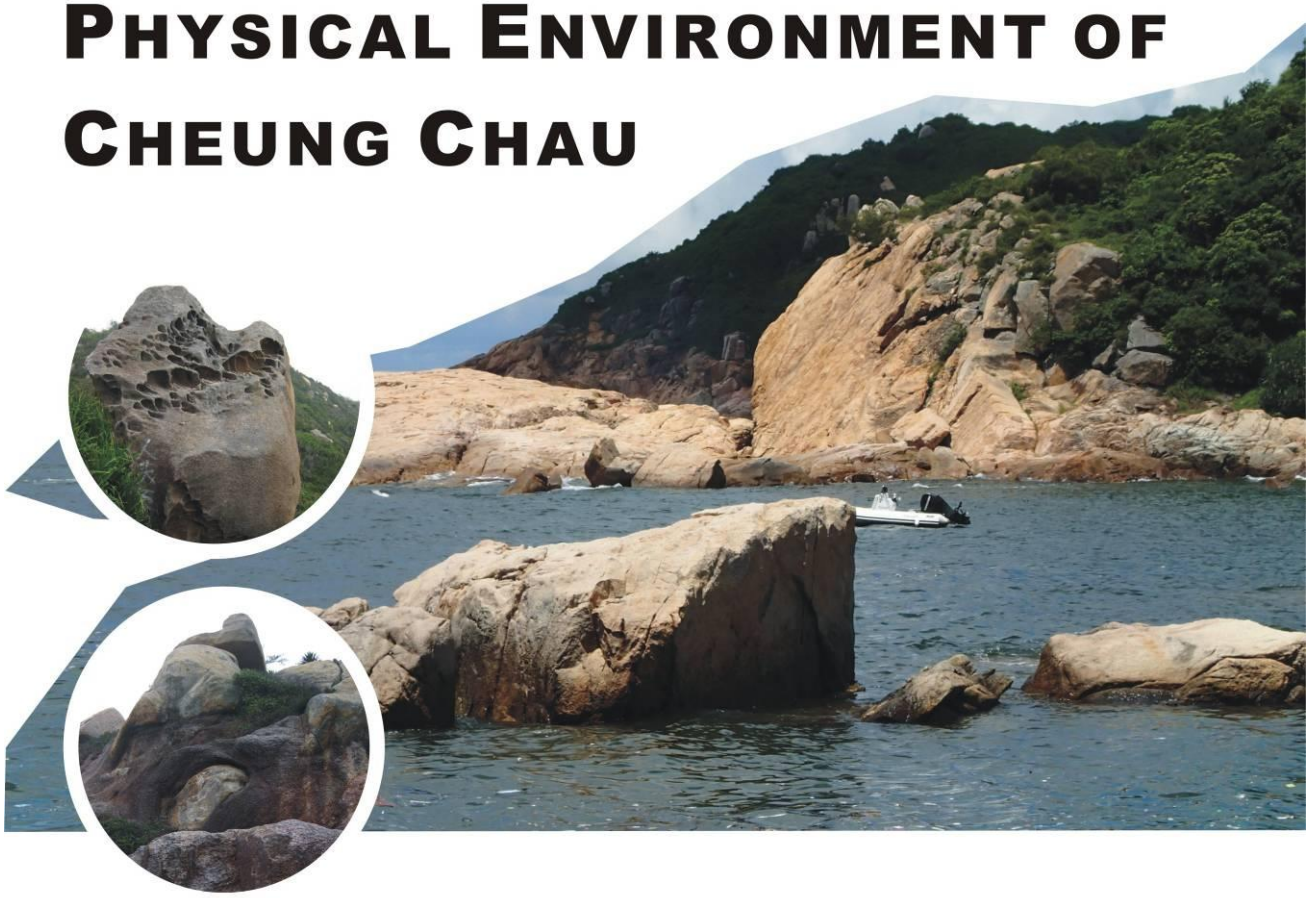
明 愛 陳 震 夏 郊 野 學 園
Caritas Chan Chun Ha Field Studies Centre

PHYSICAL ENVIRONMENT OF CHEUNG CHAU



- Name: _____
- Group number: _____
- Course Date: _____

COURSE OBJECTIVES:

Knowledge:
- To observe the geology in Cheung Chau
- To understand the physical landscapes along Little Great Wall to Nam Tum in Cheung Chau in relation to internal and external processes (weathering, erosion and mass wasting)

Skill:
- To practise geological fieldwork techniques
- To measure the weather conditions by field equipment

Value:
- To appreciate and cherish the invaluable geological resources

RELEVANCE TO DSE GEOGRAPHY CURRICULUM

- Dynamic Earth: The building of Hong Kong
- Managing coastal environments: A continuing challenge

