

Name:



**OUNDLE**

School

Non Common Entrance Examination 2014  
For Third and Fourth Form Entry

## Science

Time Allowed : 1 hour

- *Please write your name in the box above*
- *Answer as many questions as you can in the time available*
- *The paper is out of 60 marks; 20 for Biology, 20 for Chemistry, and 20 for Physics*

You will need:

- *A pen,*
- *A pencil,*
- *A ruler,*
- *A calculator,*

|                    |  |
|--------------------|--|
| Biology mark /20   |  |
| Chemistry mark /20 |  |
| Physics mark /20   |  |
|                    |  |
| Total mark /60     |  |
| Percentage         |  |

## Biology Section

1. The information in the table compares two farms. Both are the same size, on similar land, close to one another and both are equally well managed.

| Name of farm   | Activity  | Energy value of food for humans produced in one year | Number of people whose energy requirements can be met by this food |
|----------------|---|--|--|
| Greenbank Farm | Grows food for humans   | 3285 million kJ                                      | 720  |
| Oaktree Farm   | Grows food for animals on the farm which become food for humans | 365 million kJ                                       | 80   |

- (a) Use this information to work out the average daily human energy requirement in kilojoules (kJ) per day.

.....  
 .....

Energy requirement = ..... kJ/day

(2)

- (b) The figures show that farms like Greenbank Farm can be nine times more efficient at meeting human food energy requirements than farms such as Oaktree Farm.

- (i) The food chain for Greenbank Farm is:

vegetation        humans

What is the food chain for Oaktree Farm?

.....

(1)

- (ii) Explain why Greenbank Farm is much more efficient at meeting human food energy requirements.

.....  
 .....  
 .....  
 .....  
 .....

(2)

- (c) The human population has been increasing rapidly throughout this century. It is now about 6 billion and is still growing. What does the information in this question suggest about likely changes in the human diet which may need to occur during the coming century? Explain your answer.

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(2)  
(Total 7 marks)

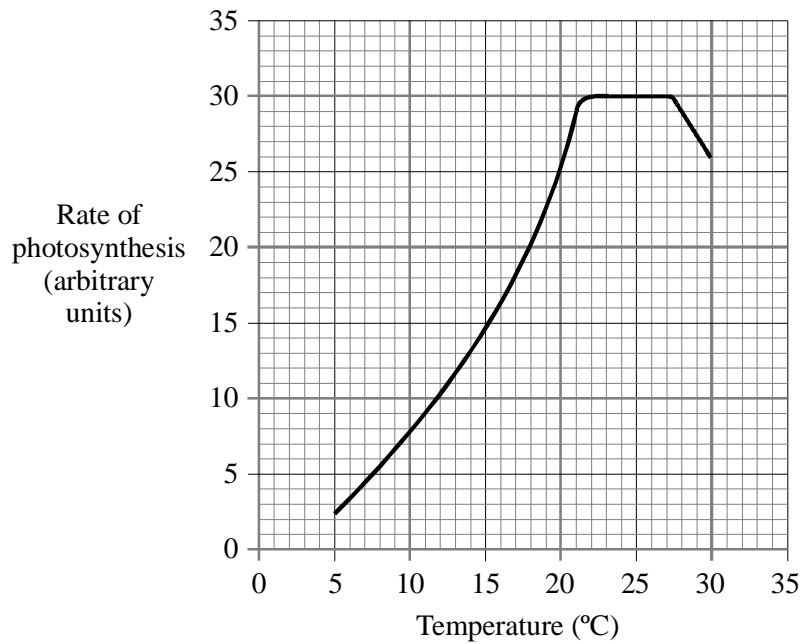
2. Green plants make food in their leaves.

- (a) From where do the leaves get the energy that they need to make food?

.....

(1)

- (b) The graph shows the effect of temperature on the rate of photosynthesis.



- (i) Between which temperatures is the rate of photosynthesis fastest?

..... and ..... °C

(1)

- (ii) A greenhouse owner wants to grow lettuces as quickly and cheaply as possible in winter.

