**Name and School:**

OUNDLE

School

2018 Academic Scholarship

Preliminary Examination

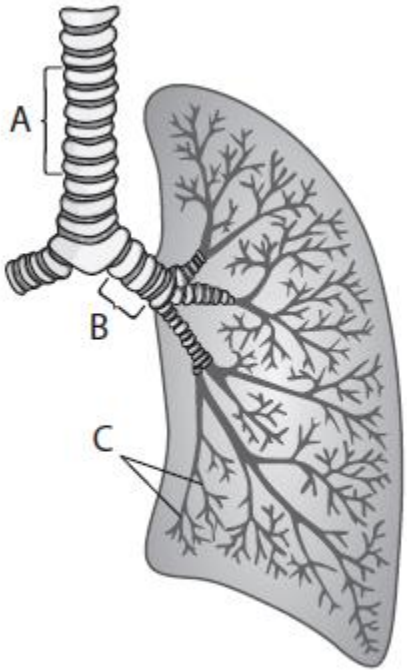
# Science

Time Allowed : 60 minutes

- Write your name on the question paper
- Write all your answers on the question paper
- Calculators are allowed

*Biology Section*

1. The picture below is part of a system found in the human body.




a. What system is it part of?

..... **[1]**

b. Can you name structures A and C?

i. A: ..... **[1]**

ii. C: ..... **[1]**

c. Smoking can cause several diseases in the body. Can you name

i. One disease linked to smoking that affects the lungs?

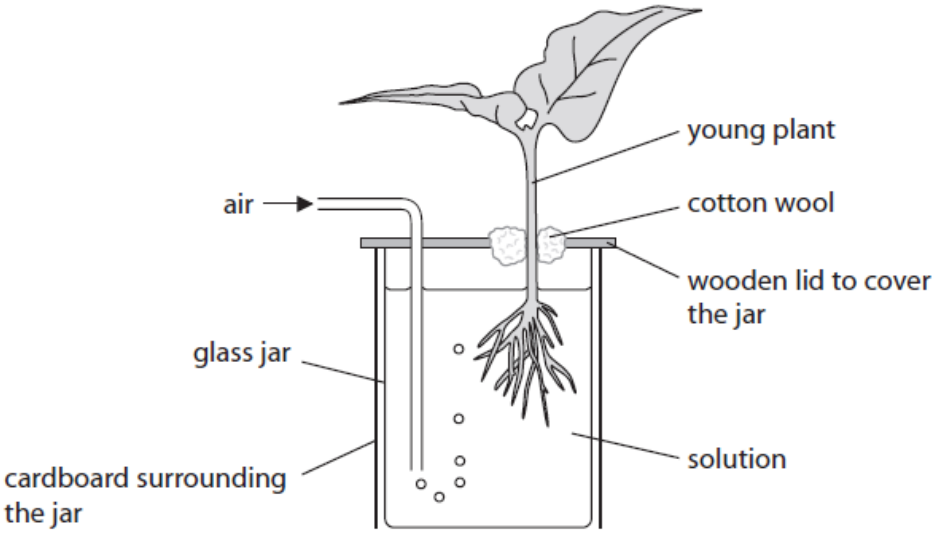
..... **[1]**

ii. One disease linked to smoking that affects another part of the body?

..... **[1]**

**Total: 5 marks**

2. Plants can be grown in solutions that contain everything they require (see diagram below)




a. On the diagram above, draw a line to the part of the plant that is responsible for support and anchorage. Label the line with the name of the part.

**[2]**

b. For the plant to photosynthesise, it needs four things. Can you name any three of these?

1. .....

2. .....

3. ..... **[3]**

c. The cardboard is put around the glass jar to stop any light reaching the water. Can you think of a reason why that is important?

.....

.....

.....

.....

..... **[2]**

d. Give the word equation for photosynthesis in the space below

**[2]**

e. What do plants use magnesium for?

