

Credit Hour System - Summer Semester Exam
Geology and Geophysics Programs
Engineering Geology and Mining Geology (G 407)
(2024 – 2025)

Fourth Level

Allowed time: 2 hour

ملحوظة: الامتحان في صفتين

Part (1) Engineering Geology Exam (25 M)

ظلل الاجابة (T) إذا كانت الاجابة صحيحة او (F) إذا كانت الاجابة خاطئة (درجة واحدة لكل سؤال)

- 1) Translational slides occur on a planar surface or on a slip plane.
- 2) Specific gravity is the maximum stress that a rock can withstand.
- 3) Fine aggregate particles are mainly larger than 4.75 mm.
- 4) Factors affecting density are mineralogy and porosity
- 5) Discontinuities (layers, fissures) inclined inside or outside of the slope are very important regarding the stress and strength of the tunnel.
- 6) Low Dam or Small Dam: if the height of the dam is between 50m and 100m
- 7) Earthflow is slower in wetter weather.
- 8) "Hard" rocks generally have higher unconfined compressive strengths and higher Young's moduli (E) than "soft" rocks.
- 9) Slopes formed by weak rocks such as shale or have thick soil deposits typically fail by rotational slides.
- 10) Slide is sliding along a curved slip plane producing slump blocks.
- 11) Subsidence is the sinking of a mass of earth material below the level of surrounding material.
- 12) Rock can excavate by hand or with light earth-moving equipment.
- 13) Granite is a good building stone if fractures are not closely spaced.
- 14) Slate is very durable, high tensile strength and difficult to work.
- 15) Water can erode the base or toe of a slope increasing slope stability.
- 16) Vegetation adds weight to the slope decreasing the driving forces.
- 17) Topography and climate are influencing soil development.
- 18) ICOLD assumes a dam as big when its height is bigger than 15m.

43. A few metallic ores such as chromite, alumina, and pyrolusite, when used for certain purposes such as refractories in high temperature furnaces may be classified as industrial minerals
44. Epithermal Au-Ag deposits are originated from meteoric water dominated hydrothermal systems.
45. Sphalerite, galena, and chalcopryrite are ore minerals from which copper, zinc, and lead respectively can be extracted.
46. For gold mining, the gossan is mined because it is more easily accessible and naturally enriched and is easier to recover
47. Ore minerals mostly occur alone.
48. Most ore minerals of the scarce metals are oxides.
49. The dense chromite crystals settle to the bottom of the magma, producing almost pure layers of chromite
50. Asbestos is characterized by good tensile strength and good insulation.

أ.د/ جلال حامد الحباك - قسم الجيولوجيا

إنتهت الأسئلة وبالتوفيق

18. Nonrenewable resource is one that is not replenished by natural processes, growth times are measured in millions of years rather than in annual seasons.
19. Much of the world's lithium is mined from sedimentary rocks such as those at King's Mountain, North Carolina.
20. Deposits of minerals are depleted by mining and eventually exhausted.
21. The quantity of a given mineral available in any one country is rarely known with accuracy.
22. Examples for late magmatic deposits are chromite, magnetite and PGE.
23. Pegmatites are very fine-grained crystals and poor in gem stones and rare earth elements (REE).
24. Tin and tungsten deposits are associated with mafic igneous rocks.
25. The world's principal deposits of chromite are in the Bushveld igneous complex in South Africa and the Great Dike of Zimbabwe.
26. Some hydrothermal solutions are formed from rainwater or seawater that circulates deep in the crust.
27. Physical weathering leads to mineral concentration through the removal of soluble materials and the concentration of a less soluble residue.
28. Borax and other boron-containing minerals are mined from evaporite lake deposits.
29. High-grade metamorphism of marine evaporite deposits causes another important mineral, sylvite (KCl), to form from carnallite.
30. Iron ores formed as a result of metasomatism are called taconites.
31. Ore type often changed from a hematite to magnetite during weathering.
32. In black smokers, the rising hydrothermal fluid appears black due to fine particles of iron sulfide and other minerals precipitated from solution as the plume is cooled by contact with cold seawater.
33. Evaluation of ore deposits depends on market location, transportation costs, their physical and chemical characteristics, and the degree of processing required for end use.
34. "Mineral deposit" is an economic term, whereas "Ore" is a geologic term.
35. Most placer deposits have minerals of low specific gravity.
36. The ore within this weathered cap is called gossan.
37. Gypsum, phosphate, halite are metallic mineral deposits.
38. Most stratabound deposits are diagenetic in origin.
39. Veins type deposits are formed when hydrothermal solutions deposited minerals in open fractures.
40. Pegmatites are crystallized from volatile-poor fluids.
41. The type of orebody has a big influence on the choice of mining method.
42. Porphyry Cu, Mo deposits are commonly associated with plutonic and ultramafic igneous rocks.

