

Y9 Science Homework Booklet

Name:

Class:

Teacher:

[illegible]

Section 1: Review of prior knowledge

1. What is the function of an enzyme?

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2. What is distillation used for?

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3. What are the disadvantages of burning coal, oil or gas?

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4. State 4 abiotic factors

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5. Write a word equation for the reaction between magnesium and hydrochloric acid to produce magnesium chloride and hydrogen.

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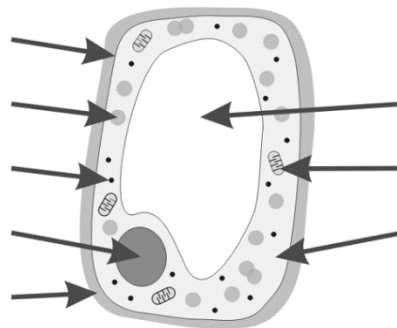
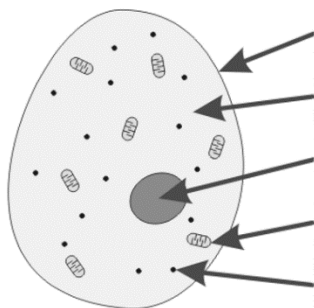
6. A cyclist travels a distance of 1800m in 2 minutes. What is their speed?

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Section 2: Refreshing current knowledge

1) Label these cells



2) Describe the difference between a unicellular and a multicellular organism.

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3) Describe the difference between discontinuous and continuous variation

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4) When drawing graphs, how should discontinuous and continuous variation be represented?

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Section 3: Application of knowledge

1) Explain how a red blood cell is adapted to its function

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2) Explain how a sperm cell is adapted to its function

Section 1: Review of prior knowledge

1. How do you calculate the actual length of a magnified image?

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2. What does the word "insoluble" mean?

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3. What is the unit for potential difference, what equipment do you use to measure it and how do you place it in a circuit?

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4. What are the five kingdoms used to classify all living organisms?

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5. What does the relative atomic mass number represent on the periodic table?

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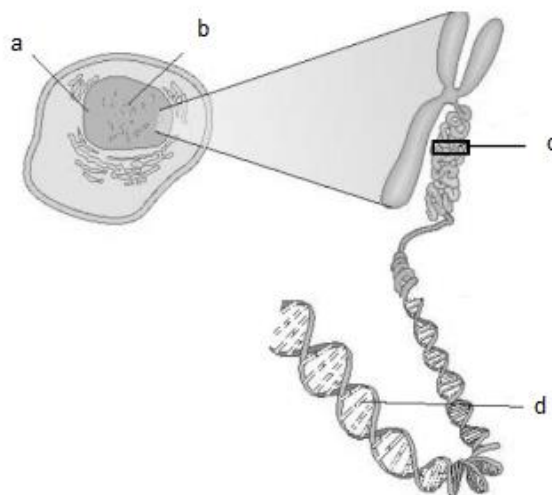
6. Give three ways you could increase the strength of an electromagnet

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Section 2: Refreshing current knowledge

1) Label this diagram, if you want use the keywords below.



chromosome

DNA

adenine

nucleus

gene

cell

2) Describe a strand of DNA

3) State the complimentary base pairs

4) What bonds the complementary base pairs together?

Section 3: Application of knowledge

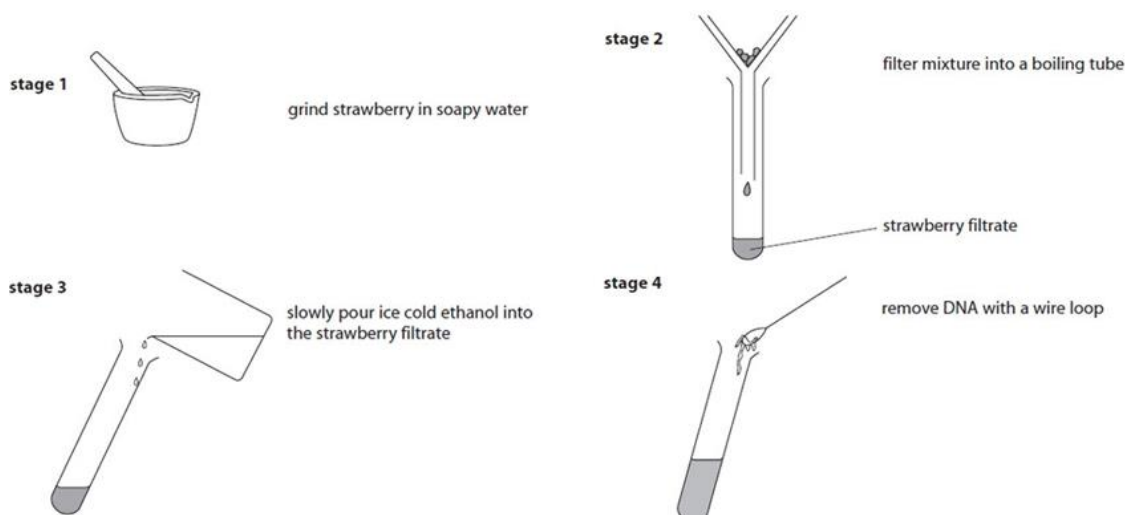
1) A female with the genotype (Dd) and a male with the genotype (DD) for sickle cell disease are about to start a family. Complete the Punnett square to show the possible genotypes of their offspring for sickle cell disease. (2)

		Female gametes	
Male gametes			

(ii) State the percentage chance that a child from these individuals will be (2)

1. a carrier of sickle cell disease %
2. an individual with sickle cell disease %

2) Some students extracted DNA from strawberries. The diagram shows the method used. Suggest the purpose of stages 1 and 3 in the DNA extraction. (2)



Section 1: Review of prior knowledge

1. How is an egg cell adapted to its function?

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2. State the pH range for alkalis

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3. What is the mass of an object if the weight is 120N on Jupiter whose GFS is 25N/kg?

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4. Define the key term species

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5. Hydrogen chloride, HCl, can be formed by the reaction of hydrogen, H₂, with chlorine, Cl₂. Write the balanced equation for this reaction.

