



UNDERSTANDING SOLAR ECLIPSE

25th OCTOBER 2022



Department of
Science & Technology
Government of Gujarat



GUJCOST
Gujarat Council on
Science & Technology

Presentation developed by:
Manthan Educational Programme Society, India

આ દિવાળીએ જ્ઞાનનો દીવો પ્રગટાવીએ



25મી ઓક્ટોબર
2022ના રોજ
સુરક્ષિત રીતે
સૂર્યગ્રહણ જોવાનું
ચૂકશો નહીં

16:34 થી 18:30 ભુજ
16:38 થી 18:30 અમદાવાદ
16:38 થી 18:31 રાજકોટ
16:40 થી 18:30 વડોદરા
16:43 થી 18:31 સુરત



ડિપાર્ટમેન્ટ ઓફ
સાયન્સ એન્ડ ટેકનોલોજી
ગુજરાત સરકાર, ગાંધીનગર



ગુજકોસ્ટ
ગુજરાત કાઉન્સિલ ઓન
સાયન્સ એન્ડ ટેકનોલોજી

**THIS DIWALI
LET'S LIGHT
THE LAMP OF
KNOWLEDGE**



**DON'T MISS
VIEWING THE
SOLAR ECLIPSE
SAFELY ON
25TH OCTOBER 2022**

16:34 TO 18:30 BHUJ

16:38 TO 18:30 AHMEDABAD

16:38 TO 18:31 RAJKOT

16:40 TO 18:30 VADODARA

16:43 TO 18:31 SURAT



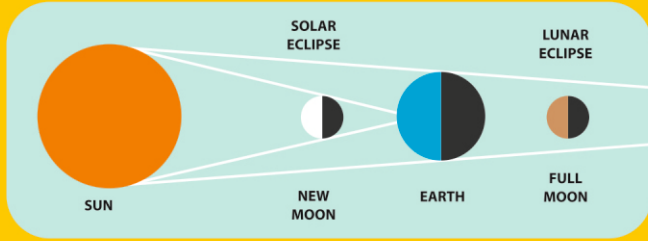
**Department of
Science & Technology
Government of Gujarat**



**GUJCOST
Gujarat Council on
Science & Technology**



What are Eclipses and how do they occur?



Total Solar Eclipse



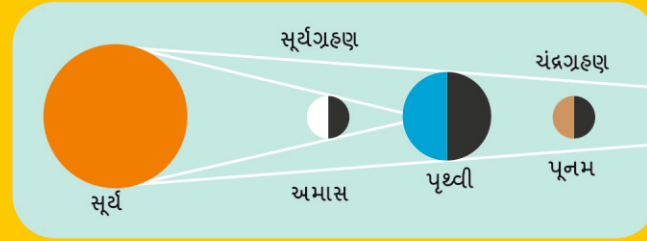
Total Lunar Eclipse

An eclipse occurs when one object in space blocks an observer from seeing another object in space.

From Earth there are two main types of eclipses: Solar Eclipses and Lunar Eclipses.



ગ્રહણ એટલે શું ? તે કેવી રીતે થાય છે?



સૂર્યગ્રહણ



ચંદ્રગ્રહણ

જ્યારે એક અવકાશી પદાર્થનું અવલોકન બીજા અવકાશી પદાર્થના વચ્ચે આવવાના કારણે આવરોધાય છે ત્યારે ગ્રહણ થાય છે.

પૃથ્વી પરથી મુખ્યત્વે બે પ્રકારના ગ્રહણ જોઈ શકાય છે: સૂર્યગ્રહણ અને ચંદ્રગ્રહણ.





સૂર્ય

સૂર્યગ્રહણ કેવી રીતે થાય છે ?



