



# 在海岸環境設計及組織實地考察

## Designing and organising fieldwork on coastal environments

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## 目標 Objectives

**55 MINS**

A. 探究為本實地考察的基本步驟

Basic procedures of an enquiry-based fieldwork

B. 建議可於海岸環境進行的實地考察技能及相應的考察示例

Suggested fieldwork skills conducting on coastal environment and corresponding fieldwork examples

C. 於海岸環境組織實地考察時的注意事項

Reminders on organizing fieldwork on coastal environment

**5 MINS**

問答環節

Q & A section






A.

探究為本實地考察的基本步驟  
Basic procedures of an enquiry-based fieldwork

## A. 探究為本實地考察的基本步驟 Basic procedures of an enquiry-based fieldwork



1. 計劃及準備 Planning and preparation



2. 數據蒐集 Data collection



抽樣、量度、記錄、誤差等  
Sampling, Measuring, Recording, Errors, etc.

3. 數據處理、分析及展示 Data processing, analysis and presentation



4. 闡釋及總結 Interpretation and conclusion



5. 評鑑 Evaluation





B.

建議可於海岸環境進行的實地考察技能及相應的考察示例  
Suggested fieldwork skills conducting on coastal environment  
and corresponding fieldwork examples



B. 建議可於海岸環境進行的實地考察技能及相應的考察示例  
Suggested fieldwork skills conducting on coastal environment and corresponding fieldwork examples



1.

量度剖面坡度  
Measuring of profile gradient



2.

量度沿岸漂移  
Measuring of longshore drift



3.

量度沖流及回流  
Measuring of swash and backwash



4.

量度沉積物  
Measuring of sediment



5.

量度水質  
Measuring of water quality



6.

量度天氣因子  
Measuring of weather elements



1.

## 量度剖面坡度

## Measuring of profile gradient

汀九：近水灣

Ting Kau : Approach beach



1.

## 量度剖面坡度

## Measuring of profile gradient

設定樣條

Run a transect



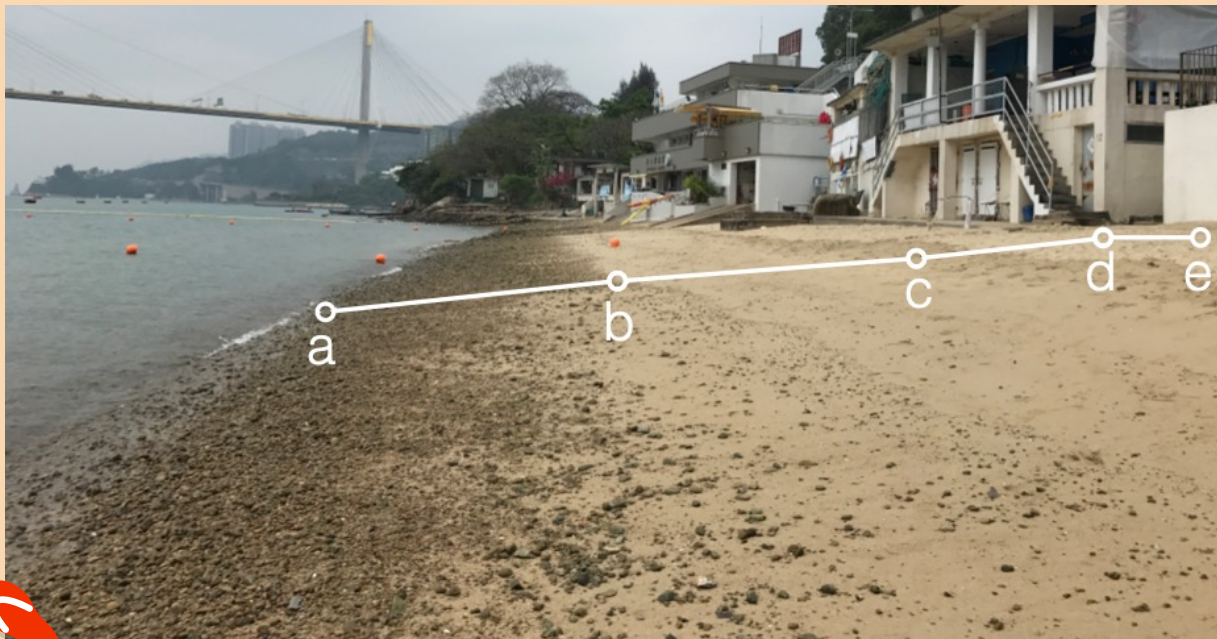


1.