At what temperature should he keep his greenhouse in order to grow the lettuces as quickly and cheaply as possible?

..... °C

Explain your answer.

(1)

.....

.....

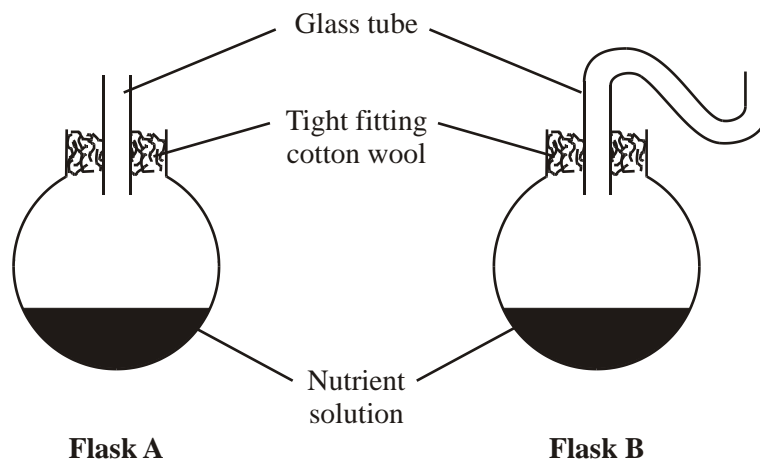
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(2)

(Total 5 marks)

3. In the 1800s, Louis Pasteur investigated the reasons why food goes rotten. To check one of Pasteur's experiments, a student set up the two flasks shown in the diagram.



After three days the nutrient solution in both flasks had gone rotten.

- (a) What makes the nutrient solution go rotten?

.....

(1)

- (b) The student then set up two more similar flasks. This time, she boiled the nutrient solution in both flasks for ten minutes.

- (i) Why did she boil the nutrient solution?

.....

(1)

- (ii) Why did the nutrient solution in flask A go rotten?

.....

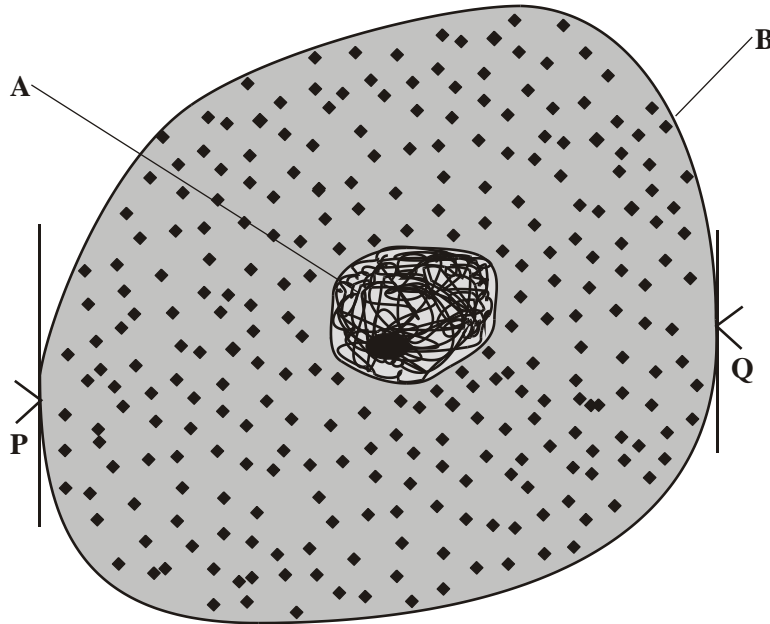
(1)

(iii) Why did the nutrient solution in flask **B** not go rotten?

.....  
.....

(2)  
(Total 5 marks)

4. The diagram shows an animal cell.



(a) Name the cell structure which controls the passage of substances in and out of the cell?

.....

(1)

(b) Distance **P** to **Q** on the diagram is the diameter of the cell. This distance was measured on three cells using a microscope. The results were as follows:

- cell 1: 63 micrometres
- cell 2: 78 micrometres
- cell 3: 69 micrometres

Calculate the average diameter of these cells. Show clearly how you work out your final answer.