ચંદ્ર

પૃથ્વી

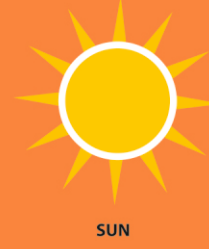
દરેક અમાવાસ્યાના દિવસે ચંદ્ર પૃથ્વી અને સૂર્યની વચ્ચે હોય છે. પરંતુ ચંદ્ર ની ભ્રમણકક્ષા પૃથ્વીના તળથી ૫ ડિગ્રી ઢળેલી હોવાથી તેનો પડછાયો પૃથ્વી પર હંમેશા પડતો નથી. જે અમાવાસ્યાએ ચંદ્રની છાયા પૃથ્વી પર પડે છે ત્યારે પૃથ્વીના એ સ્થળ પર સૂર્યગ્રહણ થાય છે.

પ્રવૃત્તિ :

પૃથ્વી અને ચંદ્રની આપેલી આકૃતિ કાપો.
પૃથ્વીની આકૃતિને બલ્બની સામે એવી રીતે રાખો કે જેથી ચંદ્રની આકૃતિ પૃથ્વી અને બલ્બની વચ્ચે રહે.

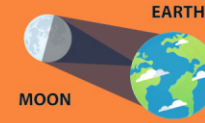
ચંદ્રની આકૃતિ ધીરે ધીરે એવી રીતે પસાર કરો કે જેથી ચંદ્રની આકૃતિનો પડછાયો પૃથ્વી પરથી પસાર થાય.

ચંદ્રનો પડછાયો પૃથ્વીના જે ભાગ પર પડે છે તે ભાગમાં સૂર્યગ્રહણ જોઈ શકાય છે.



SUN

How does Solar Eclipse occur?



MOON

EARTH

On every New Moon day the Moon is between the Earth and the Sun, but its shadow may not fall on the Earth as the Moon's orbit is 5° tilted to the plane of Earth's orbit. On those New Moon Days when the shadow of the Moon falls on the Earth the Solar Eclipse is seen from that region of the Earth.

ACTIVITY

- Take the cutout of the Earth and Moon.
- Hold the Earth in front of a bulb such that the Moon is in between Earth and bulb.
- Observe the eclipse created by the shadow of the Moon on the Earth.
- Move the Moon so that its shadow passes along the Earth.



What are eclipses And how do they work?



SUN

EARTH

MOON

High Noon

Low Noon

Partial Solar Eclipse

Total Solar Eclipse

Total Lunar Eclipse

An eclipse occurs when one object in space blocks an observer from seeing another object in space.

From Earth there are two main types of eclipses: Solar Eclipses and Lunar Eclipses.



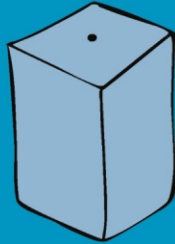
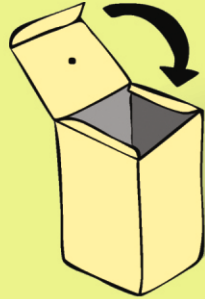
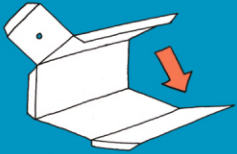


પિનહોલ કેમેરાથી સૂર્યગ્રહણ જુઓ

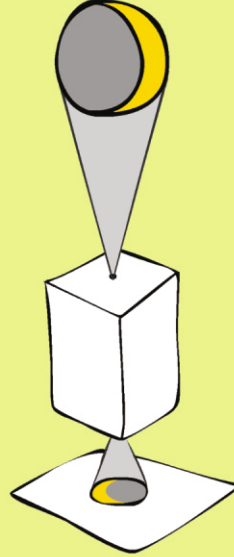


પિનહોલ કેમેરાથી સૂર્યનું પ્રતિબિંબ સફેદ કાગળ કે દીવાલ પર ઝીલી શકાય છે. આ કાર્ડને વાળી, કાપીને ચોટાડી પિનહોલ કેમેરાનું ખોખું બનાવો. સૂર્યનું પ્રતિબિંબ એક કોરા કાગળ ઉપર પાડો. આ રીતે સૂર્યનું પ્રતિબિંબ જોવું સલામત છે.

