THE DUSTON SCHOOL
Knowledge itself is power
TDS 4-19

Year 8 Science Knowledge Booklet

Term 4

Name:	**Class:**
Homework 1 Due: 4th March	**Homework 2 Due: 18th March**
Homework 3 Due: 1st April	

Science Homework 1

Read all of this knowledge organiser. The work covered will be in the first knowledge quiz of the term.

Metals

Big questions:

What is a metal?

What are the properties of metals?

How do metals react with oxygen?

Why are group 1 metals not used in building?

How do metals react with acids?

What is the order of reactivity of metals?

Why is recycling metals really important?

Key vocabulary

Properties	Characteristic of the substance. Examples are melting point, conductivity or malleability.
Melting point	The temperature required to change the state of a substance from a solid to a liquid.
Ductile	The ability to be drawn into a wire
Lustrous	Shiny.
Malleable	A substance can be bent or shaped without shattering
Conductivity	A measure of how well electricity and heat is able to flow through a substance.
Oxidise	When a substance forms a bond with oxygen.
Reactivity Series	A list of elements in order from most reactive to least reactive.
Ore	A rock that contains enough metal to make it worth extracting
Alkali Metals	Group 1 metals on the periodic table. Alkali metals react vigorously with water and produces alkali solutions.

What is a metal?

A metal is a material that is a solid at room temperature which shows specific properties.

Most metals are too reactive to exist on their own in the ground.
Metals exist combined with other elements (typically oxygen or sulfur) as compounds called ores.

Metal ore: metal compound found naturally in the ground.

Not all metals are found in ores, some are found as pure substances and just need to be collected, because they are unreactive.

Examples of these metals are:

- Gold
- Silver
- Platinum

What are the properties of metals?

- Hard
- Lustrous
- good conductor of heat
- good conductor of electricity
- malleable
- ductile

How do metals react with oxygen?

Oxidation: Forming a bond with oxygen

Metals can oxidise over time if they are left in air. Otherwise, we can speed up the chemical reaction by heating the metal.

Let's write word equations for the chemical reactions we saw.

When copper reacts with oxygen, copper oxide is produced.

Copper + oxygen -> copper oxide

When iron reacts, what is produced? Write the word equation.

Iron + oxygen -> iron oxide

Science Homework 2

Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

Questions in *italics* are from older work.

Key knowledge question	Your answer
Complete this equation - metals + hydrochloric acid → ……. + ……..	
What is the end of the name of a compound produced when reacting metals with hydrochloric acid?	
What is an ore?	
What is meant by oxidation?	
What is the name of group 1 metals?	
What does the term malleable mean?	
What does the term ductile mean?	
What is the key term to state that metals will have electricity to pass through easily?	
What is the name for the list of elements going from most reactive to least reactive?	
Name a metal that would react vigorously with water.	

Why are group 1 metals not used in building?

They are also know as the ALKALI METALS. They are Lithium, Sodium, Potassium, Rubidium, Caesium, Francium

Metal	**Lithium**	**Sodium**	**Potassium**
Symbol	Li	Na	K
Colour	grey	grey	grey
Colour when cut	silver	silver	silver
Easy to cut?	yes	yes	yes
Reaction with water	fizzing, floating on the top of the water	Fizzing, floating on the top of the water, sparks	Lilac flame
Reactivity order	3	2	1

The alkali metals are all very reactive with water
They react with water to form hydrogen gas and a metal hydroxide

Example.

Lithium + water → Lithium hydroxide + hydrogen

The reactivity of the alkali metals increases as you go down the group!

How do metals react with acids?

The group 1 metals reacted with water because they are extremely reactive.

Not all metals will react with water, but most will react with acid.

When hydrochloric acid reacts with a metal, a metal chloride is formed.

