



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: | <ul style="list-style-type: none">• 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: | <ul style="list-style-type: none">• To practise geological fieldwork techniques• To measure the weather conditions by field equipment |
| Value: | <ul style="list-style-type: none">• 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



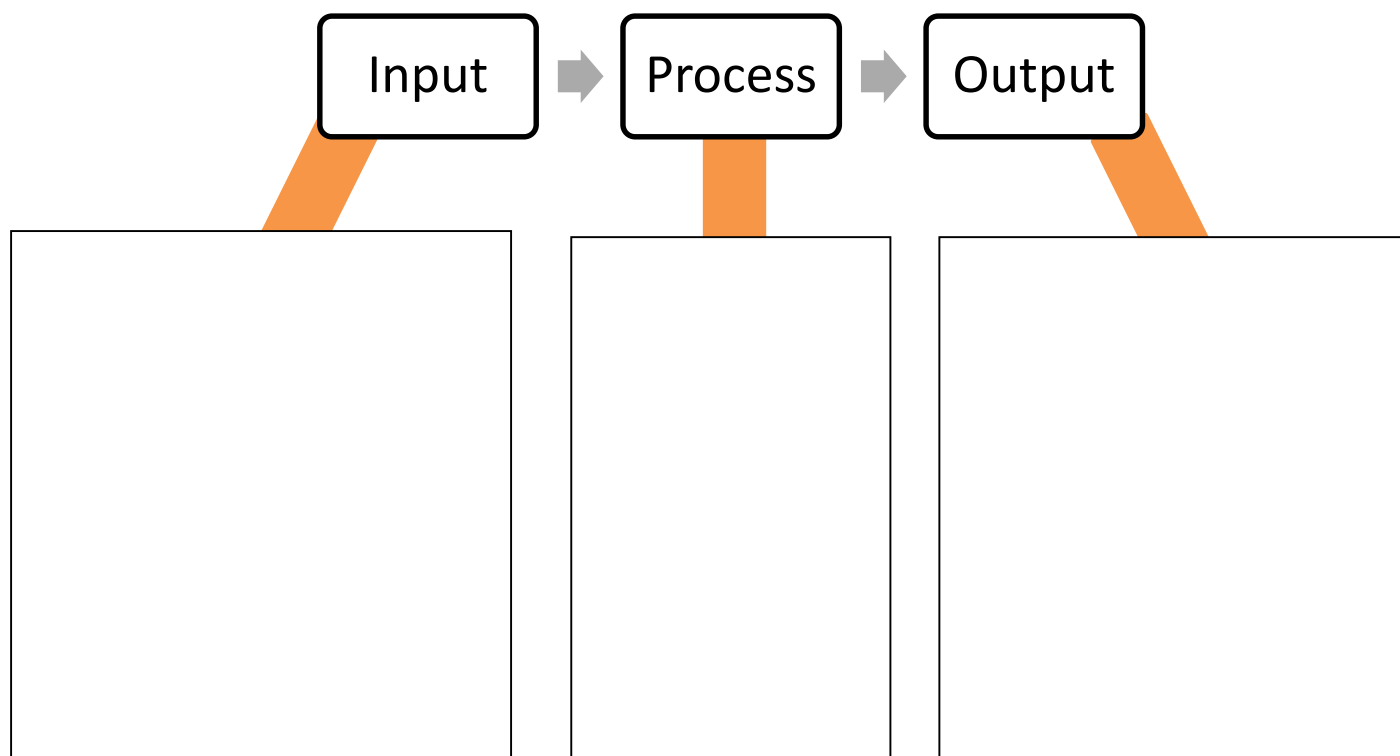
Geology + Environment → Landscape

- What is the geology of the study area?
- What are the properties of this geology?
- How does the environmental condition affect the landscape of different field sites?



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 _____
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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 and the environment nearby, what weathering is at work on the cavities?

Fill in the table below.

Type of weathering	Name of weathering	Favourable factors	
		Properties of rock	Environmental conditions
Physical			
Chemical			

2. Observe the cavities of Human Head Rock, why are they large and deep?

Hint	a) Which direction and position do the above cavities are located?

	b) What is present inside the cavities?

These cavities are called sea caves / potholes / tafone.

The processes causing those cavities are weathering / erosion.

Explain the major agent and processes involved.

Extended study:

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

- ◆ Take photo as evidence
- ◆ Describe the process which the rock breaks down:

- ◆ 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 two 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.