વાળી, કાપીને ચોટાડી
પિનહોલ કેમેરાનું
ખોખું બનાવો



પરેકે નાં છુરોં
પ્રોજેક્શન પરે



સૂર્યનું પ્રતિબિંબ
એક સફેદ કાગળ
પર પાડી શકાય.

નાનકડી અરીસાની ગોળ તકતી વડે સૂર્યનું પ્રોજેક્શન કરો

- એક રબ્બરના બોલ ઉપર નાનકડો આભલો ચોટાડો.
- બોલને એક કપ કે ગ્લાસ ઉપર ગોઠવો.
- બોલને એવી રીતે ગોઠવો કે સૂર્ય પ્રકાશનું પ્રતિબિંબ થોડા અંધારા ઓરડાની દીવાલ પર પડે.
- આ સાદી પ્રોજેક્શનની રીતથી પરોક્ષ રીતે સૂર્યગ્રહણ સાવચેતીથી જોઈ શકાય.



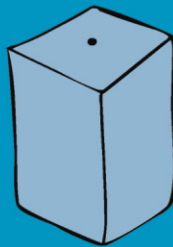
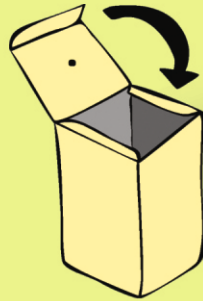
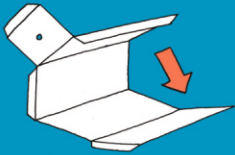


View Solar Eclipse with a Pinhole Camera

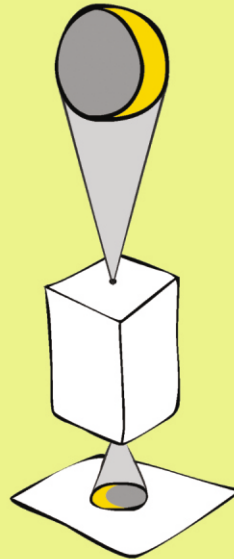


A pinhole camera can project the Sun's image on a paper or a wall. Assemble this pinhole camera as shown in the diagram. With this camera get the Sun's image on white paper. Observing the Sun in this manner is quite safe.

Fold and paste to assemble the pinhole camera



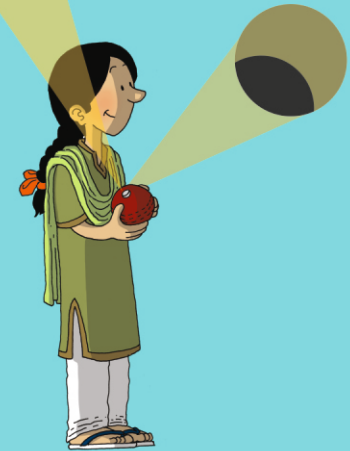
Do not look at the Sun through the pinhole



Project the image of the Sun on a white paper in a dark area.

