

QCE Biology: Units 1&2

Contents

Unit 1

Chapter 1: Basic Skills for QCE

| | | |
|--------------------------|---|----|
| | <i>Key Skills and Knowledge</i> | 1 |
| <input type="checkbox"/> | 1 How Do We Do Science? | 2 |
| <input type="checkbox"/> | 2 Systems and Systems Models | 4 |
| <input type="checkbox"/> | 3 Types of Data | 5 |
| <input type="checkbox"/> | 4 Planning a Quantitative Investigation | 6 |
| <input type="checkbox"/> | 5 Safety and Ethical Guidelines | 8 |
| <input type="checkbox"/> | 6 Accuracy and Precision | 10 |
| <input type="checkbox"/> | 7 Working with Numbers | 12 |
| <input type="checkbox"/> | 8 Fractions, Percentages and Ratios | 13 |
| <input type="checkbox"/> | 9 Dealing With Large Numbers | 14 |
| <input type="checkbox"/> | 10 Practicing With Data | 15 |
| <input type="checkbox"/> | 11 Apparatus and Measurement | 16 |
| <input type="checkbox"/> | 12 Drawing Graphs | 17 |
| <input type="checkbox"/> | 13 Interpreting Line Graphs | 19 |
| <input type="checkbox"/> | 14 Correlation and Causation | 20 |
| <input type="checkbox"/> | 15 Mean, Median, and Mode | 21 |
| <input type="checkbox"/> | 16 What is Standard Deviation? | 23 |
| <input type="checkbox"/> | 17 Reliability of the Mean | 24 |
| <input type="checkbox"/> | 18 Detecting Bias in Samples | 26 |
| <input type="checkbox"/> | 19 Statistical Tests: Which One to Use? | 27 |
| <input type="checkbox"/> | 20 Pearson Correlation Coefficient | 28 |
| <input type="checkbox"/> | 21 Spearman's Rank Correlation | 30 |
| <input type="checkbox"/> | 22 Student's t Test | 31 |
| <input type="checkbox"/> | 23 Chi-squared Test for Goodness of Fit | 32 |
| <input type="checkbox"/> | 24 Did You Get it? | 33 |

Chapter 2: Prokaryotic and Eukaryotic Cells

| | | |
|--------------------------|---|----|
| | <i>Key Skills and Knowledge</i> | 1 |
| <input type="checkbox"/> | 25 The Cell is the Unit of Life | 35 |
| <input type="checkbox"/> | 26 Types of Cells | 36 |
| <input type="checkbox"/> | 27 What Are Cells Made Of? | 37 |
| <input type="checkbox"/> | 28 What Cells Need for Survival | 38 |
| <input type="checkbox"/> | 29 Prokaryotic Cells | 39 |
| <input type="checkbox"/> | 30 Plant Cells | 41 |
| <input type="checkbox"/> | 31 Identifying Structures in a Plant Cell | 42 |
| <input type="checkbox"/> | 32 Animal Cells | 43 |
| <input type="checkbox"/> | 33 Identifying Structures in an Animal Cell | 44 |
| <input type="checkbox"/> | 34 Cell Structures and Organelles | 45 |
| <input type="checkbox"/> | 35 Optical Microscopes | 47 |
| <input type="checkbox"/> | 37 Calculating Linear Magnification | 51 |
| <input type="checkbox"/> | 39 Observing and Recording Using a Microscope | 54 |
| <input type="checkbox"/> | 40 Electron Microscopes | 55 |
| <input type="checkbox"/> | 42 Did You Get it? | 58 |
| <input type="checkbox"/> | 23 Chi-squared Test for Goodness of Fit | 32 |
| <input type="checkbox"/> | 24 Did You Get it? | 33 |

Chapter 3: Cellular Differentiation and Specialisation

| | | |
|--------------------------|---|----|
| | <i>Key Skills and Knowledge</i> | 1 |
| <input type="checkbox"/> | 44 Cellular Differentiation | 62 |
| <input type="checkbox"/> | 45 Stem Cells and Blood Cell Production | 64 |
| <input type="checkbox"/> | 46 Applications of Stem Cells | 65 |
| <input type="checkbox"/> | 47 Bioethical Issues Associated with Stem Cells | 67 |
| <input type="checkbox"/> | 48 The Hierarchy of Life | 69 |
| <input type="checkbox"/> | 49 Exploring Tissues and Organs | 71 |
| <input type="checkbox"/> | 50 Respiratory and Circulatory Systems | 72 |
| <input type="checkbox"/> | 51 Digestive and Circulatory Systems | 74 |
| <input type="checkbox"/> | 52 Circulatory and Excretory Systems | 76 |
| <input type="checkbox"/> | 53 Animals in Medical Research | 78 |
| <input type="checkbox"/> | 54 Did You Get it? | 79 |

