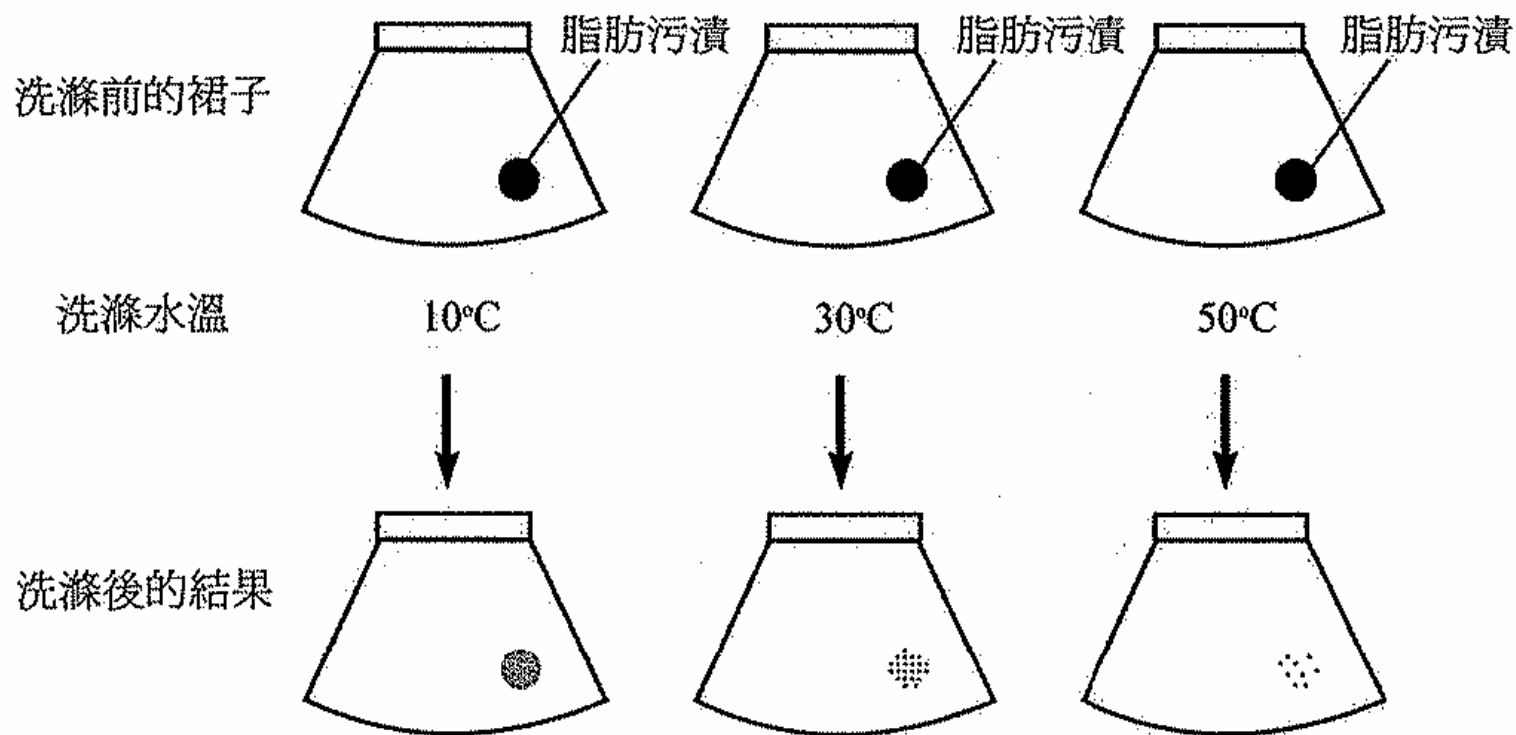


Exemplars – Q. 9 & Q.12

22 & 29 Nov 2008

Paper 1 Section B Q.9

酶在日常生活中的其中一項應用可見於生物洗衣粉。爲了研究生物洗衣粉的效能，把三條相似及染有相同脂肪污漬的裙子，用相同濃度的洗衣粉溶液，在不同水溫下洗滌。這項研究及其結果概述如下：



(N.B. 在以上三個溫度重複這項研究，但不使用洗衣粉。三條裙子上的脂肪污漬保持不變。)

(a) 試解釋為什麼生物洗衣粉能清除脂肪污漬。

(3分)



生物洗衣粉中含有**酶**，能將不溶于水**的脂肪**分解成溶于水的**甘油及脂肪酸**，**使**甘油和**脂肪酸**能顺利地**被水冲走**即清除脂肪污漬。



(a) 試解釋為什麼生物洗衣粉能清除脂肪污漬。


脂肪

催化分解
(3分)

因为生物洗衣粉内含有**酶**，~~能~~這種酶能**將**脂肪**分解**成甘油一脂及脂肪酸，使脂肪從衣物上**清除**。

(a) 試解釋為什麼生物洗衣粉能清除脂肪污漬。

(3 分)



生物洗衣粉內含有一種酶，能催化脂肪
分解。洗滌時，^{酶的活性部位}該酶能以鎖鑰原理或誘導
契合假說與脂肪(受底)結合，將脂肪轉化
成另一種可溶於水物質，從而將其分解。

Performance of the three candidates was similar in Q. 9(a).

