Biology – Cell biology

1. What type of cells are plant and animal cells?
   Eukaryotic
2. What type of cells are bacterial cells?
   Prokaryotic
3. Name five sub cellular structures found in animal cells.
   Nucleus, cytoplasm, cell membrane, mitochondria, ribosomes
4. Plant cells have all the sub-cellular structures that animal cells have, but they often have two additional structures as well. Name them.
   Chloroplasts and vacuole (also cell wall)
5. What is the name of microscopes that have a higher magnification and resolving power than light microscopes?
   Electron microscopes
6. What is the calculation for magnification?
   Magnification $= \frac{\text{size of image}}{\text{size of real object}}$
7. Why is cell division by mitosis important?
   Growth and repair in eukaryotes
8. What is the name given to an undifferentiated cell of an organism which is capable of giving rise to many more cells of the same type?
   Stem cell
9. State three places stem cells are found.
   Embryos, adult bone marrow & meristem tissue in plants
10. Describe the spreading out of particles of any substance in solution or a gas by diffusion.
    There is a net movement of particles from an area of high concentration to an area of low concentration.
11. Name three substances that either diffuse into or out of the blood.
    Oxygen, carbon dioxide and urea
12. Describe the movement of water in osmosis.
    Osmosis is the diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane
13. What is the name given to the movement of a substance from a more dilute solution to a more concentrated solution which requires energy from respiration?
    Active transport

Biology - Organisation

14. What name is given to a group of cells with a similar structure and function?
    Tissue
15. What name is given to an aggregation of tissues performing specific functions?
    Organ
16. What feature of enzymes enables them to catalyse specific reactions in living organisms?
    The shape of their active site
17. Where is amylase produced and what does it do?
    In saliva and the pancreas to break down starch
18. Where are proteases produced and what do they do?
    In the stomach and pancreas to break down proteins into amino acids
19. Where are lipases produced and what do they do?
    In the pancreas to break down lipids to glycerol and fatty acids
20. What is made in the liver and stored in the gall bladder?
    Bile
21. Where does the right ventricle pump blood to?
    The lungs
22. Where does the left ventricle pump blood to?
    The whole body
23. Where are the aorta, vena cava, pulmonary artery, pulmonary vein and coronary arteries found?
    Connected to the heart
24. Name the three types of blood vessel.
    Arteries, veins and capillaries
25. What is the blood made up of?
    Plasma, RBCs, WBCs and platelets
26. What is the state of physical and mental well-being?
    Health
27. State four causes of ill health.
    Diseases, diet, stress and life situations
28. State a proven risk factor for type 2 diabetes.
    Obesity
29. State three risk factors for cardiovascular disease.
    Diet, smoking and exercise
30. What is the result of changes in cells that lead to uncontrolled growth and division?
    Cancer
31. State four factors that affect the rate of transpiration.
    Temperature, humidity, air movement and light intensity
32. Which cells are adapted for efficient uptake of water by osmosis, and mineral ions by active transport?
    Root hair cells
33. What does xylem tissue transport?

Water

34. What do stomata and guard cells control in leaves?
    Gas exchange and water loss
35. What does phloem tissue transport?
    Dissolved sugars (food)
36. What is the movement of food molecules through phloem tissue called?
    Translocation

Biology – Infection and response

37. What is a pathogen?
    A microorganism that causes infectious disease
38. Which serious disease is spread by inhalation of droplets from sneezes and coughs and causes a fever and a red skin rash?
    Measles
39. Which virus attacks the body's immune system meaning the body can no longer deal with other infections or cancers?
    HIV
40. Which plant pathogen affects many species resulting in a lack of growth?
    Tobacco mosaic virus (TMV)
41. What type of food poisoning is spread by bacteria ingested in food or on food prepared in unhygienic conditions?
    Salmonella
42. Which STD causes a thick yellow/green discharge from the vagina or penis and pain in urinating?
    Gonorrhoea
43. Which fungal disease causes purple or yellow spots to develop on leaves, affecting the rate of photosynthesis and growth?
    Rose black spot
44. What type of pathogen is malaria caused by?
    Protist
45. State three ways white blood cells help to defend against pathogens.
    Phagocytosis, antibody production, antitoxin production
46. What is the name given to introducing small quantities of dead or inactive forms of a pathogen into the body to prevent infection?
    Vaccination
47. Which type of pathogen do antibiotics kill?
    Bacteria
48. What are drugs tested on during clinical trials?
    Healthy volunteers and patients

