Name_____ Country_____

Instructions:

1. Please write your name and nationality in English on the cover page.
2. The time allocated for this examination is four hours.
3. Please write your answers legibly. Illegible answers will be counted as incorrect.
4. Please keep your answers short and focus on the key points.
5. You may respond to questions either in English, your native language, or a combination of both.
6. Read the entire question group carefully before starting to answer.
Each question has a point value assigned, for example, (1 pt).
7. For some questions, you will be asked to provide your answers on the figures. Please do so carefully.
8. Any inappropriate examination behaviour will result in your withdrawal from the IESO.

Stop 01

IESO 2011 – Practical test Geosphere – Mineralogy

Name and surname of the Partecipant: _____
Nationality: _____
Duration time 10 min.

Identification of mineral species

Given five different mineral samples, the candidate is requested to identify each mineral species with the aid of basic chemical/physical tests or macroscopic observations. Each mineral species holds at least one unique feature or character which discriminate it from the others (for example, it is the only one reacting with acids, it is the hardest one, it is the most symmetric one, it is the only one exhibiting metallic luster …). The tests recommended for the identification are: (i)
reactivity to hydrochloric acid attack; (ii) determination of the relative Mohs hardness; (iii) crystal habit indicative of the crystal symmetry; (iv) metallic luster.
The candidate should associate the code number (from 1 to 5) of the mineral sample to the mineral name. (2 points for each right answer)

- **calcite**
- **quartz**
- **fluorite**
- **hematite**
- **sulphur**

STOP 2 15' Name_____ Country _____

Practical test: Preda Ringadora

1) Connect the fossil names with the corresponding figure.

1) AMMONITE

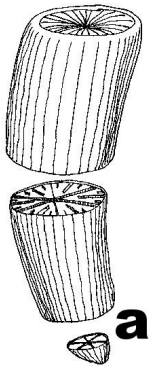
2) BELEMNITE

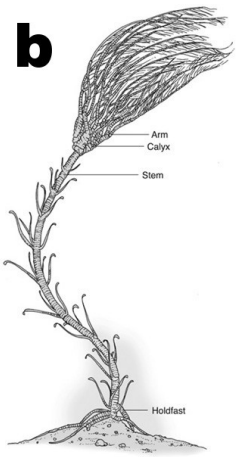
3) CORAL (SCLERACTINIAN)

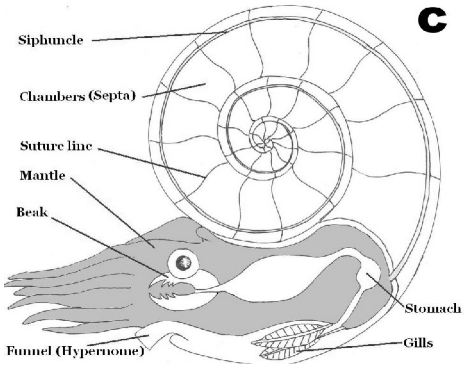
4) CRINOID

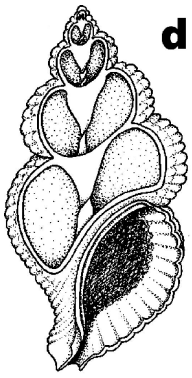
5) GASTROPOD

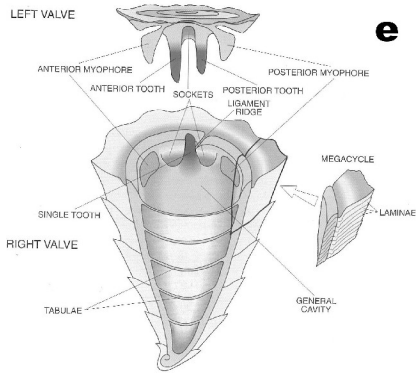
6) RUDIST











1 - __

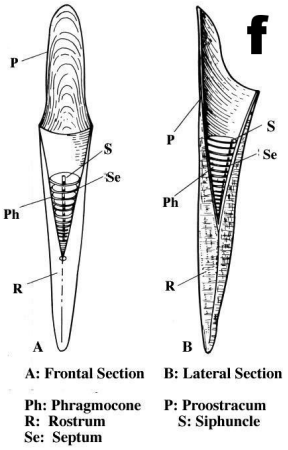
2 - __

3 - __

4 - __

5 - __

6 - __



(0.2 pt for each right answer)

2) Inside the squares A and B there are two of the fossils illustrated above. Write the name of the fossils:

A) _____ (1 pt)

B) _____ (1 pt)

3) The geological feature labelled on the stone as C is a: (0.8 pt)

