

Your metal commudity _____ **platinum**

1. **Changing the mining cost:** as mining cost of measured reserves increase → project falls
2. **Changing the value of by-product**: as value of by-product increases of measured reserves, the mining increases (لان استخداماته اصبحت اكثر من السابق كاستخدامه بالسيارات والهواتف والمجال الطبي)

The T drop to more than _____°C is needed to forming the deposit, & the T drop due to **(20°C)**

1. **Rabid adiabatic cooling (instant P-changes):** as P change from lithostatic to hydrostatic
2. **Solution Mixing:** mixing of hot hydrothermal fluids with cold water near surface

How dose the water derived from metamorphism? **By dehydration reaction (conversion of clay to mica)**

What type of fluids may be present in Mars? **May be aqueous fluids (meteoric water orconnate water)**

The movement of fluids through rock will depending on

1. **Porosity:** is a volume of the spaces in a rock per total volume of rock, decreases with depth (P)
2. **Permability (rock quality)**: is the ability of fluids to movement through a rocks, is a quantified measurement & depending on viscosity which depend on T, composition, & density

List 4 geological factor affects the economics of the deposits & why? اذكر 4 عوامل حيولوجية تؤثر على قرارك بتعدين الخام واذكر لماذا تؤثر

1. Ore grade: هو من العوامل الهامة، وزيادته تؤدي لزيادة التعدين او اختيار تعدين المنطقة
2. Value of by-product: على الرغم انه ليس جيولوجي الا اننا لا نستطيع تعدين خام معين وتكلفة تعدينه اكبر من ثمنه
3. Size, shape, thickness, & depth of the deposits: لان كل ذلك يؤثر على تكلفة التعدين
4. Gangue minerals: (تكلف اكثر) لانه يؤثر على تكلفة التعدين حيث التخلص من هذه المواد مهم ويعتبر من ميزانية التعدين خاصة تلك الضارة منها
5. Mineralogical forms, grain size, & shape: لان كل ذلك يؤثر على قيمة المعدن الذي يعدن