

1. Describe the concept of Seafloor Spreading and explain how Palaeomagnetism provides evidence for this process. (5 Marks)
2. Evaluate the “Elastic Rebound Theory” of earthquakes. How do P-wave and S-wave shadow zones provide evidence for the specific composition and state of the Earth’s Outer Core? (5 Marks)
3. Discuss the morphology of the Ocean Floor. Briefly describe the features found in the Abyssal Zone. (5 Marks)
4. Compare the “Level of Compensation” in Pratt’s vs. Airy’s models of Isostasy. How does the concept of Glacial Isostatic Adjustment (GIA) relate to modern eustatic sea-level changes? (5 Marks)
5. Critically analyze the phenomenon of “Solid Solution” and “Exsolution” in minerals. How does the cooling history of a magma determine the presence of Perthitic textures? (5 Marks)
6. Explain the construction and functioning of a Nicol Prism. Why is “Total Internal Reflection” a critical principle in its design? (5 Marks)
7. Describe the optical properties “Pleochroism” and “Extinction”. How is a Quartz Wedge used as an optical accessory? (5 Marks)
8. Distinguish between Isomorphism and Polymorphism in minerals. Provide atleast one example for each. (5 Marks)
9. Explain the process of fractional crystallization and discuss how it contributes to the diversity of igneous rock compositions from a single parent magma. (5 Marks)
10. Define “Metamorphic Facies” and briefly describe the mineralogical characteristics and tectonic environment associated with the Blueschist facies. (5 Marks)

11. In the Forsterite-Silica (Mg_2SiO_4 - SiO_2) binary system, explain the chemical and physical consequences of “crystal-liquid fractionation” occurring precisely at the peritectic point. How does this process lead to the production of silica- oversaturated (quartz normative) rocks from a silica-undersaturated parent melt? (5 Marks)
12. Describe the mineralogical and structural evolution of a pelitic protolith (shale) undergoing progressive regional metamorphism from the Greenschist Facies to the Granulite Facies. Highlight the role of “Anatexis” in the final stages. (5 Marks)
13. Explain sedimentary basins and their modes of formation, illustrating the answer with two Indian examples. (5 Marks)
14. Discuss the petrographic characteristics of oolitic limestone and fossiliferous limestone and explain their significance in interpreting depositional environments. (5 Marks)
15. Give two examples each of elastic and non-elastic sedimentary textures and evaluate the applicability of the ϕ (phi) scale in their analysis. (5 Marks)
16. Analyze the role of sediment provenance in controlling the composition and texture of different sedimentary rocks, using two suitable examples. (5 Marks)
17. Define tectonites and explain how their fabrics relate to the three principal stress axes ($\sigma_1, \sigma_2, \sigma_3$). (5 Marks)
18. Explain the concept of width of outcrop and discuss how the Rule of V's is applied in geological map interpretation to determine the attitude of strata. (5 Marks)
19. Describe the different types of faults and the criteria used for their recognition in the field and on geological maps. (5 Marks)
20. Define folds and explain how stereographic projection helps in determining fold axis and axial plane. (5 Marks)

21. Apply your knowledge of trilobite exoskeleton to explain their preservation potential in the fossil record. (5 Marks)
22. Discuss the role of microfossils in reconstructing paleoenvironments. (5 Marks)
23. Define offlap and overlap and how they can be used to interpret transgressive and regressive sequences. (5 Marks)
24. Explain the stratigraphic position of infratrapeans and intratrapeans and their stratigraphic significance. (5 Marks)
25. Describe the global distribution of volcanic exhalative deposits. (5 Marks)
26. Discuss about the classification of critical minerals by the USGS. (5 Marks)
27. Define hydrothermal ore deposits and their main types. (5 Marks)
28. Give a brief account of the Pb-Zn ore deposits of India. (5 Marks)
29. Explain how open-cast mining affects landforms and ecosystems. (5 Marks)
30. Define point sources and non-point sources of pollution with suitable examples. (5 Marks)
31. Discuss about the common causes of landslides in hilly regions. (5 Marks)
32. Explain the socio-economic factors contributing to urbanisation. (5 Marks)