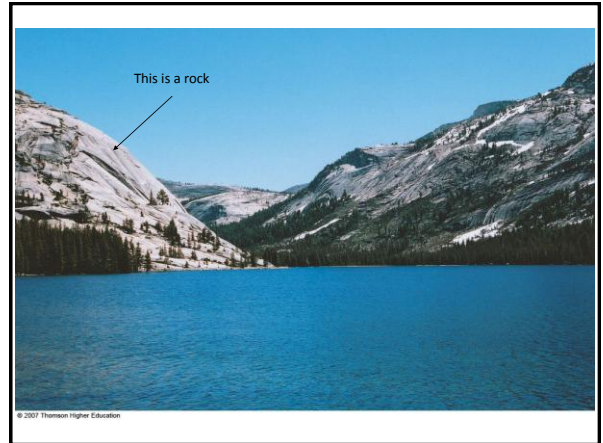


## Minerals, atoms, elements

GS 106



## What's a mineral?



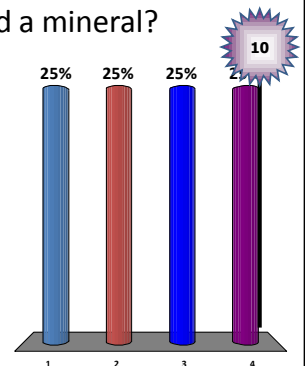
(b)

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- Natural
- Solid
- Inorganic
- Definite chemical composition
- Ordered arrangement of atoms

## Which of the following is **not** considered a mineral?

1. Salt
2. Ice
3. Diamond
- ✓ 4. Petrorleum



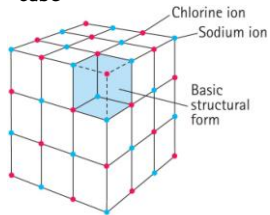
## Atoms, elements, chemical compounds

Periodic Table of the Elements

1	2																	18
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	
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1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	
1423	1424	1425	1426	1427	1428	1429	1											

## Mineral properties: crystal form

In halite, atoms are arranged in a cube



(a) Crystalline structure form of halite  
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This is why halite appears as cubes



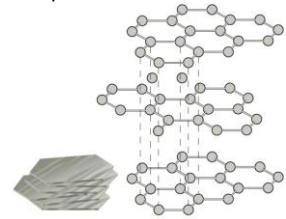
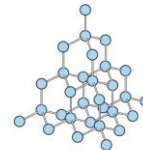
(b) Grains of the mineral halite (table salt)  
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## Mineral properties: crystal form

Diamond and graphite are examples of **polymorphs**



(a) Diamond  
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(b) Graphite  
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## Mineral properties: hardness

**TABLE 20.1** MOHS SCALE OF HARDNESS

Mineral	Hardness	Object of Similar Hardness
Talc	1	
Gypsum	2	Fingernail (2.5)
Calcite	3	Copper wire or coin (3.5)
Fluorite	4	
Apatite	5	Steel knife blade, glass (5.5)
Feldspar	6	Unglazed porcelain tile (6.5)
Quartz	7	
Topaz	8	
Corundum	9	
Diamond	10	

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## Mineral properties: cleavage

*Tendency to break along planes of weakness*



## Mineral properties: fracture

No planes of weakness

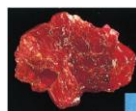
*Conchoidal fracture in quartz*



## Mineral properties: color

**Corundum ( $\text{Al}_2\text{O}_3$ )**

Chemical \_\_\_\_\_ cause different color.



Ruby



Sapphire

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## Mineral properties: density

*How much mass is packed into a volume*

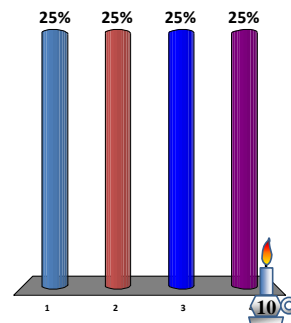
**TABLE 20.2** DENSITY OF VARIOUS MINERALS ( $\text{g/cm}^3$ )

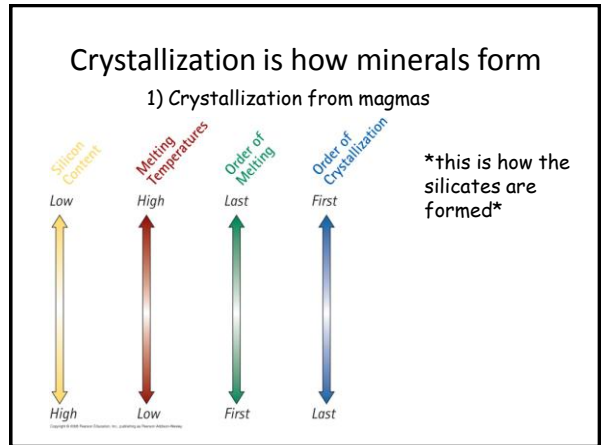
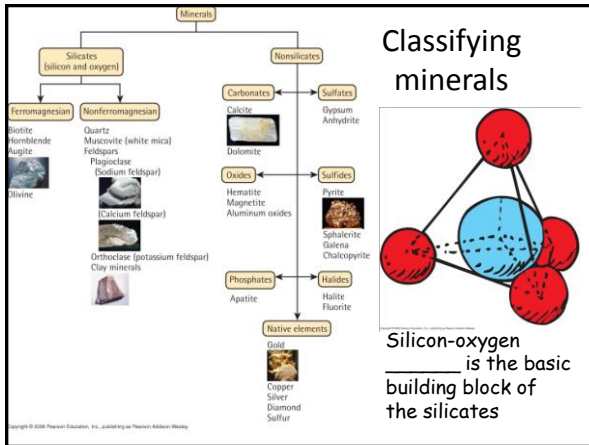
Borax	1.7	Pyrite	5.0
Quartz	2.65	Hematite	5.26
Talc	2.8	Copper	8.9
Mica	3.0	Silver	10.5
Chromite	4.6	Gold	19.3

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Mineral properties are used to identify minerals from one another. Which of the following is the **least** useful property in mineral identification?

1. Cleavage
2. Color
3. Hardness
4. Crystal form





**Crystallization is how minerals form**

2) Crystallization from water

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**Crystallization activity**

**Procedure:**

- 1. Pour 40 ml of distilled water into a glass beaker.
- 2. Measure exactly 14 grams of sodium chloride with scale. Add the sodium chloride to the distilled water in the beaker and stir.
- 3. Place the beaker on the hot plate for short time until the solution is warm. Stir the solution until as much sodium chloride dissolves as possible. The salt solution will then be **super-saturated**.
- 4. Pour it into a petri dish and set aside undisturbed until crystals develop. We will examine these crystals in a later activity.