

राष्ट्रीय प्रौद्योगिकी संस्थान नागालैंड
NATIONAL INSTITUTE OF TECHNOLOGY NAGALAND
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Prof. R. Kumar
Registrar (i/c)

Ref: NIT-N/ADMN/ REG/2022/04-001

Date: 13/04/2022

General Instructions for the candidates shortlisted for appearing the Written Examination for the Post of Technicians in Electrical and Electronics Engineering (Trade: Electrical Machines), Chemistry Laboratory and Mechanical Engineering (Trade: Machine Shop) in response to Advt. No. NIT-N/RECT-NT/2021/12 dtd. 23/12/2021:

1. In addition to the conditions stipulated as a part of general information, which were already provided in the Advertisement of the Institute as above, the following conditions shall also be adhered which may kindly be noted by all concerned.
2. Personal Interviews will not be conducted for the posts of Technicians/ Laboratory Assistant in accordance with the communication vide Ref. F.No.35 – 4/2016–TS.III dtd. 11/12/2019 of Ministry of Education under the extant rules.
3. On the date specified as date of Written Examination, Skill Test will be conducted for about 45 minutes duration. This Skill Test will only be of qualifying nature.
4. The candidates who were qualified in the Skill Test shall have to appear for the written examination, which consists of two parts as below:
 - (i) Practical Examination by conducting laboratory experiments/ procedure of 2 hours duration for 50 marks (40 marks for the Experiments/ procedure + 10 marks viva voce during the course of conducting the entrusted experiments/ procedures).
 - (ii) Theory Examination (Written) of 1 hour duration for 50 marks. The theory paper contains Questions of MCQs / Short Descriptive type.
 - (iii) No negative marks will be given for attempting wrong answers.
 - (iv) The selection of candidate for offering Appointment is based upon the performance in Practical Examination and Theory Examination (Written). The minimum marks required for consideration for offering the appointment is 60% in both the Practical Examination and Theory Examination (Written). If more than one candidate scores same marks, the rank will be decided based on an additional fresh examination on the respective subject areas of 1 hour duration.
 - (v) The Written Examination pattern, syllabus and the test modalities for the above said Posts of Technician shall be as under:

Syllabus for Practical Examination / Laboratory Experiments/Procedure:

S. No.	Discipline	Syllabus For Practical Examination / Laboratory Experiments/Procedure
1	Chemistry	Senior secondary (10+2) level Chemistry; e.g: Preparation of standard Solution, Titration, inorganic complex preparation and Determination water quality parameters.
2	Electrical & Electronics Engineering	Senior secondary (10+2)/ ITI/ Diploma in Engineering level in Electrical and Electronics Engineering in Electrical Machines and allied areas of Electrical and Electronics Engineering
3	Mechanical Engineering	Senior secondary (10+2)/ ITI/ Diploma in Engineering level in Mechanical Engineering in Machine Shop and allied areas of Mechanical Engineering.

Syllabus for the Theory Examinations (Written):

A. Name of the Post: Technician (Chemistry) – Syllabus for written examination

Unit – I (General Chemistry)

Fundamentals of atomic structure. Periodicity of the elements – shielding - effective nuclear charge - Slater's rule - atomic, covalent and van der Waals radii - ionization energy - electron affinity – electronegativity - Electronic and steric effects - Inductive effect – resonance – hyper-conjugation - steric effect, covalent and ionic bonding – Electrophiles and nucleophiles. Ionization of water - pK_w and pH - solubility product - common ion effect - Buffer solutions - standard solution – concept of normality, formality, molarity and molality.

Unit –II (Organic Chemistry)

Fundamentals of organic chemistry: Hydrocarbons, Alcohol, Phenol and Ether, Aldehydes, Ketones and Carboxylic Acid - Aromaticity and Hückel Rule - Concept of hybridization of organic compounds and shapes of molecules - Reactive intermediates: Carbocation, carbanion, free radical and benzyne, Friedel-Crafts alkylation/acylation, nitration, sulfonation, halogenation - Grignard reagents. Basics of stereochemistry of organic molecules, symmetry elements - molecular chirality - optical activity - optical purity - meso compounds - racemic mixture – resolution – enantiomers – diastereomers, basic concepts of stereo-chemical nomenclatures: threo/erythro, syn/anti, R/S, cis/trans and E/Z.

