

## Course Examination paper of Resource Geology (Answers)

### I . To Explanate the following terms

*( Ten terms , 2 marks per term, total 20 marks)*

1. **Ore Minerals:** the specific minerals within the ore which contain the metals to be recovered.
2. **Ferrous metal :** Iron, Manganese, Chromium, Vanadium, Titanium;
3. **Precious metal:** Gold, Silver, Platinum, Palladium, Osmium, Iridium, Ruthenium, Rhodium;
4. **Siderophilic elements:** Fe Ni Co C Au Ge Sn Mo Pt Ru Rh
5. **Mineralization epoch:** A long process of formation of ore deposit, during which the deposition of ore took place repeatedly or continuously, and was related to the changes of physical-chemical condition of ore-bearing fluids.
6. **Grade:** this means the concentration of the substance of interest, usually stated in terms of weight per unit volume.
7. **Hydrothermal solution:** hot, and in liquid state without regard to origin.
8. **Mineralization stage:** Shorter periods in the mineralization epoch, during which certain mineral assemblage formed;
9. **Paragenesis:** The chronological order of mineral deposition is known as the Paragenesis;
10. **Magma-related vapor-liquid hydrothermal deposit:** Magma-related vapor-liquid hydrothermal deposit are those that have been formed from the magmatic volatile and solutions.

### II. Select the correct terms from the given answers ( Ten questions , 3 marks per question, total 30 marks)

1. What is the most important mineral concentrated by fractional crystallization?  
☒ A. Chromite; B. platinum; C. cassiterite; D. gypsum
2. Within the 5 ways minerals become concentrated, which of the following occur by weathering processes?  
A. Magmatic Mineral Deposits; B. Sedimentary Mineral Deposits;  
☒ C. Residual Mineral Deposits; D. Hydrothermal Mineral Deposits; E. Placers
3. Nonmetallic substances are mainly used as?  
A. Chemicals; B. Fertilizers; C. Building Materials; D. Chemicals and Fertilizers;  
☒ E. All of the above
4. What is an ore?  
A. the distribution of many kinds of mineral deposits; B. sedimentary mineral deposits; ☒ C. when a mineral deposit can be worked profitably; D. cooling magma
5. True or False. The distribution of many kinds of mineral deposits is controlled by plate tectonics.  
☒ A. True; B. False
6. Which of the following is the best example of a renewable resource?  
A. Cement; B. Steel; ☒ C. Water; D. Copper; E. Nickel
7. Copper, Gold, lead, galena, sphalerite. What is the geologic concentration process of these raw materials?  
A. soil leaching; B. placer sorting; ☒ C. hydrothermal precipitation; D. igneous cooling; E. evaporation

**8. Which of the following is NOT a material that comes from igneous cooling.**

A. quartz; B. lithium; C. diamond; D. feldspar; E. gypsum

**9. Which of the following materials is not produced by hydrothermal precipitation?**

A. Copper; B. Galena; C. sphalerite; D. talc; E. lead

**10. True or False, Coal is the most abundant of the fossil fuels.**

A. True; B. False

**III. Briefly answer following the questions. ( 3 questions , 10 marks per question, total 30 marks) (answering questions in Chinese is allowed)**

**1. How many concentration processes that lead to the formation of ore deposits are there in our study?**

① By selectively removing a large fraction of components from approximately average rocks and thereby concentrating one or more elements in the residuum

② By direct concentrating one or more previously dispersed elements or compound through extracting them from country rocks;

③ Most ore deposits have been formed by processes that have brought together previously dispersed elements or compounds. These processes have almost invariably involved one or more fluid phases and have driven by physical, chemical, and biological mechanisms;

**2. Which genetic kinds can the ore-bearing be divided into? And explain their main characters and features?**

① dissolving and extracting metals from country rocks;

② migrating ore-forming compositions through the wall-rock ;

