

**Written Test for the post Executive Chemist, Sr.Chemist, Chemist, Jr.Lab Chemist, Welfare Officer, Asstt. Welfare Office, Dy.Security Officer, Sub Engineer, Sub Engineer(Civil), Jr.Fire Officer, Jr.Security Officer, Fireman (Mahagenco Advt. No.01/2010 & 03/2010)**

- ( 1) The written test for the post Executive Chemist, Sr.Chemist, Chemist, Jr.Lab Chemist, Welfare Officer, Asstt. Welfare Office, Dy.Security Officer, Sub Engineer, Sub Engineer(Civil), Jr.Fire Officer, Jr.Security Officer, Fireman (Mahagenco Advt. No.01/2010 & 03/2010) will be held on 20/06/2010 at Nasik.
- (2) The eligible and not eligible list of the candiadtes will be display soon.
- ( 3) All technical and non-technical posts having aptitude test paper and related knowledge paper.

**Syllabus**

Post Name	Domain Required	Topics
<b>Welfare Officer / Asst. Welfare Officer</b>	<b>Industrial Relations</b>	Economy and the labor force in India Approaches to IR IR in comparative framework Management and employer's organization Trade Union- foundations, legal framework and structures Management of Trade Unions in India Collective bargaining The role of govt. in IR The contract of employment Public policies and Wage & Reward system Working conditions, safety, health and environment Dispute resolution and industrial harmony Labor administration Social security Issues in labor policy and labor law reform Employee participation and Labor-Management co-operation Grievance and discipline handling Employment security and management of redundancies Management of IR Human Resource Management and IR Labor statistics, labor research and worker education ILO, India and International labor standard Labor legislation Introductory information about power plant Role of IRO in industries (power)
<b>Executive Chemist / Sr.Chemist / Chemist / Jr.Lab Chemist</b>	<b>Physical Chemistry</b>	Basic principles and applications of quantum mechanics – hydrogen atom, angular momentum. Variational and perturbational methods. Basics of atomic structure, electronic configuration, shape of orbitals, hydrogen atom spectra. Theoretical treatment of atomic structures and chemical bonding. Chemical applications of group theory. Chemical thermodynamics. Concepts of catalysis. Polymer chemistry. Molecular weights and their determinations. Kinetics of chain polymerization. Solids - structural classification of binary and ternary compounds, diffraction techniques, bonding, thermal, electrical and magnetic properties Collids and surface phenomena. Data analysis.

Post Name	Domain Required	Topics
Executive Chemist / Sr.Chemist / Chemist / Jr.Lab Chemist	Inorganic Chemistry	<p>Chemical periodicity Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules. Concepts of acids and bases. Chemistry of the main group elements and their compounds. Allotropy, synthesis, bonding and structure. Chemistry of transition elements and coordination compounds – bonding theories, spectral and magnetic properties, reaction mechanisms.</p> <p>Inner transition elements – spectral and magnetic properties, analytical applications. Organometallic compounds - synthesis, bonding and structure, and reactivity. Organometallics in homogenous catalysis.</p> <p>Cages and metal clusters. Analytical chemistry- separation techniques. Spectroscopic electro- and thermoanalytical methods. Bioinorganic chemistry – photosystems, porphyrines, metalloenzymes, oxygen transport, electron- transfer reactions, nitrogen fixation.</p> <p>Physical characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-, NQR, MS, electron spectroscopy and microscopic techniques. Nuclear chemistry – nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis Introduction of role of chemist in a power plant Water chemistry- various processes to be monitored Ambient monitoring, stock monitoring, monitoring of pollutants</p>
Executive Chemist / Sr.Chemist / Chemist / Jr.Lab Chemist	Organic Chemistry	<p>IUPAC nomenclature of organic compounds.</p> <p>Principles of stereochemistry, conformational analysis, isomerism and chirality. Reactive intermediates and organic reaction mechanisms. Concepts of aromaticity. Pericyclic reactions. Named reactions. Transformations and rearrangements.</p> <p>Principles and applications of organic photochemistry. Free radical reactions. Reactions involving nucleophilic carbon intermediates. Oxidation and reduction of functional groups.</p> <p>Common reagents (organic, inorganic and organometallic) in organic synthesis. Chemistry of natural products such as steroids, alkaloids, terpenes, peptides, carbohydrates, nucleic acids and lipids. Selective organic transformations – chemoselectivity, regioselectivity, stereoselectivity, enantioselectivity. Protecting groups. Chemistry of aromatic and aliphatic heterocyclic compounds. Physical characterisation of organic compounds by IR, UV-, MS, and NMR.</p>
Junior Fire Officer	Fire Engineering	Aptitude (Quantitative Ability, English, Logical & analytical ability, G.K. & related professional knowledge)
Dy.Security Officer	Security	
Junior Security Officer	Security	
Fireman	Fire Fighting	
Sub Engg	Diploma Electrical	Power Electronics A C machine Analog Circuits Control System DC Machine Digital Electronics Electrical Basics Network theory
Sub Engg	Diploma Electronics	Control Systems Digital Electronics and Logic Design Electronics Devices and Circuits Micro processor/Microcontrollers Operational Amplifiers Power Electronics Principles of Communication engineering

