

## FACULTY OF GEOLOGY, GEOPHYSICS AND ENVIRONMENTAL PROTECTION

## APPLIED GEOLOGY

## I. GEOLOGY

## MAIN TOPICS

1. Different classifications of the Earth internal structure
2. Processes taking place at the subduction zones
3. Distribution of active volcanoes
4. Origin of shallow and deep earthquakes
5. Process of physical weathering and its results
6. Types of mass movements
7. Stages of river valley evolution
8. Glacial landforms
9. Process of costal erosion and its results
10. Origin and characteristics of flysch deposits

## EXAMPLE QUESTIONS

1. The Conrad discontinuity occurs
  - a. In continental crust
  - b. In Oceanic crust
  - c. At the boundary between outer and inner core
  - d. At the boundary between lithosphere and asthenosphere
2. The accretion of tectonic plates manifests itself by
  - a. mid-oceanic ridge
  - b. negative linear thermal anomaly
  - c. oceanic trench
  - d. transform boundary

## II. GEOLOGICAL CARTOGRAPHY

## MAIN TOPICS

1. Geological structure styles
2. Structural and tectonic **units**
3. Types of unconformities
4. Folds – classifications, mechanisms and causes of folding
5. Faults – genesis and classifications
6. Nappes and overthrusts – mechanisms of formation; internal structure of nappes
7. Fractures, their genesis and classification; joint systems
8. Topographic maps, **cartographic rendering**, classification of maps

9. Geological and related maps used in Poland
10. Global Positioning System, operating principles, satellite navigation systems

#### EXAMPLE QUESTIONS

1. A complete geological map includes:
  - a. map, geological profile, lithostratigraphic cross-section, legend
  - b. map, morphological profile, geological cross-section, explanatory text
  - c. map, geological cross-section, lithostratigraphic profile, explanatory text
  - d. map, geological cross-section, lithostratigraphic profile, explanatory text
2. The syncline is:
  - a. a form of fold containing younger deposits in the core
  - b. any form convex downwards
  - c. a form of fold containing older deposits in the core
  - d. any form convex upwards

### III. MINERAL DEPOSITS

#### MAIN TOPICS

1. Parameters defining the deposit outline
2. Deposit formation processes – subdivision, characteristics
3. Copper deposits – genetic types, geological characteristics
4. Zn-Pb deposits – genetic types, geological characteristics
5. Cr deposits – genetic types, geological characteristics
6. Deposits of energy resources – subdivision, genetic types, geological characteristics
7. Geology of uranium deposits
8. Form and internal structure of the deposit
9. Technical-economic elements and parameters of deposits
10. Industrial minerals of the Lower Silesia

#### EXAMPLE QUESTIONS

1. Hydrothermal deposits are associated with processes:
  - a. evaporation
  - b. weathering and erosion
  - c. volcanic
  - d. none of the above
2. Genetic types of Zn-Pb deposits are:
  - e. VHMS, SHMS
  - f. metasomatic
  - g. evaporates
  - h. placer

## IV. HYDROGEOLOGY

### MAIN TOPICS

1. Hydrological cycle (climatic and lithogenic cycles, recharge and drainage, groundwater flow systems)
2. Hydrogeological properties of rocks. Methods of hydrogeological parameters' assessment (porosity, permeability, water-storage capacity, drainability).
3. Confined and unconfined aquifers, multiaquifer formations, hydrogeological windows.
4. Groundwater flow (hydrogeological gradient, Darcy's law, Darcian velocity and real velocity of groundwaters.
5. Chemical composition of groundwater (fresh waters, mineral waters, thermal and healing waters, major ions, accessory ions and microelements, hydro-chemical diagrams, hydro-chemical classifications)
6. Field methods of hydrogeological investigations (water level measurements, river flow and spring discharge measurements, assessment of hydrogeological parameters, water sampling)
7. Wells and other drainage devices (wells' constructions, inflow calculations, interpretation of pumping tests).
8. Contamination of groundwaters (sources of pollution, groundwater protection against pollutants).
9. Transport of contaminants within groundwater (advection, dispersion and sorption, transport of contaminants through aeration zone and in groundwater stream).
10. Groundwater monitoring (types of groundwater monitoring, basic rules of design of a monitoring net, on-site measurements and sampling).

### EXAMPLE QUESTIONS

1. „Total Dissolved Solids” presents:
  - a. Mass of a dry residue,
  - b. Sum of concentrations of major ions present in water
  - c. Equals the Total Hardness
  - d. Sum of concentrations of all ions present in water
2. hydraulic conductivity considers:
  - a. permeability of rocks in respect to water,
  - b. permeability of rocks in respect to all fluids,
  - c. both answers a and b are correct,
  - d. all answers a, b and c are wrong

## V. GEOCHEMISTRY

### MAIN TOPICS

1. Geochemistry of elements with elements of cosmochemistry
2. Crystallochemistry
3. Geochemical thermodynamics
4. Geochemistry of the Earth's interior – magmatic and metamorphic processes
5. Geochemistry of water and aqueous solutions
6. Geochemistry of the hypergene zone, soils and sedimentary rocks

7. Foundations of atmosphere and environment geochemistry
8. Foundations of radioactive and stable isotope geochemistry, geochronology
9. Foundations of geochemical prospecting
10. Geochemical analysis methodology and interpretation

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#### EXAMPLE QUESTIONS

1. The electronegativity of mineral-forming elements affects its properties because:
  - a) elements with high electronegativity form ionic bonds, making the mineral easily dissolving in water;
  - b) chemical bonds of elements with a small electronegativity difference are stronger and directional, resulting in increased hardness and reduced solubility in water;
  - c) chemical bonds of elements with high electronegativity are stronger and directional, resulting in increased hardness and reduced solubility in water;
  - d) minerals made of elements with high electronegativity are hard and insoluble in water.
  
2. Weathering process of potassium feldspars leads to the formation of kaolinite:
  - a) is a hydration reaction combined with a congruent dissolution process;
  - b) is a hydration reaction combined with a homogenous crystallization process;
  - c) is a hydrolysis reaction combined with an incongruent dissolution process;
  - d) is a congruent dissolution process combined with heterogenous crystallization