Identify the stage from evidence

Use chromosome arrangement and nuclear appearance. A stage name is a conclusion; the visible features are the evidence supporting it.

INTERPHASE - BEFORE MITOSIS

One nucleus with diffuse chromatin; individual condensed chromosomes are not distinct. A nucleolus may be visible.

Do not classify every dark nucleus as prophase.

1. PROPHASE

Condensed chromosomes become visible as dark threads or clumps. They are not yet arranged at the equator.

Look for discrete chromosomes, not simply dark staining.

2. METAPHASE

Condensed chromosomes are grouped at the equator. Sister chromatids have not yet separated towards opposite poles.

A side view often shows a band; an end-on view can look like a rosette.

3. ANAPHASE

Two sets of daughter chromosomes are separating towards opposite poles. A gap opens between the groups.

Separated sister chromatids are now daughter chromosomes.

4. TELOPHASE

Two chromosome groups have reached opposite ends. New nuclei form and chromosomes begin to decondense.

Two reforming nuclei support telophase rather than anaphase.

Use a combination of clues. Cell shape and chromosome orientation vary; neither the page direction nor the presence of a rectangular cell wall identifies a mitotic stage.

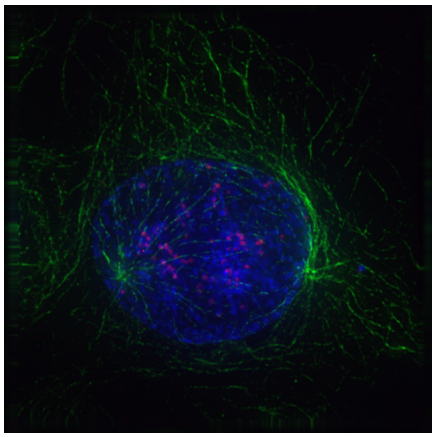
Stage features: Alberts et al., Mitosis; OpenStax Biology 2e, section 10.2.

Scope: Cambridge Biology 9700 syllabus, section 5.2, outcome 2, p. 23.

Recognise the pattern in real cells

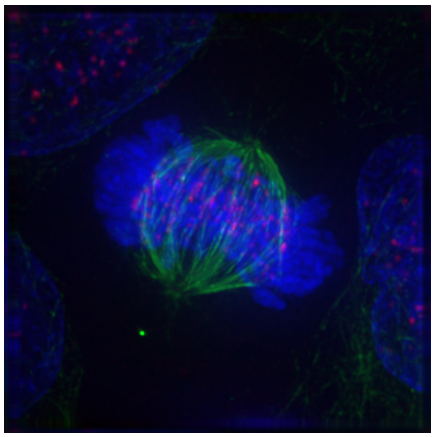
Fluorescence micrographs: blue marks DNA; green highlights microtubules. These are separate example cells, not a time-lapse of one cell.

PROPHASE



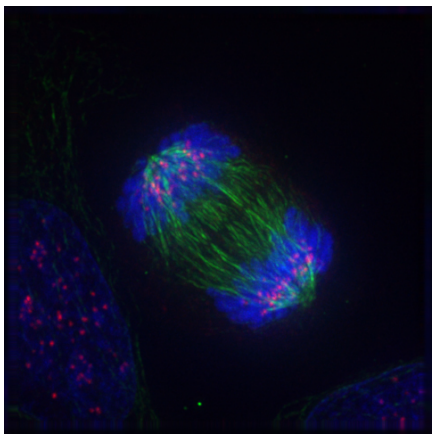
Condensed blue chromosomes occupy one region without a central aligned band.

METAPHASE



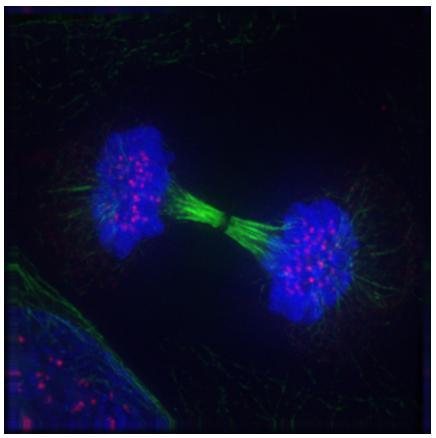
The blue chromosomes form a band between the two spindle poles.

ANAPHASE



Two distinct blue chromosome groups have separated, leaving a central gap.

TELOPHASE



Two rounded DNA regions lie at opposite ends as daughter nuclei form.

Colours are fluorescent labels, not natural cell colours. Ordinary stained root-tip slides may show chromosomes well but not spindle fibres. Images are not shown at a common scale; do not compare cell sizes.

Images: Roy van Heesbeen, Wikimedia Commons, public domain. Click each image for its source.
Fluorescence-image context: OpenStax Biology 2e, section 10.2.

Scope: Cambridge Biology 9700 syllabus, section 5.2, outcome 2, p. 23.

Observe, compare, justify

The same identification logic applies to diagrams, photomicrographs and prepared slides. A diagram may show structures that the real specimen does not resolve.

1. LOCATE A CLEAR CELL

On a prepared root-tip slide, begin at low power to find the dividing region near the tip. Centre a suitable area before increasing magnification. Use fine focus at high power and adjust illumination to resolve the stained material.

2. KEEP THE CELL BOUNDARY IN VIEW

Check that both chromosome groups belong to the same cell. Two neighbouring interphase nuclei do not by themselves indicate telophase. On an image, first locate the cell outline, then compare the chromosome pattern with page 1.

3. SEPARATE OBSERVATION FROM INTERPRETATION

Observation: "Two compact chromosome groups, with a gap between them, lie within one cell." Interpretation: "This supports anaphase." A still image does not directly show movement; movement is inferred from the arrangement.

4. RECORD WHAT THE IMAGE REALLY SUPPORTS

Describe chromosome position, condensation and any visible nuclei. Do not claim to see spindle fibres or a nuclear envelope if the stain or resolution does not show them. If anaphase and telophase are hard to distinguish, state the uncertainty and the clue needed.

Useful final check: aligned at the equator = metaphase; separated groups = anaphase; reforming daughter nuclei = telophase. Stage boundaries are gradual, so some real cells look transitional.

Root-tip identification activity: University of Arizona, The Biology Project.
Chromosome movement and nuclear reformation: Alberts et al., Mitosis.

Scope: Cambridge Biology 9700 syllabus, section 5.2, outcome 2, p. 23.