13+

Dulwich College

YEAR 9 ENTRANCE AND SCHOLARSHIP EXAMINATION

SAMPLE PAPER

Science

1 HOUR 30 MINUTES

QUESTION 1 Name: .....

a) Underline the word, number or phrase that completes each sentence correctly.

i) A car travels along a road at 90 km/h. In 40 minutes it travels

36km. 45km. 60km. 67km. [1]

ii) A spring is 5.0cm long when unstretched. When a 10N load is suspended on the spring its total length becomes 7.0cm. When a 30N load is suspended on the spring its total length will be

6.0cm. 8.0cm. 11.0cm. 15.0cm. [1]

iii) A device that converts sound energy to electrical energy is a

lamp. loudspeaker. microphone. motor. [1]

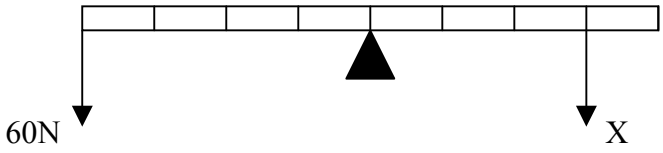
iv) The number of centimetres squared (cm^2) in a metre squared (m^2) is

1 000 000 10 000 100 0.01 [1]

v) A magnet will attract

aluminium foil. a copper coin. an iron bar. a zinc plate. [1]

vi) The diagram below shows a balanced see-saw.



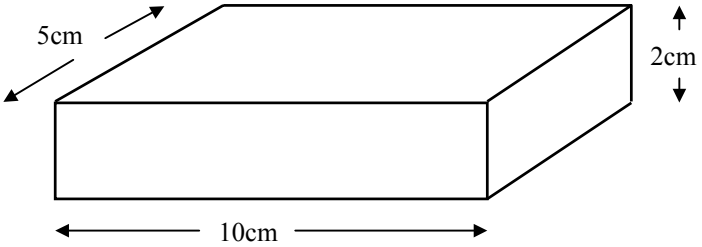
The size of X is

30N. 45N. 80N. 90N. [1]

Question 1 continued on the next side ⇨

Question 1 (continued)

b) A block of wood is shown below.



i) Calculate the volume of the block.

.....

..... [2]

ii) The mass of the block is 70g. Calculate the density of the wood using the formula density = mass/volume. Give the correct unit for your answer.

.....

.....

..... [3]

iii) Would you expect this block to float or sink when placed in water? Explain your answer.

.....

..... [2]

iv) On Earth, a 100g block weighs 1N. What is the weight of the block in the question?

..... [1]

v) Calculate the pressure exerted by the block in the question when it rests on its largest face.

.....

.....

..... [3]

[Total marks for this question: 17]

QUESTION 2 Name: .....

The table below gives some data on the planets in our Solar System.

Planet	Distance from Sun compared to Earth	Time to orbit Sun once	Diameter compared to Earth	Mass compared to Earth	Density compared to Earth
Mercury	0.4	88 days	0.4	0.06	0.98
Y	0.7	224 days	0.9	0.8	0.95
Earth	1.0	365 days (1 year)	1.0	1.0	1.0
Mars	1.5	2 years	0.5	0.1	0.70
Jupiter	5.2	12 years	11.2	317	0.24
Saturn	9.5	29 years	9.4	95	0.12
Uranus	19.2	84 years	4.0	15	0.23
Z	30.1	165 years	3.9	17	0.30
Pluto	39.5	248 years	0.2	0.002	0.36

a) The planets are listed in order of increasing distance from the Sun. Write down the names of planets Y and Z.

Planet Y is ..... Planet Z is ..... [2]

b) Which planet is almost ten times further away from the Sun than the Earth?

..... [1]

c) Describe in words how the time to orbit the Sun once changes as the distance from the Sun changes.

.....

..... [2]

d) Which planet takes twice as long to orbit the Sun as the Earth does?