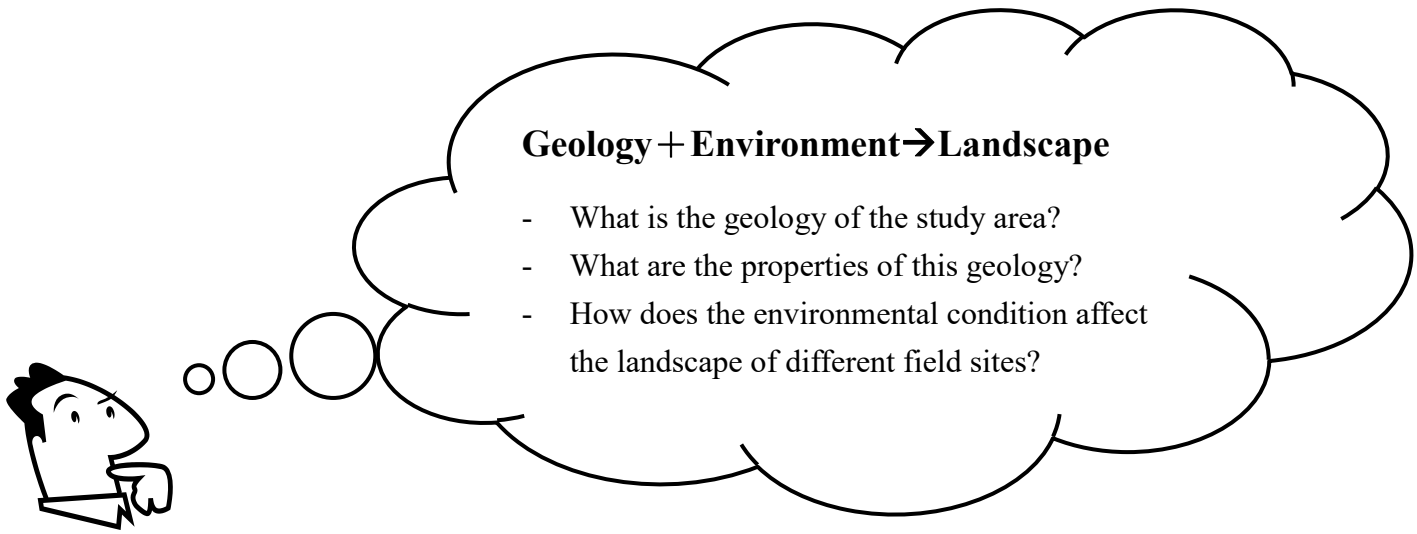
EQUIPMENT & MATERIALS

FIELDWORK

Equipment/ Materials	Quantity (for each group)	Check-in	Check-out
1. Anemometer	1		
2. Thermo-hygrometer	1		
3. Compass	1		
4. Copper penny	1		
5. Steel nail	1		
6. Card for grain size classification of granitic rocks	1		
7. Gloves	as needed		

