

Contents

Topic 1 Biology

Biology

CELL BIOLOGY

Eukaryotes and prokaryotes	10
Animal and plant cells	11
Cell specialisation and differentiation	12
Microscopy	13
Using a light microscope	14
Mitosis and the cell cycle	15
Stem cells	16
Diffusion	17
Osmosis	18
Investigating the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue	19
Active transport	20

Topic 2 Biology

TISSUES, ORGANS AND ORGAN SYSTEMS

The human digestive system and enzymes	21
Food tests	23
The effect of pH on amylase	24
The heart	25
The lungs	26
Blood vessels and blood	27
Coronary heart disease	28
Health issues and effect of lifestyle	29
Cancer	30
Plant tissues	31
Transpiration and translocation	32

Topic 3 Biology

INFECTION AND RESPONSE

Communicable (infectious) diseases	33
Viral and bacterial diseases	34
Fungal and protist diseases	35
Human defence systems and vaccination	36
Antibiotics, painkillers and new drugs	37

Topic 4 Biology

BIOENERGETICS

Photosynthesis and the rate of photosynthesis	38
Investigating the effect of light intensity on the rate of photosynthesis	40
Uses of glucose	41
Respiration and metabolism	42
Response to exercise	43

Topic 5 Biology

HOMEOSTASIS AND RESPONSE

Homeostasis	44
The human nervous system and reflexes	45
Investigating the effect of a factor on human reaction time	46
Human endocrine system	47
Control of blood glucose concentration	48
Diabetes	49
Hormones in human reproduction	50
Contraception	51
Using hormones to treat infertility	52
Negative feedback	53

Topic 6 Biology

INHERITANCE, VARIATION AND EVOLUTION

Sexual and asexual reproduction	54
Meiosis	55

DNA and the genome	56
Genetic inheritance	57
Inherited disorders	58
Variation	59
Evolution	60
Selective breeding and genetic engineering	61
Classification	62

ECOLOGY

Communities	63
Abiotic and biotic factors	64
Adaptations	65
Food chains	66
Measuring species	67
The carbon cycle, nitrogen cycle and water cycle	68
Biodiversity	69
Global warming	70

Chemistry

ATOMIC STRUCTURE AND THE PERIODIC TABLE

Atoms, elements and compounds	71
Mixtures and compounds	72
Pure substances and formulations	73
Chromatography	74
Scientific models of the atom	75
Atomic structure, isotopes and relative atomic mass	76
The development of the periodic table and the noble gases	77
Electronic structure	78
Metals and non-metals	79
Group 1 – the alkali metals	80
Group 7 – the halogens	81

BONDING, STRUCTURE AND THE PROPERTIES OF MATTER

Bonding and structure	82
Ions and ionic bonding	83
The structure and properties of ionic compounds	84
Covalent bonds and simple molecules	84
Diamond, graphite and graphene	86
Fullerenes and polymers	87
Giant metallic structures and alloys	88

QUANTITATIVE CHEMISTRY

Conservation of mass and balancing equations	89
Relative formula masses	91
The mole and reacting masses	92
Limiting reactants	94
Concentrations in solutions	95

CHEMICAL CHANGES

Metal oxides and the reactivity series	96
Extraction of metals and reduction	97
The blast furnace	98
The reactions of acids	99
The preparation of soluble salts	100
Oxidation and reduction in terms of electrons	101
pH scale and neutralisation	102
Strong and weak acids	103
Electrolysis	104
Electrolysis of copper(II) sulfate and electroplating	105

Topic 7 Biology

Topic 1 Chemistry

Topic 2 Chemistry

Topic 3 Chemistry

Topic 4 Chemistry

Topic 5 Chemistry

- The extraction of metals using electrolysis **106**
 Practical investigation into the electrolysis of aqueous solutions **107**

ENERGY CHANGES

- Exothermic and endothermic reactions **108**
 Practical investigation into the variables that affect temperature changes in chemical reactions **109**
 Reaction profiles **110**
 The energy changes of reactions **111**

Topic 6 Chemistry

RATES OF REACTION AND EQUILIBRIUM

- Ways to follow a chemical reaction **112**
 Calculating the rate of reaction **113**
 The effect of concentration on reaction rate and the effect of pressure on the rate of gaseous reactions **114**
 Rates of reaction – the effect of surface area **116**
 The effects of changing the temperature and adding a catalyst **117**
 An investigation into how changing the concentration affects the rate of reaction **118**
 Reversible reactions **119**
 The effect of changing conditions on equilibrium **120**

Topic 7 Chemistry

ORGANIC CHEMISTRY

- Alkanes **121**
 Fractional distillation **122**
 Cracking and alkenes **123**

Topic 8 Chemistry

CHEMICAL ANALYSIS

- Testing for gases **124**

Topic 9 Chemistry

CHEMISTRY OF THE ATMOSPHERE

- The composition and evolution of the Earth's atmosphere **125**
 Climate change **126**
 The carbon footprint and its reduction **127**
 Atmospheric pollutants **128**

Topic 10 Chemistry

USING RESOURCES

- Finite and renewable resources, sustainable development **129**
 Life cycle assessments (LCAs) **130**
 Alternative methods of copper extraction **131**
 Making potable water and waste water treatment **132**
 Ways of reducing the use of resources **133**
 The Haber process **134**

Physics

Topic 1 Physics

ENERGY

- Energy stores and systems **135**
 Changes in energy stores: kinetic energy **136**
 Changes in energy stores: elastic potential energy **137**
 Changes in energy stores: gravitational potential energy **138**
 Energy changes in systems: specific heat capacity **139**
 Power **140**
 Energy transfers in a system **141**
 Efficiency **142**
 National and global energy resources **143**

Topic 2 Physics

ELECTRICITY

- Standard circuit diagram symbols **144**
 Electrical charge and current **145**
 Current, resistance and potential difference and resistors **146**
 Series and parallel circuits **148**

Mains electricity: direct and alternating potential difference (ac/dc)	149
Mains electricity	150
Electric power (with electrical devices)	151
Energy transfers in appliances	152
The National Grid	153
Static charge and electric fields (1)	155
Static charge and electric fields (2)	156
PARTICLE MODEL	
Particle model of matter and density of materials	157
Changes of state and internal energy	158
Changes of temperature and specific latent heat	159
Particle motion in gases (1)	160
Particle motion in gases (2)	161
ATOMS	
The structure of the atom (1)	162
The structure of the atom (2)	163
Developing a model of the atom	164
Radioactive decay and nuclear radiation	165
Nuclear equations	166
Half-life of radioactive elements	167
Hazards and uses of radioactive emissions (1)	168
Hazards and uses of radioactive emissions (2)	169
Hazards and uses of radioactive emissions (3)	170
FORCES	
Forces and their interactions	171
Gravity	172
Resultant forces	173
Work done and energy transfer	174
Forces and elasticity	175
Distance, displacement, speed and velocity	176
Acceleration	178
Equations of motion	179
Newton's laws of motion	181
Stopping distance	183
Momentum (1)	184
Momentum (2)	185
Momentum (3)	186
WAVES	
Transverse and longitudinal waves	187
Properties of waves	188
Reflection and refraction	189
Sound waves (1)	190
Sound waves (2)	191
Electromagnetic waves	192
Emission and absorption of infrared radiation	193
ELECTROMAGNETISM	
Magnetism	195
Electromagnetism	196
Motor effect	197
Transformers	199
Biology Paper 1	201
Chemistry Paper 1	210
Physics Paper 1	217
Answers	224

Topic 3 Physics

Topic 4 Physics

Topic 5 Physics

Topic 6 Physics

Topic 7 Physics