..... [1]

Question 2 continued on the next side ⇨

Question 2 (continued)

e) Which planet will have the smallest volume?

..... [1]

f) Is Pluto or Mercury the planet with the lowest mass?

..... [1]

g) From the table, which two planets are most likely to be made from same substances as the Earth. Explain how the table helps you decide.

.....

..... [1]

h) The Earth is 150 million kilometres from the Sun. Use the table to calculate how far Mercury is from the Sun.

.....

.....

..... [3]

i) Using the fact that the Earth is 150 million km from the Sun, two pupils are trying to work out the distance between the Earth and Mars. One says that it is 75 million km, but the other says it is 375 million km. By using a diagram and some calculations, show that both pupils could be right at different times.

Your diagram

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.....

.....

.....

.....

..... [4]

[Total marks for this question: 16]

QUESTION 3 Name: .....

a) Underline the word or phrase that completes each sentence correctly.

i) Metals are usually

magnetic. brittle. electrical conductors. solids. [1]

ii) Particles are most spread out in

solutions. liquids. solids. gases. [1]

iii) Atoms are the smallest unit of

compounds. mixtures. gases. elements. [1]

iv) Wasp stings are mildly alkaline. The best cure for a wasp sting would be

limewater. vinegar. water. sodium hydroxide solution. [1]

v) Metals are usually obtained from their ores by

oxidation. neutralisation. reduction. precipitation. [1]

vi) 'Acid rain' is formed by rain dissolving

carbon dioxide. sulphur dioxide. carbon monoxide. ozone. [1]

b) Some magnesium metal was warmed with dilute sulphuric acid. Bubbles of gas were given off and tested to see if the gas were hydrogen. A colourless solution remained.

i) How would you test a gas to see if it were hydrogen?

.....

..... [2]

A second sample of magnesium was dropped into some copper(II) sulphate solution. A dark, pinkish-brown coating appeared on the surface of the magnesium and the blue colour of the solution disappeared.

ii) Name the dark coating on the surface of the magnesium.

..... [1]

iii) Write a word equation for the reaction.

.....

..... [2]

iv) Explain how this experiment enables you to say whether copper is more or less reactive than magnesium.

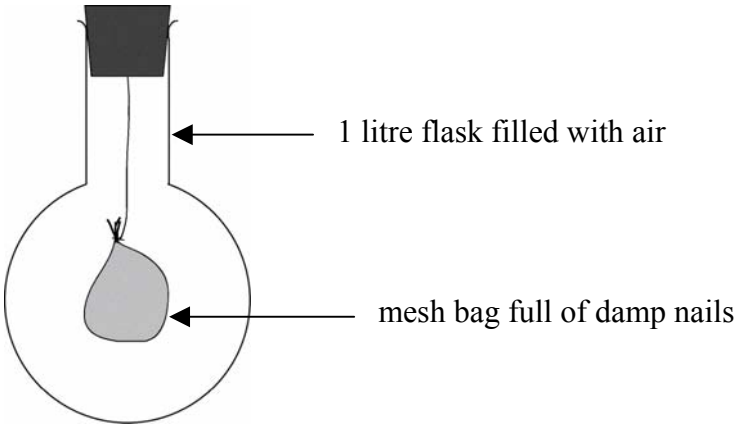
.....

..... [1]

[Total marks for this question: 12]

QUESTION 4 Name: .....

In an experiment to find the percentage of oxygen in the air, George used the apparatus below. The flask full of air is securely closed with an airtight rubber bung. Hanging from the bung is a mesh bag containing some damp iron nails. Air is able to pass freely through the fabric of the bag.



a) What change in the appearance of the nails do you think he saw after a few days?