a) cross bedding

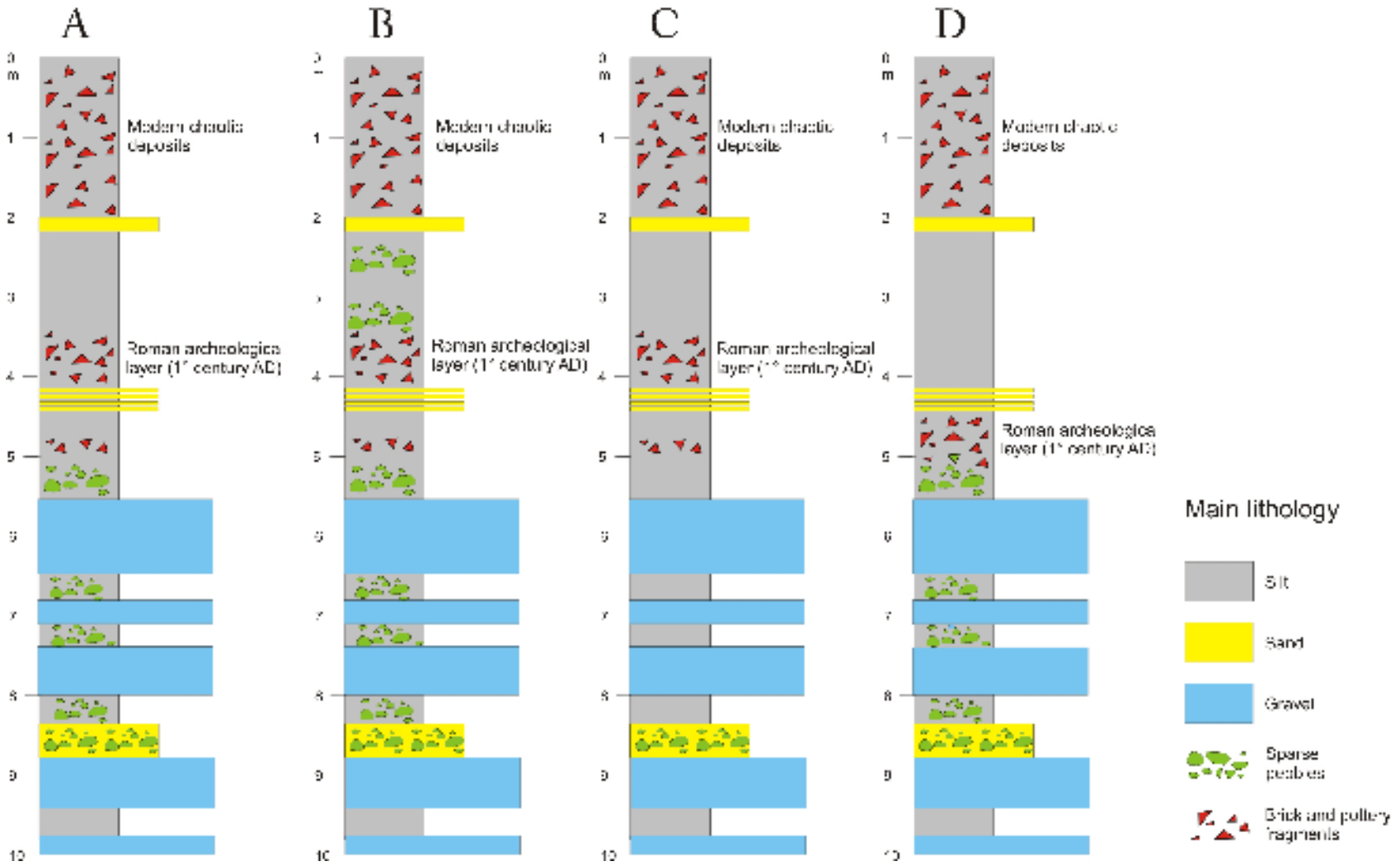
b) flute cast

c) ripple mark

d) stylolite

STOP 3, 20’ Put a cross above the letter of the right column (5 pt) Name_____
Country _____

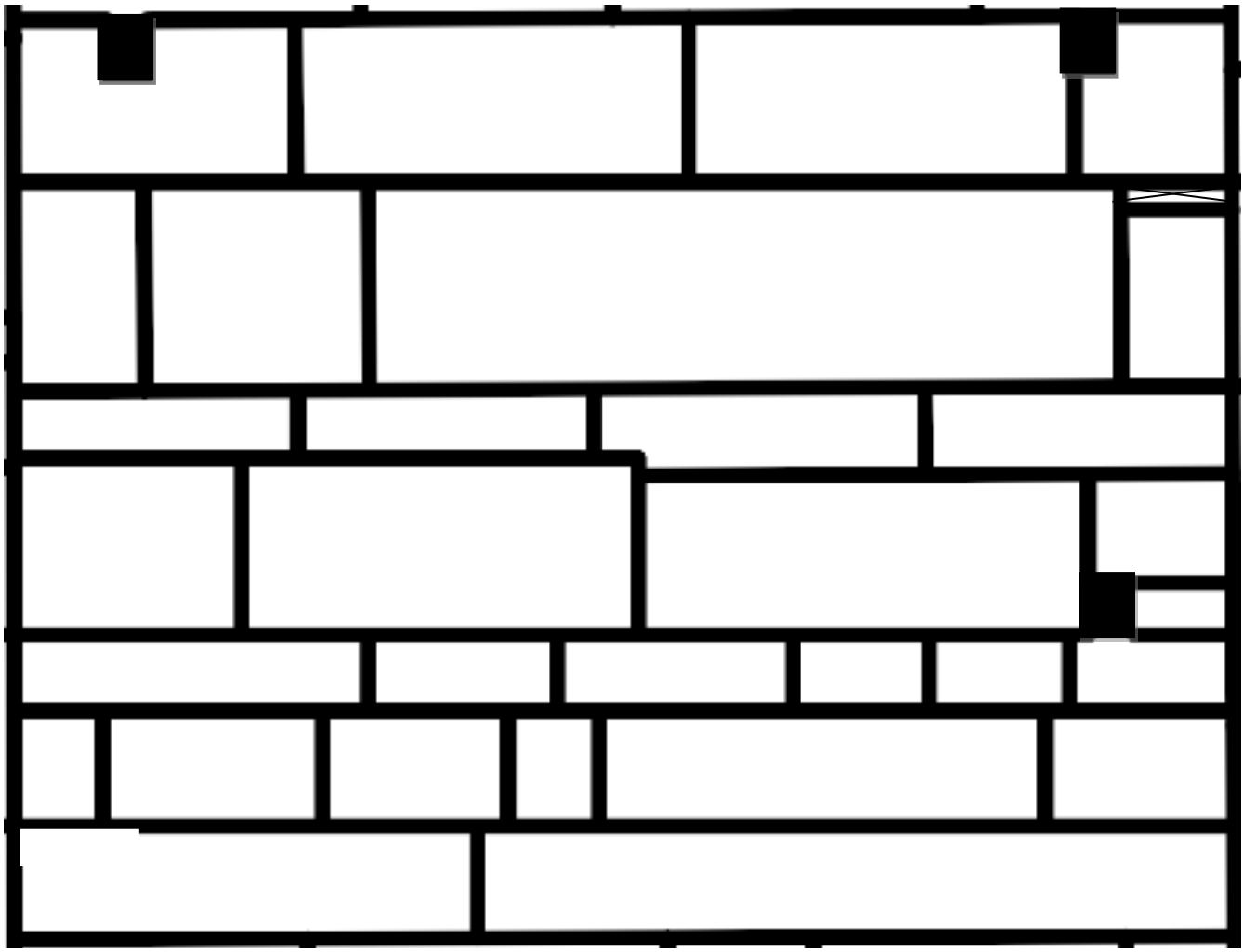
Which one of the stratigraphic columns does correctly illustrate the core?



