Term 1 presentations

Week	1	Minerals in hand specimen and under the microscope
	3	Mineral identification (practical)
	5	Rocks in hand specimen and under the microscope
	7	Igneous rocks
	9	Tsunamis

Term 2 presentations

Week	1	Contributions to geology 1
	3	Contributions to geology 2
	5	Contributions to geology 3
	7	Contributions to geology 4
	9	Contributions to geology 5

U3A
Mineral Identification

Habit

Geode

Stalactitic

Botryoidal

Fibrous

Mammillary

Radiating

Introduction

- Most minerals can be identified in hand specimen by determining a number of their physical properties and referring the properties to systematic identification tables → home in on identification
- you will be divided into 6 groups to perform the task
- each group will be provided with different a mineral set and other implements to aid with hardness estimation (copper coin, razor blade, quartz fragment) and streak (streak plate)
- there will also be a set of systematic identification tables
- all members of the group should participate in the exercise

Physical properties of minerals

(a) Crystal form

(b) Lustre

(c) Hardness

(d) Colour

(e) Streak

(f) Cleavage

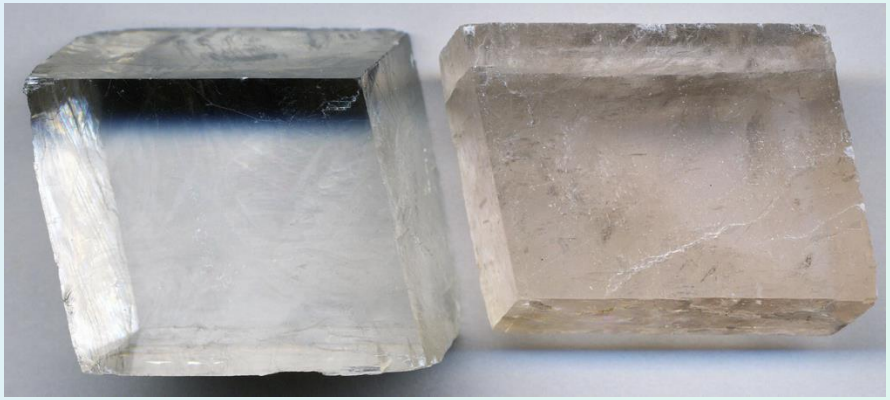
(g) Habit

(h) Specific gravity

(i) Others eg. magnetic attraction, reaction with acid, striations, lamellae, etc.

Crystal Form

Some minerals can be identified on the basis of their crystal shape (or crystal form)



calcite - rhombohedral

pyrite - cubic

Lustre

Lustre describes the way that light is reflected by the surface of a mineral.

Metallic lustre - metallic lustre corresponds to the highly reflective yet opaque appearance of a metal.

Non-metallic lustre - minerals with non-metallic lustres are less intensely coloured and will permit light to pass through thin edges

Lustre of non-metallic minerals can be further subdivided:

Dull	-	does not reflect light
Vitreous	-	glass-like
Resinous	-	lustre of resin
Pearly	-	pearl-like
Greasy	-	as if covered in oil
Silky	-	silk-like
Admantine	-	like that of diamond (high RI)

Hardness

Hardness is a measure of the resistance of a mineral to being scratched. The hardness is measured with respect to the Moh's hardness scale.

Moh's Hardness Scale

1	Talc	
2	Gypsum	fingernail
3	Calcite	1c and 2c coins
4	Fluorite	20c coin
5	Apatite	pocket knife or razorblade
6	Orthoclase	
7	Quartz	common mineral
8	Topaz	
9	Corundum	
10	Diamond	

Colour

- Colour is most obvious of physical properties → usually a poor guide to mineral identification (except for metallic minerals)
- trace amounts of impurities or, subtle variations in composition may have a profound effect on colour
- e.g. beryl normally pale cream to yellow in colour, trace amounts of Cr → brilliant green (emerald); trace amounts of Fe → blue (aquamarine); trace amounts of Mn → red
- many rock-forming minerals e.g. quartz, fluorite, calcite can occur in a range of colours
- minerals with metallic lustre have consistent, diagnostic colour

Colour

Eg. beryl $Be_3Al_2Si_6O_{18}$

variety: emerald

variety: red beryl

Streak

Streak refers to the colour of powdered mineral on a ceramic plate

Describe colour shade carefully e.g.