Projecting Sun using a Small Mirror

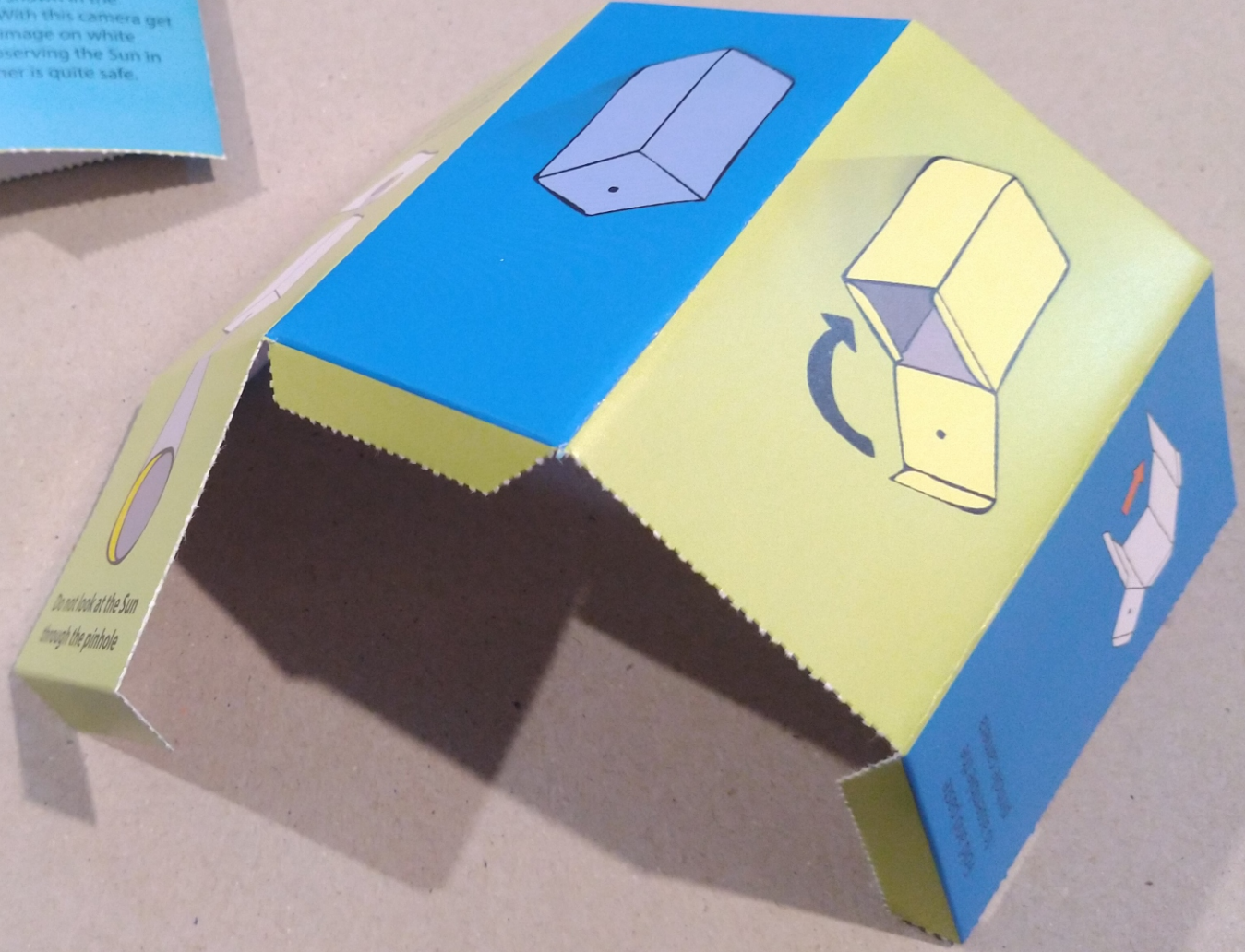
- Take a rubber ball and fix the small mirror on it.
- Place the ball on a small cup or glass.
- Try projecting the image of the Sun in a dark area/room.
- Such a simple projection method can be used to view solar eclipse safely.



8 **View Solar Eclipse with a Pinhole Camera**

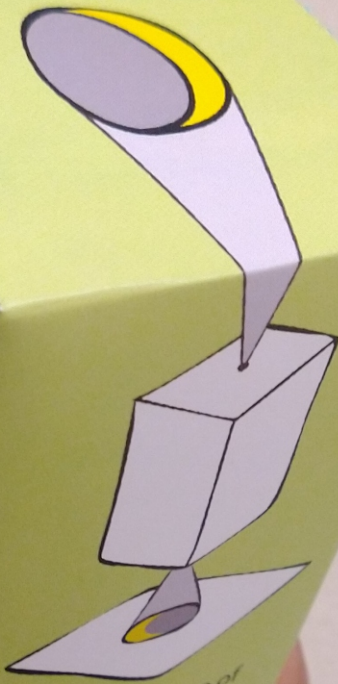


A pinhole camera can project the Sun's image on a paper or a wall. Assemble this pinhole camera as shown in the diagram. With this camera get the Sun's image on white paper. Observing the Sun in this manner is quite safe.



