

# 6. Celestial Observation Part 1 Naked Eye Objects Edexcel GCSE Astronomy Course

## Topic 6 Specification Points - Part 1 Naked Eye Objects

Topic 6 – Celestial observation

Students will gain an understanding of how to observe a variety of naked-eye astronomical phenomena. They will study how to plan their observations to be at the best time and location, taking into account effects such as weather and light pollution.

6.1 Be able to recognise the following astronomical phenomena visible to the naked eye, including: a Sun b Moon c stars (including double stars, constellations and asterisms) d star clusters e galaxies and nebulae f planets g comets h meteors i aurorae j supernovae and artificial objects, including: k artificial satellites I aircraft

6.2 Be able to recognise and draw the following constellations and asterisms, including their most prominent stars: a Cassiopeia b Cygnus c Orion d Plough e Southern Cross f Summer Triangle g Square of Pegasus

6.3 Understand the use of asterisms as pointers to locate specific objects in the night sky, including:
a Arcturus and Polaris from the Plough
b Sirius, Aldebaran and the Pleiades from Orion's Belt
c Fomalhaut and the Andromeda galaxy from Square of Pegasus

6.4 Understand why there is a range of constellation, asterism and star names among different cultures

6.21 Understand the appearance of the Milky Way from Earth as seen with the naked eye

6.1 Be able to recognise the following astronomical phenomena visible to the naked eye, including:

Let's start with some obvious ones:

a Sun - NEVER look directly at the Sun with the naked eye!!

https://sdo.gsfc.nasa.gov/

b Moon - pretty obvious, nearly everyone can recognise the Moon!

https://www.skyatnightmagazine.com/advice/skills/how-to-observe-the-moon/





c stars (including double stars, constellations and asterisms) (See item 6.2 later for which ones to learn)

Stars are so far away that they are virtually pinpoints of light. They appear to twinkle because the very narrow beam of light from them constantly changes direction due to refraction in the atmosphere.

A 'double star' consists of two stars that *appear* to be close together in the sky. Double star challenges:

https://skyandtelescope.org/astronomy-news/observing-news/see-summers-best-n aked-eye-double-stars-07092014/

A guide to the 88 constellations: <u>https://www.iau.org/public/themes/constellations/</u>

A table of well known asterisms: <u>http://maps.seds.org/Const/asterism.html</u>

d star clusters e galaxies and nebulae j supernovae

The Pleiades - a famous star cluster <u>https://www.space.com/pleiades.html</u>

Andromeda - our neighbouring galaxy https://earthsky.org/astronomy-essentials/2-ways-to-find-the-andromeda-galaxy/ You will need to learn to 'avert' your vision to see Andromeda by eye https://www.skyatnightmagazine.com/advice/how-to-master-the-art-of-averted-visi on/

The Orion Nebula - a winter sky challenge for beginners:

https://earthsky.org/clusters-nebulae-galaxies/orion-nebula-jewel-in-orions-sword/

The closest supernova seen from Earth SN187A <a href="https://en.wikipedia.org/wiki/SN\_1987A">https://en.wikipedia.org/wiki/SN\_1987A</a>

#### f planets

Planets follow the path of the **ecliptic** through the night sky and do not remain in fixed positions like stars. Planets do not twinkle like stars as they are much closer to Earth and reflect light from the Sun over a wider angular distance than stars.



Refraction in the atmosphere causes stars to twinkle. **Seeing** conditions are good when twinkling is least.

Scroll down this page to see a chart of **apparent magnitudes** of the planets: <u>https://skyandtelescope.org/observing/measuring-planet-magnitudes/</u>

#### g comets

Comets often have a tail, but not always and sometimes they have more than one. Scroll through the images at this link to familiarise yourself with different types.

#### Comet Images

If comets are bright enough to see with the naked eye, they will change position much more rapidly than planets as they travel along their highly elliptical orbits around the Sun.