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6. What happens when we move a wire in a magnetic field?

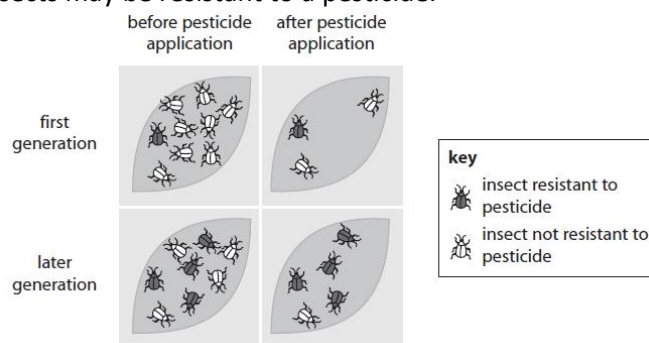
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Section 2: Refreshing current knowledge

1) Farmers use pesticides to kill insect pests on vegetables.

The diagram shows how some insects may be resistant to a pesticide.



Use the diagram to explain how the presence of resistant organisms helps to support Darwin's theory of evolution. (6)

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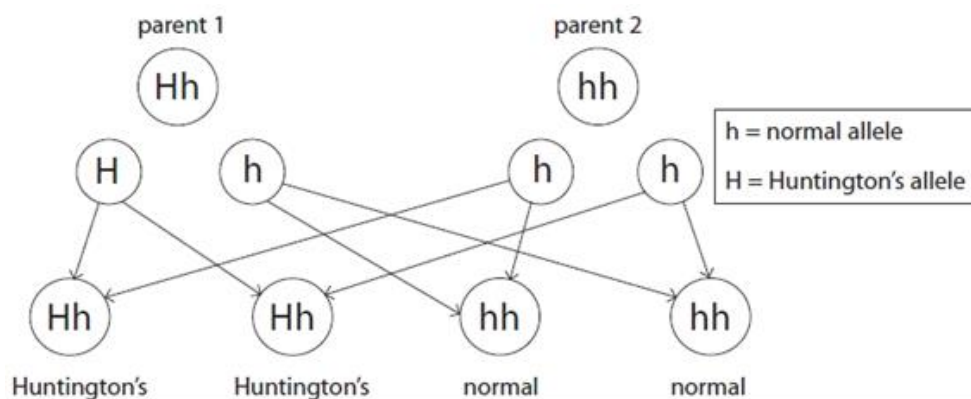
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2) The dodo was a flightless bird which is now extinct. The dodo lived on the small island of Mauritius. It became extinct in 1681. Using your knowledge of natural selection, suggest why the dodo may have become extinct. (3)

Section 3: Application of knowledge

1) Huntington's disease is a genetic disorder.
The genetic diagram shows the inheritance of this disorder.



(a) (i) Use words or letters from the box to complete the following sentences. (2)

dominant	recessive	phenotype
h	HH	hh

Huntington's disease is caused by a allele.

People with Huntington's disease can have the genotype Hh or

(ii) Complete the Punnett square to show the potential offspring of two parents heterozygous for Huntington's disease. (2)

(iii) State the probability that a child of two parents, heterozygous for Huntington's disease, will have the disease. (1)

Section 1: Review of prior knowledge

1. What is the function of the nucleus?

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2. State the formula of the following compounds:

Oxygen:

Carbon
dioxide:

Water:

3. What is the definition of current

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4. Name the enzymes which break down starch, proteins and fats.

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5. Write the general word equation for neutralisation

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6. Describe the energy transfers in a television

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Section 2: Refreshing current knowledge

1) What is the difference between ligaments and tendons?

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2) Describe what is meant by a deficiency disease and give an example of one.

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3) Describe the functions of the skeleton

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Section 3: Application of knowledge

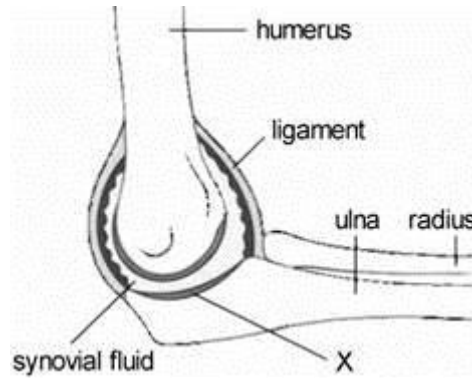
1) Ligaments hold bones together at a joint. Ligaments can stretch. Why must ligaments be able to stretch and why is it important that tendons do not stretch? (2)

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2) Diagram 2 shows the elbow joint. Tissue X covers the ends of the bones at the joint.



(i) Give the name of tissue X. (1)

(ii) Osteoarthritis is a very painful condition. In the joints of people with osteoarthritis small pieces of tissue X break off. Suggest two effects this could have on the joint. (2)

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Section 1: Review of prior knowledge

1. State 2 factors which could affect the rate of enzymes working

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2. What gas is formed when a metal reacts with an acid?

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3. What is an induced magnet?

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4. What is a binomial name?

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5. Describe how are the particles arranged in a gas

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6. If 200 J of electrical energy is supplied to a bulb and 50 J is transferred as light energy, how much energy is wasted as heat?

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Section 2: Refreshing current knowledge

1) State the word equations for aerobic and anaerobic respiration

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2) Match up the parts of the blood to their function, write the missing function.

A) Red blood cell
B) White blood cell
C) Plasma
D) Platelets

1) Ingesting pathogens and producing antibodies
2) Contains haemoglobin which binds with oxygen
3) Causes blood to clot and helps form scabs

3) Explain the difference between the left and right ventricle

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Section 3: Application of knowledge

1) Describe the functions of white blood cells. (2)

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2) Person B has a low number of red blood cells compared to the healthy person.
Suggest an effect this may have on person B and explain why this would be. (2)

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Section 1: Review of prior knowledge

1. What is a period (menstruation) and how often does a woman have a period (on average)?

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2. What can chromatography be used for?

