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Cognates Recognition: Its Effect on the Reading Comprehension of Scientific Texts

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Abstract

For decades, researchers have indicated the relevant role that cognates play in reading comprehension due to the lot of benefits these words can produce. In this respect, our article aims at discussing one of the reading strategies used by students of Biology at Constantine University 1 in understanding scientific terminology which is recognising the English cognates for the French scientific terms. Also, it investigates the extent to which the use of such strategy enhances the reading comprehension of English biology texts. The hypothesis is that: if students use the strategy of recognising cognates for understanding scientific terminology, their comprehension of biology texts will be better and faster.

Keywords: reading, reading strategies, 'recognising cognates' strategy.

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Résumé

Pendant des décennies, les chercheurs ont indiqué le rôle pertinent des cognates (mots apparentés) dans la compréhension de la lecture. Cet article vise à discuter l'une des stratégies de lectures utilisée par les étudiants de 3ème année de biologie à l'université de Constantine 1 dans la compréhension de la terminologie scientifique, qui est de reconnaitre les termes scientifiques anglais qui ressemblent aux termes scientifiques français dans leur forme, prononciation et sens (cognates). Cet article examine aussi la mesure dans laquelle l'utilisation d'une telle stratégie améliore la compréhension des textes de biologie en anglais. L'hypothèse est la suivante : si les étudiants utilisent la stratégie de reconnaissance des cognates pour comprendre la terminologie scientifique, leur compréhension des textes de biologie sera meilleure et se fera plus rapidement.

Mots clés: lecture; stratégies de lecture; stratégie de reconnaissance des cognates.

ملخص

على مدى عقود، أشار الباحثون للدور الهام الذي تلعبه الكلمات التي تشترك في الكتابة و النطق و المعنى مع لغة أخرى مكتسبة في فهم النصوص. و في هذا الصدد، يهدف هذا المقال إلى مناقشة واحدة من استراتيجيات القراءة التي يستخدمها الطلاب من قسم البيولوجيا السنة الثالثة في جامعة قسنطينة 1 لفهم المصطلحات العلمية و المتمثلة في التعرف و التمييز بين الكلمات العلمية الانجليزية و الفرنسية التي تشترك في الكتابة و النطق و المعنى.كما يهدف هذا المقال إلى التحقق من فعالية هذه الإستراتيجية في تحسين قدرة استيعاب النصوص الانجليزية. يرتكز هذا البحث على الفرضية التالية: استخدام الطلاب لإستراتيجية التعرف و التمييز بين الكلمات العلمية الانجليزية و الفرنسية التي تشترك في الكتابة و النطق و المعنى لفهم المصطلحات العلمية يفعّل و يسرّع من عملية فهمهم (استيعابهم) للنصوص.

الكلمات المفتاحية: القراءة ؛ استراتيجيات القراءة ؛ إستراتيجية التعرف و التمييز بين الكلمات التي تشترك في الكتابة و النطق.

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I- Introduction :

In the university, students of biology need English for reading purposes, especially when they consult English printed books, articles and e-books for the preparation of their licence or master dissertations. They have an English module which is meant to be English for Science and Technology (EST) course that help them improve their English and reading skills.

However, reading is a source of difficulty for these students. The problems that they encounter are due to a number of factors including their low level in English, time (one session per week is not sufficient) and the main objective of the courses which is not teaching reading. Helping students to be effective readers through using a maximum of reading strategies in order to achieve comprehension and understanding of scientific texts is not an aim for these courses , to name a few. Nevertheless, students can overcome their difficulties when they use what they learn in their Biology classes, especially the scientific terminology which is always given to them in French. Biology texts written in English contain more frequently cognates between the English and the French scientific terms and when the students encounter new English scientific terms while doing their activities, they do not 'panic', but they are rather able to comprehend the texts because they use ‘recognising cognates’ as a strategy.