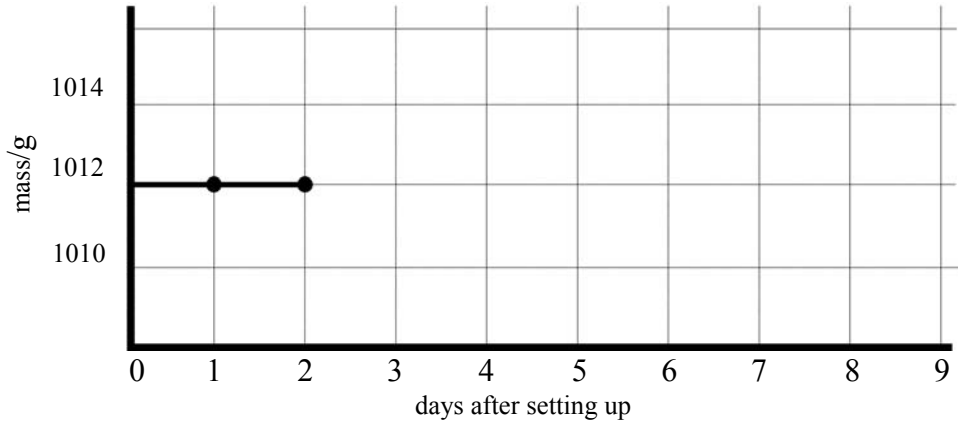
.....

..... [1]

b) Give a chemical name for the new substance formed.

..... [1]

c) He weighed the sealed flask just after the apparatus had been set up and then reweighed it every day for a week. He then plotted his results on a graph. Sketch on the axes below the graph that you would expect him to get. The first two points have been filled in for you. [1]



d) Explain the shape of the graph.

.....

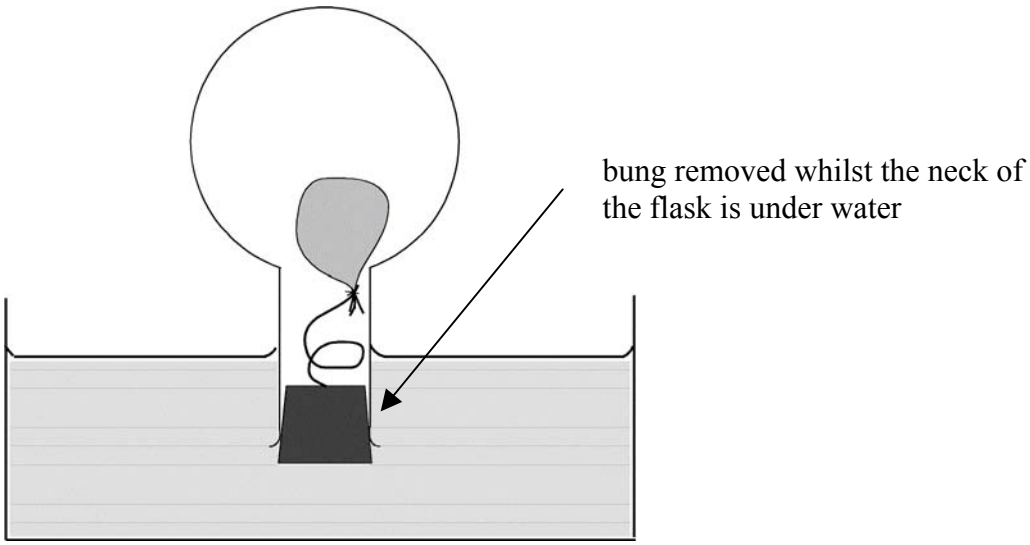
..... [1]

e) Add another line to your graph to show how the mass would have changed if the rubber bung had allowed air to leak in. Label this line clearly. [1]

Question 4 continued on the next side ⇨

Question 4 (continued)

At the end of an experiment, using a flask whose bung had not leaked, the flask was turned upside down in a large trough of water and held with the bung well below the surface. The bung was then removed whilst the mouth of the flask was kept below the surface of the water. Water rushed into the flask.



f) Why did water rush into the flask?

.....

