TEACHERS' RECRUITMENT BOARD, TRIPURA (TRBT)
EDUCATION (SCHOOL) DEPARTMENT, GOVT. OF TRIPURA
SYLLABUS: PURE SCIENCE (MCQs OF 150 MARKS): 2016
SELECTION TEST FOR GRADUATE TEACHERS (STGT) FOR CLASSES IX-X

GROUP-A: MARKS 50

1. **Atoms and molecules, Valency, formula, chemical equation and chemical reaction:** Dalton's atomic theory, law of conservation of mass, law of constant proportion, Avogadro-hypothesis, concept of molecule from Avogadro hypothesis, atomic and molecular masses, Avogadro number, molar volume, mole concept, Symbol of elements/ions, valency, formula, chemical equation and chemical reaction, definition of empirical and molecular formula, relation between empirical and molecular formula. Chemical equation-significance and limitation of chemical equation, balancing of chemical equation. Type of chemical reactions: Elementary problems related to chemical equation and chemical reactions.

2. **Structure of Atom:** Discovery and study of cathode rays and electron, discovery of proton, Rutherford's experiment on the scattering of α-particles, discovery of neutron, simple idea of nuclear forces. Bohr's model of an atom and idea of K, L, M, N. shells, distribution of electrons in K, L, M, N-shells up to atomic number 20. Definition with examples of atomic number, mass number, isotopes, isobars and isotones.

3. **Periodic classification of elements and chemical bonding:** Mendeleev's periodic law & periodic table, features of Mendeleev's periodic table, merits and demerits of Mendeleev's periodic table. Modern version of the periodic law and modern periodic table of 18 column recommended by IUPAC. Elementary ideas on atomic and ionic sizes, ionization potential, electron affinity, electronegativity, metallic and non-metallic character and their variations along a period and group. Condition for the formation of covalent and electrovalent bond, characteristic properties of electrovalent and covalent compounds and differences between them, examples of exception of octet rule. Type of covalent bond (single, double and triple bond), polar and non polar covalent bonds. Lewis dot structure of compounds.

4. **Solution, suspension and colloid:** Type of solutions: saturated, unsaturated, supersaturated, aqueous and non-aqueous solution. Definition of solubility, effect of temperature and pressure on solubility. Strength of solution-molar solution, percentage strength. Colloidal solutions: Definition of colloid, simple idea on the basis of size, difference from true solutions, properties of suspension and colloidal solution- heterogeneous nature.

5. **Acids Bases and Salts**: Arrhenius concept of acid bases, strong and weak acids, bases, alkalis, the pH scale, pH of aqueous solutions of acid and bases. Definition of salt with example, classification of salts. Definition and classification of oxides. Neutralization reaction, acid base indicators.

6. **Chemistry of non-metals, nom-metallic compounds :(a) Hydrogen** Laboratory preparation of hydrogen, preparation of hydrogen from acid, water, alkalis. Chemical properties of hydrogen, definition and reactivity of nascent hydrogen and atomic hydrogen. (b) **Oxygen:** Laboratory preparation of oxygen, preparation of oxygen form $Pb(NO_3)_2$, HNO_3, $KMnO_4$, H_2SO_4, Na_2O_2. Chemical properties of oxygen. (c) **Water:** Soft and hard water, causes of hardness of water, removal of temporary hardness of water, removal of permanent hardness of water. De-ionized water and distilled water and their differences. Chemical properties of water, water pollution, supply As-free water, water crisis and preservation of water for agriculture.**(d) Carbon:** Allotropes of carbon, physical properties and burning in oxygen, availability of carbon in

different places in free state and in compounds forms or as a byproduct, uses of allotropes of carbon. Carbon dioxide: Green house gas, global warming, pollution of air by CO.

7. **Oxidation-Reduction and Electrolysis:** Definition of oxidation and reduction, oxidizing and reducing agents; Elementary idea of electrolytes and non-electrolytes, acids, bases and salts as electrolytes, definition of electrolysis, cathode and anode reaction, electrolysis of water with Pt electrodes, and copper sulphate solution with Cu-electrodes and Pt electrodes separately. Application of electrolysis: Electroplating, extraction of metals (Al only), purification of copper.

8. **Organic Chemistry:** Definition of organic compounds, developments of organic chemistry, catenation properties, preparation of organic compounds from inorganic compounds. Functional groups: Definition of functional groups, classification of organic compounds on the basis of functional groups. Homologous series. Define isomerism, structural isomerism. Naming of organic compounds: common or trivial and IUPAC naming of saturated and unsaturated hydrocarbons, primary alcohols, ketone, aldehyde and carboxylic acid. Hydrocarbons: Type of hydrocarbons: saturated and unsaturated hydrocarbons, Definition and their general formula. Laboratory preparation of methane, preparation of methane at room temperature, chemical reactions of methane. Preparation of ethane, physical and chemical properties of ethane. Laboratory preparation of ethylene and acetylene, other methods of preparation of ethylene and acetylene, chemical reactions of ethylene and acetylene. Some common polymers: Polyethylene, Teflon, PVC-their monomer and uses, hazards of using these substances and their non-biodegradability.