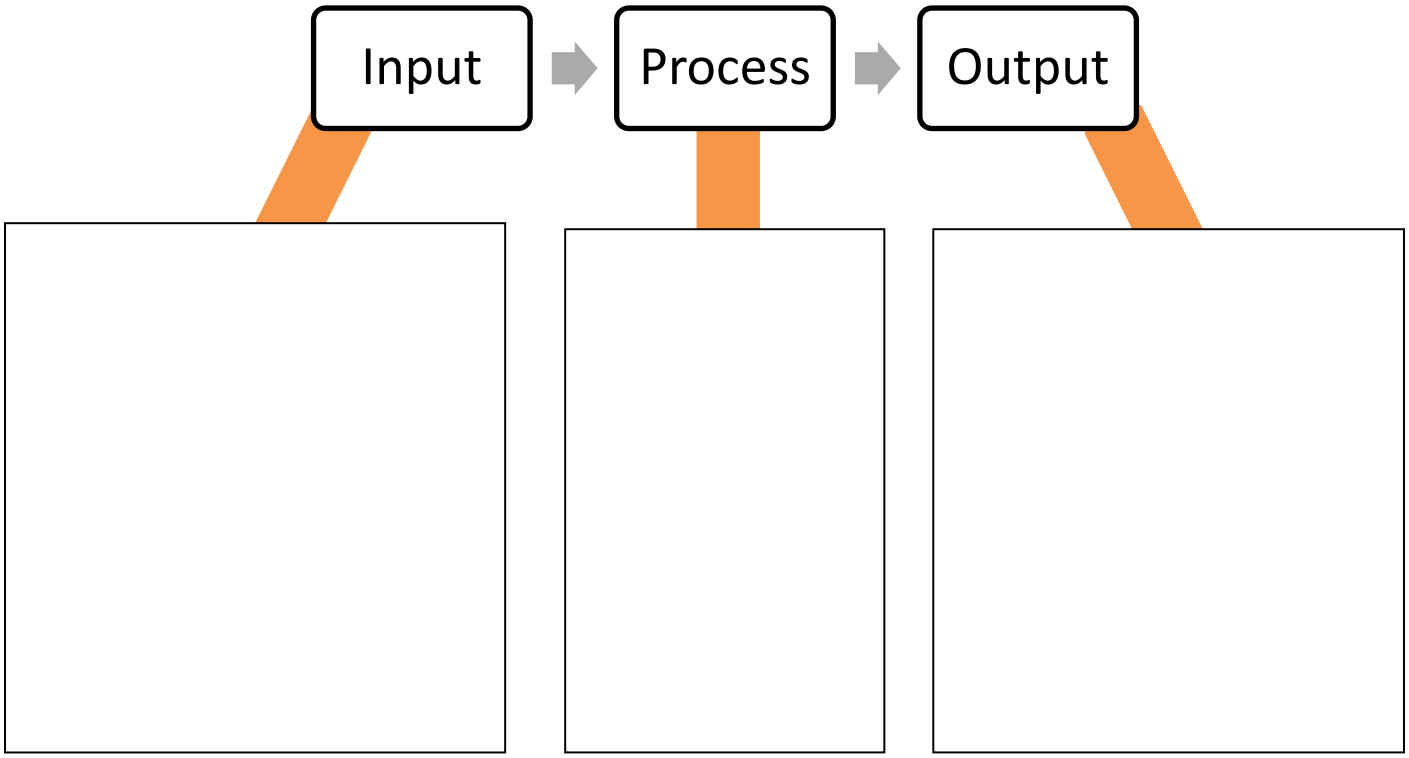
ROUTE

- Site 1: Human Head Rock
- Site 2: Outside Lover's Cave
- Site 3: Nam Tum



PRIOR KNOWLEDGE

Landform System



landform	weathered material	weathering	erosion	mass wasting
solar radiation	precipitation	vegetation	parent rock	time

PLANNING & PREPARATION

1. When to collect data?

Date: _____	Time: (AM) _____ to _____ (PM) _____ to _____

2. Study area

Coastal area of _____ (direction) Cheung Chau (refer to map on p.13)

DATA COLLECTION

Site 1: Human Head Rock

Record the weather condition and fill in table below.

Weather condition	Air temperature:	Relative humidity:	Aspect:
	Wind direction:	Wind speed:	Altitude: 22 m
Other locational characteristics (if any):			

1. Observe Human Head Rock, what feature can you find?_____, called sea caves / potholes / tafone.

Location and direction of the cavities
After observation, I have found that: a) They are evenly/unevenly distributed, mainly concentrated at _____(direction) and _____ of the boulder. b) Their size are similar/ different, means that the time of formation is consistent/ inconsistent. c) There are _____ in some of the cavities, which may be come from the boulder/ surrounding rock. d) Their formation is usually related to _____ weathering.

Type of weathering	**Name of weathering**	**Favourable factors**	
		Properties of rock	**Environmental conditions**
Physical	● Salt / water carried by air, enter the _____ of rock. ● After crystallization / solidification, pressure / stress is produced and expand the fracture. ● This is a kind of physical/ chemical weathering, called _____	● Rock composed of one type/ more than one types of minerals.	● Far from/ close to coast ● _____ & _____ climate
Chemical	● Air/ water contact the minerals of the rock and physical/ chemical changes occurred, lead to weakening of rock structure. ● This is a kind of physical/ chemical weathering.	● Some of the minerals of the rock is stable/ unstable.	● Far from/ close to coast ● Strong wind/ wave

Extended study:

Apart from the two types of weathering, did you find the third type of weathering?_____

- Take photo as evidence
- Describe breakdown process of rock:

- This is a physical/ chemical weathering process.

Site 2: Outside Lover's Cave

Record the weather condition and fill in table below.

Weather condition	Air temperature:	Relative humidity:	Aspect:
	Wind direction:	Wind speed:	Altitude: 20 m
Other locational characteristics (if any):			

1. Observe the rock wall outside Lover's Cave. Find out the evidence from rock wall to show the <u>two</u> types of weathering at work.

Evidence 1: Grab some mineral grains from the bottom of the rock wall.

a) Where do the mineral grains come from?		**Weathering:**
b) What minerals have you found? *(Hint: infer from colour, hardness & other features)*		
c) Which mineral has the largest proportion? Why?		

Evidence 2: Find the "round boulder" of Figure 1 from the rock wall.

a) What is the name of the round boulder?		**Weathering:**
b) The substance surrounding the round boulder is <u>dark / light</u>. What are they?		
c) Did you find another round boulder?		
d) Where is the round boulder located at the rock wall?	Top / Middle / Base	

Figure 1 Round boulder outside Love's Cave

2. Sketching the weathering profile

a) The whole rock wall is a weathering profile. Follow the instructions below, sketch the features caused by the actions of weathering and erosion in Figure 2. Add annotations as appropriate.