## 量度剖面坡度

### Measuring of profile gradient

- A. 在每一轉折點  
Between each key point

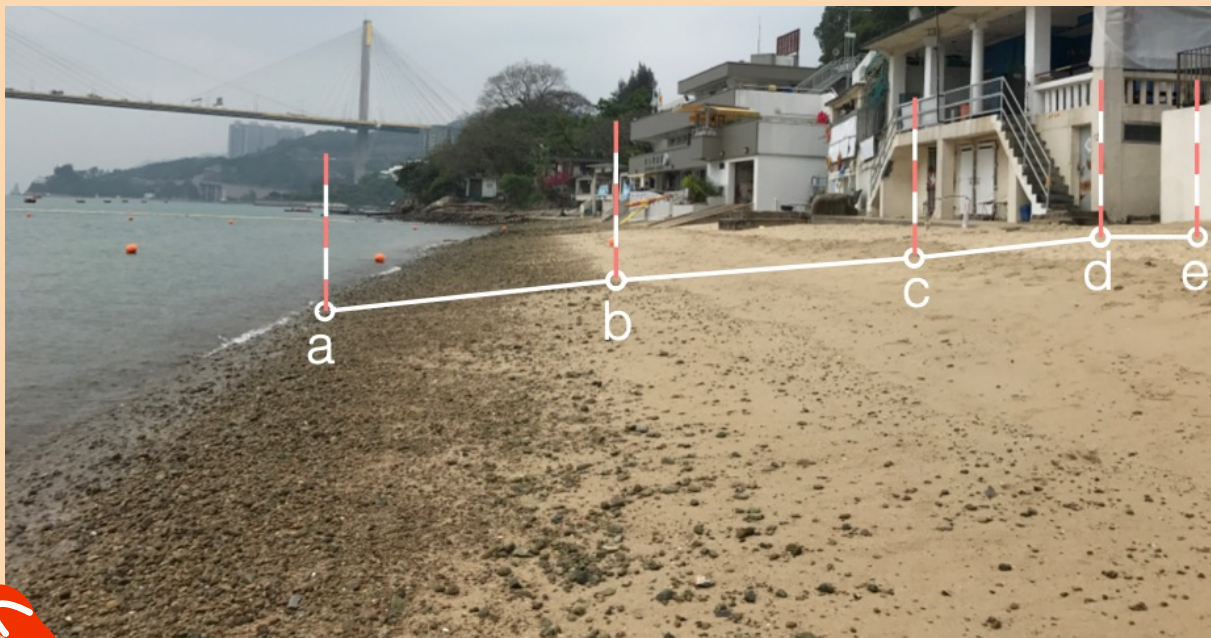


1.