Chapter 4: Cell Membrane

| | | |
|--------------------------|--|-----|
| | <i>Key Skills and Knowledge</i> | 1 |
| <input type="checkbox"/> | 55 The Plasma Membrane | 81 |
| <input type="checkbox"/> | 56 Phospholipids and the Properties of Membranes | 82 |
| <input type="checkbox"/> | 57 Proteins of the Plasma Membrane | 83 |
| <input type="checkbox"/> | 58 How Do We Know? Membrane Structure | 85 |
| <input type="checkbox"/> | 59 Cell Membrane Research | 86 |
| <input type="checkbox"/> | 60 Modelling the Plasma Membrane | 87 |
| <input type="checkbox"/> | 61 Diffusion | 89 |
| <input type="checkbox"/> | 62 Diffusion and Cell Size | 92 |
| <input type="checkbox"/> | 63 Comparing Cell Sizes | 93 |
| <input type="checkbox"/> | 64 Investigating the Effect of Cell Size | 94 |
| <input type="checkbox"/> | 65 Overcoming Limitations to Cell Size | 96 |
| <input type="checkbox"/> | 66 Osmosis | 97 |
| <input type="checkbox"/> | 67 Estimating Osmolarity of Cells | 98 |
| <input type="checkbox"/> | 68 Water Relations in Plant Cells | 99 |
| <input type="checkbox"/> | 69 Investigating Membrane Solubility and Diffusion | 100 |
| <input type="checkbox"/> | 70 Active Transport | 101 |
| <input type="checkbox"/> | 71 Ion Pumps and Cotransport | 102 |
| <input type="checkbox"/> | 72 Cytosis | 103 |
| <input type="checkbox"/> | 73 Active and Passive Transport Summary | 105 |
| <input type="checkbox"/> | 74 Did You Get it? | 106 |
| <input type="checkbox"/> | 75 Synoptic Question: Unit 1, Topic 1 | 107 |

Chapter 5: Exchange of Nutrients and Wastes

| | | |
|--------------------------|---|-----|
| | <i>Key Skills and Knowledge</i> | 1 |
| <input type="checkbox"/> | 76 Carbohydrates, Proteins, and Lipids | 110 |
| <input type="checkbox"/> | 77 The Mammalian Circulatory System | 111 |
| <input type="checkbox"/> | 78 Blood Vessels | 112 |
| <input type="checkbox"/> | 79 Capillaries and Capillary Networks | 113 |
| <input type="checkbox"/> | 80 Structure of the Mammalian Heart | 115 |
| <input type="checkbox"/> | 81 The Digestive System | 116 |
| <input type="checkbox"/> | 82 The Stomach and Small Intestine | 117 |
| <input type="checkbox"/> | 83 Digestion, Absorption, and Transport | 120 |
| <input type="checkbox"/> | 84 The Large Intestine | 122 |
| <input type="checkbox"/> | 85 Investigating Amylase Activity | 123 |
| <input type="checkbox"/> | 86 Nitrogenous Wastes in Animals | 125 |
| <input type="checkbox"/> | 87 The Excretory System | 126 |
| <input type="checkbox"/> | 88 Kidney Structure | 127 |
| <input type="checkbox"/> | 89 Nephron Structure and Function | 128 |
| <input type="checkbox"/> | 90 Organ and Tissue Transplantation | 130 |
| <input type="checkbox"/> | 91 Did You Get it? | 131 |

Chapter 6: Internal Membranes and Enzymes

| | | |
|--------------------------|--|-----|
| | <i>Key Skills and Knowledge</i> | 1 |
| <input type="checkbox"/> | 92 Enzymes | 133 |
| <input type="checkbox"/> | 93 Models of Enzyme Activity | 134 |
| <input type="checkbox"/> | 94 How Enzymes Work | 135 |
| <input type="checkbox"/> | 95 Factors Affecting Enzyme Activity | 137 |
| <input type="checkbox"/> | 96 Enzyme Inhibition | 139 |
| <input type="checkbox"/> | 97 Investigating Enzyme Activity | 140 |
| <input type="checkbox"/> | 98 Achieving Metabolic Efficiency | 142 |
| <input type="checkbox"/> | 99 Enzymes and Membranes | 143 |
| <input type="checkbox"/> | 100 Enzymes and Disease | 144 |
| <input type="checkbox"/> | 101 Did You Get it? | 146 |
| <input type="checkbox"/> | 102 Synoptic Question: Unit 1, Topic 2 | 147 |

