English International School
Moscow

Year 12 Yearly overview 2022-2023

	Autumn Term	Spring Term	Summer Term
English	Paper 1 Reading Learners are encouraged to read widely throughout their programme of study, continually deepening their appreciation of an increasingly rich array of reading material. They should develop an intimate knowledge and understanding of the conventions and discourses associated with a diverse range of genres, styles and contexts. Furthermore, learners should continue to cultivate their personal relationship with reading, enabling them to respond reflectively, analytically, discursively and creatively, as is appropriate to the task or context.	Paper 2 Writing Using their reading as inspiration, learners should explore and experiment with a similarly extensive variety of genres, styles and contexts in their writing. In addition to refining their ability to express themselves with precision and clarity of purpose, learners should become increasingly reflective writers, capable of adapting the style of their writing to fit a diverse range of forms, audiences, purposes and contexts. The knowledge and understanding that candidates are required to demonstrate in Paper 2 is the same as is covered in Paper 1.	Paper 3 Language Analysis Learners should familiarise themselves with a comprehensive set of tools, strategies and conventions for studying language. This should include the following: developing frameworks for analysing and comparing unseen texts; assimilating a range of appropriate technical terminology; assessing, evaluating and synthesising sources of evidence; carrying out independent research into language concepts; contextualising their views in relation to theories; and understanding language data presented in the form of transcripts, tables and graphs

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Maths	Pure Mathematics 1 1 1.1 Quadratics 1.2 Functions 1.3 Coordinate geometry 1.4 Circular measure 1.5 Trigonometry 1.6 Series 1.7 Differentiation 1.8 Integration	Pure Mathematics 2 2.1 Algebra 2.2 Logarithmic and exponential functions 2.3 Trigonometry 2.4 Differentiation 2.5 Integration 2.6 Numerical solution of equations	4 Mechanics 4.1 Forces and equilibrium 4.2 Kinematics of motion in a straight line 4.3 Momentum 4.4 Newton's laws of motion 4.5 Energy, work and power
Chemistry	**Chemistry:** 1. Moles and equations Masses of atoms and molecules Accurate relative atomic masses Amount of substance Mole calculations Chemical formulae and chemical equations Solutions and concentration Calculations involving gas volumes 2. Atomic structure Elements and atoms Inside the atom and numbers of nucleons; isotopes How many protons, neutrons and electrons? 3. Electrons in atoms Simple electronic structure and evidence for electronic structure	**Chemistry:** 1. Redox reactions What is a redox reaction Redox and electron transfer Oxidation numbers Redox and oxidation number Naming compounds; From name to formula Balancing chemical equations using oxidation numbers 2. Equilibrium Reversible reactions and equilibrium Changing the position of equilibrium Equilibrium expressions and the equilibrium constant, Kc Equilibria in gas reactions: the equilibrium constant, Kp	**Chemistry:** 1. Nitrogen and sulfur Nitrogen gas Ammonia and ammonium compounds Uses of ammonia and ammonium compounds Sulfur and its oxides Sulfuric acid 2. Introduction to organic chemistry Representing organic molecules Functional groups Naming organic compounds Bonding in organic molecules Structural isomerism Stereoisomerism Organic reactions – mechanisms Types of organic reaction