STOP 4, 20’ Name _____ Country _____

Cathedral, northern side

Identify the stones in the boxed wall portion using the given samples for comparison: fill the slab contour with the appropriate color.



Legend and color key:

Not to be identify	
Marble	
Gray calcarenite	
Yellow-white calcarenite	
Magmatic rock (trachyte)	
Pink-red limestone	

Score

Correct	points
all	5
1 wrong	4
2 wrong	3
3 wrong	2
4 wrong	1

STOP 5, 15’ Name _____Country _____

Roman Lapidary Museum (Lapidario Romano, Museo Civico Archeologico Etnologico)
(1pt for each right answer)

Identify the stones of the following Roman monuments using the given samples for comparison: write the stone letter into the appropriate monument box.

Stone samples
A) Limestone (biocalcarenite)
B) Brecciated marble (“arabesque”)
C) Foliated marble
D) Limestone (biocalcarenite-biocalcirudite)
E) Limestone (rudist mudstone)

N. 9: Altar (ara) of Marcus Numisius Castor

N. 10 Altar (no inscription)

N. 11 Altar of Publius Clodius

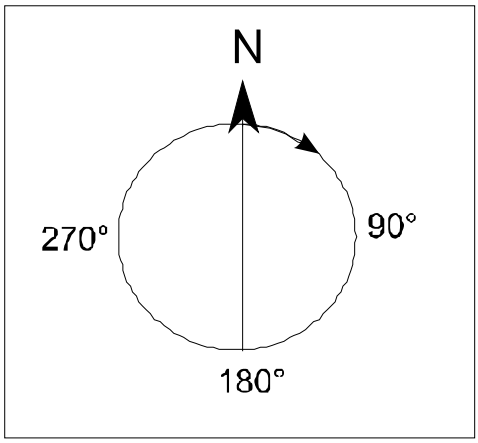
N. 19 Stele of Caius Fadius Amphio

N. 29 Lion

STOP 6, 15’ Name _____ Country _____

QUESTION 1
What is the attitude (strike, dip direction, angle of dip at clockwise measurement) of the exposed surface A : (3pt)

1. 110° - 20° - 65°
2. 340° - 250° - 65°
3. 20° - 110° - 25°
4. 170° - 80° - 25°
5. 250° - 340° - 25°
6. 110° - 20° - 65°
7. 200° - 290° - 65°
8. 20° - 110° - 65°
9. 110° - 200° - 25°
10. 200° - 290° - 25°



QUESTION 2
On the surfaces (A, B, C, D) what geological features can you identify (one or more answers may be correct): (0,5 points for each right answer)

1. wawe ripple marks
2. groove casts
3. flute casts
4. tectonic lineation
5. stylolites
6. fossil traces
7. tool marks
8. fossil shells

Geological map of Friuli Venezia Giulia – SIMPLIFIED LEGENDA stop 7b

Important note:

It’s possible to assume that the litological formation in the Slovenian

side of the hydrographic basin of river Isonzo (called Soca in Slovenia) are the same found

in the Italian side.

Quaternary covers

26

25

24

23

Cenozoic sequence

19 b : sandstone and shale

19 a: sandstone, breccias and shale

18: limestone

Mesozoic sequence

17 c: limestone

16 c: limestone

16 b: limestone

15 a: limestone

14: limestone

13 c: dolomite rock

13 a: dolomite rock

12 c: dolomite rock and limestone

9: dolomite rock and limestone

GEOLOGICAL MAP OF LOMBARDIA - SIMPLIFIED LEGENDA stop 7a

Important note: during past glacial periods, alpine glaciers transported and accumulated sediments to form morains in the pedemontane zone of Alps.
Since the end of the last glaciation, river Oglio carries to *site X* sediments already deposited by alpine glaciers in the past in the pedemontane zone, south of lake Iseo.

Quaternary covers

1

4

5

7

8

Igneous rocks

9: granite

10: diorite

11: diorite and gabbro

13: rhyolite

16: granite

17: diorite and gabbro

Sedimentary covers*:*

different types of limestone, sandstone,

dolomite rock and shale

19b

22a 22b

23

24

25
26
27a
28
29
30
31a
32a
33a
34
35
37a
39
41a
43a
44
45
46b

Crystalline rocks

48: gneiss
49: schist and phyllite
50: quartzite

Crystalline rocks

64: gneiss

65: schist and phyllite

66: schist

67: gneiss

STOP 7 25’

Practical test 2011 – Comparison of sediments and hydrographic basins

Equipment:

- Geological map 1 (Friuli Venezia Giulia), with a simplified legenda
- Geological map 2 (Lombardia), with a simplified legenda
- Pebble samples A and B
- Sand samples 1 and 2
- Stereomicroscope
- Dilute hydrochloric acid.

Exercises:

- Two geological maps are provided (1 and 2)
- Two pebble samples (A and B) are provided
- On each map, two sites (X and Y) along the river are shown. Pebbles and sand samples have been collected from these locations.
- In site X pebbles from the Oglio hydrographic basin have been collected.
- In site Y pebbles from the Isonzo hydrographic basin have been collected.

1) Recognize the rock types of the pebbles, by completing the following table (it’s possible to use the diluted HCl solution): (1,5 points)

Choose among: limestone, sandstone, dolomite rock, diorite, gneiss/micaschist

Number of pebble	Rock type
A 1	
A 2	
A 3	
B 1	
B 2	
B 3	

2) Match correctly the pebble samples with the geological maps.

(1,25 points)

Pebble sample A	Geological map number …….
Pebble sample B	Geological map number …….

3) Observe carefully the two sand samples (1 and 2) at the stereomicroscope. Which minerals are present in each sample? You could tick more than one option.

(1 point)

	Calcite present	Quartz abundant	Quartz very rare	Biotite present
Sand sample 1				
Sand sample 2				

4) Which of the two sand sample comes from site X and which from site Y ?

(1,25 points)

Sand sample 1	Site …….
Sand sample 2	Site …….

Stop 8, 15’

Name_____ Country_____

In this test you are expected to recognize the minerals of the rock, estimate their abundance and classify the rock based on the Strekeisen diagram.
Fill all tables and Strekeisen plot. Report the name of the rock.