Comet NEOWISE over Langstone Harbour, Hampshire in 2020

E.g. see how quickly NEOWISE changed position each night here: <u>https://www.nasa.gov/feature/how-to-see-comet-neowise</u>

Meteors give rise to the phenomenon we call shooting stars:

https://www.youtube.com/watch?v=p8P0qXGP3hM

They are fast moving, lasting only seconds usually, and often occur in showers at certain, predictable times of the year:

https://spaceplace.nasa.gov/meteor-shower/en/

i aurorae

These are the northern lights, Aurora Borealis, and southern lights, Aurora Australis:

https://www.youtube.com/watch?v=fVsONIc3OUY

Artificial objects, including:

k artificial satellites I aircraft

This photography site has some good descriptions and example images:<u>https://www.nationalparksatnight.com/blog/2019/2/16/how-to-tell-the-difference-between-planes-s</u> <u>atellites-and-meteors</u>

This one has examples of aircraft trails - aircraft have red, green and white navigational lights and appear to move more quickly than satellites as they are not as high up: <a href="https://alynwallacephotography.com/blog/2020/4/21/sorry-thats-no-meteor-its-a-satellite">https://alynwallacephotography.com/blog/2020/4/21/sorry-thats-no-meteor-its-a-satellite</a>

Not all satellites make dim trails - the ISS and Starlink are notably bright. This NASA link tells you how to find the ISS - if it is visible from your location you will definitely not mistake it for an aircraft! <u>https://spotthestation.nasa.gov/sightings/view.cfm?country=United\_Kingdom&region=England&city=Lond</u> <u>on#.Y1fyHOzMK3I</u>

Here is Starlink! <u>https://www.youtube.com/watch?v=qkhL0u5Yy5Y</u>

6.2 Be able to recognise and draw the following constellations and asterisms, including their most prominent stars:

a Cassiopeia b Cygnus c Orion d Plough e Southern Cross f Summer Triangle g Square of Pegasus

On a piece of plain paper, or in a drawing app, make simple sketches and label the three or four brightest stars in:

a <u>http://www.seasky.org/constellations/constellation-cassiopeia.html</u>

b http://www.seasky.org/constellations/constellation-cygnus.html

c <u>http://www.seasky.org/constellations/constellation-orion.html</u>

d The Plough (which Americans call the Big Dipper) is an asterism in Ursa Major: <u>https://nineplanets.org/the-big-dipper/</u> http://www.seasky.org/constellations/constellation-ursa-major.html

e http://www.seasky.org/constellations/constellation-crux.html

f The Summer Triangle consists of just three, bright stars <u>https://earthsky.org/tonight/summer-triangle-predominates-during-the-summer-seaso/</u>

g http://www.seasky.org/constellations/constellation-pegasus.html

6.3 Understand the use of asterisms as pointers to locate specific objects in the night sky, including:
a Arcturus and Polaris from the Plough
b Sirius, Aldebaran and the Pleiades from Orion's Belt
c Fomalhaut and the Andromeda galaxy from Square of Pegasus

These are explained very nicely with diagrams and animations here:

https://www.space.fm/astronomy/starsgalaxies/pointerstars.html



6.4 Understand why there is a range of constellation, asterism and star names among different cultures

Different peoples and cultures have different myths and legends in their heritage and so made up different stories about the shapes they traced out in the night sky. Sometimes these are remarkably similar, for example the western constellation Taurus which was interpreted as a bull in several cultures. It was even associated with wild cattle in ancient cave paintings:

### http://news.bbc.co.uk/1/hi/sci/tech/871930.stm

Watch this video, if you have time, to find out more about how different cultures interpreted the constellations:

https://www.youtube.com/watch?v=HejyXGQN-wk (10:30)

#### 6.21 Understand the appearance of the Milky Way from Earth as seen with the naked eye



Most people find it hard to observe the Milky Way because of light pollution. It forms a band of denser concentration of stars giving it a cloudy or milky appearance compared to the emptier space around it.

What we are actually seeing is the view along the disk of a spiral galaxy which is now called the Milky Way Galaxy.

Watch this video for a detailed explanation of what we call 'The Milky Way' in the night sky and what it looks like from Earth:

https://www.universetoday.com/115203/what-part-of-the-milky-way-can-we-see/