الامتحان الوطني الموحد للبكالوريا
المسالك الدولية – خيار أنجليزية
الدورة الاستدراكية 2018
-الموضوع-

RS34E

المملكة المغربية
وزارة التربية الوطنية والتكوين المهني والتعليم العالي والبحث العلمي

المركز الوطني للتقويم والامتحانات والتوجيه

3	مدة الإنجاز	علوم الحياة والأرض	المادة
5	المعامل	شعبة العلوم التجريبية : مسلك العلوم الفيزيائية – خيار أنجليزية	الشعبة أو المسلك

Candidates may use non-programmable calculators

Section I : Knowledge Retrieval (5 pts)

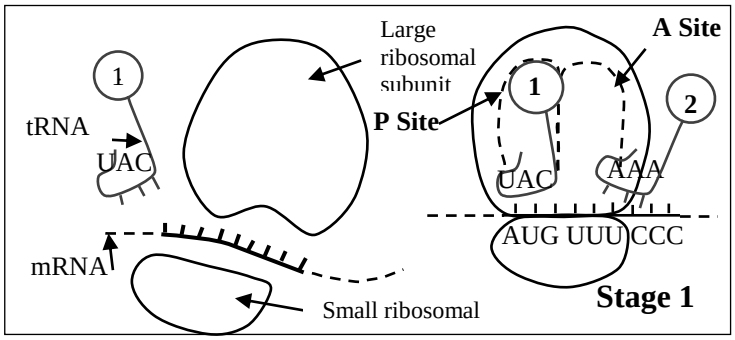
I. **Define** the following notions: (a) allele; (b) mutation. **(1pt)**

II. Chromosome characteristics (form and disposition) change according to the phases of mitosis and meiosis. Give two characteristics for each of the two phases:

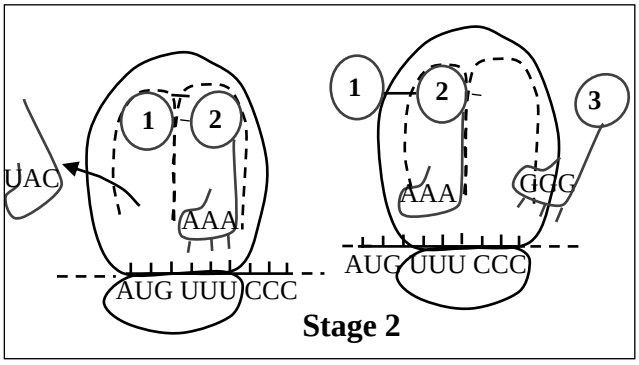
a - anaphase I of meiosis **(0.5 pt)** ; **b** - anaphase of mitosis **(0.5 pt)**

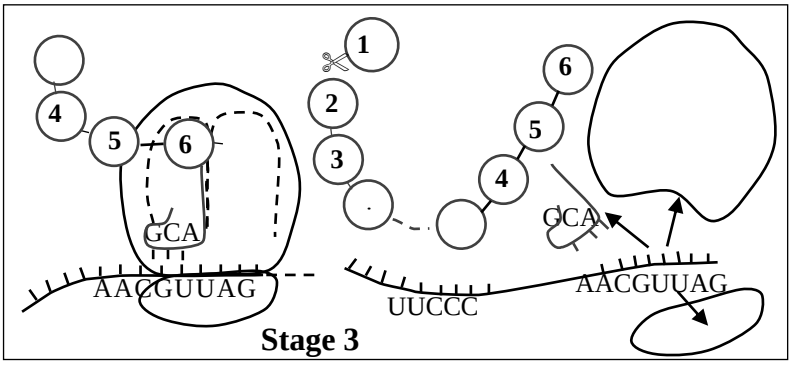
III. The figures below present three stages of a biological phenomenon in relation to the expression of genetic information.

- **Give** the name of each stage in the figures below, and **name** the biological phenomenon represented by the three stages (1, 2 and 3). **(1 pt)**



Amino acids:
1 = Met
2 = Phe
3 = Pro
4 = Gly
5 = Lys
6 = Arg





IV. For each of the propositions numbered from 1 to 4, there is only one correct suggestion in each set. **Copy down** these pairs (1 ; ..), (2 ; ..), (3 ; ..), (4 ; ..), and **match** each number with its corresponding letter. **(2 pts)**

1. The interchromosomal recombination occurring during meiosis is the result of independent and random assortment of:

a- homologous chromosomes during anaphase I.

b- homologous chromosomes during anaphase II.

c- chromatids during anaphase I.

d- chromatids during anaphase II.

