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# PAPER ANALYSIS

## GEOLOGY OPTIONAL

## UPSC CSE 2025

GEOLOGY OPTIONAL CRASH COURSE FOR IFS 2025

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# UPSC CSE – GEOLOGY OPTIONAL 2025 ANALYSIS

## Summary – UPSC CSE Geology Optional 2025 (Paper Analysis)

*Exam Date: Sunday, 31 August 2025*

The **2025 Geology Optional papers** followed the standard UPSC structure of two papers (Paper I and II), each divided into Section A and B, with Q1 and Q5 compulsory. Students had to attempt **five questions in total (250 marks)**, ensuring balance between both sections.

Our analysis of the papers, mapped carefully against the official UPSC syllabus, highlights the following key takeaways for future aspirants:

1. **Balanced Coverage Across the Syllabus**
   - Questions spanned all major areas of the syllabus, ensuring no subject could be safely ignored.
   - Both fundamental topics (e.g., *Continental Drift, GPS, Microfossils, Petrology phase diagrams*) and applied/Indian geology (e.g., *Delhi Supergroup, Spiti Basin, Pb–Zn deposits, KG Basin*) featured prominently.
2. **Weightage by Subject**
   - When regrouped into the **12 official syllabus categories**, the **weightage was broadly uniform**: most major subjects carried **~60–70 marks** each.
   - This reflects UPSC's design choice of ensuring **balanced representation**, rather than concentrating marks heavily in only a few areas.
   - Future candidates should therefore treat **all subjects as equally important** from a marks perspective, with no area being "low priority."
3. **Difficulty Profile**
   - Marks-weighted difficulty averaged **~1.5 on a 1–3 scale** (1 = easy, 2 = medium, 3 = hard).
   - **Paper I** leaned slightly tougher (~1.54) than **Paper II (~1.39)**, largely due to Structural and Engineering Geology questions.
   - Overall, a well-prepared student could expect a **moderate paper** with a few tricky concepts (e.g., sheath folds, reserve estimation, thrust geometries).
4. **Attempt Strategy Matters**
   - Because only **five questions out of eight** are attempted, students can **strategically avoid the toughest questions**.
   - Future candidates should therefore prepare across the syllabus but practice identifying **safer scoring questions** quickly under exam conditions.
5. **Overall Message to Students**
   - The 2025 paper reinforced UPSC's approach of testing **breadth + depth**: rewarding both conceptual clarity (easy factual questions) and analytical skills (applied/interpretive questions).
   - Success lies in:
     - Covering **all grouped syllabus areas**,
     - Practicing **diagram-based answers** (structural geology, petrology, geomorphology), and
     - Developing **choice-making skills** to maximize scoring by avoiding the hardest options.