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3. Describe a series circuit

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4. Define the key term adaptation

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5. Describe the difference between an atom, element, molecule and compound

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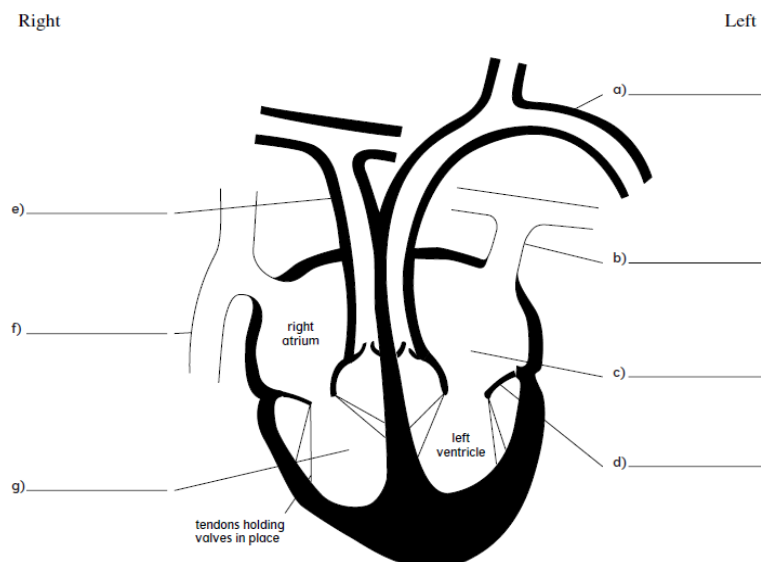
6. Which forms of energy are often produced as wasted energy?

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Section 2: Refreshing current knowledge

1) Label the parts of the heart



Section 1: Review of prior knowledge

1. Where do producers get their energy from?

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2. Define atomic number

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3. Describe the test for carbon dioxide

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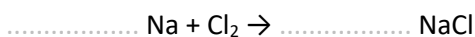
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4. What does amylase break down and state the product.

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5. Balance the equation for the reaction between sodium and chlorine to produce sodium chloride by putting numbers in the spaces provided.



6. Describe the energy changes taking place as a ball falls from a height.

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Section 2: Refreshing current knowledge

1) Complete the table

Solution	Strong Acid			Weak alkali	
pH value range			pH7		
Universal indicator colour					

2) What ions do all acids contain?

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3) What ions are commonly found in alkalis?

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4) What is the ionic equation for neutralisation?

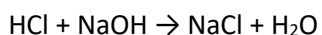
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5) Complete the table

Acid	Formula	Salt name
	HCl/	
		Sulphate
Nitric acid		
		Phosphate

Section 3: Application of knowledge

1) Titration can be used to determine the exact amount of hydrochloric acid that reacts with a given amount of sodium hydroxide solution.



(a) What type of reaction takes place when hydrochloric acid reacts with sodium hydroxide solution? (1)

- A neutralisation
- B oxidation
- C precipitation
- D reduction

(b) Suggest why universal indicator must not be used in titration experiments. (1)

(c) Sodium hydroxide solution is titrated with dilute hydrochloric acid. The results of the experiment are:

volume of sodium hydroxide solution = 25.0 cm³

volume of 0.100 mol dm⁻³ hydrochloric acid used

rough titration	= 23.1 cm ³
1 st titration	= 22.6 cm ³
2 nd titration	= 22.8 cm ³

State the volume of hydrochloric acid that must be used to calculate the concentration of sodium hydroxide solution. (1)

volume of hydrochloric acid = cm³

Section 1: Review of prior knowledge

1. What causes the physical changes that take place at puberty?

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2. How are elements in the modern periodic table arranged?

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3. If the current in a circuit is 1.4A, and the resistance is 3Ω , what is the potential difference in the circuit?

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4. Explain what happens to the heart rate and breathing rate of a person when they exercise.

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5. Describe how metamorphic rocks are formed

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6. State the equation for calculating efficiency

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Section 2: Refreshing current knowledge

1) Complete this word equation:

Potassium hydroxide + Hydrochloric acid $\rightarrow$

2) What are the products of the following neutralisation reactions?

a. Metal + acid $\rightarrow$

b. Metal oxide + acid $\rightarrow$

c. Metal hydroxide + acid $\rightarrow$

d. Metal carbonate + acid $\rightarrow$

3) State the salt formed when calcium oxide reacts with phosphoric acid

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4) State the symbol equation for reacting sodium oxide (Na_2O) with hydrochloric acid.

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5) Explain what is meant by thermal decomposition.

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6) Write a word and balanced symbol equation for the thermal decomposition of calcium carbonate.

Section 3: Application of knowledge

1) Sodium chloride solution can be made from dilute hydrochloric acid and sodium hydroxide solution. Describe a titration experiment to find the exact volume of hydrochloric acid needed to neutralise 25.0 cm^3 of sodium hydroxide solution and how you would use this result to obtain pure, dry crystals of sodium chloride. (6)

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Section 1: Review of prior knowledge

1. Name an example of a biological catalyst.

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2. State the 3 subatomic particles, include their charges and masses

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3. Name 3 different methods of heat transfer

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4. Describe the dangers of lactic acid

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5. Draw a particle diagram for oxygen, carbon dioxide and water

Oxygen	Carbon dioxide	Water

6. What is the unit for current, how do you measure it and how do you place it in a circuit?

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Section 2: Refreshing current knowledge

1) Metals are found in the Earth's crust. Unreactive metals are found as uncombined metals. Which of these metals is usually found uncombined in the Earth's crust?

A gold

B iron

C potassium

D zinc

2) Part of the reactivity series is shown

aluminium	↑	most reactive
iron		
lead		
copper		least reactive

Aluminium is extracted from aluminium oxide by electrolysis. Heating with carbon is not used to extract aluminium from aluminium oxide. Explain why aluminium is not extracted by heating with carbon.

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3) Lead is extracted from its oxide by heating the oxide with carbon rather than by using electrolysis. Explain why.