2. During the metaphase of mitosis, each chromosome is formed of:

a- a single chromatid composed of two DNA strands.

b- two chromatids, each one composed of one DNA strand .

c- two chromatids, each one composed of two DNA strands .

d- two chromatids, one composed of a single DNA strand and the other of two DNA strands.

3. In case of monohybridism, the cross between a homozygous recessive individual and a heterozygous individual gives:
a- 25% recessive phenotype and 75% dominant phenotype.
b- 75% recessive phenotype and 25% dominant phenotype..
c- 25% recessive phenotype, 50% intermediate phenotype and 25% dominant phenotype.
d- 50% recessive phenotype and 50% dominant phenotype.

4. During the replication of DNA:
a- the parental double helix remains intact and a completely new second copy is synthesised.
b- each strand of the two new DNA molecules contains a mixture of old fragments and newly synthesised ones.
c- the two strands of the parental double helix separate and each serves as a model for the synthesis of a new complementary strand.
d- the parental double helix is not used for the synthesis of two new copies of DNA.

Section II : Scientific reasoning and communication in graphic and written modes (15pts)

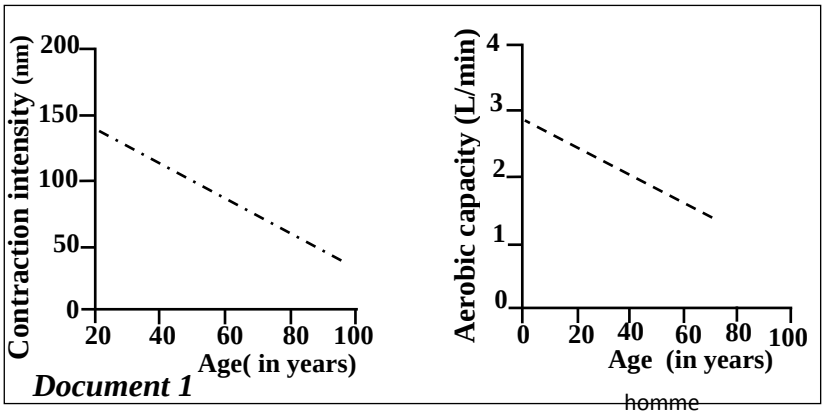
Exercise 1 (5 pts)

The ageing of population is a universal phenomenon due to the improvement of life conditions. However, getting on age is accompanied by a decrease in muscle mass and muscle function. This decrease may be linked to a disease called *sarcopenia*.

In order to determine the causes responsible for developmental sarcopenia related to age, we suggest the following data:

Document 1 presents the results of measurement of certain characteristics specific to the striated skeletal muscle with advancement of age.

NB: *Aerobic capacity: refers to the metabolic capacity of mitochondria to oxidize carbohydrates and produce ATP.*



Document 1

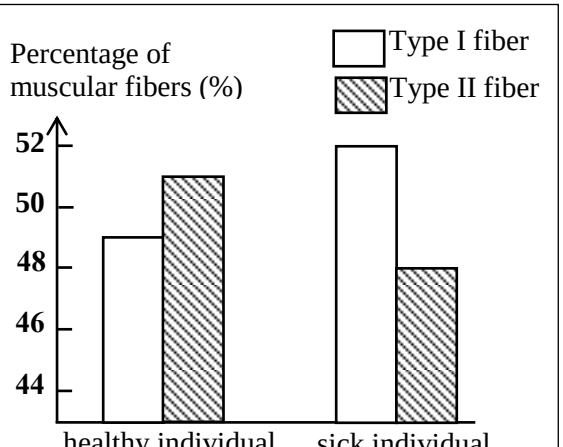
1. Based on document 1, **describe** the variations undergoing the striated skeletal muscle with advancement of age. **(1pt)**

In order to explain these variations, we suggest the following two hypotheses:

Hypothesis 1: The variation of contraction intensity is related to a low percentage of muscular fibers type II with regard to percentage of muscular fibers type I.

Hypothesis 2: The variation of aerobic capacity is due to the decrease of the number of mitochondria.

In order the verify these two hypotheses, we propose documents 2 and 3.