The present article focuses on reading strategies with particular focus on cognate recognition strategy. The motivation for such a research is the conviction of the importance of cognates in reading comprehension. Therefore, the purpose of this study is to show how students use the 'recognising cognates’ strategy in enhancing their reading skills and their global understanding of the Biology texts. Obviously, the focus of this study rests on three key concepts: **reading, reading strategies, 'recognising cognates’ strategy.** In order to orient the reader to the concepts which are investigated in the present study, a brief discussion of these concepts is provided.

I.1. Definition of Reading:

In many science departments, students typically need English for Science and Technology (EST) to understand English and will therefore expect English courses to give priority to developing their reading skills. Reading is one of the four language skills through which learners of foreign languages could keep in touch with the language. It is an important skill because all the language skills are introduced during the reading session. Carrell (1988, p. 1) has stressed this importance saying that ‘for many students, reading is by far the most important of the four skills in a [third] language, particularly in English as a [third] language”

Different researchers gave many definitions to the concept of reading, but there is no precise and exhaustive definition of reading. The reason behind this lies in the fact that each researcher has approached reading from his own area of interest. In the literature reviewed, we have selected three main views on reading, namely the traditional, the cognitive and the meta-cognitive.

According to the traditional view, reading is the ability to decode written words. All the matter is about the visual process of the text that is matching the sounds to their graphic symbols. So, the focus is basically put on the printed aspect of the text, and the understanding of its linguistic aspect is often ignored. This idea is emphasized by Fries (1962) who has seen that a reader who knows the alphabet and the code of a language can read successfully.

Opposing the traditional view, Smith (1985, pp. 99-102) suggests that ‘reading is mistakenly considered as the decoding of letters to sounds […] but reading involves illustrations, descriptions and analysis […] so, reading is extracting information from a text”. So, to Smith reading is rather a cognitive activity which involves an amount of thinking on the part of reader in order to get out the meaning of the written text. Davies (1995, p. 1) also emphasizes this idea stating that ‘reading is private; it is a mental or a cognitive process which involves a reader in trying to follow and respond to a message from a writer who is distant in space and time’. The cognitive view stresses the

importance of the background knowledge of the reader during the process of thinking about what he is reading, that is what appears at the level of the printed page.

Finally, the meta-cognitive view of reading is interested in how the reader controls and manipulates the text in order to comprehend it. Grabe (1991), as cited in Alyoucef (2005, p. 377) sees reading as an "active process of comprehending [where] students need to be taught strategies to read more efficiently (e.g., from context define expectations, make inferences about the text, skim ahead to fill in the context, etc." . So, the importance of prediction and guessing skills while reading is stressed by the meta-cognitive view. Earlier, Grellet (1981, p. 7) described reading as "a constant process of guessing and what one brings to the text in often more important than what he finds in it". To her, the stress is always on the importance of prediction and guessing skills while reading.

In general, reading is seen as an act of decoding graphic symbols. To this can be added the reader's prior knowledge of the topic and a meta-cognitive process where the reader brings his prior information to the text through prediction and guessing and this to a large extent applies to biology students.

I. 2. Definition of Reading Strategies:

Research in the process of reading has shown that it is characterized by the use of many strategies on the part of the reader in order to tackle the problem of understanding. Generally, these strategies contribute in the success of the act of reading by facilitating the reading performance. Below some definitions of reading strategies are given.

The concept of reading strategies is defined by many researchers and from different perspectives. The first view sees that a strategy is a conscious act in order to solve local problems in the text. Urquhart and Weir (1998, p. 95) define strategies as "ways of getting round difficulties encountered while reading". For Carrell (1998), reading strategies are any tactics used by the readers to comprehend a text. The other view is held by Pritchard (1990, p. 275) who defines a strategy as "a deliberate action that readers take voluntarily to develop an understanding of what they read", and Davies (1995, p.50) who describes a strategy as "a physical or mental action used consciously or unconsciously with the intention of facilitating text comprehension and/or learning". Thus, according to this latter view, strategies are means of facilitating comprehension. To Singhal (2001, p. 7) a reading strategy is a "process used by learners to enhance reading and overcome comprehension failure", a definition that combines the two above views. Finally, all the above views fuse in Barnett's (1989, p. 66) definition, who suggests that:

> the word strategy refers to the mental involved operations when readers purposefully approach a text to make sense of what they read. They may be either conscious techniques controlled by the reader or unconscious processes applied automatically. Both 'good' successful and poor (unsuccessful) strategies exist, yet the term strategy as used in pedagogical materials often implies those which are successful.

