Given a sample of an unknown mineral,

**What steps and tests would you undertake to completely describe and identify the unknown?**

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**Identifying an Unknown**

- In most cases a hand sample of the unknown will be available and from this you can prepare samples for examination using a petrographic microscope by:
  1. grinding some sample to a powder for use in grain mounts, or
  2. cutting a thin section

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**Identifying an Unknown**

**Hand Sample**

- Determine physical properties:
  - Colour
  - Streak
  - Lustre
  - Hardness
  - Etc.

- Provide a tentative identification
Identifying an Unknown
Thin Section
• As a first step, scan the whole thin section and identify grains of the unknown that exhibit different optical orientations, looking for:
  - Colour
  - Crystal shape
  - Relief
  - Textures
  - Twinning
  - Alteration products

Identifying an Unknown
Thin Section (continued)
• These properties provide the best basis for distinguishing different minerals
• Remember to cross and uncross the polars and rotate the stage as needed
• Remember that different grains of the same mineral may exhibit different optical (relief) and physical (cleavage) properties depending on the orientation

Identifying an Unknown
In the Thin Section
Record:
• Colour and pleochroism
• Relief relative to cement or oil
• Habit, textures and alteration
• Isotropic or anisotropic
• Nature of twinning, if present
• Nature of cleavage or fracture
Identifying an Unknown

Mineral to be identified

Opaque

Translucent

Isotropic

Anisotropic

List Optical Properties

1) RI (Table B.2)
2) Colour (Table B.1)
3) Mineral Identification

Scan the slide for a grain with:

The lowest interference colour, and

The highest interference colour

Lowest Colour

Highest Colour

Anisotropic

Optic Axis Figure

Optic Normal Figure

Uniaxial

Biaxial

Uniaxial

Biaxial

Identifying an Unknown

• Once the above steps have been completed you will have a list of optical and physical properties - What next?
• By comparing the determined optical properties with the properties listed in Appendix B of Nesse, several possible matches may present themselves
• This list of potential matches can be further refined by looking at the individual mineral descriptions in Nesse
• Ultimately you want to narrow the possibilities down to one mineral which may involve going back to the sample and comparing the unknown to the mineral description
Things to watch for!

- Thin sections may contain a variety of ‘foreign’ material that may be mistaken for minerals – you will find these!
- Common materials are:
  - Bubbles
  - Grinding powder
  - Textile fibres, hair

Bubbles

Grinding Powder
Reality

- Identification of minerals is subject to ambiguity and uncertainty
  - Different minerals have similar properties
  - Some minerals have a wide range of properties
  - Properties may be incorrectly measured
  - Samples may be too small or in unusable orientations
- These problems, while real, become manageable with experience – the more you do the easier identification becomes