

<i>School</i>	<i>Candidate's Name (PLEASE PRINT)</i>
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WINCHESTER  
COLLEGE

## **Election**

*Tuesday 7 May 2019*

**Science**

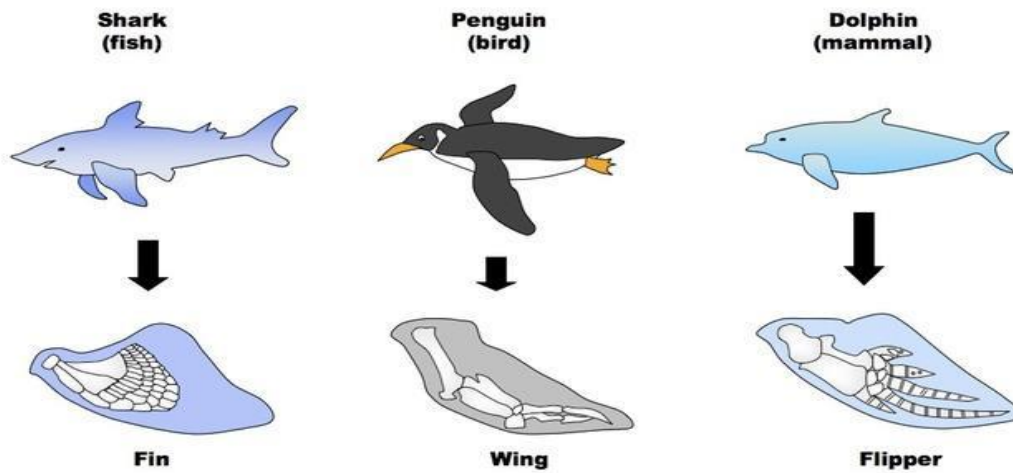
**BIOLOGY**

**THEORY SECTION**

*Recommended time: 20 minutes*

**Write all your answers in the spaces on this question paper**

1 Below is a picture of a shark, a penguin and a dolphin, three types of marine vertebrates. These animals look very similar in many ways although they are only very distantly related.



(a) Write down a distinguishing feature which makes a shark a fish, a penguin a bird and a dolphin a mammal.

Sharks are fish because.....

Penguin are birds because.....

Dolphins are mammals because..... [3]

(b) Identify two features visible from the pictures which all three have in common.

(i).....

.....

(ii).....

..... [2]

(c) Suggest why and how they have acquired these shared characteristics. Remember that they are not closely related.

(i) Why do they share the characteristics you named above?

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[2]

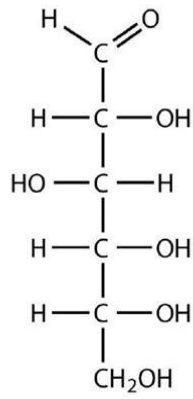
(ii) How have they acquired these features?

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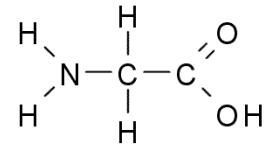
[2]

2 Most living cells get their food (chemical) energy for living processes indirectly from three types of molecule: carbohydrate (e.g. glucose), lipids (e.g. fat) and protein (chains of amino acids).

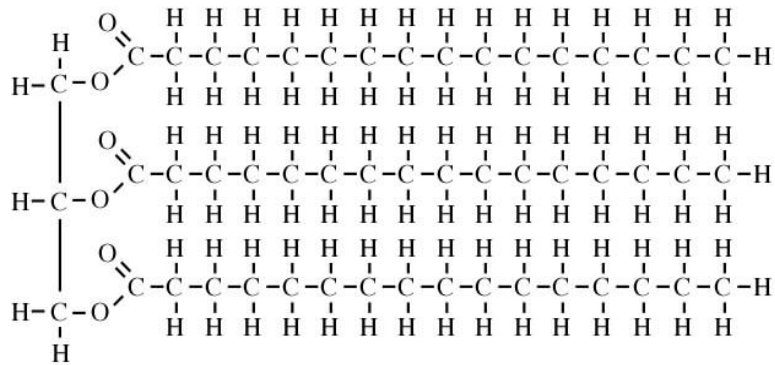
Inside cells in the process of cellular respiration these food molecules are broken down into water and carbon dioxide. We also need oxygen to do this. Some of the atoms that are removed are used to convert a carrier molecule called NAD<sup>+</sup> into NADH. The NADH is then used to generate the universal energy molecule in cells, which is called ATP. Each NADH can generate 3 molecules of ATP. Overleaf are the structural formulae of three examples of these food molecules. Fat can generate the most ATP per molecule, followed by glucose, then amino acid.



Molecule A – Glucose



Molecule B – amino acid (protein)



Molecule C – Fat

Compare the structure of the three molecules and suggest why a fat molecule can make more ATP for the cell than glucose and why glucose provides more than the amino acid.

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3 (a) Write out the balanced symbol equation for photosynthesis.

..... [4]

Here are two grape vine leaves. Leaf A has grown in soil lacking the chemical element magnesium. Leaf B was grown in soil containing magnesium.