4) When iron nails are left exposed to air and water, the iron reacts to form rust. In this reaction, iron is
A oxidised B crystallised C neutralised D reduced

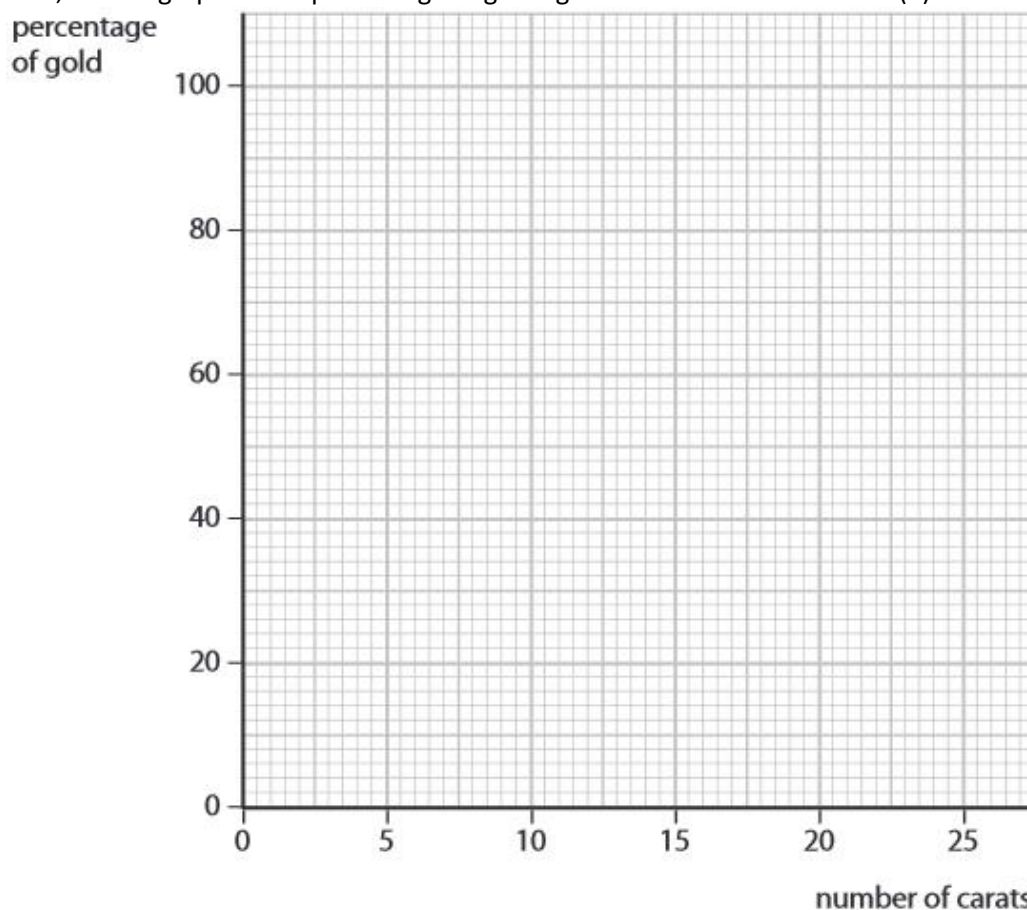
Section 3: Application of knowledge

1) Lithium and caesium are two metals in group 1 of the periodic table. Caesium is more reactive than lithium. Explain, in terms of the structure of their atoms, why caesium is more reactive than lithium. (3)

2) The purity of gold is often measured in carats. The data shows how the number of carats is related to the percentage of gold.

number of carats	percentage of gold
24	100
22	92
18	75
9	38

On the grid provided, draw a graph of the percentage of gold against the number of carats. (2)



Section 1: Review of prior knowledge

1. What chemical is used to test for starch?

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2. Describe the test for hydrogen gas

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3. Describe the energy changes taking place as a javelin is thrown across a field.

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4. State what protease breaks down and its products.

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5. Complete the equation for the reaction between zinc and copper sulphate by putting formulae in the spaces provided.



6. How long did it take for a car to travel 30 metres when travelling at 0.6m/s?

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Section 2: Refreshing current knowledge

1) Petrol is a flammable liquid.

Which hazard symbol is used on containers to show that the liquid in the container is flammable



a)



b)



c)



d)

2) Pieces of zinc react with dilute hydrochloric acid to produce zinc chloride and hydrogen gas.

(i) State what you would **see** when zinc is added to dilute hydrochloric acid.

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(ii) Write the word equation for this reaction.

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(iii) Describe a test to show that this reaction is exothermic.

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Section 3: Application of knowledge

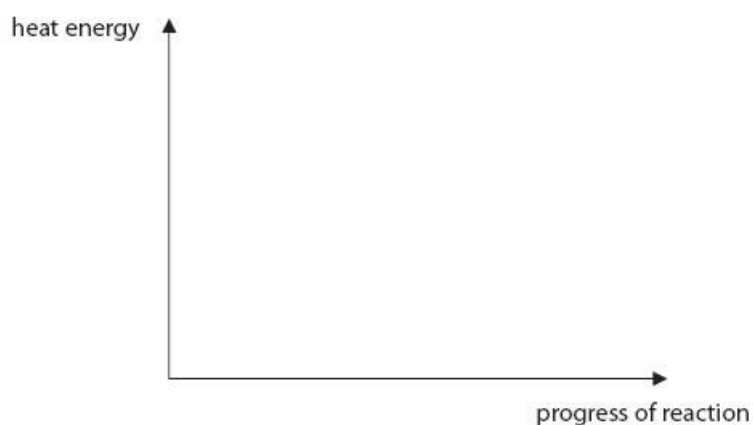
1) The neutralisation reaction between ethanoic acid and sodium carbonate is an endothermic reaction. Describe what is meant by the term endothermic reaction. (2)

2) This question is about three different reactions, P, Q and R.
As the reactions are carried out, the initial and final temperatures are recorded.

reaction	initial temperature / °C	final temperature / °C
P	16	12
Q	15	34
R	17	17

Explain which of these reactions, P, Q or R, is exothermic. (2)

3) On the diagram below draw labelled lines to show the relative energies of the reactants and products in an exothermic reaction.