..... **[1]**

**Total: 10 marks**

3.

a. Can you name one important difference between an insect and an arachnid (a spider)

. ..... **[1]**

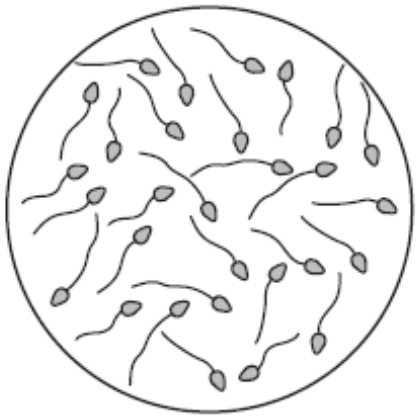
b. Can you name one important difference between a reptile and an amphibian?

..... **[1]**

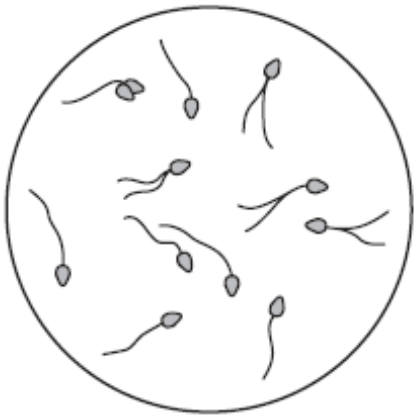
**Total: 2 marks**

4. The picture below shows sperm cells from two different men.

Man A



Man B



a. Man A is more fertile (it is easier for him to have babies with his partner) than Man B. Can you give two reasons why this might be?

Reason 1: .....

.....

.....

Reason 2: .....

.....

..... **[2]**

b. What does the nucleus of the sperm contain?

..... **[2]**

c. Sperm and egg cells are a special type. What are they called?

..... **[1]**

d. When the sperm and egg come together, their two nuclei join. What is this process called?

..... **[1]**

**Total: 6 marks**

*Chemistry Section*

5. This question is about solvents, solutes and solutions.
   Water is a good solvent for most polar compounds, however, there are compounds which do not dissolve in water.

a. Give the name of two alternative solvents to water.

.....

..... **[2]**

b. Given a beaker of water and a beaker of table salt (sodium chloride), describe how you could prepare a saturated solution.
   Make reference to the names of any apparatus you would use.

.....

.....

.....

.....

..... **[3]**

c. A saturated solution of sodium chloride is also known as brine. Give two differences between brine and seawater.

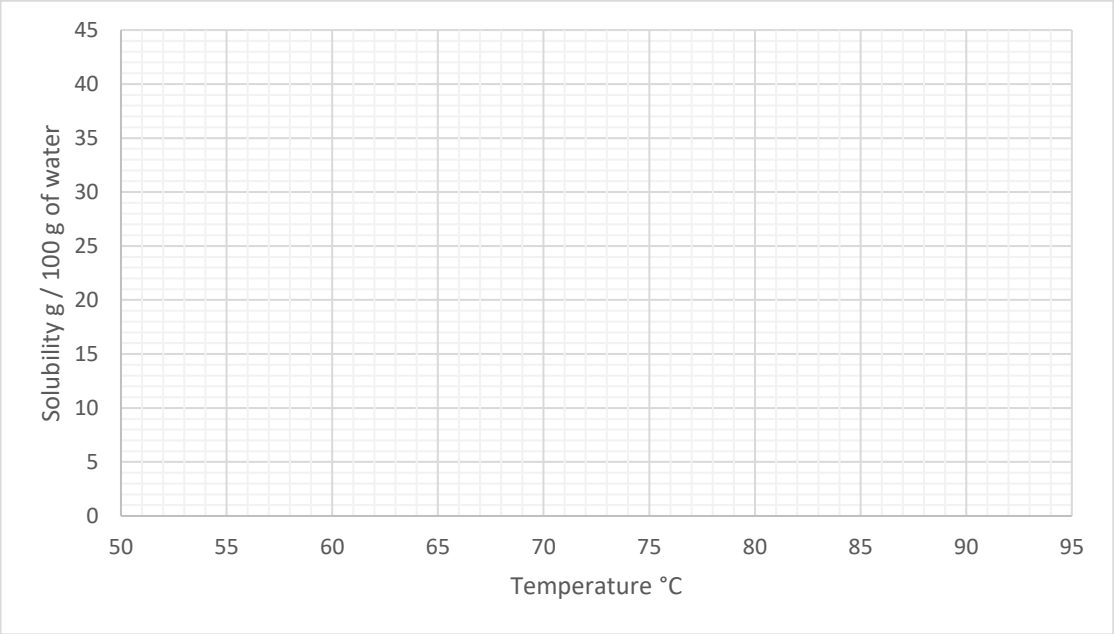
.....

