

## **Test Specifications for the Admission Test to the single cycle master degree in Medicine and Surgery taught in English**

### **Section 1: Thinking Skills (Critical Thinking and Problem Solving)**

Section 1 will assess the thinking skills that students must possess if they are to succeed in a course of study at the highest level. Such skills are basic to any academic studies, which often require students to solve novel problems, or consider arguments put forward to justify a conclusion, or to promote or defend a particular point of view.

#### ***Critical Thinking***

Critical Thinking involves reasoning using everyday written language. Questions focus on the skills involved in understanding and evaluating arguments. These include: drawing and summarising conclusions, identifying assumptions and reasoning errors, and assessing the impact of additional evidence.

#### **Summarising the Main Conclusion**

In this type of question you have to judge which one of the statements A to E best expresses the main conclusion of the argument. The conclusion can appear anywhere within an argument - not necessarily at the end. What you are looking for is the statement which follows from, or is supported by the rest of the passage.

#### **Drawing a Conclusion**

In this type of question you are asked which conclusion follows from the information given. You need to consider each of the statements A to E, and to think about whether the information in the passage gives you good reasons to accept the statement.

#### **Identifying an Assumption**

An assumption is something which is not stated in the argument, but which is taken for granted in order to draw the conclusion. So you need first to identify the conclusion of the argument. Then look for the reasoning it gives to support this conclusion, and think about any important point which is not actually stated in the reasoning.

#### **Assessing the Impact of Additional Evidence**

This type of question will typically ask you to consider what would weaken or strengthen an argument. First, you need to be clear about what the argument is trying to establish. Work out what the conclusion is, and then consider what effect each of the possible answers would have on the conclusion.

#### **Detecting Reasoning Errors**

This type of question asks you to identify the flaw in the argument, which means that you must explain why the conclusion does not follow from the reasons which are given. So you need to be clear about what the conclusion is, and what reasons are meant to support it.

#### ***Problem Solving***

Problem Solving involves reasoning using numerical and spatial skills. Questions are of three kinds, each assessing a key aspect of insight into unfamiliar problems. The three kinds are Relevant Selection, Finding Procedures, and Identifying Similarity.

Although most questions fall into one category some questions fit into more than one of the categories.

#### **Relevant Selection**

Very often a real world problem will be overloaded with information, much of which is unimportant. This kind of question demands Relevant Selection, in which the task is to select only that information which is necessary and helpful in finding a solution.

#### **Finding Procedures**

Sometimes you will find that even if you have selected all the relevant information, no solution presents itself. For this type of question, you have to find a method or procedure which you can use to generate a solution.

#### **Identifying Similarity**

In this type of question you will be presented with information and asked to identify the same information presented in a different way, or a situation in which different information has a similar structure. In this type of question you will be presented with information and asked to identify the same information presented in a different way, or a situation in which different information has a similar structure.

### **Section 2: Biology**

#### **The chemistry of living things**

The bio-elements.

The biological importance of weak interactions. Properties of water. Organic molecules in living organisms and their respective functions. The role of enzymes.

#### **The cell as the basis of life**

Cellular theory. Cell size. Prokaryotic and eukaryotic cells.

The cell membrane and its functions.

Cellular structures and their specific functions.

Cell reproduction: mitosis and meiosis. Chromosomes.

Animal tissues.

#### **Bioenergetics**

The energy currency of cells: ATP. Transporters of energy: NAD, FAD.

Oxidation-reduction reactions in living things. Photosynthesis. Glycolysis. Aerobic respiration. Fermentation.

### **Reproduction and Inheritance**

Life cycles. Sexual and asexual reproduction.

Mendelian genetics. Basic laws and applications.

Classical genetics: chromosome theory of inheritance; sex chromosomes, chromosome maps. Molecular genetics: DNA and genes, genetic code and its translation, protein synthesis. DNA of prokaryotes. The chromosome of eukaryotes. Regulation of gene expression.

Human genetics: transmission of mono and multi-factorial features, hereditary diseases.

New frontiers of genetics: recombinant DNA and its potential bio-technological applications.

### **Inheritance and environment**

Mutations. Natural and artificial selection. Evolutionary theories. The genetic basis of evolution.

### **Anatomy and Physiology of animals and humans**

Anatomy of the major organs and their functions and interactions.

Homeostasis. Hormonal regulation.

Nerve impulse. Transmission and processing of information.

The immune response.

## **Section 3: Chemistry**

### **The constitution of matter**

States of matter; heterogeneous and homogeneous systems; compounds and elements.

