

**SYLLABUS FOR DIRECT RECRUITMENT TO THE POSTS OF ASST. MECHANIC
(GROUP 'C') UNDER PHE DEPARTMENT**

Paper	Subject	Marks	Duration
Paper-I	General Knowledge (50 questions)	100	3 hours with an additional time of 40 minutes for visually handicapped/Cerebral palsy candidates
	General English (25 questions)	50	
	Essay Writing	30	
	English Comprehension	20	
	Total	200	
Paper-II	Simple Arithmetic (50 questions)	100	3 hours with an additional time of 40 minutes for visually handicapped/Cerebral palsy candidates
	Basic Computer Knowledge (50 questions)	100	
	Total	200	
Paper-III	Technical Subject (100 questions)	200	3 hours with an additional time of 40 minutes for visually handicapped/Cerebral palsy candidates
	Grand Total	600	

Notes:

- (1) Questions shall be set in Objective Type Multiple Choice pattern only except for essay writing and English Comprehension under Paper-I with all questions carrying equal marks and answers for each of the questions shall be marked using blue or black ball point pen. In other words, there shall be multiple probable answers (at least four) wherein the candidate has to choose the correct answer for every objective type question.
- (2) Questions will be set in tune with the level of educational qualifications prescribed in the corresponding Recruitment Rules/Service Rules for the post(s)
- (3) A brief description of the syllabus for direct recruitment for the said post is as follows;

Paper-I

General Knowledge: Questions will be designed to test the candidate's knowledge of current events and of such matters of everyday observation and experience as may be expected of an educated person. The test will also include questions relating to Indian history and culture, Indian polity including the Constitution of India, geography, economy and general science. Questions on Mizo history and culture will also form part of the syllabus.

General English: Questions will be designed to test the candidates understanding and knowledge of English language, vocabulary, spelling, grammar, sentence structure, synonyms, antonyms, sentence completion, phrases and idiomatic use of words etc. There will be questions on comprehension of a passage also.

Essay Writing: Question on essay writing will be designed to test the candidate's grasp of his material, its relevance to the subject chosen, and to his ability to think constructively and to present his ideas logically, constructively and concisely.

English Comprehension: There will be questions on comprehension of passages also to test the vocabulary, grammar, logical thought ability and overall grasp of the candidates over English language.

Paper-II

Simple Arithmetic: Number system, simplification, roots, averages, discounts, percentages, profit & loss, ratio and proportion, partnership, chain rule, time & work, time & distance, simple & compound interest, mensuration, permutations & combinations, heights & distances, line graphs, bar graphs, pie charts and tabulation.

Basic Computer knowledge: Introduction to Computers, introduction to Graphical user interface based Operating System, elements of Word Processing, Spreadsheets, Power point presentations, Computer communication and internet, world wide web and web browser, communication and collaboration.

Paper-III

Sl. No	Subject/Topic	Marks
1.	<i>Hand & Power Tools:-</i> Marking scheme, marking material-chalk, Prussian blue. - Cleaning tools- Scraper, wire brush, Emery paper, - Description, care and use of Surface plates, steel rule, measuring tape, try square. Callipers-inside and outside. Dividers, surface gauges, scribe, - Punches-prick punch, centre punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer- ball pein, lump, mallet. Screw drivers-blade - Screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice & Cclamps, - Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, - Pliers - Combination pliers, multi grip, long nose, flatnose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers. - Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, Pipe flaring & cutting tool, pullers-Gear and bearing.	20
2.	<i>Systems of measurement, -</i> Description, Least Count calculation, care & use of - Micrometers- Outside, and depth micrometer, - Micrometer adjustments, - Description, Least Count calculation, care & use of Vernier Calliper. - Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.	20
3.	Different types of metal joint (Permanent, Temporary), methods of Bolting, Riveting, Soldering, Brazing, Seaming etc. <i>Fasteners -</i> Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals. Types of Gaskets - paper, multilayered metallic, liquid, rubber, copper and printed. - Thread Sealants-Variou types like, locking, sealing, temperature resistance, antilocking, lubricating etc.	20

	Cutting tools – Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding. Limits, Fits & Tolerances – Definition of limits, fits & tolerances with examples used in auto components.	
4.	Basic electricity – Electricity principles, - Ground connections, - Ohm's law, - Voltage, Current, Resistance, Power, Energy. - Voltmeter, ammeter, Ohmmeter, Multimeter, - Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings. - Fuses & circuit breakers, - Ballast resistor, - Stripping wire insulation, - cable colour codes and sizes, - Resistors in Series circuits, - Parallel circuits and Series parallel circuits, - Electrostatic effects, Capacitors and its applications, - Capacitors in series and parallel.	20
5.	- Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, - Magnetic effects, Heating effects, Thermo-electric energy, Thermistors, Thermo couples, - Electrochemical energy, Photo-voltaic energy, Piezoelectric energy, Electromagnetic induction, - Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.	20
6.	Introduction to welding and Heat Treatment Welding processes - Principles of Arc welding, brief description, classification and applications. - Manual Metal Arc welding - principles, power sources, electrodes, welding parameters, edge preparation & fit up and welding techniques; - Oxy – Acetylene welding - principles, equipment, welding parameters, edge preparation & fit up and welding techniques; - Basic knowledge about advance welding process & equipments like MIG, TIG, Spot Welding, Plasma Cutter. Heat Treatment Process – Introduction, Definition of heat treatment, - - Definition of Annealing, Normalizing, Hardening and tempering. - - Case hardening, Nitriding, Induction hardening - Flame Hardening process used in auto components with examples.	20
7.	Non-destructive Testing Methods - Importance of NonDestructive Testing In Automotive Industry, Definition of NDT, - Liquid penetrant and Magnetic particle testing method – Portable Yoke method Introduction to Hydraulics & Pneumatics – Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application in automobile of Gear pump- Internal & External,	20

	- single acting, double acting & Double ended cylinder; Directional control valves 2/2, 3/2, 4/2, 4/3 way valve, Pressure relief valve, Non return valve, Flow control valve used in automobile.	
8.	Introduction to Engine: - Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2 & 4-stroke diesel engine (Compression ignition Engine (C.I)), - Principle of Spark Ignition Engine (SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, - Main Parts of IC Engine - Direct injection and indirect injection, Technical terms used in engine, Engine specification. - Study of various gauges/ instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such as gearshift position, Seat belt warning light, Parking-brake-engagement warning light and an Engine-malfunction light. - Different type of starting and stopping method of Diesel Engine - Procedure for dismantling of diesel engine from a vehicle.	20
9.	Diesel Engine Components: - Description and Constructional feature of Cylinder head, Importance of Cylinder head design, - Type of Diesel combustion chambers, - Effect on size of Intake & exhaust passages, Head gaskets. - Importance of Turbulence. Valves & Valve Actuating Mechanism – - Description and Function of Engine Valves, different types, materials, - Type of valve operating mechanism, Importance of Valve seats, Valve seats inserts in cylinder heads, - importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve- timing diagram, concept of Variable valve timing. - Description of Camshafts & drives , - Description of Overhead camshaft (SOHC and DOHC), importance of Cam lobes, Timing belts & chains, Timing belts & tensioners.	20
10.	Description & functions of different types of pistons, piston rings and piston pins and materials. - Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy. - Compression ratio. - Description & function of connecting rod, - importance of big- end split obliquely - Materials used for connecting rods big end & main bearings. Shells piston pins and locking methods of piston pins.	20