Year 9 Revision List

Biology

BBL5: Inheritance

1. The genome is the entire DNA of an organism.
2. A chromosome is a very long molecule of DNA.
3. A gene is a region of a genome used by cells as instructions for making proteins.
4. Watson, Crick, Wilkins and Franklin were the scientists responsible for formulating the model of the structure of DNA.
5. Genetic information is passed down from parents to offspring.
6. Offspring or normally similar, but not identical, to their parents.
7. Variation is the differences between organisms of the same species.
8. Discontinuous variation is types of variation that will fall into different categories (E.g. Blood group or flower colour).
9. Continuous variation is types of variation where there is a range from one extreme to another (E.g. Length of a tail, width of a leaf)
10. Some variation can lead to organisms having traits that help them survive.
11. Natural selection is the process by which advantageous traits make an organism more likely to survive.
12. Evolution by natural selection is the gradual change of a population over generations.
13. If a species does not adapt when their environment changes, they may not survive and become endangered, or extinct.
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BBL6: Cells to systems (GCSE)

1. Plant and animal cells (eukaryotic cells) have a cell membrane, cytoplasm and genetic material enclosed in a nucleus.
2. Bacterial cells (prokaryotic cells) are much smaller in comparison. They have cytoplasm and a cell membrane surrounded by a cell wall. The genetic material is not enclosed in a nucleus. It is a single DNA loop and there may be one or more small rings of DNA called plasmids.
3. Pupils should be able to demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, including the use of standard form.
4. Explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, chloroplasts in plant cells and plasmids in bacterial cells are related to their functions.
5. Most animal cells have the following parts: a nucleus, cytoplasm, a cell membrane, mitochondria, ribosomes.
6. In addition to the parts found in animal cells, plant cells often have: chloroplasts, a permanent vacuole filled with cell sap.
7. Plant and algal cells also have a cell wall made of cellulose, which strengthens the cell.
8. Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures.
9. Explain how the structure of different types of cell relate to their function in a tissue, an organ or organ system, or the whole organism.
10. Cells may be specialised to carry out a particular function:
    - sperm cells, nerve cells and muscle cells in animals
    - root hair cells, xylem and phloem cells in plants.
11. Explain the importance of cell differentiation.
12. As an organism develops, cells differentiate to form different types of cells.

13. Most types of animal cell differentiate at an early stage.
14. Many types of plant cells retain the ability to differentiate throughout life.
15. In mature animals, cell division is mainly restricted to repair and replacement. As a cell differentiates it acquires different sub-cellular structures to enable it to carry out a certain function. It has become a specialised cell.
16. Understand how microscopy techniques have developed over time
17. Explain how electron microscopy has increased understanding of sub-cellular structures. Limited to the differences in magnification and resolution.
18. An electron microscope has much higher magnification and resolving power than a light microscope. This means that it can be used to study cells in much finer detail. This has enabled biologists to see and understand many more sub-cellular structures.
19. Carry out calculations involving magnification, real size and image size using the formula:
20. A stem cell is an undifferentiated cell of an organism which is capable of giving rise to many more cells of the same type, and from which certain other cells can arise from differentiation.
21. Describe the function of stem cells in embryos, in adult animals and in the meristems in plants.
22. Stem cells from human embryos can be cloned and made to differentiate into most different types of human cells.
23. Stem cells from adult bone marrow can form many types of cells including blood cells.
24. Meristem tissue in plants can differentiate into any type of plant cell, throughout the life of the plant.
25. Knowledge and understanding of stem cell techniques are not required.
26. Treatment with stem cells may be able to help conditions such as diabetes and paralysis.
27. In therapeutic cloning an embryo is produced with the same genes as the patient.
28. Stem cells from the embryo are not rejected by the patient's body so they may be used for medical treatment.
29. The use of stem cells has potential risks such as transfer of viral infection, and some people have ethical or religious objections.
30. Stem cells from meristems in plants can be used to produce clones of plants quickly and economically.
31. Rare species can be cloned to protect from extinction.
32. Crop plants with special features such as disease resistance can be cloned to produce large numbers of identical plants for farmers. Cells are the basic building blocks of all living organisms.
33. A tissue is a group of cells with a similar structure and function.
34. Organs are aggregations of tissues performing specific functions.
35. Organs are organised into organ systems, which work together to form organisms.
36. The structure and functioning of the human heart and lungs, including how lungs are adapted for gaseous exchange.
37. The heart is an organ that pumps blood around the body in a double circulatory system. The right ventricle pumps blood to the lungs where gas exchange takes place. The left ventricle pumps blood around the rest of the body.
38. Knowledge of the blood vessels associated with the heart is limited to the aorta, vena cava, pulmonary artery, pulmonary vein and coronary arteries. Knowledge of the names of the heart valves is not required.
39. Knowledge of the lungs is restricted to the trachea, bronchi, alveoli and the capillary network surrounding the alveoli.
40. The natural resting heart rate is controlled by a group of cells located in the right atrium that act as a pacemaker. Artificial pacemakers are electrical devices used to correct irregularities in the heart rate.
41. The body contains three different types of blood vessel: arteries, veins, capillaries.
42. Explain how the structure of these vessels relates to their functions.
43. Use simple compound measures such as rate and carry out rate calculations for blood flow.
44. Evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs, mechanical devices or transplant.
45. Blood is a tissue containing plasma, in which red blood cells, white blood cells and platelets are suspended.
46. The function of each of these blood components.