I.3.Recognising Cognates:

Holmes (1986, p.15) defines a cognate in L2 as "a word which is derived from the same source as a word which has a similar meaning in L1".

Studies on the performance of the readers during the reading process identify a variety of comprehension strategies. These strategies range from simple to complex and from most used to less used. Recognising cognates is one strategy from the array of strategies examined by researchers. It involves the ability of readers to apply their linguistic knowledge of other languages (French in our case) to the target language (English).When students recognise words as cognates, they can access unfamiliar English words and "better" understand what they read. So, this ability to use cognates

is a powerful strategy for helping the French- minded English learners access information in the text and build English fluency.

II– Methods and Materials:

A questionnaire and a test have been used as suitable data collection tools to measure the extent to which 'recognizing cognates' is used as a reading strategy, and the extent to which it enhances the reading comprehension of scientific texts by using a sample of 19 third-year biology students, option "Molecule and Cellular Biology" from the University of Constantine 1.

II.1. The Questionnaire:

The questionnaire is given in order to get insights into the students' level of proficiency in reading English texts. The researcher wants to know how students used the strategy of 'recognising cognates' in enhancing the degree of comprehension of authentic scientific texts.

The questionnaire consists of two sections. The first one concerns the students general information such as their medium of instruction (Arabic, French or both), the status of English in their study (whether they need it or not), what language skill they need to develop and practice in English (reading or writing), and what kinds of documents they read in English. The second section tries to investigate the students' reading situation and the strategies they employ. The aim is to seek information such as the degree of difficulty with which students read in English, and if they really have a difficulty, which elements of the text (general vocabulary, scientific terminology, sentence structure or grammar) make the text difficult for them. The other aim is to know what procedures students use when they encounter a problem. Moreover, the questionnaire seeks to know whether the students are aware of the existence of such cognates between the English and French scientific terms, and whether they use them. Finally, the opinion of the students about the role of cognates in reading comprehension is probed.

According to the data obtained from the questionnaire, one can conclude that the necessity for the English language is stressed by all the students of Biology. These students are aware enough about the importance of the English language in their studies. Most of them are also aware that they need to read and to write in English for their studies and future research. So, even though the English course focuses on reading, the students see that writing in English is also necessary in their studies. All this seems to help them understand their specific needs in English.

The questions of the second section which is concerned with the students' reading situation and strategies reveals that there are differences between the students of our sample concerning their proficiency level. Indeed, (57,89%) have an intermediate level since they answer question 6 by 'difficult to understand', and (42,10%) have a pre-advanced level since they answer the same question by 'easy to understand'. Their difficulty comes from the general vocabulary, less difficulty stems from the grammatical and syntactic level of the text, and no difficulty at all with the scientific terminology (Question 07). Despite this difficulty, these students do not seem to abandon the text; they rather take different actions in order to work out the meaning of the text. The results show that the students skim the text, thus, bottom-up information is used during this skimming together with strategies of recognising the French/ English cognates and guessing the meaning of general vocabulary. Recognizing cognates, especially at the level of the scientific terms, is widely used by students. All of them agree on the positive role of these cognates in improving the reading comprehension for the majority answered (Question 11) by 'yes'.

Through this analysis, we notice some correlations between the answers in this questionnaire. First, the fact that both Arabic and French are used to explain the scientific terminology during the Biology course (Question 2), makes most of the students (94.73%) pay attention to the English scientific terms that look as the French ones (cognates) while reading the English text (Question 9). Second, no one among the

students who have difficulties with the English text, have a difficulty with the scientific terminology (Question 7) because among the strategies they use to comprehend, we find the strategy of recognising cognates (Question 8). Third, the same students who answered in (Question 6) that they find the English texts difficult to understand; all agree in (Question 12) on the easiness of the English text with the significant presence of cognates at the level of terminology.

