SEVENOAKS SCHOOL

YEAR 9 (13+) SCHOLARSHIP

May 2022
for entry in September 2022

SCIENCE 1

Your Name: _____

Your School: _____

Time allowed: 1 hour

Equipment needed: Pen, pencil, and ruler.
You may use an eraser and a calculator if needed.

Information for candidates:

1. Write your name and school on this page.
2. Write all of your answers on the question papers in the space provided. If you need additional paper then please ask the invigilator. Please put your name on the sheets of paper you use.
3. The marks for each question or part question are shown in square brackets [ ] after the question.
4. Answer **ALL QUESTIONS**.
5. The total mark for this paper is 60.

BIOLOGY

Question 1

Mr Smith, the PE teacher, loves his car so much that he is convinced it is a living organism.

Using your knowledge of the **life processes**:

Give one reason that supports Mr Smith's belief that his car is alive. [1]

a. _____

_____

b. Give one reason that proves his car is not alive. [1]

_____

_____

Question 2

The pictures below show two different flowers, A and B.

a. Which flower is pollinated by bees? [1]

_____

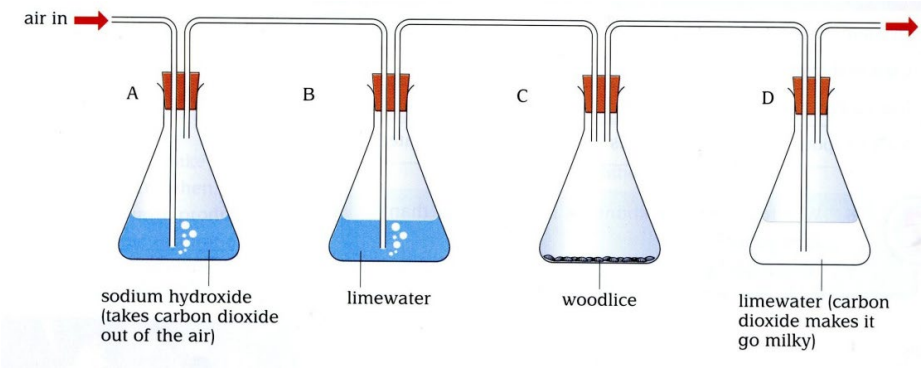
b. Explain your answer to part (a) [1]

_____

_____

Question 3

The following apparatus is used to demonstrate one of the life processes in woodlice.



a. State which life process is being demonstrated in this experiment. [1]

_____

b. Explain your answer to part a) [1]

_____

c. Why is it important to remove all the carbon dioxide out of the air in flask A? [1]

_____

_____

Question 4

Josie is a keen gardener. She plans an experiment to find out which brand of liquid artificial fertiliser, *GrowBest*™ *or MegaYield*™, produces the best crop of tomatoes.

a. What will be the independent variable in this experiment? [1]

_____

b. Describe how Josie could **measure** which brand of fertiliser produced the best crop. [2]

_____

_____

c. Briefly describe **three** things that would need to be kept the same to make the experiment valid (a fair test). [3]

_____

_____

_____

d. Josie's sister, Donna, is worried that GrowBest™ and MegaYield™ are damaging to the environment. Suggest an alternative that Josie could use. [1]

