

Explore the Universe Observing Certificate

Welcome to the Explore the Universe Observing Certificate Program. This program is designed to provide the observer with a well-rounded introduction to the night sky visible from North America. Using this observing program is an excellent way to gain knowledge and experience in astronomy. Experienced observers find that a planned observing session results in a more satisfying and interesting experience. This program will help introduce you to amateur astronomy and prepare you for other more challenging certificate programs such as the *Messier* and *Finest NGC*.

The program covers the full range of astronomical objects. Here is a summary:

Observing Objective	Requirement	Available
Constellations and Bright Stars	12	24
The Moon	16	32
Solar System	5	10
Deep-Sky Objects	12	24
Double Stars	10	20
Total	55	110

In each category a choice of objects is provided so that you can begin the certificate at any time of the year. In order to receive your certificate you need to observe a total of 55 of the 110 objects available. Here is a summary of some of the abbreviations used in this program

Spring Summer Observers Checklist

Constellations and Bright Stars

NightWatch Chart #

Sea- son	Name	Abbr.	Observing Notes	Bright Star (s)	Mag.	Bayer	Flam- steed	BOG?	Seen? ✓	Log Page
Spr	Ursa Major The Great Bear	UMa	Ursa Major has important pointer stars leading to Polaris, Arcturus.	Dubhe Merak	1.81 2.34	Alpha (α) Beta (β)	50 UMa 48 UMa	14	<input type="checkbox"/>	1,2
Spr	Leo The Lion	Leo	Prominent constellation includes the bright star Regulus.	Regulus Denebola	1.36 2.14	Alpha (α) Beta (β)	32 Leo 94 Leo	33	<input type="checkbox"/>	3
Spr	Virgo The Maiden	Vir	Virgo contains the giant Virgo cluster of galaxies, visible in telescopes.	Spica	0.98	Alpha (α)	67 Vir	42	<input type="checkbox"/>	5
Spr	Libra The Scales	Lib	Alpha & Beta Librae are prominent but other stars need darker skies.	Zuben El Genubi Zuben Eschamali	2.75 2.61	Alpha (α) Beta (β)	9 Lib 27 Lib	49-50	<input type="checkbox"/>	7
Spr	Bootes The Herdsman	Boo	Arcturus is the 4 th brightest star. Take the arc to Arcturus from UMa.	Arcturus	-0.05	Alpha (α)	16 Boo	41-42	<input type="checkbox"/>	4
Spr	Ursa Minor The Lesser Bear	UMi	Contains Polaris the Pole Star. Needs darker skies to stand out.	Polaris Kochab	1.97 2.07	Alpha (α) Beta (β)	1 UMi 7 UMi	27	<input type="checkbox"/>	1

Early Spring Observing

Win	Gem	M35 NGC 2168	5.10 06:08.9 +24:20	Open cluster, 28'. Another open cluster, this one lies at the feet of Gemini. Its appearance is best under dark skies, but it can be seen fairly well with 10x50 binoculars from a suburban location.	36	<input type="checkbox"/>	18
Win	Tau	M45 Pleiades	1.20 03:47.0 +24:07	Visual open cluster, 110'. Known since ancient times, this spectacular cluster is best viewed through binoculars or a wide-field telescope.	73	<input type="checkbox"/>	19
Win	Tau	Hyades	0.50 04:27.0 +16:00	Unaided-eye open cluster, 330'. This is the group of stars that forms the V-shaped head of Taurus the bull. Although it's easily visible with the unaided eye, take a closer look with binoculars and you'll see the beautiful and colourful double stars Theta (182) and Delta (182).	36	<input type="checkbox"/>	15

Win Tau M1

The **Crab Nebula** is a supernova remnant and pulsar wind nebula in the constellation of Taurus.

At an apparent magnitude of 8.4, comparable to that of Saturn's moon Titan, it is not visible to the naked eye but can be made out using binoculars under favourable conditions.