Document 2

fiber types / characteristics	Fiber type I	Fiber type II
contraction intensity	+	++++
resistance to fatigue	++++	+
number of mitochondria	++++	+

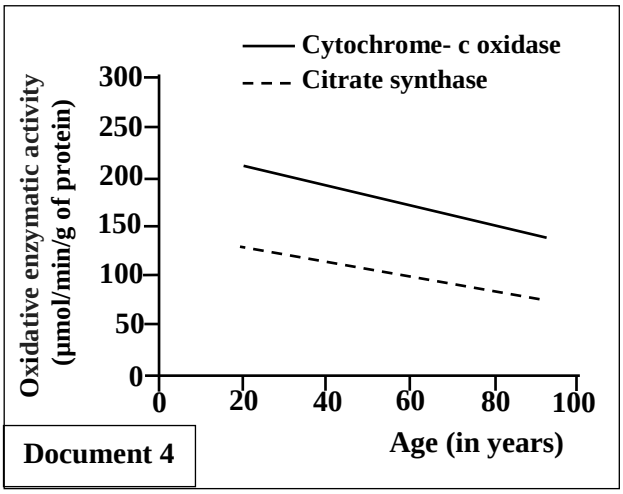
Key: + *indicates the importance of each characteristic.*

Document 3

2. Based on document 2 and 3, **verify** the two hypotheses. **Justify** your answer. **(1,5 pts)**

In order to explain the causes of variations of aerobic capacity in sarcopenia patients, to oxidize the glucose, measures of *cytochrome - c oxidase* and *citrate synthase* activities were taken at the level of striated skeletal muscle with advancement of age.

Document **4** presents the results obtained and document **5** illustrates the action sites of the two enzymes.