Credit Hour System – Summer Semester Exam
Geology and Geophysics Programs
Economic Geology (G 434)

Fourth Level

Allowed time 2 hour

ملحوظة: الامتحان في ثلاث صفحات

(50 M) الجزء التحريري

Answer (T) for True sentences Or (F) for False sentences: (One mark each)

1. Volcanogenic massive sulfide deposits are poor in copper and zinc.
2. Mineral deposits are any volume of rock containing an enrichment of one or more minerals.
3. Gangues are defined as waste materials associated with ores.
4. Leaching of silica from the banded iron formation during weathering can lead to decreasing Fe percent.
5. Stratabound deposits form when a magma invades and reacts with muddy sediment.
6. Volcanogenic massive sulfide deposits associated with mid-ocean ridge volcanism.
7. Most industrial minerals are of low in volume.
8. Calcareous (e.g., limestone, dolostone) rocks are most suitable for the formation of skarns.
9. Syngenetic Cu-Ni sulfides are associated with granitic rocks.
10. Metallogenic Provinces are limited regions of the crust within which mineral deposits occur in unusually large numbers.
11. Porphyry copper deposits are copper ore bodies which are associated with porphyritic intrusive rocks and the fluids that accompany them during the transition and cooling from magma to rock.
12. Basic rocks commonly contain pegmatites, REE and gems.
13. Banded Iron Formations are restricted to the Phanerozoic.
14. Sulfide-rich liquid found in the silicate magma is homogeneous at lower temperature and immiscible at high temperature.
15. Metallic minerals are those from which metals such as Cu, Au, Fe, & Zn can be recovered by smelting.
16. Nonmetallic minerals are those used for their physical or chemical properties, that than for the chemical elements they contain.
17. Many famous ore bodies are associated with extrusive igneous rocks.

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أ.د. جلال حامد الحباك - قسم الجيولوجيا

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

جامعة أسيوط

كلية العلوم - قسم الجيولوجيا

امتحان التحريرى للمستوى الرابع بكلية العلوم شعبى الجيولوجيا والجيوفيزياء

المادة: جيولوجيا مصر (415 ج)

(Geology of Egypt) (415 G)

الفصل الدراسى الصيفى ٢٠٢٤/٢٠٢٥ م الدرجة: ٥٠ درجة الزمن: ثلاث ساعات

Answer the following questions:

First question: (10 Marks)

- 1- Compare in a geologic time table between the Miocene rock units at Nile Delta and Gulf of Suez. (3 Marks)
- 2- In a geologic time table summarize the Early Cretaceous rock units at southern and northern Western Desert. (4 Marks)
- 3- Write an essay on the GSSP of the Paleocene/Eocene boundary. (3 Marks)

Second question: (10 Marks)

- 1- Construct the subsurface stratigraphic sequence of the Paleozoic rock units in the Northern Western Desert. (3 Marks)
- 2- Write the geologic age and the geographic location of the following rock units:
Temsah - Wata - Lakia - El Heiz - Safa (4 Marks)
- 3- Trace the important Eocene rock units at the Nile Valley region. (3 Marks)

Third question: (10 Marks)

- 1- Correlate the formation of the same age between column (A) and column (b):
(5 Marks)

Column (A)

Thebes

Wadi Malik

Lakia

Masajid

Esna

Kurkur

Column (B)

Khatatba

Garra

Um Bogma

Dungul

Tarawan

- 2- Write briefly on the Hammamat sediments in the Eastern Desert of Egypt. (5 Marks)

Fourth question: (10 Marks)

- Write short notes on the occurrences of ophiolites in the Eastern Desert of Egypt.

Fifth question: (10 Marks)

- Compare between the calcalkaline and the younger granites in Egypt.

