

Science Revision Plan - Week 4 (Week Beginning 23rd January)

With the mocks and summer exams quickly approaching, we wanted to share with you the revision for Science each week. Enabling you to support your child to revise the right content in a way that will have a positive impact on their grade. We have included this week's focus, quiz date and resources below.

Dan Fleetwood
Director of Science

Focus of revision:

- Biology - Infection and Response
- Chemistry - Chemical Changes
- Physics - Atomic Structure

Knowledge Test Date:

- Tuesday 31st January

How to Self Quiz

Our approach is based on research around **retrieval practice**: the more frequently students quiz themselves, the more they will remember long term.

- Students are expected to spend a **minimum 10-20 minutes every evening** testing themselves.
- To test:
 - Fold the page in half or cover so only questions are visible
 - Answer the questions on paper to best of their ability
 - Reveal answers, mark using a different coloured pen.
- Students then need to **rate the questions red, amber or green** using their highlighters. Red and amber highlighted sections should be revisited on a regular basis.
- Boxes in grey are not needed for students on the combined science course (This is most students) and can be left out of the quizzing.

Self Quizzing Questions:

See next page(s)

Biology - Infection & Response

	Question	Answer
1	What is the term for a microorganism that causes a disease?	A pathogen.
2	What are the four main pathogens?	Bacteria, virus, fungi and protist.
3	Which pathogen is a tiny single celled organism.	A protist.
4	Which type of pathogen is a section of DNA within a protein coat that divides by invading cells?	A virus.
5	How can pathogens be spread?	Direct contact, air, water, vectors.
6	Which group of microorganisms includes mushrooms and moulds?	Fungi.
7	How can you prevent the spread of disease in humans	Good hygiene, destroying vectors and vaccination
8	Which virus can interfere with your body's ability to fight disease?	HIV.
9	How does tobacco mosaic virus harm the plant?	It reduces photosynthesis and so growth.
10	What disease is caused by a parasite transmitted by mosquitoes?	Malaria.
11	What type of pathogen causes malaria?	Protist.
12	How is HIV spread?	Sexual contact, exchange of body fluids, sharing needles.
13	Which part of the body does the HIV virus attack?	The immune system.
14	How do viruses make you feel ill?	They reproduce rapidly and invade and damage cells.
15	How do bacteria make you feel ill?	They reproduce rapidly and produce toxins.
16	Which virus causes a mosaic pattern on the leaves of plants.	Tobacco mosaic virus.
17	What is meant by the efficacy of a drug?	A measure of how effective a drug is.
18	What is meant by the toxicity of a drug?	A measure of how toxic a drug is.
19	What is a placebo?	A substance that does not contain the drug.
20	What is a double blind trial?	A trial in which patients with the target disease are given either the new medicine or a placebo. Neither the doctor nor the patients know who has received which until the end of the trial.
21	What type of medication contains inactive or dead virus to help develop immunity to a disease?	A vaccine.
22	Who discovered penicillin?	Alexander Fleming.
23	What's the difference between antibiotics and antiseptics?	Antibiotics destroy bacteria in the body, while antiseptics destroy microorganisms in the environment.
24	What type of drugs kill bacteria?	Antibiotics.
25	What do white blood cells make in response to a vaccination?	Antibodies.
26	What are new medical drugs tested on in preclinical trials?	Cells, tissues and live animals.
27	What is a common starting point for the synthesis of new drugs?	Chemicals extracted from plants.
28	What is introduced into your body in a vaccination?	Dead or inactive forms of the pathogen.
29	What are the stages involved in testing and trialling new drugs?	Drug discovery, preclinical trials, clinical trials, drug licencing.
30	What are new medical drugs extensively tested for?	Efficacy, toxicity and dosage.
31	What are new medical drugs tested on in clinical trials?	Healthy volunteers and patient volunteers.
32	What key word describes when a large proportion of a population is immune and the spread of a pathogen is reduced?	Herd immunity.
33	How does the skin prevent microorganisms from entering the body?	It acts as a barrier, produces antimicrobial secretions and is covered in a layer of microorganisms that act as an extra barrier.
34	How does your nose prevent microorganisms from entering the body?	It contains hair and mucus that traps pathogens.
35	How does the stomach prevent microorganisms from entering the body?	It produces acid.
36	What are antibodies?	Proteins made by white blood cells to destroy pathogens (both bacteria and viruses).

