DULWICH COLLEGE
FOUNDED 1619

Year 9 Entrance and Scholarship Examination Science

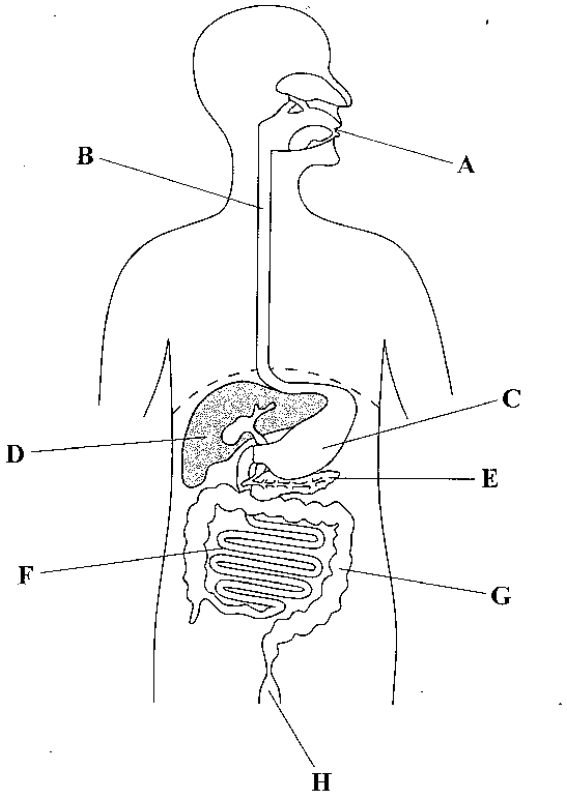
Specimen Paper

Time allowed for this paper is 60 minutes.

BIOLOGY Name: .....

QUESTION 1

The diagram shows the structure of the human digestive system.



(a) Why does food need to be digested?

.....

.....

.....[2]

(b) From the diagram above select the letter, or letters, that show where each of the following processes take place. Write the letter in the space provided.

(i) Change of pH from 7 to 2.....

(ii) Digestion by enzymes .....

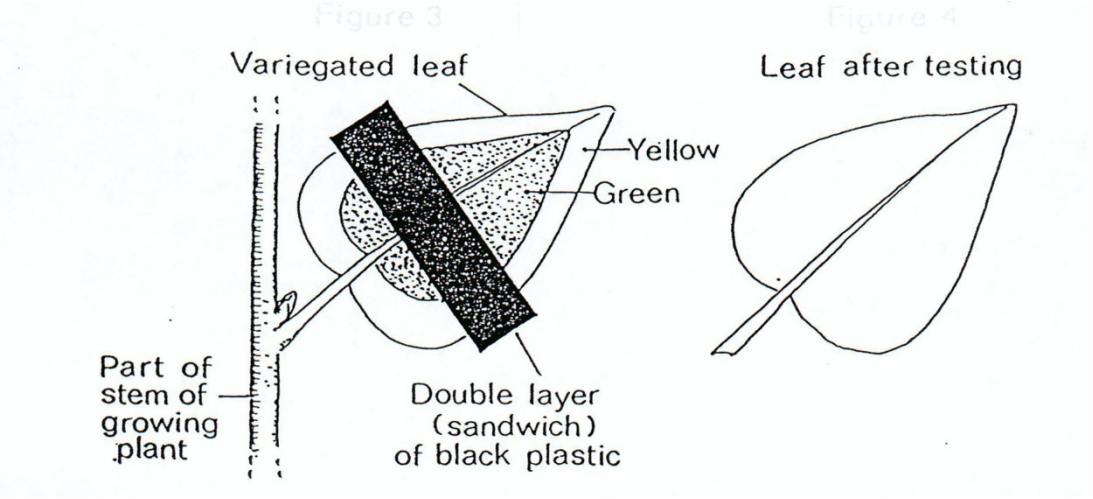
(iii) Absorption of digested food .....

(iv) Egestion .....