Document 4

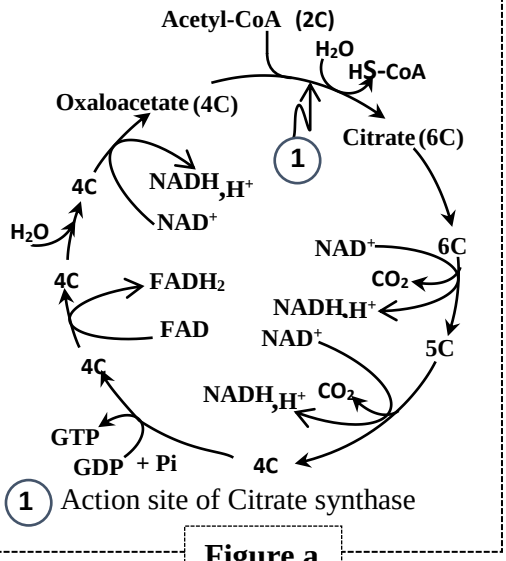


Figure a

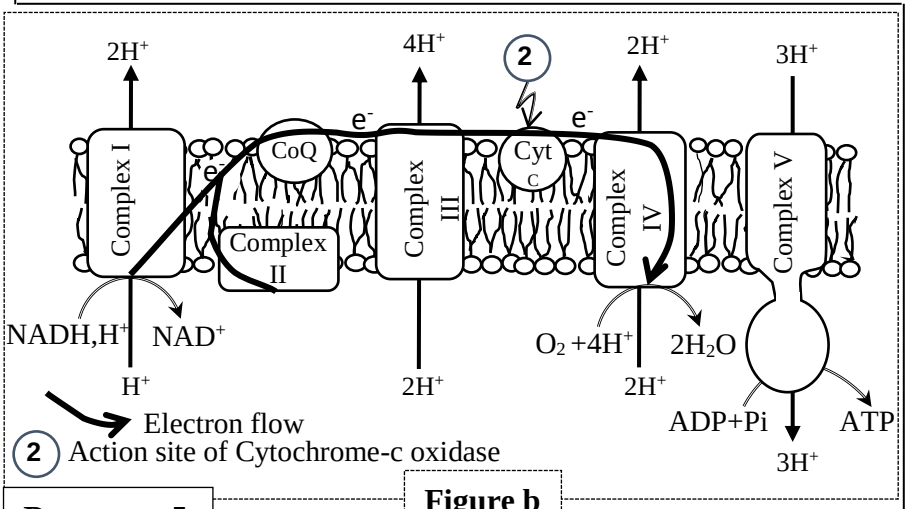


Figure b

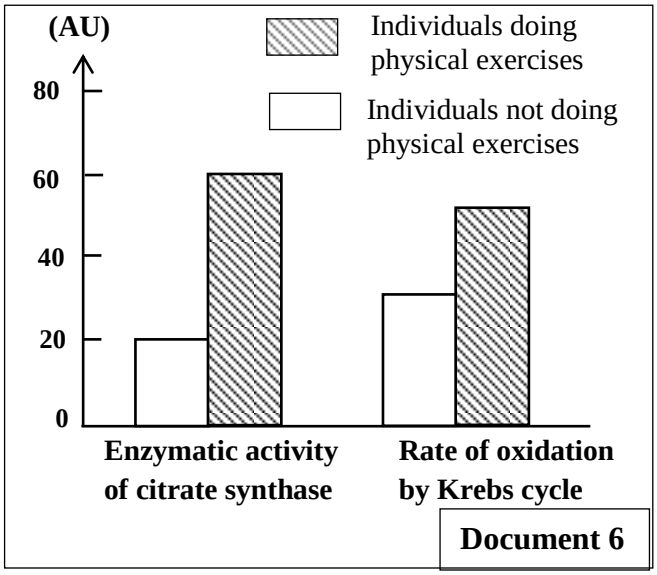
Document 5

3. Based on documents **4** and **5** and your knowledge, **explain** the decrease in ATP production in patients suffering from sarcopenia.**(1,5 pts)**

To treat sarcopenia, doctors (*physiotherapists*) use an adequate physical exercise programme **(**sports**)** that patients have to follow.

In order to determine the effect of physical activity on the function of mitochondria, we suggest document **6**, which presents *citrate synthase* activity, and the rate of oxidation of metabolites by Krebs cycle in individuals who do physical exercises and those who do not.

4. Based on your answer to question 3 and document 6, **determine** the role of physical exercises in medical treatment of sarcopenia.**(1 pt)**



Document 6

Exercise 2 : (5 pts)

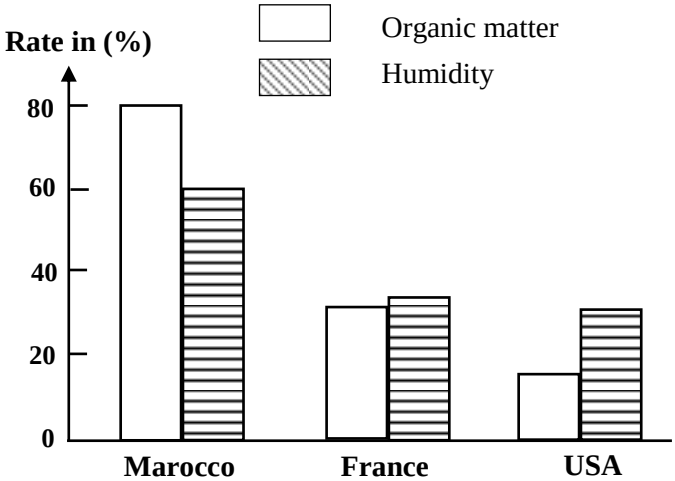
The question of household waste is a daily issue; it is the concern of everybody at all levels professional and familial; household waste never stops growing in quantity, quality and harmfulness.
In order In order to know the impact of garbage on the environment in Morocco and the techniques of treatment and management of this waste, we suggest the following data:

Document 1 presents the evolution in percentage of some constituents of household waste in Morocco and the time needed to decompose in the environment, and **Document 2** shows the rate of organic matter and the garbage humidity in Morocco, France and the USA.

Constituents of household waste	**1960**	**1999**	**2004**	**2013**	**Time needed to decompose in the environment**
Organic matter	75%	70%	65%	70%	3 to 6 months
Plastic matter	0,3%	3%	9%	10%	450 years
Metals	0,4%	3%	4%	2%	200 to 500 years
Cardboard paper	20%	20%	10%	7%	3 to 12 months