Characters of the rock forming minerals (not all are present in the rock):

Plagioclase: White milky appearance, anhedral to subhedral (elongate prismatic habit), sometimes twinning and cleavage detectable.

Quartz: Colourless to greyish, is the most transparent, often anhedral interstitial, conchoidal fractures, no cleavage.

Biotite: Black-dark brown, vitreous lustre, thin cleavage system, hexagonal euhedral sections are in general subequant..

Pyroxene: Black, prismatic elongated, cleavage parallel to the elongation.

Olivine: Green, dark green, prismatic subequant, no cleavage.

Oxides: Equant, fine grained, black metallic lustre.

Tourmaline: Strongly elongated to acicular habit, light brown to greenish.

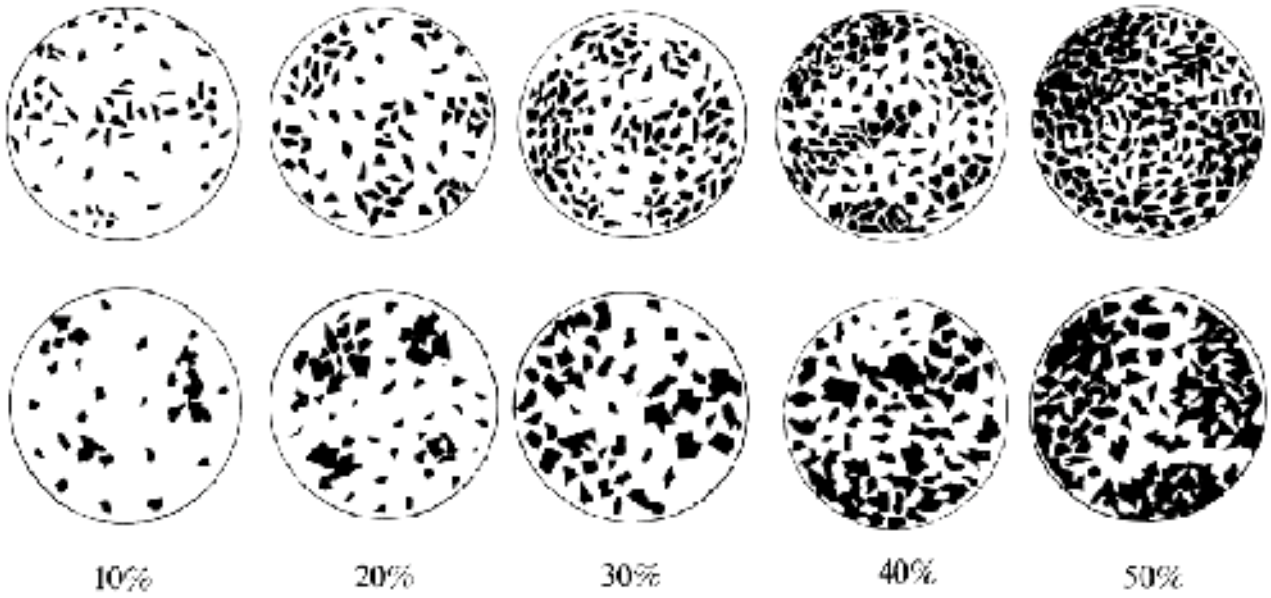
K-Feldspar: Orange to reddish, forms large crystals, anhedral to subhedral, sometimes twinning and cleavage detectable.

In the following table select the minerals you recognize on the selected areas of the pillar, then indicate the amount of each phase. Minerals not recognized must be indicated as 0%. To evaluate the amount of each mineral phase use the reference grids in the next page. Note that indicating the amount of minor phases as <10% means total is not expected to be 100%.

