Name and School:

OUNDLE

School

2017 Academic Scholarship

Preliminary Examination

Science

Time Allowed : One hour

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

Biology Section

1. All living things carry out certain life processes. Definitions of these processes are given below. In the spaces, write the name of each process.

a. The release of energy from food

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(1)

b. The ability to react to the surroundings or environment

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(1)

c. The release of waste products that have been produced by cells

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(1)

d. The production of offspring

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(1)

2. Animals and plants need a source of food.

a. How do animals obtain their food?

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(1)

b. What is the name of the process by which plants produce their food?

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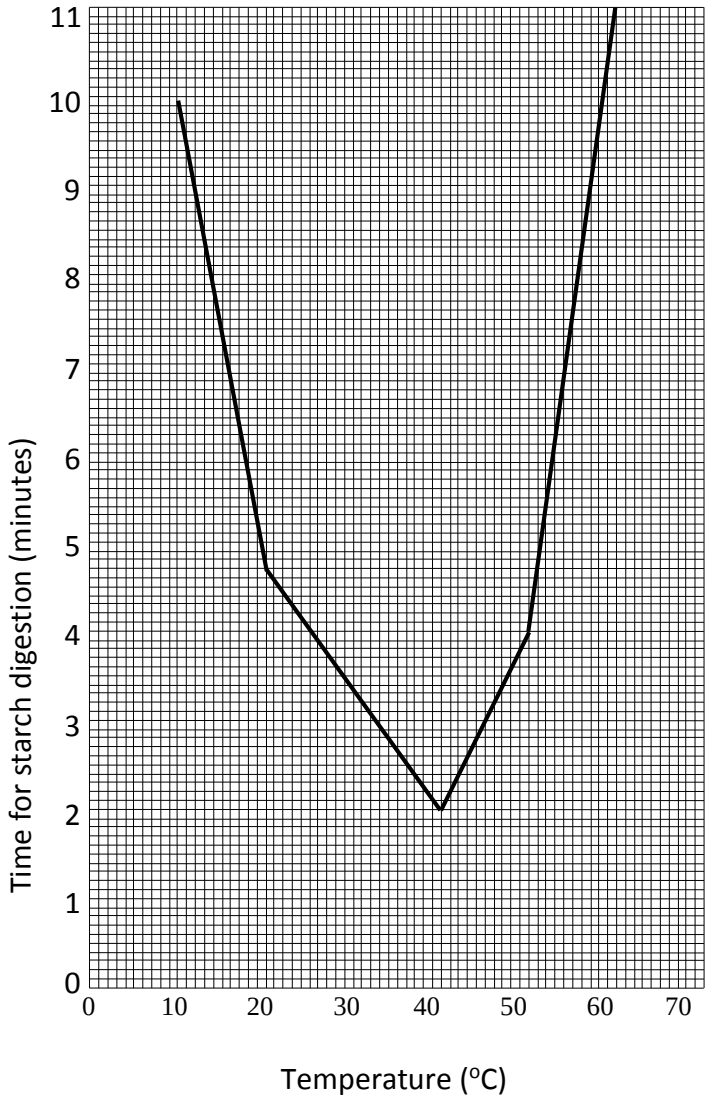
(1)

3. The graph below shows the results of an experiment involving an enzyme that breaks down (digests) starch.



a. Where in a human might an enzyme that digests starch be found?

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(1)

b. What is produced when starch is digested?

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(1)

c. At what temperature does the enzyme digest starch the fastest?

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(1)

4. The image below is a picture of a mountain hare.

Mountain hares eat sedge (a plant) and a type of grass called fescue. In turn hares are eaten by foxes and eagles.

a. In the space below construct a food web with all the animals and plants, showing the direction of the flow of energy

(3)

b. Mountain hares turn white in the winter. Describe two other adaptations that mountain hares show to avoid predators.

1. .....

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2. .....