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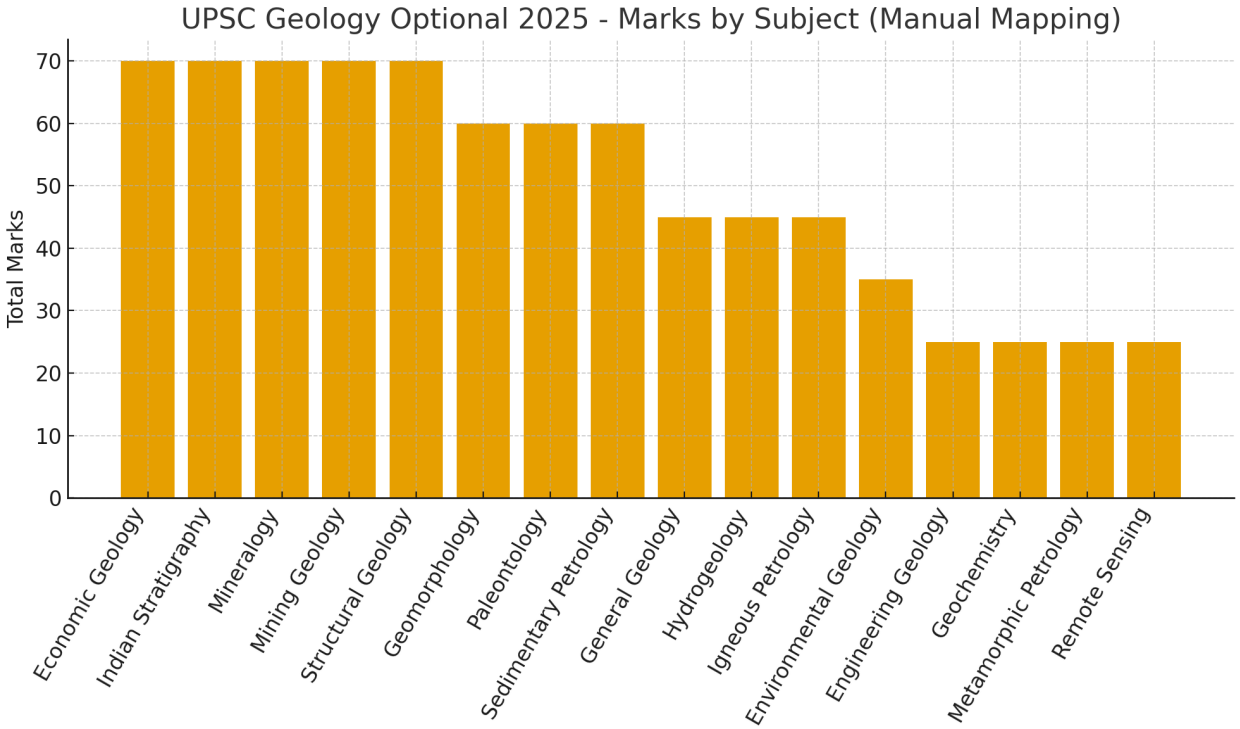
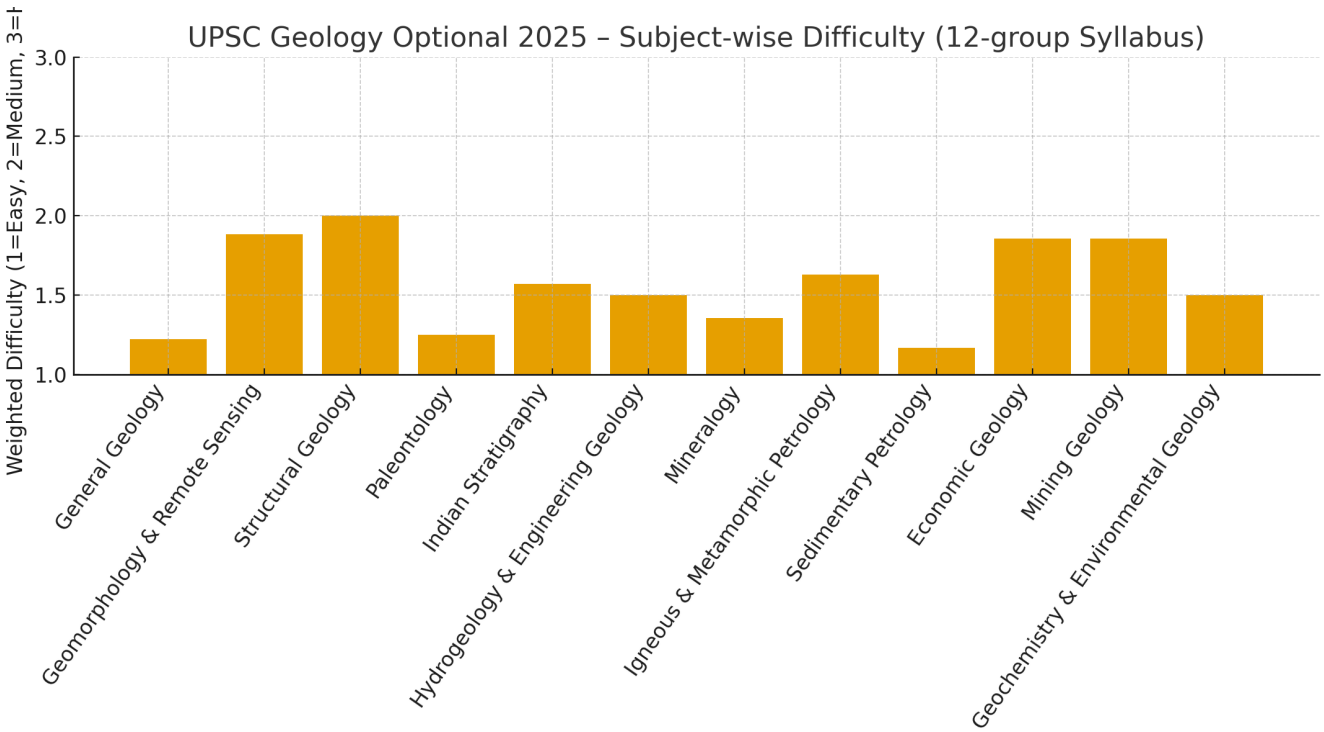
# 2025 IFoS Geology Optional Crash Course

