Science

AQA GCSE Biology	
1	Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells.
2	Describe the features of bacterial (prokaryotic) cells.
3	Demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, including standard form.
4	Recall the structures found in animal and plant (eukaryotic) cells including algal cells.
5	Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures.
6	*Required practical 1: use a light microscope to observe, draw and label a selection of plant and animal cells.*
7	Describe the functions of the structures in animal and plant (eukaryotic) cells.
8	Describe what a specialised cell is, including examples for plants and animals.
9	Describe what differentiation is, including differences between animals and plants.
10	Define the terms magnification and resolution.
11	Compare electron and light microscopes in terms of their magnification and resolution.
12	Carry out calculations involving magnification using the formula: magnification = size of image/ size of real object including standard form.
13	***Bio ONLY: Describe how bacteria reproduce and the conditions required.***
14	***Bio ONLY: Describe how to prepare an uncontaminated culture.***
15	***Bio ONLY: Calculate cross-sectional areas of colonies or clear areas around colonies using πr^2.***
16	***Bio ONLY: Calculate the number of bacteria in a population after a certain time if given the mean division time.***
17	***Bio & HT ONLY: Express answers for last two points in standard form.***
18	*Required practical 2: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.*
19	Describe how genetic information is stored in the nucleus of a cell (including genes & chromosomes).
20	Describe the processes that happen during the cell cycle, including mitosis (including recognise and describe where mitosis occurs).
21	Describe stem cells, including sources of stem cells in plants and animals and their roles.
22	Describe the use of stem cells in the production of plant clones and therapeutic cloning.
23	Discuss the potential risks, benefits and issues with using stem cells in medical research/treatments (including diabetes and paralysis).
24	Describe the process of diffusion, including examples.
25	Explain how diffusion is affected by different factors.
26	Define and explain "surface area to volume ratio", and how this relates to single-celled and multicellular organisms (including calculations.)
27	Explain how the effectiveness of an exchange surface can be increased, including examples of adaptations for small intestines, lungs, gills roots & leaves.
28	Describe the process of osmosis (including calculation of water uptake & percentage gain and loss of mass of plant tissue).

29	*Required practical 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.*
30	Describe the process of active transport, including examples - gut and roots.
31	Explain the differences between diffusion, osmosis and active transport.
32	Describe the levels of organisation within living organisms.
33	Describe the digestive system and how it works as an organ system (from KS3).
34	Describe basic features of enzymes (including rate calculations for chemical reactions).
35	Describe the lock and key theory as a model of enzyme action and explain how the shape a of the active sites makes the enzyme specific.
36	Explain the effect of temperature and pH on enzymes.
37	Describe the digestive enzymes, including their names, sites of production and actions.
38	Describe how the products of digestion are used.
39	Describe the features and functions of bile and state where it is produced and released from.
40	*Required practical 4: use qualitative reagents to test for a range of carbohydrates, lipids and proteins.*
41	*Required practical 5: investigate the effect of pH on the rate of reaction of amylase enzyme.*
42	Describe the structure of the human heart and lungs (including how lungs are adapted for gaseous exchange).
43	Explain how the heart moves blood around the body (including role and position of the aorta, vena cava, pulmonary artery & vein and coronary arteries).
44	Explain how the natural resting heart rate is controlled and how irregularities can be corrected.
45	Describe the structure and function of arteries, veins and capillaries.
46	Use simple compound measures such as rate and carry out rate calculations for blood flow.
47	Describe blood and identify its different components, including identifying blood cells from photographs/diagrams.
48	Describe the functions of blood components, including adaptations to function.
49	Describe what happens in coronary heart disease and what statins are used for.
50	Describe and evaluate treatments for coronary heart disease and heart failure (including drugs, mechanical devices or transplant).
51	Recall that heart valves can become faulty and describe the consequences of this.
52	Describe how patients can be treated in the case of heart failure.
53	Describe health and the explain causes of ill-health and the relationship between health and disease.
54	Describe how different types of diseases may interact and translate disease incidence information between graphical and numerical forms.
55	Describe what risk factors are and give examples discussing human and financial costs of non-communicable diseases at local, national and global levels.
56	Describe what cancer is and explain the difference between benign and malignant tumours.
57	Describe the known risk factors for cancer, including genetic and lifestyle risk factors.
58	Describe plant tissues (epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem) and describe their functions.