Good Luck

Prof. Dr. Ali A. Khudier

Prof. Dr. Nageh A. Obaidalla

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

جامعة أسيوط

كلية العلوم - قسم الجيولوجيا

امتحان التحريرى للمستوى الرابع بكلية العلوم شعبة الجيولوجيا والكيمياء

المادة: خريطة مصر الجيولوجية (١٠ : ج)

(Geologic Map of Egypt (410 G)

الزمن: ساعتان

الدرجة: ٥٠ درجة

القصل الدراسى الصيفى ٢٠٢٤/٢٠٢٥ م

Answer the following questions:

First Question: (10 Marks)

- 1) Compare in a geologic time table between the Cenomanian sediments at north Sinai and Bahariya Oasis. (5 Marks)
- 2) Write the geologic age and the economic important of the following rock units:
(5 Marks)
a- Kharita b- Malha c- Abu Madi d- Safa e- Umm Bogma

Second Question: (10 Marks)

- 1- In a geologic time table trace and arrange the Nile Valley Eocene rock units from the Upper to Lower Egypt, explaining the economic important of these rocks.
(5 Marks)
- 2- Construct a geologic time table for the Neogene (Miocene & Pliocene) rock units in the Nile Delta region. (5 Marks)

Third Question: (10 Marks)

- 1- Sketch the subsurface stratigraphic sequence of the Paleozoic strata in northern Western Desert. (5 Marks)
- 2- Write brief notes on the occurrences of the ophiolitic rocks in the Eastern Desert of Egypt. (5 Marks)

Fourth Question: (10 Marks)

- Mention the main reason for the abundant occurrences of the low grade metamorphic rocks and the Hammamat Sediments in the central and southern Eastern Desert.

Fifth Question (10 Marks)

- Write brief notes on the rocks of medium to high metamorphic grades occurring in Egypt.

Good Luck

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Prof. Dr. Ali A. Khudier

Prof. Dr. Nageh A. Obaidalla

47. Large Tourmaline crystals are found in granite pegmatites or high temperature vein, schist and gneisses.
48. Garnet is characteristic of metamorphic rocks such as schists.
49. Quartz, feldspars, cordierite and nepheline all have high relief and red interference colors.
50. Zircon (ZrSiO_4) Prismatic habit, Very high relief, Strong interference colors and very high (third- or fourth-order) interference colors.
-

تمت الاسئلة وبالتوفيق

أ.د. جلال الحباك

30. Sedimentary quartz is low temperature mineral that is extremely weak to chemical weathering.
31. The most distinctive properties of biotite are the combination of strong pleochroism and parallel extinction.
32. Quartz shows fair or moderate relief, Perfect cleavage in one direction, Parallel extinction with red interference color.
33. Orthopyroxene distinguished from clinopyroxene by Pink to green pleochroism and Straight extinction in all (001).
34. Enstatite, hypersthene, and ferrosilite are members of the orthopyroxene solid solution series.
35. Olivine minerals are distinguished from orthopyroxene by high birefringence and from clinopyroxene by parallel extinction.
36. Color variation of fluorite is most probably due to different degrees of the chemical variation.
37. Olivine is abundant in most acidic rocks
38. Jasper distinguished by its red color which is due to hematite impurities. It differs from cinnabar by being much harder.
39. Biotite is a common mineral in siliceous volcanic rocks, but less common in siliceous intrusive rocks such as granite.
40. Microcline does not occur in volcanic rocks.
41. Chalcedony is the general name for fibrous amphibole.
42. It is generally difficult to distinguish between individuals in clinopyroxene group optically.
43. Clinopyroxenes are abundant in many intrusive and extrusive igneous rocks, including diorite, gabbro, the peridotite family, basalt, and andesite.
44. The colorless varieties of fluorite are used in objective lenses of the microscopes while the beautifully colored fluorite is used as ornamental material in plates and vases.
45. Garnet is characteristic of sedimentary rocks such as limestone.
46. Microcline is common in quartz-rich intrusive rocks such as granite.

