



IHSB STEM FEST 2026

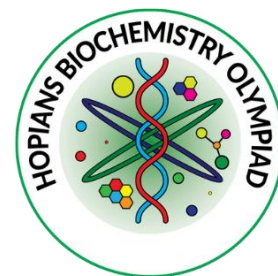
Concern of INTERNATIONAL HOPE SCHOOL BANGLADESH



Dear Sir/Ma'am,

Warm greetings from the IHSB STEM Fest Organizing Team at International Hope School Bangladesh (IHSB)!

In the following document you will find the detailed information about our upcoming Event, the "**Hopians Bio-Chemistry Olympiad.**"



Event Details:

Event Date: 23rd January 2026 (Friday) (Competition Day)
24th January 2026 (Saturday) (Award Ceremony)

Registration Fee: Individual Competition - **BDT 500 ₳**

Registration Deadline: 10th January 2026

Category Details:

The Event has been divided into THREE Categories

- Middle - School Category (Grade: 06 - 08)
- Secondary Category (Grade: 09 - 10)
- Higher Secondary Category (Grade: 11 - 12)

Competition Details:

- The **OLYMPIAD** Will Consist of **ONE ROUND**.
- The Use of **CALCULATOR** is **Allowed**.
- The Duration will be 50 Minutes.
- The questions will comprise of Multiple Choice Question (MCQ).
- Negative Markings **WON'T BE APPLIED** in Case of **INCORRECT ANSWERS**.
- Please Note that all the **OLYMPIADS QUESTION** will be **PRESENTED** in **ENGLISH!**
- **Top 05 Students from each Category will be AWARDED!**
(May Vary Depending on Number of Participants)

*** Exclusive Invitation to the Award Ceremony will be extended solely to the TOP ACHIEVERS in recognition of their outstanding Performance. ***



IHSB STEM FEST 2026



Concern of INTERNATIONAL HOPE SCHOOL BANGLADESH

For any inquiries or queries related to the "**Hopians Bio-Chemistry Olympiad**," we encourage you to reach out to the designated contact points listed below:

Hopians Bio-Chemistry Olympiad

Event Affairs

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Our team is committed to assisting you and providing any necessary information or clarification. Your engagement and enthusiasm are integral to the success of the event, and we welcome the opportunity to address any questions you may have.

Thank you for your cooperation, and we eagerly anticipate your active participation in the **Hopians Bio-Chemistry Olympiad**.

Sincerely,

IHSB STEM Fest Organizing Team

Uttara Main Campus

INTERNATIONAL HOPE SCHOOL BANGLADESH



Middle-School Category Syllabus (Grade: 6 – 8)

Chemistry

1. Basics of Chemistry

- **Introduction to Chemistry**
 - What is Chemistry? Importance in Daily Life.
 - Branches of Chemistry: Physical, Organic, & Inorganic.
- **States of Matter**
 - Solids, Liquids, & Gases: Properties & Examples.
 - Changes in States of Matter: Melting, Freezing, Evaporation, Condensation, & Sublimation.
- **Elements, Compounds, and Mixtures**
 - Definitions with Examples.
 - Differences Between Elements, Compounds, & Mixtures.
 - Introduction to the Periodic Table.
- **Atoms and Molecules**
 - Basic Structure of an Atom (Protons, Neutrons, Electrons).
 - Concept of Molecules & Molecular Formulas.

2. Physical & Chemical Changes

- Differences Between Physical & Chemical Changes.
- Examples from Everyday life: Burning, Rusting, Melting, etc.
- Conservation of Mass During Chemical Changes.

3. Introduction to the Periodic Table

- Structure of the Periodic Table: Groups & Periods.
- Properties of Metals, Nonmetals, & Metalloids.
- Basic Introduction to Alkali Metals, Alkaline Earth Metals, & Noble Gases.

4. Basic Chemical Reactions

- Types of Chemical Reactions:
 - Combination
 - Decomposition
 - Displacement
 - Combustion
- Simple Examples with Word Equations.

5. Acids, Bases, & Salts

- Properties of Acids & Bases.
- Everyday Examples of Acids & Bases (Lemon Juice, Vinegar, Baking Soda, etc.).
- Introduction to Indicators: Litmus Paper & Natural Indicators (e.g. Turmeric).
- Neutralization Reactions.