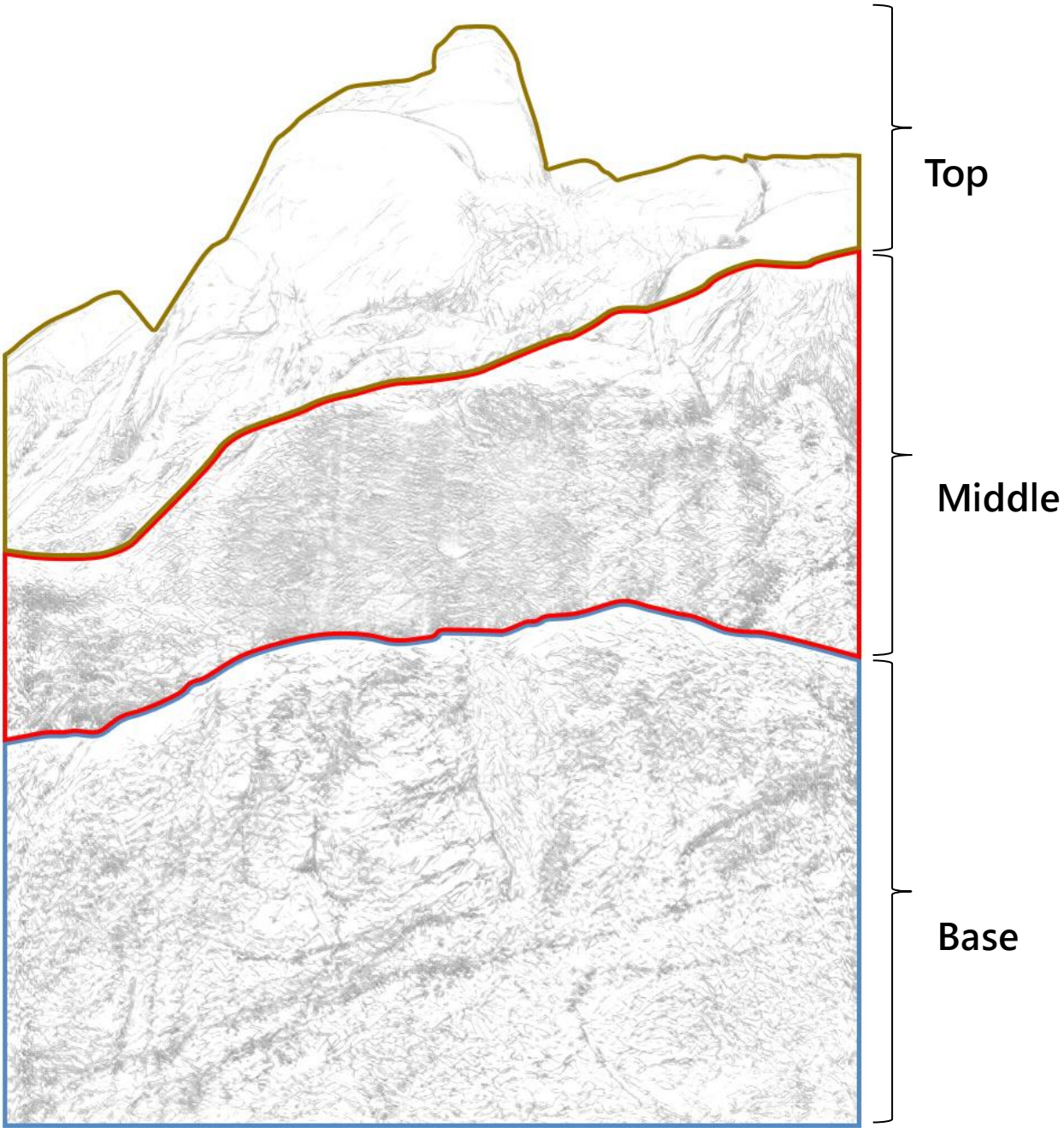


Figure 2

Hint	1. Draw the round boulder (more than one). Their level of weathering and erosion is same / different. 2. The round boulder at the top is its future feature. It is called _____. Draw the feature in Figure 2. 3. The base is the **past** of the round boulder. Draw "joint" and "oxidation" in Figure 2.

b) From Figure 2 and field evidence, what is the relationship between weathering intensity and depth from ground surface? Draw the relationship in Figure 3b *(refer to Figure 3a)*.