sphalerite	-	brown
goethite	-	yellow-brown
hematite	-	red brown

Streak

Cleavage

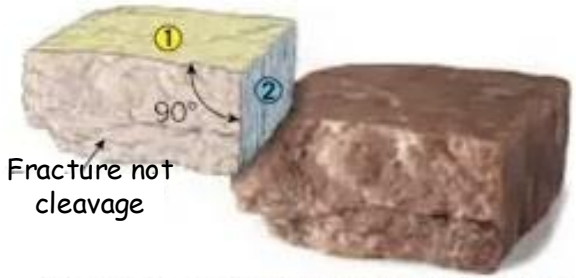
- Cleavage refers to the propensity of many minerals to break along distinct planar directions → planes of weakness in crystal lattice

- cleavage is quantified by the number of directions along which the mineral breaks and the angles between them

- quality of cleavage can be described using terms such as perfect, good, fair etc.

Cleavage

A. Cleavage in one direction
Example: muscovite



B. Cleavage in two directions at 90°
Example: feldspar

C. Cleavage in two directions ≠ 90°
Example: hornblende

D. Cleavage in three directions at 90°
Example: halite

E. Cleavage in three directions ≠ 90°
Example: calcite

F. Cleavage in four directions
Example: fluorite

Habit

Habit is the term used to describe the appearance of single crystals or aggregates of crystals

prismatic	-	perfect prisms
bladed	-	elongate flattened crystals
tabular	-	flat, slab-like crystals
fibrous	-	aggregates of slender fibres
acicular	-	slender needle-like
pisolitic	-	rounded, pea-sized masses
platy (micaceous)		thin sheets
botryoidal	-	like a bunch of grapes
columnar	-	stout column-like crystals
drusy	-	a surface covered with small crystals
reniform	-	kidney shaped
dendritic	-	plant-like, diverging branches
earthy	-	soil-like
massive	-	structureless

Habit

massive

prismatic

fibrous

tabular

bladed

acicular

platy

radiating

Specific gravity

Specific gravity is the relative density of a mineral i.e. the ratio of the weight of the mineral to the same volume of water.

Estimation of specific gravity requires experience gained through the handling of minerals.

As a guide:	AM4	galena	high
	AM5	sphalerite	medium
	AM67	quartz	low

Use terms such as Low, Medium or High not numerical values

Strategy for systematic mineral identification

Step 1. List all of the physical properties that you can of the unknown mineral (Use suggested format on sheet)

Step 2. The first division is based on whether the mineral has a metallic or non-metallic lustre.

Step 3. The second division is based on whether the mineral has a coloured or colourless streak.

Step 4. The third division is made using the hardness value.

Step 5. The fourth division is based on the cleavage properties.

Step 6. Consider other properties e.g. magnetic attraction, effervescence when dripped with dilute HCl

Metallic or Sub-metallic

Streak	Colour	S.G.	Qualitat. S.G.	H	Remarks	Name, Composition Crystal system
Black	Iron-black	4.7	H	1-2	Usually splintery or in radiating fibrous aggregates	**PYROLUSITE** MnO_2 Tetragonal
	Steel-grey to Iron-black	2.1	L	2.5	1 perfect cleavage. May be in hexagonal shaped plates. Greasy feel	**GRAPHITE** C Hexagonal
Black to greenish -black	Blue-black	4.7	H	1-1.5	One perfect cleavage. Hexagonal shaped leaves. Greenish-grey streak	**MOLYBDENITE** MoS_2 Hexagonal
Grey-black	Blue -black to lead greasy	7.6	VH	2.5	Three cleavages at right angles In cubic crystals and angular masses	**GALENA** PbS Isometric
Grey-black	Blue-black	4.5	H	2	One good cleavage. Bladed crystals showing striations	**STIBNITE** Sb_2S_3 Orthorhombic
Bright red	Red to vermillion	8.1	VH	1+	Good cleavages. Admantine Lustre. Usually granular massive or earthy	**CINNABAR** HgS Rhombohedral