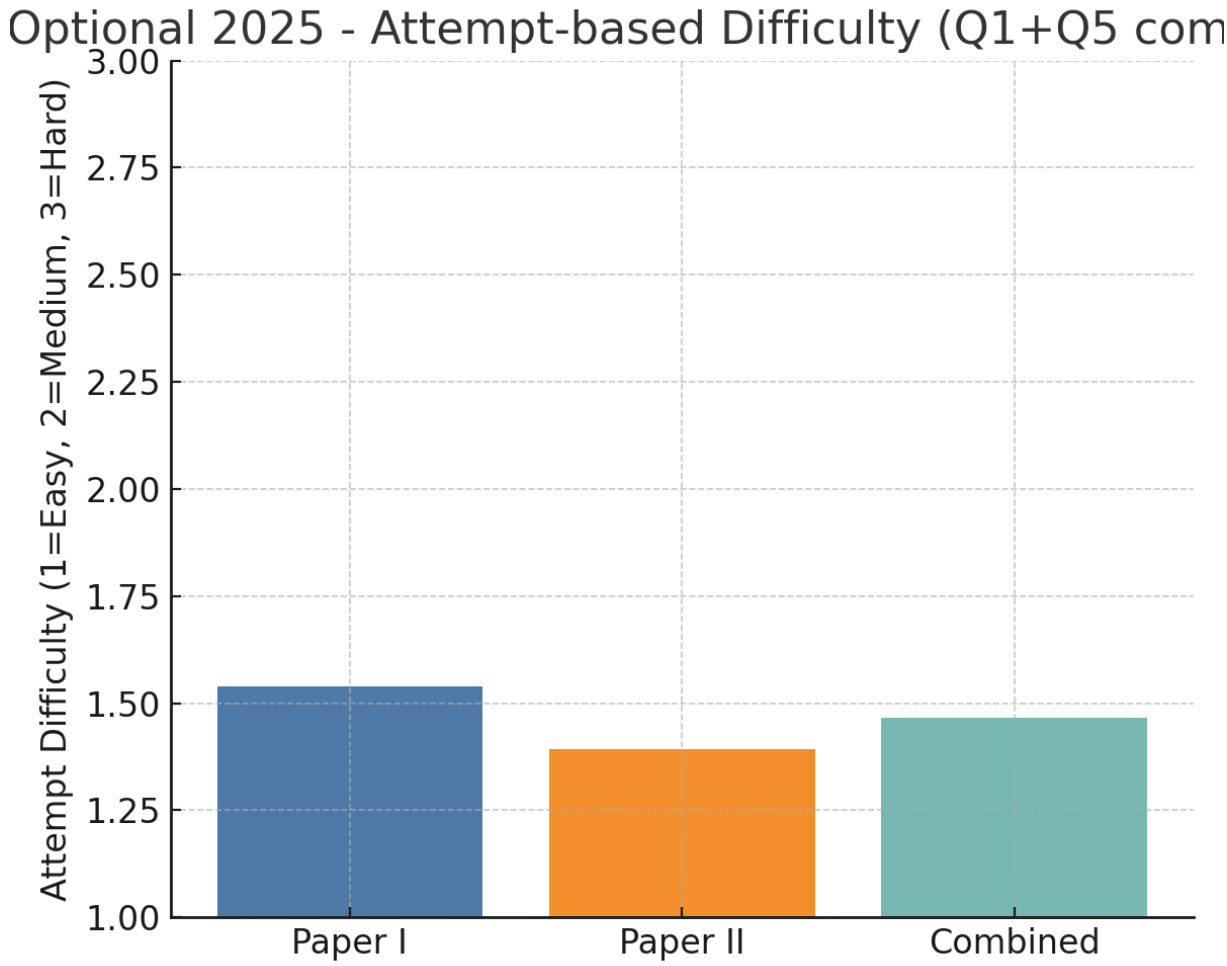
**QUESTION PAPER SPECIFIC INSTRUCTIONS**