II.2. The Reading Comprehension Test

The reading comprehension test aims at evaluating the use by students of the strategy of 'Recognising Cognates' at the level of scientific terminology. The goal is to arrive at a clear understanding of this strategy and how students use it and the extent to which this strategy contributes in the reading comprehension of the scientific texts.

II.2.1. Description of the Test

The test consists of a text taken from a specialized book entitled ' The World of Cell' (Becker et al. 1999), followed by three activities.

The text has been adapted. It is an expository text with definitions, illustrations, classifications, and descriptions. The text contains 335 words, four paragraphs, and twenty nine lines, that is, it is neither too short, nor too long. Among the 335 words, there are 95 words which are scientific terms (2 words are in the title). We have tried to classify these scientific terms in the table below according to Trimble (1985) classification of the lexical areas in EST discourse.

Technical vocabulary		**Sub-technical vocabulary**	
Single words	**Compound words**	**Single words**	**Compound words**
Cell, organelles, membranes, metabolites, substrates, intermediates, sugars, amino-acids, nucleotides, Transport, genes	Cell and subcell-lar compartment, active transport, simple diffusion, lipid bilayer, facilitated diffusion, transport proteins, membranes single, file, product in the various metabolic-pathways, specific organelles, Cell function Transport processes, The bacterium Escherichia coli, the surrounding milieu, biological membrane,	Feature, ability, aspect, accumulate Substances, concentrations, macromolecules, transported, molecule, sodium, potassium, calcium, chlorides, hydrogen, mechanisms, movement, oxygen, carbon dioxide, ethanol	move into, move out, move across, dissolved ions, small organic molecules – solutes, nonpolar molecules, significant rate, thermodynamic equilibrium, respective freeenergy gradients freeenergy gradients
11 words	**14 compounds=35 words**	**20 words**	**11compounds=27words**

Table1.Classification of the Text's Scientific Terms

All these 95 technical and sub-technical words have cognates in French (Cell= Cellule, Organelles = Les organelles, Active transport = Le transport actif …) except few ones such as:
feature, ability, cross, move across, lipid bilayer, and also some parts of the compounds such as:

- Products in the **various** metabolic **pathways.**
  no cognate ▲ no cognate
- The surrounding milieu
  no cognate
- Significant rate.
  no cognate
- Free- energy gradient.
  no cognate

The three activities are as follows:

Activity One

In this activity, the students are asked to underline all the words they understand, then, give their translation in French. The aim of this activity is to see how much the students recognise the cognates between the English and the French scientific terms**.**

Activity Two

It consists of five '**Wh**' questions through which the students' reading comprehension of the text is tested.

Activity Three

It consists of two parts. In the first part, the students are given two expressions from the reading text and required to find a single scientific term from the same text which refers to the whole expression. In the second part, three expressions which do not belong to the reading text but are about the same topic which is 'the Cell and Transport Processes' are given to the students. Students are asked to fill in the gaps with the appropriate missing word which is a scientific term which has a French cognate.

Through this activity, students are invited to show the productive aspect of the use of cognates. This means that students first recognize (activity one) and second and most importantly utilise these cognates.

II.2.2. Administration of the Test

The test was administered by the researcher (the teacher of this group) during an ordinary teaching session. Two students were absent the day of the test, the others were given one hour and a half to answer the questions. They were reminded to work independently.

III- Results and discussion :

The following is a detailed performance of the test takers.

Activity one:

The students are asked to underline all the words they understand and give their translation in French and also translate the title into French.

All the students underlined both general and scientific terms. These general terms consisted of articles, adverbs like: *some, most, always, almost, every* and adjectives

such as: *different, small, essential, central; w*hereas, the scientific terms got the lion's share of the whole underlined words.