47. Recognise different types of blood cells in a photograph or diagram and explain how they are adapted for their function.
48. In coronary heart disease layers of fatty material build up inside the coronary arteries, narrowing them. This reduces the flow of blood through the coronary arteries, resulting in a lack of oxygen for the heart muscle. Stents are used to keep the coronary arteries open. Statins are widely used to reduce blood cholesterol levels which slows down the rate of fatty material deposit.
49. In some people heart valves may become faulty, preventing the valve from opening fully, or the heart valve might develop a leak. Pupils should understand the consequences of faulty valves. Faulty heart valves can be replaced using biological or mechanical valves.
50. In the case of heart failure, a donor heart, or heart and lungs can be transplanted. Artificial hearts are occasionally used to keep patients alive whilst waiting for a heart transplant, or to allow the heart to rest as an aid to recovery.
51. Describe the relationship between health and disease and the interactions between different types of disease.
52. Health is the state of physical and mental well-being.
53. Diseases, both communicable and non-communicable, are major causes of ill health. Other factors including diet, stress and life situations may have a profound effect on both physical and mental health.
54. Different types of disease may interact.
55. Defects in the immune system mean that an individual is more likely to suffer from infectious diseases.
56. Viruses living in cells can be the trigger for cancers.
57. Immune reactions initially caused by a pathogen can trigger allergies such as skin rashes and asthma.
58. Severe physical ill health can lead to depression and other mental illness.
59. Translate disease incidence information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables.
60. Discuss the human and financial cost of these non-communicable diseases to an individual, a local community, a nation or globally.
61. Explain the effect of lifestyle factors including diet, alcohol and smoking on the incidence of non-communicable diseases at local, national and global levels.
62. Risk factors are linked to an increased rate of a disease. They can be aspects of a person's lifestyle, substances in the person's body or environment.
63. A causal mechanism has been proven for some risk factors, but not in others.

- The effects of diet, smoking and exercise on cardiovascular disease.
- Obesity as a risk factor for Type 2 diabetes.
- The effect of alcohol on the liver and brain function.
- The effect of smoking on lung disease and lung cancer.
- The effects of smoking and alcohol on unborn babies.
- Carcinogens, including ionising radiation, as risk factors in cancer.
- Many diseases are caused by the interaction of a number of factors.

IOL13: Interdependence

1. Interdependence refers to how organisms interact with each other and the environment in which they live.
2. A population refers to organisms of the same type living in the same place.
3. A species is a group of similar organisms that can reproduce to make fertile offspring
4. A community refers to populations of organisms living and interacting in the same place.
5. An ecosystem is made up of a biological community and the physical environment in which a community lives.
6. Producers make their own food.
7. All consumers depend on producers for food.
8. An arrow in a food chain/food web depicts the flow of biomass through the chain/web.
9. Decomposers break down dead organic matter.

10. Producers often depend on consumers to spread their pollen and seeds.
11. Food security means having enough affordable and nutritious food in an area or country.
12. Bioaccumulation is the build-up of toxins within a food chain, causing harm to organisms at the top of the chain.