59	Explain how the structure of plant tissues are related to their function within the leaf (plant organ) including stomata and guard cells
60	Recall the plant parts that form a plant organ system that transports substances around the plant.
61	Explain how root hair cells, xylem and phloem are adapted to their functions.
62	Describe the process of transpiration and translocation including the role of the different plant tissues.
63	Explain how the rate of transpiration can be affected by different factors (including naming the factors).
64	Describe the role of stomata and guard cells in the control of gas exchange and water loss.
65	Explain what a pathogen is and how pathogens are spread (including how viruses, bacteria, protists and fungi are spread in animals and plants).
66	Explain how pathogenic bacteria and viruses cause damage in the body.
67	Explain how the spread of diseases can be reduced or prevented.
68	Describe measles, HIV and tobacco mosaic virus as examples of viral pathogens.
69	Describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens.
70	Describe the signs, transmission and treatment of rose black spot infection in plants as an example of fungal pathogens.
71	Describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector as an example of a protists pathogen.
72	Describe defences that stop pathogens entering the human body (including skin, nose, trachea & windpipe, stomach).
73	Recall the role of the immune system.
74	Describe how white blood cells destroy pathogens.
75	Describe how vaccination works, including at the population level.
76	Explain how antibiotics and painkillers are used to treat diseases, including their limitations.
77	Describe how sources for drugs have changed over time and give some examples.
7.	Describe how new drugs are tested, including pre-clinical testing and clinical trials (including double blind trials and placebos).
79	***Bio & HT ONLY: Describe what monoclonal antibodies are and why they are useful.***
80	***Bio & HT ONLY: Describe how monoclonal antibodies are produced.***
81	***Bio & HT ONLY: Explain how monoclonal antibodies are used for diagnosis, research, chemical testing and disease treatments.***
82	***Bio & HT ONLY: Evaluate the advantages and disadvantages of monoclonal antibodies (including side effects).***
83	***Bio & HT ONLY: Describe some observable signs of plant disease, and how plant diseases can be identified.***
84	*Bio ONLY: Give examples of plant pathogens.*
85	*Bio ONLY: Give examples of plant ion deficiencies and their effects.*
86	*Bio ONLY: Describe physical, chemical and mechanical defence responses of plants.*

AQA GCSE Chemistry	
87	State that everything is made of atoms and recall what they are.

88	Describe what elements and compounds are.
89	State that elements and compounds are represented by symbols; and use chemical symbols and formulae to represent elements and compounds.
90	Write word equations and balanced symbol equations for chemical reactions, including using appropriate state symbols.
91	***HT ONLY: Write balanced half equations and ionic equations.***
92	Describe what a mixture is.
93	Name and describe the physical processes used to separate mixtures and suggest suitable separation techniques.
94	Describe how the atomic model has changed over time due to new experimental evidence, including discovery of the atom and scattering experiments (including the work of James Chadwick).
95	Describe the difference between the plum pudding model of the atom and the nuclear model of the atom.
96	State the relative charge of protons, neutrons and electrons and describe the overall charge of an atom.
97	State the relative masses of protons, neutrons and electrons and describe the distribution of mass in an atom.
98	Calculate the number of protons, neutrons and electrons in an atom when given its atomic number and mass number.
99	Describe isotopes as atoms of the same element with different numbers of neutrons.
100	Define the term ‘relative atomic mass’ and why it takes into account the abundance of isotopes of the element.
101	Calculate the relative atomic mass of an element given the percentage abundance of its isotopes.
102	Describe how electrons fill energy levels in atoms, and represent the electron structure of elements using diagrams and numbers.
103	Recall how the elements in the periodic table are arranged.
104	Describe how elements with similar properties are placed in the periodic table.
105	Explain why elements in the same group have similar properties and how to use the periodic table to predict the reactivity of elements.
106	Describe the early attempts to classify elements.
107	Explain the creation and attributes of Mendeleev's periodic table.
108	Identify metals and non-metals on the periodic table, compare and contrast their properties.
109	Explain how the atomic structure of metals and non-metals relates to their position in the periodic table.
110	Describe noble gases (group 0) and explain their lack of reactivity.
111	Describe the properties of noble gases, including boiling points, predict trends down the group and describe how their properties depend on the outer shell of electrons.
112	Describe the reactivity and properties of group 1 alkali metals with reference to their electron arrangement and predict their reactions.
113	Describe the properties of group 7 halogens, and how their properties relate to their electron arrangement, including trends in molecular mass, melting and boiling points and reactivity.
114	Describe the reactions of group 7 halogens with metals and non-metals.