Biology - Bioenergetics

49. What is the word equation for photosynthesis?
    Carbon dioxide +water → glucose + oxygen
50. Name an endothermic reaction in which energy is transferred from the environment to chloroplasts by light.
    Photosynthesis
51. State four factors that affect the rate of photosynthesis.
    Temperature, light intensity, carbon dioxide concentration and the amount of chlorophyll
52. How do plants produce proteins?
    Using glucose and nitrate ions in the soil
53. What is the name for an exothermic reaction that is continuously occurring in living cells?
    Respiration
54. Write the equation that represents aerobic respiration.
    Glucose + oxygen → carbon dioxide + water
55. What is the chemical formula for glucose?
    $C_6H_{12}O_6$
56. What is the equation for anaerobic respiration in muscles?
    Glucose → lactic acid
57. What is the equation for anaerobic respiration in plant and yeast cells?
    Glucose → ethanol + carbon dioxide
58. Anaerobic respiration in yeast is called fermentation. What is it used to manufacture?
    Bread and alcoholic drinks
59. What increases during exercise to supply muscles with more oxygenated blood?
    Heart rate, breathing rate & breath volume

Chemistry – Atomic Structure and the periodic table

1. What is the name given to the smallest part of an element that can exist?
   Atom
2. About how many elements are there in the periodic table?
   100
3. What name is given to two or more elements chemically combined in fixed proportions?
   Compound
4. What name is given to two or more elements or compounds not chemically combined?
   Mixture
5. What are filtration, crystallisation, simple distillation, fractional distillation and chromatography all used for?
   Separation of mixtures
6. What name is given to an incorrect model of an atom that suggested atoms are a ball of

positive charge with negative electrons embedded in them?

Plum pudding model

7. Who adapted the nuclear model of the atom by suggesting that electrons orbit the nucleus at specific distances?

   Niels Bohr

8. What was James Chadwick able to provide evidence for the existence of?

   Neutrons in the nucleus

9. Complete the table

Name of particle	Relative Charge
Proton	***+1***
Neutron	***0***
Electron	***-1***

10. What does the atomic number indicate about the atoms of an element?

    The number of protons

11. What is the approximate radius of an atom?

    0.1nm ($1x10^{-10}$m)

12. Complete the table

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

13. What is the mass number of an element the sum of?

    The protons and neutrons in an atom

14. What is the name of atoms of the same element that have different numbers of neutrons?

    Isotopes

15. What are elements in the periodic table arranged in order of?

    Atomic number

16. What do elements in the same group of the periodic table have in common?

    The same number of electrons in the outer shell and similar properties

17. How did Mendeleev overcome problems with ordering the elements?

    He left gaps for undiscovered elements

18. What react to form positive ions?

    Metals

19. The elements of which group of the periodic table are unreactive and do not easily form molecules?

    Group 0

20. Which group of the periodic table is known as the alkali metals?

    Group 1

21. Does reactivity increase or decrease going down group 1?

    Increase

22. Which group of the periodic table is known as the halogens?

    Group 7

Chemistry – Bonding, structure and the properties of matter

23. What are the three types of chemical bond?

    Ionic metallic and covalent

24. Which chemical bond forms when non-metals combined with metals?

    Ionic

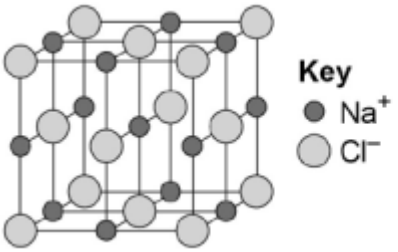
25. What charge do ions of group 2 elements have?

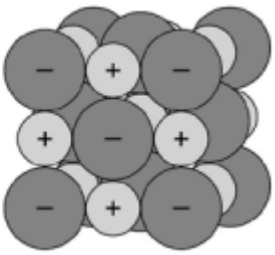
    +2

26. What charge do ions of group 7 elements have?

    -1

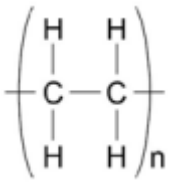
27. Which ionic structure can be represented in the following forms:





    Sodium Chloride

28. What is a covalent bond?
29. ***A shared pair of electrons between two atoms***
30. What type of structure is represented here:



    Polymer

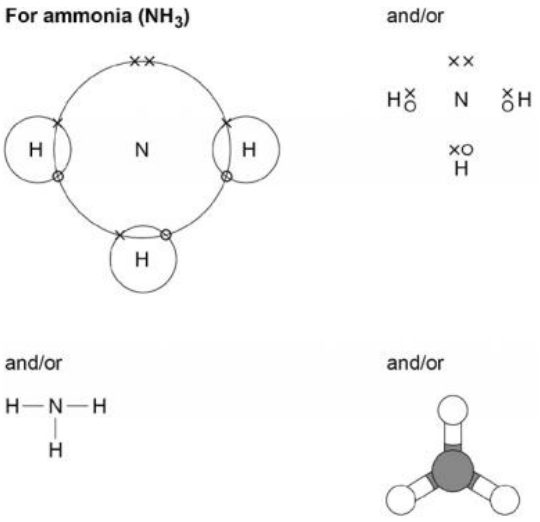
31. What does (aq) show in a chemical equation?