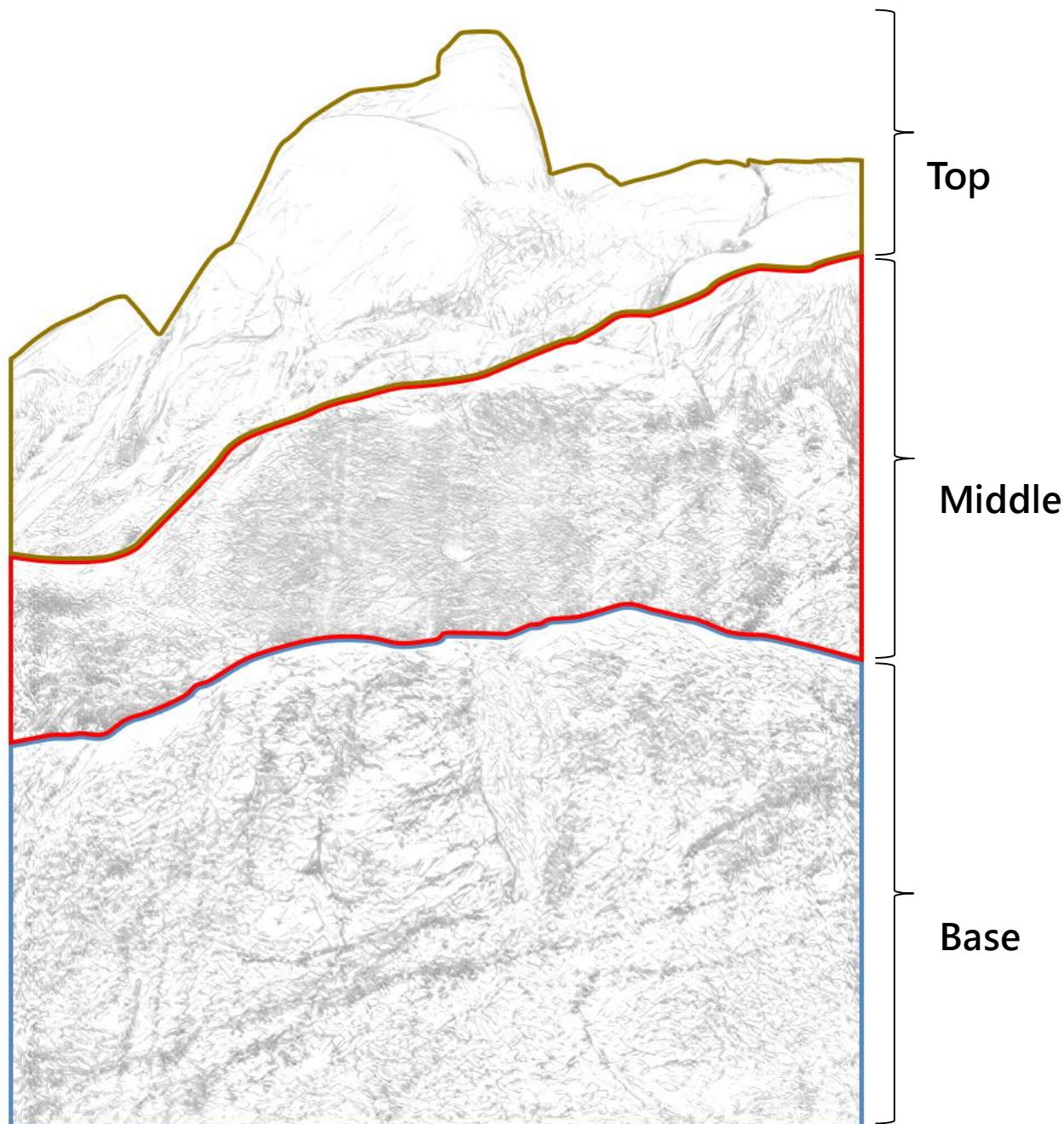


Figure 2

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).

