SCIOLY.ORG

Astronomy/DSOs

The **Astronomy DSO list** specifies which Deep Space Objects may be covered in the Astronomy event that year, and tend to reflect the topic of the event for the specific year in some form. It is typically listed in section 3.c of the rules. The DSO list is sometimes similar to the DSO list of the Division B event Reach for the Stars.

Contents

General Tips

The DSO list can seem daunting at first. A good strategy for learning them is to take personalized notes from various sources while including images for identification.

Categorize the DSOs by their types or stages in stellar evolution (e.g. Brown Dwarfs, Red Giants, White Dwarfs, Cepheid Variables, Supernova remnants, Globular Clusters). Take notes on each of these stages, as well as what makes them significant in the study of astronomy.

For example - a Type Ia Supernova can either be the result of collision of two white dwarfs or accretion of matter from a stellar companion (often reaching the Red Giant stage), and its mostly uniform brightness can help astronomers determine distance to distant galaxies using the distance modulus.

For each DSO, take notes on what makes it unique and significant. The Chandra X-ray Observatory (https://www.youtube.com/user/cxcpub/videos) posts videos at the start of the competition season that briefly explain each object's significance. The Chandra photo album (http://chandra.harvard.edu/photo/) and NASA's APOD (https://apod.nasa.gov/apod/astropix.html) are also good resources for images and information on DSOs. For Variable stars, AAVSO (https://www.aavso.org/) is a helpful resource.

Find photos (and light curves for variable stars) of the Deep Space Objects, as many as possible and across all wavelengths. Almost all tests include tasks to identify DSOs based on images or find all images of a certain DSO/category, and more difficult tests sometimes include more obscure images of the DSOs. Include the wavelength of light a certain image was taken in.

Take notes on miscellaneous information about each DSO, including, but not limited to: constellation, alternate names, magnitude, stellar classification, right ascension/declination, and color index.

Take practice tests. They can help reveal weaknesses in any notes on Deep Space Objects.

If certain information about a DSO is given (such as the the masses and the separation of the binary system), calculate the period. Use information in any pre-existing notes to calculate other values before the test, saving valuable time.

2021 DSOs

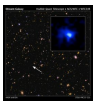
2021 DSOs

Name	Images		Constellation	Magnitude		Distance	Coordinates		External Links
				Apparent	Absolute		Right Ascension	Declination	
SN UDS10WiI (https://en.wikipedia.org/wiki/SN_UDS10WiI)			Cetus			10.5 Gly, 3.2 Gpc	02h 17m 46.3s	-05° 15′ 24.00″	Hubble (https://hubblesite.org/contents/news-releases/2013/news-2013-11.html)
	SN UDS10WiI is the furthest supernova so far of the type used to measure cosmic distances. It was discovered by the Hubble Space Telescope and was discovered as part of a three-year Hubble program that started in 2010 to survey faraway Type 1a supernovae known as the CANDELS (https://en.wikipedia.org/wiki/Cosmic_Assembly_Near-infrared_Deep_Extragalactic_Legacy_Survey) survey.								
NGC 2623 (https://en.wikipedia.org/wiki/NGC_2623)			Cancer	13.36		250 Mly, 76.7 Mpc	08h 38m 24.1s	+25° 45′ 16.70″	
	NGC 2623 is the result of a major collision and subsequent merger between two galaxies. The merger is going through late stages and is thought to eventually resemble what the Milky Way will look like when it collides with our neighboring galaxy, Andromeda in 4 billion years.								
GRB 150101B (https://en.wikipedia.org/wiki/GRB_150101B)			Virgo			1.7 Gly, 0.52 Gpc	12h 32m 04.96s	−10° 56′ 00.7″	Chandra (http://simbad.u-strasbg.fr/simbad/sim-basic?Ident=GRB+150101B) SIMBAD (http://simbad.u-strasbg.fr/simbad/sim-basic?Ident=GRB+150101B)
	GRB 150101B is a likely merger of 2 neutron stars 1.7 billion light years from Earth. It is fairly similar to GW170817, the first source shown to emit gravitational waves and light.								
JKCS 041 (https://en.wikipedia.org/wiki/JKCS_041)			Cetus			~9.9 Gly, ~ 3.04 Gpc	02h 26m 44s	−04° 41′ 37″	Chandra (https://chandra.harvard.edu/photo/2009/jkcs041/)
	JKCS 041 is a group of galaxies about 9.9 billion light years. it is the farthest galaxy group from Earth discovered. It has a redshift of 1.9.								
MACS									