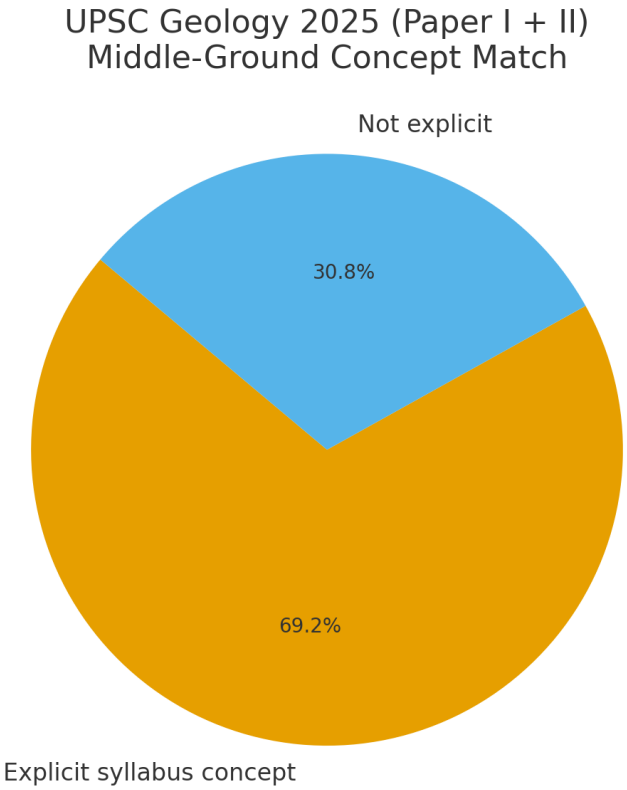
Please read each of the following instructions carefully before attempting questions:

1. There are **EIGHT questions** divided in **Two Sections** and printed both in **Hindi** and in **English**.
2. Candidate has to attempt **FIVE questions in all**.
    - Question Nos. **1 and 5 are compulsory**.
    - Out of the remaining, **THREE are to be attempted** choosing at least **ONE from each section**.
3. The number of marks carried by a question/part is indicated against it.
4. **Answers must be written in the medium authorized** in the Admission Certificate, which must be stated clearly on the cover of this Question-cum-Answer (QCA) Booklet in the space provided.
    - No marks will be given for answers written in a medium other than the authorized one.
5. **Word limit**, wherever specified in the questions, should be adhered to.
6. **Diagrams/sketches**, wherever required, may be drawn in the space provided for answering the question itself.
7. **Attempts of questions shall be counted in sequential order.**
    - Unless struck off, attempt of a question shall be counted even if attempted partly.
8. Any page or portion of the page left blank in the answer book must be **clearly struck off**


UPSC Geology Optional 2025 - Marks by Subject (Manual Mapping)
Total Marks
0
10
20
30
40
50
60
70
Economic Geology
Indian Stratigraphy
Mineralogy
Mining Geology
Structural Geology
Geomorphology
Paleontology
Sedimentary Petrology
General Geology
Hydrogeology
Igneous Petrology
Environmental Geology
Engineering Geology
Geochemistry
Metamorphic Petrology
Remote Sensing


UPSC Geology Optional 2025 – Subject-wise Difficulty (12-group Syllabus)
Weighted Difficulty (1=Easy, 2=Medium, 3=H
1.0
1.5
2.0
2.5
3.0
General Geology
Geomorphology & Remote Sensing
Structural Geology
Paleontology
Indian Stratigraphy
Hydrogeology & Engineering Geology
Mineralogy
Igneous & Metamorphic Petrology
Sedimentary Petrology
Economic Geology
Mining Geology
Geochemistry & Environmental Geology