(b) 從研究的結果可得出什麼結論？

(1 分)



在 10°C 至 50°C 間，當溫度上升，脂肪酶的活性愈高，即洗衣粉的清污效能愈高。



從研究的結果可得出什麼結論？
生物洗衣粉中
脂肪酶的最適溫度是 50°C 。



最適溫度高於 50°C 後，當溫度越低，酶催化脂肪分解效率越低。

Performance of the three candidates was similar in Q. 9(b).

(c) 一名學生質疑生物洗衣粉是否較普通（非生物）洗衣粉更有效清除脂肪污漬。
若你是該學生，描述你如何進行一項研究以找出哪種洗衣粉更為有效。

(5 分)



以兩個桶中加入相同溫度的水，並保持水溫不變；
在兩布料上滴上相同體積的油漬；
將入入了桶中，每個桶加入相同質量的非生物洗衣粉或老粉；
隔了 30 分鐘取出兩樣布的布料，比較布料上油
漬的體積面積大小；面積較小者代表該洗衣劑
更為有效。

重複在數個相同溫度下以相同的裝置進行實驗，
觀察在溫度不同下兩洗衣粉的相對活性是否有異。



Level 5

- Shows high ability to apply relevant concepts of enzyme activity to explain the working principle of biological washing powders and to design an investigation to solve a given problem.
- The description of the investigation is comprehensive. Covering the variables to be controlled, the variables to be measured and the way of interpreting the results in relation to the problem.
- The ideas are presented in a logical and coherent manner with an accurate use of scientific terminology.

- (c) 一名學生質疑生物洗衣粉是否較普通（非生物）洗衣粉更有效清除脂肪污漬。若你是該學生，描述你如何進行一項研究以找出哪種洗衣粉更為有效。

(5 分)



~~將普通洗衣粉在~~ 把三條相似及染有相同脂肪污漬的裙子，用相同濃度的普通~~的~~洗衣粉溶液，在分別為 10°C 、 30°C 及 50°C 的水溫下洗滌，~~與~~與在相同溫度下的前述以生物洗衣粉洗滌的裙子比較，污漬越少~~的~~的洗衣粉較有效。



Level 4

- Shows competence in using the concepts of enzyme activity to explain the working principle of biological washing powders and in designing a scientific investigation.
- Has concepts in controlling variables, but the way of measuring the results is not clearly presented.
- The ideas are presented with the use of appropriate scientific terminology.

- (c) 一名學生質疑生物洗衣粉是否較普通（非生物）洗衣粉更有效清除脂肪污漬。若你是該學生，描述你如何進行一項研究以找出哪種洗衣粉更為有效。

(5 分)



取相同脂肪污漬的

(5 分)

翠指系碟，裙子，~~才~~分成兩組，~~在~~~~在~~50°C時
以非生物洗衣粉及生物洗衣粉，~~另一組是50°C~~
時洗碟，洗碟後比較其污漬洗潔
程度，加入一些肥皂，在60°C用非生物洗衣粉
洗碟，裙子。



Level 2

- Demonstrate basic understanding of enzyme activity and the application of enzyme in biological washing powders.
- Has some ideas of controlling variables but leaves out the way of measuring the results.
- The ideas are presented in a basic level of written communication.

[Paper 1 Section B Q.12]

Hydrogen and nitrogen are essential components of proteins. Compare and contrast the processes by which non-leguminous plants acquire these two elements from the environment and describe how they can be incorporated together to form proteins in mesophyll cells.

(11 marks)



Level 5

The source of hydrogen is water in the soil.

Water enters the root by osmosis and transport along xylem, by mass flow to the mesophyll cell. (The source of nitrogen is Nitrate.

ion in soil.) the nitrate ions uptake by active transport through root hair cells and to the xylem by mass flow too.

The uptake of water require no energy while uptake of NO_3^- require energy.

Water is break down into H^+ and OH^- by light.

Nitrates is break down by enzyme

the margin.



Level 5

In chloroplast in mesophyll cells,
water is first photolysis into H^+ and OH^- , the H^+
is accept by NADP to form NADPH. the carbon dioxide is
combine with RuBP to form a 6C-compound the 6C compound
form two PGA the PGA is reduced to triose phosphate by NADPH, triose
phosphate
In cytoplasm, the glucose convert to hexose phosphate,
and then two triose phosphate then to pyruvate. then pyruvate
is oxidise to acetyl CoA, the acetyl CoA enter krebs cycle in
mitochondria, ^{in mesophyll cells} to combine with a 4C-compound to form
6C-compound, the 6C-compound is convert to 5C-compound
and 4C compound by decarboxylation. the 4C, 5C-compound
is combine with the Nitrogen element of nitrate ion.
to form amino acid. the amino acid is transaminate,
to other amino acid and form protein by
polymerization in mesophyll cell.