Chemistry

BOM10: Atoms and the periodic table (GCSE)

1. All substances are made of atoms. An atom is the smallest part of an element that can exist.
2. Atoms of each element are represented by a chemical symbol, e.g. O represents an atom of oxygen, Na represents an atom of sodium.
3. There are about 100 different elements. Elements are shown in the periodic table.
4. Compounds are formed from elements by chemical reactions.
5. Chemical reactions always involve the formation of one or more new substances and often involve a detectable energy change.
6. Compounds contain two or more elements chemically combined in fixed proportions and can be represented by formulae using the symbols of the atoms from which they were formed.
7. Compounds can only be separated into elements by chemical reactions.
8. Chemical reactions can be represented by word equations or equations using symbols and formulae.
9. Use the names and symbols of the first 20 elements in the periodic table, the elements in Groups 1 and 7, and other elements in this specification.
10. Name compounds of these elements from given formulae or symbol equations
11. Write word equations for the reactions in this specification
12. Write formulae and balanced chemical equations for the reactions in this specification.
13. New experimental evidence may lead to a scientific model being changed or replaced.
14. Before the discovery of the electron, atoms were thought to be tiny spheres that could not be divided.
15. The discovery of the electron led to the plum pudding model of the atom. The plum pudding model suggested that the atom is a ball of positive charge with negative electrons embedded in it.
16. The results from the alpha particle scattering experiment led to the conclusion that the mass of an atom was concentrated at the centre (nucleus) and that the nucleus was charged. This nuclear model replaced the plum pudding model.
17. Niels Bohr adapted the nuclear model by suggesting that electrons orbit the nucleus at specific distances. The theoretical calculations of Bohr agreed with experimental observations.
18. Later experiments led to the idea that the positive charge of any nucleus could be subdivided into a whole number of smaller particles, each particle having the same amount of positive charge. The name proton was given to these particles.
19. The experimental work of James Chadwick provided the evidence to show the existence of neutrons within the nucleus. This was about 20 years after the nucleus became an accepted scientific idea.
20. Why the new evidence from the scattering experiment led to a change in the atomic model
21. The difference between the plum pudding model of the atom and the nuclear model of the atom.
22. The relative electrical charges of the particles in atoms are:

Name of particle	Relative charge
Proton	+1
Neutron	0
Electron	–1

23. In an atom, the number of electrons is equal to the number of protons in the nucleus. Atoms have no overall electrical charge.
24. The basic structure of an atom is a positively charged nucleus composed of both protons and neutrons surrounded by negatively charged electrons.
25. The number of protons in an atom of an element is its atomic number. All atoms of a particular element have the same number of protons. Atoms of different elements have different numbers of protons.
26. Use the nuclear model to describe atoms.
27. Atoms are very small, having a radius of about 0.1 nm (1×10^{-10} m).

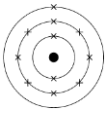
28. The radius of a nucleus is less than 1/10 000 of that of the atom (about 1×10^{-14} m).
29. Atoms are very small, having a radius of about 1×10^{-10} metres. (Physics spec only)
30. Almost all of the mass of an atom is in the nucleus.
31. The relative masses of protons, neutrons and electrons are:

Name of particle	Relative mass
Proton	1
Neutron	1
Electron	Very small

32. The sum of the protons and neutrons in an atom is its mass number.
33. Atoms of the same element can have different numbers of neutrons; these atoms are called isotopes of that element.
34. Atoms can be represented as shown in this example:

(Mass number) 23
(Atomic number) 11 Na

35. Calculate the numbers of protons, neutrons and electrons in an atom or ion, given its atomic number and mass number.
36. Relate size and scale of atoms to objects in the physical world.
37. The relative atomic mass of an element is an average value that takes account of the abundance of the isotopes of the element.
38. Calculate the relative atomic mass of an element given the percentage abundance of its isotopes.
39. The electrons in an atom occupy the lowest available energy levels (innermost available shells). The electronic structure of an atom can be represented by numbers or by a diagram. For example, the electronic structure of sodium is 2,8,1 or showing two electrons in the lowest energy level, eight in the second energy level and one in the third energy level.

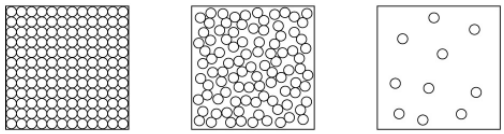


40. Answer questions in terms of either energy levels or shells.
41. The electrons are arranged at different distances from the nucleus (different energy levels). The electron arrangements may change with the absorption of electromagnetic radiation (move further from the nucleus; a higher energy level) or by the emission of electromagnetic radiation (move closer to the nucleus; a lower energy level). (Physics spec only)
42. The elements in the periodic table are arranged in order of atomic (proton) number and so that elements with similar properties are in columns, known as groups. The table is called a periodic table because similar properties occur at regular intervals.
43. Elements in the same group in the periodic table have the same number of electrons in their outer shell (outer electrons) and this gives them similar chemical properties.
44. Explain how the position of an element in the periodic table is related to the arrangement of electrons in its atoms and hence to its atomic number
45. Predict possible reactions and probable reactivity of elements from their positions in the periodic table.
46. Before the discovery of protons, neutrons and electrons, scientists attempted to classify the elements by arranging them in order of their atomic weights.
47. The early periodic tables were incomplete, and some elements were placed in inappropriate groups if the strict order of atomic weights was followed.
48. Mendeleev overcame some of the problems by leaving gaps for elements that he thought had not been discovered and, in some places, changed the order based on atomic weights.
49. Elements with properties predicted by Mendeleev were discovered and filled the gaps. Knowledge of isotopes made it possible to explain why the order based on atomic weights was not always correct.
50. Describe these steps in the development of the periodic table.
51. Elements that react to form positive ions are metals.
52. Elements that do not form positive ions are non-metals.
53. Atoms turn into positive ions if they lose one or more outer electron(s). (Physics spec only)