The students	The number of the underlined scientific terms among the 93 terms present in the text
Student 1	90
Student 2	89
Student 3	87
Student 4	85
Student 5	82
Student 6	82
Student 7	81
Student 8	73
Student 9	70
Student 10	70
Student 11	51
Student 12	48
Student 13	40
Student 14	38
Student 15	24
Student 16	15
Student 17	12

Table 2. The Number of the Underlined Scientific Terms per Student

Concerning the translation into French, all the students succeeded in giving the French equivalent terms (cognates) for example: cell=**cellule**, sugars= **les sucres**, genes, **les gènes**, Bacterium Escherichia coli= **Les bactéries Escherichia coli**, Carbon dioxide= **Le dioxyde de carbone** ... and the French equivalent title which is '**la cellule et les processus de transport**'.

Activity Two

The students have been asked to read the text and to answer five reading comprehension questions in order to get 5 points.

scores	**5pts**	**4pts**	**3pts**	**2pts**	**Total**
students	4	8	4	1	17
percentage	23.52%	47.05%	23.15%	5.88%	100%

Table 3. The Percentage of the Students Scores in the Reading Comprehension Activity

(23.52%) of the students succeeded wholly in answering all the five questions, (47.05%) of them got 4 points by answering 4 questions, (23.52%) answered 3 questions, and (5.88%) succeeded in answering only 2 questions.

Activity Three

Students are required to supply the five missing words in order to complete the fives expressions (scored on 5 points).

scores	4	3	2	1	0	Total
students	4	4	3	1	5	17
percentage	23.52%	23.52%	17.64%	5.88%	29.41%	100%

Table 4. The Percentage of the Students Scores in Activity Three

Most of the students (29.41%) failed in finding the missing word. (23.52%) succeeded partially by scoring 4 points, against (23.52%) succeeded only in finding 3 words (cognates). Finally, (17.64%) found only 2 words.

As far as the data obtained is concerned, we can say that the majority of students (13 out of 17) showed a great ability of recognising the English cognates of the French scientific terms. Students underlined a considerable number of these cognates and most of them were able to translate them into French, especially the English title which consists of three cognates, where all the students gave the equivalent French title .Therefore, all the students can make prediction about the content of the text and activate their prior knowledge from their subject matter class.

It can also be noticed that some students have translated successfully some parts of the compounds which do not have a French cognate.

- e.g. the surrounding milieu= le milieu environnant
- e.g. Signifiant rate = un taux significatif
- e.g. Lipid bilayer= bicouhe lipidique
- e.g. The various metabolic pathways = les differentes voies métaboliques
- e.g. Free -energie gradient = gradient d'energie libre

Moreover, the identification of cognates helps some students in guessing the meaning of other words. For example, some students translated the phrasal verb ' move across' by 'traverser' in the following sentence:*'Most of the substances that move across membranes are not macromolecules but dissolved ions'.*

These students succeeded in understanding an English phrasal verb (phrasal verbs pose enough problems for the foreign learners) most likely because they know that in French we say: '*la plupart des substances qui traversent les membranes ne sont pas des macromolecules mais des ions dissous'.* It is also noticeable that an ignorance of the compounds on the part of some students was clear when they decomposed the cognates and treated them as single words when translating.

Concerning the reading comprehension activity, the students' scores indicate that they understood the text differently. In effect, half of them succeeded in answering four questions, (23.52%) answered all the five questions, (23.52%) succeeded in answering three questions, and few of them (5.88%) answered only two questions. This is acceptable since we have seen earlier in the questionnaire that the level of proficiency of the students of our sample is different, and because the number of the underlined words which the students understand was different (activity1).

The results of the third activity, on the other hand, show that the students are not good in using the cognates as in recognising them. Five students could not find any of the missing words, only 4 students found 4 missing words, other 4 students found 3 words, 3 students found 2 words and one student found 1 word. So, the cognates constitute a passive vocabulary for our students.

- **Correlating 'Recognizing Cognates' with Reading Comprehension**

A correlational study is undertaken in order to test the hypothesis. The relationship between the use of the 'recognizing cognate' strategy at the level of scientific terminology and the reading comprehension of Biology texts was examined. In order to be able to do so, the Pearson's correlation coefficient 'r' is used, is one of the most common correlation coefficients.