See Nightwatch Chart # 15

Deep-Sky Objects

Sea- son	Cons	Object	Mag.	RA	Dec	Observing Notes	BOG?	Seen? ✓	Log Page
Spr	Cnc	M44 The Beehive	3.10	08:40.1	+19:59	Open cluster, 95'. With a magnitude of 3.1, this cluster is bright enough to be quite easily seen with the unaided eye from a dark sky. To locate it, try scanning along an imaginary line from Regulus in Leo to Pollux in Gemini.	38	<input type="checkbox"/>	3
Spr	Com	Coma Cluster Melotte 111	1.80	12:25.0	+26:00	Open cluster, 275'. This rather large group of stars lies between Leo and Boötes. It is made up of several chains of mag. 5-6 stars that are said to be the amber tresses of Queen Berenice's hair offered to the god Aphrodite for the safe return of her beloved king from battle.	40 (Map)	<input type="checkbox"/>	
Spr	Ser	M5 NGC 5904	5.70	15:18.6	+02:05	Globular cluster, 17.4'. A globular that is as big and bright as the more famous M13. It is located about 2½ binocular fields north of Beta Librae, the northernmost bright star in Libra.	52	<input type="checkbox"/>	7

Sum	Her	M13 Hercules Cluster	5.70	16:41.7	+36:28	Globular cluster, 17'. This well-known globular cluster contains hundreds of thousands of stars. Look for an out of focus star below Eta, the upper-right Keystone star in Hercules. Note the two 7 th magnitude stars lying on either side.	59	<input type="checkbox"/>	6
Sum	Sco	M4 NGC 6121	5.80	16:23.6	-26:32	Globular cluster, 26'. Located a degree west of Antares in Scorpius, this globular cluster is easily found under a dark sky. However, because most of its individual stars are quite dim, it can prove difficult from light-polluted skies.	59	<input type="checkbox"/>	7,8
Sum	Ser	M16 Eagle Nebula	6.00	18:18.6	-13:58	Emission nebula & open cluster 35'x28'. Located 4 degrees north of the M24 (see below) this nebulous open cluster contains between 20 and 30 stars ranging from magnitude 8 to 10.		<input type="checkbox"/>	8
Sum	Sgr	M8 Lagoon Nebula	~3.00	18:03.8	-24:23	Emission nebula, 45' x 30'. This huge cloud of gas is bisected at one end by a dark lane. To find this deep-sky object, first locate the spout of the Sagittarius "teapot" and simply slew your binoculars upward 6 degrees.	59	<input type="checkbox"/>	8
Sum	Sgr	M17 Swan Nebula	6.00	18:20.8	-16:11	Emission nebula, 20' x 15', also known as the Omega Nebula. It is located about halfway between M24 & M16. You may also note the open cluster M18 just below it.	59	<input type="checkbox"/>	8
Sum	Sgr	M22 NGC 6656	5.10	18:36.4	-23:54	Globular cluster, 24'. This globular cluster is almost a magnitude brighter than the well-known M13. Look for a nebulous disk two degrees north-east from the top of the teapot lid.	59	<input type="checkbox"/>	8
Sum	Sgr	M23 NGC 6494	5.50	17:56.8	-19:01	Open cluster, 27'. Nearly 5 degrees west of M24 (see below) lies this rich open cluster made up of over 120 faint stars. Under dark skies, you may be able to resolve some of them with a pair of 10x50 binoculars.		<input type="checkbox"/>	8
Sum	Sgr	M24 Sagittarius Starcloud	4.60	18:16.5	-18:50	Star cloud, 95' x 35'. The small Sagittarius star cloud lies a little over 7 degrees north of the teapot lid. On some charts it is mislabelled as the small open cluster NGC 6603. It's actually the large cloud surrounding NGC 6603.		<input type="checkbox"/>	8
Sum	Sgr	M25 IC 4725	4.60	18:31.6	-19:15	Open cluster, 32'. Slew your binoculars about 3 degrees eastward of M24, and you'll be rewarded with a view of this attractive little cluster containing several bright stars.		<input type="checkbox"/>	8

