

INDIAN STATISTICAL INSTITUTE

Recruitment for posts of Associate Scientist A (*Specialization: Geology*)

SECTION II

Syllabus for Online and Skill Tests

- **Structural Geology:** Stress, Mohr construction for two-dimensional stress; Strain, Longitudinal strain, Shear strain; Rotational and irrotational strain; Rheology; Brittle fracturing; Shear Zones; Mechanics of folding; Geometrical analysis of cylindrical folds; Superposed folding.
- **Tectonics:** History of development tectonic concepts; Geophysical data base for development of plate tectonic theory; Processes and structure of different types of plate margins; Continental rifts, Passive continental margins; Foreland basins and a brief history of Himalaya.
- **Geochemistry:** Earth in relation to the solar system; Cosmic abundance of elements; Average chemical composition of crust, mantle, core and entire earth; Phase transition in mantle, behavior of isotopes during magmatic crystallization; Evolution of atmosphere; Evolution of atmosphere, hydrosphere; Brief concept of biosphere; Brief idea of dating of older rocks and Quaternary sediments.
- **Igneous Petrology:** Study of 2 or 3 component systems in high- and low-pressure and their petrogenetic significance; Principles of experimental petrology; Magma genesis and layered complexes; Physical volcanology; Pyroclastics.
- **Metamorphic petrology:** Ocean floor metamorphism; Paired metamorphic belt; Petrography and equilibrium relations in metamorphism of pelitic, Carbonate and mafic rocks; Granulite and eclogite facies of metamorphism; Metamorphic reactions, PT- t paths during metamorphism.
- **Geostatistics:** Scientific methods & some basic concept of statistics: sample; Measurement; Models and probability; Binomial, Normal, Poisson distribution; Statistical inferences, Confidence intervals; Chi-square, Student's t and f test; Correlation and regression; Kolmogorov-Smirnov test.
- **Remote Sensing and GIS:** Geographic Information Systems and Global Positioning system; Introduction to photogrammetry, terrestrial and aerial photographs, Stereovision, Application of geoinformatics in geological and resource mapping, geoenvironmental assessment.
- **Mineral Deposits and Economic Resources:** Processes of formation of mineral deposits, Changing perception of ore genesis, Modern sea floor deposits, Their genetic implications and ancient analogies.
Important metallic, non-metallic and atomic mineral deposits of India and of neighboring countries. Ore texture, mineral resources- time, space, and dynamic controls, resource management concept, mineral economics, present status of resources, resource development and future sources.

- **Sedimentology and Basin Analysis:** Different group of sedimentary rocks, primary and diagenetic processes; provenance; climatic and tectonic signatures; volcanoclastics.
 Provenance- definition and concepts, evidence from detrital components, climatic signatures, tectonic provenances.
 Deposition of Carbonate, Chert, Evaporite; Sedimentary structure and fluid dynamic interpretation; Classification of Newtonian flows; Sediment gravity flow; Facies analysis; Facies model for continental and marine environments; Introduction to the basic ideas of sequence stratigraphy. Basin mapping methods, Basin modeling and its uses, Basin modeling techniques. Palaeocurrent analysis; Resource potential of sedimentary basins, use of modeling in hydrocarbon generation and exploration.
- **Paleontology:** Fossils, Different types of fossils, Usage of fossils, Taphonomy, Taxonomy and paleospecies, Phylogenetic systematics and cladograms, Law of Faunal succession and biostratigraphy, Organic evolution and Darwin's theory, Ecology and habitats, Hard-part morphology of major invertebrate groups, the molluscs, brachiopods, cephalopods, trilobites, corals and foraminifer and their fossil records in India; basic ideas on vertebrate evolution through Geologic time, Gondwana and Siwalik vertebrates of India.
- **Stratigraphy of India:** Archaean Cratons in Peninsular India; Broad overview of the general characters of these Archaean Cratons in the light of evolution of the Indian shield; General characteristics of the Proterozoic Basins of India. Gondwana Supergroup of peninsular India. Phanerozoic successions (apart from Gondwana) in different parts of the peninsular and extra- Peninsular India.

Sample Questions for the Online Test

Note: For each of the questions there are four suggested answers, of which only one is correct. You will score

4 marks for each correctly answered question,

0 mark for each incorrectly answered question, and

1 mark for each unattempted question.

- Pure albite has less SiO_2 by weight% than pure orthoclase. In a perthite exsolved albite lamellae should contain
 - Same weight% of silica as the original solid solution
 - More weight% of silica than the host feldspar
 - Less weight% of silica than the host feldspar
 - Less weight% of silica than the original solid solution.
- Continental early Triassic deposits of India is devoid of
 - Coal
 - Red beds
 - Sandstones
 - Dykes and sills
- Barapasaurus* is a
 - Theropod dinosaur
 - Sauropod dinosaur
 - Ornithopod dinosaur
 - Pteropod dinosaur
- The Andes Mountains of South America are a result of which type of plate boundary?
 - Convergent
 - Divergent
 - Transform
 - They are not related to a plate boundary
- In the given stereogram, if A and B are the poles of the two limbs of a cylindrical fold, then
 - Fold axial plane dips towards east and the fold axis is horizontal, trending north-south
 - Fold axial plane dips to west and fold axis is horizontal, trending north-south
 - Fold axial plane is horizontal and fold axis is vertical
 - Fold axial plane is vertical and the fold axis plunging towards north
- Which of the following best defines a mineral and a rock?
 - A rock has an orderly, repetitive, geometrical, internal arrangement of minerals; a mineral is a lithified or consolidated aggregate of rocks.
 - A mineral consists of its constituent atoms arranged in a geometrically repetitive structure; in a rock, the atoms are randomly bonded without any geometric pattern.
 - In a mineral the constituent atoms are bonded in a regular, repetitive, internal structure; a rock is a lithified or consolidated aggregate of different mineral grains.
 - A rock consists of atoms bonded in a regular, geometrically predictable arrangement; a mineral is a consolidated aggregate of different rock particles.
- A 2D circular marker on a rock body has been deformed to become an ellipse having 32 cm and 8 cm as major and minor axes. Assuming volume constant homogeneous rock deformation the radius of the original undeformed marker is
 - 10 cm.
 - 25 cm.
 - 16 cm.
 - 2.5 cm.
- In a cross-bedded sandstone the axes of trough cross strata are oriented towards 355° , 350° , 005° , 285° , 075° , 010° , and 0° . The mean paleocurrent direction is approximately towards
 - 90° .
 - 180° .
 - 0° .
 - 235° .

9. *Stegosaurus* are not found in Triassic deposits of Spiti area because
- (a) *Stegosaurus* is not found in Triassic.
 - (b) *Stegosaurus* is terrestrial and Spiti Triassic deposits are marine.
 - (c) Both (a) and (b) makes the occurrence impossible.
 - (d) *Stegosaurus* is a deep marine swimmer and Triassic deposits of Spiti are shallow marine.
10. The average thickness of the continental crust is about
- (a) 35 – 40 km.
 - (b) 100 – 200 km.
 - (c) 1000 – 2000 km.
 - (d) 5 – 10 km.
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