The general equation for this reaction is:

Metal + hydrochloric acid → metal chloride + hydrogen

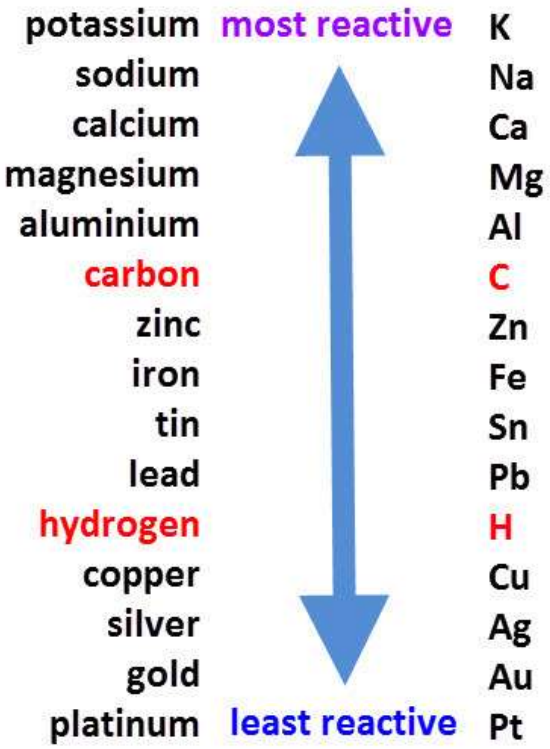
What is the order of reactivity of metals?

Over the course of this topic, we have discussed how different metals react.

We have looked at the reactions between metals and oxygen, and metals with hydrochloric acid.

If we were to merge the results from these practicals together, we can get an order of the metals we have used in practicals, and how reactive they are.

This is called the reactivity series



The reactivity series is a list of commonly used metals, from most reactive to least reactive.

There are two non-metals that also get listed, carbon and hydrogen. The information is useful when looking to extract metals from their natural ores.

Why is recycling metals really important?

Metals are finite.

Finite: **non-replaceable material that will eventually run out**

There are other ways of extracting metals from the earth that are not as straightforward as mining.

Why might we do them?

Because if mining is not providing any more metals, we can use these processes to extract the last of the metals from the earth.

The processes are called **Phytomining** and **Bioleaching**.

Bioleaching is a technique that makes use of bacteria to extract metals from metal ores. Some strains of bacteria are capable of breaking down ores to form acidic solutions containing metals ions such as copper ions.

Phytomining is when plants are grown on an **ore** that contains lower amounts of metal, and absorb metal ions through their roots and concentrate these ions in their cells. The plants are harvested and burnt. The ash left behind contains a higher **concentration** of the metal than the original ore. The ash is processed to obtain the metal.

Key knowledge question	Answer
Complete this equation - metals + hydrochloric acid → ……. + ……..	Metal + hydrochloric acid → metal chloride + hydrogen
What is the end of the name of a compound produced when reacting metals with hydrochloric acid?	Chloride
What is an ore?	Rocks that contain metal or metal compounds
What is meant by oxidation?	Forming a bond with oxygen
What is the name of group 1 metals?	Alkali metals
What does the term malleable mean?	Be bent or shaped without shattering
What does the term ductile mean?	Can be shaped into a wire
What is the key term to state that metals will have electricity to pass through easily?	good conductor
What is the name for the list of elements going from most reactive to least reactive?	Reactivity series
Name a metal that would react vigorously with water	Any alkali metal (eg. lithium, sodium, potassium)

Disease and Drugs

Big questions:

1. What are Microorganisms?
2. What are the differences between the different types of micro-organisms?
3. How are diseases transmitted?
4. How does the body defend itself against disease?
5. How do vaccinations work?
6. What is a drug?
7. How do drugs affect the body?
8. What are the effects of alcohol on the body?
9. Why is smoking bad for you?