③ make ore precipitate

**3. What are the features of magma?**

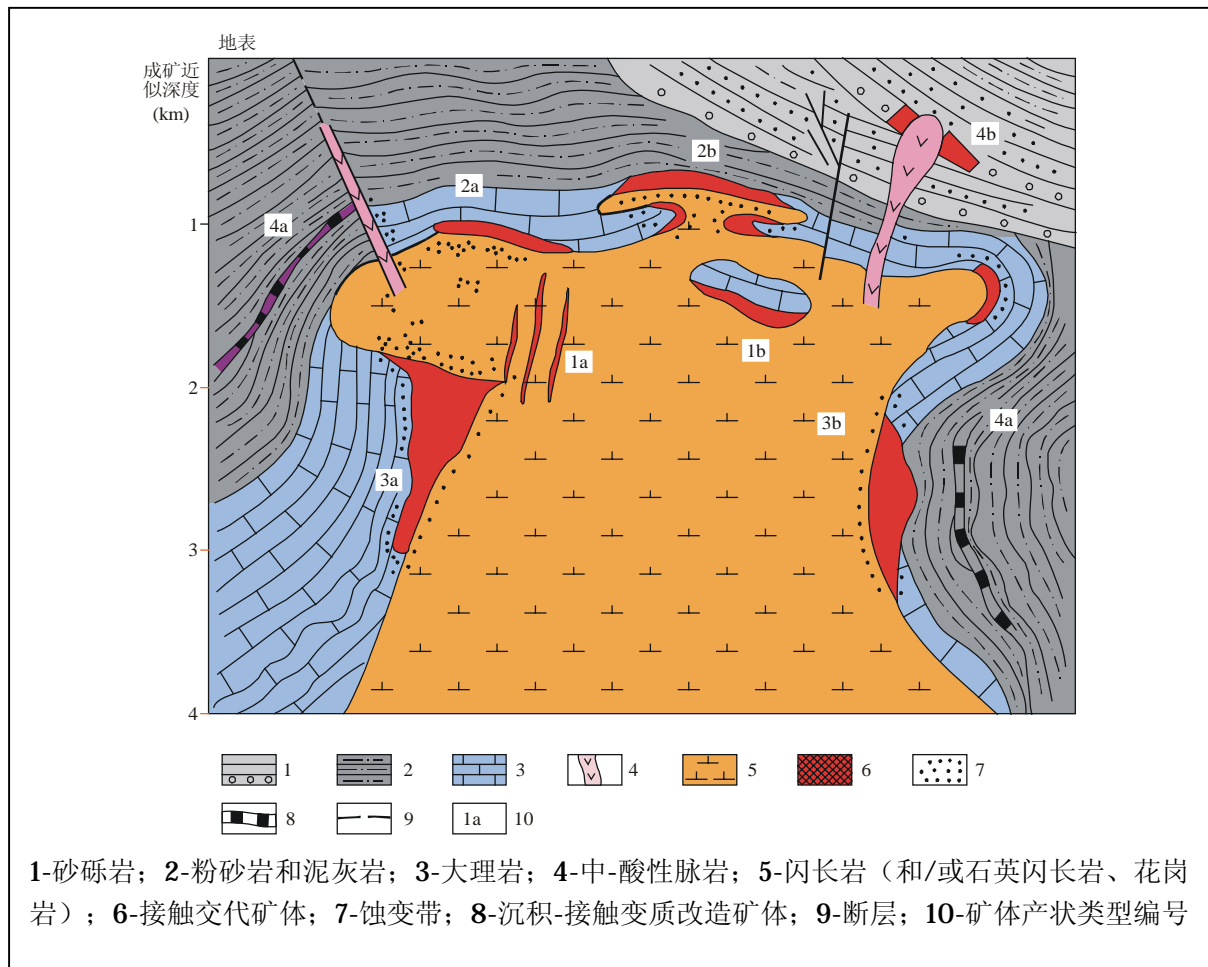
①To consist of a silicate melt or a mush of liquid fluid, crystals, water and volatiles and other substances;

②Most magmas are probably not homogeneous in composition, and constantly change due to chemical reaction or crystallization;

③Magma is of high temperature (900°C ~ 1500°C) and sometime high pressure, so can flow through channels underground or on the surface of the earth, and heats the cool water both in ocean and underground to create the hydrothermal solutions.