..... **[2]**

d.

i. The solubility of sodium chloride in water varies with the temperature of the water.
Draw a line on the graph below which illustrates the relationship between the two variables. Label the line *sodium chloride*.

**[2]**




ii. Above 50°C the solubility of carbon dioxide gas in water is approximately inversely proportional to increasing temperature.
On the graph above draw a line showing this trend in solubility. Label the line *carbon dioxide*. **[2]**

e. Describe what happens to the solvent molecules when a solution is heated.

.....

.....

..... **[2]**

**Total: 13 marks**

6. Listed below are a set of metals and compounds:

| | | |
|---|---|---|
| titanium | magnesium oxide | gold oxide |
| lithium | potassium sulfate | iron |
| calcium carbonate | zinc sulphide | silver |

a. One of these compounds does not exist. Which one does not exist, give the reason why?

.....

..... **[2]**

b. Many pure metals react with dilute acids. Give the chemical name of an acid which iron would react with.

..... **[1]**

c. Only a few metals react vigorously with water. Choose a metal from the list that reacts vigorously with water.

..... **[1]**

d. Using a suitable example, describe what you understand a displacement reaction to be.

+ → +

.....

.....

.....

..... **[3]**

**Total: 7 marks**

*Physics Section*

1. In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

   What is the average speed of the car?

   A 1.5 km/h  B 90 km/h  C 144 km/h  D 216 km/h

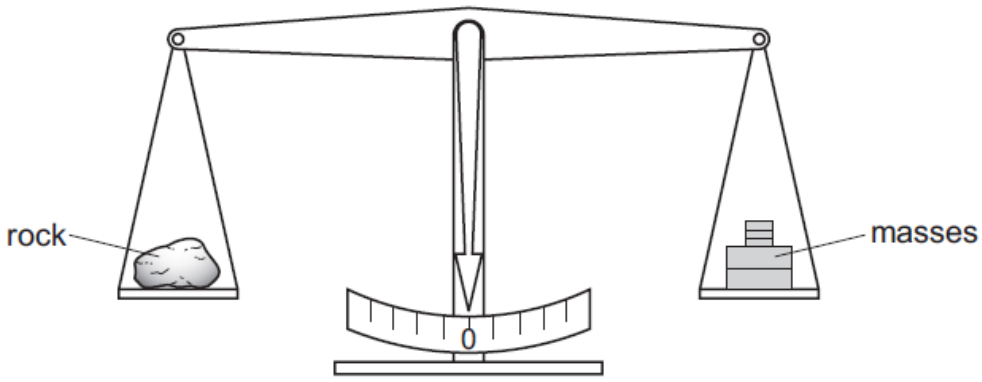
   Answer..... **[1]**

2. Which quantity is measured in joules?
   A density
   B energy
   C pressure
   D weight

   Answer..... **[1]**

3. A geologist places a small rock on the left-hand pan of a balance. The two pans are level as shown when the masses with a total weight of 23N are placed on the right-hand pan.

   Take the weight of 1.0 kg to be 10N.




   What is the mass of the small rock?