6. Air & Water

- Composition of Air & its Role in Life.
- Properties & Importance of Water.
- Water Cycle & Purification Methods (Filtration, Boiling, Sedimentation).

7. Basic Laboratory Techniques & Safety

- Laboratory Equipment: Beakers, Test Tubes, Bunsen Burner, etc.
- Safety Rules in the Chemistry Lab.
- Importance of Accurate Measurement & Observation.

8. Environmental Chemistry

- Pollution: Air, Water, & Soil.
- Effects of Pollutants on Health & Environment.
- Introduction to Green Chemistry & Sustainable Practices.

10. Problem-Solving & Logical Reasoning

- Practice Problems Based on:
 - Balancing Simple Chemical Equations.
 - Classifying Reactions.
 - Identifying Properties of Substances Based on Given Descriptions.
 - Analytical Puzzles & Quizzes to Build Reasoning Skills.

Biology

1. Cell Biology

2. Human Body Systems

- Circulatory System
- Digestive System
- Respiratory System
- Skeletal and Muscular Systems
- Nervous System

3. Plant Biology

- Plant Structure
- Photosynthesis
- Plant Growth

4. Ecology

- Ecosystems
- Food Chains & Webs
- Habitats & Adaptations



5. Reproduction in Living Things

- Plant Reproduction
- Animal Reproduction

6. Microorganisms

- Types of Microorganisms
- Good vs. Bad Microorganisms
- Basic Hygiene

7. Environmental Science

- Natural Resources
- Pollution and Its Impact
- Conservation

8. Scientific Method & Investigation

- Data Collection & Analysis
- Lab Techniques & Safety



Secondary Category Syllabus (Grade: 9 – 10)

Chemistry

1. Atomic Structure & Periodicity

- **Atoms & Subatomic Particles**
 - Proton, Neutron, & Electron: Charges, Masses, & Locations.
 - Atomic Number, Mass Number, Isotopes, & their Applications.
- **Electronic Configuration**
 - Valence Electrons & their Role in Bonding.
- **Periodic Table**
 - Modern Periodic Table & Periodic Law.
 - Trends: Atomic Size, Ionization Energy, Electronegativity, Metallic & Non-Metallic Character.
 - Groups & Periods: Focus on Alkali Metals, Halogens, Noble Gases, & Transition Elements.

2. Chemical Bonding & Structure

- **Types of Bonds**
 - Ionic Bonding: Formation, Properties, & Examples (e.g., NaCl, MgO).
 - Covalent Bonding: Single, Double, & Triple Bonds with Examples (e.g., H₂, O₂, N₂).
 - Metallic Bonding: Characteristics & Importance
- **Properties of Solids, Liquids, & Gases**
 - Differences Based on Particle Arrangement & Forces.
 - Melting, Boiling, Evaporation, Sublimation, & Condensation.
- **Kinetic Molecular Theory**
 - Behavior of Particles in Different States.
 - Diffusion & Brownian Motion.

3. Stoichiometry & Chemical Calculations

- **The Mole Concept**
 - Molar Mass, Avogadro's Number, & Empirical/Molecular Formulas.
- **Stoichiometric Calculations**
 - Balancing Chemical Equations.
 - Reacting Masses, Volumes, & Yields.
 - Limiting Reactants & Percentage Yield.

4. Acids, Bases, & Salts

- **Properties & Theories.**
 - Properties of Acids, Bases, & Salts.
- **Reactions Involving Acids & Bases**
 - Neutralization Reactions.
 - Reactions with Metals, Oxides, & Carbonates.
- **The pH Scale**
 - Indicators & pH



5. Chemical Reactions & Energy Changes

- **Types of Chemical Reactions**
 - Synthesis, Decomposition, Displacement, & Double Displacement Reactions.
 - Redox Reactions: Oxidation & Reduction Processes, Oxidation Numbers.
- **Energy Changes**
 - Exothermic & Endothermic Reactions.
 - Bond Energy Calculations.

6. Electrochemistry

- **Electrolysis**
 - Principles & Applications.
 - Electrolysis of Molten & Aqueous Solutions (e.g. NaCl, CuSO₄).
- **Electrochemical Cells**
 - Applications in Batteries & Electroplating.