15. Pyroxenes group Single Chain Inosilicates Silicates with two sets of cleavage which are approximately perpendicular angle of cleavage ($88-92^\circ$).
16. All members of the garnet family have very high relief.
17. Epidote group belong to ring silicates and occur in complete euhedral crystals aggregates with low relief.
18. All Ortho -pyroxenes have low birefringence (first order red maximum) and Parallel extinction.
19. Orthopyroxene occurs with clinopyroxene in many igneous rocks, such as gabbro, norite, basalt, andesite, and the peridotite family.
20. Quartz, feldspars, cordierite and nepheline all have low relief and gray to white interference colors.
21. Hornblende occurs in some volcanic rocks, but it is more abundant in extrusive rocks than in intrusive rocks.
22. Orthopyroxene is an indicator mineral for the granulite and pyroxene hornfels facies of metamorphism.
23. Feldspar group are belong to the tectosilicates or Framework Silicates and occur in plates or lath-shaped or euhedral crystals.
24. Monoclinic and triclinic minerals have parallel extinction.
25. Clays Minerals are unstable in low-temperature hydrous environments.
26. The clinopyroxene group includes diopside, augite, jadeite, pigeonite, hedenbergite, and others.
27. Calcite with CaCO_3 Trigonal Habit crystals often rhombohedrons twinning is frequent forming fibrous, granular massive, compact to earthy.
28. Tourmaline is an example of ring silicates (cyclosilicates), parallel extinction, high relief and moderately birefringence.
29. Sedimentary quartz is low temperature mineral that is extremely weak to chemical weathering.

ملحوظة: الامتحان فى اربع صفحات

(50 M) الجزء التحريرى

Answer (T) for True sentences Or (F) for False sentences: (One mark each)

1. Minerals in metamorphic rocks have crystallized from other minerals.
2. Minerals characteristic of high- grade metamorphic environments include the zeolites, chlorites, and muscovite.
3. Graphite is distinguished by its extreme softness, metallic luster, soapy-feeling, infusibility and low specific gravity.
4. Fluorite (or Fluorspar) has the composition of CaF_2 , Cubic Habit usually crystalline in cubes, octahedrons, dodecahedrons or combination of any two forms also granular, massive or compact.
5. Hornblende similar to augite in cleavage, pleochroism and extinction angle.
6. Microcline is distinguished from orthoclase and albite by the extinction angle of 15° on (001) and by cross-hatching
7. Garnet is anisotropic, therefore extinct under crossed polarizers.
8. Agate is a special variety with alternating concentric bands of chalcedony and opal usually of different shades or colors.
9. Chert is similar to flint but differs by its lighter color as well as its presence in compact massive rock form.
10. Clino- pyroxene is parallel extinction while ortho -pyroxene is oblique extinction.
11. Sericite is very fine-grained muscovite and matted Occurs in minute shreds and is a secondary mineral formed by hydrothermal alteration of the feldspar.
12. Isochromes are lines connecting points of equal interference color.
13. All uniaxial minerals show inclined extinction.
14. Orthorhombic minerals show inclined extinction

- C.) None of the above.
- D. All of the above.

9. What is the main driving force behind the formation of most sedimentary basins.....

- A. Volcanic eruptions.
- B. Tectonic plate movements
- C. Asteroid impacts.
- D. Biological activity.
- E. All the above.

10. Sedimentary basins can be classified based on.....

- A. The type of plate motions (divergent, convergent).
- B. Type of the lithosphere.
- C. Distance from plate margins.
- D. All the above.

III. Write briefly on the following (5 marks)

- A. Characteristics of the sedimentary basin.
- B. The cyclical opening and closing of ocean basins (Wilson cycle) (3 marks).
- C. Aulacogens (failed arms).

Good luck

Dr. Abdalla El Ayyat

- A. Circular or more frequently elongate depressions, troughs, or embayments.
- B. But often they may have quite irregular boundaries.
- C. All the above.
- D. Both (A) and (C).

4. Aulacogens are.....

- A. The second, failed arm of a three-armed rift, two of whose arms continued to open to form an ocean basin.
- B. Aulacogens start at the passive continental margin.
- C. Extending from the margins toward the open sea.
- D. Both (A) and (C).
- E. All the above.
- F. None of the above.

5. Which of the following is NOT a process that contributes to basin formation.....

- A. Tectonic down faulting
- B. Deposition of sediments
- C. Uplift and erosion
- D. Cooling and contraction of the crust

6. What is a "paleo-high" in the context of sedimentary basins.....

- A. A raised area separating adjacent sedimentary basins.
- B. A region of high heat flow within a basin.
- C. A type of sedimentary rock formation.
- D. A layer of volcanic ash within a basin.