Optional 2025 - Attempt-based Difficulty (Q1+Q5 com
Attempt Difficulty (1=Easy, 2=Medium, 3=Hard)
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
Paper I
Paper II
Combined


UPSC Geology 2025 (Paper I + II)
Middle-Ground Concept Match
Not explicit
30.8%
69.2%
Explicit syllabus concept

**UPSC CSE Geology Paper I (2025) - Question to Syllabus Mapping**

**Section A**

| Q. No | Question | Subject | Subtopic |
|---|---|---|---|
| 1(a) | Discuss the position of Asteroid belt within the solar system and comment on the composition of meteorites. | General Geology | The Solar System, meteorites, origin and interior of the Earth and age of Earth. |
| 1(b) | What are sheath folds? Discuss the deformational conditions of their formation. | Structural Geology | Folds and faults classification and mechanics. |
| 1(c) | What is Global Positioning System (GPS)? Explain its geological applications. | Geomorphology and Remote Sensing | The Geographic Information System (GIS) and Global Positioning System (GPS)—its applications. |
| 1(d) | Discuss the statement: “Physical weathering adds to the effectiveness of Chemical weathering.” | Geomorphology | Basic concepts of geomorphology. Weathering and soil formations. |
| 1(e) | Discuss the types of Penetrative and Non-penetrative lineations with suitable diagrams and their genesis. | Structural Geology | Structural analysis of folds, foliations, lineations, joints and faults. |
| 2(a) | What do you understand by continental drift? Discuss various geological evidences in favour of continental drift. | General Geology | Continental drift; Seafloor spreading, plate tectonics. |
| 2(b) | Geomorphic diversity is controlled by a number of endogenic and exogenic processes. Discuss. | Geomorphology | Geomorphic cycles and their interpretation. Morphology and its relation to structures and lithology. |
| 2(c) | Describe morphotectonic features characteristic of rejuvenation in a mountainous terrain. | Geomorphology | Applications of geomorphology in mineral prospecting, civil engineering, hydrology and environmental studies. |

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|---|---|---|---|
| 3(a) | Waves are responsible for modifying coastal geomorphology. Justify the statement giving suitable examples and neat diagrams. | Geomorphology | Coastal geomorphology. |
| 3(b) | Explain how Remote Sensing and GIS may help in delineation of groundwater potential zones. | Geomorphology and Remote Sensing / Hydrogeology | Applications of remote sensing in geology; Groundwater recharge; Exploration for groundwater. |
| 3(c) | Using neat sketches describe various types of thrust geometries formed in a compressional regime. | Structural Geology | Folds and faults classification and mechanics. |
| 4(a) | On the basis of dip isogons, describe the classification of folds with neat diagram. | Structural Geology | Structural analysis of folds. |
| 4(b) | What are volcanoes? Describe various causes and products of volcanism. | General Geology | Volcanoes — causes and products, volcanic belts. |
| 4(c) | How does strain analysis help in understanding the nature of rock deformation? Discuss some methods of estimation of two-dimensional strain. | Structural Geology | Stress and strain ellipsoid and stress–strain relationships of elastic, plastic and viscous materials; Strain markers in deformed rocks. |

**Section B**

| Q. No | Question | Subject | Subtopic |
|---|---|---|---|
| 5(a) | Discuss favourable conditions for fossilization. | Paleontology | Modes of preservation of fossils. |
| 5(b) | Discuss different concepts of biozonation with neat diagrams. | Paleontology / Indian Stratigraphy | Classification of stratigraphic sequences: biostratigraphic… |
| 5(c) | Describe the lithology, type locality, age and depositional environment of Blaini Boulder Bed. | Indian Stratigraphy | Study of stratigraphic distribution and lithology of Phanerozoic rocks of India with reference to |