Key vocabulary

Microbe	Micro-organism- cannot be seen without a microscope
Pathogen	A microbe that causes disease
Toxin	A harmful substance that damages cells
Barrier defense	Eg skin, scabs, tears, mucus. Stops pathogens from entering body
White blood cell	Specialised cell to neutralise or destroy pathogen- engulf, produce antibodies, produce antitoxins
Antibody	A protein that attaches to pathogen's antigens, to destroy pathogen or to clump them together for easier phagocytosis
Antitoxin	A substance that neutralises toxins
Antigen	A chemical on the pathogen that causes an immune response.
Transmission	The spread of a disease/ pathogen
Vector	An organism that spread pathogens between people eg mosquitos
Communicable	A disease that can be spread
Vaccine	An dead or inactive form of the pathogen, causes white blood cells to make the specific antibodies, leads to memory cells and immunity
Immune	Memory cells present, therefore you make antibodies to neutralise/ destroy the pathogen without showing any symptoms.
Herd immunity	A significant proportion of the population has immunity, therefore limits the spread of a pathogen. Protects the most vulnerable.
Recreational Drug	A drug taken for pleasure
Medicinal Drug	A drug with a health benefit
Pre-clinical trial	Tested in a lab; on cells, tissues or animals
Clinical trial	Tested on humans; first on healthy volunteers, then in double blind trials
Stimulant	A drug that speeds up the brain's activity, make the synapses more active
Depressant	Slows down the brain's activity by making the synapses less active.

What are Microorganisms?

What are the differences between the different types of micro-organisms?

Micro-organisms (microbes) are any living thing too small to see without magnification.

Pathogens are microbes that cause disease

- **Viruses** are very tiny and simple, made just of a protein coat and RNA. They enter the host cells, replicate, destroy the cell and invade new cells.
- **Bacteria** survive on the surface of your cells. They produce toxins which make you unwell. They have flagellae to help them move, no membrane bound organelles, loop of free floating DNA, and are surrounded by a protective capsule. They can be treated using antibiotics.
- **Protists** are single celled eukaryotes. To spread from host to host the malarial protist needs to travel inside a mosquito, who sucks up the protist along with the blood of one person and then injects it into the next along with her numbing saliva. An organism that transmits disease is called a VECTOR
- **Fungi** are eukaryotes which are able to digest dead organisms. They are the largest of the 4 pathogens. Fungi secrete enzymes that digest the area of skin. Fungal infections can be treated with anti-fungals/ fungicides.

	Virus	Bacteria	Protist	Fungus
Size	Smallest, very tiny and simple	Very small, approx. 100x smaller than a human cell	Varies with lifecycle	biggest
Appearance	Just genetic material and protein coat	No organelles, loop DNA, cell wall, capsule, sometimes flagellum	Eukaryotic, single cell, mouth pore, contractile vacuoles, cilia	Eukaryotic, can be multicellular, chitin cell wall
Examples of diseases caused	Flu, polio, common cold, AIDS, measles	Tonsillitus, TB, Plague, chlamydia	malaria	Athletes foot, thrush, ringworm, Rose black spot

How are diseases transmitted?

A **communicable disease** can pass from one person to another

Disease/Pathogen	Cause/Pathogen	Method for spread
Gonorrhoea	bacteria	Direct – sexual contact
Black Spot	fungus	Fungal spores distributed by wind, water
Malaria	Protist (Plasmodium)	Vector – carried by mosquito. Eggs laid in water and hatch into larvae in water.

Disease/Pathogen	Cause/Pathogen	Method for spread
Measles	virus	Airborne droplets
HIV	virus	Direct contact – body fluids
Tobacco mosaic virus	virus	Enters through wounds – spread from infected plants
Salmonella	bacteria	Eating contaminated food, unhygienic food preparation

To stop the spread of pathogens:

Method	Example	How it works
Sterilising water	Cholera	Chemicals or UV light kill pathogens in unclean water.
Suitable hygiene - food	Salmonella	Cooking foods thoroughly and preparing them in hygienic conditions kills pathogens.
Suitable hygiene - personal	Athlete's foot	Washing surfaces with disinfectants kills pathogens. Treating existing cases of infection kills pathogens.
Vaccination	Measles	Vaccinations introduce a small or weakened version of a pathogen into your body, and the immune system learns how to defend itself.
Contraception	HIV/AIDs	Using barrier contraception, like condoms, stops the transfer of bodily fluids and sexually transmitted diseases.