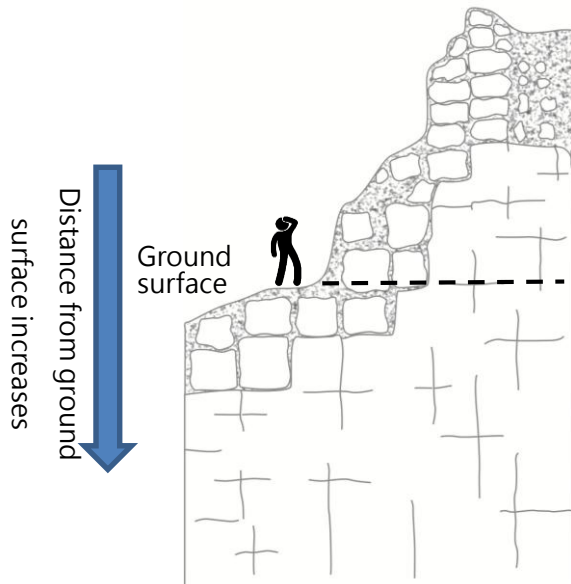


Figure 3a

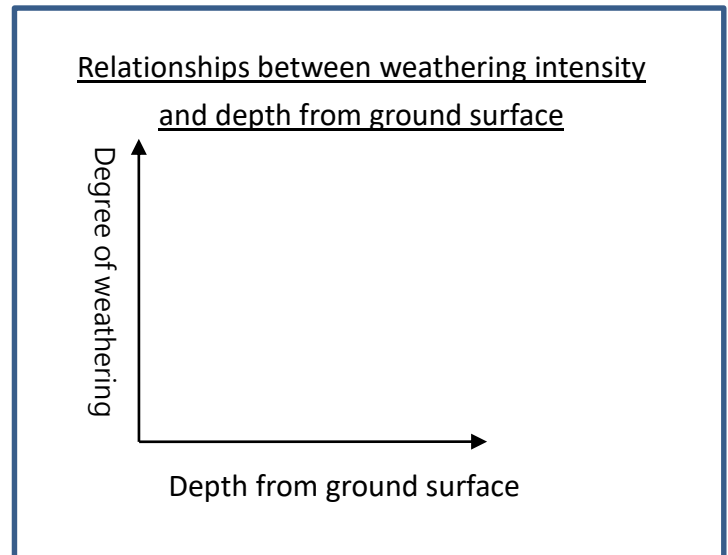


Figure 3b

- 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.

①

②

③



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):			
Tidal condition	Tidal Level: _____ m (height), at _____ (time)		

Conduct geological study at Point 1, 2 and 3.