7. Formation of a rift valley is due to.....

- A. The formation of Fold Mountains.
- B. The forces of tension in the earth's crust.
- C. The subsidence of the floor of a river valley.
- D. The over-deepening of a valley by ice action.

8. A Rift basin is.....

- A. A normal fault bounded basin that develops during extension of continental lithosphere.
- B. Elongate depression overlying a place where the lithosphere has ruptured in extension.

7. Basin relief can be created mechanically on a regional scale in two very important ways: thermally or flexurally, or by a combination of those two effects.

A. True

B. False

8. The type of basin is indicated according to nature of the underlying crust, the type of former plate movement involved during basin formation, i.e., divergence or convergence.

A. True

B. False

9. Nearly all sedimentary basins go through Wilson Cycle.

A. True

B. False

10. Sedimentary basins are the repositories of a great volume of economic deposits, including hydrocarbons, coals, ground water and many of the mineral and metal deposits.

A. True

B. False

II. Choose the correct answer (10 marks)

1. Basins are separated from another by.....

A. Raised linear areas termed arches, paleo-highs, schwelle, axis of uplift, or positive areas.

B. Artificial dams constructed by man.

C. Natural lakes and forests.

D. None of the above.

2. Sedimentary basins are filled with strata deposited entirely in.....

A. Terrestrial environments, others with strata deposited below sea level in marine environments.

B. Many basins include both kinds of sediments.

C. All the above.

D. None of the above.

3. In plan view sedimentary basins may be approximately.....

Geology Department
Faculty of Science
Assiut University



Time: 2 hours
September 2025
Summer Semester 2025

Sequence stratigraphy & sedimentary basins (420G)

Students: 3rd level of Geology

Sedimentary basins (25 marks)

Answer the following questions

I. True or False (10 marks)

1. A sedimentary basin is a low area in the Earth's crust, of tectonic origin, in which sediments accumulate.

A. True

B. False

2. Sedimentary basins are separated from another by raised linear areas termed arches, paleo-highs, schwelle, or positive areas.

A. True

B. False

3. The essential element of the sedimentary basin is tectonic creation of relief, to provide both a source of sediment and a relatively low place for the deposition of that sediment.

A. True

B. False

4. Embayments are basins that are not completely closed structurally, but which open out into a deeper area.

A. True

B. False

5. The axis of a basin is a line connecting the lowest structural points of the basin, as in a synclinal axis.

A. True

B. False

6. On a small scale, hundreds to thousands of meters laterally, fault movements can create relief resulting in small but often deep basins.

A. True

B. False



Summer Semester Final Examination
Geology Students
(Sequence Stratigraphy)

September 2025

G420

25 Marks

Time: 2 hours

Drawings are essential as possible

Answer the following questions

First question

(10 degrees)

A. Put true or false in front of the following sentences (5 degrees, 1 each).

1. Most parasequences are coarsen upward. ()
2. Forestepping and downstepping at the shoreline are interpreted as the result of positive accommodation. ()
3. Each systems tract represents a specific part in the relative sea-level cycle. ()
4. The greatest time gap was almost recorded in the proximal area due to the rise in relative sea-level. ()
5. The deposition during the minimum accommodation space marks the FSST ()

B. Choose the correct answer (5 degrees, 1 each).

1. Condensed sedimentary beds are a marker for (HST - TST - FSST - LST).
2. The (HST - TST - LST - MFS) may comprise one or more submarine fans deposited.
3. The highly fossils content is a marker for (HST - TST - FSST - LST).
4. In a proximal position, the SB should be overlaid by (HST - TST - FSST - LST).
5. At the (TS - HST - MFS - LST), there is no, or very little, sediment reaches to the distal position.

Second question: Write on the following

(10 degrees, 2.5 degrees each)

1. Sequence boundary
2. Maximum flooding surface
3. Relative sea-level
4. Accommodation space

Third question

(5 degrees)

The concept of the correlative conformities marked the birth of modern sequence stratigraphy, **Discuss**.