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	Subshells and atomic orbitals; electronic configurations Orbitals and the Periodic Table Patterns in ionisation energies in the Periodic Table 4. Chemical bonding Types of chemical bonding Ionic bonding and Covalent bonding Shapes of molecules and ions Metallic bonding Intermolecular forces and Hydrogen bonding Bonding and physical properties 5. States of matter States of matter The gaseous state The liquid state The solid state Simple molecular lattices Carbon nanoparticles Conserving materials 6. Enthalpy changes What are enthalpy changes? Standard enthalpy changes Measuring enthalpy changes Hess's law; Enthalpy change of reaction from enthalpy changes of formation; Enthalpy change of	Equilibria and the chemical industry Acid-base equilibria 3. Rates of reaction Reaction kinetics The effect of concentration on rate of reaction The effect of temperature on rate of reaction Catalysis Enzymes 4. Periodicity Structure of the Periodic Table Periodicity of physical properties Periodicity of chemical properties Oxides of Period 3 elements Chlorides of Period 3 elements 5. Group 2 Physical properties of Group 2 elements Reactions of Group 2 elements Thermal decomposition of Group 2 carbonates and nitrates Some uses of Group 2 compounds 6. Group 17 Physical properties of Group 17 elements	3. Hydrocarbons The homologous group of alkanes Sources of the alkanes Reactions of alkanes The alkenes Addition reactions of the alkenes Oxidation of the alkenes Addition polymerisation Tackling questions on addition polymers 4. Halogenoalkanes Nucleophilic substitution reactions Mechanism of nucleophilic substitution in halogenoalkanes Elimination reactions Uses of halogenoalkanes 5. Alcohols, esters and carboxylic acids The homologous series of alcohols Reactions of the alcohols Carboxylic acids 6. Carbonyl compounds The homologous series of aldehydes and ketones Preparation of aldehydes and ketones Reduction of aldehydes and ketones

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	formation from enthalpy changes of combustion Calculating the enthalpy change of hydration of an anhydrous salt Bond energies and enthalpy changes Calculating enthalpy changes using bond energies	Reactions of Group 17 elements Reactions of the halide ions Disproportionation Uses of the halogens and their compounds	Nucleophilic addition with HCN Testing for aldehydes and ketones Reactions to form tri-iodomethane Infra-red spectroscopy
Biology	1: Cell structure 1.1 The microscope in cell studies 1.2 Cells as the basic units of living organisms 2: Biological molecules 2.1 Testing for biological molecules 2.2 Carbohydrates and lipids 2.3 Proteins 2.4 Water 3: Enzymes 3.1 Mode of action of enzymes 3.2 Factors that affect enzyme action 4: Cell membranes and transport 4.1 Fluid mosaic membranes 4.2 Movement into and out of cells	5: The mitotic cell cycle 5.1 Replication and division of nuclei and cells 5.2 Chromosome behaviour in mitosis 6: Nucleic acids and protein synthesis 6.1 Structure of nucleic acids and replication of DNA 6.2 Protein synthesis 7: Transport in plants 7.1 Structure of transport tissues 7.2 Transport mechanisms 8: Transport in mammals	9: Gas exchange 9.1 The gas exchange system 10: Infectious diseases 10.1 Infectious diseases 10.2 Antibiotics 11: Immunity 11.1 The immune system 11.2 Antibodies and vaccination 12: Energy and respiration 12.1 Energy 12.2 Respiration

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		8.1 The circulatory system 8.2 Transport of oxygen and carbon dioxide 8.3 The heart	
Physics	**Scalars and Vectors** -understand the difference between scalar and vector quantities and give examples of scalar and vector quantities included in the syllabus -add and subtract coplanar vectors -represent a vector as two perpendicular components Equations of Motion -define and use distance, displacement, speed, velocity and acceleration -use graphical methods to represent distance, displacement, speed, velocity and acceleration -determine displacement from the area under a velocity–time graph -determine velocity using the gradient of a displacement–time graph -determine acceleration using the gradient of a velocity–time graph -derive, from the definitions of velocity and acceleration, equations	**Work, energy and power** -recall and apply the principle of conservation of energy -recall and understand that the efficiency of a system is the ratio of useful energy output from the system to the total energy input -use the concept of efficiency to solve problems -derive, using W = Fs, the formula □EP = mg□h for gravitational potential energy changes in a uniform gravitational field -recall and use the formula □EP = mg□h for gravitational potential energy changes in a uniform gravitational field -derive, using the equations of motion, the formula for kinetic energy EK = 1/2mv2 -recall and use EK = 1/2mv2 **Deformation of solids**	**Waves** -understand that polarisation is a phenomenon associated with transverse waves -explain and use the principle of superposition - show an understanding of experiments that demonstrate diffraction including the qualitative effect of the gap width relative to the wavelength of the wave; for example diffraction of water waves in a ripple tank - recall and use d sin θ = nλ **Electricity** -understand that an electric current is a flow of charge carriers -understand that the charge on charge carriers is quantized -recall and use P = VI, P = I 2R and P = V 2 / R -define resistance