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|---|---|---|---|
| | | | fauna, flora and economic importance. |
| 5(d) | What engineering properties make Marble, Sandstone and Granite useful as building stones? | Hydrogeology and Engineering Geology | Rock as construction material. |
| 5(e) | Explain different genetic types of water and their significance in water supply. | Hydrogeology | Hydrologic cycle and genetic classification of water. |
| 6(a) | Discuss the evolutionary lineage of Equidae and comment on its migration. | Paleontology | Evolutionary trend in Hominidae, Equidae and Proboscidae. |
| 6(b) | Give the lithostratigraphic classification and distribution of Delhi Supergroup. Also comment on its economic significance. | Indian Stratigraphy | Distribution and classification of Precambrian rocks of India. |
| 6(c) | What are different types of wells used for the extraction of groundwater and why the well field should be protected? | Hydrogeology | Types of wells. Problems and management of groundwater. |
| 7(a) | What do you understand by boundary problems in stratigraphy? Discuss the Cretaceous–Palaeogene boundary problem giving Indian examples. | Indian Stratigraphy | Major boundary problems — Cambrian/Precambrian, Permian/Triassic, Cretaceous/Tertiary and Pliocene/Pleistocene. |
| 7(b) | What are important groups of microfossils? Add notes on their distribution and significance. | Paleontology | Different kinds of microfossils; Application of microfossils in correlation, petroleum exploration, paleoclimatic and paleoceanographic studies. |
| 7(c) | Why is earthquake-resistant site selection needed? Discuss the | Hydrogeology and Engineering | Earthquake-resistant structures. |

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| | geological considerations required for developing earthquake-resistant structures. | Geology | |
| 8(a) | Discuss the interrelationship amongst Porosity, Permeability and Hydraulic conductivity. How are they important in groundwater movement? A sediment sample… Calculate the Hydraulic conductivity. | Hydrogeology | Porosity, permeability, hydraulic conductivity, transmissivity and storage coefficient. |
| 8(b) | Describe important Lower Gondwana plant fossils with the help of neat diagrams and comment on their palaeogeographic significance. | Paleontology | Gondwana flora and fauna and its importance. |
| 8(c) | Discuss the lithology, fossil content and age of Palaeozoic sequence of Spiti Basin of Himachal Pradesh. | Indian Stratigraphy | Study of stratigraphic distribution and lithology of Phanerozoic rocks of India with reference to fauna, flora and economic importance. |

**UPSC CSE Geology Paper II (2025) - Question to Syllabus Mapping**
**Section A**

| Q. No | Exact Question | Syllabus Subject Heading | Exact Topic (from syllabus) |
|---|---|---|---|
| 1(a) | Describe the symmetry elements shown by the normal class of the orthorhombic system. What are the different forms for this? Draw the sketch stereogram of the form (hkl). Give examples of minerals that crystallize in this system. | Mineralogy | Classification of crystals into systems and classes of symmetry; International system of crystallographic notation; Use of projection diagrams to represent crystal symmetry. |

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| 1(b) | Discuss in brief the characteristic optical properties of hornblende and augite under petrological microscope. | Mineralogy | Optical properties of common rock forming minerals; Pleochroism, extinction angle, double refraction, birefringence. |
| 1(c) | Draw a neat labelled diagram for perthite texture. Explain the formation of perthite with the help of a suitable phase diagram. | Igneous Petrology | Petrogenetic significance of the textures and structures of igneous rocks. |
| 1(d) | With the help of diagrams, describe the various diagenetic textures of carbonate rocks. | Sedimentary Petrology | Diagenesis and lithification; Clastic and non-clastic rocks; Textures and structures of sedimentary rocks. |
| 1(e) | Describe ultrahigh-pressure and ultrahigh-temperature metamorphism. | Metamorphic Petrology | Types and agents of metamorphism; Metamorphic grades and zones; Facies of regional and contact metamorphism; Granulite terrains of India. |
| 2(a) | Give a detailed account related to the classification of crystals into different crystallographic systems based on symmetry elements. | Mineralogy | Classification of crystals into systems and classes of symmetry. |
| 2(b) | Describe the structure of the pyroxene group of minerals with suitable diagrams. Discuss the chemical compositions and optical properties of | Mineralogy | Physical and chemical characters of rock-forming silicate mineral groups. |