GROUP-B: MARKS 50

1. **System of Measurements and measuring devices:** Physical quantities, Scalar and Vector quantities with examples, Units of Physical quantities, Fundamental and derived quantities, Idea of dimension of a Physical quantity

2. **Rest and Motion:** Uniform and Non-uniform motion in one dimension, Distance, Displacement, Speed, Velocity, Acceleration, Retardation, Relation $v=u+ft$ (symbols have their usual meanings), with numerical problems. Distance-time graph, Velocity-time graph for uniform and uniformly accelerated motion.

3. **Newton's Laws of Motion:** Statement of Newton's laws, Inertia of rest and Inertia of Motion, Definition of force and momentum, P=mf (deduction not required) with numerical problems. Conservation of momentum.

4. **Work, Power and Energy:** Definition of Work, power, energy and their units, kinetic and potential energy (definition and examples). Different types of lever and their mechanical advantages, inclined plane and its mechanical advantage.

5. **Heat:** Heat and temperature-definition and differences between them, Units of heat, Celsius and Fahrenheit Scale of temperature and their relationship with numerical problems. Thermometer (clinical and laboratory), Idea of Specific heat with unit, Principle of Calorimetry, definition of water equivalent and thermal capacity.

6. **Light:** *Reflection:* Reflection of light, laws of reflection, *Reflection from plane and curved surfaces:* Reflection from plane mirror, concave mirror and convex mirror, Sign Convention, Mirror formula, magnification, Uses of mirrors, Numerical problems. *Refraction:* Laws of refraction, refraction through a rectangular glass slab, critical angle and total internal reflection, Natural

phenomena depending on total internal reflection, concave and convex lens, image formation, real and virtual image formation by lens, magnification, magnifying glass.

7. **Sound:** Motion of simple pendulum, oscillation and waves, sound as a wave, types of waves, characteristics of wave motion. Amplitude, Frequency, wavelength, velocity, Relation $V=n\lambda$, Numerical Problems. Natural and forced vibration with resonance, Propagation of sound, Determination of velocity of sound, Reflection of sound and Echo with some practical applications, Ultra sound, SONAR and their uses. Musical Sound and noise, their differences. Noise pollution, hazardous effect on public health, possible remedial measures.

8. **Current Electricity and Magnetism:** Concepts of e. m. f. and potential difference, Ohm's law, Resistance, Factors on which resistance of a material depends, Resistances in series and parallel, Numerical problems. *Heating effect of current:* Joule's law with practical application to heater and electric iron, Electric power and energy, household consumption, Domestic electric circuits, Switches, Earthing, Colour coding of wires. Magnetic effect of current, Ampere's swimming rule, Action of magnet on current, solenoid, Flemming's left hand rule, Burlow's wheel and its application in case of motor, Electromagnet, its strength and uses, use of voltmeter and ammeter.

GROUP-C: MARKS 50

1. **Arithmetic: (a)** Ratio and Proportion-Application to Simple Problems, Partnership. **(b)** Percentage and Its Application Including Profit and Loss. **(c)** Simple Interest and Compound Interest. **(d)** Instalments. **(e)** Banking; Saving Bank Accounts, Computation of Interest for a Series of Months.

2. **Algebra: (a)** Factorization. **(b)** Solution of Simultaneous Linear Equations in Two Variable and Application to Solve Simple Problem. **(c)** Solution of Quadratic Equation. **(d)** Simple In-Equation. **(e)** Logarithms: General Properties of Logarithms and Simple Problems. **(f)** Set Theory: Concepts of Sets, Null Set, Subset, Power Set, Universal Set, Cardinality, Operation on Sets- Union of Two Sets, Intersection of Two Sets, Complement of a Set, Difference of Two Sets.

3. **Geometry: (a)** Application of Theorems Relating to Parallelogram. (b) Circle and Circle Relating Theorems, Tangent to a Circle. (c) Concept of Similarity of Triangles. (d) Application of Pythagorous Theorem.

4. **Mensuration: (a)** Perimeter and Area of a Triangle, Rectangle, Square, Pythagorous, Trapezium, Rhombus. **(b)** Circumference and Area of Circle. **(c)** Surface and Volume of a Rectangular Parallepiped, Cube, Right Circular Cylinder, Right Circular Cone, Sphere.

5. **Trigonometry: (a)** Idea of Trigonometrical Angles. **(b)** Trigonometrical Ratio of Acute Angles. **(c)** Trigonometrical Ratio of Specific Angles. **(d)** Trigonometrical Ratio of Complementary Angles. **(e)** Practical Application of Trigonometry: Height and Distance.

6. **Statistics: (a)** Representation of Statistical Data, Tally Marks, Tabulation, Frequency, Cumulative Frequency, Percentage Frequency, Class Limits, Class Boundaries. **(b)** Measures of Central Tendency: Mean, Median and Mode.

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