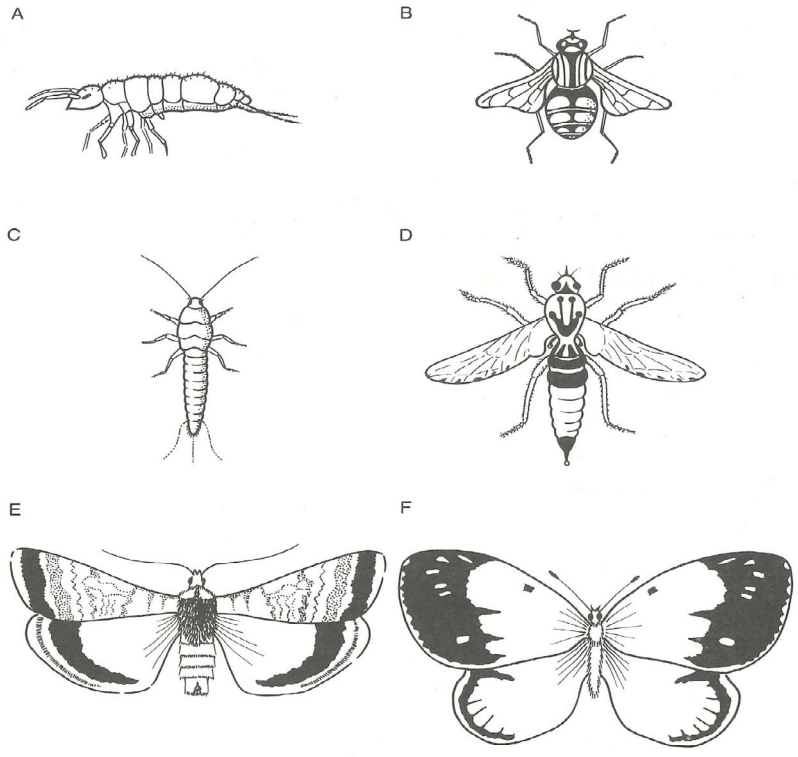
_____

_____

Question 5

Use the following key to identify the insects labelled A-F [6]

Letter	Name of insect
A	
B	
C	
D	
E	
F	



KEY

1. a) wings absent – go to number 2
   b) wings present – go to number 3
2. a) three tail filaments – silverfish
   b) two tail filaments – springtail
3. a) one pair of wings – go to number 4
   b) two pairs of wings – go to number 5
4. a) end of abdomen pointed – robber fly
   b) end of abdomen not pointed – go to number 6
5. a) club-shaped antennae – clouded yellow butterfly
   b) pointed antennae – large yellow moth
6. a) wings larger than body – green lacewing
   b) wings shorter than body – hoverfly

Total for BIOLOGY: 20 marks

CHEMISTRY

Liberia is a country on the west coast of Africa. Many parts of Liberia do not have a plentiful supply of drinking water. Liberia does, however, have a long coastline so efforts are made to make sea water drinkable.

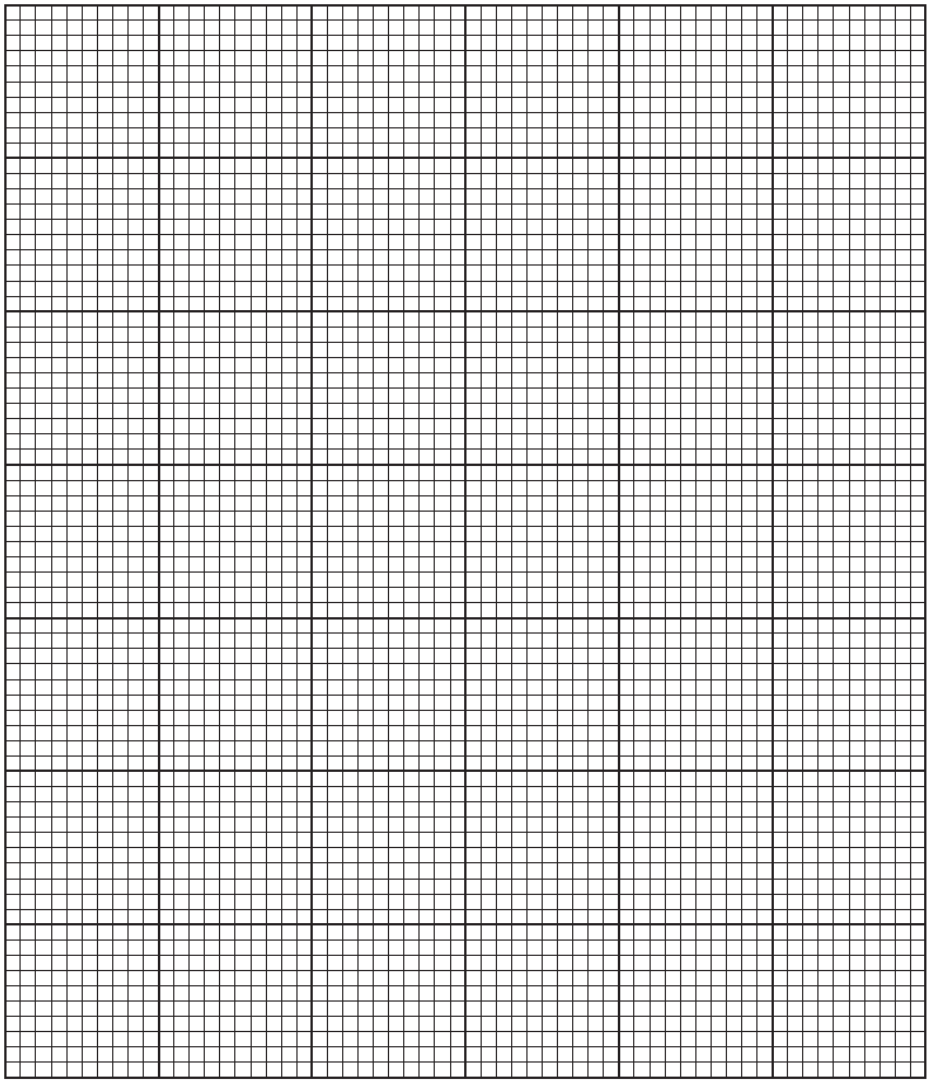
a. Water collected from the sea contains dissolved salt as well as sand and grit. Explain how safe, drinkable water could be obtained from the sea water collected. [6]