.....  
.....

Average diameter = ..... micrometres

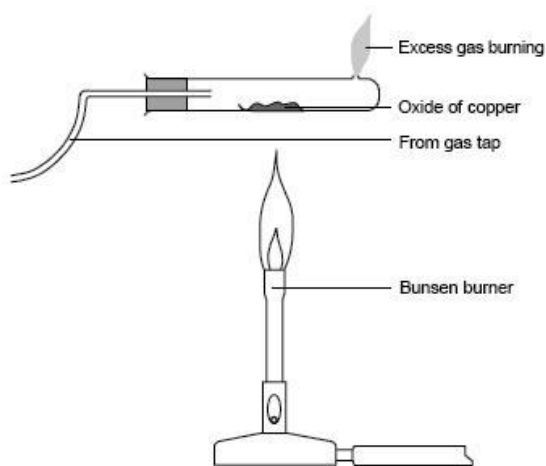
(2)

(Total 5 marks)

[Total Marks for Biology section: 23]

## Chemistry Section

1. Apparatus was set up as shown in the diagram below.



A sample of copper (II) oxide was placed in a test tube and heated whilst hydrogen gas was passed over the sample. The excess gas was burned off.

- (a) What would you observe inside the test tube as heating proceeded?

.....  
.....  
.....  
.....

(3)

- (b) Write a word equation to describe what is happening in this experiment?

.....

(2)

- (c) What is a 'reducing agent', and what is the 'reducing agent' in this reaction?

.....  
.....  
.....

(2)

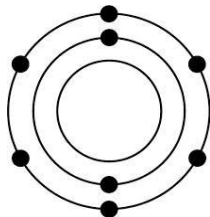
- (d) Explain why the excess hydrogen must be burned off.

.....  
.....

(1)

(Total 8 marks)

2. Look at the following electronic arrangement for the chemical element Tg.



(a) In which group in the periodic table might you find element, Tg?

.....

(1)

(b) In which period might Tg be found in?

.....

(1)

(c) Sketch the electronic arrangement of the **ion** that element, Tg, forms:

(1)

(d) What would the charge of the ion be?

.....

(1)

(Total 4 marks)

3. Tom wanted to make some lead crystals from lead nitrate solution. He decided to place a piece of zinc into a test tube containing the lead nitrate solution. On leaving the mixture for ten minutes, some shiny grey crystals of lead appeared in the test tube.

(a) Write a word equation for the reaction that occurred.

.....

(2)

(b) Name another metal, which would have achieved similar results to the zinc? Why would this metal have been fine to use?

.....

.....

.....

.....

(2)

(c) Name 2 metals that would not have reacted to give lead crystals?

.....

(2)

(d) Write a balanced chemical equation for the above reaction.

.....

(2)

**(Total 8 marks)**

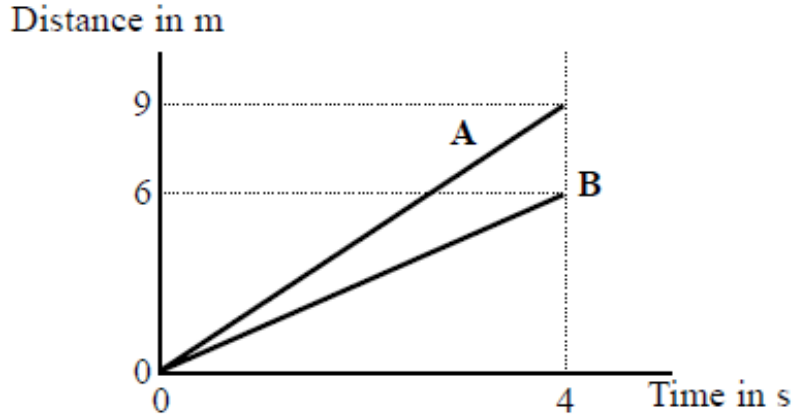
**[Total Marks for Chemistry section: 20]**



## Physics Section

4. Two students, A and B, walk across a classroom. The other students take readings of distance and time.

The readings are used to plot the following graph.