Sum	Sct	M11 Wild Duck Cluster	5.80	18:51.1	-06:16	Open cluster, 13'. You can find the "wild duck" cluster, as Admiral Smyth called it, nearly three degrees west of Aquila's beak lying in one of the densest parts of the summer Milky Way: the Scutum Star Cloud.	59	<input type="checkbox"/>	9
Sum	Vul	Collinder 399 The Coathanger	3.60	19:25.4	+20:11	aka Brocchi's Cluster, 60'. Popularly known as The Coathanger this unmistakable collection of 10 stars lies a little over 7 degrees below Beta Cygni, the head of the swan.		<input type="checkbox"/>	10

Double & Multiple Stars

PSA

Sea- son	Cons	Object	Mag.	Sep.	Pos. Angle	RA	Dec	Observing Notes	BOG?	Seen? ✓	Log Page
Spr	Leo	Zeta-36	3.5 & 5.8	325.9"	340°	10:16.7	+23:25	Proper name; Aldhafera. Secondary is 35 Leonis; Optical pair.		<input type="checkbox"/>	
Spr	Com	17 Com	5.3 & 6.6	145.4"	251°	12:28.9	+25:55	In Coma Cluster; Common proper-motion pair.		<input type="checkbox"/>	
Spr	Com	32 & 33 Com	6.3 & 6.7	95.2"	49°	12:52.2	+17:04	Located south of the Coma Cluster near the star Alpha Comae Berenices.		<input type="checkbox"/>	
Spr	CVn	15 & 17	6.3 & 6.0	284.0"	277°	13:09.6	+38:32	Nice even-magnitude pair located near Alpha CVn.		<input type="checkbox"/>	
Spr	UMa	Zeta 79&80	2.4 & 4.0	708.7"	71°	13:23.9	+54:56	Middle star in the Big Dipper handle; Zeta 79 is also a telescopic double.		<input type="checkbox"/>	
Spr	Lib	Alpha 2&1	2.8 & 5.2	231.0"	314°	14:50.9	-16:02	Proper name Zuben El Genubi. Common proper-motion pair. Look for colour.		<input type="checkbox"/>	
Spr	Boo	Mu 51	4.3 & 7.0	108.3"	171°	15:24.5	+37:23	Located near Beta and Delta Bootis, a nice contrast of magnitudes.		<input type="checkbox"/>	
Spr	CrB	Nu-1&2	5.4 & 5.3	364.4"	165°	16:22.4	+33:48	Look for the half circle of CrB then starhop from 13-Epsilon.		<input type="checkbox"/>	
Spr	Dra	17&16	5.4 & 5.5	90.3"	194°	16:36.2	+52:55	Find the 4 star "Head of the Dragon" pattern then use 23-Beta and 33-Gamma as pointers.		<input type="checkbox"/>	
Spr	Dra	Nu-24&25	4.9 & 4.9	61.9"	312°	17:32.2	+55:11	Located in the 4 star "Head of the Dragon" pattern. An outstanding even-magnitude double!		<input type="checkbox"/>	