7. Rates of Reaction

- **Factors Affecting Reaction Rate**
 - Concentration, Temperature, Surface Area, & Catalysts.
- **Collision Theory**
 - Activation Energy & Successful Collisions.
- **Graphical Representation**
 - Interpreting Rate Graphs (e.g. Concentration vs. Time).

8. Organic Chemistry

- **Introduction to Hydrocarbons**
 - Alkanes, Alkenes: Structure, Properties, & Reactions.
- **Functional Groups**
 - Alcohols, Carboxylic Acids, Esters,
- **Common Reactions**
 - Combustion, Substitution, Addition, & Esterification.
- **Polymers**
 - Types of Polymers: Addition & Condensation Polymerization.
 - Examples: Polyethylene, PVC, & Nylon.

9. Environmental Chemistry

- **Pollution**
 - Air pollution: Causes, Effects, & Control Measures.
 - Water Pollution & its Treatment.
- **Green Chemistry**
 - Principles & Applications.
 - Sustainable Practices in Industry.

10. Practical Chemistry

- **Laboratory Techniques**
 - Titration: Acid-Base & Redox Titrations.
 - Preparation of Salts (e.g. Soluble & Insoluble Salts).
 - Filtration, Crystallization, & Distillation.



- **Qualitative Analysis**
 - Tests for Common Cations (e.g. Na^+ , Ca^{2+} , Fe^{3+}) & Anions (e.g. Cl^- , SO_4^{2-} , CO_3^{2-}).
 - Identification of Gases: H_2 , O_2 , CO_2 , NH_3 , & Cl_2 .
- **Quantitative Analysis**
 - Simple Stoichiometric Calculations Based on Experimental Data.

11. Analytical Chemistry

- **Chromatography**
 - Principles & Applications in Separating Mixture

Biology

1. Cell Biology

- **Structure & Function of Cells**
 - Differences between Prokaryotic & Eukaryotic Cells
 - Organelles & their Functions (Nucleus, Mitochondria, Chloroplasts, etc.)
 - Plasma Membrane (Structure & Transport Mechanisms)
- **Cellular Processes**
 - Diffusion, Osmosis, & Active Transport
 - Enzyme Function & Factors Affecting Enzyme Activity
 - Respiration: Aerobic vs. Anaerobic

2. Genetics

- **DNA & Inheritance**
 - Structure of DNA
 - DNA Replication
 - Role of RNA in Protein Synthesis
- **Sexual & Asexual Reproduction**
 - Differences & Examples

3. Ecology

- **Levels of Organization**
 - Individual, Population, Community, Ecosystem
- **Energy Flow in Ecosystems**
 - Producers, Consumers, Decomposers
 - Food Chains & Food Webs
 - Energy Transfer & Trophic Levels
- **Adaptation to Environment**
 - Structural, Behavioral, & Physiological Adaptations
- **Human Impact on Ecosystems**
 - Pollution (Air, Water, Soil)
 - Deforestation, Climate Change, & Conservation



- **Biogeochemical Cycles**
 - Carbon, Nitrogen, & Water Cycles

4. Human Biology & Physiology

- **Organ Systems**
 - Digestive System: Structure & Function
 - Circulatory System: Heart, Blood Vessels, & Blood
 - Respiratory System: Breathing & Gas Exchange
 - Excretory System: Kidneys & Osmoregulation
 - Nervous System: Neurons, Reflex Arcs, & the Brain
- **Homeostasis**
 - Regulation of Body Temperature, Blood Glucose, & Water Balance
 - Negative Feedback Mechanisms
- **Reproduction**
 - Male & Female Reproductive Systems
 - Sexual Reproduction & Fertilization

5. Plant Biology

- **Plant Structure**
 - Roots, Stems, Leaves, & Flowers
 - Tissues in Plants: Xylem, Phloem, & Meristematic Tissue
- **Photosynthesis**
 - The Process of Photosynthesis (Light & Dark Reactions)
 - Role of Chlorophyll & Other Pigments
 - Factors Affecting Photosynthesis
- **Plant Nutrition**
 - Mineral Requirements for Plants (Nitrogen, Phosphorus, Potassium)
 - Deficiency Symptoms & Effects
- **Plant Reproduction**
 - Pollination, Fertilization, & Seed Formation
 - Asexual & sexual Reproduction in Plants