## 量度剖面坡度

### Measuring of profile gradient

- A. 在每一轉折點  
Between each key point

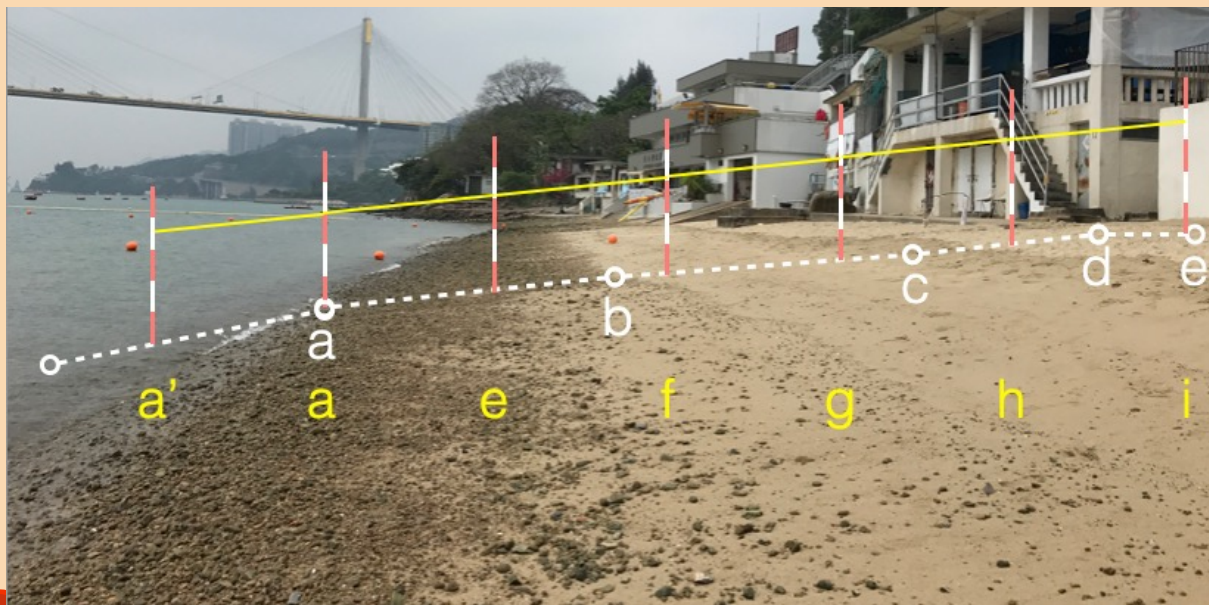


1.

## 量度剖面坡度

### Measuring of profile gradient

- B. 在樣條上以若干距離  
At certain distance on a transect



1.

# 量度剖面坡度

## Measuring of profile gradient



捲尺 (30米)  
Measuring tape (30m)



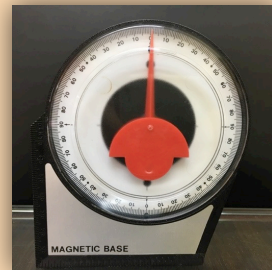
測距桿  
Ranging poles



水平尺  
Level meter



手水準儀  
Abney level



測斜儀  
Clinometer

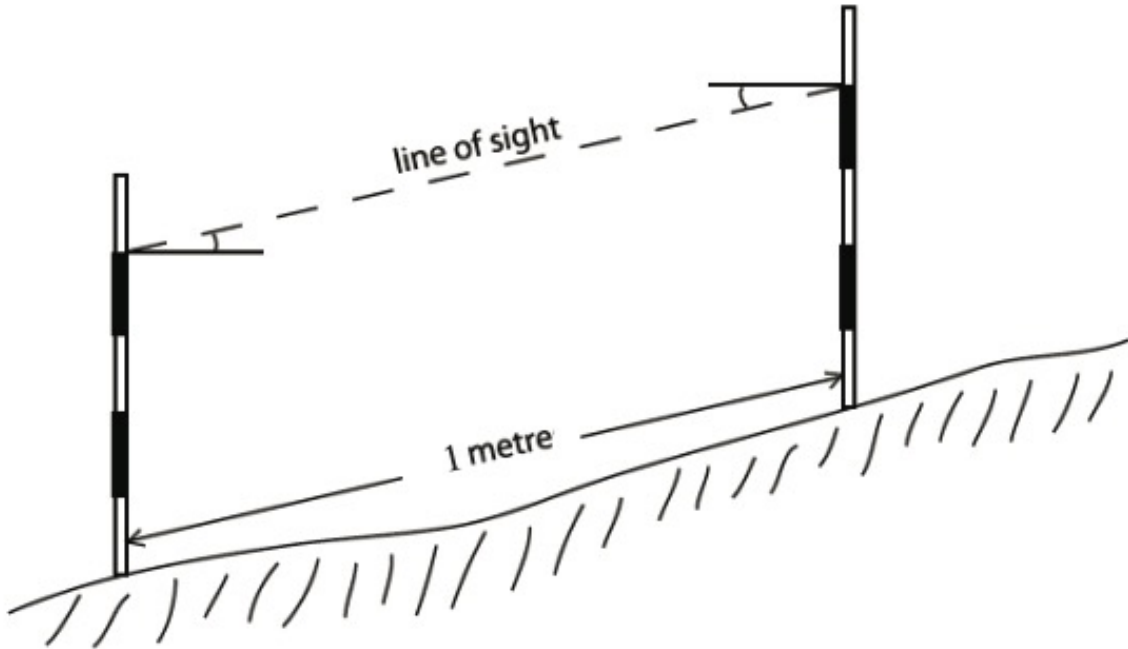
1.