    Aqueous solution

32. What state of matter are most polymers at room temperature?

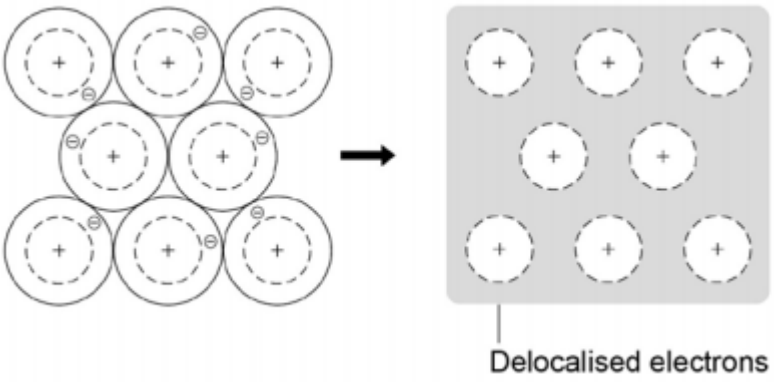
    Solid

33. What type of chemical bonding is represented in these diagrams?



Covalent

34. Which type of chemical bonding can be represented in the following form:



Metallic

35. What determines the amount of energy needed to melt or boil a substance?
    The strength of the forces/bonds between the particles
36. State key properties of ionic compounds.
    They have high melting and boiling points and they conduct electricity when molten or dissolved in water
37. What forces acting between small molecules hold them together when liquid?
    Weak intermolecular forces
38. Name three examples of giant covalent structures that you need to know.
    Diamond, graphite and silica
39. How are atoms arranged in pure metals?
    Layers
40. Which particles in metals allow them to conduct electricity and thermal energy?
    Delocalised electrons
41. How many covalent bonds does each carbon atom in diamond have?
    4
42. How many covalent bonds does each carbon atom in graphite have?
    3
43. Which material is a single layer of graphite and has properties that make it useful in electronics and composites?
    Graphene
44. What name is given to cylindrical fullerenes with very high length to diameter ratios?
    Carbon nanotubes

Chemistry – Quantitative Chemistry

45. Which law states that no atoms are lost or made during a chemical reaction?
    (The law of) conservation of mass
46. Why do some reactions appear to involve a change in mass?
    A reactant or product is a gas
47. What name is given to the reactant that is completely used up in a chemical reaction?
    The limiting reactant

Chemistry – Chemical changes

48. What do metals react with oxygen to form in oxidation reactions?
    Metal oxides
49. Which chemical reaction can be used to extract metals less reactive than carbon from their oxides?
    Reduction (using carbon)
50. What do acids react with metal to form?
    A salt and hydrogen
51. What word is used to describe the following reaction: acid + alkali → salt + water?
    Neutralisation
52. What produce hydrogen ions (H^+) in aqueous solutions?
    Acids
53. What do aqueous solutions of alkalis contain?
    Hydroxide ions (OH^-)
54. Write the ionic equation for a neutralisation reaction.
    $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
55. What process can be used to split ionic compounds that are either molten or in aqueous solution by passing a current through them?
    Electrolysis
56. What process is used to extract metals that are more reactive than carbon?
    Electrolysis
57. Why is cryolite mixed with aluminium oxide in extraction of aluminium?
    To lower the melting point

Chemistry – Energy Changes

58. What name is given to a reaction that transfers energy to the surroundings, increasing the temperature of the surroundings?
    Exothermic
59. What name is given to a reaction that transfers energy from the surroundings, decreasing the temperature of the surroundings?
    Endothermic
60. What name is given to the minimum amount of energy that particles must have to react in a chemical reaction?
    Activation energy