6. Microorganisms

- **Types of Microorganisms**
 - Bacteria, Fungi, Viruses, Protists
 - Characteristics & Classification
- **Role of Microorganisms**
 - Decomposers, Nitrogen Fixation, & Symbiotic Relationships
 - Use in Industry (Fermentation, Antibiotics)
- **Diseases Caused by Microorganisms**
 - Pathogens & Methods of Transmission
 - Prevention of Infectious Diseases (Vaccines, Hygiene)

7. Biochemistry

- **Basic Biomolecules**
 - Carbohydrates, Proteins, Lipids, & Nucleic Acids
 - Functions & Structure of Each Type of Molecule



- **Enzyme Activity**
 - Enzyme Structure & Function
 - Factors Affecting Enzyme Activity (Temperature, pH, Substrate Concentration)
 - Enzyme Inhibition
- 8. **Human Health & Disease**
 - **Non-Communicable Diseases**
 - Cardiovascular Diseases (e.g., Atherosclerosis, Heart Attack)
 - Diabetes & Obesity
 - Cancer (Causes & Prevention)
 - **Infectious Diseases**
 - Common Pathogens (Bacteria, Viruses, Fungi)
 - Transmission & Prevention of Infectious Diseases
 - The Role of Antibiotics & Vaccines
 - **Immune System**
 - White Blood Cells, Antibodies, & Antigens
 - Vaccination, Active, Passive & Herd Immunity
- 9. **Scientific Investigations & Laboratory Skills**
 - **Experimental Design**
 - Variables: Independent, Dependent, Control
 - Data Collection & Interpretation
 - **Lab Techniques**
 - Microscopy (Light Microscopy)
 - Use of Scientific Equipment
- 10. **Human Impact on the Environment**
 - **Pollution**
 - Types of Pollution: Air, Water, Soil
 - Effects on Health & Ecosystems
 - Pollution Control Methods
 - **Conservation & Sustainability**
 - Protecting Biodiversity (Conservation Methods, Endangered Species)
 - Sustainable Development & Resource Use
 - Climate Change & its Effects



Higher - Secondary Category Syllabus (Grade: 11 - 12)

Chemistry

1. Physical Chemistry

1.1 Atomic Structure

- Subatomic Particles: Protons, Neutrons, & Electrons.
- Quantum Mechanical Model of the Atom.
 - Orbitals: Shapes (s, p, d, f), Energy Levels, & Electron Configurations.
 - Aufbau Principle, Pauli Exclusion Principle, Hund's Rule.
- Ionization Energy, Electron Affinity, & Periodic Trends.

1.2 Chemical Bonding & Molecular Structure

- Ionic, Covalent, & Metallic Bonds.
- Hybridization: sp, sp², sp³, & their Geometries.
- Molecular Orbital Theory: (H₂, O₂, N₂).
- Intermolecular Forces: Hydrogen Bonding, Van Der Waals Forces.
- Resonance Structures.

1.3 States of Matter

- Gaseous State:
 - Ideal & Real Gases: Gas Laws (Boyle's, Charles's, Avogadro's).
- Liquid State:
 - Vapor Pressure, Boiling Point, & Viscosity.
- Solid State:
 - Crystal Lattices, Unit Cells, & Types Of Crystals (Ionic, Molecular, Metallic).

1.4 Thermodynamics

- First Law of Thermodynamics: Internal Energy, Work, & Heat.
- Enthalpy Changes: Formation, Combustion, & Neutralization.

1.5 Chemical Equilibrium

- Dynamic Equilibrium: Le Chatelier's Principle.
- Equilibrium Constant (K_c, K_p) & their Calculations.
- Application to Acid-Base Equilibria & Solubility Equilibria.

2. Inorganic Chemistry

2.1 Periodic Table

- Periodicity of Atomic Properties:
 - Atomic & Ionic Radii, Ionization Energy, Electronegativity.
- Trends in Groups & Periods:
 - Alkali Metals, Alkaline Earth Metals, Halogens, & Noble Gases.

2.2 Transition Elements

- General Properties: Variable Oxidation States, Colored Compounds, & Catalytic Behavior.
- Coordination Chemistry:
 - Ligands, Coordination Number, & Geometries.



2.3 Chemical Reactions

- Redox Reactions:
 - Oxidation Number & Balancing Redox Equations.
 - Standard Electrode Potentials & Electrochemical cells.