Chapter 7: Respiration and Mammalian Gas Exchange

| | |
|---|-----|
| <i>Key Skills and Knowledge</i> | 149 |
| <input type="checkbox"/> 103 Metabolism and Life | 150 |
| <input type="checkbox"/> 104 ATP in Cells..... | 151 |
| <input type="checkbox"/> 105 Measuring Respiration..... | 153 |
| <input type="checkbox"/> 106 Cellular Respiration Inputs and Outputs..... | 155 |
| <input type="checkbox"/> 107 Anaerobic Pathways..... | 157 |
| <input type="checkbox"/> 108 Investigating Yeast Fermentation..... | 158 |
| <input type="checkbox"/> 109 Principles of Gas Exchange | 160 |
| <input type="checkbox"/> 110 The Human Gas Exchange System..... | 161 |
| <input type="checkbox"/> 111 The Lungs..... | 162 |
| <input type="checkbox"/> 112 Gas Transport in Humans | 164 |
| <input type="checkbox"/> 113 Did You Get it? | 166 |

Chapter 8: Plant Gas Exchange and Transport Systems

| | |
|---|-----|
| <i>Key Skills and Knowledge</i> | 167 |
| <input type="checkbox"/> 114 Energy Transformations in Cells..... | 168 |
| <input type="checkbox"/> 115 The Role of Photosynthesis..... | 169 |
| <input type="checkbox"/> 116 Chloroplasts | 170 |
| <input type="checkbox"/> 117 Photosynthesis: Inputs and Outputs..... | 171 |
| <input type="checkbox"/> 118 Investigating Photosynthetic Rate | 173 |
| <input type="checkbox"/> 119 Photosynthesis and Productivity | 174 |
| <input type="checkbox"/> 120 The Plant Body..... | 175 |
| <input type="checkbox"/> 121 Xylem | 176 |
| <input type="checkbox"/> 122 Phloem..... | 177 |
| <input type="checkbox"/> 123 Uptake at the Root | 178 |
| <input type="checkbox"/> 124 Transpiration | 179 |
| <input type="checkbox"/> 125 Gas Exchange and Stomata..... | 181 |
| <input type="checkbox"/> 126 Conditions for Photosynthesis | 183 |
| <input type="checkbox"/> 127 Investigating Plant Transpiration..... | 184 |
| <input type="checkbox"/> 128 Translocation..... | 187 |
| <input type="checkbox"/> 129 Plants and Technology | 188 |
| <input type="checkbox"/> 130 Did You Get it? | 189 |
| <input type="checkbox"/> 131 Synoptic Question: Unit 1, Topic 3 | 190 |

Chapter 9: Neural Homeostatic Controls

| | |
|---|-----|
| <i>Key Skills and Knowledge</i> | 192 |
| <input type="checkbox"/> 132 Homeostasis..... | 193 |
| <input type="checkbox"/> 133 Negative feedback | 194 |
| <input type="checkbox"/> 134 Sensory Receptors | 196 |
| <input type="checkbox"/> 136 Neurones | 199 |
| <input type="checkbox"/> 138 Transmission of Nerve Impulses | 202 |
| <input type="checkbox"/> 139 Chemical Synapses | 204 |
| <input type="checkbox"/> 141 Drugs at Synapses..... | 207 |
| <input type="checkbox"/> 142 Did You Get it? | 208 |

Unit 2**Chapter 10: Hormonal Homeostatic Controls**

| | |
|--|-----|
| <i>Key Skills and Knowledge</i> | 209 |
| <input type="checkbox"/> 143 Types of Cell Signalling..... | 210 |
| <input type="checkbox"/> 145 How Hormones Work..... | 213 |
| <input type="checkbox"/> 146 What is Signal Transduction? | 214 |
| <input type="checkbox"/> 147 Types of Signal Transduction | 215 |
| <input type="checkbox"/> 148 Action of Insulin | 217 |
| <input type="checkbox"/> 149 Hormone Regulation by Negative Feedback | 218 |
| <input type="checkbox"/> 151 Did You Get it? | 220 |

