Study Plan for a Nebula using R, V, B Filters and Clear Images

Phase 0 — Prep and calibration

- Calibrate with master bias, darks, flats for R, V, B (and clear if used).
- Calibrate science frames: (raw – bias – dark) / flat.
- Remove cosmic rays by stacking or sigma-clipping.
- Register & align filters to common WCS grid.
- Perform photometric scaling using standards or field stars.

Phase 1 — Clean images for analysis

- Match PSF across bands (convolve sharper images).
- Subtract large-scale sky background.
- Optional: mask/suppress stars to focus on nebular emission.

Phase 2 — Core science products

- Build RGB composites (B=blue, V=green, R=red).
- Generate flux-ratio maps: V/R ~ [O III]/Hα, B/V, B/R.
- Optional: continuum subtraction using scaled B.
- Extract surface-brightness radial profiles.
- Analyze morphology: rims, knots, filaments, asymmetries.
- Measure angular size $\rightarrow$ physical scale (if distance known).

Phase 3 — Photometry and extinction clues

- Integrated photometry per filter with background subtraction.
- Compute color indices (B–V, V–R).
- Estimate extinction E(B–V) from nebular colors or field stars.

Phase 4 — Kinematics & physics (limits of RVB)

- What RVB can infer: ionization stratification, density clumping, photoionization fronts.
- What requires spectroscopy: expansion velocity, Te, ne, abundances.

Phase 5 — Uncertainty & quality control

- Generate error maps (noise, background, registration blur).
- Check systematic effects: zero-points, flats, PSF mismatch.

Phase 6 — Deliverables

- Figures: RGB composite, flux ratio maps, radial profiles.
- Table: fluxes, colors, angular size, extinction, physical size.
- Interpretation paragraphs linking maps to physical processes.

Practical tips

- Keep photometric masks consistent across filters.
- Clip low S/N in ratio maps to avoid artifacts.
- Ensure common WCS/pixel scale for all outputs.
- Use clear stack mainly for faint outer halo detection.