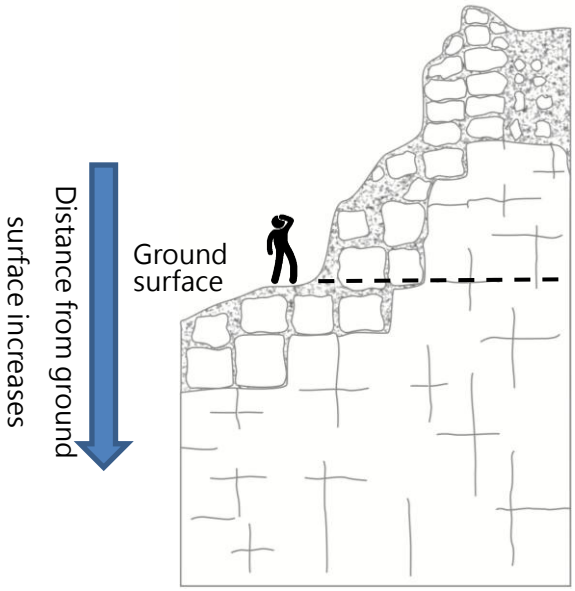


Figure 3a

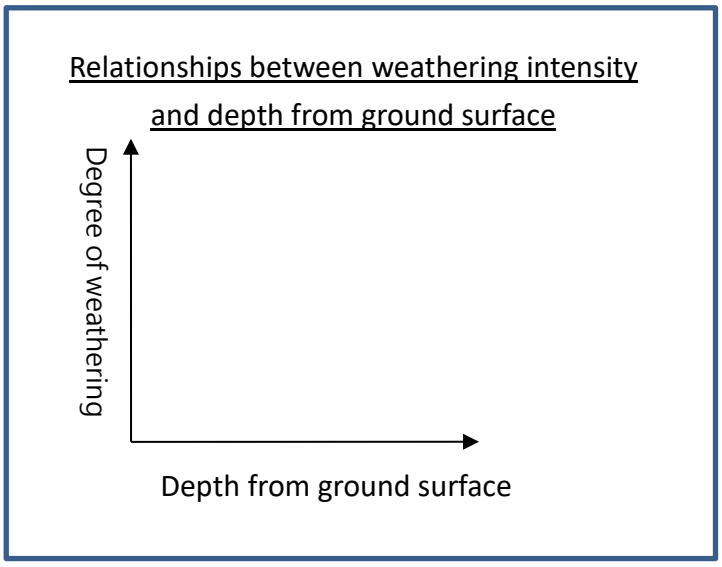


Figure 3b

c) If weathering and erosion continue to work on the round boulder of the rock wall, what kind of mass wasting might happen?

_____

3. Observe the footpath you passed through.

a) This landform feature caused by erosion is called valley / rapid / badland / gully.

b) List **THREE** favourable conditions for the formation of the above landform feature.

❶ _____

❷ _____

❸ _____

Site 3: Nam Tum

Record the weather condition and fill in table below.

Weather condition	Air temperature:	Relative humidity:	Aspect:
	Wind direction:	Wind speed:	Altitude: 5 m
Other locational characteristics (if any):			

Conduct geological study at Point 1, 2 and 3.