### **The structure of the atom**

Elementary particles, atomic number and mass number, isotopes, electronic structure of atoms of the elements.

### **The periodic table of elements**

Groups and periods, transition elements, periodic properties of elements: atomic radius, ionization potential, electron affinity, metals and non-metals; relations between electronic structure, position in the periodic table and properties.

### **The chemical bond**

Ionic bond, covalent bond, bond polarity, electronegativity.

### **Fundamentals of inorganic chemistry**

Nomenclature and main properties of inorganic compounds: oxides, hydroxides, acids, salts; position in the periodic table.

### **Chemical reactions and stoichiometry**

Atomic and molecular weight, Avogadro constant, concept of the mole, conversion from grams to moles and vice versa, elementary stoichiometric calculations, balancing simple reactions, various types of chemical reactions.

### **Solutions**

Solvent properties of water, solubility, the main ways of expressing the concentration of solutions.

### **Oxidation and reduction**

Oxidation number, the concepts of oxidising and reducing agents.

### **Acids and bases**

Concepts of acids and bases, acidity, neutrality and basicity of aqueous solutions, pH.

### **Fundamentals of organic chemistry**

Bonds between carbon atoms; molecular, structural and displayed formulae; concept of isomers; aliphatic, alicyclic and aromatic hydrocarbons; functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides.

## **Section 4: Physics & Mathematics**

### **Physics**

#### **Measures**

Direct and indirect measures, fundamental and derived quantities, physical dimensions of quantities, knowledge of the metric system and the CGS System of Units, Technical (or practical) (ST) and the International System (SI) of Units (names and relationships between fundamental and derived units), and multiples and submultiples (names and values).

#### **Kinematics**

Kinematic quantities, various types of motion with particular regard to uniform and uniformly accelerating rectilinear motion, uniform circular motion, harmonic motion (for all motion: definition and relationships between measures).

#### **Dynamics**

Vectors and operations on vectors. Forces, moments of forces about a point.

Vector composition of forces. Definitions of mass and weight. Acceleration due to gravity.

Density and specific gravity. Law of universal gravitation, 1st, 2nd and 3rd laws of motion. Work, kinetic energy, potential energy. Principle of conservation of energy.

#### **Fluid mechanics**

Pressure, and its units of measurement (not only in the SI system). Archimedes' principle. Pascal's principle. Stevino's law.

## **Thermodynamics**

Thermometry and calorimetry. Specific heat, heat capacity.

Mechanisms of heat propagation. Changes of state and latent heat. Ideal Gas Laws. First and second laws of thermodynamics.

## **Electrostatics and electrodynamics**

Coulomb's law. Field and electric potential. Dielectric constant. Capacitors. Capacitors in series and in parallel. Direct current. Ohm's law. Electrical resistance and resistivity, electrical resistors in series and in parallel. Work, Power, Joule effect. Generators. Electromagnetic induction and alternating currents. Effects of electrical currents (thermal, chemical and magnetic).

## **Mathematics**

**Algebra and numerical sets: Natural numbers, integers, rational and real numbers. Sorting and comparison, scales and scientific notation. Operations and their properties.**

**Proportions and percentages. Powers with whole and rational exponents and their properties. Roots and their properties. Logarithms (base 10 and base e) and their properties. Elements of combinatorics. Algebraic and polynomial expressions. Special products of binomials, nth power of a binomial, factorisation of polynomials. Algebraic fractions. Algebraic equations and inequalities of the first and second order. Systems of equations.**

**Functions : Basic concepts of functions and their graphical representations (domain, codomain, sign, maxima and minima, increasing and decreasing, etc.). Elementary functions: whole and fractional algebraic functions, exponential, logarithmic and trigonometric functions. Composite functions and inverse functions. Trigonometric equations and inequalities.**

**Geometry: Polygons and their properties. Circle and circumference. Measurement of length, area and volume. Isometries, similarities and equivalences in the plane. Geometric loci. Measure angles in degrees and radians. Sine, cosine, tangent of an angle and their significant values. Trigonometric formulas. Solving triangles. Cartesian reference system in a plane. Distance between two points and the midpoint of a segment. Equation of a line. Concepts of parallel and perpendicular. Distance of a point from a straight line. Equation of the circle, the parabola, hyperbola, ellipse and their representation in the Cartesian plane. Pythagorean theorem.**

**Probability and Statistics: Frequency distributions and their graphic representations. Concepts of random experiments and of events. Probability and frequency.**