37	Why is an active drug often used as a placebo instead of a sugar pill?	So the patient is not deprived of treatment while taking part in the trial.
38	What are antibiotic resistant bacteria?	Strains of bacteria that are no longer able to be destroyed by antibiotics.
39	What is immunity?	The ability of your white blood cells to produce the right antibodies quickly as a result of memory cells.
40	What is meant by the dosage of a drug?	The quantity of the drug given.
41	What is an antigen?	The unique proteins on the surface of cells.
42	Why do you get ill when you first meet a new pathogen?	There is a delay while your body identifies which antibody is needed.
43	How do antibiotics cure bacterial diseases?	They destroy the bacterial pathogens inside the body.
44	How do white blood cells defend the body from pathogens?	They engulf them, make antitoxins and make antibodies.
45	How do the bronchi and trachea prevent microorganisms from entering the body?	They produce mucus to trap pathogens and contain cilia to move the mucus to the back of the throat.
46	Give three reasons why experimental drugs are tested on animals.	To find out how they work in a whole living organism, to gain information about possible doses, and to predict how the drugs might behave in humans.
47	What are high doses of an experimental drug used to test for?	To find the optimum dosage for the drug.
48	What are low doses of an experimental drug used to test for?	To test for possible side effects.
49	Why do antibiotics not work against viruses?	Viruses reproduce inside cells, so it is difficult to produce drugs that destroy the virus without damaging the cell.
50	What are memory cells?	White blood cells that 'remember' the right antibody used to destroy a particular pathogen.

Chemistry - Chemical Changes

	Question	Answer
1	What term describes a substance that attacks metals, stonework and skin?	Corrosive
2	What type of substance turns litmus paper red?	Acid
3	What happens in all chemical reactions?	New substances are formed.
4	What kind of reaction occurs between an acid and an alkali?	Neutralisation
5	What do you call a solution which is neither acidic nor alkaline?	Neutral
6	Give the name and formula of a common laboratory acid.	Hydrochloric acid (HCl), nitric acid (HNO ₃), sulfuric acid (H ₂ SO ₄), etc
7	Which ion is in excess in all acid solutions?	Hydrogen ions or H ⁺ ions
8	Which ion is in excess in all alkali solutions?	Hydroxide ions or OH ⁻ ions
9	What scale is used for measuring acidic and alkaline properties?	The pH scale
10	Name three examples of acid/alkali indicators apart from universal indicator.	Litmus, methyl orange and phenolphthalein
11	What pH values are acidic?	Below 7
12	What happens to the pH as the H ⁺ ion concentration increases?	It decreases
13	If a solution has the same concentration of hydrogen ions as hydroxide ions, how is it described?	Neutral or pH = 7
14	What word describes a solution that contains a large amount of solute in a small volume of solvent?	Concentrated
15	How can a solution be made more dilute?	By adding solvent/water
16	What kind of reaction occurs between an acid and a base?	Neutralisation
17	What is formed when an acid reacts with a base like a metal oxide?	Salt + water
18	What acid would be used to make zinc sulfate from zinc oxide?	Sulfuric acid

19	What process can be used to separate an insoluble solid from a liquid?	Filtration
20	How can a sample of a dissolved salt be obtained from a salt solution?	Evaporation of the water
21	In general, what is the pH of an alkaline solution?	Greater than 7
22	What colour is litmus solution in acidic solutions?	Red
23	What name is given to substances that react with acids to form a salt and water only?	Bases
24	Which salt is formed when copper oxide reacts with sulfuric acid?	Copper sulfate
25	What type of solution has a pH of 7?	Neutral
26	Name the salt produced when sodium hydroxide reacts with hydrochloric acid.	Sodium chloride
27	What name is given to substances that are soluble bases?	Alkalis
28	Name a piece of apparatus used to measure volumes of liquid.	Measuring cylinder/ pipette/ burette
29	Name the separation method used to produce crystals from a solution.	Crystallisation
30	Name the acid needed to make ammonium nitrate.	Nitric acid
31	Which acid is needed to make copper sulfate?	Sulfuric acid
32	Which base is needed to make copper sulfate?	Copper oxide
33	What is the name of the salt formed from zinc oxide and hydrochloric acid?	Zinc chloride
34	Which gas is formed when dilute hydrochloric acid reacts with magnesium?	Hydrogen
35	Which gas is formed when dilute hydrochloric acid reacts with magnesium carbonate?	Carbon dioxide
36	What is the chemical test for hydrogen?	It gives a squeaky pop with a lighted splint
37	What is seen when magnesium is added to dilute sulfuric acid?	Effervescence/ fizzing/ bubbles
38	Which gas is produced when copper carbonate is added to dilute nitric acid?	Carbon dioxide
39	What is the chemical test for carbon dioxide?	It turns limewater milky.
40	What do we call the liquid that dissolves a solute to form a solution?	Solvent
41	When Aluminium oxide is electrolysed what forms at the cathode?	Aluminium
42	Why is electrolysis used to extract aluminium from its ore?	Aluminium is more reactive than carbon.
43	Name the compound from which aluminium is extracted.	Aluminium oxide/ bauxite.
44	In electrolysis positive ions move towards the...?	Cathode (negative electrode)
45	In electrolysis negative ions move towards the...?	Anode (positive electrode)
46	Where does oxidation happen in electrolysis?	Anode (positive electrode)
47	Which electrode is connected to the negative terminal of an electricity supply?	Cathode (negative electrode)
48	Which electrode is connected to the positive terminal of an electricity supply?	Anode (positive electrode)
49	Which electrode would you expect to have bromine produced at?	Anode (positive electrode)
50	Where are hydrogen ions produced?	Cathode (negative electrode)
51	What is the name of the electrode that the negative ions move to?	Anode.
52	How do you test for chlorine gas?	bleaches litmus
53	What is produced at the anode (positive electrode) when lead bromide is electrolysed?	Bromine.
54	If a metal chloride is being electrolysed what gas will be produced?	Chlorine