115	***Chem ONLY: Describe the properties of transition metals and compare them with group 1 elements, including melting points and densities, strength and hardness, and reactivity (for CR, Mn Fe, Co, Ni & Cu).***
116	Describe the three main types of bonds: ionic bonds, covalent bonds and metallic bonds in terms of electrostatic forces and the transfer or sharing of electrons.
117	Describe how the ions produced by elements in some groups have the electronic structure of a noble gas and explain how the charge of an ion relates to its group number.
118	Describe the structure of ionic compounds, including the electrostatic forces of attraction, and represent ionic compounds using dot and cross diagrams.
119	Describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent a giant ionic structure.
120	Work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure.
121	Describe covalent bonds and identify different types of covalently bonded substances, such as small molecules, large molecules and substances with giant covalent structures.
122	Represent covalent bonds between small molecules, repeating units of polymers and parts of giant covalent structures using diagrams.
123	Draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane.
124	Deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule.
125	Describe the arrangement of atoms and electrons in metallic bonds and draw diagrams of the bonding in metals.

AQA GCSE Physics	
126	Name the three states of matter; identify them from a simple model and state which changes of state happen at melting and boiling points.
127	Explain changes of state using particle theory and describe factors that affect the melting and boiling point of a substance.
128	***HT ONLY: Discuss the limitations of particle theory.***
129	Recall what (s), (l), (g) and (aq) mean when used in chemical equations and be able to use them appropriately.
130	Explain how the structure of ionic compounds affects their properties, including melting and boiling points and conduction of electricity (sodium chloride structure only).
131	Explain how the structure of small molecules affects their properties.
132	Explain how the structure of polymers affects their properties.
133	Explain how the structure of giant covalent structures affects their properties.
134	Explain how the structure of metals and alloys affects their properties, including explaining why they are good conductors.
135	Explain why alloys are harder than pure metals in terms of the layers of atoms.
136	Explain the properties of graphite, diamond and graphene in terms of their structure and bonding.
137	Describe the structure of fullerenes, and their uses, including Buckminsterfullerene and carbon nanotubes.
138	***Chem ONLY: Compare the dimensions of nanoparticles to other particles and explain the effect of their surface area to volume ratio on their properties.***

139	***Chem ONLY: Discuss the applications of nanoparticles and their advantages and disadvantages, including uses in medicine, cosmetics, fabrics and the development of catalysts.***
140	Define a system as an object or group of objects and state examples of changes in the way energy is stored in a system.
141	Describe how all the energy changes involved in an energy transfer and calculate relative changes in energy when the heat, work done or flow of charge in a system changes.
142	Use calculations to show on a common scale how energy in a system is redistributed.
143	Calculate the kinetic energy of an object by recalling and applying the equation: ***[E_k = ½mv^2].***
144	Calculate the amount of elastic potential energy stored in a stretched spring by applying, but not recalling, the equation: ***[E_e= ½ke^2].***
145	Calculate the amount of gravitational potential energy gained by an object raised above ground level by recalling and applying, the equation: ***[E_e = mgh].***
146	Calculate the amount of energy stored in or released from a system as its temperature changes by applying, but not recalling, the equation: ***[ΔE = mcΔθ].***
147	Define the term 'specific heat capacity'.
148	***Required practical 1: investigation to determine the specific heat capacity of one or more materials.***
149	Define power as the rate at which energy is transferred or the rate at which work is done and the watt as an energy transfer of 1 joule per second.
150	Calculate power by recalling and applying the ***equations: [P = E/t & P = W/t].***
151	Explain, using examples, how two systems transferring the same amount of energy can differ in power output due to the time taken.
152	State that energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed and so the total energy in a system does not change.
153	Explain that only some of the energy in a system is usefully transferred, with the rest 'wasted', giving examples of how this wasted energy can be reduced.
154	Explain ways of reducing unwanted energy transfers and the relationship between thermal conductivity and energy transferred.
155	Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.
156	***Required practical 2: investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material.***
157	Calculate efficiency by recalling and applying the equation: ***[efficiency = useful power output / total power input].***
158	**HT ONLY: Suggest and explain ways to increase the efficiency of an intended energy transfer.**
159	List the main renewable and non-renewable energy resources and define what a renewable energy resource is.
160	Compare ways that different energy resources are used, including uses in transport, electricity generation and heating.
161	Explain why some energy resources are more reliable than others, explaining patterns and trends in their use.
162	Evaluate the use of different energy resources, taking into account any ethical and environmental issues which may arise.