(v) Where bile is made ..... [5]

QUESTION 2

In an experiment designed to test the hypothesis that light is necessary for photosynthesis a variegated leaf attached to a suitable pre-treated plant was covered with black plastic as shown in the diagram below. After several hours in sunlight it was tested for the products of photosynthesis.



(a) In what way should the plant be pre-treated before the experiment?

.....

.....

.....[2]

(b) Describe the procedure you would use to test the leaf for products of photosynthesis.

.....

.....

.....

.....[2]

(c) Complete the diagram above and label it fully to show the results you would expect from the test. [2]

QUESTION 3

The table shows the results of biochemical tests on four substances found in food: protein, starch, fat and sugar.

Substance	Colour with Benedict's solution test	Colour with Iodine solution test	Colour with Biuret solution test	Colour with Emulsion test
A	Blue	Yellow-brown	Violet	Clear
B	Blue	Yellow-brown	Blue	Milky
C	Brick red	Yellow-brown	Blue	Clear
D	Blue	Bluey-black	Blue	Clear

(a) Identify substances **A**, **B**, **C** and **D**.

A .....

B .....

C .....

D ..... [4]

(b) **Explain the following statements:**

(i) Getting rid of undigested food (faeces) is **not** a type of excretion.

.....

..... [1]

(ii) A puffer fish inflating its body in defence would **not** be thought of as growth.

.....

..... [1]

(iii) Cellular respiration is **not** the same as breathing.

.....

..... [1]

TOTAL: 20 MARKS

CHEMISTRY Name: .....

QUESTION 1

Draw a ring around the word or phrase that best completes each sentence.

(a) The best method for separating water from a mixture of sand and seawater is

filtration. **chromatography.** **evaporation.** **distillation.** [1]

(b) The name for the reaction between sodium hydroxide and hydrochloric acid is

displacement. **neutralisation.** **reduction.** **precipitation.** [1]

(c) If a glowing splint re-lights when inserted into a sample of gas, the gas must be

oxygen. **hydrogen.** **carbon dioxide.** **nitrogen.** [1]

(d) When copper(II) carbonate is heated, the powder changes from green to

white. **blue.** **yellow.** **black.** [1]

QUESTION 2

The table shows some of the chemical reactions of four elements.

Element	Reaction with water	Reaction with dilute hydrochloric acid	Reaction when heated in air
A	none	none	burns to given an acidic oxide
B	vigorous, gas given off	violent, gas given off	burns to give a basic oxide
C	none	none	reacts slowly to give a basic oxide
D	none	vigorous, gas given off	burns to give a basic oxide

(a) Elements **B**, **C** and **D** are all metals.
Write the letters down in order of the reactivity of the metals starting with the **MOST** reactive.

most reactive .....

.....

.....

least reactive ..... [1]

Question 2 continues on the next side →

QUESTION 2 (continued)

(b) (i) Name **ONE** gas, present in the air, with which all four elements will react.

.....

(ii) Name the gas which is produced when element **B** reacts with water.

.....[2]

(c) What evidence is there to show that element **A** is the only non-metal?

.....

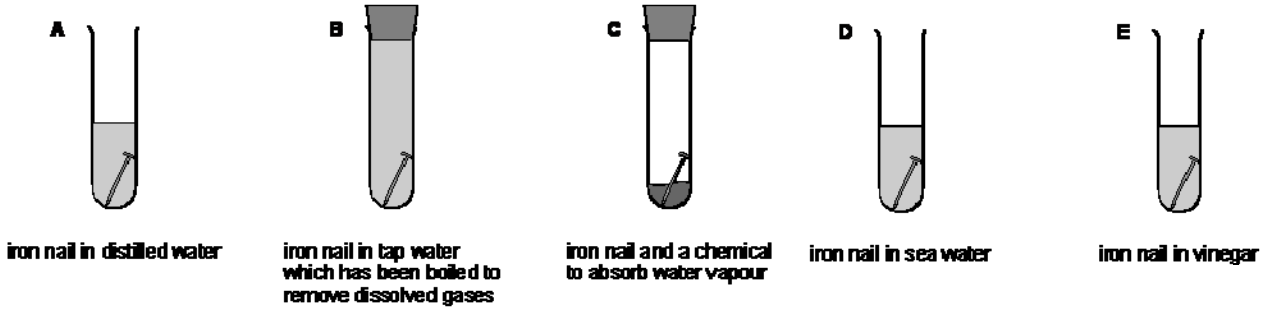
.....[1]

(d) Give the name of an element which could be element **B**.