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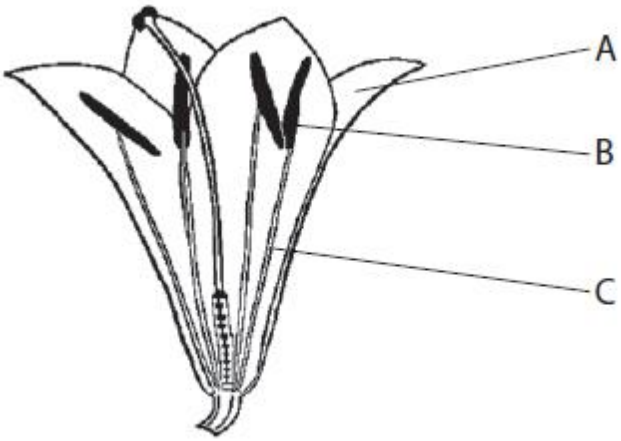
(1)

5. Most plants can be pollinated by either the wind or by insects. The diagram below shows a cross-section of a plant.



a. Name the structures

i. A: .....

ii. B: .....

iii. C: .....

(3)

b. Is this flower wind or insect pollinated? Explain your answer.

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(2)

c. Some plants use water to transport their seeds. Can you suggest two properties that their seeds need to have?

1. .....

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2. .....

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(2)

Marks for Biology Section = 20 marks

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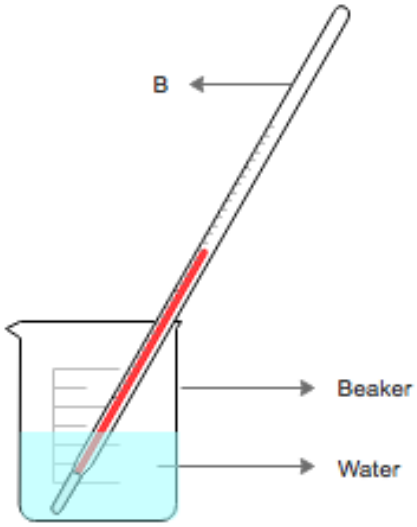
Chemistry Section

1. A student is going to carry out some investigations on water. The student pours some pure water into a beaker, she then adds a piece of equipment to the beaker that can measure the temperature of the water.



a. What is the name of the piece of equipment labeled B, which is used to measure the temperature of the water?

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(1)

b. If the student heated the water until it was boiling, what temperature would the water be at?

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(1)

c. If the student cooled the water to below 0°C what is the name of the phase change that would occur to the water?