Post Name	Domain Required	Topics
Sub Engg	Diploma Diploma Electronics & Power	AC power transmissions Bulk power transmissions Distribution of power Generation of electrical power Electronics & Communication/Basics
Sub Engg	Electronics & Telecomm	Analog Circuits Basics Integrated Circuits and Digital Electronics Micro Processor and Micro Controllers Other Electronic Devices PLT Semiconductors and Transistor Devices
Sub Engg	Diploma Mechanical	Applied Mechanics Fluid Mechanics Hydraulic Machines Machine Design Pipe and Fitting Refrigeration and Air Conditioning SOM Theory of machines Welding Technology Workshop Technology Thermodynamics
Sub Engg	Diploma Instrumentation	Fundamentals Transducers Electronics Control System Digital Circuits Micro processors & Microcontrollers Measurements Transistors & OPAMPS
Sub Engg( Civil)	Diploma Civil	Basic Soil Mechanics Foundation Engg Soil Exploration Fluid Mechanics Water Supply Engg Structural Engineering – 1/Construction Materials Structural Engineering – 1/Construction Planning & Management Transportation Engineering/Airport & Harbor Engg Transportation Engineering/Highway Engg

## PERSONNEL MANAGEMENT AND INDUSTRIAL RELATIONS

1. The national policy on safety, health & environment at work place stipulated goals with an aim to improve the safety, health & environment at work place. State which of the following are drawn from the goal statements;

a] providing a statutory framework on Occupational Safety and Health in respect of all sectors of industrial activities including the construction sector, designing suitable control systems of compliance, enforcement and incentives for better compliance.

b] providing administrative and technical support services.

c] calling upon the co-operation of social partners in the supervision of application of legislations and regulations relating to safety, health and environment at work place;

d] providing an effective enforcement machinery as well as suitable provisions for compensation and rehabilitation of affected persons;

1] a&b only

2] a&c only

3] a only

4] d only

**Directions for questions 2 to 6:** Refer the following data to fill the blanks (2), (3), (4), (5) and (6) and choose the correct answer from the given options.

State the maximum allowed time limit, in each step, to settle a grievance under the model grievance procedure;

**STEP 1:** The grievance is to be submitted to departmental representative, who is a representative of management. He has to give his answer within \_\_\_(2)\_\_\_.

**STEP 2:** If the departmental representative fails to provide a solution, the aggrieved employee can take his grievance to head of the department, who has to give his decision within \_\_\_(3)\_\_\_.

**STEP 3:** If the aggrieved employee is not satisfied with the decision of departmental head, he can take the grievance to Grievance Committee. The Grievance Committee makes its recommendations to the manager within \_\_\_(4)\_\_\_ in the form of a report.

The final decision of the management on the report of Grievance Committee must be communicated to the aggrieved employee within \_\_\_(5)\_\_\_ of the receipt of report.

An appeal for revision of final decision can be made by the worker if he is not satisfied with it. The management must communicate its decision to the worker within \_\_\_(6)\_\_\_.

2. 1] 48 hours

2] 24 hours

3] 8 hours

4] 72 hours

3. 1] 3 days

2] 2 days

3] 4 days

4] 1 day

4. 1] 3 days

2] 7 days

3] 10 days

4] 15 days

5. 1] 3 days

2] 5 days

3] 7 days

4] 10 days

6. 1] 3 days

2] 7 days

3] 1 day

4] 15 days

## CIVIL

1. Which of the following is/are the assumption(s) of Bernaulli's equation?
  - 1] There is loss of liquid while flowing.
  - 2] There is no external force except the gravity acts on the liquid.
  - 3] The velocity of energy of liquid particle, across any cross-section of pipe is uniform.
  - 4] Both [2] and [3]
2. In constructions, why are the lintels preferred to arches?
  - 1] Arches will not long last
  - 2] Arches require more head room to span the open as like doors, windows etc.
  - 3] Arches require strong abutments to withstand arch thrust
  - 4] Bothe [2] and [3]
3. What is called a 'level line'?
  - 1] The line parallel to the mean sphireodal surface of earth
  - 2] The line is horizontal
  - 3] The line passing through the centre of cross-hairs and the centre of the eye piece
  - 4] The line passing through the objective lens and the eye piece of a dumpy or tilting level

## MECHANICAL ENGINEERING

1. The chronological order of strokes in a four stroke petrol engine is:
  - 1] Suction stroke, working stroke, compression stroke and exhaust stroke.
  - 2] Suction stroke, compression stroke, working stroke and exhaust stroke.
  - 3] Compression stroke, working stroke, suction stroke and exhaust stroke.
  - 4] Compression stroke, suction stroke, working stroke and exhaust stroke.
2. The enthalpy of steam is defined as:
  - 1] Difference of internal energy and product of pressure and volume.
  - 2] Product of internal energy and pressure.
  - 3] Sum of internal energy and product of pressure and volume.
  - 4] Amount of heat change divided by the absolute temperature.
3. Which of the following operations can be performed using a drilling machine?