54. The majority of elements are metals. Metals are found to the left and towards the bottom of the periodic table. Non-metals are found towards the right and top of the periodic table.
55. Explain the differences between metals and non-metals on the basis of their characteristic physical and chemical properties. This links to Group 0 (page 24), Group 1 (page 24), Group 7 (page 25) and Bonding, structure and the properties of matter (page 26)
56. Explain how the atomic structure of metals and non-metals relates to their position in the periodic table
57. Explain how the reactions of elements are related to the arrangement of electrons in their atoms and hence to their atomic number.
58. The elements in Group 0 of the periodic table are called the noble gases. They are unreactive and do not easily form molecules because their atoms have stable arrangements of electrons. The noble gases have eight electrons in their outer shell, except for helium, which has only two electrons.
59. The boiling points of the noble gases increase with increasing relative atomic mass (going down the group).
60. Explain how properties of the elements in Group 0 depend on the outer shell of electrons of the atoms
61. Predict properties from given trends down the group.
62. The elements in Group 1 of the periodic table are known as the alkali metals and have characteristic properties because of the single electron in their outer shell.
63. Describe the reactions of the first three alkali metals with oxygen, chlorine and water.
64. In Group 1, the reactivity of the elements increases going down the group.
65. Explain how properties of the elements in Group 1 depend on the outer shell of electrons of the atoms
66. Predict properties from given trends down the group.
67. The elements in Group 7 of the periodic table are known as the halogens and have similar reactions because they all have seven electrons in their outer shell. The halogens are non-metals and consist of molecules made of pairs of atoms.
68. Describe the nature of the compounds formed when chlorine, bromine and iodine react with metals and non-metals.
69. In Group 7, the further down the group an element is the higher its relative molecular mass, melting point and boiling point.
70. In Group 7, the reactivity of the element's decreases going down the group.
71. A more reactive halogen can displace a less reactive halogen from an aqueous solution of its salt.
72. Explain how properties of the elements in Group 7 depend on the outer shell of electrons of the atoms
73. Predict properties from given trends down the group.

BOM11: Energy and the particle model (GCSE)

1. The three states of matter are solid, liquid and gas. Melting and freezing take place at the melting point, boiling and condensing take place at the boiling point.
2. The three states of matter can be represented by a simple model. In this model, particles are represented by small solid spheres. Particle theory can help to explain melting, boiling, freezing and condensing.



3. The amount of energy needed to change state from solid to liquid and from liquid to gas depends on the strength of the forces between the particles of the substance. The nature of the particles involved depends on the type of bonding and the structure of the substance. The stronger the forces between the particles the higher the melting point and boiling point of the substance.
4. (HT only) Limitations of the simple model above include that in the model there are no forces, that all particles are represented as spheres and that the spheres are solid.
5. Predict the states of substances at different temperatures given appropriate data
6. Explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding

7. Recognise that atoms themselves do not have the bulk properties of materials
8. (HT only) explain the limitations of the particle theory in relation to changes of state when particles are represented by solid inelastic spheres which have no forces between them.
9. In chemical equations, the three states of matter are shown as (s), (l) and (g), with (aq) for aqueous solutions.
10. Include appropriate state symbols in chemical equations for the reactions in this specification.
11. Describe how, when substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved.
12. Changes of state are physical changes which differ from chemical changes because the material recovers its original properties if the change is reversed.
13. The particle model can be used to explain: the different states of matter; differences in density.
14. Recognise/draw simple diagrams to model the difference between solids, liquids and gases.
15. Explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules.
16. Energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy.
17. Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.
18. Heating changes the energy stored within the system by increasing the energy of the particles that make up the system. This either raises the temperature of the system or produces a change of state.
19. If the temperature of the system increases, the increase in temperature depends on the mass of the substance heated, the type of material and the energy input to the system.
20. The specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.
21. If a change of state happens the energy needed for a substance to change state is called latent heat. When a change of state occurs, the energy supplied changes the energy stored (internal energy) but not the temperature.
22. If a change of state happens the specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance with no change in temperature.
23. Specific latent heat of fusion – change of state from solid to liquid
24. Specific latent heat of vaporisation – change of state from liquid to vapour
25. Interpret heating and cooling graphs that include changes of state.
26. Distinguish between specific heat capacity and specific latent heat.
27. The molecules of a gas are in constant random motion. The temperature of the gas is related to the average kinetic energy of the molecules.
28. Changing the temperature of a gas, held at constant volume, changes the pressure exerted by the gas.
29. Explain how the motion of the molecules in a gas is related to both its temperature and its pressure
30. Explain qualitatively the relation between the temperature of a gas and its pressure at constant volume.