1. What is the symbol equation for photosynthesis?

2. Use the periodic table to state the number of protons, electrons and neutrons found in the following elements: neon, beryllium and nitrogen.

3. Describe 1 problem associated with acid rain

4. List 3 chemical barriers which provide us with protection from pathogens.

5. What is the amplitude of a wave and what is it measured in?

6. Identify the input and output energies for the following appliances: TV; Battery operated radio and microphone.

1) Natural gas is a good fuel because

- A supplies of it will never run out
B it always burns with a yellow flame that is easily seen
C it produces no waste gases on complete combustion
D it produces no solid waste on complete combustion

2) All alkanes

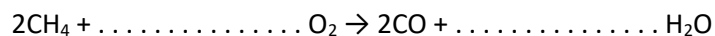
- A have molecules containing oxygen atoms B form a colourless mixture when shaken with bromine water
C can burn in a limited supply of air to form carbon monoxide D have molecules that each have a C=C bond

3) Which of these is the formula of a molecule of a hydrocarbon?

- A $\text{CH}_3\text{COOCH}_3$ B $\text{CH}_3\text{CH}_2\text{Cl}$ C CH_3CH_3 D CH_3COOH

4) Carbon monoxide gas, CO, can be formed when methane, CH₄, undergoes incomplete combustion.

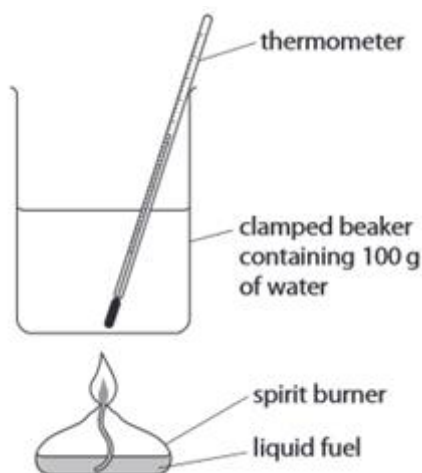
(i) Balance this equation for the incomplete combustion of methane by putting numbers in the spaces provided. (2)



(ii) Carbon monoxide is a toxic gas and can cause death. Explain how carbon monoxide can cause death. (2)

Section 3: Application of knowledge

Experiments were carried out to measure the heat energy given out when three liquid fuels, A, B and C, were burned. In each experiment the same mass of fuel was used to heat the same volume of water, using the apparatus shown.



Here are the results, together with the cost of the mass of fuel burnt in each experiment.

fuel	initial temperature of water (°C)	final temperature of water (°C)	cost of fuel burnt (pence)	observations of the way the fuel burns
A	15	51	3.0	burns with a blue flame – no smoke
B	16	21	0.5	burns with a yellow flame – black smoke
C	15	39	2.0	burns with a yellow flame – no smoke

A student considered these results and decided that fuel B was the best fuel.

Considering all the evidence for the fuels, A, B, and C, explain whether this is a good choice or not. (6)

Section 1: Review of prior knowledge

1. What is the function of the chlorophyll in plants?

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2. What is the greenhouse effect?

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3. What is refraction and what causes it?

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4. Describe a situation which would result in anaerobic respiration taking place.

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5. Iron is extracted from iron oxide, Fe_2O_3 . In the extraction process the iron oxide is heated with carbon to form iron and carbon dioxide. Write the balanced equation for this reaction.

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6. A peregrine falcon can fly at speeds of 50m/s, at this speed how far can it travel in 7 seconds?

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Section 2: Refreshing current knowledge

1) Draw one straight line from each fraction to a use of that fraction

fraction		use of fraction
kerosene	●	● surfacing roads
fuel oil	●	● fuel for large ships
bitumen	●	● fuel for planes
		● fuel for trains

2) The petrol fraction and the diesel oil fraction have different physical properties. Choose one property, describing the difference between the fractions.

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3) The petrol fraction contains octane, C_8H_{18} . Octane is a hydrocarbon. Describe what is meant by the term hydrocarbon.

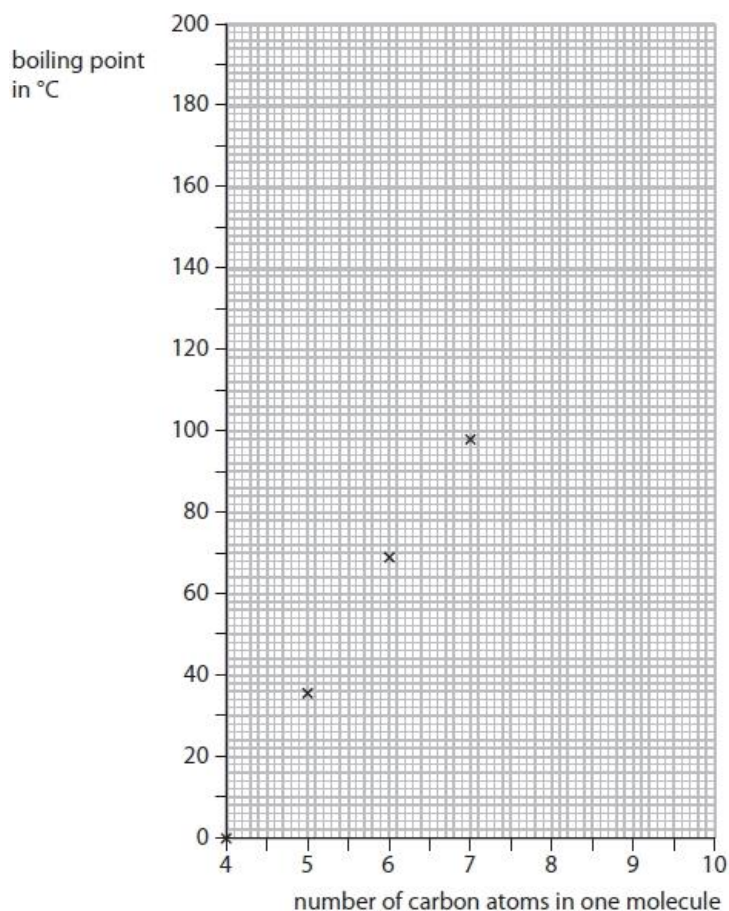
Section 3: Application of knowledge

1) The alkanes are hydrocarbons. The table shows the number of carbon atoms per molecule and the boiling point for some alkanes.

alkane	number of carbon atoms in one molecule	boiling point ($^{\circ}C$)
butane	4	0
pentane	5	36
hexane	6	69
heptane	7	98
octane	8	126
nonane	9	151

The boiling points for butane, pentane, hexane and heptane are plotted on the graph.