Leaf A

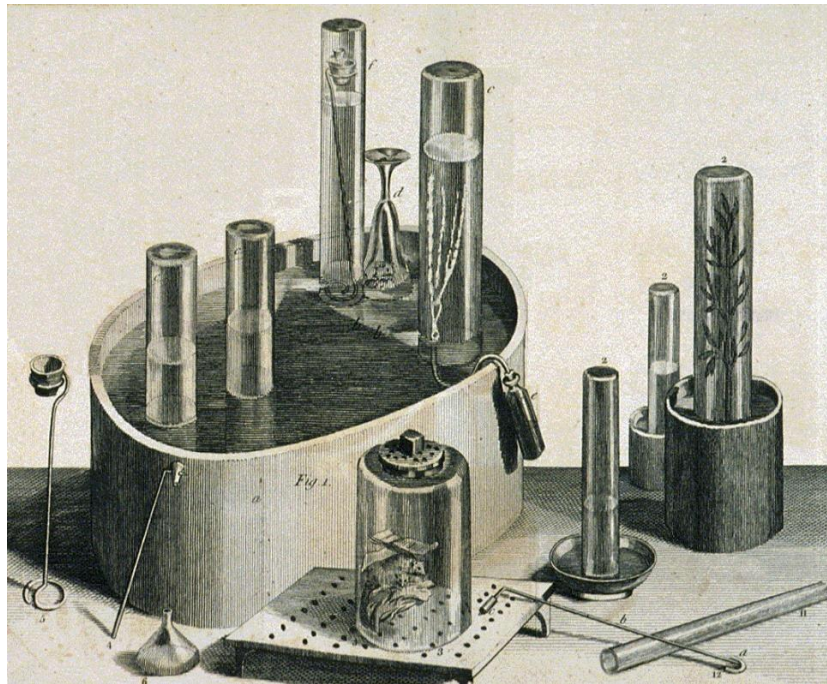
Leaf B

(b) Use your knowledge of photosynthesis to suggest why the absence of magnesium in the soil might make leaf A appear different to leaf B.

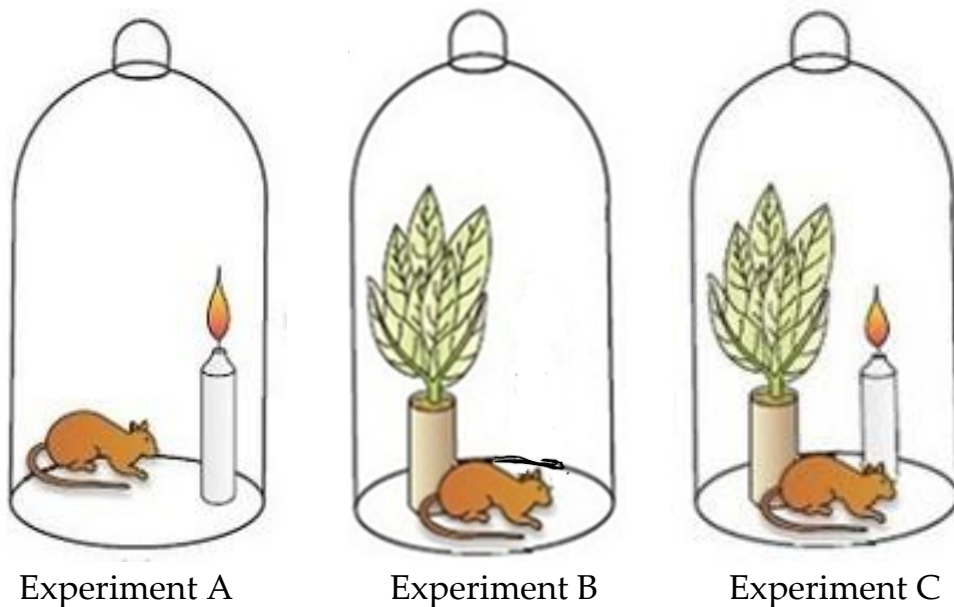
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.....  
..... [2]

4 This question is about the composition of air. The existence of oxygen was determined by Joseph Priestley and Antoine Lavoisier, two 18<sup>th</sup> Century scientists from England and France. They independently carried out various experiments using airtight bell jars, candles and living organisms.

*Apparatus from the laboratory of Joseph Priestley 1772*



*An artist's impression of experiments similar to those of Joseph Priestley 1772*



(a) In *Experiment A* a living mouse was placed in the airtight jar with a burning candle. After less than an hour the candle went out and the mouse then died. Explain in your own words why this occurred and the effect that the candle had.

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[2]

(b) In *Experiment B* a living mouse was placed in the jar with a live plant and the jar was placed in sunlight. After many hours the mouse remained alive. Explain in your own words why the mouse did not die.

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[2]

(c) In *Experiment C* a burning candle is in the airtight jar with the mouse and plant. What effect might the presence of the burning candle have on the survival of the mouse? Explain your answer.

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.....  
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[3]

**End of Paper**

**References**

*Question 1*

[www.studyblue.com/notes/n/ap-biology-study-guide-2014-15-davis/deck/11779224](http://www.studyblue.com/notes/n/ap-biology-study-guide-2014-15-davis/deck/11779224)

*Question 2*

Molecules and respiration

[wikibooks.org/wiki/Medical\\_Physiology/Basic\\_Biochemistry/Amino\\_Acids\\_aand\\_Protein](http://wikibooks.org/wiki/Medical_Physiology/Basic_Biochemistry/Amino_Acids_aand_Protein).

*Question 3*

[www.omafra.gov.on.ca/IPM/images/grapes/plantnutrition/magnesium/magnesium7\\_zoom.jpg](http://www.omafra.gov.on.ca/IPM/images/grapes/plantnutrition/magnesium/magnesium7_zoom.jpg)

*Question 4*

[www.smores.com/t9zaf-joseph-priestley](http://www.smores.com/t9zaf-joseph-priestley)

<http://scihi.org/joseph-priestley-discovery-oxygen/>