	0	<10%	10%	20%	30%	40%
Tourmaline						
K-feldspar						

Olivine						
Oxides						
Quartz						
Pyroxene						
Biotite						
Plagioclase						

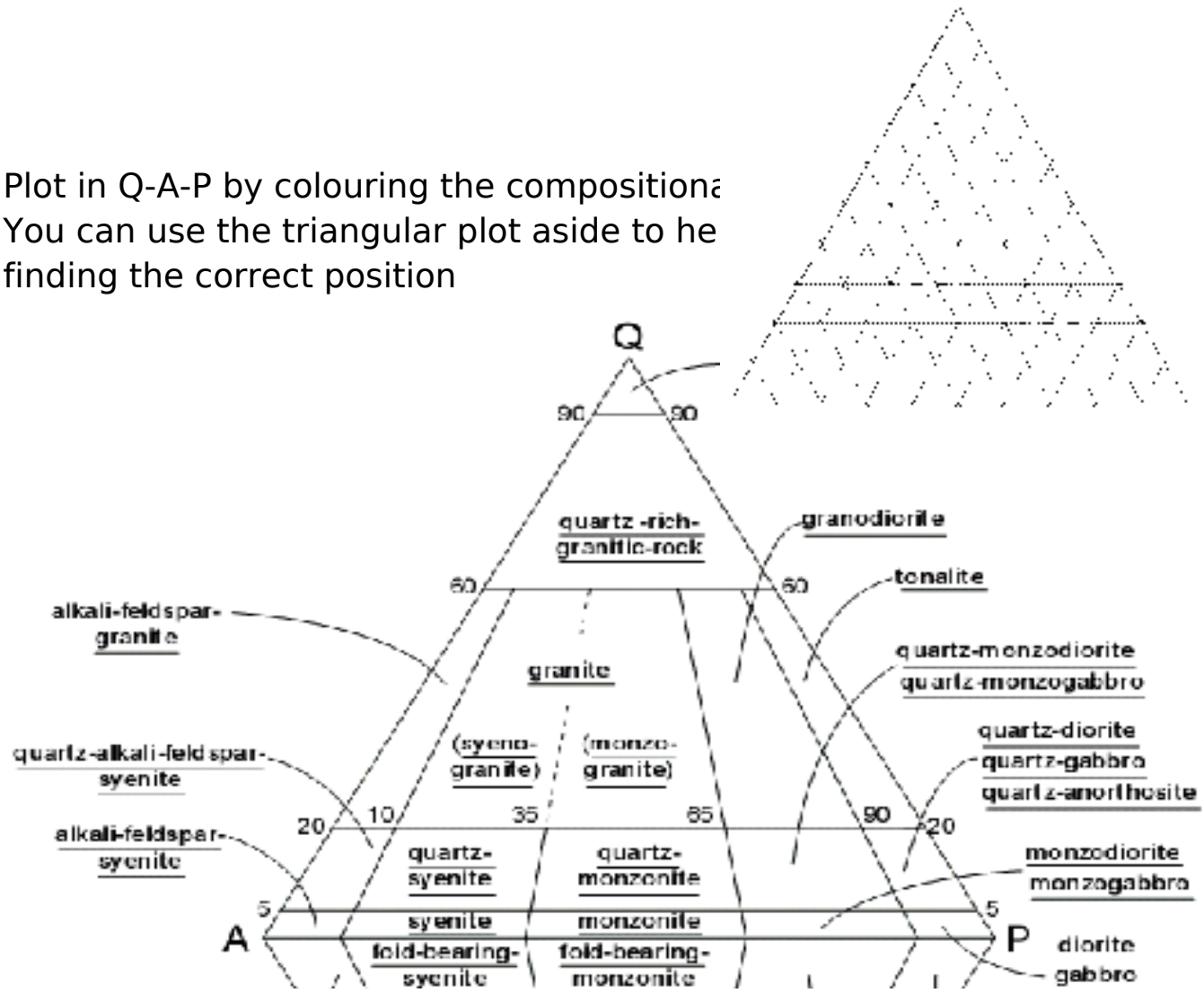
Reference grids



In order to define the rock you must recalculate the relative amount of Q, A and P

	Estimated value	Recalc to 100
Q (Quartz)		
A (K-feldspar)		
P (Plagioclase)		
Sum Q+A+P		Sum =100

Plot in Q-A-P by colouring the compositiona
You can use the triangular plot aside to he
finding the correct position



The observed rock is: _____

Score:

Plot in the right field: 4 points

Plot in the fields adjacent to the correct one: 1 points

STOP 9, 20’ Records from the past

- Instruction sheet -

Background information

To help to make climate forecasts for the future, it is useful to study past climate. The field of science which aims to gain better insight into past climate on Earth and the mechanisms that are causing climate change is called palaeoclimatology.

The floors of oceans and lakes are covered with various layers of mud-like sediments, which contain fossils. One type of fossil from lake or ocean sediments that is often used by palaeoclimatologists is diatoms. Each kind of diatom has a different shape of its skeleton. This difference is used to identify the various fossil types of diatom.

In addition to this, every species grows optimally under a certain temperature called the optimal temperature (To), so the presence of a certain species can provide some clues about the climate at the time when the individuals were still alive.

Scientists can determine the temperature at the time of formation, which is called the balanced average temperature (Tm), by applying the following formula:

$$T_w = \frac{(n_{S1} \times T_{o,S1}) + (n_{S2} \times T_{o,S2}) + (n_{S3} \times T_{o,S3}) + (n_{S4} \times T_{o,S4})}{n_{S1} + n_{S2} + n_{S3} + n_{S4}}$$

T_w – balanced average temperature (°C)
Sn – type of diatom
$T_{o,Sn}$ – optimal temperature of the type of diatom (°C)
n_{Sn} – amount of diatoms of a certain type

Aim

Reconstructing a climate history by analyzing the types of diatoms from a sediment core.

Materials

10 Petri dishes that correspond to sediment samples from different parts of a sediment core. The depth and age are indicated on each Petri dish. (BP years= years Before Present)

Sample number	Age (BP years)	Depth (cm)
1	1000	5
2	2000	10
3	3000	15
4	4000	20
5	5000	25
6	6000	30
7	7000	35
8	8000	40
9	9000	45
10	10000	50

Each Petri dish contains 12 pink, green, yellow and purple beads. Each color represents a specific type of diatom that survives best in certain temperatures (= optimal temperature, To).

Type of diatom	To (°C)
pink	20
yellow	15
green	10
purple	5

Procedure

1. Color the attached diagram (on the worksheet) according to the diatom composition found in each Petri dish. Count the amount of beads of each color found in each Petri dish and color the circles accordingly. From the bottom (horizontal axis) to the top of each column of circles, color first the pink ones, then the yellow ones, the green ones, and the purple ones.
2. Draw a line above the top set of pink dots ; this will give you a line with the age on the X-axis and the number of diatoms per type on the Y-axis.
3. Calculate the balanced average temperature (Tm) for depths at 1000 years BP, 4000 years BP and 7000 years BP . Fill the “Table of the Tm values” and answer the question according to the instructions provided.

This activity has been adapted for IESO2011 from the original version titled “Experiment from the Past” published by International Polar Foundation http://www.educapoles.org/

Records from the past (2,4pt)