Unit – III (Physical Chemistry)

Laws and terms of Thermodynamics; State & path functions - concept of heat and work - internal energy, enthalpy, entropy, free energy, heat capacities & their applications. Electrochemistry: Conduction in electrolyte solutions-ionic mobility-dilution principle-transport number- electrochemical cells - EMF, Nernst equation - Primary & Secondary cells - Ionic equilibrium - Ion conductance - Measurement of conductance - cell constant. Specific conductance & molar conductance and their variation with dilution for strong and weak electrolytes - Kohlrausch's law of independent migration of ions - Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes - Ionic mobility.

Unit – IV (Inorganic Chemistry)

Structure and Bonding - bonding in homo-nuclear diatomic molecules (e.g.: H₂, N₂, O₂, F₂) VSEPR model, Concepts of Lattice energy and its application - s, p and d block elements, their properties (physical and chemical), compounds and reactions General Principle and Process of Isolation of Elements - Acid -Base concept: Arrhenius concept, Brønsted-Lowry acids and bases - Lewis acids and bases - Acid and base strength - Dissociation constant of weak acids and bases, Coordination chemistry: Werner's theory, classification of ligands, coordination number, nomenclature of coordination compounds, isomerism. Environmental Chemistry.

Unit-V (Chemistry in everyday life)

Importance of Chemistry in daily life - basis of classification of drugs and their function(s) in the body – Antipyretics – analgesics – antibiotics - tranquilizers – Chemotherapy and its applications - drug-target interaction of enzymes and receptors - antiseptics and disinfectants. Artificial sweetening agents - Food Preservatives and synthetic detergents.

B. Syllabus for written examination for the post of Technician, Mechanical Engineering – Machine Shop Trade:

- 1. General studies and current affairs:** Current events of national and international importance; General issues on Environmental Ecology, Bio-diversity, and Climate Change; Five Year Plans in India; Science & Technology in India.
- 2. Qualitative aptitude:** Areas and Volume; Averages, Mean, Median and Mode; Heights and distances; L.C.M and H.C.F; Percentage; Points, lines and angles; Ratio and Proportions; Speed, Distance and Time; Time and Work.
- 3. Manufacturing Technology:** Casting process: Pattern and Pattern making; Moulding; Defects and remedies in casting – Metal joining : Different types of welding processes; Welding techniques; Defects in welding; Fundamentals of soldering and brazing; Riveted joints – Metal forming: Fundamentals of rolling, drawing and extrusion; Sheet metal forming – Machining: Fundamentals of turning, milling, shaping, broaching and grinding – CAD and CNC programming fundamental concepts.
- 4. Strength of Materials:** Concepts of stress and strain; Hooks law; Elastic constants; Review of simple and compound stresses, Mohr's Circle; Generalized Hook's Law; Theories of Failure; Direct and shear stresses in beams due to transverse and axial loads; torsion of solid & hollow shafts; Thin cylinders & spheres: Hoop and axial stresses and strain.
- 5. Thermal Engineering:** Classifications of heat engines – Carnot cycle – Otto and Diesel cycle – Actual and theoretical PV diagram of four and two stroke engines; S.I and C.I engines – Valve and port timing diagram – Comparison of two and four stroke engines – Carburettor and injector system – Lubrication and Cooling system; Classification and working principle of compressors – Reciprocating and centrifugal compressors – single stage and multi stage compressors - Isothermal and Isentropic efficiency of reciprocating and centrifugal compressors; Basic fundamentals of Vapour compression and vapour absorption refrigeration cycle.

6. Fluid Mechanics and Hydraulics: Properties of fluids– Variation of Static Pressure – Pressure Measurement –Stability of bodies in fluid - metacentric height and its measurement- Flow characteristics- application of continuity equation, energy equation and momentum equation- Boundary layer concepts – One dimensional flow through pipes – Euler’s equation – Bernoulli’s and Energy equation - Laminar and turbulent flow- Classification of turbines- Pelton wheel, Francis turbine and Kaplan turbines- working principles-Centrifugal pumps– working principle - work done by the impeller Rotary pumps-Cavitations in pumps.

As the Post is for Technician (Machine Shop Trade), the question paper contains about 40% of the questions in the area of Machine Shop.