## 量度剖面坡度

### Measuring of profile gradient

使用手水準儀或測斜儀 / 使用繩綁於兩枝測距桿上

By using an **abney level** or **clinometer** / By using a rope tied on two **ranging poles**



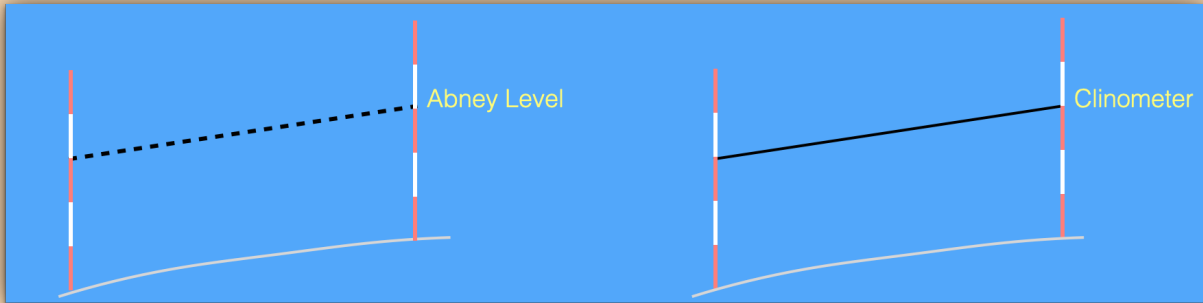
1.

## 量度剖面坡度

### Measuring of profile gradient

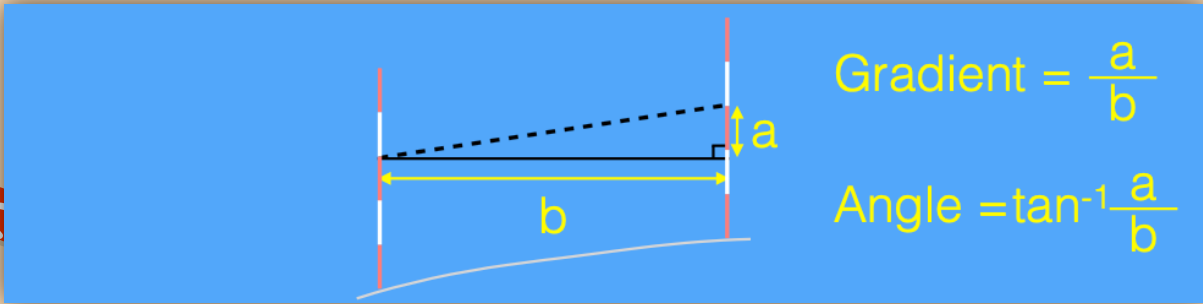
使用手水準儀或測斜儀

By using an **abney level** or a **clinometer**



使用繩綁於兩枝測距桿上

By using a rope tied on two **ranging poles**



2.

## 量度沿岸漂移

## Measuring of longshore drift

觀察

By observation



2.

## 量度沿岸漂移

## Measuring of longshore drift

使用漂浮物 (如：膠樽、小樽、鈕扣等)

By a float (e.g. bottle, a small bottle, a button, etc.)





2.