2.4 Industrial Chemistry

- Production of Chemicals:
 - Haber Process, Contact Process
- Applications of Catalysts in Industry.

3. Organic Chemistry

3.1 Fundamentals

- IUPAC Nomenclature of Organic Compounds.
- Hybridization in Carbon & Bond Types.
- Structural Isomerism & Stereochemistry (Optical & Geometrical Isomerism).

3.2 Hydrocarbons

- Alkanes, Alkenes, & Alkynes:
 - Preparation, Properties, & Reactions (Substitution, Addition).
- Aromatic Compounds:
 - Benzene: Structure, Resonance, & Electrophilic Substitution.

3.3 Functional Groups

- Alcohols, Phenols
- Aldehydes & Ketones:
 - Preparation, Nucleophilic Addition Reactions.
- Carboxylic Acids & Derivatives (Esters, Amides).
- Amines: Basicity, Preparation, & Reactions.

3.4 Reaction Mechanisms

- Free Radical Substitution.
- Electrophilic & Nucleophilic Substitution.
- Elimination & Addition Reactions.

3.5 Polymers

- Addition & Condensation Polymers.
- Biopolymers: Proteins, Carbohydrates.

4. Analytical Chemistry

4.1 Qualitative Analysis

- Identification of Cations (e.g., Na^+ , Fe^{3+} , Cu^{2+}) & Anions (e.g., Cl^- , SO_4^{2-} , CO_3^{2-}).
- Flame Tests & Precipitate Colors.

4.2 Quantitative Analysis

- Volumetric Analysis:
 - Acid-Base Titrations, Redox titrations.

4.3 Spectroscopy

- Basic Principles of IR & Mass spectroscopy.
- Applications in Identifying Organic & Inorganic Compounds.

5. Environmental Chemistry

- Air Pollution: Greenhouse Gases, Ozone Depletion, Acid Rain.
- Water Pollution & Purification Methods.
- Green Chemistry Principles & Sustainability.



6. Practical Chemistry

- **Laboratory Techniques**
 - Filtration, Recrystallization, & Distillation.
 - Chromatography: Paper & Thin-Layer Chromatography.
- **Experiments**
 - Preparation of Salts (Soluble & Insoluble).
 - Simple Electrolysis Experiments.
 - Conducting Acid-Base & Redox Titrations.
 - Identification of Gases: H₂, O₂, CO₂, NH₃.

Biology

1. Cell Biology

- **Cell Structure & Function**
 - Prokaryotic vs. Eukaryotic Cells
 - Organelles: Nucleus, Mitochondria, Chloroplasts, Golgi Apparatus, Endoplasmic Reticulum, Ribosomes, Lysosomes, Vacuoles
 - Plasma Membrane: Structure & Functions (Fluid Mosaic Model)
- **Cell Division**
 - Mitosis & its Stages
 - Meiosis & Genetic Variation
 - Cell Cycle Regulation
- **Cellular Transport**
 - Diffusion, Osmosis, Active Transport, & Endocytosis/Exocytosis
 - Facilitated Diffusion & Carrier Proteins
- **Enzyme Action**
 - Structure of Enzymes
 - Enzyme-Substrate Complex
 - Factors Affecting Enzyme Activity (Temperature, pH, Substrate Concentration)
 - Inhibition (Competitive, Non-competitive)

2. Biochemistry

- **Biomolecules**
 - Carbohydrates: Monosaccharides, Disaccharides, Polysaccharides, Glycogen, Starch
 - Proteins: Amino Acids, Peptide Bonds, Protein Structure (Primary, Secondary, Tertiary, Quaternary)
 - Lipids: Fatty Acids, Triglycerides, Phospholipids, Cholesterol
 - Nucleic Acids: DNA, RNA, Nucleotides, Base Pairing, Structure of DNA
- **Metabolism**
 - ATP: Structure & Role in Energy Transfer
 - Glycolysis, Krebs Cycle, & Oxidative Phosphorylation
 - Anaerobic vs. Aerobic Respiration