A correlation coefficient 'r' shows the degree of correspondence between two sets of scores. It is a correspondence between two or more variables that expresses how the increase in the magnitude of one variable is followed by an increase or a decrease in the magnitude of the other variable.

r (xy) value differs from (-1) to (+1) , (+1) represents a perfect positive correlation whereas (-1) represents a perfect negative correlation. A very strong positive correlation approaches (+1), (e.g.0, 90). A very strong negative correlation approaches (-1),eg-:0.90).

When 'r' equals (0), it means that there is no relation between X and Y.

As far our correlation study is concerned, X represents the number of the underlined scientific terms (cognates) among the 93 terms in the whole text, and Y represents their scores in the reading comprehension activity (Activity 2).

Students	X	Y	*x*	*y*	*x* 2	*y* 2	*xy*
S 1	90	5	29	1.12	841	1.25	32.48
S2	89	5	28	1.12	784	1.25	31.36
S3	87	5	26	1.12	676	1.25	29.12
S4	85	4	24	0.12	576	0.01	12.88
S5	82	5	21	1.12	441	1.25	23.52
S6	82	4	21	0.12	441	0.01	2.52
S7	81	4	20	0.12	400	0.01	2.4
S8	73	4	12	0.12	144	0.01	1.44
S9	70	4	9	0.12	81	0.01	1.08
S10	70	3	9	-0.88	81	0.77	-7.92
S11	51	4	-10	0.12	100	0.01	-1.2
S12	48	3	-13	-0.88	169	0.77	11.44
S13	40	4	-21	0.12	441	0.01	-2.52
S14	38	3	-23	-0.88	529	0.77	20.24
S15	24	2	-37	-1.88	1969	3.53	69.56
S16	15	4	-46	0.12	2116	0.01	-5.52
S17	12	3	-49	-0.88	2401	0.77	43.12
∑	1037	66	0	0	11590	11.69	254
M	61	3.88					

Table 5. Computation of Pearson's Moment-product Correlation Coefficient 'r' between 'Recognizing Cognates' and Reading Comprehension

SD x= $\sqrt{\frac{\sum x2}{N}} = \sqrt{\frac{11590}{17}} = 26.11$

SD y= $\sqrt{\frac{\sum y2}{N}} = \sqrt{\frac{11.69}{17}} = 0.82$

'r' (xy) = $\frac{\sum xy}{(N)(SD\,x)(SD\,y)} = \frac{254}{17*26.11*0.82} = \frac{254}{363.91} = \mathbf{0.7}$

Since the value of 'r' obtained is (0.7) (Table8), we can say that the results of the correlation coefficient between the use of the 'recognising cognates' strategy and reading comprehension are very significant and are in the direction of our hypothesis.

IV- Conclusion:

The outcome of the students questionnaire analysis showed that most of the students face many difficulties while reading the English texts. These difficulties stem mainly from the general vocabulary, grammar and sentence structure. All the students agreed on the fact that they have no difficulty with scientific terminology for they showed that they were aware of the existence of cognates. Besides, the reading strategy of **'**Recognising Cognates' was among the widely used strategies by students. So, biology students use to a large extent this strategy and believe that it helps them in the reading comprehension of biology texts.

The findings of the test and the correlational study confirm our hypothesis that if students use the strategy of 'recognising cognates' in decoding scientific terminology, their comprehension of biology texts will be better and faster.