.....[1]

QUESTION 3

Jessica was investigating the rusting of iron. She set up five experiments as shown below, and left the test-tubes for three days.



Jessica wrote the following results in her book:

Test tube	Observation
A	nail slightly rusty
B	nail still shiny
C	nail still shiny
D	nail very rusty
E	nail slightly rust, bubbles of gas seen

(a) Explain why the nails had **NOT** rusted in test-tubes **B** and **C**.

Test-tube B: .....

.....

Test-tube C: .....

.....[2]

Question 3 continues on the next side →

QUESTION 3 (continued)

(b) In test-tube **E** the iron nail reacted with the vinegar.

(i) Is vinegar **acidic**, **alkaline** or **neutral**? .....

(ii) When the iron reacted with the vinegar, bubbles of gas were formed.

What gas was formed?.....[2]

(c) Before putting the iron nail in test-tube **D**, Jessica weighed the nail.
After three days, she dried and weighed the nail **and** the rust which had formed.

How did the total mass of the nail and rust compare to the mass of the nail at the beginning?

.....

.....

Give the reason for your answer .....

.....[2]

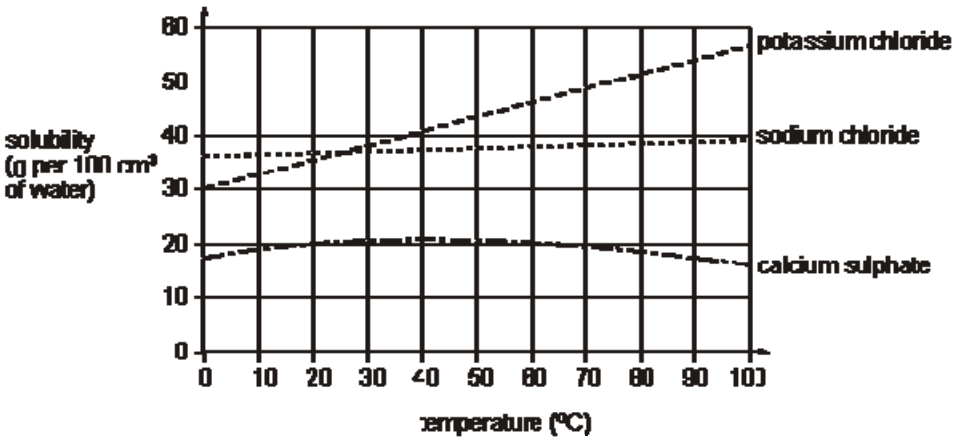
(d) Jessica concluded that the presence of salt in the water made the nail rust more quickly.
Explain why she drew that conclusion from her experiments.

.....

.....[1]

QUESTION 4

The graph below shows how the solubility of three salts, sodium chloride, potassium chloride and calcium sulphate, changes as the temperature changes.



(a) Ken had a beaker containing 54 g of potassium chloride dissolved in 100 cm^3 of water at 90 °C. He cooled the solution to 40 °C.
Explain what he would see in the beaker as the solution cooled to 40 °C? Refer to the graph.

.....

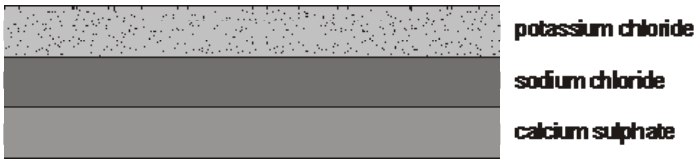
.....

.....[2]

Question 4 continues on the next side →

(b) Water in a lake had the three salts dissolved in it.

The water evaporated from the lake and the salts were deposited in layers in the order shown opposite.