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	that represent uniformly accelerated motion in a straight line **Newtons law and Momentum** -understand that mass is the property of an object that resists change in motion -recall F = ma and solve problems using it, understanding that acceleration and resultant force are always in the same direction -define and use linear momentum as the product of mass and velocity -define and use force as rate of change of momentum **Linear Momentum** -state the principle of conservation of momentum -apply the principle of conservation of momentum to solve simple problems, including elastic and inelastic interactions between objects in both one and two dimensions (knowledge of the concept of coefficient of restitution is not required) -recall that, for a perfectly elastic collision, the relative speed of	-understand that deformation is caused by tensile or compressive forces (forces and deformations will be assumed to be in one dimension only) -understand and use the terms load, extension, compression and limit of proportionality -recall and use Hooke's law -recall and use the formula for the spring constant k = F / x -define and use the terms stress, strain and the Young modulus -understand and use the terms elastic deformation, plastic deformation and elastic limit -understand that the area under the force–extension graph represents the work done -determine the elastic potential energy of a material deformed within its limit of proportionality from the area under the force–extension graph **Waves** -describe what is meant by wave motion as illustrated by vibration in ropes, springs and ripple tanks	-recall and use V = IR -sketch the I–V characteristics of a metallic conductor at constant temperature, a semiconductor diode and a filament lamp - recall and use the circuit symbols shown in section 6 of this syllabus -draw and interpret circuit diagrams containing the circuit symbols shown in section 6 of this syllabus -define and use the electromotive force (e.m.f.) of a source as energy transferred per unit charge in -recall Kirchhoff's first law and understand that it is a consequence of conservation of charge -recall Kirchhoff's second law and understand that it is a consequence of conservation of energy **Particle physics** -infer from the results of the □-particle scattering experiment the existence and small size of the nucleus

	approach is equal to the relative speed of separation **Torque** -understand that the weight of an object may be taken as acting at a single point known as its centre of gravity -define and apply the moment of a force **Density and Pressure** -define and use pressure -derive, from the definitions of pressure and density, the equation for hydrostatic pressure $\Delta p = \rho g \Delta h$ -use the equation $\Delta p = \rho g \Delta h$ -understand that the upthrust acting on an object in a fluid is due to a difference in hydrostatic pressure	-understand and use the terms displacement, amplitude, phase difference, period, frequency, wavelength and speed -understand the use of the time-base and y-gain of a cathode-ray oscilloscope (CRO) to determine frequency and amplitude -derive, using the definitions of speed, frequency and wavelength, the wave equation $v = f \lambda$ -understand that when a source of sound waves moves relative to a stationary observer, the observed frequency is different from the source frequency (understanding of the Doppler effect for a stationary source and a moving observer is not required)	-describe a simple model for the nuclear atom to include protons, neutrons and orbital electrons -distinguish between nucleon number and proton number -understand that isotopes are forms of the same element with different numbers of neutrons in their nuclei -understand and use the notation AX for the representation of nuclides -understand that a quark is a fundamental particle and that there are six flavours (types) of quark: up, down, strange, charm, top and bottom -recall and use the charge of each flavour of quark and understand that its respective antiquark has the opposite charge (no knowledge of any other properties of quarks is required)
ICT	**1. Data processing and information** Students should know and understand data and information; quality of information; encryption;	**8. Algorithms and flowcharts** Students should be able to edit a given algorithm; write an algorithm using pseudocode to solve a given problem; edit a given flowchart; and, draw a	**12. Database and file concepts** Students should be able to create a database by assigning appropriate data types and field sizes to a field; create and use relationships; create and