APPENDIX 1

The Student's Questionnaire

I- Section One: Background knowledge

1-Do you study in:

a-Arabic. ☐

b- French. ☐

c-both. ☐

2-If in ' Arabic', are the scientific terms given to you, in:

a- Arabic. ☐

b- French. ☐

c- Both. ☐

3- Do you need English in your study?

a- Yes. ☐

b- No. ☐

c- No idea. ☐

4-If 'Yes', what do you exactly need?

a- To read in English. ☐

b- To write in English. ☐

c- Both. ☐

5- If ' To read in English', what kinds of documents you read?

a- Books linked to your field and speciality (Biology). ☐

b- Articles in the internet. ☐

c- The texts given to you at the English course. ☐

d- Other things:……

II- Section Two: Reading Situation and Strategies

6-How do you find the English texts when you read them?

a- Difficult to understand ☐

d- Easy to understand. ☐

7- If ' difficult', is it because:

a- General vocabulary. ☐

b- Scientific terminology. ☐

c- Sentence structure. ☐

d- Grammar. ☐

8-When you have problems, do you:

a- Try to understand by reading carefully. ☐

b- Start guessing the meaning of general vocabulary. ☐

C -Start guessing the meaning of scientific terms. ☐

d- Do not do anything and abandon reading. ☐

9-Do you pay attention to the English scientific terms that they look as the French one (cognates)?

a- Yes. ☐

b- No. ☐

10- If ' Yes', what do you exactly do?

a- Just recognise their meanings by saying: ' ah! Yes this is like the French word. ☐

b- Check them up in a specialised dictionary. ☐

c- Other things:……

11-Do you see that these cognates helps you understand the text better?

a- Yes. ☐

b- No. ☐

12-If the text contains a considerable number of these cognates, how do you find the text?

d- difficult to understand. ☐

b- Easy to understand. ☐

APPENDIX 2

The Reading Comprehension Test

Cells and Transport Processes

An essential feature of every cell and subcellular compartment is its ability to accumulate a variety of substances at concentrations that are often strikingly different from those in the surrounding milieu .Some of these substances are macromolecules, which are moved into and out of cells and organelles.

Most of the substances that move across membranes are not macromolecules but dissolved ions and small organic molecules – solutes, in other words. These solutes cross membranes single file, one ion or molecule at a time. Some of the more common ions transported across membranes are sodium (Na^+), potassium (k^+) ,calcium (Ca^{++}) ,chloride (Cl^-) ,and hydrogen (H^+).Most of the small organic molecules are metabolites −substrates , intermediates , and products in the various metabolic pathways that take place within cells or specific organelles. Sugars, aminoacidss, and nucleotides are some common examples. Such solutes are almost always present at higher concentrations on the inside of the cell or organelle than on the outside.

A central aspect of cell function , then , is transport : the ability to move ions and organic molecules across membranes selectively .The importance of membrane transport is evidenced by the fact that about 20%of the genes that have been identified in the bacterium Escherichia coli are involved in some aspect of transport.

Three different mechanisms are involved in the movement of solutes across membranes .Certain small, nonpolar molecules such as oxygen, carbon dioxide, and ethanol move across membranes by simple diffusion ─direct, unaided movement of solutes molecules into and through the lipid bilayer in the direction dictated by the difference in the concentrations of the solute on the two sides of the membrane. For most solutes, however, movement across biological membrane at a significant rate is possible only because of the presence of transport proteins. In some cases, transport proteins are involved in facilitated diffusion of solutes, moving them down their free-energy gradient in the direction of thermodynamic equilibrium. In other cases, transport proteins mediate the active transport of solutes, moving them against their respective free-energy gradients.

Activity One:

1. Underline all the words that you understand.
2. Give their translation in French.
3. Translate the title into French.

Activity Two:

1. What is the essential feature of a cell?
2. What are dissolved ions?
3. Give two examples of the metabolites.
4. What is the central function of the cell function?
5. What do transport proteins mediate?

Activity Three:

1. Pick up from the text the exact word which refers to the following:

a. Substrates, intermediates, and products in the various metabolic pathways that take place within cells or specific organelles=……..

b. the ability to move ions and organic molecules across membranes selectively=……

2. From your understanding of the above text, fill in the gaps with the appropriate word.

a. …….is the unassisted movement of a solute from a region where its concentration is higher to a region where its concentration is lower.

b. Oxygen is an example of a nonpolar ……. that moves across membranes by simple diffusion.

c.Transport ……are involved in both facilitated diffusion and active transport.

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