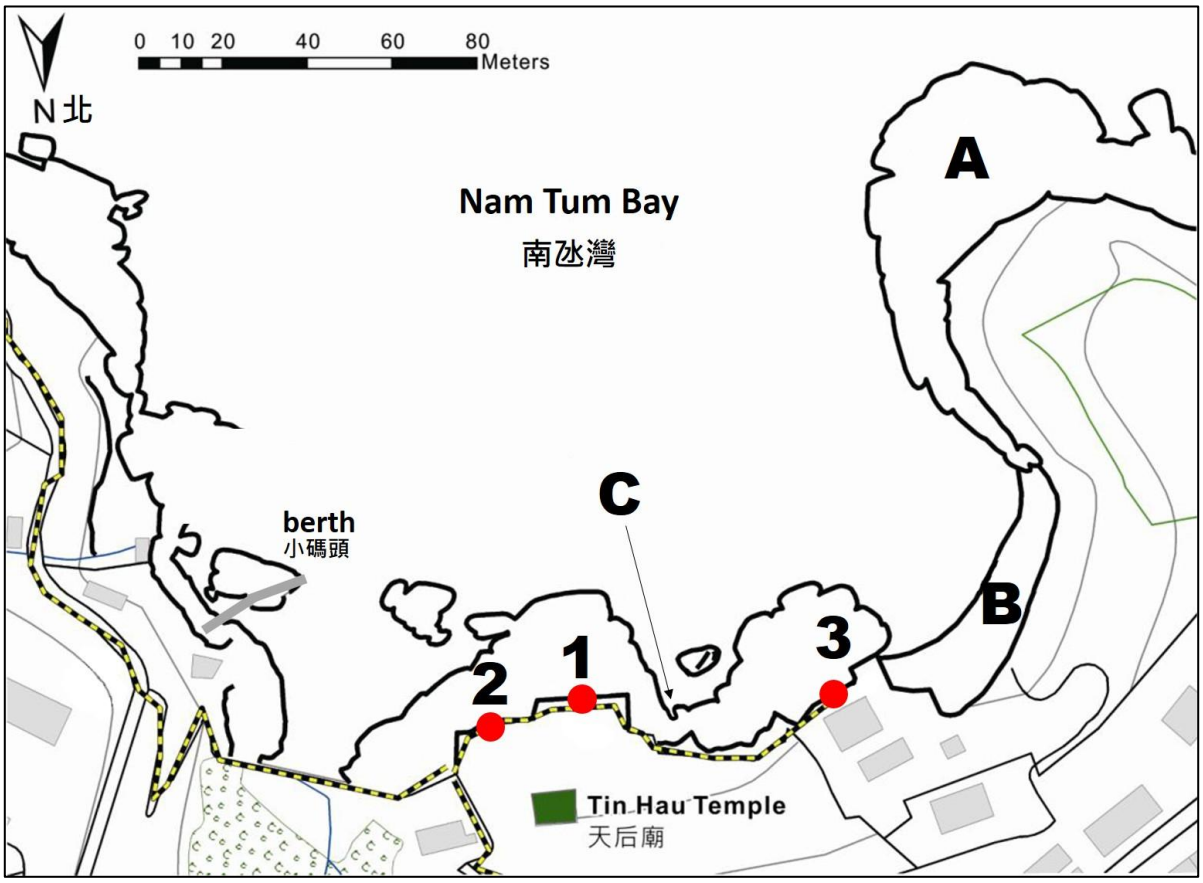


Figure 4 Sketch map of Nam Tum

POINT 1

1. Observe coastal landforms A, B and C and fill in the table below.

	A	B	C
Coastal landform			
Major formation process	Erosion/ Deposition	Erosion/ Deposition	Erosion/ Deposition
From field evidence, is the coastal landform still developing?			

2. Face **SOUTH** and observe the rocky shore.

   Fissures of different arrangements appear on the rocks. They are called _____.

   Explain the processes which they form, expand and extend.

❶ Location of rock formation and rock characteristics	❷ Process that the rock exposed to Earth's surface	❸ Effect of environment
Rock formed above/ near /deep under the Earth's surface. Under what condition when the rock formed? - High/ low temperature and high/ low pressure - Molten/ solid state, called _____ - Cooled / heated rapidly/ slowly, which crystallize to form minerals What features were caused?	When the rock is exposed to the Earth's surface, the pressure withstands increases/ decreases Why the pressure changes? What are the result of the pressure change?	What agent lead to the expansion of fissure of the rock at this location?

POINT 2

Observe the white lines on the rock.

1. Refer to Mohs Hardness Scale (Table 2), use appropriate tools to conduct test which indicate which kind of mineral do the white lines belong to? *(Hints: Talc 滑石/ Calcite 方解石/ Flourite 螢石/ Quartz 石英)*

Procedure	Result (Mineral scratched?)	Inference *(refer to Hint above)*
◆ Use **fingernail** to scratch the surface of white line	☐ Yes ☐ No	Must not be _____
◆ Use a **cooper penny** to scratch the surface of white line	☐ Yes ☐ No	Must not be _____
◆ Use a **steel nail** to scratch the surface of white line	☐ Yes ☐ No	Must not be _____

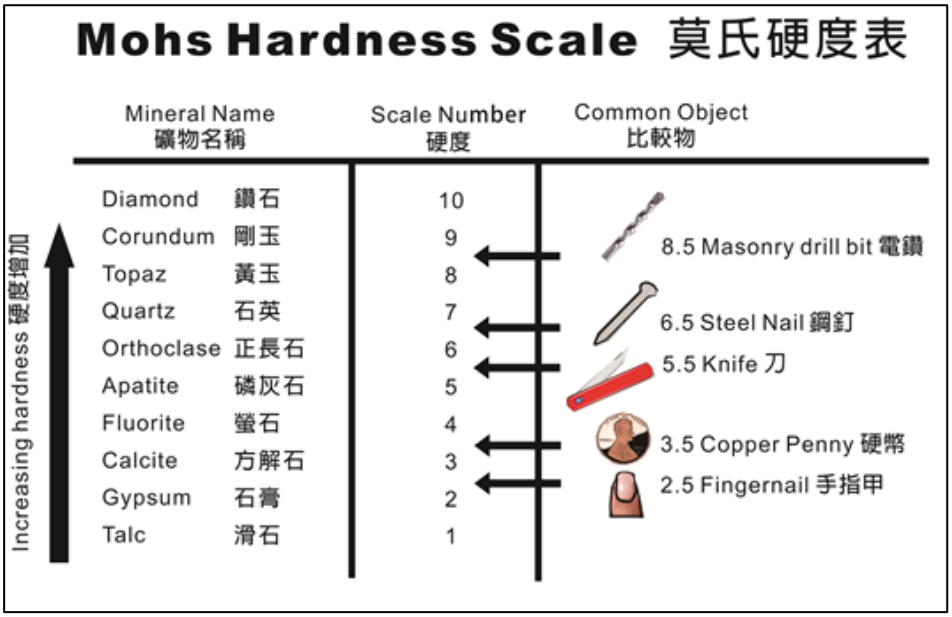


Table 2

2. These white minerals are in a liquid state during formation. Use the words in the box and infer the processes they change from liquid to solid state. *(Hints: Melting point of this substance is below 600℃)*

under Earth's surface / fracture / underground water / silicon dioxide / depressurize / fill in / rise / precipitate / cool / crystallize /