CR5: The reactivity series of metals

1. The reactivity series ranks metals by their reactivity with substances.
2. Group 1 elements are examples of the most reactive elements.
3. Gold, silver and copper are examples of less reactive elements.
4. Due to carbons position in the reactivity series, it can be used to extract iron and copper from their oxides.
5. Ceramics are hard, brittle, and heat-resistant, but they don't conduct electricity.
6. Polymers are lightweight, can be flexible or rigid, and are good insulators.
7. Composites combine materials to be stronger and lighter, designed for specific uses.
8. Catalysts speed up reactions without being used up.

Physics

OEOO8: Magnetism

1. A magnetic field is the area around a magnet in which another magnet experiences a force.
2. A magnetic field flows from north to south; this is represented using field lines.
3. The Earth has a magnetic field.
4. A compass will move to align its poles with the magnetic field of the Earth.
5. Magnets can be permanent or temporary.
6. A wire that is carrying an electric current has a magnetic field.
7. An electromagnet is made from a copper coil wrapped around an iron core.
8. An electromagnet is only magnetic when current is flowing.
9. Increasing the current increases the strength of the magnet.
10. Direct current is current that moving in one direction only.
11. A wire with flowing current will experience a force in a magnetic field; this is the motor effect.

OEOO9: Gas pressure

1. Atmospheric pressure is 100 000 Pascals (Pa) or N/m^2 at sea level.
2. Pressure is dependent on depth within a fluid.
3. If upthrust is greater or equal to the weight of a substance, the substance will float.
4. Substances will float on fluids if they have a lower density.
5. Pressure is exactly the same at any point of the same depth.
6. All objects moving through a fluid will experience drag.
7. Drag caused when objects fall through air is called air resistance.
8. An object can be made more streamline to decrease drag.

OEOO10: Static electricity

1. Atoms have positive and negative charges.
2. The negative charge of an atom is called an electron
3. Friction between two insulating materials causes the electrons to be transferred.
4. When electrons are transferred, they build up in one place.
5. Electrostatic charge occurs because electrons are not free to move around an insulator.
6. If the electrons are transferred onto an insulating material that material becomes negatively charged
7. The insulating material which gains the electrons becomes negatively charged
8. Objects with electrostatic charge can exert a non-contact force known as the electrostatic force
9. Oppositely charged materials attract each other
10. Objects with the same charge repel each other
11. When electrostatic charge builds up charge will jump across the gap and cause a spark, known as a static shock

BOE14: Light

1. Luminous objects emit light
2. In a vacuum light travel at 300 000 000 m/s
3. Light waves do not require a medium, will propagate in a vacuum
4. Plane mirrors are examples of specular reflection
5. Normal lines are drawn perpendicular to the surface of a boundary.
6. On plane mirrors (I=R) as a principle
7. Refraction happens at the boundary between mediums
8. I=e (refraction) as a principle
9. White light can be dispersed by a prism (due to the different wavelengths of the component colours).
10. Red coloured objects are red as they reflect red light (relationship extended to all the colours)
11. Diffuse reflection (scattering) happens when light hits a rough surface.
12. The Human eye contains a convex (transparent) lens.
13. Convex lenses focus beams of light.
14. Photo sensitive materials can detect light
15. The retina is an example of a photo sensitive material

BE5: Life on earth

1. Day and night are caused by the Earth's rotation on its axis every 24 hours.
2. The Earth's axis is tilted at 23.5 degrees, which affects the length of days and seasons.
3. The angle of the Sun's rays affects the intensity of heat on Earth's surface.
4. It is summer when the hemisphere is tilted towards the Sun, experiencing longer days and more direct sunlight.
5. It is winter when the hemisphere is tilted away from the Sun, experiencing shorter days and less direct sunlight.