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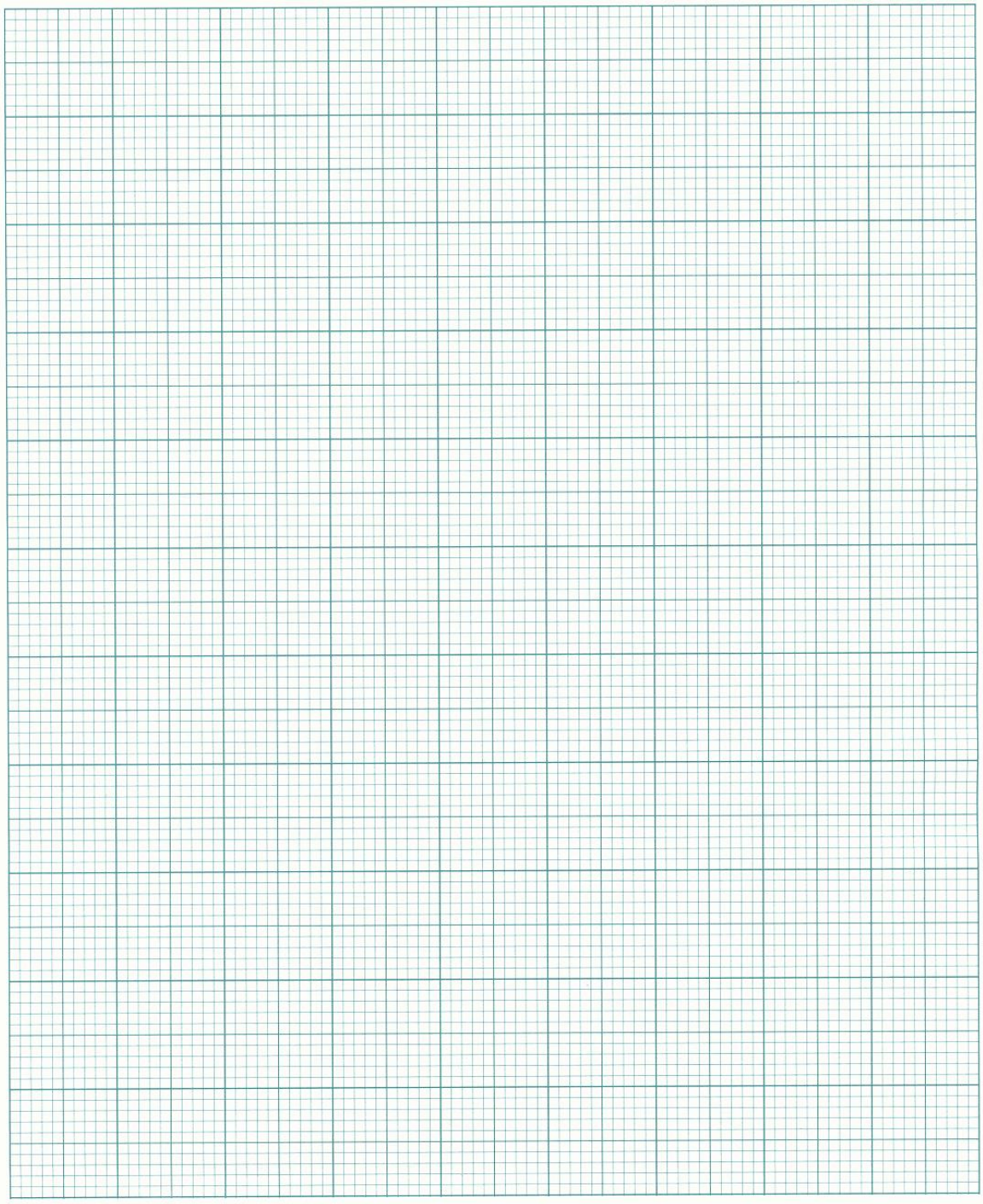
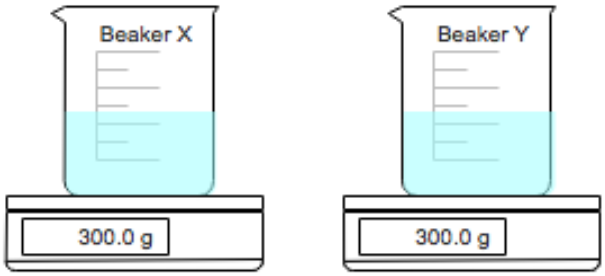
(1)



(6)

The student is told that she will investigate the speed at which two beakers of water evaporate. She makes up an identical beaker of water to the first and then she labels one Beaker X and the other Beaker Y. Beakers X and Y are placed on separate balances that will record their masses. The balances also maintain the beakers at a constant temperature; Beaker X is at a different temperature to Beaker Y



The results of the experiment are shown in the table below

Beaker X		*Beaker Y*	
Time (hours)	Mass (g)	Time (hours)	Mass (g)
0	300	0	300
1	280	1	270
2	260	2	240
3	240	3	210
4	220	4	180
5	200	5	150

d. On the graph paper on the previous page, plot a graph showing the results for Beaker X.

e. Plot the results for Beaker Y on the same graph **(2)**

f. Which of the two beakers is at a higher temperature? Explain how do you know this from the experiment?

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(2)

2. This question is on Fossil Fuels.

a. Give the name of a fossil fuel which is a solid and one which is a liquid.

Solid: .....

Liquid: .....

(2)

b. If you were given a mixture of a solid and a liquid fossil fuel describe how you would isolate a pure sample of both.

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(3)

c. The burning of fossil fuels is a very useful chemical reaction Can you give the name and the chemical formula of a gas that is produced when fossil fuels are burnt?

Name: .....

Chemical Formula: .....

(2)

Marks for Chemistry Section = 20 marks

Physics Section

1. A large electromagnet is used in a scrap yard to pick up old cars.

In the diagram above the car is being held stationary 5 metres above the ground.

a. Describe the forces acting on the car in this position.