(i) Plot the boiling points for octane and nonane and draw the line of best fit. (2)



(ii) Describe the trend shown by the line of best fit on the graph. (2)

(iii) Extend the line on your graph to estimate the boiling point of the alkane with ten carbon atoms in one of its molecules. (2)

boiling point =

Section 1: Review of prior knowledge

1. State the word equation for the breakdown of lactic acid

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2. The formula of aluminium nitrate is $\text{Al}(\text{NO}_3)_3$. State the total number of atoms in the formula $\text{Al}(\text{NO}_3)_3$

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3. A jumbo jet has a mass of 40,000,000g. If its engines produce a force of 800,000N, what will its acceleration be?

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4. Name an organ which produces enzymes.

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5. Which gas is responsible for acid rain?

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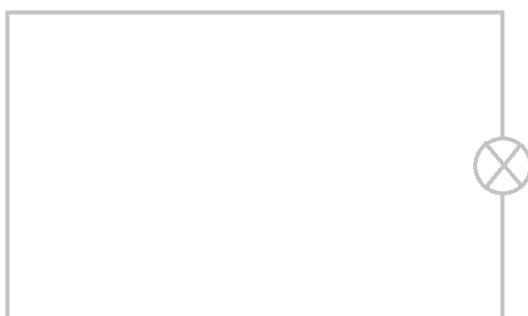
6. Describe the energy changes taking place in a battery-operated series circuit containing a single bulb.

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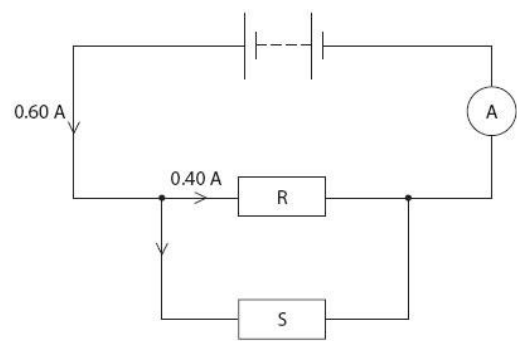
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Section 2: Refreshing current knowledge

1) Draw a circuit to show how an ammeter and voltmeter should be placed in a circuit.



2) (a) The diagram shows an electric circuit with two resistors, R and S.



Use information from the diagram to calculate the current in S.

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3) Draw the symbols for these electrical components

Component	Symbol	Component	Symbol	Component	Symbol
Battery		Resistor		Diode	
Switch		Variable resistor		Thermistor	
Voltmeter		Lamp		LDR	
Ammeter		Motor		LED	

Section 3: Application of knowledge

1) Describe what happens to current and voltage in a series and a parallel circuit (3)

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2) Describe how a student should increase the current in a bulb in a circuit. (2)

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Section 1: Review of prior knowledge

1. Give two ways that the structure of a root hair cell is adapted to absorb water and minerals

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2. Describe how sedimentary rocks are formed

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3. State the forms of energy emitted from the following: fires; bicycle and fan.

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4. In what order does food pass through your body? (Name the organs)

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5. Magnesium carbonate reacts with dilute nitric acid. Give the names of the products formed in this reaction.

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6. If the current in a circuit is 1.4A, and the resistance is 3Ω , what is the potential difference in the circuit?

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Section 2: Refreshing current knowledge

1) Describe the difference between an insulator and a conductor

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2) State the equation for calculating resistance

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3) Describe what causes resistance in wires

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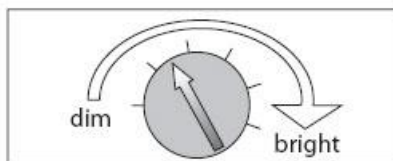
4) Explain what will happen to resistance when the length of a wire increases

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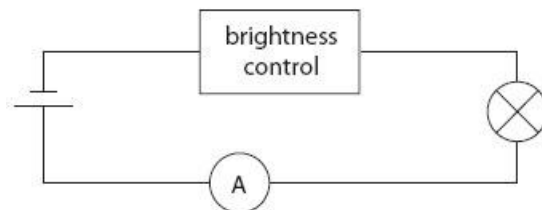
Section 3: Application of knowledge

1) An inventor is designing a battery-powered torch. She wants the torch to have a brightness control. She builds this circuit to test the lamp in the torch.



brightness control

a) Add a voltmeter to the circuit which will measure the potential difference (voltage) across the lamp. (1)

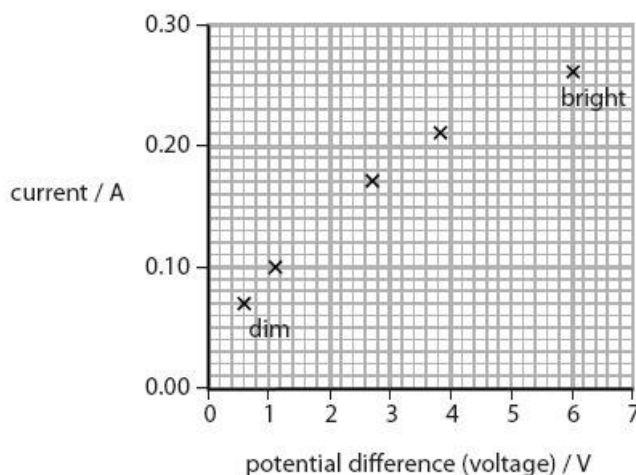


b) She sets the control at the "bright" position. The current is 0.26 A and the potential difference (voltage) across the lamp is 6.0 V. Calculate the resistance of the lamp. (2)

c) The inventor takes readings of the potential difference (voltage) across the lamp and the current at different positions of the control from "dim" to "bright". She plots a graph of the readings.

	dim					bright
voltage / V	0.6	1.1	2.0	2.7	3.9	6.0
current / A	0.07	0.10	0.14	0.17	0.21	0.26

(i) Complete this graph by plotting the missing point and drawing the curve of best fit. (2)



(ii) Describe what this graph shows about how the current changes as the voltage changes. (2)

Section 1: Review of prior knowledge

1. How are villi adapted to help absorb nutrients?

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2. Calcium nitrate solution reacts with sodium carbonate solution. The products are calcium carbonate and another salt. Write the word equation for this reaction.