Level 5

- Shows extensive knowledge and understanding of the acquisition and incorporation of hydrogen and nitrogen to form proteins.
- The concepts are well integrated and effectively communicated in a logical and coherent manner with an accurate use of scientific terminology.



Level 4

For non-leguminous plants, hydrogen is obtained from water while nitrogen is obtained from ~~nitrite~~, ~~nitra~~ nitrates and ammonium ions dissolved in soil water. Both absorption use water as a medium and both are absorbed through roots.

However, hydrogen in water is obtained by osmosis while nitrogen in ions ~~are~~ is obtained by active transport because of the low concentration of nitrogen-containing ions. Absorption of nitrogen requires energy while that of hydrogen does not.

By photosynthesis, ~~triose phosphate~~ sugar is formed ^{in the mesophyll cells}. The sugar is converted into pyruvic acid and later Acetyl CoA and then enter the Krebs' ~~cycle~~ cycle. The intermediata of Keeb's cycle, which contain hydrogen and nitrogen, formed amino acids. The amino acids then combine together to form protein.



Level 4

- Shows sound knowledge and understanding of the acquisition of hydrogen and nitrogen in plants. The importance of photosynthesis and Krebs cycle in providing the carbon skeleton of amino acids is mentioned though details are not adequately illustrated.
- The ideas are communicated in a concise and coherent manner with an appropriate use of scientific terminology.



Level 3

Both hydrogen and nitrogen are absorbed ~~at~~^{by} the root in the soil.

~~However, hydrogen is absorbed in the form of water or NH_4Cl by roots.~~

Both hydrogen and nitrogen can be absorbed by root in the form of ~~it~~ ammonium chloride. However, hydrogen is mainly absorbed in the form of ~~the~~ water and nitrogen is absorbed in the form of nitrate ion.



Level 3

The plants absorb water ~~at~~ by osmosis due to the water potential gradient between the soil and the root cells. However, the plants absorb nitrate and ammonium chloride by active transport, which is energy-consuming.

Both the hydrogen and nitrogen elements ~~are~~ are transported to the plant cells for protein synthesis. In mesophyll cells, the hydrogen and nitrogen ~~react~~ react ~~with~~ with some ~~amino~~ intermediate in the Krebs's cycle of respiration. ~~to form amino acid.~~
And then, some other element, such as phosphate or sulphur may be added. So that, amino acids are produced.



Level 3

The amino acids join together to form protein in
transcription between mRNA and tRNA. ~~The~~ peptide bonds
are formed between the amino acids and ~~the~~ specific
proteins ~~are~~ are synthesised by the structural
protein and functional protein, such as some
enzyme for respiration are produced



Level 3

- Shows general knowledge and understanding of the acquisition of hydrogen and nitrogen in plants. However, the candidate fails to give the details of the processes by which hydrogen and nitrogen are incorporated to form amino acids. Minor misconceptions and irrelevant materials are found.
- The ideas are clearly presented with the use of scientific terminology.



Level 2

Proteins are produced by hydrolysis of amino acids and amino acids are produced by amination and transamination. Amino acids are composed of carboxyl group and amino group, which contain hydrogen and nitrogen respectively.

For hydrogen, it is absorbed from ^{absorbing} water by the root of non-leguminous plants. Similarly, nitrogen is absorbed from nitrate ions dissolved in water by the root of non-leguminous plants. However, in order to use the hydrogen to form proteins, hydrogen needs to be converted into pyruvate by photosynthesis first. And then the pyruvate enters the Krebs cycle and to form the carboxyl group of amino acids. And nitrate ions are just directly converted into amino group of amino acids.

We can say that, when hydrogen and nitrogen are absorbed from the environment, there are more steps for hydrogen to be converted into protein than nitrogen.



Level 2

- Shows basic knowledge and understanding of the required concepts. Contents presented are confused and misconceptions on the Calvin cycle and protein synthesis are detected.
- Able to present his / her ideas, though the range of scientific terms used is limited.



Level 1

The non-leguminous plants acquire these two elements from air. Nitrogen converts to nitrate by lightning and dissolve in the soil which can then be obtained by plants. Hydrogen can be obtained from water in soil by mass flow. Nitrogen can also be obtained from inorganic fertilizers.

In meso mesophyll cells,

Photosynthesis is carrying at mesophyll cell, during the light Calvin cycle, 3-carbon substances are produced for the synthesis of other nutrients. The 3-carbon substances then carry out a process which is the conversion of glycolysis. Adding nitrogen, carbon pyruvate pyruvate acid and hydrogen together to form protein in mesophyll cells.



Level 1

- Shows an elementary level of both the knowledge of the concepts and written communication.