<u>How does the body defend itself against disease?</u>

The first line of defence-

The skin acts as a barrier, Hydrochloric acid in the stomach, If our skin is cut, platelets seal the wound by clotting, The breathing organs produce mucus to cover the lining of these organs and trap the microbes

Second line of defence-

If microbes enter our body they need to be neutralised or killed. This is done by WHITE BLOOD CELLS

1) Engulf the microbe- Phagocytosis
2) Produce antibodies to neutralise the microbe- specific antibodies for specific pathogens
3) Produce antitoxins to neutralise the toxins produced by microbes

Once you have been exposed to a pathogen, whether naturally or by vaccination, your body contains cells which are able to **rapidly** produce **antibodies** which can bind to the pathogen and cause it to be destroyed by white blood cells.

The pathogen **cannot reproduce** to cause you to feel ill and so you are **IMMUNE**.

Science Homework 3

Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

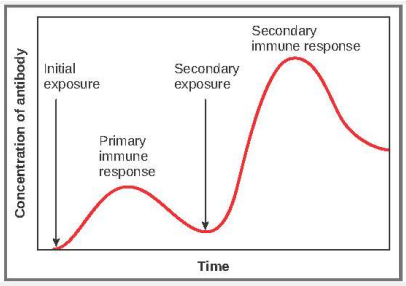
Questions in *italics* are from older work.

Key knowledge question	Your answer
How are antibodies specific to one pathogen?	
How does our body protect itself from invading pathogens?	
Name 3 ways that pathogens are spread	
Name the 3 things that white blood cells do to invading pathogens	
Name the 4 types of pathogen	
What are toxins?	
What do protists do to red blood cells?	
What is a pathogen?	
What do we call the process where a white blood cell engulfs a pathogen?	
Name 3 fungal diseases.	

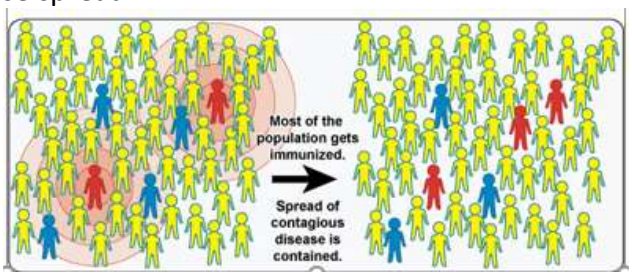
How do vaccinations work?

A vaccine stimulates the production of **antibodies** and **memory cells** against the target pathogen, without making the person ill. Once you have been exposed to a pathogen, you will be able to make **antibodies** quickly in response to any future infection

The pathogen cannot reproduce to cause you to feel ill and so you are **IMMUNE**.
The secondary response is much more **rapid and larger.** This is because the memory cells divide quickly and make antibodies in response to the infection.



Herd **immunity** occurs when a significant portion of a population becomes **immune** to an infectious disease, limiting further disease spread



What is a drug?

Medicinal drugs:
These are drugs used to treat a condition. They usually have a benefit to your health.
Recreational drugs:
These are drugs taken for enjoyment, to help relaxation or to stay awake.
These have no health benefits and in many cases are harmful
Many of our medicines today originate from natural sources. Digitalis, a heart drug, comes from foxgloves Aspirin from willow trees. Penicillin from a fungus

New drugs are tested to determine safety, dosage levels and how well they work (efficacy)

The main stages are:

1. Preclinical testing in the lab and animals

2. Clinical trials using volunteers: phase I tests for dosage and safety; phase II to monitor efficacy and side effects; phase III to monitor long term effects.

3. Trial results are peer-reviewed and published

Drug use can lead to long term health issues

Drug addiction: When the body becomes used to the changes caused by a drug. A person does not feel normal without it.

Withdrawal symptoms: Caused when a person may try to stop taking the drug. Symptoms include anxiety, headaches and sometimes pain.

An **overdose** is when someone takes too much of a drug. This can cause death or serious illness.

Legal recreational drugs can still have a harmful effect on the body. Examples include; Alcohol: can damage the liver, Tobacco: increases risk of cancer, Caffeine: can cause insomnia, risk of heart attacks

How do drugs affect the body?