Do not look at the Sun through the pinhole

Do not look at the Sun
through the pinhole

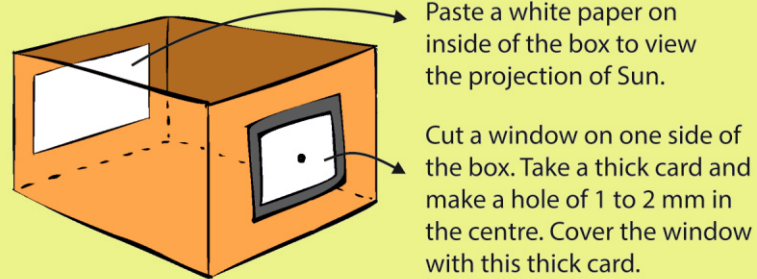


Project the image of
the Sun on a white
paper in a dark area.



Make Your Own Box Pinhole Camera

Take a cardboard box and prepare a box pinhole camera as shown.



With your back to the Sun, allow the image of the Sun to be projected inside the box through the pinhole, such that your head does not obstruct the light from the Sun. You may now view the solar eclipse safely as shown here.

Never attempt to see the Sun directly through the pinhole.



Projecting Sun using a Telescope

- Mount the telescope firmly on a tripod.
- Point the telescope in the direction of the Sun.
(Never see the Sun through the telescope, it could cause permanent blindness)
- Place a stiff white card perpendicular to the direction of the telescope at a convenient distance.
- You should see a bright circle of light projected from the telescope on the card. This is the projection of disc of the Sun. You can try to focus the image by moving the card further or backward.
- In this way, it is very safe to see the projected image of the Sun during the solar eclipse.



KITCHEN UTENSIL AS PROJECTORS FOR ECLIPSE



USING MIRRORS FOR PROJECTING ECLIPSED SUN



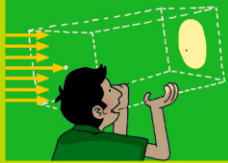
USING SAFE SOLAR VIEWERS FOR VIEWING SOLAR ECLIPSE



DO's for Solar Eclipse



You can directly view the Solar Eclipse using a scientifically tested solar filter, certified to be safe. *In all cases, please examine the filter before use. A solar filter with pinhole / scratches must not be used.*



View the Solar Eclipse through a projected image of the Sun by a pinhole camera.



A small telescope can be used to project a magnified image of the sun on a white screen which can conveniently be shown to a larger group. Adjust the eyepiece to obtain a sharp projected image. *(But this projection needs little expertise)* **Never look at the Sun directly through a telescope, it may cause damage or blindness to the eyes.**

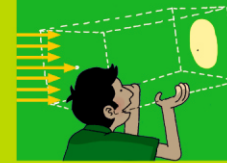


Observe the Solar Eclipse under the supervision of elders.

સૂર્યગ્રહણ વખતે શું કરવું જોઈએ?



સૂર્યગ્રહણ જોવા માટે વૈજ્ઞાનિક રીતે પ્રમાણિત કરેલા સૂર્ય ફિલ્ટર જ વાપરો. તો જ તમારી આંખો સલામત રહેશે. દરેક વખતે ફિલ્ટરની ચકાસણી કરીને પછી જ વાપરો કાણાવાળું કે લીલાવાળું ફિલ્ટર વાપરવું નહીં.



પિન-હોલ કેમેરા મારફત અંધારા વિસ્તારમાં સૂર્યનું પ્રોજેક્ટેડ પ્રતિબિંબ મેળવો.