Formation process:_____, as magma_____, magma *(e.g. volatiles)*_____ and_____, solution are rich in _____ i.e. highly saturated, enter the rocks' _____ with _____. Due to further depressurization, they _____ from solution to solid form of silicon dioxide, and _____, _____ the voids of rock fracture and form the veins.

3. Therefore, the white lines formed in the process are called talc / calcite/ fluorite / quartz veins.
4. Comparing the rock with this mineral, the bulging part is the white mineral / rock, therefore the white mineral / rock is more resistant.

POINT 3

Observe the designated boulder with different characteristics.

Complete the table below.

	A	B
Texture	 Phaneritic / aphanitic	 phaneritic/ aphanitic
Mineral composition		mainly quartz & feldspar
Grain size*	mm	mm
Rock type		
Rock name		

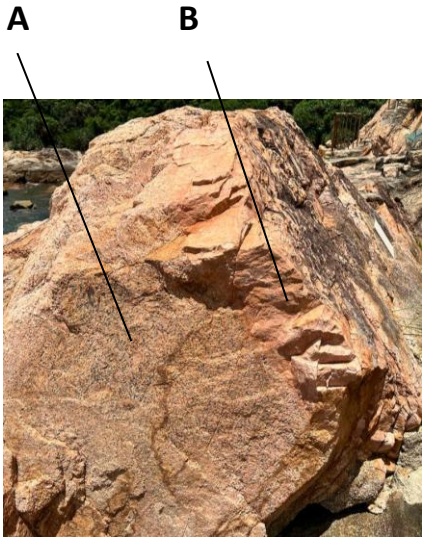


Figure 5

* Use the card for grain size classification of granitic rocks to measure the grain size

1. Draw the boundary of the two types of rock in Figure 5. Infer why the grain size of A & B are different.

magma/ solubility / cool/

magma/ over-saturated/ pressure/

crystallize/ fine-grained/ crystallize

Formation process: Residual _____ fill and _____ along the fractures of rock mass. If the rock mass breaks, the residual _____ flow into the fractures. _____ drops rapidly and the _____ of quartz and feldspar solution reduce and become _____, causing them to _____ and _____ rapidly and form _____ texture.

2. Is A and B formed at the same stage?

   ☐ Yes ☐ No (<u>A / B</u> formed first)

3. Observe the feature which the boundary of A and B extend to the ground surface. Refer to Figure 6, infer which part does it represent. _____

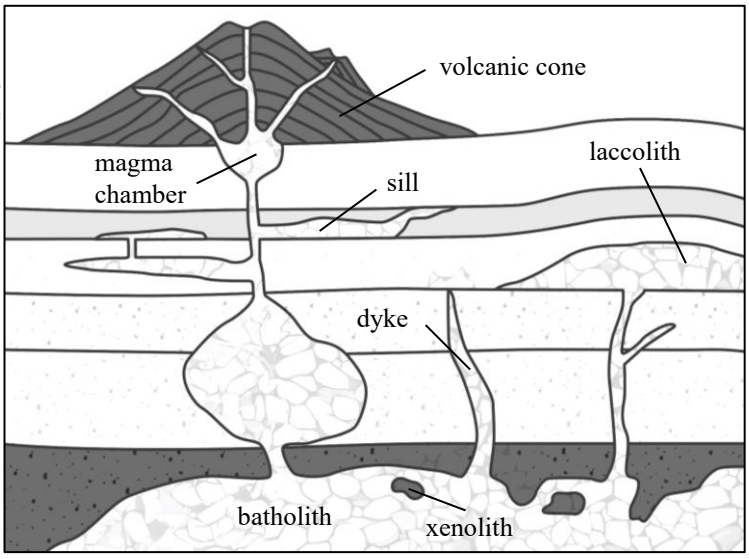


Figure 6

Extended study:

Observed the designated location on the rock surface (Figure 7).

- What it the mineral crystal? *(Hint: colour, location of occurrence)*

  _____

- How this mineral promotes weathering of rock?