Physics - Energy

1. Write the equation used to calculate the kinetic energy of a moving object.
   Kinetic energy = 0.5 × mass × (speed)² or
   $E_{\mathrm{K}} = \frac{1}{2}\, m\, v^2$
2. Write the equation used to calculate the amount of elastic potential energy stored in a stretched spring.
   Elastic potential energy =
   0.5 × spring constant × (extension)² or
   $$E_{\mathrm{e}} = \frac{1}{2}\, k\, e^2$$
3. What is the unit for kinetic energy, gravitational potential energy and elastic potential energy?
   Joules, J
4. Write the equation used to calculate the amount of gravitational potential energy gained by an object raised above ground level.
   g.p.e. =
   mass × gravitational field strength × height
   or $E_{\mathrm{p}} = m\,\mathrm{g}\,\mathrm{h}$
5. What is the rate at which energy is transferred or work is done?
   Power
6. Write two equations to calculate power.
   Power = $\frac{energy\ transferred}{time}$ or $P = \frac{E}{t}$

   And

   Power = $\frac{Work\ done}{time}$ or $P = \frac{W}{t}$

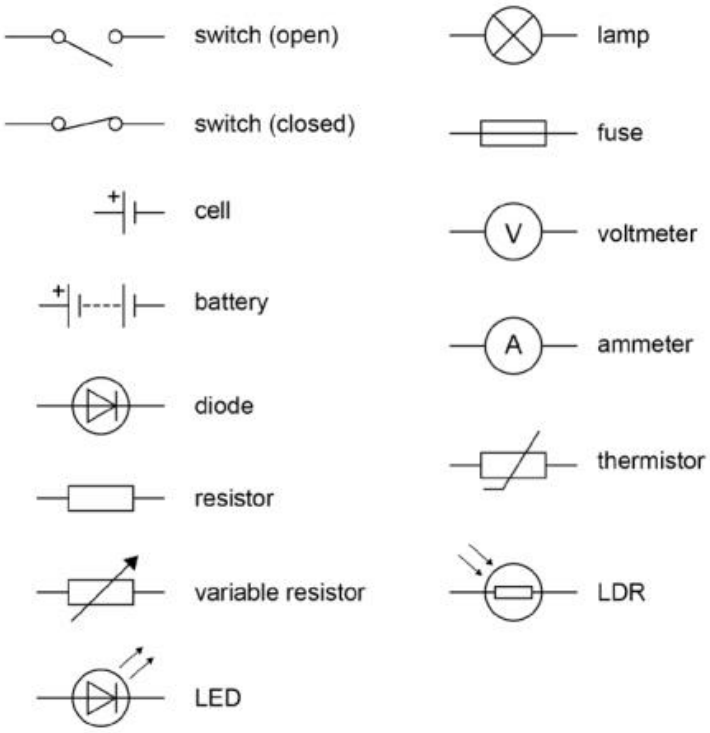
7. What is the unit for Power?
   Watts
8. What can be transferred usefully, stored or dissipated, but cannot be created or destroyed?
   Energy
9. Write the equation for calculating the energy efficiency of any energy transfer.
   Efficiency = $\frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$

   And

   Efficiency = $\frac{useful\ power\ output}{total\ power\ input}$
10. What are the three main forms of fossil fuels used as energy resources?
    Coal, oil and (natural) gas
11. State the three principle uses of energy resources.
    Transport, electricity generation and heating
12. Name seven renewable energy resources available for use on Earth.
    Biofuel, wind, hydro-electricity, geothermal, the tides, the Sun, and water waves
13. What is a renewable resource?
    One that can be replenished as it is used

Physics - Electricity

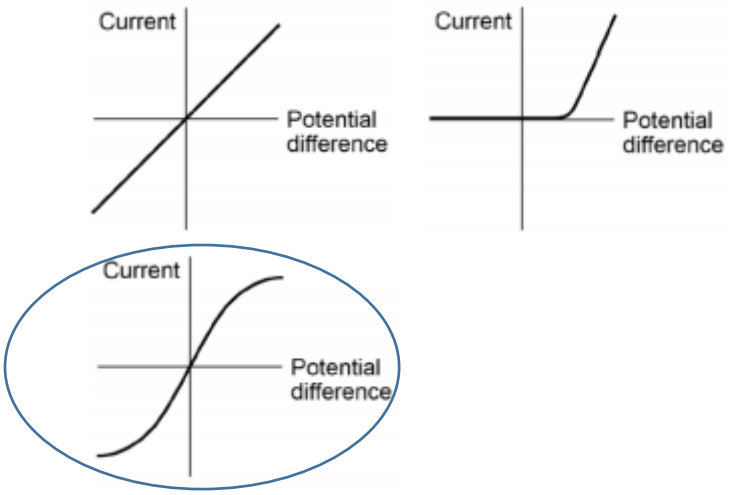
14. State what the following symbols show:



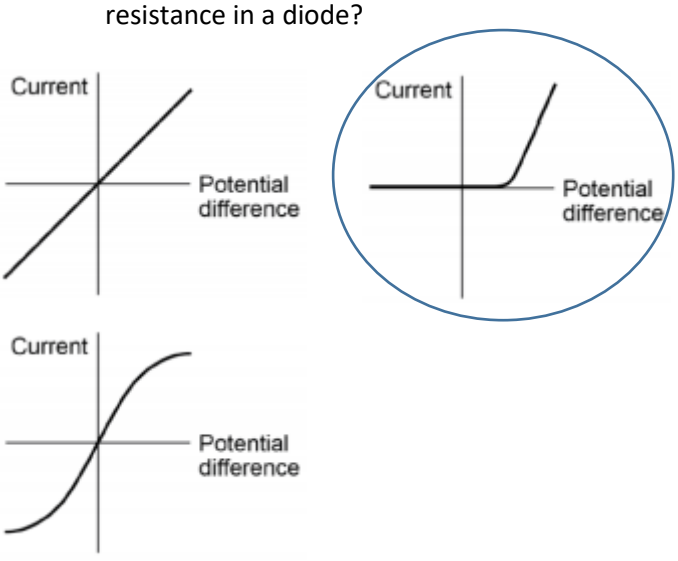
15. Write the equation used to calculate current, potential difference or resistance.

Potential difference = current × resistance or ***V = I R***

16. What is the unit for resistance?
    Ohms, Ω
17. Which of the following graphs shows resistance in a filament lamp?



18. Which of the following graphs shows resistance in a diode?



19. What happens to the resistance of a thermistor as the temperature increases?
    It decreases
20. What happens to the resistance of an LDR as the light intensity increases?
    It decreases
21. Describe the current in a series circuit.
    It is the same through each component.
22. Describe the potential difference in a series circuit.
    It is shared between components
23. Describe resistance in a parallel circuit.
    It is less than the resistance of the smallest individual resistor
24. Describe domestic mains electricity supply in the UK.
    It is ac (alternating current), has a frequency of 50 Hz and is about 230V
25. What colour is the insulation on wires in a plug?
    Live wire – ***brown***
    Neutral wire – ***blue***
    Earth wire – ***green and yellow stripes***
26. Write two equations for calculating power transfer in an electric circuit.
    Power = potential difference × current

    P = V I

    Power = (current)^2 × resistance

    P = I^2 R

27. What does the amount of energy an appliance transfers depend on?
    How long the appliance is switched on for and the power of the appliance
28. What are the two equations for calculating the amount of energy transferred by electrical work?
    Energy transferred = power × time

    E = P t

    Energy transferred = charge flow × potential difference

    E = Q V

29. How is electrical power transferred from power stations to consumers?
    The national grid

Physics - Particle model of matter

30. What is the equation for calculating density?
    density = $\frac{mass}{volume}$

    ρ = $\frac{m}{V}$

31. True or False: changes of state are physical changes?
    True
32. What is the total kinetic and potential energy of all particles that make up a system known as?
    Internal energy
33. Which three factors affect the increase in temperature of a substance?

Its mass, the type of material and the energy input

34. What is the amount of energy required to raise the temperature of a substance by 1°C known as?
    Specific heat capacity
35. What is the energy needed for one Kg of a substance to change state without a change in temperature known as?
    Specific latent heat
36. Describe the motion of molecules of a gas.
    Constant random motion
37. What happens to the pressure exerted by a gas, held at constant volume, when the temperature is increased?
    It increases

Physics – Atomic Structure

38. What happens to an atom when it has an outer electron removed (e.g. by ionising radiation)
    It forms a positive ion
39. What is the name given to the process when radiation is released as an unstable nucleus becomes more stable?
    Radioactive decay
40. What is radioactivity measured in?
    Bequerels (Bq)
41. What is an alpha particle?
    It consists of two neutrons and two protons – a helium nucleus
42. What is a beta particle?
    A high speed electron
43. What change takes place in a nucleus when a beta particle is emitted?
    A neutron turns into a proton
44. What electromagnetic radiation can be released from the nucleus of a radioactive sample?
    Gamma rays
45. How is an alpha particle represented in nuclear equations?
    $^{4}_{2}\mathrm{He}$
46. How is a beta particle represented in nuclear equations?
    $^{0}_{-1}\mathrm{e}$
47. What is the time taken for the number of nuclei of an isotope in a sample to halve known as?
    Half life
48. What is the presence of radioactive materials on or in other objects known as?
    Radioactive contamination
49. What is the process of exposing an object to nuclear radiation without causing it to become radioactive known as?
    Irradiation