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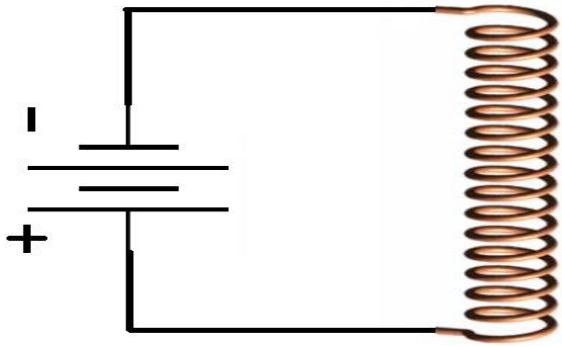
(2)

Joanna decided to investigate electromagnets and builds a very simple circuit containing a coil of wire and two cells.



Her electromagnet fails to pick up any iron paperclips and she has read in a book that increasing the current that flows through the coils in an electromagnet increases the strength of the magnet.

b. What device does she need to add to her circuit to measures the current flow?

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(1)

c. Add the correct electrical circuit symbol for this device to the circuit diagram on the previous page.

(1)

d. Suggest two other ways of increasing the strength of an electromagnet.

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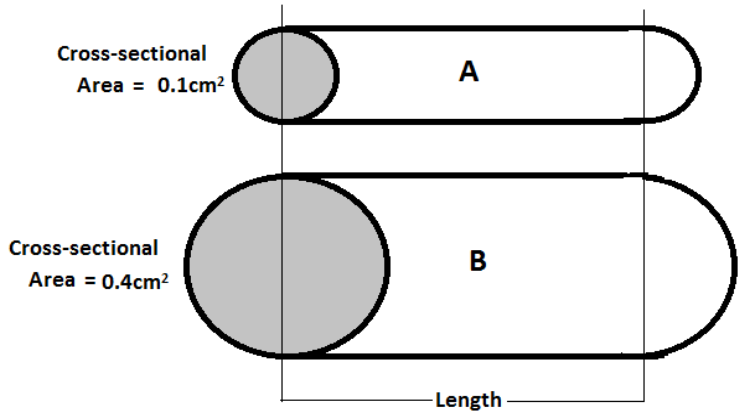
(2)

The thickness of a wire affects the amount of current that flows through it. Physicists determine the thickness of a wire by calculating the cross sectional area.



In the diagram above wire A and B have exactly the same length and are made from the same metal. Wire A has a cross-sectional Area of $0.1cm^2$ and wire B has a cross-sectional Area of $0.4cm^2$.

Both wires are placed into an electrical circuit and the current is measured.

The current in Wire A = 0.5A

The current in Wire B = 2.0A

e. Describe the relationship between the cross-sectional Area of the wire and current in the circuit.

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(2)

f. A third wire is put into the circuit and the current is measured. It has the same length and is made from the same material. The radius of this wire is 0.5cm. Approximate (using clear calculations) how much current will flow through this wire.

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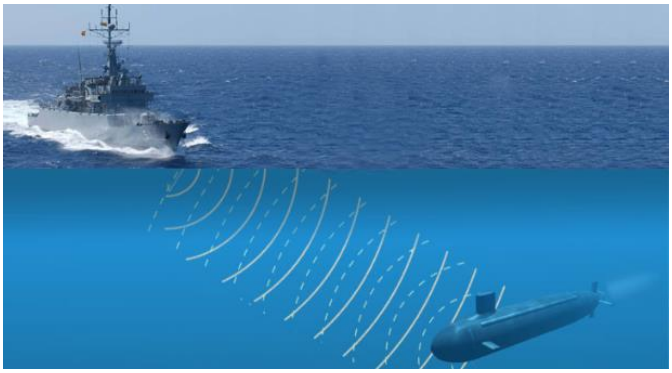
(4)

2. Warships send pulses of sound, or pings that reflect off submarines.



The speed of sound in water is approximately 1500m/s.

a. If a Warship was to receive a signal (a reflected ping) 1.4 seconds after sending the pulses how far away is the submarine?

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(3)

Inside a submarine the pressure is 10N/cm^2 the same as at the surface. The pressure of the water outside the submarine is 130N/cm^2.

b. The hatch to enter the submarine from the outside has an area of 92cm^2. What is the force acting on the outside of the hatch?

Force = ...

(2)

c. Is the hatch designed to open inwards or outwards? Explain your answer.

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(2)

d. The pressure in water increases by 0.80N/cm^2 for every metre of depth. How deep is the submarine?

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(2)

e. Why does the pressure increase as you go deeper?

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(1)

Marks for Physics Section = 22 marks