Your answer should include:
A description of the separation techniques used
An explanation of how the properties of the substances allow them to be separated
Appropriate scientific terminology

In other parts of the world, drinking water is plentiful but sea water is used to obtain salt by trapping salt water in shallow pools and allowing the water to evaporate and the salt to dry in the sun.

b. A sample of salt collected in this way was weighed daily for a week to ascertain when the salt was dry. The results of this investigation are shown below. Plot a line graph of these data. [5]

Time (days)	Mass of salt sample (g)
1	49
2	42
3	35
4	28
5	21
6	21
7	21



c. Which was the first day that the salt was dry? [1]

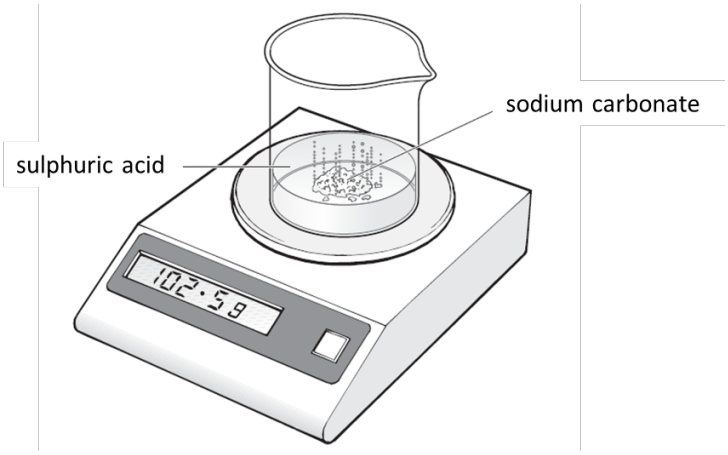
_____

d. Why was the salt left and weighed again after the day that you identified in question c? [1]

_____

_____

Salts can also be obtained by the reaction between acids and bases. Sodium sulphate (a salt) is made by reacting sodium carbonate with sulphuric acid.



e. The initial mass of the reaction mixture was 102.5 grams. State and explain whether the mass reading on the balance would increase or decrease during the experiment. [2]

_____

_____

_____

f. The reaction mixture was tested with universal indicator at the beginning and end of the reaction. Suggest the colour of the indicator. [2]

Beginning _____ End _____

g. Suggest the identity of the gas being given off during this reaction. [1]

_____

h. Explain a test which could be carried out to confirm the identity of the gas. Include what the positive result would be in your answer. [2]