- (a) Complete the sentence.

The line for student A is steeper than the line for student B.

This shows that student A is walking ..... than student B.

(1)

- (b) Use word from the box to complete the sentence.

|              |            |       |          |          |
|--------------|------------|-------|----------|----------|
| acceleration | horizontal | speed | straight | vertical |
|--------------|------------|-------|----------|----------|

The graph shows that each student walks at a steady ..... because the lines are both .....

(2)

- (c) After 4 seconds, what is the distance between students A and B?

Distance = ..... m

(2)

- (d) State the equation which related average speed, distance, and time.

.....

(2)

- i. Calculate the average speed of student B, giving the unit.

Speed of student B = .....

(2)

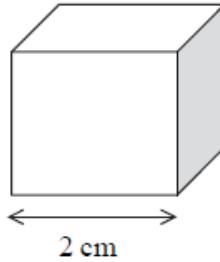
**(Total 8 marks)**

4. State the equation which related density, mass, and volume.

.....  
.....

(1)

(a) A student wants to find the density of a solid metal cube of length 2cm.



i. State the equipment that she would need to measure the mass and the length of the cube.

Mass .....

Length .....

(2)

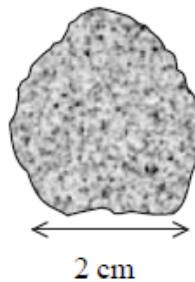
ii. The student find that the density is  $8.0 \text{ g/cm}^3$ .

State the density of a solid metal cube of the same material of length 4cm.

Density = .....  $\text{g/cm}^3$

(1)

(b) The student also wants to find the density of the stone below.



i. State the equipment that she would need to find the volume of the stone.

.....

(1)

ii. The density of water is  $1.0 \text{ g/cm}^3$ .

State the problem that would occur in trying to determine the volume of an object if its density is less than  $1.0 \text{ g/cm}^3$ .

.....

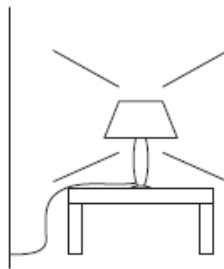
(1)

(Total 6 marks)

5. In the box below are the names of different forms of energy.

|          |                   |            |                         |
|----------|-------------------|------------|-------------------------|
| chemical | elastic potential | electrical | gravitational potential |
| kinetic  | light             | sound      | thermal                 |

(a) The diagram shows a table lamp, lighting up a room.

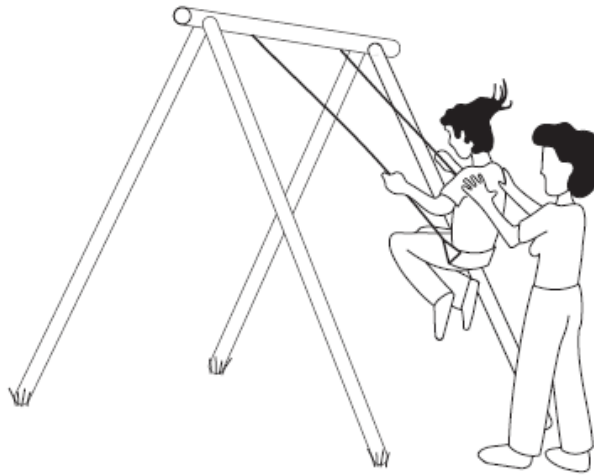


Use words from the box above to describe the energy transfer taking place.

..... energy to ..... energy.

(2)

(b) The diagram shows a child on a swing.



Use words from the box to complete the following sentences.

When the child swings downwards, his ..... energy  
increased and his ..... energy decreases.

The swing gradually loses energy in the form of .....  
energy.

The lost energy is replaced when an adult pushes the swing. This adult gets energy  
from the ..... energy in food.

(4)

(Total 6 marks)

[Total Marks for Physics section: 20]