  _____

  _____

  _____

Figure 7

DATA PROCESSING, PRESENTATION AND ANALYSIS

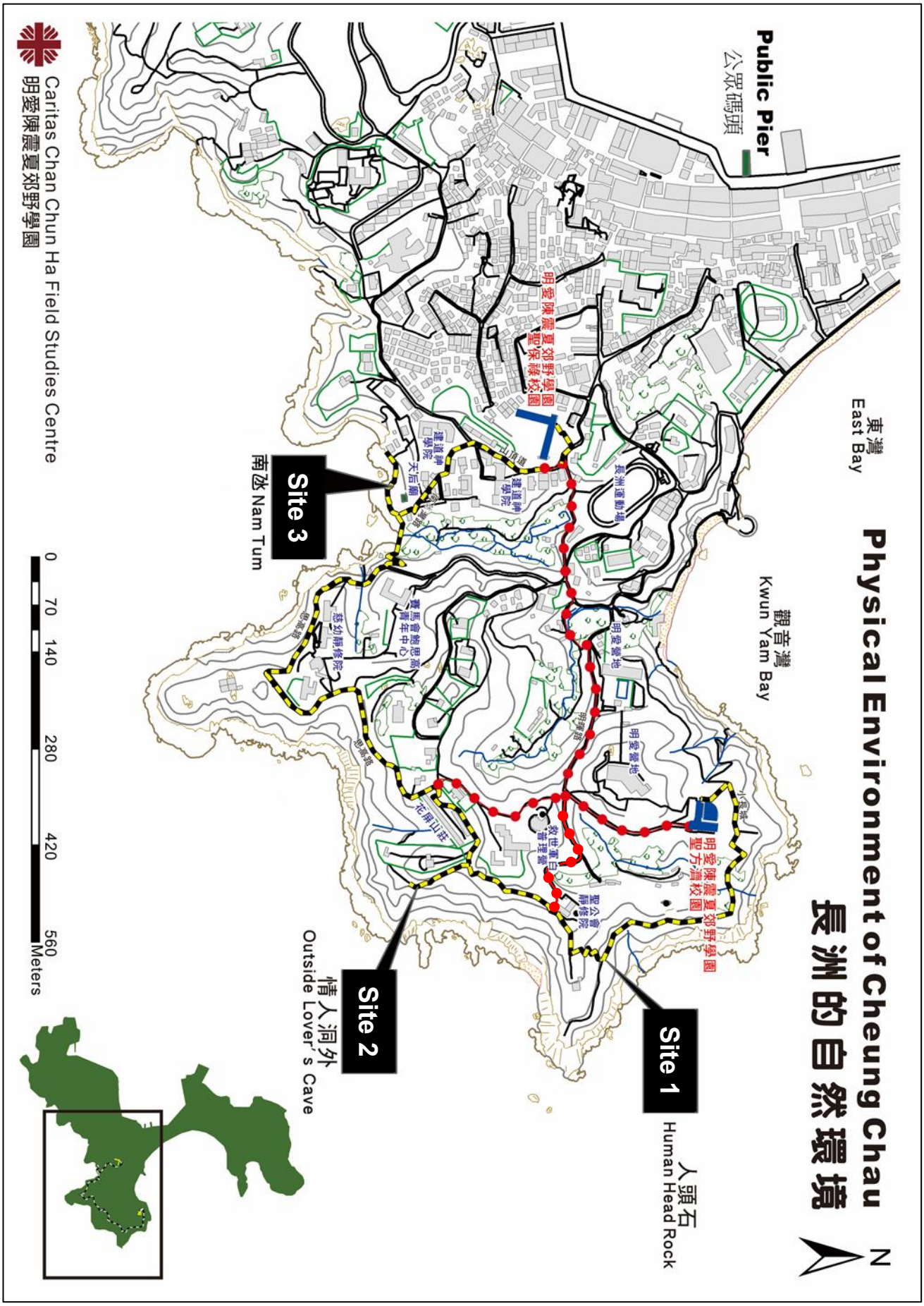
Complete the observation summary below.

Evidence	Site	Landform/ landform feature	Weathering/ Erosion/ Deposition	Agent of weathering/ erosion/ deposition	Environmental / geological factor
External processes	Human Head Rock				
	Outside Lover's Cave		Rainsplash action		
		Uneven surface of rock wall, rock debris/mineral grains on ground surface		Temperature change	
	Nam Tum				
			Deposition	constructive ( )	
Internal processes	Nam Tum				

DISCUSSION QUESTIONS

1. List the favourable factors of weathering and erosion in Cheung Chau. Discuss the **significant factors** affecting weathering and erosion. Give field evidence to justify your answer.
   (*Hint: you may list the favourable factors of weathering and erosion in the spaces below.)*

2. 'Volcanism was common in Cheung Chau in the past.' Discuss the validity of this statement with reference to the field evidence.


Physical Environment of Cheung Chau
長洲的自然環境
Caritas Chan Chun Ha Field Studies Centre
明愛陳震夏郊野學園
Public Pier
公眾碼頭
東灣
East Bay
觀音灣
Kwun Yam Bay
人頭石
Human Head Rock
Site 1
Site 2
Site 3
南涌 Nam Tum
情人洞外
Outside Lover's Cave
N
0
70
140
280
420
560
Meters