_____

_____

_____

Total for CHEMISTRY: 20 marks

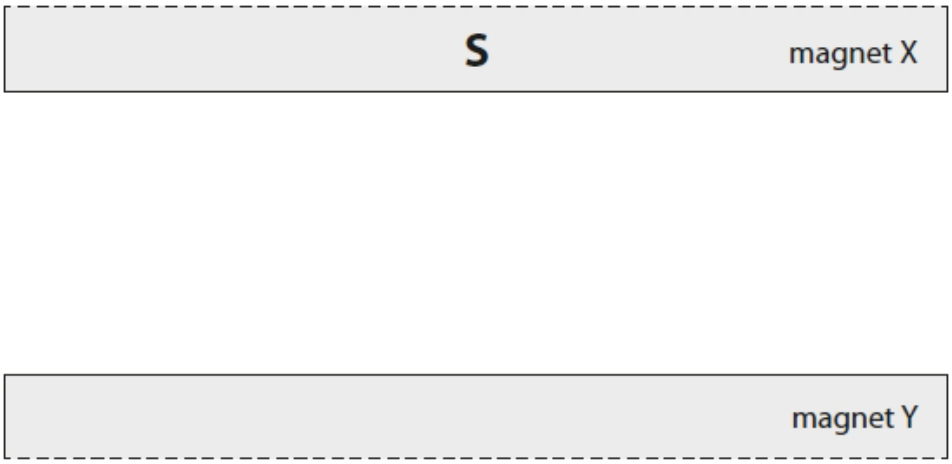
PHYSICS

Question 1

Very strong magnets can be made using the element neodymium.

Diagram 1 shows parts of two neodymium magnets, X and Y, when they are held close together.

Diagram 1



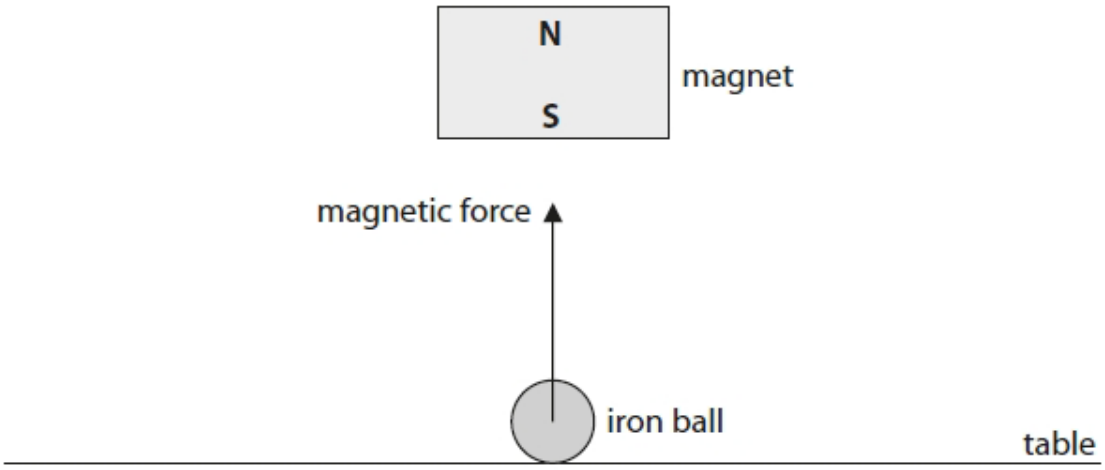
A uniform magnetic field is produced in the space between the magnets.
The diagram shows the south pole of magnet X.

a. Complete the diagram by drawing the uniform magnetic field and labelling the pole on magnet Y. [3]

b. Diagram 2 shows another neodymium magnet being used to lift an iron ball from a table.

The iron ball is shown at the instant it leaves the surface of the table.

Diagram 2



i. Explain why the iron ball experiences an upward magnetic force. [2]

_____

_____

_____

_____

_____

_____

ii. The iron ball experiences an upward resultant force at the instant shown in diagram 2. Draw a labelled arrow on diagram 2 to show the weight of the iron ball. [1]

iii State the formula linking weight, mass and gravitational field strength. [1]

_____

At the instant shown, the resultant force acting on the iron ball is 124 mN and the magnetic force is 165 mN.

iv Calculate the mass of the iron ball. [3]

mass of iron ball = ... kg

v. Explain why the resultant force acting on the iron ball increases as the iron ball moves towards the magnet. [2]

_____

_____

_____

_____

_____

_____

Question 2

The photograph shows a mains-operated, decorative lamp, X.

Lamp X has seven identical bulbs that are connected in series.

a. Give a disadvantage of connecting the bulbs in series. [1]

_____

_____

b. Suggest an advantage of connecting the bulbs in series. [1]

_____

_____

c. Each bulb has a working resistance of 390 Ω.
The voltage across each bulb is 33 V.
This equation may be useful: **voltage = current x resistance**

Calculate the current in each bulb. [3]

current = ... A

d. Another decorative lamp, Y, uses five of the same 390 Ω bulbs connected in series.
Both lamps are mains operated.

Explain how the brightness of each bulb in lamp Y compares to the brightness of each bulb in lamp X. [3]

_____

_____

_____

_____

_____

_____

_____

_____

Total for PHYSICS: 20 marks