..... [2]

g) When George did the experiment he first measured the volume of the empty flask. How do you think that he did this?

.....

.....

.....

..... [2]

h) He found the volume of the flask to be 1050 cm^3 and the total volume of the nails, bag and thread to be 30 cm^3. When the flask was opened under water 153 cm^3 of water entered the flask.

i) What volume of air was present in the flask when the bag of nails and the bung were in place?

..... [1]

ii) Use the results to calculate the percentage of oxygen in the air.

.....

..... [2]

Question 4 continued on the next side ⇨

Question 4 (continued)

i) What is the accepted value for the percentage of oxygen in air?

..... [1]

j) Suggest one reason why George's value does not match the accepted value and say how he might improve his experiment to overcome the problem.

Reason: .....

.....

.....

..... [1]

Improvement: .....

.....

.....

..... [1]

k) Describe how you would test an unknown gas to see whether it were oxygen.

.....

.....

..... [2]

l) Give ***two*** uses for oxygen gas.

Use 1: .....

Use 2: ..... [2]

m) Name ***two*** other gases present in the air.

Gas 1: .....

Gas 2: ..... [2]

[Total marks for this question: 21]

QUESTION 5 Name: .....

a) Underline the word or phrase that best completes each sentence.

i) All individual living things
take in food. need carbon dioxide. produce waste. need light. [1]

ii) In digestion
fat is released. vitamin C is absorbed. protein is broken down.
sugar is respired. [1]

iii) Mammals differ from birds because their
temperature is raised. reproduction is sexual. young are born live.
eyes face forward. [1]

iv) A vacuole in a plant cell
stores waste. cools the cytoplasm. holds water from respiration.
maintains its shape. [1]

v) Hair is useful to mammals because
it insulates them. it is waterproof. its colours are distinctive.
it protects the skin. [1]

vi) In sexual reproduction
anthers make pollen. sperm swim to the ovum. two nuclei fuse together.
two parents are needed. [1]

vii) A leaf's waxy cuticle
cuts down loss of water. attracts carbon dioxide. is pale green.
fixes the epidermal cells together. [1]

viii) Two muscles that pull in opposite directions are called
altruistic. agonistic. antagonistic. agnostic. [1]

ix) A refrigerator preserves food because
microbes grow slowly in the dark. it slows decay. bacteria can not get in.
bacteria are killed inside. [1]

b) Name and complete the following important biological word equation

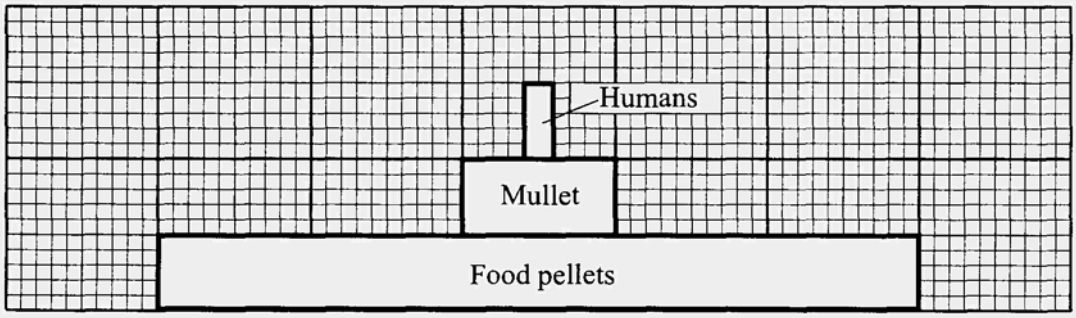
..... + ... ⟶ ..... + ... + energy
[5]

Question 5 continued on the next side ⇨

Question 5 (continued)

c) In a 'fish farm', fish called mullet are grown in big mesh cages in the sea. This is a pyramid of biomass for one food chain on this farm.