Dr. Kamel Mahfouz

انتهت الأسئلة..... بالتوفيق والنجاح

E. Assuming that the following mineral deposits were formed from one magma series and related hydrothermal system. Rearrange them according to their time (from earlier to later) and write the process of formation of each deposit. (5 pts)

1. Cassiterite-wolframite (SnO-WO),
2. chromite, Au -porphyry type,
3. Cu-Ni-Sulphides,
4. Diamond deposits,
5. Fe-Ni Laterite deposits

F. Differentiate between the following pairs of terms: (a) ore and mineral deposits; (b) epigenetic and syngenetic deposits; (c) hypogene and supergene hydrothermal solution. (5 pts)

G. Classify metamorphism-related mineral deposits and describe their major characteristics, citing examples. (5 pts)

Best Wishes Mohamed Abdel Moneim

4. VMS deposits are derived via: a. magmatic fractionation, b. fluid immiscibility, c. hydrothermal, d. metasomatic process.
5. The metal zonation of VMS is represented in the inner zone by: a. pyrite and chalcopyrite, b. pyrite-sphalerite-galena, c. sphalerite-galena-pyrite, d. Fe and Mn oxides deposit.
6. Halite is formed by: a. mechanical placer, b. chemical sedimentary, c. supergene enrichment, d. biogenic process.
7. The main factor controlling the placer deposits is: a. pressure, b. temperature, c. specific gravity, d. hardness.
8. Residual mineral deposits produced as a result of: a. mechanical weathering, b. chemical weathering, c. evaporation, d. supergene enrichment process.
9. The existing mineral deposits that turned into a more highly concentrated mineral deposits by weathering process is: a. secondary enrichment, b. placer deposits, c. residual, d. skarn deposit.
10. Hot aqueous solutions responsible for the formation of many ore deposits are named: a. magma melts, b. sea water, c. hydrothermal solutions, d. ground water.
11. Bauxite and laterite are formed due to: a. residual, b. placer, c. metamorphic, d. supergene enrichment process.
12. Pt, Cu—Ni sulphide deposits of Bushveld, South Africa are formed via: a. fluid immiscibility, b. magmatic segregation, c. pegmatitic, d. metamorphogenic process.
13. Li, deposits of Kings Mtn. N.C. is deposited via: a. pegmatitic, b. fluid immiscibility, c. magmatic fractionation, d. residual process.
14. Skarn type deposits are: a. magmatic, b. sedimentary, c. metamorphic, d. metasomatic process.
15. A region characterized by a particular assemblage of mineral deposit type is defined as: a. metalogenic epoch, b. metallotectic, c. metalogenic provinces, d. metallogeny.

C. Write the metal zonation of porphyry type deposits. (5 pts)

- a. A core composed of
- b. Intermediate zone
- c. The outer or upper zone

D. Match the ore metal (A) with the ore forming processes (B) (5 pts)

A	B
Chromite	hydrothermal
Cu-Au	sedimentary (residual)
Nb-Ta	magmatic fractionation
Bauxite	metamorphic
Skarn type (W-Mo)	pegmatitic



Ore forming processes (438)

Answer the following questions :

A. Complete the following sentences by the name of mineral deposit process: (10 pts)

1. The process by which chromite separated from the magma is named.....
2. Sn-W, Beryl deposits associated with coarse grained felsic rocks is forming by process.
3. Bauxite is deposited from Al-rich felsic rocks by process named.....
4. The process by which leaching of certain elements from the upper part of a mineral deposit and their re-precipitation at depth produce higher concentration is named
5. Minerals concentrated by flowing surface water and depositing high density minerals either in stream or near cost lines is named.....
6. Ore deposits formed by replacement of wall rocks (carbonates) adjacent to an intrusive body (granites) is named
7. Based on the degree of temperature hydrothermal solution classified into 1., 2., 3.....
8. Stratiform accumulations of sulfide minerals that precipitate from hydrothermal fluids in the seafloor volcanic is named
9. Ore minerals which are spatially and genetically related to felsic to intermediate intrusions and are dominantly structurally controlled is named
10. Coal deposits is formed by

B. Choose the correct answer for each sentence from (a,b,c,d) of the following: (15 pts)

1. Lithophile elements are typically found associated with: a. basic and ultrabasic , b. felsic igneous, c. intermediate igneous, d. metamorphic rocks
2. In the porphyry type deposits Cu, Au, are derived from: a. mafic mantle, b. felsic crustal, c. mixing of crustal and mantle, d. metamorphic rocks).
3. Ore deposits that form after their host rock are: a. epigenetic b. pregenetic, c. syngenetic, d. metallogenic .

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