**C. Syllabus for the post of Technician Electrical and Electronics Engineering
(Trade: Electrical Machines):**

Unit-1: Computer awareness

Basic knowledge of Computer Applications, MS Word, MS Excel, Power Point etc. Internet, MS-DOS, Windows

Unit-2: Electric Charges and Fields

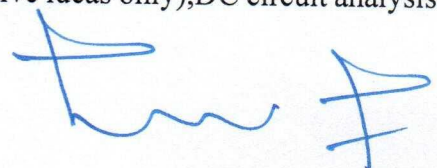
Electric Charges; Conservation of charge, Coulomb's law-force between two-point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in a uniform electric field. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet

Unit-3: Electrostatic Potential and Capacitance

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges, and of electric dipole in an electrostatic field. Conductors and insulators, free charges, and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, a combination of capacitors in series and in parallel, the capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

Unit-4: Current Electricity

Electric current, the flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and nonlinear), electrical energy and power, electrical resistivity and conductivity; temperature dependence of resistance. The internal resistance of a cell, potential difference, and emf of a cell, a combination of cells in series and in parallel, Kirchhoff's laws and simple applications, Wheatstone bridge, meter bridge(qualitative ideas only). Potentiometer - principle and its applications to measure potential difference and for comparing EMF of two cells; measurement of internal resistance of a cell (qualitative ideas only),DC circuit analysis



Unit-5: Magnetic Effects of Current and Magnetism

Concept of the magnetic field, Oersted's experiment. Biot - Savart law and its application to the current-carrying circular loop. Ampere's law and its applications to an infinitely long straight wire. Straight and toroidal solenoids (only qualitative treatment), force on a moving charge in uniform magnetic and electric fields. Force on a current-carrying conductor in a uniform magnetic field, the force between two parallel current-carrying conductors- definition of the ampere, torque experienced by a current loop in the uniform magnetic field; moving coil galvanometer-its current sensitivity and conversion to ammeter and voltmeter.

Unit-6: Magnetism and Matter

Current loop as a magnetic dipole and its magnetic dipole moment, magnetic dipole moment of a revolving electron, bar magnet as an equivalent solenoid, magnetic field lines; earth's magnetic field and magnetic elements.

Unit-7: Electromagnetic Induction

Electromagnetic induction; Faraday's laws, induced EMF and current; Lenz's Law, Eddy currents. Self and mutual induction.

Unit-8: Alternating Current

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits. AC generator and transformer.

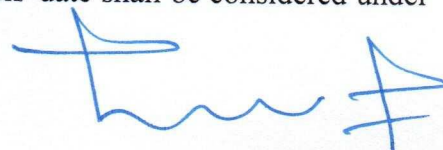
Unit-9: Semiconductor Electronics: Materials, Devices and Simple Circuits

Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Semiconductor diode - I-V characteristics in forward and reverse bias, diode as a rectifier; Special purpose p-n junction diodes: LED, photodiode, solar cell.

As the Post is for Technician, (Electrical Machines) the question paper contains about 40% of the questions in the area of Electrical Machines.

5. General Instructions:

- a) The list of the shortlisted candidates for appearing the scheduled written test as in para 3 above for the above posts have been uploaded on the Institute website. However, if any candidate whose name has appeared in the said list is unable to receive the intimation of the examination through e-mail or speed post, he/she may appear for the test with the proof of his/ her identity along with copy of the application/ copy of the DD / proof of payment made for making such application against the above advertisement for the said post of Technicians.
- b) No request for change of venue for the written examination/ date shall be considered under any circumstances.



- c) The shortlisted candidates are to abide by the Protocol as well as SOP in connection with COVID-19 as adopted by the Government of Nagaland as on date of their travel and appearing for the afore mentioned test in this Institute.
- d) The candidates needing special assistance, are required to inform the undersigned through e-mail registrar@nitnagaland.ac.in or over Phone No. 09840778590/09443208298 or Dr.J. Arul Valan, Assistant Professor & HoD, Data Centre, NIT Nagaland through e-mail: valan@nitnagaland.ac.in over Phone No. 09443109434 at least 5 days before the scheduled date of examination so that necessary arrangements can be made.
- e) Electronic devices of any form shall not be allowed during the Examination. The decision of the Institute Authorities about the nature of such electronic devices are final and binding upon the candidates appearing the test/ examination.
- f) The candidates those are currently serving in the State Government, Central Government, Quasi-Government, Public Sector Undertakings/Units/Enterprises, Autonomous Institutes of State and Central Governments, etc., are required to produce "No Objection Certificate (NOC)" from their Head of the Institution for attending the skill test and written examination otherwise they will not be eligible to attend the skill test and written examination.



Registrar 13/04/22

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