The bars are drawn to the same scale



Not all the biomass or energy in the food is transferred to humans.

i) What percentage of biomass in the pellets goes up the chain to form human biomass? Show your calculations

.....

..... [2]

ii) Give **two** reasons why much of the biomass from the pellets does not form human biomass.

.....

.....

..... [2]

iii) In a natural ecosystem, what would the fish find in place of the 'food pellets' bar in the fish farm?

..... [1]

iv) Suggest two reasons why the owners might decide to use food pellets instead of the natural base of the food chain?

.....

..... [2]

v) Suggest what use humans make of the following from their diet.

Protein .....

Oil or Fat ..... [2]

[Total marks for this question: 23]

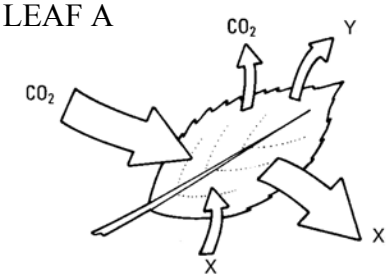
QUESTION 6 Name: .....

This question is about gas exchange

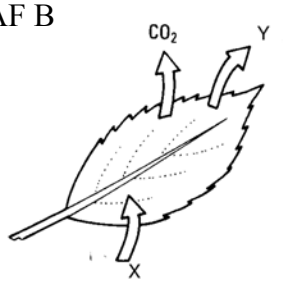
These diagrams below show two leaves with arrows indicating some of the things that enter or leave them.

One leaf is shown in day conditions and one as it might be at night.

LEAF A



LEAF B



i) In **Leaf A** carbon dioxide is shown both entering and leaving.
Will more enter it or leave it?

..... [1]

ii) Which leaf is in daylight?

..... [1]

iii) Suggest an identity for gas X?

..... [1]

iv) Through what structure do gases enter and leave a leaf?

..... [1]

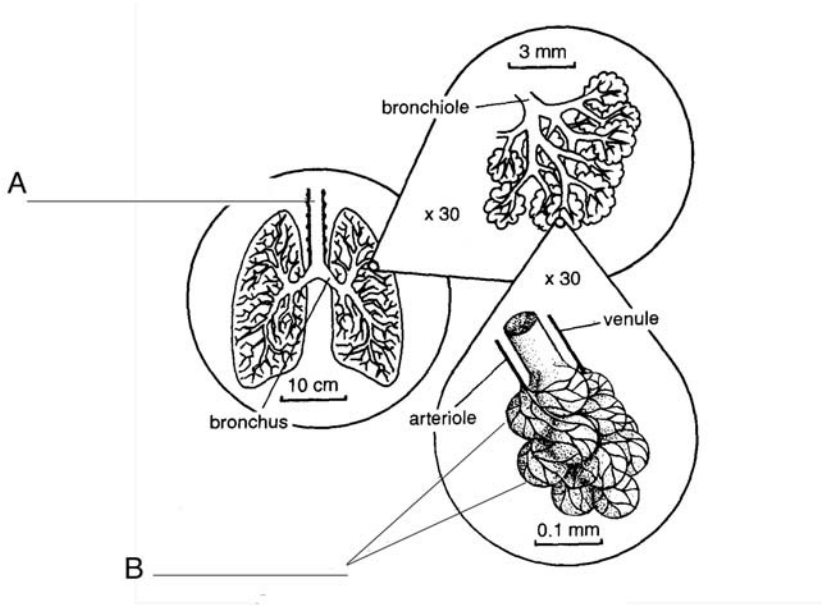
v) Substance Y is shown to leave the leaf. Where does the plant take it up?

..... [1]

Question 6 continued on the next side ⇨

Question 6 (continued)

b) These diagrams show parts of human lungs at three magnifications.



i) From the diagram above name A and B.

A ..... B ..... [2]

ii) Explain how structure B is damaged by smoking.
You may find it easiest to use a simple diagram and just a few words.

.....

..... [3]

[Total marks for this question: 10]