

HARYANA PUBLIC SERVICE COMMISSION

BAYS NO. 1-10, BLOCK-B, SECTOR-4, PANCHKULA

Hydrologist and Geophysicist (Class – II) Examination – 2015

Advt. No. : 9

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INSTRUCTIONS FOR CANDIDATES

HYDROLOGIST AND GEOPHYSICIST (CLASS – II) EXAMINATION – 2015

A competitive examination for recruitment to the posts of **Hydrologist and Geophysicist (Class-II)** in Public Health Engineering Department, Haryana, will be held by the Haryana Public Service Commission at Panchkula or any where in the State of Haryana as per provision contain in the Haryana Public Health Engineering Department, Hydrologist and Geophysicist (Group – B) Service Rules, 2012 and amended vide notification dated G.S.R. 13/Const./Art./309/2015 dated 18.08.2015. The syllabus for this examination as prescribed by the Govt. is appended and the Examination will be held in accordance with this syllabus. The number of posts is as under:-

Sr. No.	Name of the post	Gen
1	Hydrologist (Class-II) in Public Health Engineering Department, Haryana	01
2	Geophysicist (Class-II) in Public Health Engineering Department, Haryana	01

1. Essential Qualifications:-

(A) Hydrologist

- (i) Atleast 2nd Class M. Sc. Or M. Tech. in Geology from recognized university / institution.
- (ii) Knowledge of Hindi / Sanskrit up to Matric or higher qualification with Hindi as one of the subject.

(B) Geophysicist

- (i) Atleast 2nd Class M. Sc. Or M. Tech. in Geophysics from recognized university / institution.
- (ii) Knowledge of Hindi / Sanskrit up to Matric or higher qualification with Hindi as one of the subject.

2. Age:-

Candidate should not be less than **20 years** and not more than **42 years** as on last date of submission of application to the Commission's office i.e. **08.03.2016**.

Age Relaxation:

(a) Upper age limit is relaxable upto 45 years for:-

- (i) Unmarried women of Haryana only.
- (ii) Wives of disabled Ex-servicemen with disability between 20% to 50% and widows of those Ex-servicemen who killed in action.
- (iii) Women whose husbands have been ordered by civil / criminal Courts to pay maintenance to them, Women whose husbands have remarried, widows, women

who are legally separated from their husbands or have been divorced, women living separately from their husbands for more than two years because of desertion, Wives of serving/disabled military personnel and widows of those killed in action. Woman living separately from her husband due to desertion will be required to submit with her application an affidavit to the effect that she has been deserted by her husband, and has been living separately from him for more than two years and this affidavit should be counter-signed by two responsible persons such as members of the Legislative Assembly, Local Bodies, Panchayats and the Bar Association. Where, however, a woman who has remarried, she would not be eligible for the above concession in the matter of age.

(b) Upper age limit is relaxable for Physically Handicapped category of Haryana by 10 years.

3. **For evidence of age:** The Matriculation certificate or equivalent academic certificate thereto is the only acceptable document.

4. **Pay Scale: ₹ 9300-34800 + 5400/- Grade Pay**

5. **Application Fees:-**

The online application fees which is payable at all branches of State Bank of Patiala and State Bank of India is as under:-

Sr. No.	Categories of candidates	Fees
1	For Male candidates of General and reserved categories candidates of Haryana & other states.	₹ 1000/-
2	For Female candidates of General and reserved categories candidates of Haryana & other states.	₹ 250/-
3	For all Physically Handicapped candidates (with at least 40% disability) categories of Haryana only.	NIL

Notes:-

- (i) The person already in Govt. service and person employed in Public Sector Undertakings including Quasi Government Organizations whether in permanent, Quasi permanent or temporary capacity should take print of two sets of their online application form. One set is required to be submitted to their employer for NOC whereas the other is required to be sent to the Commission by the closing date to avoid rejection of their applications. The applications so submitted will be considered provisionally but the set of applications through their employers should ordinarily reach the Commission's office within a fortnight after the closing date. In cases where the through proper channel application is not received within the above time or if the application is received direct, the candidate will be interviewed only if he produces the permission of his employer at the time of interview.
- (ii) If the employer's permission is not furnished due to the fact that the candidate had resigned after sending the application form, in that case the candidate will be interviewed only if he produces a letter from the employer to the effect that he has resigned from the post and his resignation has been accepted.

- (iii) The candidate who joins service under Government, Quasi Government Organization, Public Sector undertakings after the submission of application form will have to produce “NO OBJECTION CERTIFICATE” from the employer on or before the date of his interview failing which he will not be interviewed.
- (iv) Persons in private employment are not required to produce the employer’s permission (NO OBJECTION CERTIFICATE) at the time of interview.
- (v) Government Employees of the Union and other States will not be allowed any benefit of their past Service under their respective Governments.
- (vi) It is made clear that the **dependent of ESM candidates** will be considered as **General Category** candidates for all intents and purposes.