A. Reaming	B. Countersinking	C. Spot Facing	D.
Thread tapping			
1] Only A, B and D	2] Only B, C and D	3] Only A, B and C	4] All of these
4. Which of the following are the advantages of impulse turbine over reaction turbines?

A. Occupies less space per unit power.			
B. Compounding is not necessary for speed reduction as the rotor speeds are usually low.			
C. Suitable for high power generation.			
1] B and C only	2] A only	3] C only	4] A and C only

## ELECTRICAL

1. The speed of an AC motor depends on \_\_\_\_ .  
1] Frequency                      2] Number of poles                      3] Both [1] & [2]                      4] None of these
2. The speed of the motor can be varied by \_\_\_\_.  
1] Changing supply frequency                      2] Changing number of poles  
3] Using multi speed windings                      4] All of these
3. Output power requirements of constant torque loads vary with \_\_\_\_\_.  
1] Speed                      2] voltage                      3] Current                      4] power factor
4. Maximum demand controller is used to \_\_\_\_\_.  
1] Switch off essential loads in a logical sequence  
2] Exceed the demand of the plant  
3] Switch off non-essential loads in a logical sequence  
4] Controls the power factor of the plant
5. Select the application of fluid coupling fitting from the following:  
1] Acts as a voltage limiter                      2] Enables no-load start-up of prime-mover  
3] Works on the principle of eddy current                      4] None of these

## ELECTRONICS

1. The stability factor is defined as:  
1]  $\Delta I_c / \Delta \beta$                       2]  $\Delta I_c / \Delta I_{co}$                       3]  $\Delta I_c / \Delta V_{BE}$                       4] All of these
2. Among the circuit stabilization techniques \_\_\_\_\_ gives better stable operating point.  
1] Voltage divider biasing circuit or self biasing circuit                      2] Base biasing circuit or fixed biasing circuit  
3] Collector feedback biasing circuit                      4] None of these
3. Normally emitter region in transistor is:  
1] Heavily doped  
2] Very lightly doped  
3] Doped in between that of base region and collector region  
4] None of these
4. Both in n-p-n and p-n-p transistors neglecting the reverse saturation current emitter Current is:  
1] The sum of collector current and base current  
2] The difference of collector current and base current  
3] The product of collector current and base current  
4] Both emitter and base current direction
5. The knee voltage of silicon diode is equal to?  
1] 5 V                      2] 0.5V                      3] 0.7V                      4] 1V

## INSTRUMENTATION

1. Schottky Diode is also referred as:  
1] Variable Diode            2] Surface Barrier Diode            3] Photo Diode            4] Tunnel Diode
2. Q meter is an instrument which is used to measure some of the electrical properties of:  
1] Inductive coils & Resistors            2] Resistors & Capacitors  
3] Inductive coils & Capacitors            4] All of these
3. Which of the combination of material are used for the construction of optical fibers?  
1] Glass core & glass cladding.            2] Glass core & plastic cladding.  
3] Plastic core & glass cladding.            4] All of these.
4. Technique used inside the telephone system is:  
1] Circuit switching            2] Packet switching            3] Both 1 & 2            4] None of these
5. An amplifier incorporating voltage shunt feedback is of which of the following types?  
1] Trans-conductance    2] Trans-resistance            3] Trans-inductance            4] None of these

## **APTITUDE**

1. Find the amount obtained by investing Rs. 24, 000 at 18% per annum simple interest for five years?  
1] Rs. 21, 600            2] Rs. 44, 000            3] Rs. 48, 000            4] Rs. 45, 600
2. A number when increased by 30% becomes 78. What is the number?  
1] 60            2] 70            3] 40            4] 48
3. A two-digit number is such that twice the ten's digit add to eleven times the units digit is equal to the number itself. What is the number?  
1] 48            2] 86            3] 73            4] 54

Direction for question 4 and 5: Fill in the blank in the given sentence so as to make sense. Select the correct word from the answer choices and mark its number as the answer.

4. A welcoming party was \_\_\_\_\_ the day after the new teach arrived.  
1] conducted            2] thrown            3] initiated            4] organised
5. The store \_\_\_\_\_ medicines as well as cosmetics.  
1] stocks            2] displays            3] keeps            4] brands

## INDUSTRIAL CHEMISTRY

1. Which of the following is a basic dye?  
1] Alizarin                      2] Phthalein                      3] Aniline yellow                      4] Orange - 1
2. Which of the following is not a chemical generally used to make an explosive?  
1] nitroglycerin                      2] nitrocellulose                      3] ammonium nitrate 4] phenol
3. Which of the following is not a typical characteristic of metal hydride fuel cells, which can chemically bond and store hydrogen within the cell?  
1] Ability to be recharged with electrical energy.  
2] High operating temperatures.  
3] Extended shelf life.  
4] Fast kinetics.

