

EXERCISES:

31. State the chemical family or group to which each of the following elements belongs.
 (a) radon **NG** (c) iron **TM** (e) iodine **H** (g) lithium **AM**
 (b) calcium **AEM** (d) cesium **AM** (f) zinc **TM** (h) chlorine **H**
32. Give the symbols for two other elements in the same family as the following.
 (a) Na (b) Ar (c) Mg (d) Br → **F/Cl/I**
33. Give the symbols for two other elements in the same period as the following.
 (a) **C** (b) **S**

Li Ba B NO F Na Mg Al Si

(b) METALS, NONMETALS AND SEMICONDUCTORS

In addition to the above groups, rows and blocks, there is another way of classifying elements: according to the metallic character of the element.

The properties of metals

- Metals • reflect light when polished (are shiny and have a "metallic lustre").
- are opaque.
 - are good conductors of electricity and heat.
 - are generally, but not always, flexible when in thin sheets.
 - are generally **malleable** (can be hammered or rolled into thin sheets) and **ductile** (can be drawn or stretched into wires).
 - are usually solid at room temperatures (mercury is an exception).

The properties of nonmetals

- Non-metals • are gases, liquids or brittle solids at room temperature.
- are poor heat and electrical conductors.
 - if solids, are dull to lustrous in appearance and opaque to translucent.

EXERCISE:

34. Classify each of the following samples as one of:
- a METAL (has the properties of a metal),
 - a NONMETAL (has the properties of a nonmetal), or
 - a MIXTURE of metallic and nonmetallic properties. →

SAMPLE	PROPERTIES	CLASSIFICATION
A	Pale yellow gas, nonconductor	Non-Metal
B	Conductor, shiny, hard, silvery, malleable	METAL
C	Nonconductor, yellow, looks waxy, soft, brittle	NON-METAL
D	Hard, silvery-grey, brittle, somewhat shiny, fair conductor	MIX
E	Liquid, shiny, silvery, conductor	METAL
F	Dark red, liquid, nonconductor	NON-METAL
G	Fair conductor, brittle, dull grey	MIX

- ii) Elements become more metallic (or better metals) going down a family in the periodic table.

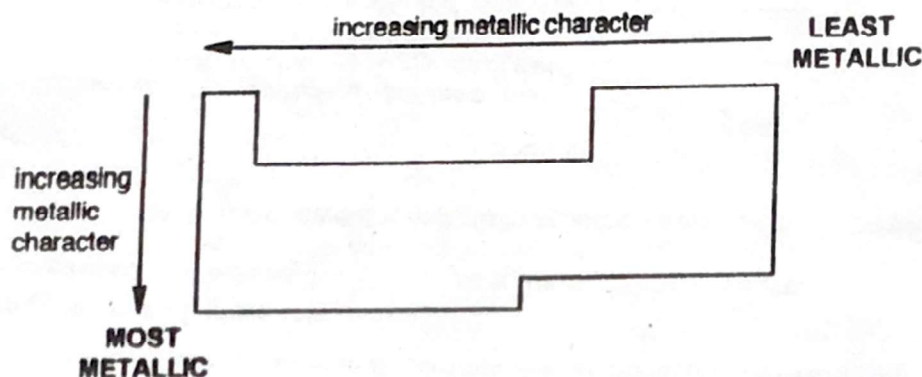
EXAMPLE: Examining the elements of group 14,

C, Si, Ge, Sn and Pb,

the following properties are found.

C	Carbon exists in two common forms: diamond is a transparent, colourless nonmetal with very low electrical conductivity; graphite is a steel-gray nonmetal with moderate electrical conductivity and a slightly metallic lustre.
Si	Ultrapure silicon is a blue-gray semiconductor having a metallic lustre; silicon's chemical properties are those of a nonmetal but its physical and electrical properties are those of a semiconductor.
Ge	Germanium is a brittle gray-white semiconductor whose properties are more metallic than nonmetallic.
Sn	Tin is a malleable silver-white metal. One form of tin is a semiconductor but "common" tin is metallic.
Pb	Lead is a highly malleable blue-white metal.

The diagram below summarizes the above two trends in the periodic table.



EXERCISES:

35. On which side of the periodic table do you find the nonmetals? **RIGHT**
36. Which member of each of the following pairs is more metallic?
 (a) B or **Ga** (b) **Ge** or S (c) Br or **Sn** (d) **Mg** or P (e) As or **Bi**
37. Arrange the following in order from most metallic to least metallic: P, Ca, F, Si, Ge.
38. Which member of each of the following pairs would you expect to be a better electrical conductor?
 (a) **Sb** or P (b) **K** or I (c) **Ge** or As (d) B or **Al** (e) **Tl** or S (f) **Sb** or Te
39. Match the following elements with the best description. Use the process of elimination by making the most obvious matches first.
- | | |
|---------------|---------------------------------------------------------------------------|
| (a) P | (i) brittle; steel-gray; partially reflective; fair conductor (As) |
| (b) Ba | (ii) soft; silvery-white; reflective; good conductor (Ba) |
| (c) Sb | (iii) waxy yellow solid; translucent; poor conductor (P) |
| (d) Ar | (iv) brittle; bluish-white; reflective; fair conductor (Sb) |
| (e) As | (v) colourless gas; extremely poor conductor (Ar) |

Ca, Ge, Si, P, F