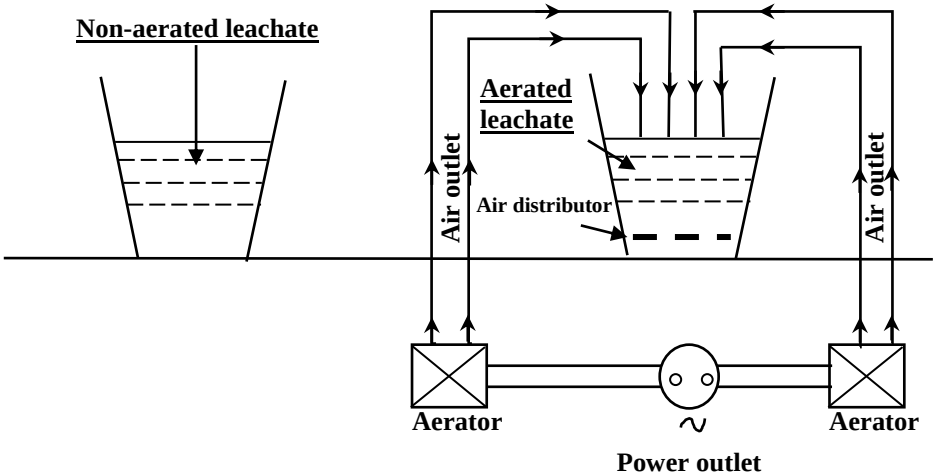
Document 1

1. Use document 1 **to describe** the evolution of each constituent of garbage in Morocco and **show** why they pose a risk to the environment. **(1,5 pts)**
2. **Based** on data in document 2, **compare** the rate of organic matter and humidity of household waste among the three countries: Morocco, France and the USA, and **deduce** the characteristics of garbage in Morocco. **(1 pt)**
3. **Based** on your previous answer to question 2 and your knowledge, **suggest** two appropriate techniques to valorise garbage in Morocco.**(0,5 pt)**



Document 2

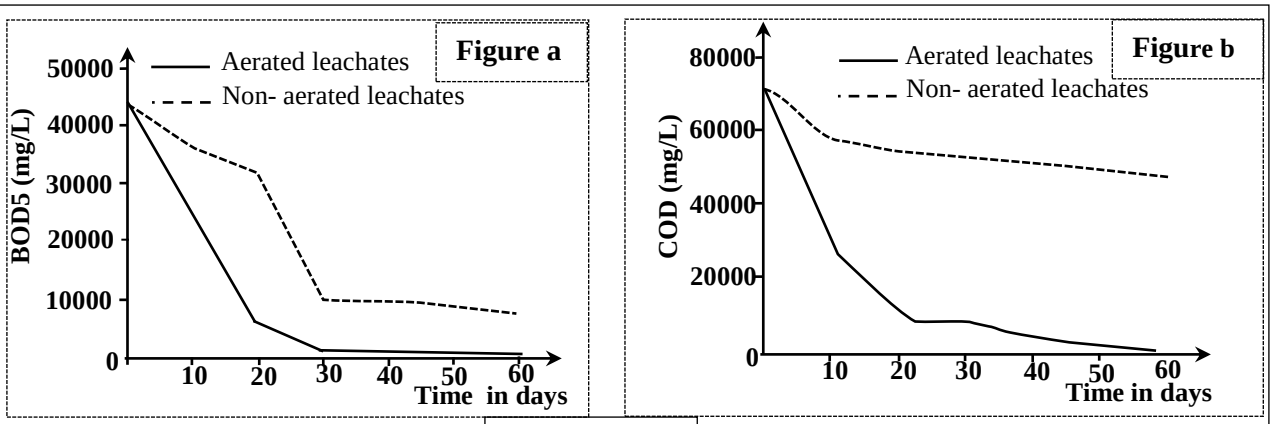
Leachates (Lixiviats) resulting from Moroccan household waste are one of the major constraints for the management of landfills; the controlled landfill of Agadir city is among the sites that suffer from the problem of managing large quantities of leachates. Studies have been carried out with the objective of developing a technique to treat leachates by using intensive aeration, a technique which is relatively simple and cheap. See diagram in document **3**.



NB : *The power of air streams generated by the aerators contribute to the degradation of oxidizable matters.*

Document 3

Document 4 shows the results of the effect of intensive aeration of leachates from household waste of Agadir city on BOD5 (*figure a*) , and COD (*figure b*).