6. Scheme of Examination: The selection of candidate shall be made by the Commission, after holding a competitive examination, the syllabus for which is given in **Appendix E** of the relevant service rules and the same is also given at point No. 7 and 8 respectively.

Provided that if the number of candidates is **more than twenty times** the number of vacancies advertised, the Commission may hold a screening test to shortlist the candidate for the competitive examination.

Provided further that a candidate shall not be considered qualified for appointment, unless he obtains not less than forty percent marks in each subject and also not less than fifty percent marks in the aggregate, and no candidate who fails to obtain the qualifying marks shall be called for interview by the Commission.

However, candidates three times of the advertised posts including bracketed candidates, if any, in order of merit of the Examination will be called for interview for Personality Test.

Interview for Personality Test:-

The candidate will be interviewed by a Board of competent and unbiased observers who will have before them a record of his career. The object of the interview is to assess his suitability for the posts for which he has competed. Special attention will be paid in the Personality Test to assessing the candidate’s capacity for leadership, initiative and intellectual curiosity, tact and other social qualities, mental and physical energy, powers of practical application, integrity of character and aptitude for adapting themselves to the field life.

7. Papers and Syllabus : The examination will be held on the basis of the syllabus given below:-

(A) FOR THE POST OF HYDROLOGIST

<u>Sr. No.</u>	<u>Subject</u>	<u>Duration</u>	<u>Marks</u>
1.	General English	3 hrs.	100
2.	Geology Paper I	3 hrs.	200
3.	Geology Paper II	3 hrs.	200
4.	Hydrogeology	3 hrs.	200

Total			700
Marks of Interview for Personality Test will be			100

(B) FOR THE POST OF GEOPHYSICIST

<u>Sr. No.</u>	<u>Subject</u>	<u>Duration</u>	<u>Marks</u>
1.	General English	3 hrs.	100
2.	Geology Paper I	3 hrs.	200
3.	Geology Paper II	3 hrs.	200
4.	Geology Paper III	3 hrs.	200

Total			700
Marks of Interview for Personality Test will be			100

8. Standard and Syllabus of Paper:

**Schedule
Standard and Syllabus**

The standard of the paper in General English will be such as may be expected of a science graduate. The papers on geological subjects will be approximately of the M. Sc. Degree standard of an Indian University and questions will generally be set to test the candidate's grasp of the fundamentals in each subject.

There will be no practical examination in any of the subjects.

(1) General English

Candidate will be required to write a short Essay in English. Other questions will be designed to test their under-standing of English and workmanlike use of words.

(2) GEOLOGY – PAPER I

Section A : Geomorphology and Remote Sensing

Basic principles. Weathering and soils, Mass wasting. Influence of climate on processes. Concept of erosion cycles. Geomorphology of fluvial tracts, arid zones, coastal regions, 'Karst' landscapes and glaciated ranges. Geomorphic mapping, slope analysis and drainage basin analysis. Applications of geomorphology in mineral prospecting, civil engineering, hydrology and environmental studies. Topographical maps. Geomorphology of India.

Concepts and principles of aerial photography and photogrammetry, satellite remote sensing – data products and their interpretation. Digital image processing. Remote sensing in landform and land use mapping, structural mapping, hydrogeological studies and mineral exploration. Global and Indian Space Missions. Geographic Information System (GIS) – principles and applications.

Section B : Structural Geology

Principles of geological mapping and map reading, projection diagrams. Stress-strain relationships of elastic, plastic and viscous materials. Measurement of strain in deformed rocks. Behaviour of minerals and rocks under deformation conditions. Structural analysis of folds, cleavages, lineations, joints and faults. Superposed deformation. Mechanism of folding and faulting. Time-relationship between crystallization and deformation. Unconformities and basement-cover relations. Structural behaviour of igneous rocks, diapirs and salt domes. Introduction to petrofabrics.

Section C : Geotectonics

Earth and the solar system, Meteorites and other extra-terrestrial materials, Planetary evolution of the earth and its internal structure. Heterogeneity of the earth's crust. Major tectonic features of the Oceanic and Continental crust. Continental drift – geological and geophysical evidence, mechanics, objections, present status. Gravity and magnetic anomalies at Mid-ocean

ridges, deep sea trenches, continental shield areas and mountain chains. Palaeomagnetism. Seafloor spreading and Plate Tectonics. Island arcs, Oceanic islands and volcanic arcs. Isostasy, orogeny and epeirogeny. Seismic belts of the earth. Seismicity and plate movements. Geodynamics of the Indian plate.