   A 0.023 kg  B 2.3 kg  C 23 kg  D 230 kg

   Answer..... **[1]**

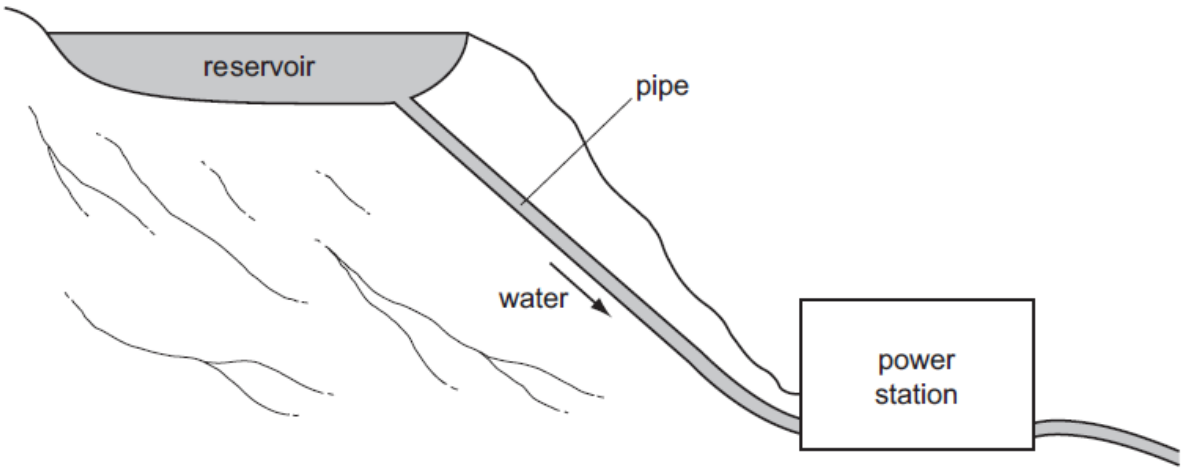
4. A stone has a volume of 0.50 $cm^3$ and a mass of 2.0g.

What is the density of the stone?

A 0.25 $g/cm^3$
B 1.5 $g/cm^3$
C 2.5 $g/cm^3$
D 4.0 $g/cm^3$

Answer..... **[1]**

5. The diagram shows a hydroelectric system.

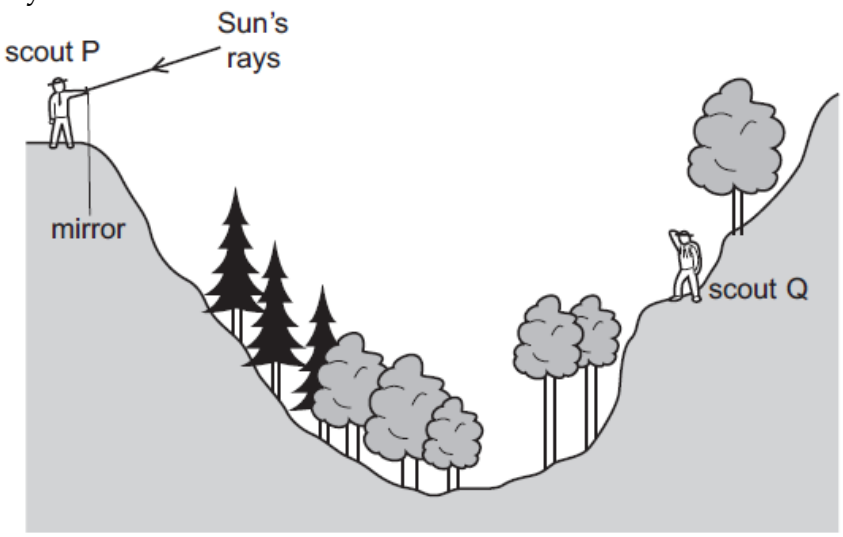



What are the main energy changes taking place?

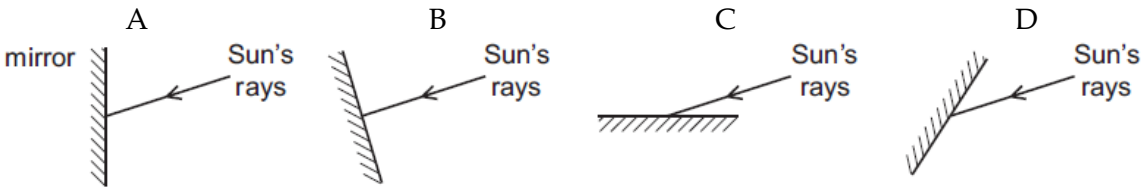
A chemical energy → kinetic energy → electrical energy
B electrical energy → gravitational energy → kinetic energy
C gravitational energy → kinetic energy → electrical energy
D kinetic energy → electrical energy → gravitational energy

Answer..... **[1]**

6. Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's rays.