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	checking the accuracy of data; and, data processing. **2. Hardware and software** Students should know and understand mainframe computers and supercomputers; system software; utility software; custom written software and off-the-shelf software; and, user interfaces. **3. Monitoring and control** Students should know and understand monitoring technologies (sensors, uses, calibration, advantages and disadvantages); and, control technologies (sensors, actuators, uses, write an algorithm, draw a flowchart, advantages and disadvantages of different control technologies). **4. eSecurity** Students should know and understand what personal data is; how to keep personal data secure; how to prevent misuse of personal	flowchart to solve a given problem. **9. Spreadsheets** Students should be able to create a spreadsheet structure; create formulae and use functions; use validation rules; test a spreadsheet structure; use a spreadsheet to extract data; automate operations with a spreadsheet by creating macros; creating a graph or chart appropriate to a specific purpose; and, apply chart formatting. **10. Modelling** Students should be able to use what-if analysis, and test a spreadsheet model. They should be able to know and understand what-if analysis; the characteristics of modelling software; the need for computer models; the effectiveness of spreadsheet models; and, the use of a model to create and run simulations.	interpret an entity relationship diagram; create a relational database; validate and verify data entry; perform searches; perform calculations; sort data; design and create a data entry form; design and create a switchboard/menu; import/export data; and, create a data dictionary. They should know and understand the relationships between tables; the function of key fields; the normalisation of data up to third normal form (3NF); identify different data types; query selection, and file and data management. **Paper 2: past papers**

	data; types and uses of malware; consequences of malware for organisations and individuals; and, prevention of malware. **5. The digital divide** Students should know and understand what the digital divide is; the causes and effects of the digital divide; and, how to reduce the effects of the digital divide. **6. Expert systems** Students should know and understand how expert systems are used to produce possible solutions for different scenarios. **7. Using networks** Students should know and understand the advantages and disadvantages of networking computers; how the internet is used for communication; how to setup a video and a web conference and describe how they use networks;	**11. Sound and video editing** Students should be able to edit a video clip and a sound clip to meet the requirements of its intended application and audience. They should know and understand the effects of different methods of compression on video and sound; why typical features found in video editing and sound editing software are used; and, why files sizes depend on sampling rates and sampling resolution. **Paper 1: past papers**	

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	and, the impact of video conferencing on our lives.		
Geography	**1. Settlement Dynamics** Demonstrate an understanding of: -Changes in rural settlements in LICs, MICs and HICs -Urban growth. The process of urbanisation and its causes and consequences in LICs, MICs and HICs, including counterurbanisation and re-urbanisation -The changing structure of urban settlements including CBD change, urban segregation and urban land use models in LICs, MICs and HICs **Case study:** candidates must study urban settlements showing the challenges of, and evaluating the attempted solutions in, each of the following: • a shanty town (squatter settlement) in an LIC or MIC • providing infrastructure (either power or transport) for a city. **2. Rocks and Weathering** Demonstrate an understanding of:	**1. Population** Demonstrate an understanding of: - Natural increase as a component of population change - Demographic transition Model - Population–resource relationships - The management of natural increase **Case study**: candidates must study one country's population policy regarding natural increase, showing the difficulties faced and evaluate the attempted solution(s) **2. Atmosphere and weather** Demonstrate an understanding of: • Factors affecting diurnal energy budget: incoming (shortwave) solar radiation, reflected solar radiation, energy	**1. Migration** Demonstrate an understanding of: • Migration as a component of population change • Types of migration • The management of international migration **Case study**: candidates must study one international migration stream: its causes, character, scale, pattern and impacts on source areas and receiving/destination areas. **2. Hydrology and fluvial geomorphology** Demonstrate an understanding of:

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	- Nature of tectonic plates and their global patterns. -Physical, Chemical and mechanical weathering process -The factors affecting the rate of weathering such as human impacts, temperature, precipitation and chemical composition of rocks	absorbed into the surface and subsurface and albedo. • The global energy budget. • Atmospheric moisture processes, evaporation, condensation, freezing, melting, deposition, sublimation, greenhouse effect and global warming. • **Case study**: candidates must study an urban area, which shows the effects of human activity on climate: temperature (heat island), humidity, precipitation and winds.	• The drainage basin system. Outputs, Flows and Store • Discharge relationships within drainage basins. Components of hydrographs (storm and annual). Influences on hydrographs. • River channel processes and landforms • The human impact on a drainage basin system. **Case study**: candidates must study a recent river flood event showing the causes of the flood, impacts on both people and the environment, and evaluate the solutions of flooding. **Revision and final exam**