**IV. Explanation the model figures with geological characters of ore deposits (Choosing to answer 2 questions from 3 questions , 10 marks per question, total 20 marks) (answering questions in Chinese is allowed)**

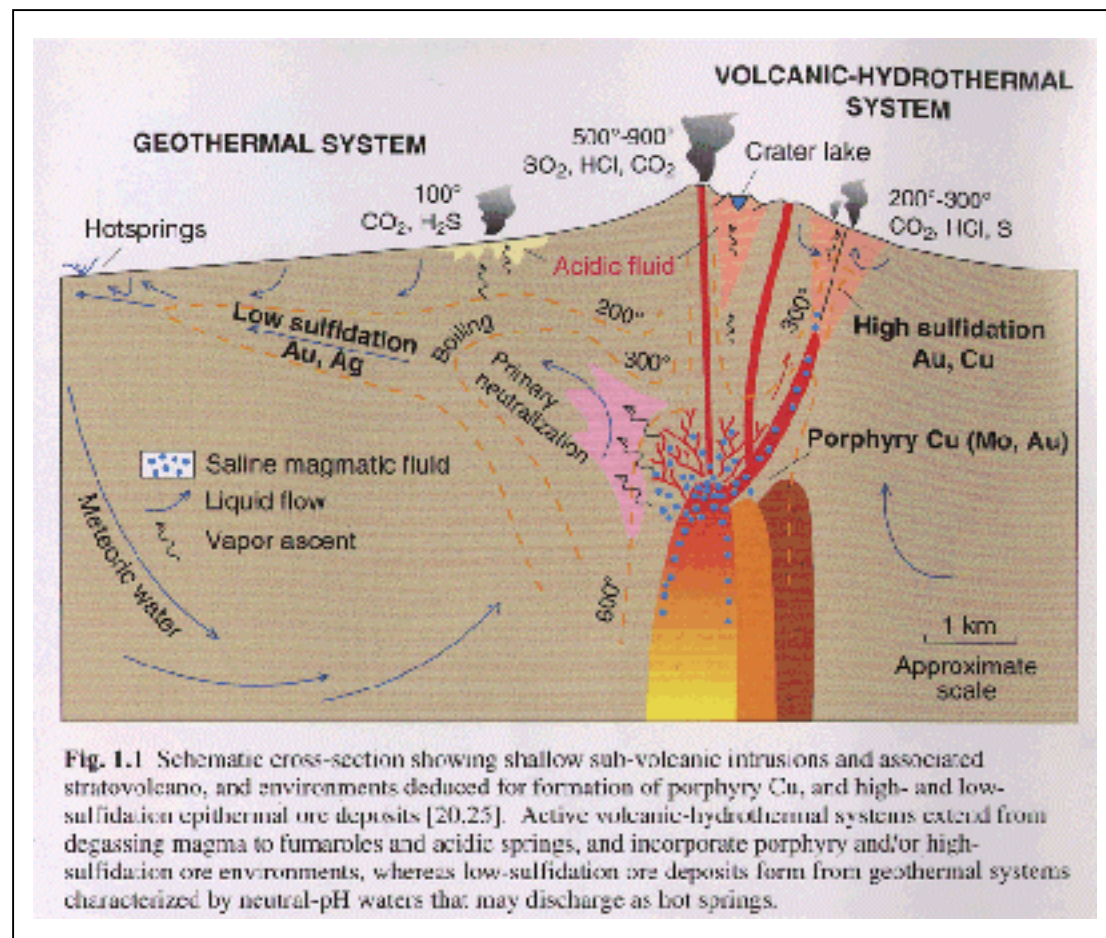
1. To describe the main characters of the shown ore deposit by unscrambling the following figures.