સફેદ કાર્ડ કે દીવાલ પર સૂર્યનું પ્રતિબિંબ મેળવવા નાનું દૂરબીન કે બાયનોક્યુલરનો ઉપયોગ કરી શકાય. જેના દ્વારા મોટા સમૂહ ને ગ્રહણ બતાવી શકાય. પરંતુ આ પ્રોજેક્શન કરવા માટે આવડત જરૂરી છે. ટેલીસ્કોપમાંથી કદાપિ સીધું સૂર્ય સામે ન જોવું. તેમ જોવાથી આંખોને ગંભીર નુકશાન થશે કે અંધાપો પણ આવી શકે.



સૂર્યગ્રહણ અનુભવી મોટેરાઓની સાથે રહીને જુઓ.

શું ના કરવું જોઈએ?

×



નરી આંખે સૂર્યગ્રહણ
જોવા પ્રયત્ન કરશો નહીં.

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દૂરબીન કે બાયનોક્યુલર વડે સૂર્ય તરફ જોશો નહીં.
તે તમારી આંખોને મોટું નુકશાન કરી શકે છે.

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ગ્રહણ જોવા મેશવાળા કાચ, રંગીન ફિલ્મ, ચેક્સરે
ફિલ્મ, ગોગલ્સ, નોન-સિલ્વર બ્લેક એન્ડ વ્હાઇટ
ફિલ્મ વાપરશો નહીં. તે બિલકુલ સલામત નથી.

રંગીન પાણીમાં કે સાદા પાણીમાં સૂર્યના
પ્રતિબિંબને જોશો નહીં.



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ખાલી સૂર્યની દ્રશ્ય શક્તિ ઘટાડે તેવા ફિલ્ટર વાપરશો નહીં. સૂર્યનાં કિરણોમાં
૫૮% ઇન્ફ્રારેડ કિરણો હોય છે. ખતું નુકસાન કરનારા ઇન્ફ્રારેડ કિરણો જ છે.

DON'Ts for Solar Eclipse

×



Never ever observe the Sun with naked eye -
be it during transit, solar eclipse or otherwise

×



Never look at the Sun directly through a telescope or
binoculars. It may cause permanent blindness.

×



Don't use smoked glass, colour film sunglass,
black & white exposed films or X-ray films,
photographic neutral density filters and
polarizing filters. They are not safe.

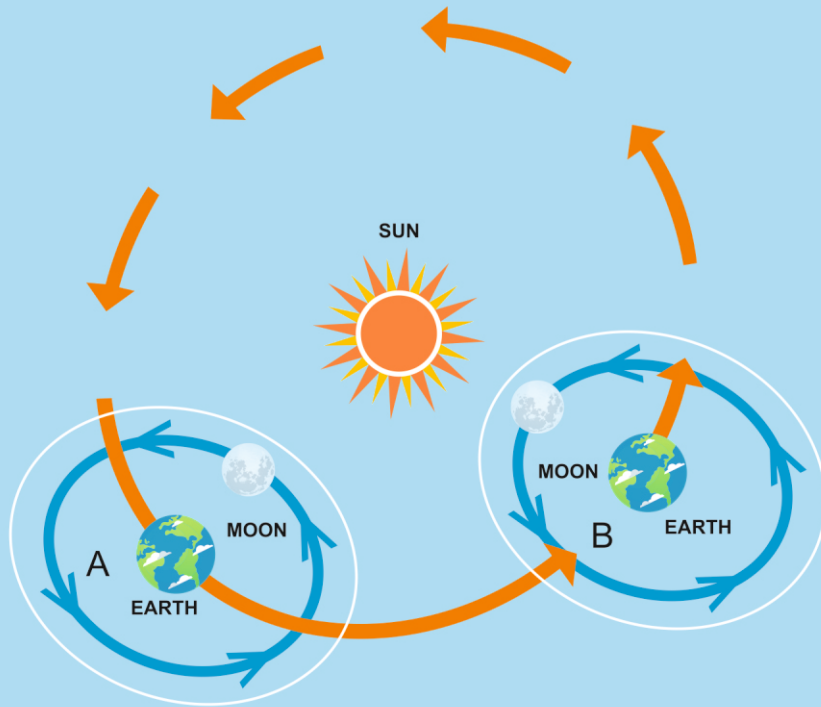
Don't look at a reflection of the Sun from
plain or coloured water.