J0717.5+3745 (https://en.wikipedia.org/wiki/MACS_J0717.5%2B3745)			Auriga			5.4 Gly, 1.7 Gpc	07h 17m 36.50s	+37° 45′ 23″	Chandra (https://chandra.harvard.edu/photo/2016/frontier/)
			MACS J0717.5+3745 is a massive galaxy cluster where 4 galaxy subclusters are colliding.						
MACS J1149.5+2223			Leo			Approximately 5 billion light-years	11h 49m 36.3s	+22° 23′ 58.1″	Chandra (https://chandra.harvard.edu/photo/2017/macsj1149/) Frontier Fields (https://frontierfields.org/2014/02/25/meet-the-frontier-fields-macs-j1149-52223/)
			MACS J1149.5+2223 is a galaxy cluster which bends light from more distant objects due to its huge mass through gravitational lensing.						
Bullet Cluster (1E 0657-56) (https://en.wikipedia.org/wiki/Bullet_Cluster)			Carina			3.7 billion light-years, 1.141 Gpc	06h 58m 37.9s	−55° 57′ 0″	
			The Bullet Cluster is a system of two colliding galaxy clusters. Most of its mass is concentrated around galaxies instead of gas, which could be evidence for the existence of dark matter.						
H1821+643 (https://en.wikipedia.org/wiki/H1821%2B643)			Draco	14.24		3.4 Gly, 1.0 Gpc	18h 21m 57.24s	+64° 20′ 36.23″	Chandra (https://chandra.harvard.edu/photo/2019/whim/) SIMBAD (http://simbad.u-strasbg.fr/simbad/sim-id?Ident=H1821%2B643)
			H1821+643 is a luminous quasar which has been used to search for the WHIM. At its core is one of the most massive black holes known.						
GOODS-S 29323			Fornax			13.2 Gly, 4.05 Gpc	03h 32m 28s	−27° 48′ 30″	Chandra (https://chandra.harvard.edu/photo/2016/bhseeds/)
			GOODS-S 29323 is a direct collapse black hole seed candidate. It could support a model of SMBH formation which would allow them to form quickly in the early universe.						
H2356-309			Sculptor			Approximately 2 billion light-years	23h 59m 07.9s	-30° 37′ 41.00″	Chandra (https://chandra.harvard.edu/photo/2010/h2356/) SIMBAD (https://simbad.u-strasbg.fr/simbad/sim-basic?Ident=H2356-309)
			H2356-309 is a blazar which was used to detect WHIM (in the form of an oxygen absorption line) in the Sculptor Wall.						
PSS 0133+0400			Pisces			Approximately 10.1 billion light-years	01h 31m 04.8s	+03° 45′ 37.8″	Chandra (https://chandra.harvard.edu/photo/2019/dark/)
			PSS 0133+0400 is a quasar which was used in a study to find out that the strength or amount of dark energy may be increasing.						
PSS 0955+5940			Ursa Major			Approximately 10.2 billion light-years	09h 51m 37.4s	+59° 54′ 43.6″	Chandra (https://chandra.harvard.edu/photo/2019/dark/)
			PSS 0955+5940 is a quasar which was used in the same study as PSS 0133+0400.						
GW151226 (https://en.wikipedia.org/wiki/GW151226)						Approximately 1.4 billion light-years	n/a	n/a	LIGO (https://www.ligo.org/science/Publication-GW151226/index.php)
			GW151226 was a Gravitational-Wave signal observed by the twin detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) on December 26, 2015 at 03:38:53 UTC making it the second definitive observation of a merging binary black hole system detected by the LIGO Scientific Collaboration and Virgo Collaboration.						
M87 (https://en.wikipedia.org/wiki/Messier_87)			Virgo	7.19		53.5 ± 1.6 Mly, 16.4 ± 0.5 Mpc	12h 30m 49.42338s	+12° 23′ 28.0439″	Chandra (https://chandra.si.edu/photo/2019/black_hole/)
			M87 is a nearby elliptical galaxy with an active galactic nucleus. The central SMBH of M87 was imaged by the Event Horizon Telescope as the first black hole to be imaged.						
3C 273 (https://en.wikipedia.org/wiki/3C_273)			Virgo	12.9		2.443 Gly, 749 Mpc	12h 29m 06.7s	+02° 03′ 09″	AAVSO (https://www.aavso.org/vsots_3c273) Chandra (https://chandra.harvard.edu/photo/2000/0131/)
			3C 273 is the most optically bright quasar, and also one of the closest, in our night sky. Along with 3C 48, it was the first object to be identified as what we now know to be quasars.						

DLA0817g (https://en.wikipedia.org/wiki/DLA0817g)			Cancer			12.276 Gly, 3.764 Gpc	08h 17m 40.86s	+13° 51′ 38.2″	NRAO (https://public.nrao.edu/news/alma-discovers-massive-rotating-disk-in-early-universe/)
			DLA0817g is the oldest and farthest known disk galaxy.						