Which mirror position would allow the Sun's rays to be reflected to scout Q?




Answer..... **[1]**

7. A gardener studies the growth of one of his plants. At the same time each day, he measures the height *h* of the top of the plant from the ground, as shown in Fig. 7.

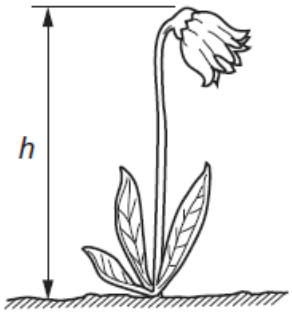



**Fig. 7**

The table of his results is shown below.

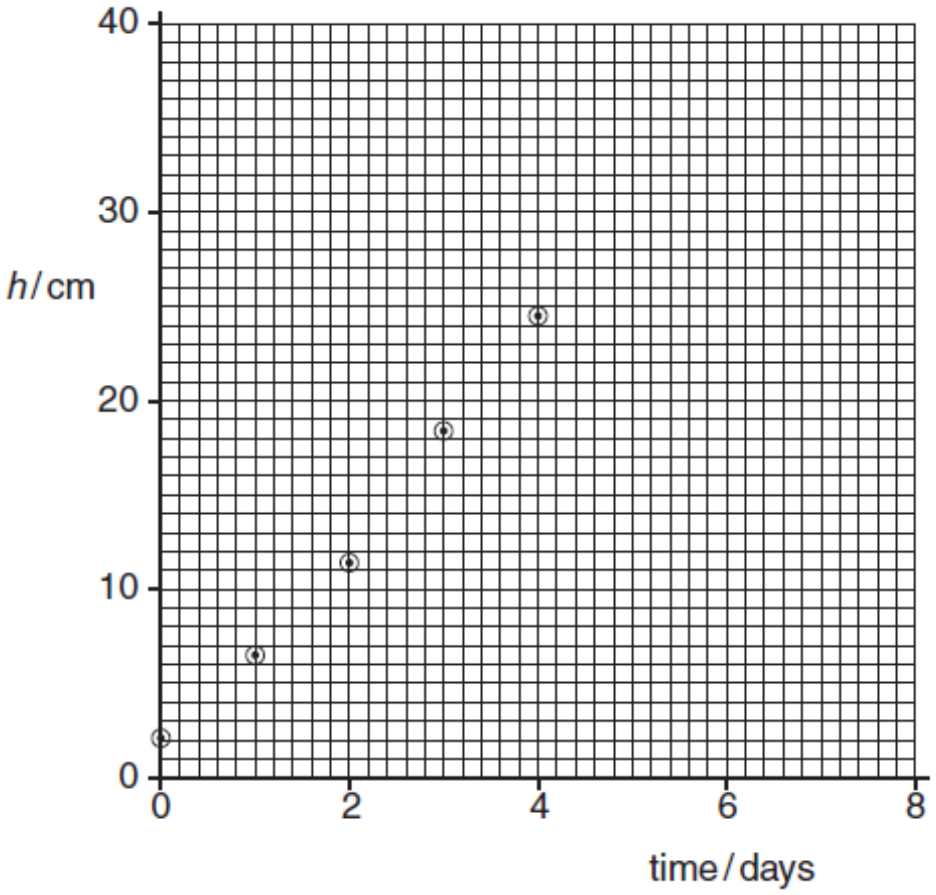
| time since first measurement / days | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| height *h* / cm | 2.1 | 6.5 | 11.4 | 18.4 | 24.5 | 26.7 | 30.7 | 37.1 |

a. From the values in the table, deduce the average speed of growth of the plant during the 7 days. Work in days and cm.

average speed = ..... cm / day **[4]**

b.

i. Complete graph by plotting the last three values of height *h* against time. Do **not** draw a line through the points.