– Worksheet , Diagram -

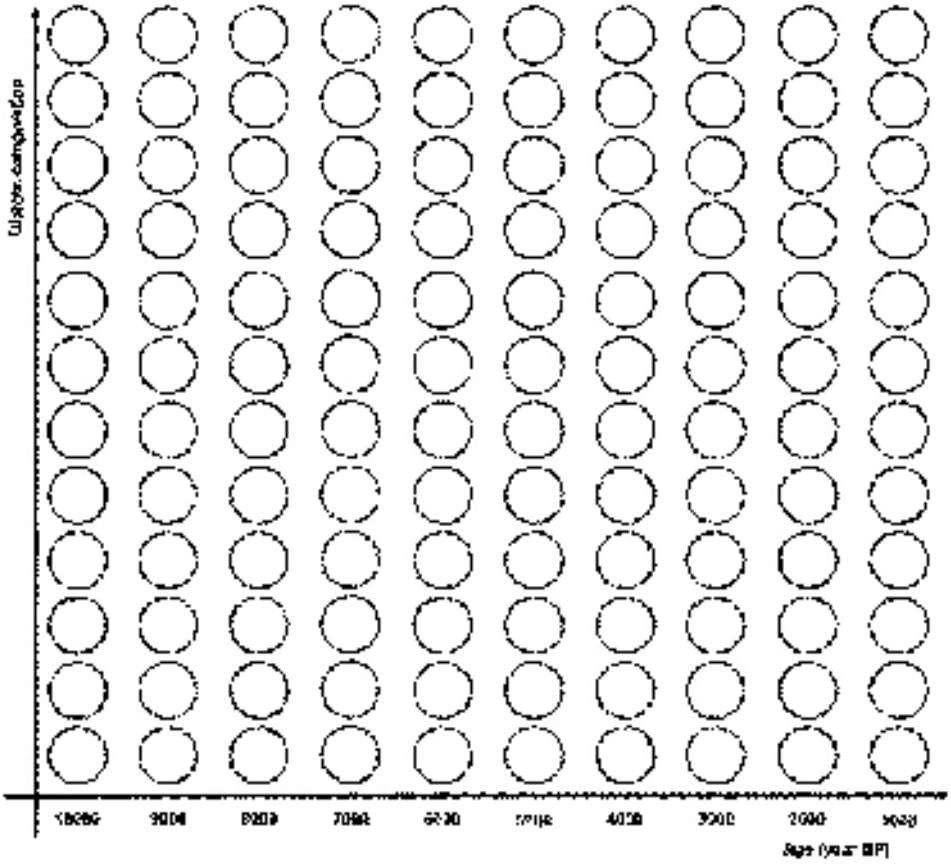


Table of Tm values

Age (years BP)	$n_{pink} * T_{0,pink}$	$n_{yellow} * T_{0,yellow}$	$n_{green} * T_{0,green}$	$n_{purple} * T_{0,purple}$	n_{total}	Tm (°C)
1000						
4000						
7000						

$$T_m = \frac{(n_{S1} \times T_{o,S1}) + (n_{S2} \times T_{o,S2}) + (n_{S3} \times T_{o,S3}) + (n_{S4} \times T_{o,S4})}{n_{S1} + n_{S2} + n_{S3} + n_{S4}}$$

T_m = balanced average temperature (°C)
Sn = type of diatom
$T_{o, Sn}$ = optimal temperature of the type of diatom (°C)
n_{Sn} = amount of diatoms of a certain type

Analysis of the results

Question 1 (0,6pt)
Put the 3 time periods listed in the table above in the following ordinated list from the coldest (1) to the warmest (3)

1 (coldest)	=	time period_____Age (years BP)
2	=	time period_____Age (years BP)
3 (warmest)	=	time period_____Age (years BP)

Question 2 (1,5pt)
The curves for the two warm periods show exactly the same maximum in terms of number of “pink diatoms” while the balanced average temperature (Tm) for these periods differ, how can you explain that? (mark one correct answer)

a) The most recent warm period has more “purple diatoms”
b) The Tm takes into account the relative composition of diatoms present in each sample
c) The Tm takes into account the age of each samples
d) The optimal temperature of the “pink diatoms” changes according to the ages

STOP 10 15'
Practical activity – Remote Sensing
Processing and analysis of digital satellite imagery

Instructions

Name:_____

Country:_____

- Download the data (Landsat satellite imagery of Venice
- Generate computerised colour images in
  - o True colour
  - o False colour
- Answer the questions

1) Data Download

Download all files from http://download.terra.unimore.it/ieso/ and save them on the **Desktop** (double clicking on every file)

2) Open the satellite imagery

a) Start the **LEOWorks3.0** programme (clicking on the **Windows Start button**)

b) Open the following files and press **OK** on the **Image Preview** window (cf. Fig.1):

- *Venice_Band_1.tif* (channel 1, blue).
- *Venice_Band_2.tif* (channel 2, green)
- *Venice_Band_3.tif* (channel 3, red)
- *Venice_Band_4.tif* (channel 4, near infrared NIR)
- *Venice_Band_5.tif* (channel 5, short wavelength infrared SWIR)
- *Venice_Band_7.tif* (channel 7, short wavelength infrared SWIR)

Fig.1: Image Preview window

3) True-colour combination of spectral bands: generate a real colour image

- In the Menu bar click on: **Image → Combine from… → [Red Green Blue]**, a new window called **Combine RGB** appears (cf. Fig.2)
- On the three input windows select the bands:
  - a) for red (*Select Red Band*) select *Venice_Band_3*,
  - b) for green (*Select Green Band*) select *Venice_Band_2*
  - c) for blue (*Select Blue Band*) select *Venice_Band_1*.

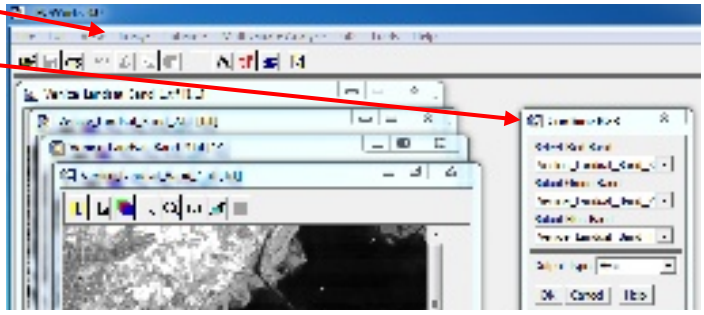


Fig.2: Combination of the spectral bands

- Clicking **OK** the combined true-colour image appears.

  Keep it open in order to compare it with the next results.

4) False-colour combination: generate an infrared false colour image

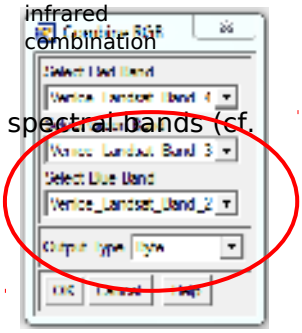


Fig.3: False colour infrared combination

- Repeat the steps of point 3) choosing now the following association of spectral bands (cf. Fig.3):
  a) for red select *Venice_Band_4*,
  b) for green select *Venice_Band_3*
  c) for blue select *Venice_Band_2*.
- Clicking on **OK** you obtain now an infrared false colour image of Venice.

  Keep it open in order to compare it with the next results.

5) Try another combination: generate a different false colour image using other spectral bands (754)

- Repeat the steps of point 3) choosing now this association of spectral bands (cf. Fig.4):
  a) for red select *Venice_Band_7*,
  b) for green select *Venice_Band_5*
  c) for blue select *Venice_Band_4*.
- Clicking on **OK** you obtain now a different false colour image of Venice.