# 量度沿岸漂移

## Measuring of longshore drift



捲尺  
Measuring tape



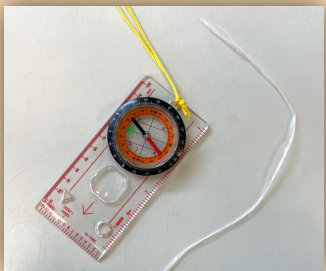
測距桿  
Ranging poles



漂浮物  
Floats



風速計  
Anemometer



指南針 + 尼龍繩  
Compass + Nylon thread



計時器  
Timer

3.

## 量度沖流及回流

# Measuring of swash and backwash

觀察及數算：頻率

By observation and counting: frequency



3.

## 量度沖流及回流

# Measuring of swash and backwash

觀察：強度

By observation: strength



3.

### 量度冲流及回流

## Measuring of swash and backwash



1米高  
1m high

記錄冲流強度  
Record strength  
of backwash

記錄回流強度  
Record strength  
of swash



冲流回流指示器  
Swingometer



4

量度沉積物

Measuring of sediment

a.

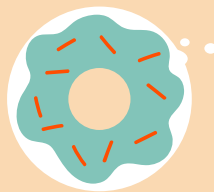
量度沉積物大小

Measuring sediment size

b.

量度沉積物形狀

Measuring sediment shape



4

# 量度沉積物 Measuring of sediment

觀察  
By observation

a.

# 量度沉積物大小 Measuring sediment size



4

# 量度沉積物 Measuring of sediment



鏟  
Trowel



取樣瓶  
Sampling bottle



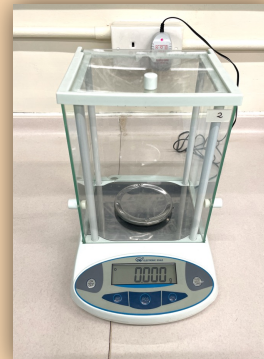
篩子  
Sand sieves



坩堝 + 小藥匙  
Crucible + Spatula




焗爐  
Furnace



電子秤  
Electronic balance

4



## 量度沉積物 Measuring of sediment

a.

## 量度沉積物大小 Measuring sediment size

使用篩子  
By using sand sieves

顆粒大小 (毫米) Grain sizes (mm)	尺度 Phi	溫氏分級 Wentworth classification
4,690~2.00	-12 ~ -1.0	礫石 / 卵石 Gravel / Pebble
2.00~0.0625	-1.0 ~ 4.0	砂粒 Sand
0.0625~0.0039	4.0 ~ 8.0	粉砂 Silt
0.0039~0.00006	8.0 ~ 14.0	黏土 Clay



4

## 量度沉積物 Measuring of sediment

使用篩子  
By using sand sieves

顆粒大小 (毫米) Grain sizes (mm)	重量 (克) Weight (g)	百分比 %
> 2.0		
2.0 ~ > 1.0		
1.0 ~ > 0.6		
0.6 ~ > 0.3		
0.3 ~ > 0.125		
0.125 ~ > 0.063		
< = 0.063		

a.