×

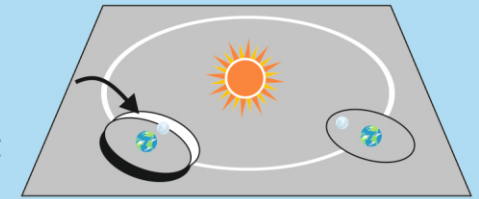
Don't use any filter that simply reduces the visible intensity of the Sun.
Fifty-eight percent of the Sun's rays are in the infrared region of the solar
spectrum. Damage to the eye is predominantly caused by this invisible
infrared energy and the visible part of the solar spectrum.

Solar Eclipses don't occur on every New Moon days



ACTIVITY

You are given an illustration of two instances of solar eclipse. The given cutout is the orbit of the Moon. Give it a twist so that the orbit remains at an angle. Now what do you observe?



The plane of the Moon's orbit is inclined at a small angle of about 5° to the plane of the Earth's orbit. The two diagonally opposite points where these planes intersect are called the nodes of Moon's orbit.

On most of the New Moon days, the Moon is not at a node and hence either above or below the Sun - Earth line. Only when the Moon happens to be very close to one of the node on a New Moon day, its shadow can fall on the Earth and solar eclipse can be seen.

In position A

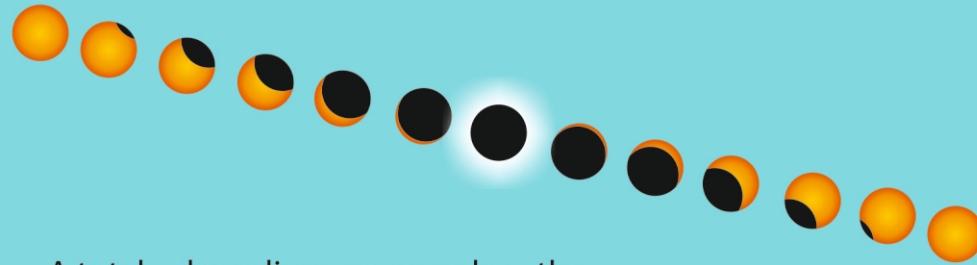
When the Moon is above the Sun Earth line or below, it can not cast shadow on the Earth and hence, no solar eclipse can occur.

In position B

When the Moon is between the Sun and the Earth, its shadow falls on the Earth as the Moon is in the ecliptical plane, thus we can see an eclipse.



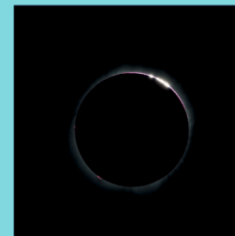
Total Solar Eclipse



A total solar eclipse occurs when the Sun is completely obscured by the Moon. The intensely bright disk of the Sun is covered by the dark silhouette of the Moon, and the faint corona becomes visible. During total solar eclipse, totality is visible only from a narrow belt on the surface of the Earth. Before the corona becomes visible, you would also see diamond ring and Baily's beads.



DIAMOND RING



BAILY'S BEADS



CORONA



Partial Solar Eclipse

A partial solar eclipse occurs when the Sun, Moon and Earth are not exactly in line of sight of the observer. Moon only partially obscures the Sun then. This phenomenon can usually be seen from a large part of the Earth outside of the track of an annular or total solar eclipse.