55	What do we call a liquid, containing free moving ions, which is broken down by electricity in the process of electrolysis?	Electrolyte
56	Why can a molten or dissolved ionic compound conduct electricity?	Free moving ions.
57	What is oxidation?	gain of oxygen / loss of electrons
58	What is produced at the cathode (negative electrode) if the metal in the solution is more reactive than hydrogen?	Hydrogen.
59	Why is electrolysis an expensive way to extract metal from its ore?	Large amounts of energy needed.
60	What is produced at the cathode (negative electrode) when lead bromide is electrolysed?	Lead.
61	What is reduction?	loss of oxygen / Gain in electrons
62	What is an ore?	Metal compound in a rock.
63	What is aluminium oxide mixed with to lower its boiling point?	molten cryolite
64	Ionic compounds need to be either _____ or _____ to be electrolysed	Molten or dissolved in water
65	Why do ionic compounds need to be molten or dissolved to conduct?	Ions (i.e. charge carriers) must be free to move.
66	What does OIL RIG stand for?	Oxidation is Loss, Reduction is Gain
67	When Aluminium oxide is electrolysed what forms at the anode?	Oxygen
68	If metal sulphate is being electrolysed what gas will be produced?	Oxygen
69	Predict the products of electrolysis of copper sulphate solution	Positive electrode: Oxygen gas; Negative electrode: Copper.
70	Are hydrogen ions reduced or oxidised at the electrodes?	Reduced
71	How are metals, less reactive than carbon, extracted from their ores?	Reduction with carbon.
72	How do you test for oxygen gas?	Relights a glowing splint
73	What solution have you electrolysed if you get hydrogen gas, chlorine gas and sodium hydroxide produced?	Sodium chloride solution (brine)
74	Which state do ionic compounds not conduct electricity?	Solid
75	Why do the carbon anodes need replacing regularly?	They gradually decay away (due to reacting with the oxygen)
76	How many electrons does an aluminium ion gain at the cathode?	Three
77	How many electrons do oxygen ions lose at the anode?	Two