(i) What evidence is there that these three salts were deposited at a temperature above 25°C?
.....[1]

(ii) In what order would the salts be deposited at 10 °C?

top: .....

middle: .....

bottom: .....
[1]

TOTAL: 20 MARKS

PHYSICS Name: .....

QUESTION 1

Draw a ring around the word or phrase that best answers each question.

(a) Pluto has recently been declassified as a planet, and now is considered to be a

dwarf planet **proto-planet** **asteroid** **meteorite**

(b) Which of the following energy sources does not produce CO_2 as a natural product of electricity production?

Gas **Nuclear** **Coal** **Biomass**

(c) Energy is measured in which unit:

newton **kilogram** **watt** **joule**

(d) Which one of the following equations correctly connects distance, speed and time taken.

$$\boldsymbol{Time\ taken = \frac{Distance}{Speed}}$$

$$\boldsymbol{Speed = \frac{Time\ taken}{Distance}}$$

$$\boldsymbol{Distance = \frac{Speed}{Time\ taken}}$$

$$\boldsymbol{Speed = Distance\ x\ time\ taken}$$

(e) Which of the following indicates the strength of a sound wave emitted by a speaker:

Pitch **Wavelength** **Amplitude** **Frequency**

(f) When light passes through a clear plastic block it changes direction. This is because of:

reflection **refraction** **diffraction** **dispersion**

[6]

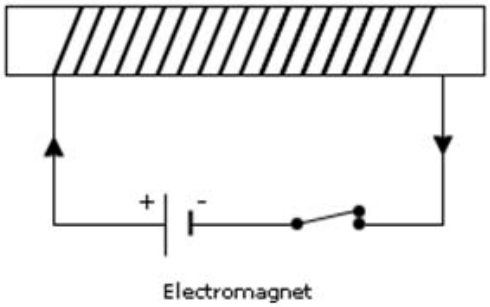
QUESTION 2

Identify the useful and non-useful energy forms which the following device transforms:

Device	Input energy form	Useful energy output	Unwanted energy output
Motorcycle			

[3]

QUESTION 3



(a) (i) An electromagnet is a coil of wire around a core. What might the core be made of to ensure as strong a magnetic field as possible?

.....

.....[1]

(ii) A current flows through the coil. State what happens to an iron bar which is placed near the electromagnet.

.....

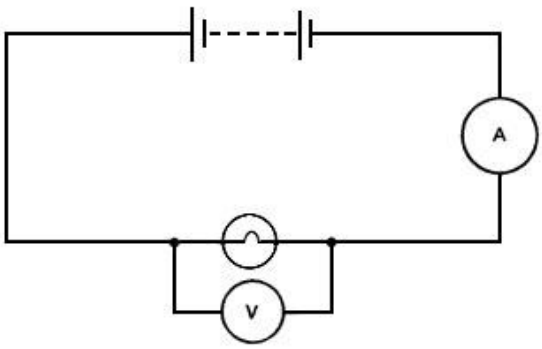
.....[1]

(iii) The current in the coil is now reversed. Describe what would happen this time if the same iron bar was placed near the electromagnet.

.....

.....[1]

(b)



An electric circuit is set up to measure the resistance of one of the lightbulbs. The potential difference is measured to be 12 volts (V) and the current is 50 milliamperes (mA).

Write down the current in amperes.

.....[1]

QUESTION 4:

An astronaut leaving on a space mission is asked to supply details of his weight. To do this, he stands on his bathroom scales on Earth before joining the crew, and emails in that he weighs 80kg. He then takes the scales with him in the rocket to conduct experiments.

(a) Explain what is wrong with the information in his email.

.....

.....[2]

(b) State how the scales reading would be different if he were able to stand on them while the rocket was accelerating away from the Earth. Explain your answer.

.....

.....

.....[2]

(c) When in the International Space Station (ISS) orbiting the Earth, he attempts to stand on the same scales. If he were able to do so, write down what the bathroom scales would read.

.....[1]

(d) Explain whether you think that the astronaut still has any weight while orbiting the Earth.

.....

.....[2]

TOTAL: 20 MARKS