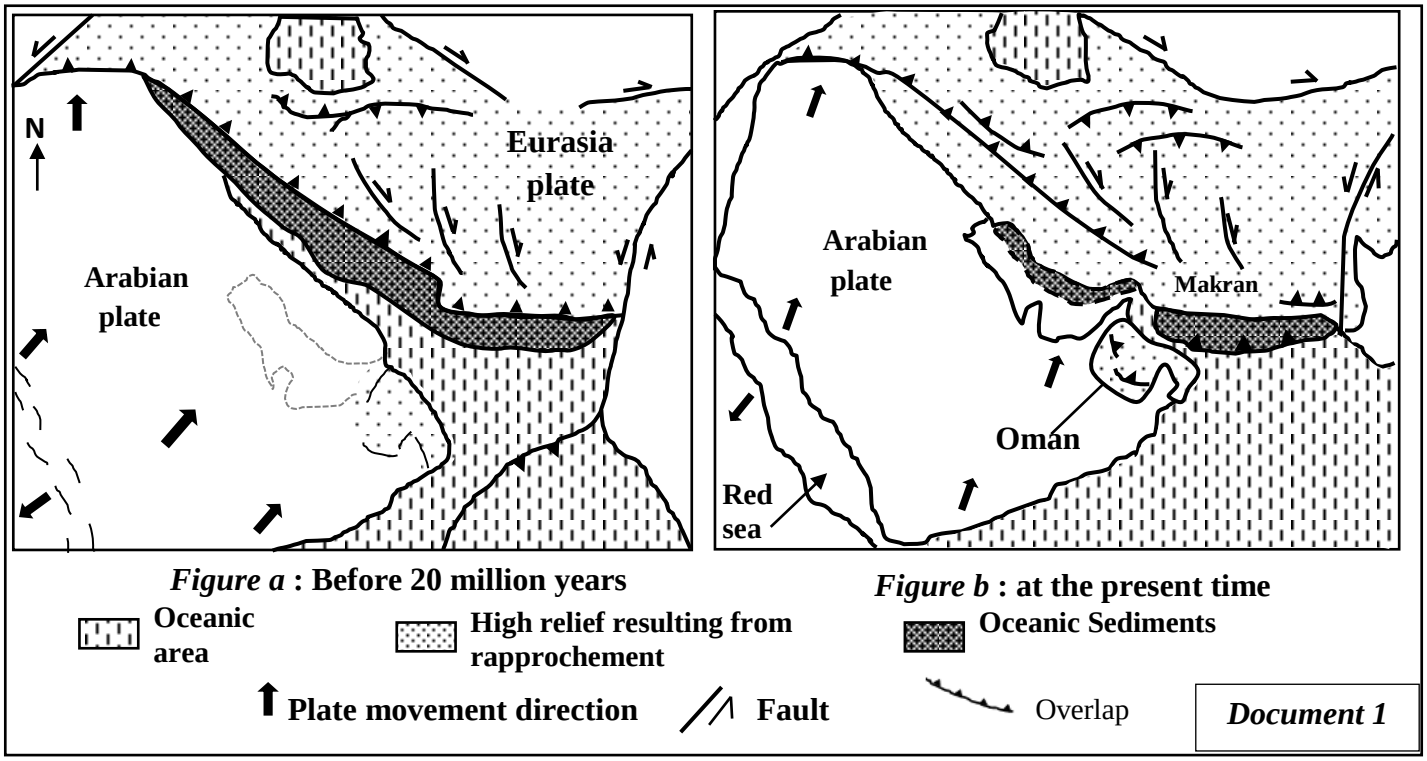
Document 4

4. Based on document **4**, **compare** the evolution of BOD5 and COD in aerated leachates and non-aerated leachates. **(1pt)**
5. By **using** documents 3 and 4 and your knowledge, **explain** the variation of BOD5 and COD in aerated leachates. **(1pt)**

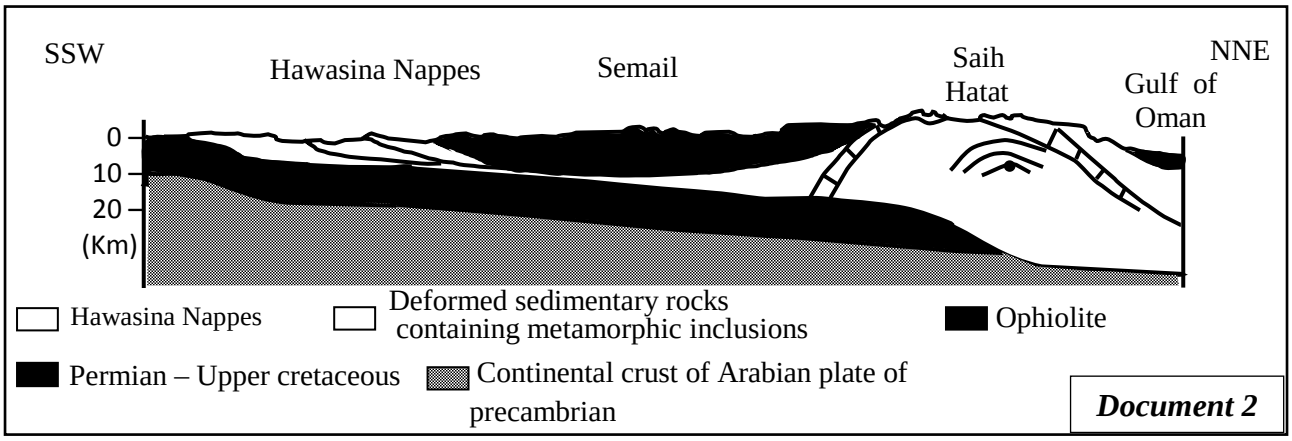
Exercice 3 : (5 pts)

The mountain range in Oman is a recent chain that has the largest ophiolitic nappe in the world (500 km long). To know more about some of its tectonic and rocky structures and to determine the conditions and stages of its formation, we present the following data:

● The figures in document **1** show the position of the Arabian plate and the Eurasia plate now (at the present time) and before 20 million years. Document **2** presents a geological cross section at level of Oman mountain range.