Physics - Atomic Structure

	Question	Answer
1	Give an approximate size of the radius of an atom.	1×10^{-10} metres
2	What are the three subatomic constituents of an atom?	Proton, Neutron, Electron
3	Where is the most mass of an atom concentrated?	In the nucleus
4	Approximately what proportion of the total radius of an atom is the radius of the nucleus?	1/10,000
5	Describe the arrangement of protons, neutrons and electrons in an atom.	Protons and neutrons are in the atom's nucleus. Electrons are in discrete energy levels around the nucleus.
6	What charge does the nucleus of an atom have? Why?	Positive charge. Nucleus contains protons & neutrons. Protons have a positive charge, neutrons have no charge.
7	What charge does a proton have?	Positive / +1
8	What charge does a neutron have?	Neutral / 0
9	What charge does an electron have?	Negative / -1
10	Give two ways that an atom's electron arrangement can be changed.	Absorbing EM radiation, emitting EM radiation
11	How does an atom's electron arrangement change when it absorbs EM radiation.	Electrons move further away from the nucleus. They move to a higher energy level.
12	How does an atom's electron arrangement change when it emits EM radiation?	Electrons move closer to the nucleus. They move to a lower energy level.
13	How does the ratio of electrons to protons in an atom result in the atom having no overall charge.	Number of protons is equal to number of electrons. Protons and electrons have equal and opposite charges, so charge cancels.
14	What do all forms of the same element have in common?	They all have the same number of protons.
15	What is the name given to the number of protons in an atom?	Atomic number
16	What is an atom's mass number?	The total number of protons and neutrons in an atom.
17	What is an isotope of an atom?	An atom of an element that has a different number of neutrons, but the same number of protons.
18	What may lead to a scientific model being changed or replaced?	Discovery of new experimental evidence which doesn't agree with the existing theory.
19	How did the plum-pudding model describe the atom?	A ball of positive charge, with negatively charged electrons distributed evenly throughout it.
20	Prior to the discovery of the electron what was believed about the atom?	The atom was believed to be indivisible.
21	Which experiment led to the plum-pudding model being discarded?	Rutherford's alpha-scattering experiment / gold foil experiment
22	Rutherford was the first scientist to suggest the existence of the ...	Nucleus
23	What were the conclusions of alpha-scattering experiment?	Most of the mass of the atom is concentrated at the centre in the nucleus. The nucleus is positively charged.
24	What reinforces a scientific theory?	When experimental results agree with the hypothesised theoretical calculations and theories.
25	What did James Chadwick's experiments on the atom prove?	The existence of neutrons
26	Why do unstable nuclei give out radiation?	Unstable nuclei undergo decay to become more stable. As they release radiation their stability increases.
27	What is the name of the process in which an unstable nucleus gives out radiation to become more stable?	Radioactive decay
28	Define the activity of an unstable nucleus.	Activity is the rate of decay of a source of unstable nuclei.
29	What is the unit of radioactive activity?	Becquerel (Bq)
30	What is count rate?	The number of radioactive decays per second for a radioactive source.

31	Give an example of a detector that may be used to measure count-rate.	Geiger-Muller tube
32	State four types of nuclear radiation.	Alpha particles, Beta particles, Gamma rays, Neutrons.
33	What are the constituents of an alpha particle?	Two protons and two neutrons. It is the same as a helium nucleus.
34	What is the range of an alpha particle through air?	A few centimetres (normally in the range of 2-10cm)
35	What will stop beta radiation from passing through a point?	A thin sheet of aluminium Several metres of air
36	What will stop gamma radiation from passing through a point?	Several centimetres of lead A few metres of concrete
37	What type of radiation is most ionising?	Alpha radiation
38	What type of radiation is least ionising?	Gamma radiation
39	State any changes to mass or charge that occur due to the emission of a gamma ray?	Both mass and charge remain unchanged.
40	Describe the nature of radioactive decay	Random
41	Define the half-life of a radioactive isotope.	The time it takes for the number of unstable nuclei in a substance to halve. The time it takes for the count rate from a sample to fall to half its initial level.
42	What is radioactive contamination?	The presence of unwanted radioactive nuclei on other materials.
43	What is irradiation?	The process of exposing a material to nuclear radiation. The material does not become radioactive.
44	Why is it important for the results of studies on the effects of radiation to be published and shared with other scientists?	To allow the findings to be independently checked (peer review)
45	Give 4 sources of background radiation?	Rocks, Cosmic rays from space, Nuclear weapons testing, nuclear accidents
46	How should background radiation be dealt with in calculations?	Background count should be subtracted from any readings before calculations.
47	What is the unit used to measure radiation dosage?	Sieverts(Sv)
48	How many millisieverts are equal to 1 sievert?	1000 mV is equal to 1 sievert
49	Why might the radiation dosage that different people experience differ?	Some occupations involve working with radiation. Background radiation differs with location
50	What determines how dangerous a particular radioactive isotope is?	The half-life of the isotope.
51	What name is given to the process by which the nuclei of heavy elements split apart?	Nuclear fission
52	What is absorbed by a uranium nucleus that causes it to undergo fission?	A neutron
53	When a uranium nucleus breaks apart because of fission, what is produced?	Two smaller nuclei + 2-3 neutrons + ionising radiation.
54	True or false: nuclear fission only occurs in large, stable nuclei.	FALSE - it occurs in large, unstable nuclei
55	If the neutrons produced by each fission event go on to cause more fission events, and this process continues, what might occur?	Chain reaction
56	True or false: generating electricity via nuclear fission is unpopular because it releases carbon dioxide.	FALSE
57	Why is generating electricity via nuclear fission unpopular in some countries?	Risk of disaster if chain reaction occurs. Large building and decommissioning costs. Problems with storing radioactive waste.
58	What name is given to the process by which two smaller nuclei join together to form one larger nucleus?	Nuclear fusion
59	Which releases more energy per event: nuclear fission or nuclear fusion?	Nuclear fusion
60	Why are nuclear fusion power stations not yet in operation?	Humans have not managed to obtain high enough temperatures to carry out fusion over a long period.