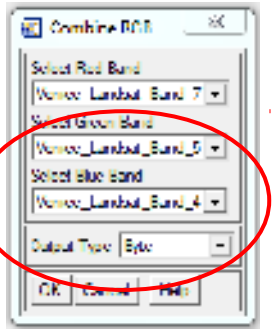


Fig.4: False colour 754 combination

You have now created three different combined images of the same subject. Observe and compare them in order to answer the following questions.

Questions

Only one answer per question is correct, mark the right one.
Every right answer corresponds to 0.35 points. 15'

The LANDSAT system constitutes the longest continuous record of the Earth surface

Name:_____

Country:_____

1) The Landsat satellite is
   a) polar b) geostationary
2) Landsat is used
   a) for weather applications
   b) land use
   c) to constantly monitor a localised region on the Earth surface
   d) none of them

The geometrical resolution of an image is the size of the pixels in meters.

3) Given that the Landsat images cover an area of 20 km × 20 km and that there are 500×500 pixels in the image, which is its resolution?
   a) 20
   b) 40
   c) 400
   d) no answer is correct

In this practical activity you used different spectral bands, every single image reflects a part of the electromagnetic spectrum

4) Which of the following bands are outside the visible spectrum?
   a) red
   b) red and NIR
   c) near and middle infrared
   d) green and blue

The combined images are, respectively, true- and false-colour combinations of the three visible channels red, green, blue, or further spectral channels of a Landsat scene.

5) False-colour images are used to
   a) increase the interpretability of satellite images
   b) provide visually impaired people a mean for detecting the same features in land use

Comparing the combined images obtained from steps 3), 4), 5) in the Instruction sheet:

6) The colours of the different features of the soil depend on the bands selected for the combination, because every object has its own radiation characteristics
   a) true; b) false
7) Which channel is best suited to give information regarding vegetation?
   a) green
   b) infrared
   c) red
   d) none of them
8) The infrared range is very useful for interpreting the Earth's surface because
   a) it consists of reflected and emitted energy
   b) it gives information about the vitality/health status of the vegetation
   c) none of them
   d) both of them

Referring to the image obtained combining the spectral bands 7, 5, 4:

9) For which application is this combination useful?
   a) to detect coast lines and shores that are well defined due to this combination
   b) to find textural and moisture characteristics of soils
   c) both of them
   d) none of them
10) In combined image 754, vegetation appears to be
   a) red

b) green
c) blue

Practical Test Atmosphere

Name_____ Country _____

Fog in a jar

- Instruction sheet -

Background information

Formation of fog, cloud and several other meteorological events share the same physical phenomenon: the condensation of water vapor that happens when water passes from the gaseous to liquid state. During this lab you will simulate the formation of fog in a jar through the creation of suitable conditions.

Materials

2 glass jars
1 stick of incense
1 matchbox
2 aluminum boxes previously filled with ice
1 laser pointer
Cold water
Warm water

Procedure

1. Fill jar 1 with cold water (T approx 10°C) and jar 2 with warm water (T approx 35°C).
2. Wait for 10 min approx in order to allow that the glass of both jars to come to the same temperature of the surrounding water. This helps you to prevent condensation inside the jars.
3. Measure the water temperature in both jars. Write the results in question 1.
4. Remove 3/4 of the water from both jars.
5. Light the stick of incense and try to put some smoke into jar 1. Blow gently the incense smoke into the jar.
6. Quickly place the aluminum box containing ice on the top of jar.
7. Repeat the same procedure (steps 5 – 6) with jar 2.
8. Carefully observe what happens inside both jars.
9. Use the laser pointer to observe the progress of the phenomenon and try to compare them estimating which one of the two jars produces more fog.

Fog in a jar

– Worksheet -

Question 1: 2 point

Write down the temperatures of the water of the two jars:

Jar no.	Temperature °C
1 (cold water)	
2 (warm water)	

Question 2: 1 point

In most climate areas fog is more common during the cold season; does this experiment help you to understand this phenomenon?

a) yes
b) no

Question 3: 3 points

In your opinion which of the following sentences explain better the role played by the smoke inside the jars (**mark ONE** of the following answers)

a) Warm up the air inside the jar further
b) Warm up the water inside the jar further
c) Give tiny particles that provide surfaces on which water vapor can condense
d) Give tiny and warm particles that increase the difference in temperature between air and water. This affects the condensation positively.

Question 4: 4 points

In the atmosphere which one of the following processes, in your opinion and most likely, emits substances that could play the same role of the smoke you use in this lab? (mark **no more then TWO** of the following answers)

a) The erosion of a river
b) A volcanic eruption
c) The respiration of living organisms
d) Fossils fuels burning
e) An earthquake

Question 5: 4 points

Which of the following situations, in your opinion, is more suitable for fog formation? (**mark ONE** of the following answers)

a) Close to a shoreline there is an upwelling of a deep and cold ocean current. Here the water meets warm air coming from the inland area covered with forest
b) An hilly area has no vegetation cover since is quite arid, ther are only rock

outcrops facing south forming very warm air masses meeting cool ones coming from the adjacent peaks

c) A very wide area is covered with snow in the mid of winter season. Here cold air masses meet slightly cool ones coming from an adjacent and dense woods

Question 6: 2 points

One of the conditions that helps the formation of fog is the ice presence that decreases the temperature of air inside the jar. Which one of the following conditions could lead to the formation of fog? (**mark ONE** of the following answers)

a) increasing of air pressure inside the jar
b) decreasing of air pressure inside the jar
c) An increase or decrease of the air pressure inside the jar leads to fog formation
d) An increase of the pressure coupled with heating of the air inside the jar

