

Astrophotography — Workbook

This workbook turns the Astrophotography course into a repeatable night-shoot system. You will build a planning checklist around the moon and weather, lock your field exposure settings for the Milky Way and star trails, plan your move into tracking and telescopes, and run a deep-sky capture-and-stacking pipeline. Work one section per module, then use the templates to plan every outing and log every imaging session the same disciplined way.

Planning the Shoot: Sky, Site, and Gear

Decide when and where to shoot, and confirm your gear covers the basics before you ever drive to a dark site.

Worksheet: Night-Out Planning Worksheet

Pick a real date in the next month and fill this in using a planning app such as PhotoPills, Stellarium, or Clear Outside. Do not leave the house until every field has an answer.

Shoot date

Moon phase (% illuminated)

Moon rise / set times

End of astronomical twilight (dark start)

Site name and Bortle class

Direction of nearest city glow

Primary target and its highest altitude that night

Cloud / transparency forecast

Exercise: Pick Your First Three Targets

Using the season and your latitude, choose three targets you could realistically shoot this month and justify each one. Mix at least one wide-field and one deep-sky object.

- Is the Milky Way core above the horizon during dark hours this month from your location?

- Which target needs only a camera and tripod, and which would reward a tracker?

- For each target, at what time is it at least thirty degrees above the horizon?

-
- What moon phase does each target need, and does your chosen date provide it?
-

Checklist: Beginner Gear Readiness Checklist

- Camera can shoot full manual mode and save RAW files
- Have a wide, fast lens (about 14 to 24mm full frame, f/2.8 or faster)
- Tripod is sturdy and does not need its center column raised
- Remote release or two-second self-timer is set up to avoid shake
- Spare batteries are fully charged for a cold night
- Red headlamp is packed to protect night vision
- Planning app is installed and set to your shoot coordinates

Wide-Field Capture: Milky Way and Star Trails

Lock the field technique that produces sharp focus, clean exposure, and strong wide-field compositions.

Exercise: Calculate Your Safe Shutter Speed

For two of your lenses, work out the maximum exposure that keeps stars as points. Use the 500 rule by hand, then compare it to the NPF rule from PhotoPills.

- What is 500 divided by your full-frame-equivalent focal length for each lens?

• What shutter time does the NPF rule give for the same lens and aperture?

• Why does the NPF rule usually give a shorter time than the 500 rule?

• How will you confirm in the field that your stars are actually round, not streaked?

Worksheet: Milky Way Frame Plan

Plan one Milky Way nightscape before you arrive on location. Fill in the capture settings and the foreground plan so you can set up in twilight and wait for dark.
Foreground subject and why it adds to the shot

Time the core will be positioned where you want it

Lens and aperture

Shutter speed (from NPF or 500 rule)

Starting ISO

Focus method (live-view magnify on which star?)

Foreground lighting plan (silhouette / low warm light / separate blend)

Checklist: Star-Trail Sequence Checklist

- Composed with Polaris in frame for circles, or off to one side for arcs
- Manual focus set on the stars and locked down
- Aperture wide open, ISO moderate (about 800 to 1600), shutter near 30 seconds
- Long-exposure noise reduction turned OFF so frames fire back to back

- Intervalometer set to shoot continuously for 30 to 60 minutes or more
- Plan to blend the series in StarStaX using its gap-filling mode

Going Deeper: Tracking Mounts and Telescopes

Plan your move from tripod to tracking, and learn to read what a telescope and mount actually offer.

Exercise: Polar Alignment Dry Run

Whether or not you own a tracker yet, write the polar-alignment steps in order so they are automatic. If you do have one, practice the sequence indoors first, then under the sky.

- What are the steps, in order, from leveling the tripod to Polaris on its reticle mark?

- Why does a longer lens demand more accurate polar alignment than a wide lens?

- What focal length will you start tracked imaging with, and why start short?

- How will you know your alignment is good enough (how long can a frame stay untrailed)?

Worksheet: Telescope and Mount Spec Comparison

Choose two telescope-plus-mount setups you are considering and fill in their numbers. Compute the focal ratio yourself and judge which is the more forgiving beginner imaging rig.

Telescope type (refractor / reflector / compound)

Aperture (mm)

Focal length (mm)

Focal ratio (focal length divided by aperture)

Mount type (equatorial tracking / alt-az)

Mount payload rating (kg)

Combined weight of scope plus camera (kg)

Verdict: is the mount strong enough, and is this beginner-friendly?

Checklist: Shooting-Through-the-Telescope Checklist

- Have the correct T-ring for your camera and a T-adapter for the focuser
- Polar aligned the mount carefully before searching for any object
- Slew to the target by go-to coordinates or by star-hopping from a known star
- Took a short high-ISO test frame to confirm the object is on the sensor
- Achieved exact focus with a Bahtinov mask on a bright star
- Set a reminder to recheck focus every 30 to 60 minutes as the tube cools

Processing: Stacking and Finishing the Image

Run a complete deep-sky pipeline from calibration frames through stacking to a restrained, natural finish.

Worksheet: Capture Plan for a Stackable Set

Plan a full deep-sky session so every frame you need is accounted for. Decide your sub length and counts before you start so you do not discover a missing calibration set during editing.

Target name (e.g., M42, M31)

Light-frame exposure length (seconds)

Number of light frames planned

Total integration time (you calculate: subs times length)

Number of dark frames (match light exposure and temperature)

Number of flat frames

Number of bias / dark-flat frames

Sensor temperature noted for matching darks

Exercise: Stack One Set in DeepSkyStacker

Run a real set of frames through DeepSkyStacker end to end, then write down what each setting did so you can repeat it. If you have no data yet, download a free sample light set to practice.

- What star-detection threshold gave roughly twenty to fifty detected stars per frame?
 - Which stacking mode did you use to reject satellite and aircraft trails, and why?
 - Did you save the result as a 32-bit TIFF without applying DSS preview adjustments?
 - Why does the fresh stack look nearly black, and what is the next step to fix that?
-

Checklist: Finishing and Restraint Checklist

- Cropped away the ragged stacking edges where frames did not overlap
- Stretched the data in several gentle Curves or Levels steps, not one harsh move
- Neutralized the background so the sky is dark with no orange or green cast
- Reduced background noise without smearing real detail into plastic
- Boosted saturation only enough to show honest nebula and star color
- Tamed the brightest stars so they do not bloat the frame
- Stepped away, then checked that the image is not overprocessed

Your Action Plan

1. Install one planning app (PhotoPills, Stellarium, or Clear Outside) and set it to your home coordinates
2. Find your Bortle class on lightpollutionmap.info and identify the nearest darker site you can reach
3. Pick a new-moon week this month and complete the Night-Out Planning Worksheet for it
4. Practice live-view manual focus on a distant light at home so you can nail focus in the dark
5. Shoot your first Milky Way frames using your calculated NPF or 500-rule shutter and a wide-open aperture
6. On a moonlit or hazy night, capture a 30 to 60 minute star-trail sequence and blend it in StarStaX
7. Decide your next upgrade from your results: a faster lens, then a star tracker, then a mount and telescope
8. If tracking, master polar alignment with a 50mm lens before attaching anything longer
9. Shoot a full deep-sky set with matching dark, flat, and bias frames, then stack it in DeepSkyStacker
10. Stretch and finish the stack with restraint, save it, and log the session in your imaging tracker