## 量度沉積物大小 Measuring sediment size



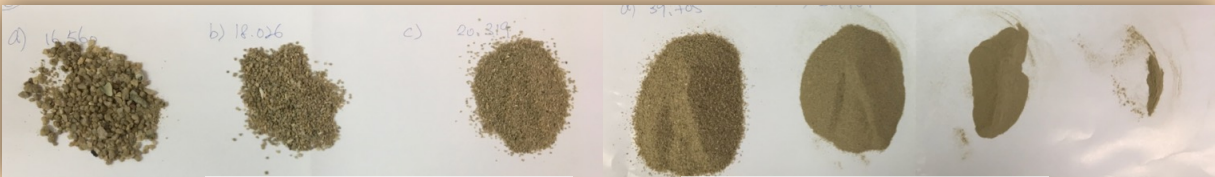
4

# 量度沉積物 Measuring of sediment

使用篩子  
By using sand sieves

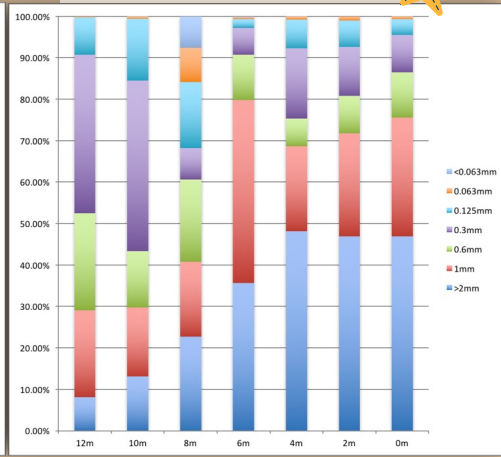
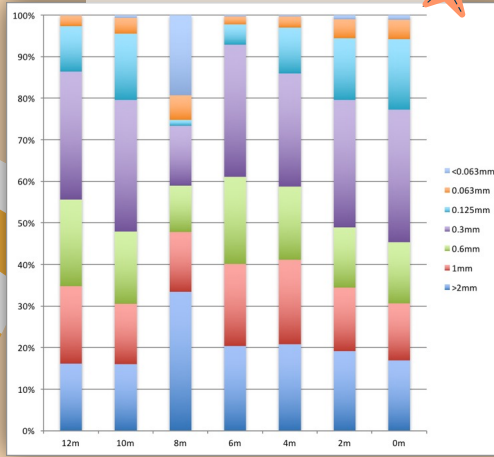
a.

# 量度沉積物大小 Measuring sediment size



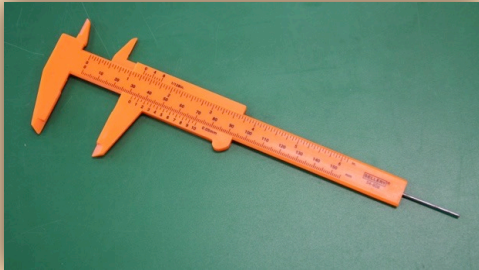
渡頭灣  
To Tau Wan

海星灣  
Starfish Bay



4

## 量度沉積物 Measuring of sediment



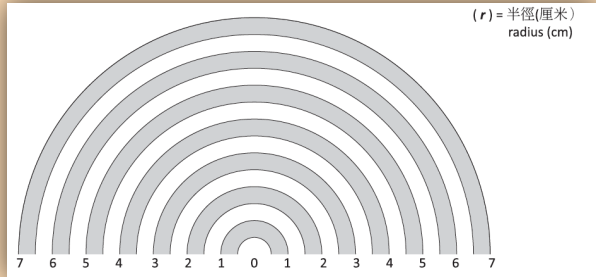
卡尺  
Vernier calliper



10倍放大鏡  
10X Magnifying Glass

b.

## 量度沉積物形狀 Measuring sediment shape



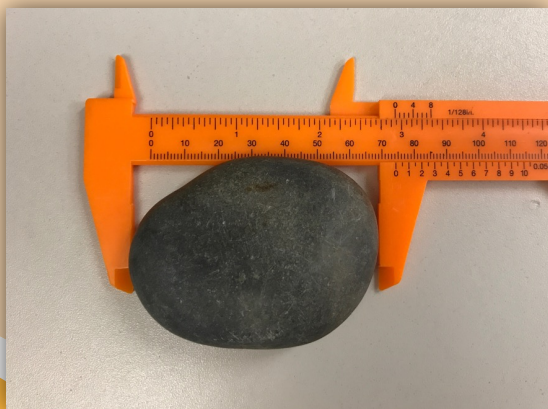
卡耶圓度級別表  
Cailleux roundness chart

鮑爾斯圓度分級表  
Power's scale of roundness

4

## 量度沉積物 Measuring of sediment

使用卡耶圓度指數 (卵石)  
By Cailleux Roundness Index (Pebble)



卡尺  
Vernier calliper

用來量度：  
卵石最長軸長度 (厘米) = L  
To measure:  
length of the longest axis (cm) = L

b.