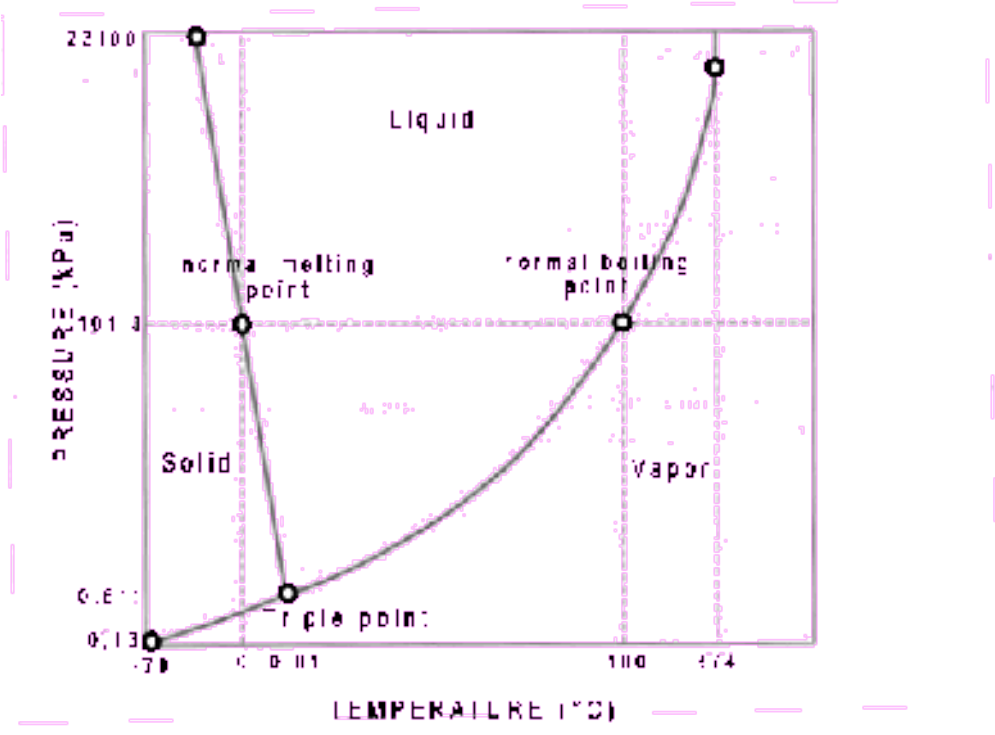
Question 7: 2 points

Which one of the following substances of the atmosphere does NOT act as condensation nucleus? (**mark ONE** of the following answers)

a) marine aerosol made by waves
b) carbon dioxide
c) particles lifted during a sand storm
d) particles emitted during a forest fire

Question 8: 2 points

Mark on the following graph two points that represent the conditions of the water inside the two jars (mark the point 1=cold jar; mark the point 2=warm jar).



IESO 2011
PRACTICAL TEST
“Oceanography”
Temperature and Depth Measurements
- Instruction sheet -

During this practical test you will measure the temperature of water at different depths at a sampling site. With the data collected, you will construct a thermal profile and conduct an investigation based on the data.
You will use thermometers fastened at fixed distances along a line called “mooring rope” ending with a weight. The upper end will be fixed to the boat. This system is called “mooring system”. During scientific measurements, it is generally fixed to a floating buoy.
The thermometers are actually micro-data-loggers that measure and record temperature data at desired time intervals. This operation is called a “mission”. The data loggers and the computers have already been configured for this mission.

Materials

- Temperature micro-data-loggers (thermochron iButton, Dallas-Maxim model DS1921G)
- Data-logger/PC cabling system (named LinkUSB)
- Computer with drivers and software already installed (named OneWireViewer)

Procedure

- **PAY SPECIAL ATTENTION TO SAFETY INSTRUCTIONS**
- **Preparation phase.** Using the hardware and software provided, you have to program all the data loggers in order to start your “mission” with the following characteristics:
  Measurement rate: 1 min.
  Format of temperature data: °C.
  Alarm: off
- **Start** the “mission” of each data logger.
- **Preparation of the mooring line**. Put the data loggers inside the chambers. Tightly close the chamber with a suitable o-ring using the given keys. Then fix the thermochrons at the following depths: sea floor, +10m above sea floor (asf), +20m asf, +30m asf.
- **Measurement**. Put the mooring line in the water following the instructions from the staff of the boat. Pay special attention to them!
- **Leave the mooring line** in the water for at least 10 minutes.
- Carefully raise the mooring line. Collect all the data from the loggers following the instructions provided by the student staff. For each data logger you have to choose (among all the collected values) a single value of temperature that, in your opinion, is representative of the temperature of the water at that depth where the thermometer was placed.
- **Go to the worksheet and answer the questions.**

IESO 2011
PRACTICAL TEST
"Oceanography"
Temperature and Depth Measurements

NAME_____ _____ country _____

- Worksheet –

Question 1

Record the data in the following table:

Depth (meter below sea level)	**Temperature (°C)**
0 m (sea level)	
- m	
- m	
- m (sea floor)	

5 points

Question 2

Draw a graph using the data you collected. Place the temperature on the horizontal axis (Scale the axis from -5°C to +30°C). Place the depth on the vertical axis. Be sure to place the sea surface at the top and the sea floor at the bottom of the axis.

5 points

Question 3

According to the data collected, this water mass is characterized by: (Choose only ONE of the following answers)

a) no thermal stratification
b) strong thermal stratification
c) weak thermal stratification
d) I would need more data to say something definitively.

5 points

Question 4

In your opinion, which of the following statements is most likely the main cause of the present condition of the water column; This should reflect your answer to question 3. (Choose only ONE of the following answers)

1. absence/presence of differences in density as a consequence of differences in temperature and/or salinity.
2. differences in the concentration of dissolved oxygen.
3. differences in the phytoplankton concentration.
4. Wave action
5. Non-natural causes such as the transit of boats and ships.

5 points

Question 5

Which of the following events, in your opinion, COULD CERTAINLY NOT affect the present

situation of stratification. (Choose ONE of the following answers)

a) inflow of water with a different salinity
b) inflow of water with a different temperature
c) a very strong wind
d) inflow of water with similar salinity and temperature
e) release of phosphorous from the sediment 5 points

Question 6

Which of the following best explains the importance of the stratification of a water mass? (Choose ONE of the following answers)

a) Because stratification affects the erosional processes carried on by the water mass
b) Because stratification and the temperature of the water affect only the primary production. (warm water means more productivity)
c) Because stratification could affect anoxic conditions at the bottom.

5 points

Question 7

Using the graph that you prepared for question 2, draw a thermal profile of this water mass during a hypothetical winter when the sea surface had frozen.

8 points

NAME_____ _____ country _____