In the brain most drugs work by altering activity at the synapse

The signal is transmitted to another neurone across a junction called a **synapse** by chemicals called **neurotransmitters.**

Depressants, such as alcohol and solvents, slow down the brain's activity by making the synapse less active. **Stimulants,** such as nicotine, ecstasy and caffeine, make the synapse more active. **Painkillers,** such as morphine, block nerve impulses that cause pain. **Hallucinogens**, such as LSD distort what the user sees and hears, by effecting the receptors for a particular type of neurotransmitter: serotonin.

What are the effects of alcohol on the body?

Alcohol is a chemical called **ethanol**, found in alcoholic drinks. This legal drug can lower your inhibitions and affect your judgement. It is a **depressant** and slows down your reaction times. It is an **addictive** drug that can have serious consequences. It is recommended that men should drink no more than 21 units a week, and women 14 units.

Alcohol can reach the brain in just one minute. Too much alcohol can **damage the brain cells** and cause depression.

The liver breaks down alcohol to remove this toxic drug from the body. Too much alcohol can **damage the liver** leading to **cirrhosis or cancer**.

Alcohol can reduce **fertility** in men and women, for example reduces the amount of sperm a men produces.

Drinking during pregnancy increases the chances of a **miscarriage**, **stillborn** and **premature** babies

Foetal Alcohol Syndrome: Poor growth in the womb and after birth, muscle weakness and poor coordination, problems in three or more major areas: thinking, speech, movement, or social skills, heart defects, facial Abnormalities

Compared with non-alcohol using **teenagers**, some alcohol-using teenagers show significantly **smaller brain** volumes and lower density within the areas responsible for **memory and learning**

Why is smoking bad for you?

Cigarettes contain over 4000 chemicals

Carbon monoxide – poisonous gas, reduces the amount of oxygen that red blood cells can carry around the body

Nicotine – addictive drug that affects the central nervous system, increases the heart rate, narrows the blood vessels, causing high blood pressure

Tar – brown, sticky substance that consists of tiny particles formed when tobacco smoke condenses, paralyses tiny hairs in the airways called cilia, this stops them removing mucus easily

Emphysema: Smoking causes the lungs to loses elasticity, and causes the air sacs to stick together.

Cancer: Nicotine and tar cause tumours in the lung tissue

Smoking during **pregnancy** can cause tissue damage in the unborn baby, particularly in the **lung and brain,** and some studies suggest a relationship between tobacco and **miscarriage**. Smoking also increases the risk of **stillbirth** and the risk of **sudden infant death syndrome** (SIDS), also known as "cot death.

Key knowledge question	Answer
How are antibodies specific to one pathogen?	Each pathogen has a specific antigen on it's surface
How does our body stop pathogens from entering? Name 3.	Skin, (hydrochloric) acid in the stomach, platelets/ scabs to seal cuts, mucus to trap microbes (in lungs etc), enzymes in eye (tears).
Name 3 ways that pathogens are spread	Food, water, airborne droplets, insect bites (vectors), direct contact (touch, sexual intercourse), indirect contact (touching surfaces that have pathogens on)
Name the 3 things that white blood cells do to invading pathogens	Engulf (phagocytosis), produce antibodies, produce antitoxins.
Name the 4 types of pathogen	Virus, fungi, bacteria, protist
What are toxins?	Harmful substances that cause damage to cells
What do protists do to red blood cells?	Bursts them
What is a pathogen?	An organism that causes disease
What do we call the process where a white blood cell engulfs a pathogen?	Phagocytosis
Name 3 fungal diseases.	Athletes foot, thrush, ringworm, rose black spot.

Wider reading

How to get the most out of your knowledge organiser:

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.

- There are several different things you can do
  - Look, cover, write, check, correct
  - Read through the organisers
  - Mind maps
  - Key spellings
  - Make a glossary
  - Missing out key words
  - Questions/answers answers/questions
  - Flash cards
  - Revision clock learning
  - Mnemonics

Science Learning Tools and wider study:

The Oak Academy – Online Science lessons
BBC Bitesize KS3 science
<u>You tube channels:</u>
Fuse school
Ted talks
Free science lessons
Primrose Kitten
<u>Shows on Netfilx</u>
Our planet
Tiny creatures
A life on our planet