Section D : Stratigraphy

Nomenclature and modern stratigraphic code. Radioisotopes and measuring geological time. Geological time-scale. Stratigraphic procedures of correlation of unfossiliferous rocks. Precambrian stratigraphy of India. Stratigraphy of the Paleozoic, Mesozoic and Cenozoic formations of India. Gondwana system and Gondwanaland. Rise of the Himalaya and evolution of Siwalik basin. Deccan Volcanics. Quaternary Stratigraphy. Rock record, palaeoclimates and palaeogeography.

Section E : Paleontology

Fossil record and geological time-scale. Morphology and time-ranges of fossil groups. Evolutionary changes in mollusks and mammals in geological tie. Principles of evolution. Use of species and genera of foraminifera and echinodermata in biostratigraphic correction. Siwalik vertebrate fauna and Gondwana flora, evidence of life in Precambrian times, different microfossil groups and their distribution in India.

(3) GEOLOGY – PAPER II

Section A : Mineralogy

Physical, chemical and crystallographic characteristics of common rock forming silicate mineral groups. Structural classification of silicates. Common minerals of igneous and metamorphic rocks. Minerals of the carbonate, phosphate, sulphide and halide groups.

Optical properties of common rock forming silicate minerals, uniaxial and biaxial minerals. Extinction angles, pleochroism, birefringence of minerals and their relation with mineral composition. Twinned crystals. Dispersion. The U-Stage.

Section B : Igneous and Metamorphic Petrology

Forms, textures and structures of igneous rocks. Silicate melt equilibria, binary and ternary phase diagram. Petrology and geotectonic evolution of granites, basalts, andesites and alkaline rocks. Petrology of gabbros, kimberlites, anorthosites and carbonatites. Origin of primary basic magmas.

Textures and structures of metamorphic rocks. Regional and contact metamorphism of pelitic and impure calcareous rocks. Mineral assemblages and P/T conditions. Experimental and thermodynamic appraisal of metamorphic reactions. Characteristics of different grades and facies of metamorphism. Metasomatism and granulitization, migmatites. Plate tectonics and metamorphic zones. Paired Metamorphic belts.

Section C : Sedimentology

Provenance and diagenesis of sediments. Sedimentary textures. Framework matrix and cement of terrigenous sediments. Definition, measurement and interpretation of grain size. Elements of hydraulics. Primary structures, palaeocurrent analysis. Biogenic and chemical sedimentary structures. Sedimentary environment and facies. Facies modeling for marine non-marine and mixed sediments. Tectonics and sedimentation. Classification and definition of sedimentary basins, Sedimentary basins of India. Cyclic sediments. Seismic and sequence Stratigraphy. Purpose and scope of basin analysis. Structure contours and isopach maps.

Section D : Geochemistry

Earth in relation to the solar system and universe, cosmic abundance of elements. Composition of the planets and meteorites. Structure and composition of earth and distribution of elements. Trace elements. Elementary crystal chemistry and thermodynamics. Introduction to isotope geochemistry. Geochemistry of hydrosphere, biosphere and atmosphere. Geochemical cycle and principles of geochemical prospecting.

Section E : Environmental Geology

Concepts and principles. Natural hazards – preventive / precautionary measures – floods, landslides, earthquakes, river and coastal erosion. Impact assessment of anthropogenic activities such as urbanization open cast mining and quarrying, river-valley projects, disposal of industrial and radio-active waste, excess withdrawal of ground water, use of fertilizers, dumping of ores, mine waste and fly-ash. Organic and inorganic contamination of ground water and their remedial measures. Soil degradation and remedial measures. Environment protection – legislative measures in India.

(4) HYDROGEOLOGY

Section A : Origin, occurrence and distribution of water

Origin of water: meteoric, juvenile, magmatic and sea waters. Hydrologic cycle: precipitation, runoff, infiltration and evapotranspiration, Hydrographs. Subsurface movement and vertical distribution of groundwater, Springs, Classification of aquifers, Concepts of drainage basin and groundwater basin. Hydrological properties of rocks – specific yield, specific retention, porosity, hydraulic conductivity, transmissivity, storage coefficient, water table fluctuations – causative factors, concept of barometric and tidal efficiencies, water table contour maps, Classification of rocks with respect to their water bearing characteristics, Hydro-stratigraphic units, Groundwater provinces of India, Hydrogeology of and Zones of India, wet lands.

Section B : Well hydraulics and well design

Theory of groundwater flow, Darcy's Law and its applications, determination of permeability in laboratory and in field, Types of wells, drilling methods, construction, design, development and maintenance of wells, specific capacity and its determination. Unconfined, confined, steady, unsteady and radial flow conditions, Pumps tests – methods, data analysis and interpretation for hydro geologic boundaries, Evaluation of aquifer parameters using Thiem, Theis, Jacob and Walton methods, Groundwater modeling – numerical and electrical models.