## 量度沉積物形狀 Measuring sediment shape

$$R = \frac{2r}{L} \times 1,000$$



卡耶圓度級別表  
Cailleux roundness chart

用來量度：  
卵石最尖角半徑 (厘米) = r  
To measure:  
radius of the sharpest angle (cm) = r

4



## 量度沉積物 Measuring of sediment

b.

## 量度沉積物形狀 Measuring sediment shape

使用鮑爾斯圓度分級表 (砂)  
By Power's scale of roundness (Sand)

圓度級別 Roundness Classes	1 稜角極多 very angular	2 稜角狀 angular	3 半稜角狀 sub-angular	4 半圓狀 sub-rounded	5 圓狀 rounded	6 極圓狀 very rounded
純球狀 High sphericity						
類球狀 Low sphericity						
圓度指標 Roundness Indices	0.12 to 0.17	0.17 to 0.25	0.25 to 0.35	0.35 to 0.49	0.49 to 0.70	0.70 to 1.00

5.

## 量度水質

### Measuring of water quality

a.

鹽度  
Salinity

鹽度計  
Salinity meter

b.

大腸桿菌  
E. coli

大腸桿菌培養皿  
E. coli culture disc

c.

混濁度  
Turbidity

試管 + X標記卡  
Test tube + X mark card

d.

溶解氧  
Dissolved oxygen

溶解氧計  
Dissolved oxygen meter

e.

酸鹼值  
pH value

酸鹼值計及量杯 / 酸鹼值索引及試紙  
pH meter & measuring cup /  
pH index & paper

f.

溫度  
Temperature

溫度計  
Thermometer



5.

## 量度水質

### Measuring of water quality

a.

## 鹽度

### Salinity

使用鹽度計

By using salinity meter

鹽度是水中溶解鹽的含量。

海水的鹽度約為千分之三十五（千分比）。

Salinity is the amount of dissolved salt content of the water.

The salinity of seawater is about 35 parts per thousand (ppt).

#### 指標 Objective

廢物的排放不得致使自然環境鹽度水平的變化多於10%

Change due to waste discharge not to exceed 10% of natural ambient level



5.

## 量度水質 Measuring of water quality

b.

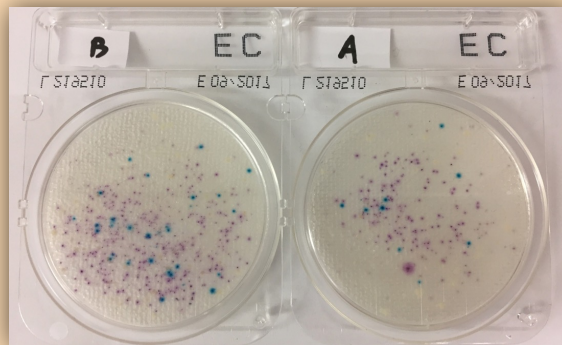
## 大腸桿菌 *E. coli*

使用大腸桿菌培養皿

By using *E. coli* culture disc

大腸桿菌是人類糞便內的一種細菌，通常用作反映水中糞便污染的程度，大腸桿菌含量越高表示受糞便污染的程度越大。

*E. coli* is a kind of bacteria found in human faeces, often used as an indicator of sewage pollution. A higher *E. coli* count indicates greater faecal contamination and higher health risk.



### 指標 Objective

全年幾何平均數不超過610個/100毫升

Annual geometric mean not to exceed 610 cfu/100mL





5.

## 量度水質 Measuring of water quality

使用大腸桿菌培養皿  
By using *E. coli* culture disc

為了保障泳灘的水質，當局按照水污染管制條例而訂立了一個水質指標。這個指標是以三月至十月收集到的所有海水樣本中的大腸桿菌幾何平均含量計算，每100毫升海水的大腸桿菌不應超過180個。水樣本應每月抽取最少三次，而每次抽樣相隔三至十四天。

### b. 大腸桿菌 *E. coli*



Water Quality Objective (WQO) for bathing beaches has been set under the Water Pollution Control Ordinance (WPCO). The WQO states that the level of *E. coli* should not exceed 180 per 100mL, calculated as the geometric mean for all samples collected from March to October inclusive. Samples have to be taken at least 3 times a month at intervals of between 3 and 14 days.