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3. What is the motion of any object if all forces are balanced?

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4. Describe the function of enzymes

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5. What are the colours of light in the visible spectrum? (Start with the longest wavelength)

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6. Explain the difference between a scalar and vector quantity

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Section 2: Refreshing current knowledge

1) What is the power of a device that is used for 3600s and consuming 450kJ of energy

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2) How long was a 100W device left on for it consumed 2520kJ of energy?

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3) Describe how a coal power station generates electricity.

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4) Summarise how electricity is generated in a coal power station either state a step-by-step; write bullet points or create a flow chart.

Section 3: Application of knowledge

1) The photograph shows a portable petrol-driven generator.



The small petrol engine drives the dynamo. The dynamo generates electricity. This arrangement is not efficient in generating electricity. Apart from efficiency, state one advantage and one disadvantage this petrol-driven generator has, when compared with a small wind-powered generator.

(i) Advantage (1)

(ii) Disadvantage (1)

2) a) Homeowners are being encouraged to fit solar panels to the roofs of their homes.

Explain why using solar panels to generate electricity for the National Grid benefits the environment. (2)

b) A homeowner fits a solar panel to her roof.

The cost of the solar panel is £4800.

The solar panel supplies an average of 800 kW h of electrical energy to the National Grid each year.

The homeowner is paid 40p for each kW h of energy supplied to the National Grid.

Calculate the payback time for the solar panels by selling energy to the National Grid. (3)

payback time = years

Section 1: Review of prior knowledge

1. State the word equation for aerobic respiration

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2. Magnesium carbonate, MgCO_3 , can be reacted with dilute sulfuric acid, H_2SO_4 , to form magnesium sulphate, water and carbon dioxide. Write the balanced equation for this reaction.

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3. What is the voltage of the power supply for a 144W device which has current of 16A flowing through it?

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4. What is immunity?

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5. Describe the test for oxygen

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6. Describe the energy transfer taking place in the formation of fossil fuels.

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Section 2: Refreshing current knowledge

1) What is the difference between weight and mass?

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2) How is weight calculated?

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3) What is the GFS of Mars if a 150kg object has a weight of 570N?

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4) How can weight be measured?

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5) How is weight affected by the gravitational field strength?

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Section 3: Application of knowledge

1) The photograph shows a man dropping an egg inside a padded box from a height.



He is investigating to see if the padding stops the egg from breaking. The weight of the egg is 0.6 N. Calculate the work done on the egg to lift it up by 20 m. State the unit. (3)

2) A car engine produces an average driving force of 1200 N. The car travels 8.0 m. Calculate the work done by the force over this distance. (2)

3) A car engine produces an average driving force of 800 N. The car travels 6.5 m. Calculate the work done by the force over this distance. State the unit. (3)

Section 1: Review of prior knowledge

1. Describe how to test for starch in food.

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2. Methane burns in oxygen to form carbon dioxide and water. Write the balanced equation for this reaction

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3. Describe a longitudinal wave

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4. What type of protein do pathogens have on their surface?

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5. Use the periodic table to state the number of protons, electrons and neutrons found in the following elements:
aluminium, oxygen and hydrogen.

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6. What type of substances reflect waves?

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Section 2: Refreshing current knowledge

1) State Hooke's law

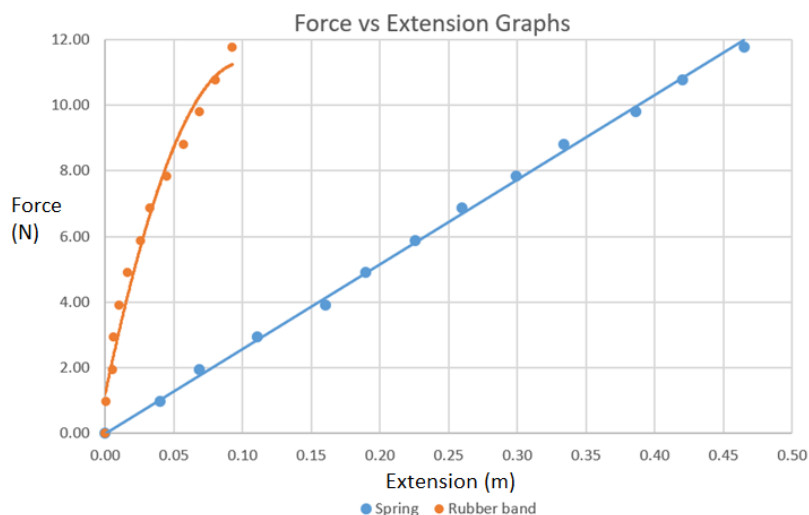
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2) Describe how to calculate the extension of a spring

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3) Compare the results between a spring and a rubber band when the force added to each was increased.



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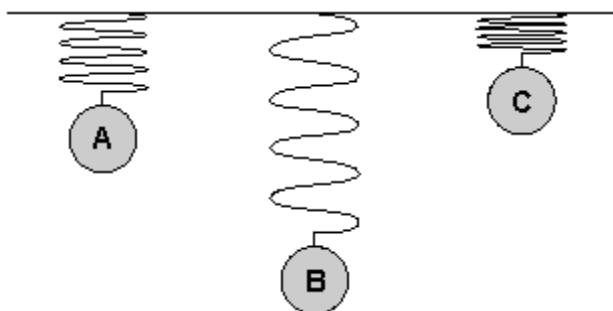
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Section 3: Application of knowledge

1) John attaches three metal balls to identical springs. The diagram below shows what happens.