2021 DSO Surveys (Surveys)

Name	Images		Area Surveyed	Instrument(s)	Wavelength(s)	Objects	External Links
Chandra Isotropic Universe Survey			Full Sky	Chandra X-Ray Observatory, XMM-Newton	X-Ray	Galaxy Clusters	Chandra (https://chandra.harvard.edu/photo/2020/isotropic/)
			The purpose of this survey is to explore whether or not the universe is isotropic. It uses X-Ray luminosity of galaxy clusters to calculate expansion speeds across the sky.				
Hubble CANDELS Survey			~800 square arcmin	Hubble Space Telescope	Near-Infrared to Mid-Ultraviolet	Distant Galaxies	NASA (https://www.jpl.nasa.gov/news/news.php?feature=4028)
			The purpose of the Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey is to collect data on the first third of galactic evolution by imaging galaxies of redshift 1.5-8. This survey also measures supernovae with a redshift of 1.5 or greater to test their accuracy as standard candles for cosmology.				

Previous DSO Lists

2020 DSOs

2020 DSOs

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				Apparent	Absolute		Right Ascension	Declination	
SN UDS10Wil (https://en.wikipedia.org/wiki/SN_UDS10Wil)			Cetus			10.5 Gly, 3.2 Gpc	02h 17m 46.3s	-05° 15′ 24.00″	
			SN UDS10Wil is the furthest supernova so far of the type used to measure cosmic distances. It was discovered by the Hubble Space Telescope and was discovered as part of a three-year Hubble program that started in 2010 to survey faraway Type 1a supernovae known as the CANDELS (https://en.wikipedia.org/wiki/Cosmic_Assembly_Near-infrared_Deep_Extragalactic_Legacy_Survey) survey.						
NGC 2623 (https://en.wikipedia.org/wiki/NGC_2623)		[[]]	Cancer	13.36		250 Mly, 76.7 Mpc	08h 38m 24.1s	+25° 45′ 16.70″	
			NGC 2623 is the result of a major collision and subsequent merger between two galaxies. The merger is going through late stages and is thought to eventually resemble what the Milky Way will look like when it collides with our neighboring galaxy, Andromeda in 4 billion years.						
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			The Bullet Cluster is a system of two colliding galaxy clusters. Most of its mass is concentrated around galaxies instead of gas, which could be evidence for the existence of dark matter.						
H1821+643 (https://en.wikipedia.org/wiki/H1821%2B643)		[[]]	Draco	14.24		3.4 Gly, 1.0 Gpc	18h 21m 57.24s	+64° 20′ 36.23″	Chandra (https://chandra.harvard.edu/photo/2019/whim/) SIMBAD (http://simbad.u-strasbg.fr/simbad/sim-id?Ident=H1821%2B643)
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			H2356-309 is a blazar which was used to detect WHIM (in the form of an oxygen absorption line) in the Sculptor Wall.						
152156.48+520238.5		[[]]	Boötes			Approximately 10.75 billion light-years	15h 21m 56.5s	+52° 02′ 38.50″	Chandra (https://chandra.harvard.edu/photo/2015/3quasars/)
			152156.48+520238.5 is a quasar which has similar properties to the quasar PHL 1811. The disk around it may be puffed up (from high accretion rates), causing it to be fainter in X-rays and have weak emission lines.						
153714.26+271611.6		[[]]	Corona Borealis			Approximately 11.03 billion light-years	15h 37m 14.3s	+27° 16′ 11.6″	Chandra (https://chandra.harvard.edu/photo/2015/3quasars/)
			153714.26+271611.6 is a quasar similar to PHL 1811. Like 152156.48+520238.5, it has weak emission lines probably caused by a puffed-up accretion disk.						
222256.11-094636.2		[[]]	Aquarius			Approximately 11.48 billion light-years	22h 22m 56.10s	-09° 46′ 36.20″	Chandra (https://chandra.harvard.edu/photo/2015/3quasars/)
			222256.11-094636.2 is a quasar similar to PHL 1811. Like 152156.48+520238.5, it has weak emission lines and weak X-ray emission, likely caused by a puffed-up disk.						
PSS 0133+0400	[[]]	[[]]	Pisces			Approximately 10.1 billion light-years	01h 31m 04.8s	+03° 45′ 37.8″	Chandra (https://chandra.harvard.edu/photo/2019/dark/)
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kipedia.org/wiki/3C_273)									31/)
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2018 DSOs
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2013 DSOs
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2011 DSOs
2010 DSOs
2009 DSOs

See Also

Astronomy
Astronomy/Stellar Evolution
Astronomy/Variable Stars
Astronomy/Star and Planet Formation
Astronomy/Type Ia Supernovae
Astronomy/Type II Supernovae
Astronomy/Exoplanets

Links

Basic note sheet (http://scioly.org/wiki/images/8/88/DSO.docx) for the 2011 DSOs
SIMBAD Astronomy Database for DSOs (http://simbad.u-strasbg.fr/simbad/sim-fid)