Referent answer points:

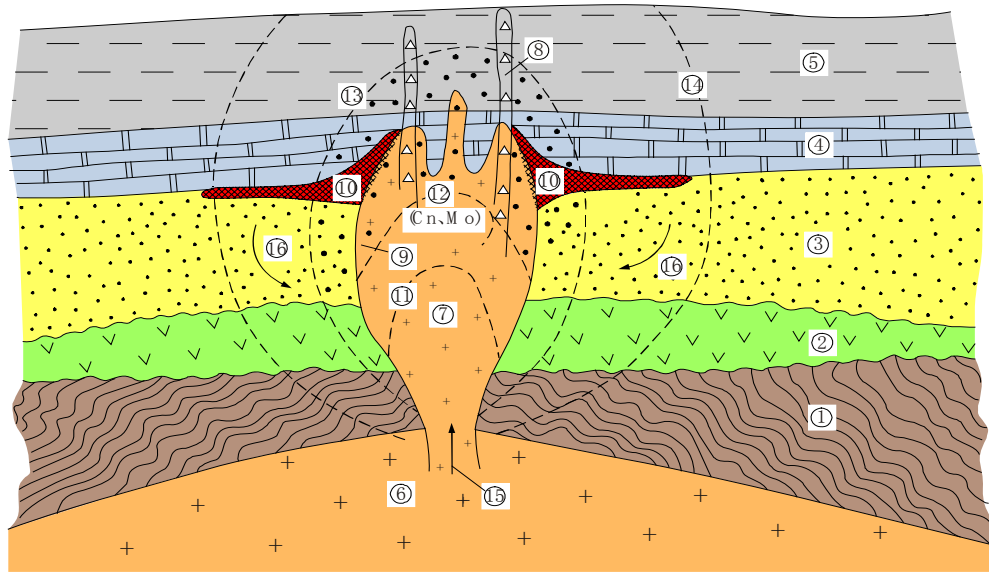
1. ore deposit type;
2. geological conditions controlling on the formation of ore deposit shown in figure;
3. basic geological characters of ore deposit;

2. Explanation the formation conditions and processes of epithermal ore deposit by reading the following model figure.



Low sulfide deposits	high sulfide deposits
<b>Deposit Form</b> Open-space veins dominant, stockwork ore common Disseminated and replacement ore minor ◆ <b>Textures</b> Veins, cavity filling (bands, colloforms, druses), breccias ◆ <b>Ore Minerals</b> Pyrite, electrum, gold, sphalerite, galena (arsenopyrite) ◆ <b>Gangue</b> Quartz, chalcedony, calcite, adularia, illite, carbonates ◆ <b>Metals</b> •Au, Ag, Zn, Pb (Cu, Sb, As)	<b>Disseminated ore dominant, replacement ore common</b>  <b>Stockwork ore minor, veins commonly subordinate</b> <b>Wallrock replacement, breccias, veins</b>  Pyrite, enargite, chalcopryrite, tennantite, covellite, gold, tellurides Quartz, alunite, barite, kaolinite, pyrophyllite  Cu, Au, Ag, As (Pb, Hg, Sb, Te, Sn, Mo, Bi)

3. To describe the main characters of zoning and alteration in porphyry copper ore deposit by unscrambling the following figures.



斑岩型铜（钼）矿床的成矿模式①基底岩石；②火山岩；③泥沙质岩；④碳酸盐岩；⑤泥质岩；⑥深成岩基；⑦浅成斑岩体；⑧爆破角砾岩筒；⑨带黑点的范围表示斑岩型铜钼矿化；⑩矽卡岩型矿化；⑪钾化带底界；⑫绢英岩化带底界；⑬青盘盐化带底界；⑭青盘盐化带顶界；⑮上升岩浆流体；⑯循环天水

#### Reference answer:

- ①. High-level (epizonal) stock emplacement levels in volcano-plutonic arcs, commonly oceanic volcanic island and continent-margin arcs.
- ②. Virtually any type of country rock can be mineralized, but commonly the high-level stocks and related dikes intrude their coeval and cogenetic volcanic piles.
- ③. Depth zoning is commonly evident with pyrite-rich deposits containing enargite near surface, passing downwards into tetrahedrite/tennantite + chalcopyrite and then chalcopyrite in porphyry intrusions at depth.
- ④. Strong alteration zones develop in and around granitic rocks with related porphyry deposits. Often there is early development of a wide area of secondary biotite that gives the rock a distinctive brownish colour. Ideally, mineralized zones will have a central area with secondary biotite or potassium feldspar and outward 'shells' of cream or green quartz and sericite (phyllic), then greenish chlorite, epidote, sodic plagioclase and carbonate {prophylic} alteration. In some cases white, chalky clay (argillic) alteration occurs.