Document 1



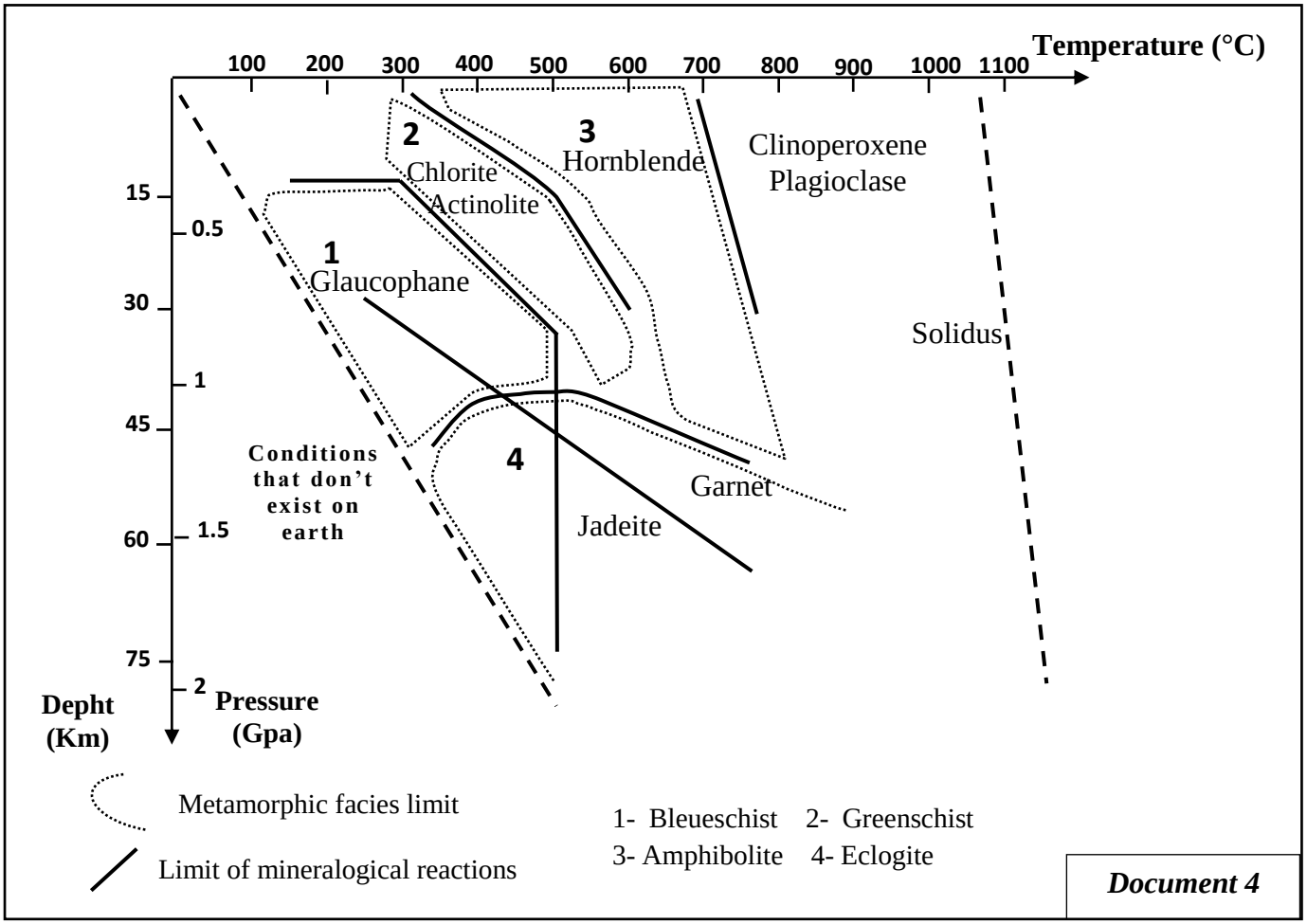
Document 2

1. By exploiting documents 1 and 2, **find** the clues showing the confrontations of the two plates and the clues of an obduction. **(1 pt)**

The study of three samples of rocks R_1, R_2 and R_3 belonging to *Saih Hattat* allowed to obtain the results in document 3. The diagram *Pressure–Temperature* in document 4 shows the areas of stability of certain metamorphic mineral assenblages and the different metamorphic facies.