- **Water & Its Properties**
 - Polarity & Hydrogen Bonding
 - Cohesion, Adhesion, & Surface Tension
 - Solvent Properties
- **3. Genetics & Molecular Biology**
 - **DNA & RNA**
 - Structure of DNA & RNA
 - DNA Replication & Repair Mechanisms
 - Transcription & Translation
 - Codons, Anticodons, & Genetic Code
 - **Genetic Variation**
 - Mutations: Types & Causes
 - Genetic Recombination in Meiosis
 - Genetic Drift, Gene Flow, & Natural Selection
- **4. Ecology**
 - **Levels of Organization**
 - Individuals, Populations, Communities, Ecosystems
 - Biotic & Abiotic Factors
 - Niche & Habitat
 - **Energy Flow**
 - Trophic Levels: Producers, Consumers, Decomposers
 - Food Chains & Food Webs
 - Energy Transfer & Efficiency
 - **Population Ecology**
 - Population Growth Models (Exponential, Logistic)
 - Carrying Capacity, Limiting Factors
 - Predator-Prey Relationships
 - Population Regulation (Density-dependent vs. Density-independent)
 - **Ecosystem Dynamics**
 - Carbon, Nitrogen, & Water Cycles
 - Ecological Succession (Primary vs. Secondary)
 - Human Impact on Ecosystems (Climate Change, Deforestation, Pollution)
 - **Conservation Biology**
 - Biodiversity & Conservation Strategies
 - Protected Areas, Ecological Corridors, & Species Recovery Plans
- **5. Human Physiology**
 - **Homeostasis**
 - Negative & Positive Feedback Mechanisms
 - Thermoregulation, Osmoregulation, & Blood Glucose Regulation
 - **Nervous System**
 - Structure of Neurons (Dendrites, Axons, Synapses)
 - Resting Potential & Action Potential
 - Synaptic Transmission & Neurotransmitters
 - Reflex Arcs & Central Nervous System



- **Endocrine System**
 - Hormones & their Functions (Insulin, Adrenaline, Thyroxine)
 - Feedback Mechanisms in Hormonal Regulation
 - The Role of the Hypothalamus & Pituitary Gland
 - **Circulatory System**
 - Structure & Function of the Heart, Blood Vessels, & Blood
 - The Cardiac Cycle, Blood Pressure, & Circulatory Pathways
 - Transport of Oxygen, CO₂, Nutrients, & Waste Products
 - **Respiratory System**
 - Structure of the Lungs & Gas Exchange (Alveoli)
 - Mechanism of Breathing (Inspiration & Expiration)
 - Transport of Oxygen & Carbon Dioxide in the Blood
 - **Excretory System**
 - Structure of Kidneys & Nephrons
 - Filtration, Reabsorption, & Secretion
 - Regulation of Water & Salt Balance
- 6. Plant Biology**
- **Plant Structure**
 - Plant Tissues: Meristematic, Permanent, Xylem, Phloem
 - Roots, Stems, Leaves, & Flowers
 - **Photosynthesis**
 - Light-dependent & Light-independent Reactions
 - Role of Chloroplasts & Chlorophyll
 - Factors Affecting Photosynthesis (Light Intensity, Temperature, CO₂ Concentration)
 - **Plant Transport**
 - Xylem & Phloem Function
 - Transpiration & its Role
 - Water & Mineral Transport in Plants
 - **Plant Growth & Development**
 - Growth Hormones (Auxins, Gibberellins, Cytokinins)
 - Photoperiodism & Vernalization
- 7. Immunology**
- **Immune System Components**
 - White Blood Cells: Macrophages, Lymphocytes (T-cells, B-cells)
 - Antibodies & Antigens
 - The Role of the Thymus & Bone Marrow
 - **Immune Response**
 - The Innate Immune System (Physical Barriers, Inflammation, Phagocytosis)
 - The Adaptive Immune Response (Humoral Immunity, Cell-Mediated Immunity)
 - **Vaccination**
 - Active vs. Passive Immunity
 - Vaccine Development & Herd Immunity



- **Disorders of the Immune System**

- Autoimmune Diseases (e.g., Rheumatoid Arthritis, Multiple Sclerosis)
- Immunodeficiencies (e.g., HIV/AIDS)
- Allergies

8. Biotechnology

- **Gene Cloning & Recombinant DNA**

- Restriction Enzymes & Ligases
- Applications of Genetic Engineering (e.g., Insulin Production, GM Crops)

- **Cloning & Stem Cells**

- Therapeutic vs. Reproductive Cloning
- Stem Cells & their Potential in Medicine