Which ball is the heaviest?
Write the letter.

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Explain your answer.

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Section 1: Review of prior knowledge

1. Name the substrate for the following enzymes: amylase, protease and lipase.

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2. Describe the structure of an atom

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3. State 2 common forms of waste energies.

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4. State the word equation for anaerobic respiration

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5. Describe how igneous rocks are formed

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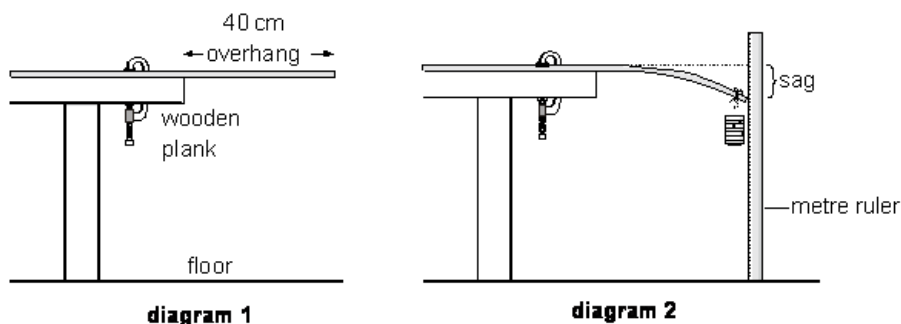
6. A kettle uses the mains electricity at 230V. The current is 13A. What is the power of the kettle?

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Section 2: Refreshing current knowledge

Oliver clamped a wooden plank to a desk. There was a 40 cm overhang as shown in diagram 1.

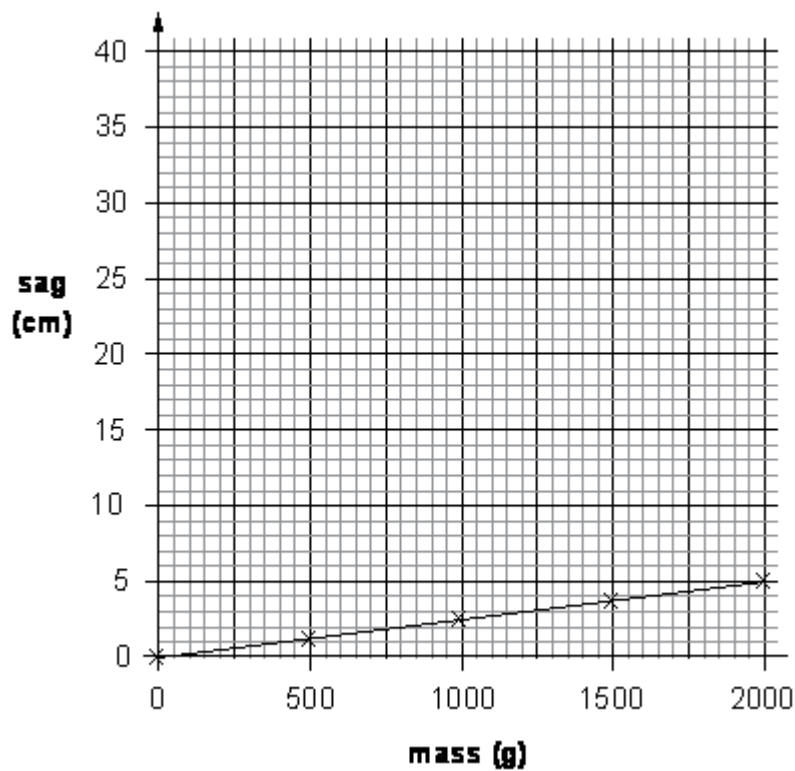


Oliver added masses to the end of the wooden plank as shown in diagram 2. He measured the sag. The graph below shows his results.

Oliver repeated his test with a new plank with an 80 cm overhang. His results are shown below.

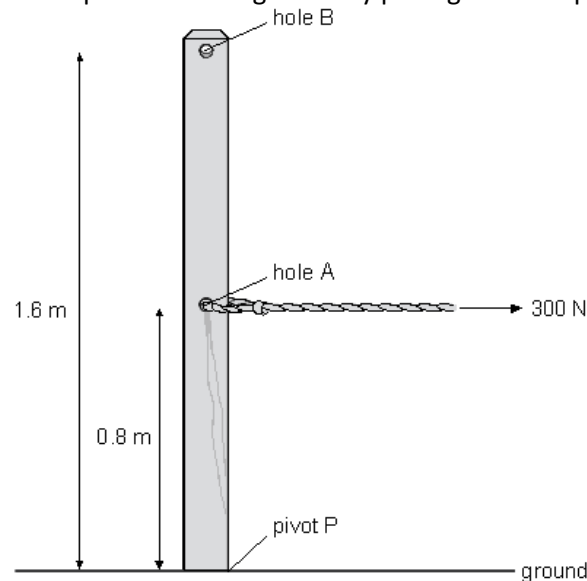
mass (g)	sag (cm)
0	1.0
500	15.0
1000	25.0
1500	31.0
2000	35.0

(i) Plot the results from Oliver's second test on the grid above. Use the points to draw a line of best fit.



Section 3: Application of knowledge

1) A builder tried to remove a wooden post from the ground by pulling with a rope.



(a) (i) The builder attached a rope to hole A, 0.8 m above the ground. He pulled with a horizontal force of 300 N. Calculate the turning moment about the pivot P. Give the unit.

(ii) He then attached a rope to hole B, 1.6 m above the ground. He pulled with a horizontal force. What force would produce the same turning moment as before?

(b) The post breaks off and falls on the ground as shown.



The weight of the broken post is 120 N. The area in contact with the ground is 0.2 m^2 . Calculate the pressure of the broken post on the ground. Give the unit.