Rock samples	Conditions of formation	
	Pressure (GPa)	Temperature (°C)
R_1	0.3	320
R_2	0.8	420
R_3	1.6	530

Document 3



Document 4

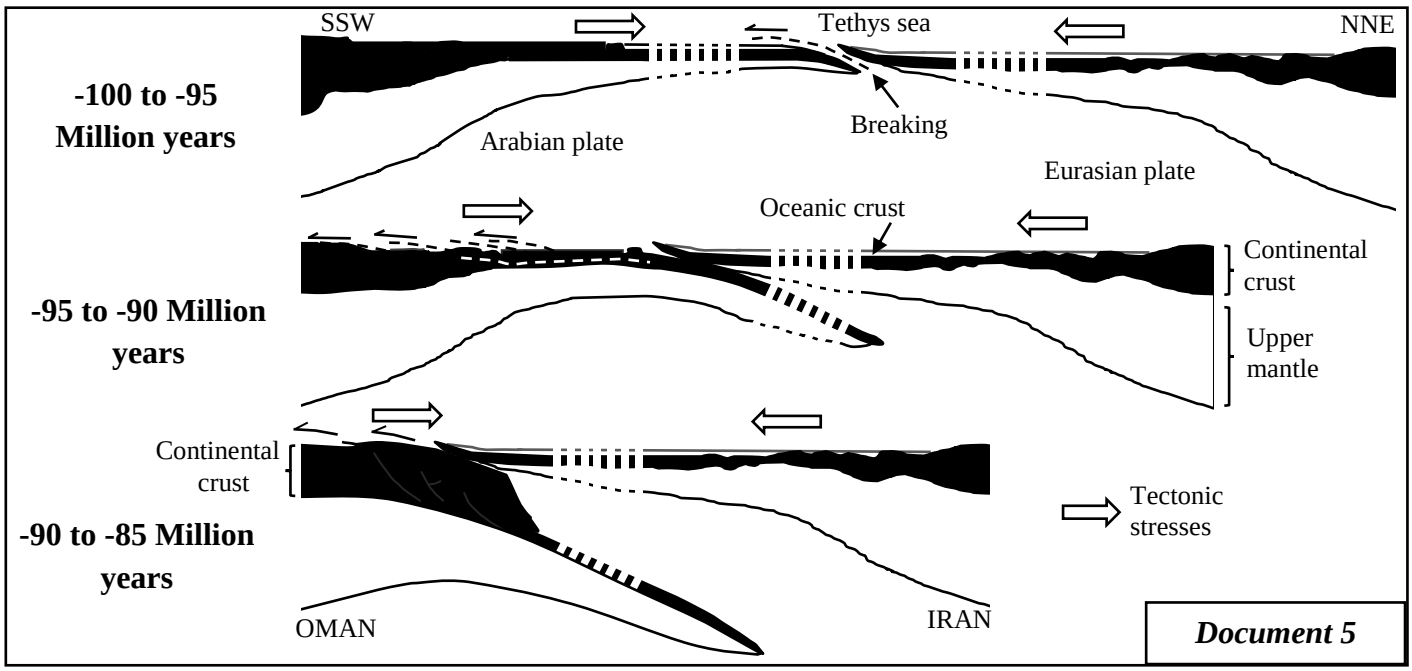
2- Based on documents 3 et 4:

a- Determine the metamorphic facies that each of these rocks, R_1 and R2 and R_3 belongs to. **(0.75pt)**

b- Determine the mineralogical transformations when passing from rock R_1 to the rock R_2, and from rock R_2 to rock R_3. **(1 pt)**

c-Deduce the metamorphic type in this region and the geological phenomenon that is responsible for that metamorphism. **Justify** your answer. **(0.75pt)**

Document 5 summarises the steps of the formation of Oman mountain range according to Michard's explanatory model.



Document 5

3- Based on document 5 and pervious data, **determine** the steps of the formation of Oman mountain range, **specifying** the geological phenomena that have taken place in that region. **(1.5 pt)**