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|---|---|---|---|
| | orthopyroxene. | | |
| 2(c) | Describe the structural classification of silicates with neat sketches. Give one example for each type. | Mineralogy | Structural classification of silicates. |
| 3(a) | What are migmatites? Describe the important types of migmatites and the processes of their formation. | Metamorphic Petrology | Metasomatism and granitisation, migmatites. |
| 3(b) | Draw a neat labelled sketch for the albite–anorthite phase diagram (1 atm, dry). Trace the curve of crystallization of an initial melt Ab20–An80 within this system. How can you interpret zoning in plagioclase with this system? | Igneous Petrology | Generation and crystallisation of magmas. Crystallisation of albite–anorthite system. |
| 3(c)(i) | Briefly write on the characteristics of I, S, M and A type granites. Elucidate the petrographic and petrogenetic attributes for each type. | Igneous Petrology | Petrography and petrogenesis of granite and related rocks. |
| 3(c)(ii) | Write a short account on the Deccan Flood Basalt Volcanism in India. | Igneous Petrology / Indian Stratigraphy | Deccan volcanic province. |
| 4(a) | Discuss the genesis of any four sedimentary structures which are helpful in palaeocurrent analysis. How are palaeocurrent patterns helpful in establishing the depositional environment? | Sedimentary Petrology | Sedimentary structures and their significance; Sedimentary facies and provenance. |
| 4(b) | Discuss the concept of facies model and give a brief account of a facies model. | Sedimentary Petrology | Sedimentary facies and provenance. |
| 4(c) | What are conglomerates? Describe their fabrics, classification and geological significance. | Sedimentary Petrology | Clastic rocks — classification, petrography and depositional environment. |

**Section B**

| Q. No | Exact Question | Syllabus Subject Heading | Exact Topic (from syllabus) |
|---|---|---|---|
| 5(a) | What do you understand by metallogenic epochs and provinces? Discuss any two major metallogenies in India. | Economic Geology | Metallogenic epochs and provinces. |
| 5(b) | Discuss the mode of occurrence, origin and distribution of gold deposits in India. | Economic Geology | Geology of the important Indian deposits of gold. |
| 5(c) | What do you understand by 'pathfinder' elements? What are the elements/ions used in the prospecting of sulphides of epigenetic origin, porphyry copper deposit and sulphide deposits in general? | Mining Geology / Geochemistry | Methods of prospecting — geochemical; Elements of crystal chemistry, trace elements. |
| 5(d) | Define gravitation. What are the corrections necessary to obtain the absolute value of gravity (g) while using gravity method in mineral exploration? | Mining Geology / Geophysics | Methods of prospecting — geophysical (gravity method). |
| 5(e) | What are the major components of chondrites? Discuss the mineralogical and textural features, and significance of chondrites. | Geochemistry | Composition of the planets and meteorites. |
| 6(a) | Give a detailed account of geology, mode of occurrence, genesis and distribution of Pb-Zn deposits of Aravalli region. | Economic Geology | Geology of the important Indian deposits of lead and zinc. |
| 6(b) | Describe the distribution of petroliferous basins of India. Discuss the geology of KG Basin. | Economic Geology | Deposits of petroleum in India. |
| 6(c) | What are volcanogenic massive sulphide (VMS) deposits? Cite suitable Indian examples. | Economic Geology | Classification of ore deposits; Processes of formation of mineral deposits; Indian deposits. |

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|---|---|---|---|
| 7(a) | Discuss the direct and indirect geochemical methods used for prospecting of hydrocarbon deposits. | Mining Geology / Geochemistry | Methods of prospecting — geochemical; Hydrocarbon exploration. |
| 7(b) | What are the physiological and morphological changes of the plants helpful in geobotanical prospecting of copper, manganese and uranium deposits? Add a note on commonly found plant indicators for zinc. | Mining Geology | Methods of prospecting — geobotanical. |
| 7(c) | What do you understand by 'tonnage factor'? Discuss graphical methods used in reserve calculation. | Mining Geology | Estimation of reserves of ore. |
| 8(a) | What do you understand by isomorphism and polymorphism? Discuss monotropy by citing examples of diamond and graphite. | Geochemistry | Isomorphism and polymorphism. |
| 8(b) | What are the most important conditions necessary for safe disposal of radioactive waste in geological repositories? Add a note on the concept of multiple barriers to protect biosphere and hydrosphere. | Environmental Geology | Radioactive waste disposal; Environmental protection — legislative measures in India. |
| 8(c) | What are the major environmental considerations while disposing disseminated precious metal mine waste? | Environmental Geology | Environmental impact of mining and waste disposal. |