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Sea- son	Cons	Object	Mag.	Sep.	Pos. Angle	RA	Dec	Observing Notes	BOG?	Seen? ✓	Log Page
Sum	Cyg	Albireo (Beta Cygni)	3.1 & 5.1	34.3"	54°	19:30.7	+27:58	Albireo is one of the most beautiful double stars in the sky. Use tripod-mounted binoculars or a telescope.		<input type="checkbox"/>	
Sum	Lyr	Epsilon	5.4 & 5.1	207.7"	173°	18:44.3	+39:40	Wide easy binocular pair. Telescope users can try splitting each star again to see the Double-Double.		<input type="checkbox"/>	
Sum	Lyr	Zeta 6&7	4.3 & 5.9	43.7"	150°	18:44.8	+37:36	Zeta, Epsilon, and Vega form a wide triangle. Use tripod-mounted binoculars or a telescope.		<input type="checkbox"/>	
Sum	Lyr	Delta 11&12	5.6 & 4.5	630.0"	n/a	18:53.7	+36:58	Very wide, easy binocular double with colour. From Vega, go to Zeta, then on to Delta.		<input type="checkbox"/>	
Sum	Cap	Alpha 2&1	3.6 & 4.2	377.7"	291°	20:18.1	-12:33	Wide visual or binocular double in nice starfield.		<input type="checkbox"/>	
Sum	Cap	Beta 1&2	3.4 & 6.2	205.3"	267°	20:21.0	-14:47	Look for Beta just below Alpha. Nice magnitude contrast with secondary star.		<input type="checkbox"/>	
Sum	Cyg	Omicron 31 (Triple!)	3.8 - 6.7 4.8	107.0" -337.5"	173° -323°	20:13.6	+46:44	Beautiful triple star for binoculars. Look for colour.		<input type="checkbox"/>	

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Variable Stars (Supplementary)

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Visual / Binocular Objects

Season	Cons	Star	Variable Type	Magnitude Range	Period (days)	Spectral Range	RA	Dec	Notes
Sum	Lyr	Beta 10 Lyrae	E (Eclipsing Binary)	3.3-4.3	12.94	B8-A8	18:50.1	+33:22	Bright EB; Proper name Sheliak; use Gamma Lyrae (Mag.3.3) for comparison.
Sum	Aql	Eta 55 Aquilae	DCEP (Delta Cepheid)	3.5-4.4	7.17	F6-G4	19:52.5	+01:00	Bright Cepheid; use Beta Aquilae (Mag.3.7) for comparison.
Aut	Cep	Mu Cephei	SR (Semi-Regular)	3.4-5.1	730	M2	21:43.5	+58:47	Known as Herschel's "Garnet Star." Compare colour to the white star Alpha Cephei.

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Binocular / Small Telescope Objects

Season	Cons	Star	Variable Type	Magnitude Range	Period (days)	Spectral Range	R.A.	Dec.	Notes
Spr	CVn	Y Canum Venaticorum	SR (Semi-regular)	4.8-6.4	157	C5-4J (N3)	12:45.1	+45:26	Known as "La Superba," it is a deep-red carbon star with a semi-regular period.
Sum	Oph	X Ophiuchi	M (Mira, Long Period Variable)	6.8-8.8 (Av) 5.9-9.2 (Ex)	334	M6-K1	18:38.3	+08:50	Good example of a long-period variable for small instruments; variable-star chart recommended.
Sum	Scu	R Scuti	RV (RV Tauri)	5.0-7.0 (Av) 4.5-8.6 (Ex)	140	G0-K0	18:47.5	-05:42	RV Tauri type variable with cycles of shallow and deep minima.
Sum	Lyr	RR Lyrae	RR (RR Lyrae)	6.9-8.1	0.56	A8-F7	19:25.5	+42:47	Interesting short-period variable that goes through a complete cycle in less than one day.

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Small/Medium Telescope

Season	Cons	Star	Variable Type	Magnitude Range	Period (days)	Spectral Range	RA	Dec	Notes
Spr	Leo	R Leonis	M (Mira, LPV)	5.8-10.0 (Av) 4.4-11.3 (Ex)	313	M8	09:47.6	+11:26	Bright LPV that is well placed for observing in the spring season.
Spr	Vir	R Virginis	M (Mira, LPV)	6.9-11.5 (Av) 6.0-12.1 (Ex)	146	M4.5	12:38.5	+06:59	LPV with a shorter-than-average period of just 145 days.
Sum	Aql	R Aquilae	M (Mira, LPV)	6.1-11.5 (Av) 5.5-12.1 (Ex)	284	M5-M9	19:06.4	+08:14	The brightest LPV in Aquila. Its red colour intensifies around minima.

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near M49
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