163	Justify the use of energy resources, with reference to both environmental issues and the limitations imposed by political, social, ethical or economic considerations.
164	Calculate the density of a material by recalling and applying the equation: [ρ = m/V].
165	Recognise/draw simple diagrams to model the difference between solids, liquids and gases.
166	Use the particle model to explain the properties of different states of matter and differences in the density of materials.
167	***Required practical 5: use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids.***
168	Recall and describe the names of the processes by which substances change state
169	Use the particle model to explain why a change of state is reversible and affects the properties of a substance, but not its mass.
170	State that the internal energy of a system is stored in the atoms and molecules that make up the system.
171	Explain that internal energy is the total kinetic energy and potential energy of all the particles in a system.
172	Calculate the change in thermal energy by applying but not recalling the equation ***[$\Delta E = m\ c\ \Delta\theta$].***
173	Calculate the specific latent heat of fusion/vaporisation by applying, but not recalling, the equation: ***[E = mL].***
174	Interpret and draw heating and cooling graphs that include changes of state.
175	Distinguish between specific heat capacity and specific latent heat.
176	Explain why the molecules of a gas are in constant random motion and that the higher the temperature of a gas, the greater the particles' average kinetic energy.
177	Explain, with reference to the particle model, the effect of changing the temperature of a gas held at constant volume on its pressure.
178	Calculate the change in the pressure of a gas or the volume of a gas (a fixed mass held at constant temperature) when either the pressure or volume is increased or decreased.
177	***PHY ONLY: Explain, with reference to the particle model, how increasing the volume in which a gas is contained can lead to a decrease in pressure when the temperature is constant.***
180	***PHY ONLY: Calculate the pressure for a fixed mass of gas held at a constant temperature by applying, but not recalling, the equation: [pV = constant].***
181	***PHY & HT ONLY: Explain how work done on an enclosed gas can lead to an increase in the temperature of the gas, as in a bicycle pump.***
182	Describe the basic structure of an atom and how the distance of the charged particles vary with the absorption or emission of electromagnetic radiation.
183	Define electrons, neutrons, protons, isotopes and ions.
184	Relate differences between isotopes to differences in conventional representations of their identities, charges and masses.
185	Describe how the atomic model has changed over time due to new experimental evidence, including the discovery of the atom and scattering experiments (including the work of James Chadwick).
186	Describe and apply the idea that the activity of a radioactive source is the rate at which its unstable nuclei decay, measured in Becquerel (Bq) by a Geiger-Muller tube.

187	Describe the penetration through materials, the range in air and the ionising power for alpha particles, beta particles and gamma rays.
188	Apply knowledge of the uses of radiation to evaluate the best sources of radiation to use in a given situation.
189	Use the names and symbols of common nuclei and particles to complete balanced nuclear equations, by balancing the atomic numbers and mass numbers.
190	Define half-life of a radioactive isotope.
191	***HT ONLY: Determine the half-life of a radioactive isotope from given information and calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives.***
192	Compare the hazards associated with contamination and irradiation and outline suitable precautions taken to protect against any hazard the radioactive sources may present.
193	Discuss the importance of publishing the findings of studies into the effects of radiation on humans and sharing findings with other scientists so that they can be checked by peer review.
194	***PHY ONLY: State, giving examples, that background radiation is caused by natural and man-made sources and that the level of radiation may be affected by occupation and/or location.***
195	***PHY ONLY: Explain the relationship between the instability and half-life of radioactive isotopes and why the hazards associated with radioactive material differ according to the half-life involved.***
196	***PHY ONLY: Describe and evaluate the uses of nuclear radiation in exploration of internal organs and controlling or destroying unwanted tissue.***
197	***PHY ONLY: Evaluate the perceived risks of using nuclear radiation in relation to given data and consequences.***
198	***PHY ONLY: Describe nuclear fission.***
199	***PHY ONLY: Draw/interpret diagrams representing nuclear fission and how a chain reaction may occur.***
200	***PHY ONLY: Describe nuclear fusion.***