Section C : Groundwater chemistry

Groundwater quality – physical and chemical properties of water, quality criteria for different uses, graphical presentation of water quality data, groundwater quality in different provinces of India – problems of arsenic and fluoride, Saline water intrusion in coastal and other aquifers and its prevention, Radioisotopes in hydrogeological studies, Groundwater contamination.

Section D : Groundwater exploration

Geological – lithological and structural mapping, fracture trace analysis, Hydrogeological – lithological classification with respect of hydrologic properties, Hydraulic continuity in relation to geologic structures, Location of springs Remote sensing – hydrogeomorphic mapping of the terrain using different images of different satellite missions, lineament mapping, shallow groundwater potential zone mapping using satellite images, Surface geophysical methods – seismic, gravity, geo-

electrical and magnetic, Subsurface geophysical methods – well logging for delineation of aquifers and estimation of water quality.

Section E : Groundwater problems and management

Groundwater problems related to foundation work, mining, canals and tunnels, Problems of over exploitation and groundwater mining. Groundwater development in urban areas and rain water harvesting, Artificial recharge methods, Groundwater problems in arid regions and remediation. Groundwater balance and methods of estimation. Groundwater legislation. Sustainability criteria and managing renewable and nonrenewable groundwater resources.

(5) GEOLOGY – PAPER III

Section A : Indian mineral deposits and mineral economics

Occurrence and distribution in India of metalliferous deposits – base metals, iron, manganese, aluminium, chromium, nickel, gold, silver, molybdenum. Indian deposits of non-metal – mica, asbestos, barites, gypsum, graphite, apatite and beryl. Gemstones, refractory minerals, abrasives and minerals used in glass, fertilizer, paint, ceramic and cement industries. Building stones. Phosphorite deposits. Placer deposits, rare earth minerals.

Strategic, critical and essential minerals. India's status in mineral production. Changing patterns of mineral consumption. National Mineral Policy. Mineral Concession Rules. Marine mineral resources and Law of Sea.

Section B : Ore genesis

Ore deposits and one minerals. Magmatic processes of mineralization. Porphyry, skarn and hydrothermal mineralization. Fluid inclusion studies. Mineralisation associated with – (i) ultramafic, mafic and acidic rocks, (ii) greenstone belts, (iii) komatiites, anorthosites and kimberlites and (iv) submarine volcanism. Magma-related mineralization through geological time. Stratiform and stratabound ores. Ores and metamorphism – cause and effect relations.

Section C : Mineral exploration

Methods of surface and subsurface exploration, prospecting for economic minerals – drilling, sampling and assaying. Geophysical techniques – gravity, electrical, magnetic, airborne and seismic. Geomorphological and remote sensing techniques. Geobotanical and geochemical methods. Borehole logging and surveys for deviation.

Section D : Geology of fuels

Definition, origin of coal. Stratigraphy of coal measures. Fundamentals of coal petrology, peat, lignite, bituminous and anthracite coal. Microscopic constituents of coal. Industrial application of coal petrology. Indian coal deposits. Diagenesis of organic materials.

Origin, migration and entrapment of natural hydrocarbons. Characters of source and reservoir rocks. Structural, stratigraphic and mixed traps. Techniques of exploration. Geographical and geological distributions of onshore and offshore petroliferous basins of India.

Mineralogy and geochemistry of radioactive minerals. Instrumental techniques of detection and measurement of radioactivity. Radioactive methods for prospecting and assaying of mineral deposits. Distribution of radioactive minerals in India. Radioactive methods in petroleum exploration – well logging techniques. Nuclear waste disposal – geological constraints.

Section E : Engineering Geology

Mechanical properties of rocks and soils. Geological investigations for river valley projects – Dams and reservoirs; tunnels – types, methods and problems. Bridges – types and foundation problems. Shoreline engineering. Landslides – classification, causes, prevention and rehabilitation. Concrete aggregates – sources, alkali-aggregate reaction. Aseismic designing – seismicity in India and earthquake-resistant structures. Problems of groundwater in engineering projects. Geotechnical case studies of major projects in India.

- 9. Correspondence with the Commission :-** All communication in respect of the application should be addressed to the **Secretary, Haryana Public Service Commission, Bays No. 1-10, Block-B, Sector-4, Panchkula – 134 112** and should contain the following particulars:-

Name of examination: **Hydrologist / Geophysicist Class-II Examination – 2015**

Month and year of examination.

Roll No. / Registration No. (if the Roll No. communicated to the candidate)

Name of the candidate:

Father's Name:

Address as given in application:

Communications not giving these particulars may not be attended to. In all correspondence with the Commission, concerning this examination, the candidate should invariably super scribe the envelope and correspondence with the words “**Hydrologist / Geophysicist (Class-II) Examination – 2015**”.

Dated: 03.02.2016

Secretary,
Haryana Public Service Commission,
Panchkula