**[2]**

ii. Describe how the graph shows that the speed of growth of the plant is not constant.

.....

..... **[1]**

**Total: 7 marks**

8. A student has devised the circuit in Fig. 8.1 to control the lighting of three lamps, A, B and C.

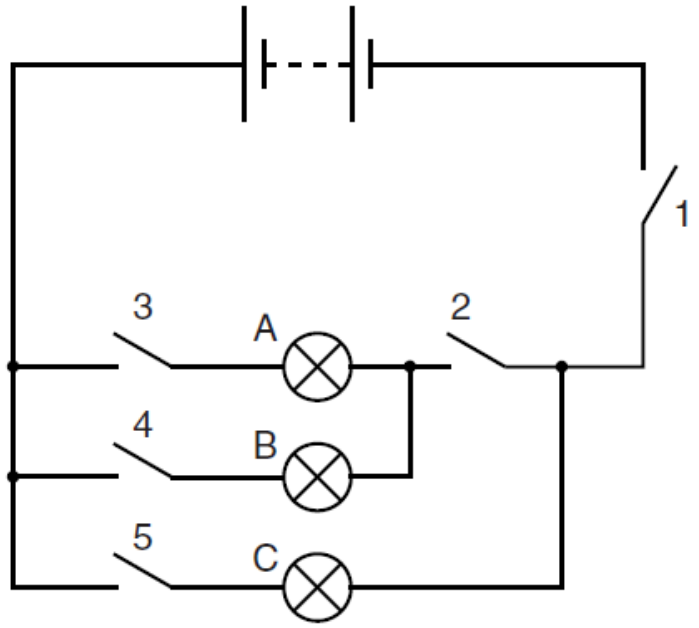



*Figure 8.1*

More than one switch must be closed in order to light any lamp.

a. In the table below, put ticks to indicate which switches **must** be closed in order to light the lamps. The first row has been completed for you.

| lamp that is lit | switches closed | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| lamp A only | ✓ | ✓ | ✓ | | |
| lamp B only | | | | | |
| lamp C only | | | | | |

**[3]**

b. **All** the switches are now closed.

Which of the lamps light up? ..... **[1]**

c. Which one switch **must** be open to ensure that none of the lamps light up?

..... **[1]**

d. The student then builds the following circuit Fig. 8.2.

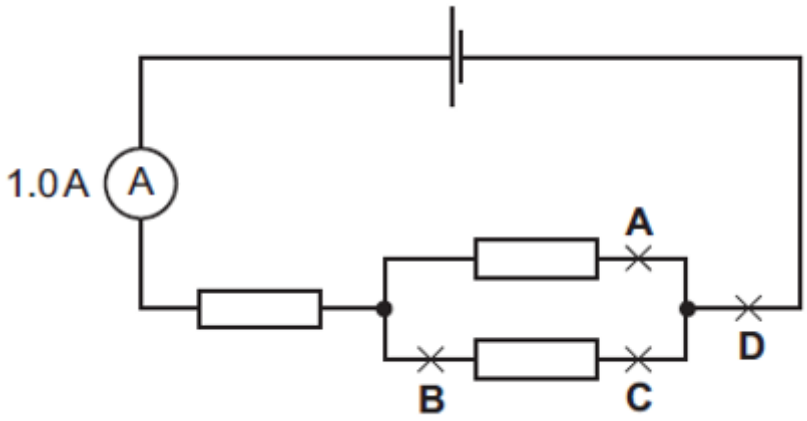



*Figure 8.2*

The reading on the ammeter in the circuit is 1.0A and all the resistors are identical.

i. What would be the reading on an ammeter placed at point D?

Current = ..... A **[1]**

ii. What would be the reading on an ammeter placed at point C?

Current = ..... A **[1]**

**Total: 7 marks**