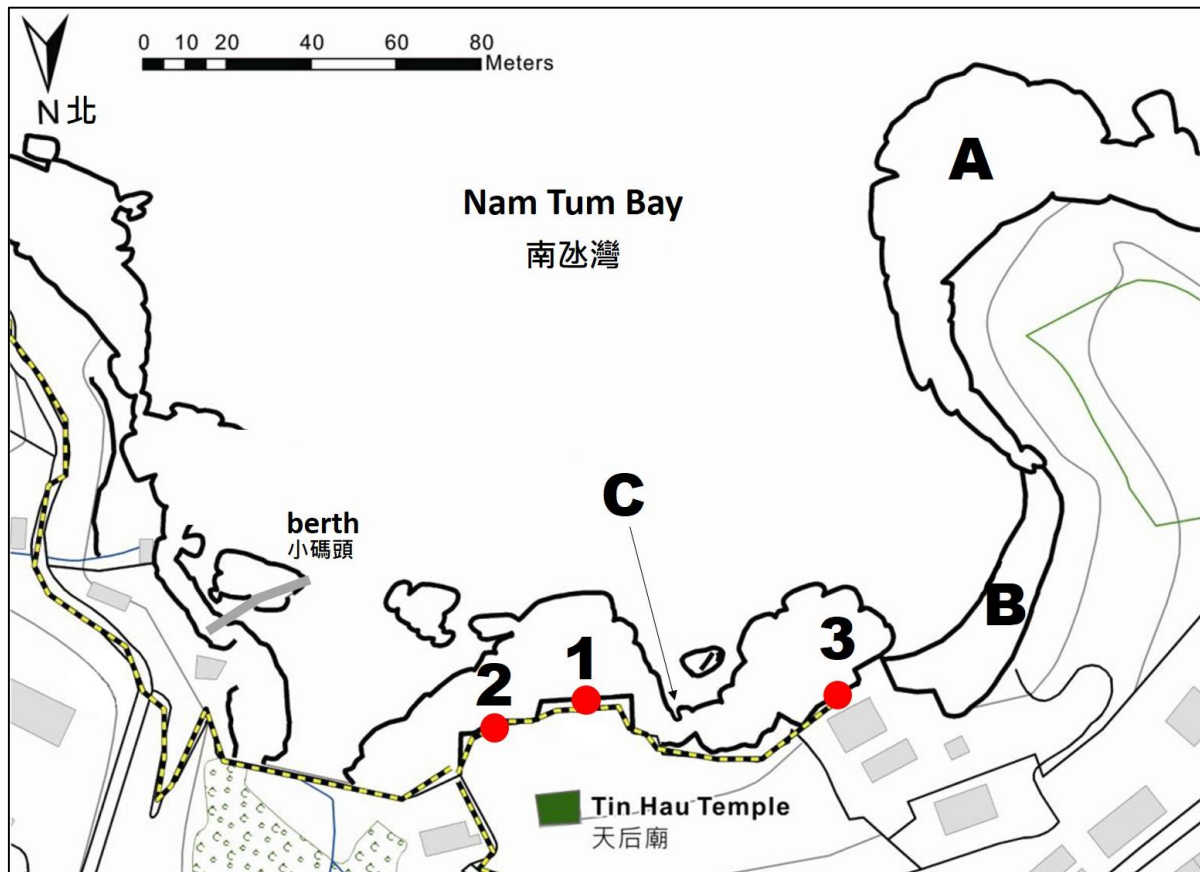


Figure 4 Sketch map of Nam Tum



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.

① Location of rock formation and rock characteristics	② Process that the rock exposed to Earth's surface	③ Effect of environment
Rock formed <u>above/ near /deep under</u> the Earth's surface. Under what condition when the rock formed? - <u>High/ low</u> temperature and <u>high/ low</u> pressure - <u>Molten/ solid</u> state, called _____ - <u>Cooled / heated</u> <u>rapidly/ slowly</u>, which crystallize to form minerals What features were caused?	When the rock is exposed to the Earth's surface, the pressure withstands <u>increases/ decreases</u> 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/ Fluorite 螢石/ Quartz 石英)

Procedure	Result (Mineral scratched?)	Inference (refer to Hint above)
♦ Use finger nail 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 _____

Mohs Hardness Scale 莫氏硬度表		
Mineral Name 礦物名稱	Scale Number 硬度	Common Object 比較物
Diamond 鑽石	10	
Corundum 剛玉	9	8.5 Masonry drill bit 電鑽
Topaz 黃玉	8	
Quartz 石英	7	6.5 Steel Nail 鋼釘
Orthoclase 正長石	6	
Apatite 磷灰石	5	5.5 Knife 刀
Fluorite 螢石	4	
Calcite 方解石	3	3.5 Copper Penny 硬幣
Gypsum 石膏	2	
Talc 滑石	1	2.5 Fingernail 手指甲

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°C)

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.

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		

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

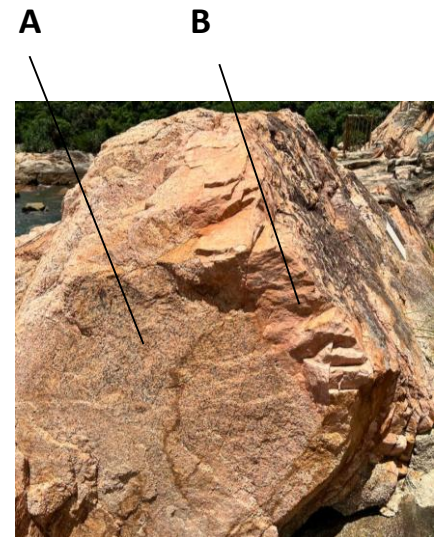


Figure 5

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 (A/ B 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.

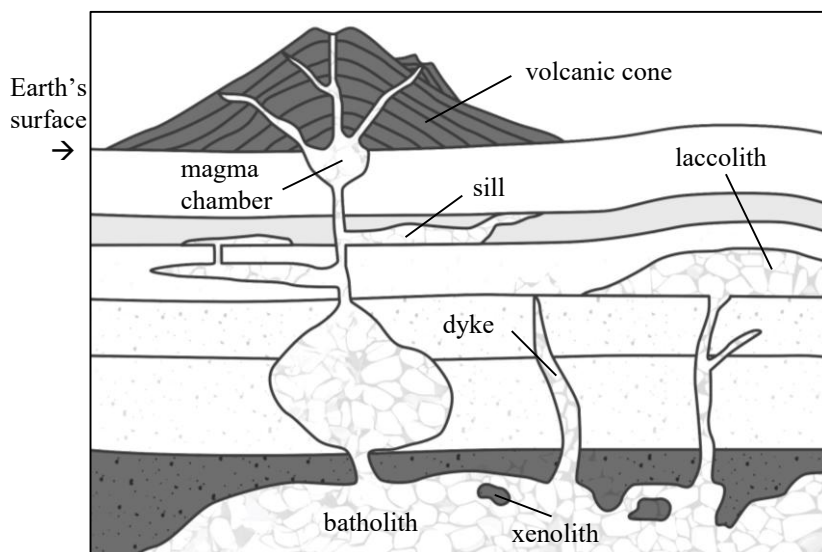


Figure 6

Extended study:

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

- What is 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

- 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.)

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