Chapter 11: Thermoregulation

| | |
|--|-----|
| <i>Key Skills and Knowledge</i> | 221 |
| <input type="checkbox"/> 152 Mechanisms for Thermoregulation | 222 |
| <input type="checkbox"/> 153 Structural Features for Thermoregulation..... | 223 |
| <input type="checkbox"/> 155 Physiological Mechanisms for Thermoregulation.. | 227 |

| | |
|--|-----|
| <input type="checkbox"/> 156 Hormonal Mechanisms for Thermoregulation..... | 229 |
| <input type="checkbox"/> 157 Modelling Human Thermoregulation..... | 231 |
| <input type="checkbox"/> 158 Did You Get it? | 233 |

Chapter 12: Thermoregulation

| | |
|---|-----|
| <i>Key Skills and Knowledge</i> | 234 |
| <input type="checkbox"/> 159 What is Osmoregulation..... | 235 |
| <input type="checkbox"/> 161 Osmoregulation in Fish..... | 238 |
| <input type="checkbox"/> 162 Managing Fluid Balance on Land | 240 |
| <input type="checkbox"/> 164 Osmoregulation in Plants | 242 |
| <input type="checkbox"/> 165 Investigating Stomatal Density..... | 246 |
| <input type="checkbox"/> 166 Salt Tolerance in Plants..... | 247 |
| <input type="checkbox"/> 167 Did You Get it? | 249 |
| <input type="checkbox"/> 168 Synoptic Question: Unit 2, Topic 1 | 250 |

Chapter 13: Infectious Disease

| | |
|---|-----|
| <i>Key Skills and Knowledge</i> | 254 |
| <input type="checkbox"/> 169 Infection and Disease..... | 253 |
| <input type="checkbox"/> 170 Bacterial Diseases | 256 |
| <input type="checkbox"/> 171 Fungal Diseases | 258 |
| <input type="checkbox"/> 172 Protistan Diseases..... | 259 |
| <input type="checkbox"/> 173 Viral Diseases..... | 261 |
| <input type="checkbox"/> 174 HIV: An Example of a Viral Disease | 262 |
| <input type="checkbox"/> 175 Prions | 264 |
| <input type="checkbox"/> 176 Did You Get it? | 265 |

Chapter 14: Immune Response

| | |
|---|-----|
| <i>Key Skills and Knowledge</i> | 266 |
| <input type="checkbox"/> 177 The Nature of Antigens..... | 267 |
| <input type="checkbox"/> 178 The Body's Defences: An Overview | 269 |
| <input type="checkbox"/> 179 The Innate Immune Response | 270 |
| <input type="checkbox"/> 180 Phagocytes and Phagocytosis..... | 273 |
| <input type="checkbox"/> 181 The Lymphatic System..... | 274 |
| <input type="checkbox"/> 182 Processing Antigens..... | 275 |
| <input type="checkbox"/> 183 The Adaptive Immune Response | 276 |
| <input type="checkbox"/> 184 Clonal Selection | 278 |
| <input type="checkbox"/> 185 Antibodies | 279 |
| <input type="checkbox"/> 186 Acquired Immunity..... | 280 |
| <input type="checkbox"/> 187 Vaccines and Vaccination..... | 282 |
| <input type="checkbox"/> 188 Vaccines Can Eliminate Infectious Disease..... | 284 |
| <input type="checkbox"/> 189 Vaccine Development..... | 285 |
| <input type="checkbox"/> 190 Long Term immune Response Data | 286 |
| <input type="checkbox"/> 191 Physical Defences in Plants | 288 |
| <input type="checkbox"/> 192 Chemical Defences in Plants | 289 |
| <input type="checkbox"/> 193 Did You Get it? | 291 |

Chapter 15: Transmission and Spread of Disease

| | |
|--|-----|
| <i>Key Skills and Knowledge</i> | 266 |
| <input type="checkbox"/> 194 Transmission of Disease | 293 |
| <input type="checkbox"/> 195 Testing Antibiotics..... | 295 |
| <input type="checkbox"/> 196 Patterns of Disease | 297 |
| <input type="checkbox"/> 197 The Effectiveness of Hand Washing..... | 299 |
| <input type="checkbox"/> 198 Modelling Disease Outbreak and Spread..... | 301 |
| <input type="checkbox"/> 199 Predicting Future Patterns of Disease..... | 304 |
| <input type="checkbox"/> 200 Containing The Spread of Disease | 306 |
| <input type="checkbox"/> 201 Biosecurity Measures to Protect Australia | 308 |
| <input type="checkbox"/> 202 The Effectiveness of Health Programs..... | 309 |
| <input type="checkbox"/> 203 Aboriginal Protocols in Medicine..... | 311 |
| <input type="checkbox"/> 204 Did You Get it? | 312 |
| <input type="checkbox"/> 205 Synoptic Question: Unit 2, Topic 2..... | 313 |