5.

量度水質

Measuring of water quality

b.

大腸桿菌

E. coli

使用大腸桿菌培養皿

By using E. coli culture disc



5.

## 量度水質

### Measuring of water quality

C.

## 混濁度

### Turbidity

使用試管 + X標記卡

By using test tube + X mark card

將海水注入試管中，及從上方觀察試管底部白紙上X標記的清晰度。

Fill a test tube with sea water and view from above to see how clearly visible the cross drawn on the white paper below is.



5.

## 量度水質

### Measuring of water quality

C.

## 混濁度

### Turbidity

使用濁管

By using turbidity tube

將水注入刻度管中，再配合刻度管最下方的對比色圖案來判斷其濁度。

The turbidity tube condenses water in a graded tube which allows determination of turbidity based on a contrast disk in its bottom



5.

## 量度水質

### Measuring of water quality

d.

## 溶解氧

### Dissolved oxygen

使用溶解氧計

By using dissolved oxygen meter

溶解氧是指溶解在水中的氧氣的含量。

Dissolved Oxygen is the amount of gaseous oxygen dissolved in the water.



參數 Parameter

溶解氧  
(深度 - 平均值)  
Dissolved Oxygen  
(depth-average)

指標 Objective

90%樣本不低於4毫克/公升  
Not less than 4mg/L in 90% of the samples

5.

## 量度水質 Measuring of water quality

e.

## 酸鹼值 pH value

使用酸鹼值計及量杯 / 酸鹼值索引及試紙

By using pH meter and measuring cup / pH index and paper

酸鹼值計+量杯

pH meter+measuring cup



酸鹼值索引 + 試紙 + 鑷子  
pH index + paper + forceps



### 指標 Objective

水的酸鹼值應在6.5-8.5單位的幅度內。

廢物的排放不得致使自然的酸鹼值幅度擴逾0.2單位。

To be in the range 6.5 - 8.5, change due to waste discharge not to exceed 0.2.

EPD, HKSAR

<http://wqrc.epd.gov.hk/en/water-quality/marine-1.aspx>

5.

## 量度水質

### Measuring of water quality

使用電子溫度計

By using digital thermometer

#### 指標 Objective

廢物的排放不得致使自然環境的每日溫度幅度的變化多於攝氏2.0度。

Change due to waste discharge not to exceed 2° C.

EPD, HKSAR

<http://wqrc.epd.gov.hk/en/water-quality/marine-1.aspx>

f.

## 溫度

### Temperature



6.

## 量度天氣因子

## Measuring of weather elements

a.

光度  
Light intensity

光度計  
Light meter



b.

風速、風向  
Wind speed, wind direction

風速計、  
指南針 + 尼龍繩  
Anemometer,  
compass + Nylon thread



c.

溫度  
Temperature

溫度計  
Thermometer

電子溫濕計  
Digital thermohygrometer



d.

相對濕度  
Relative humidity

濕度計  
Hygrometer

黑球溫度計  
Wet bulb globe  
temperature meter







於海岸環境組織實地考察時的注意事項  
Reminders on organizing fieldwork on coastal environment





## C. 於海岸環境組織實地考察時的注意事項 Reminders on organizing fieldwork on coastal environment

### 安全 Safety



危險、預防  
Danger, Prevention

### 選點 Site selection

目標、可達度  
Objectives, Accessibility

### 時間 Time



潮汐、每日/每季變化  
Tide, Daily/seasonal change

### 量度 Measurement

抽樣、方法、誤差  
Sampling, Method, Errors

### 儀器 Equipment



效度、信度、校準  
Validity, Reliability, Calibration

### 其他 etc.

限制  
Limitation

# Thanks!

## Q&A



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YouTube: [可觀Channel](https://www.youtube.com/channel/UC...)

