

Bachelor of Metallurgical Engg. Examination, 2025
(2nd Year, 1st Semester)
GEOLOGY AND MINERALS BENEFICIATION

Time: Three Hours

Full Marks: 100
(50 marks for each part)

Part-I

Use Separate Answer scripts for each part.

Answer Question No.1 and 2 and any THREE from the rest

1. Mark the correct answer

1X15= 15

- A. In which environment Lead and iron are immobile in nature?
i) Siliceous environment
ii) Calcareous environment
iii) Both (i) and (ii)
iv) None of these
- B. Geomagnetic secular variations originate from which interior part of the earth?
i) inner core
ii) outer core
iii) crust
iv) mantle
- C. Name one mineral having a high dielectric capacity?
i) Quartz
ii) Mica
iii) Feldspar
iv) Calcite
- D. In geological studies, the Mohorovicic Discontinuity, commonly called the Moho, is the boundary between the
i) the mantle and the crust
ii) asthenosphere and the mantle
iii) mantle and the outer core
iv) outer core and the inner core
- E. Heavy mineral placer deposits are associated with
i) near shore and beach sediment
ii) shelf sediment
iii) relict sediment of modern continental shelf
iv) deep sea gravels
- F. The softest mineral known as per Mohs scale is
i) Apatite
ii) Orthoclase
iii) Talc
iv) Gypsum
- G. Explosive eruptions often involve rhyolitic magmas. This is because of their
i) High silica content
ii) High water content
iii) Low volatile solubility
iv) Deep-seated nature

- H. Under intense pressure and high temperature, hydrogen atoms combine to form helium. This process is called:
- Nuclear fusion
 - Nuclear fission
 - Metamorphism
 - Convection
- I. What drives the Earth's internal heat engine?
- Radioactivity
 - Solar Energy
 - Volcanoes
 - Ocean tides
- J. In general, igneous rocks:
- Form at relatively high temperatures
 - Form by crystallization of solids from a liquid
 - Form at high and low pressures
 - All of the above
- K. Minerals:
- Can form by life-processes – organic
 - Are crystalline solids
 - Have a unique chemical composition
 - Can be any state (solid, liquid, or gas) as long as that state occurs naturally
- L. Metamorphic rocks are changed rocks. Which of the following rock types could be the "parent" of a metamorphic rock?
- Sedimentary
 - Igneous
 - Metamorphic
 - All of the above
- M. Which property is most useful in distinguishing Orthoclase and Tourmaline?
- Hardness
 - Sample size
 - Type of luster
 - Angle of cleavage
- N. Oxygen built up in the Earth's atmosphere because:
- The oceans separated from the crust
 - Rocks weathered and released their oxygen
 - Algae and other organisms employed photosynthesis
 - Oxygen settled on Earth from planets further from the sun
- O. The age of the Earth is currently thought to be
- About 6 billion years old
 - About 4,500,000 years old
 - About 4,500,000,000 years old
 - None of the above

2. Write a short notes on (any three):

3X5 =15

- Bowen's reaction series
- Bauxite and its Indian resources
- Lead-Zinc ores and its Indian resources
- Classification of igneous rocks in relation to mineralogy
- Differences between Laccolith and Lopolith

3. a) Why streak rather than colour of a mineral is considered as a diagnostic property?
What is lustre? On which factors does the lustre of a mineral depend? 5
- b) Arrange the following in (i) Acid (ii) Basic & (iii) ultrabasic igneous rocks: 3
Granite, Rhyolite, Andesite, Basalt, Gabbro, Peridotite & Dunite.
- c) Arrange the following rocks according to decreasing SiO₂ content: 2
Gabbro, Granulite, Peridotite

4. a) Mention the type of feldspar that is recorded in each of the following rocks: 5
Granite, Diorite, Pegmatite, Basalt
- b) Describe textural characters of Conglomerate, Gneiss and Phyllite, 5

5. a) Define mineral. Is pearl a mineral? Arrange the following minerals in order of decreasing hardness-Apatite, Diamond, Fluorite and Gypsum. 5
- b) What is Mohs' Scale of hardness? Why the hardness of minerals is considered as a vector property? Distinguish between Ilmenite and Tourmaline on the basis of their physical properties. 5

6. Enumerate the physical properties that help in the identification of minerals in hand specimens. State the diagnostic physical properties of the following minerals in hand specimens: chalcopyrite, galena, kyanite. 10

B.E. Metallurgical Engineering. Second Year First Semester Exam-2025

Subject: Geology and Mineral Beneficiation

Time: Three hours

Full Marks: 100

(50 marks for each part)

Use a separate answer-script of each part.

Part-II

CO-1 Q1

2x5

(a). What is Mineral Beneficiation? Write the name of four different metals and their ores with chemical formula.

(b). State the laws of comminution

OR

(a). Write the various objectives of comminution

(b). Draw a flow sheet of Crushing plant

CO-2 Q2

2x5

(a). Describe the functional diagram of double toggle blake jaw crusher.

(b). Distinguish between Open circuit crushing and Close circuit crushing

OR

(a). Describe the motion of the charge in a Tumbling Mill.

(b). Derive the relation between Roll diameter, Particle size, Rolls gap and Angle of Nip.

CO-3 Q3.

2x5

(a). Derive the Terminal velocity of a fine particle falling through a fluid.

(b). Distinguish between Free settling and Hindered settling ratio.

OR

(a). Distinguish between Laminar flow and Turbulent flow

(b). Write the various factors on which the capacity of a screen is dependent.

CO-4 Q4

2x5

(a). State the working principle of gravity concentration process and represent the movement of various spheres under shaking condition.

(b). Write the name and role of various chemical reagents used in froth flotation process

OR

(a). Draw the flowsheet for the selective flotation and describe briefly.

(b). Distinguish between Concentration and Classification

CO-5 Q.5 Short Notes

2x5

(a). Hydraulic classifier

(b). Wet Magnetic separator

Or

Pollution in mineral beneficiation plants

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