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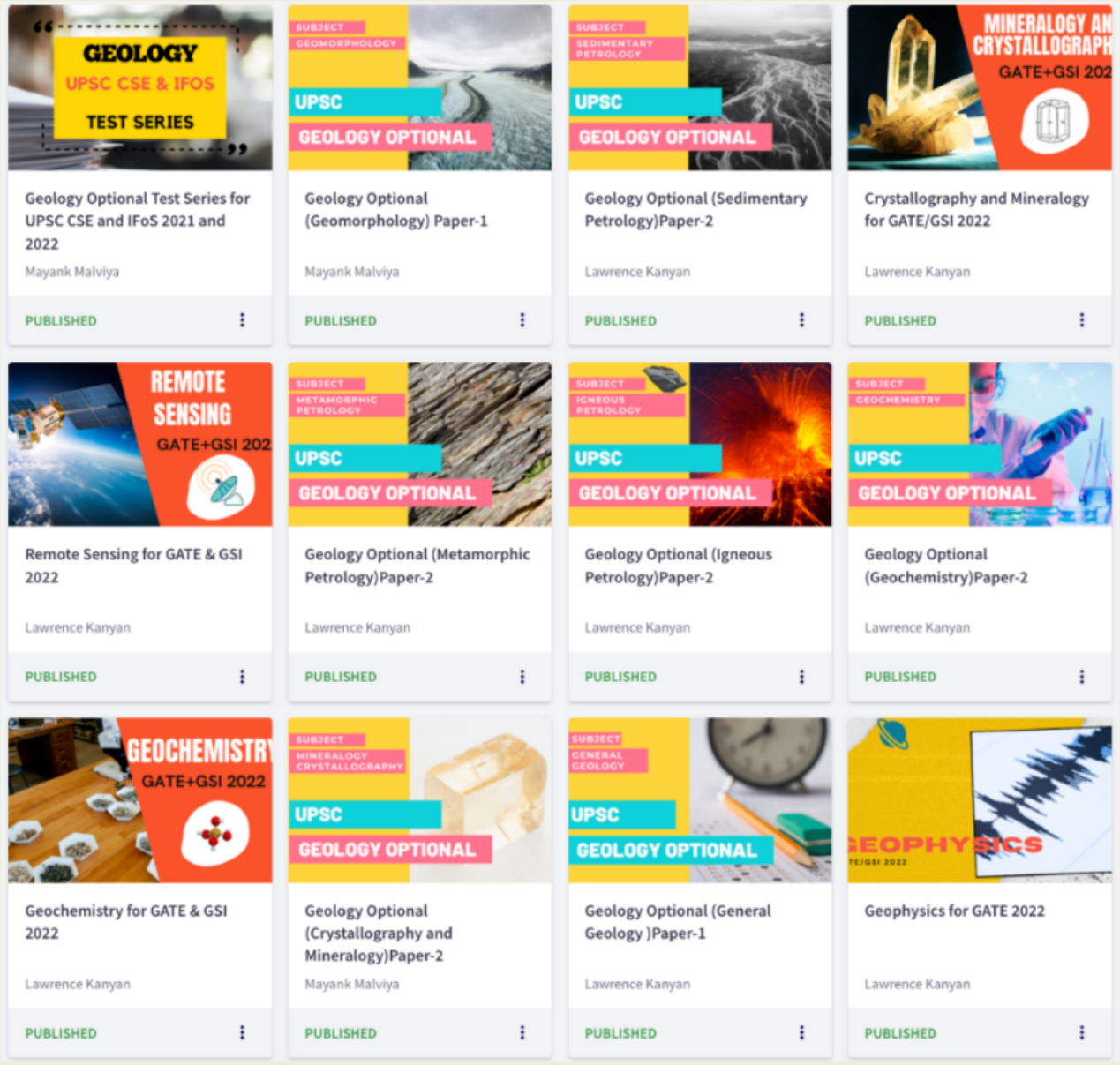


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