Non-metallic
Coloured streak

Streak	Colour	S.G.	Qualitat. S.G.	H	Remarks	Name, Composition Crystal system
Dark brown	Black	7.0 to 7.5	VH	5-5.5	One perfect cleavage. With greater amounts of Mn, streak and colour are darker	**WOLFRAMITE** $(Fe,Mn)WO_4$ Monoclinic
	Light to dark brown	3.83	M	3.5-4	In cleavable masses or small rhombohedral crystals	**SIDERITE** $FECO_3$ Rhombohedral
Light brown	Light to dark brown	3.9-4.1	M-H	3.5-4	6 perfect cleavages. Usually cleavable granular. Resinous to admantine lustre.	**SPHALERITE** ZnS Isometric
	Brown to black	6.8	VH	6-7	Occurs in twinned crystals. Irregular masses; in rolled grains. Admantine to dull	**CASSITERITE** SnO_2 Tetragonal
Light green	Bright green	3.9-4.03	M	3.5-4	Radiating, fibrous, mamillary. May alter to azurite. Effervesces in cold HCL	**MALACHITE** $Cu_2CO_3(OH)_2$ Monoclinic
Light blue	Intense azure-blue	3.77	M	3.5-4	In small crystals, often in groups. Radiating, fibrous. Effervesces in cold HCl	**AZURITE** $Cu_3(CO_3)_2(OH)_2$ Orthorhombic

Non-metallic
Colourless streak
Hardness >2.5 <3
Cannot be scratched by a fingernail can be scratched by a copper coin

1. Cleavage prominent

Cleavage	Colour	S.G.	Qualitat. S.G.	H	Remarks	Name, Composition Crystal system
Perfect in one direction	Lilac, greyish white	2.8 to 3.0	L to M	2.5-4	Crystals 6-sided prismatic. Usually small irregular sheets and scales. Pegmatite mineral	LEPIDOLITE $K(Li,Al)_3AlSi_3O_{10}(O,OH,F)_4$ Monoclinic
Three directions at right angles (cubic)	Colourless, white, red,blue	2.1 to 2.3	L	2.5	Common salt. Soluble in water, taste salty. In granular masses or in cubic crystals.	HALITE NaCl Isometric
Cleavages in 3 directions at 90°	White, blue and grey	2.9	L	3-3.5	Massive aggregates. Cleavages difficult to see.	ANHYDRITE $CaSO_4$ Orthorhombic
Three directions not at 90° (Rhombohedral)	Colourless, white and various tints	2.71	L	3	Effervesces in cold dilute HCl. Clear varieties show strong double refraction.	CALCITE $CaCO_3$ Rhombohedral
	Colourless, white, pink	2.85	L	3.5-4	See later entry	DOLOMITE $CaMg(CO_3)_2$
Three directions 2 at 90°	Colourless, white, blue, yellow, red	4.5	H	3-3.5	Frequently in aggregates of platy crystals. Pearly lustre on basal cleavage.	BARITE $BaSO_4$ Orthorhombic

Non-metallic
Colourless streak
Hardness >3 <5.5
Cannot be scratched by a fingernail can be scratched by a copper coin

2. Cleavage not prominent

Colour	S.G.	Qualitat. S.G.	H	Remarks	Name, Composition Crystal system
Colourless, white	3.0-3.2	M	3.5- 5	Commonly in dense compact masses showing no cleavage. Cold HCl has little or no effect	**MAGNESITE** $MgCO_3$ Rhombohedral
White, yellow, green, brown	5.9-6.1	H to VH	4.5-5	Common salt. Soluble in water, taste salty. In granular masses or in cubic crystals.	**SCHEELITE** $CaWO_4$ Tetragonal
White, yellow, brown, grey	2.6-2.9	L	5	Usually in hexagonal prisms with pyriamid. Poor basal cleavage. Massive varieties also.	**APATITE** $Ca_5(F,Cl,OH)(PO_4)_3$ Hexagonal
Olive to blackish, green, yellow-green, white	2.2	L	2-5	Massive. Fibrous in the asbestos variety, chrysotile. Frequently mottled green	**SERPENTINE** $Mg_6Si_4O_{10}(OH)_8$ Monoclinic
Light to dark brown	3.83-3.88	L	3.5-4	Usually cleavable, but may be in compact concretions in clay or iron-stone	**SIDERITE** $CaMg(CO_3)_2$ Rhombohedral

Listing physical properties

Lustre:	vitreous
Streak:	colourless
Hardness:	5.5-7
Cleavage:	2@60/120
Colour:	dark green
Habit:	tabular
S.G.	M
Others:	
Name:	

Listing physical properties

Lustre:	vitreous
Streak:	colourless
Hardness:	5.5-7
Cleavage:	2@60/120
Colour:	dark green
Habit:	tabular
S.G.	M
Others:	
Name:	amphibole