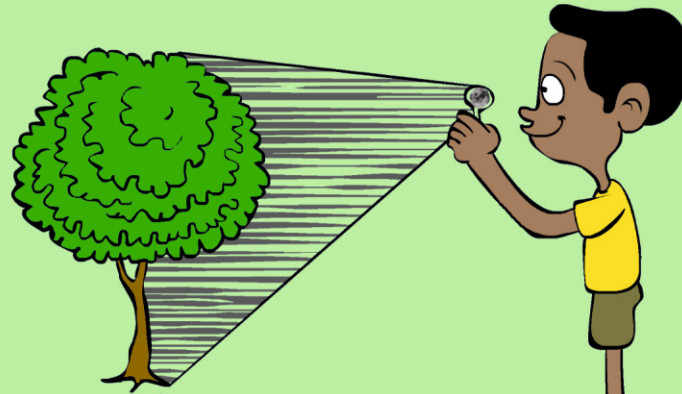
કંકણાકૃતિ સૂર્યગ્રહણ



ANNULAR SOLAR ECLIPSE

How does a small Moon cover the giant disc of Sun?

The Sun is almost 400 times larger than the Moon, but it is also 400 times more distant from the Moon, so they appear to be of the same size. When the Moon is closer to the Earth, and hence its apparent size is slightly larger than that of the Sun, total solar eclipse takes place and Moon can fully cover the Sun. The distance between the Earth and the Moon goes on changing significantly because Moon's orbit is elliptical. Some times, when the Moon is farther away from the Earth, the Moon cannot fully cover the Sun and only a ring of Sun is seen surrounding the Moon in the centre. This is called Annular Solar Eclipse.



ACTIVITY

- Take out the cutout of the Moon.
- Hold it near your eye and observe how it covers a big tree. Similarly the Moon covers the big Sun during the solar eclipse.
- If you will move the cutout away, you cannot cover the tree fully.








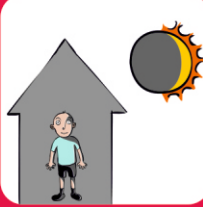


Superstitions related to Eclipses and getting rid of them

Do's

Don'ts

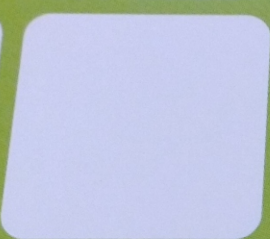
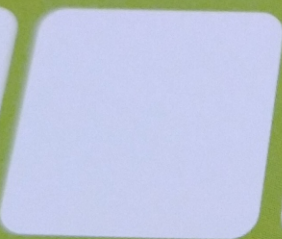
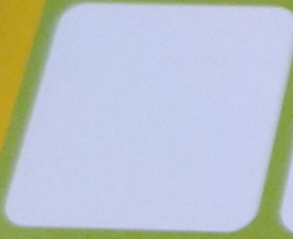
Paste the cutouts in the appropriate boxes of do's and don'ts. Try to find the do's and don'ts related to eclipses and fill the remaining squares appropriately.



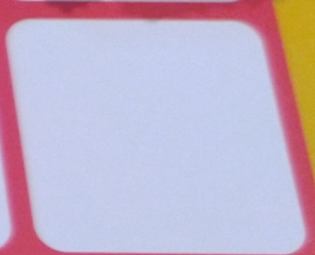
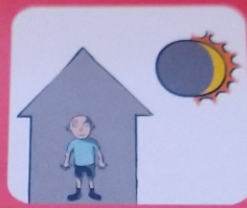
7

Superstitions related to Eclipses and getting rid of them

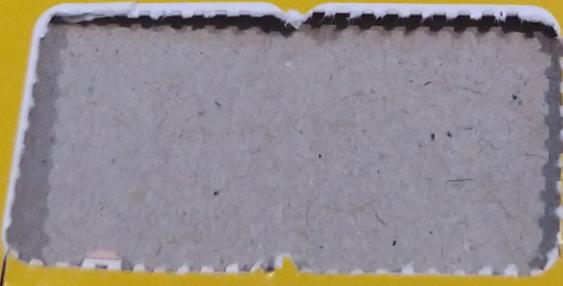
Do's



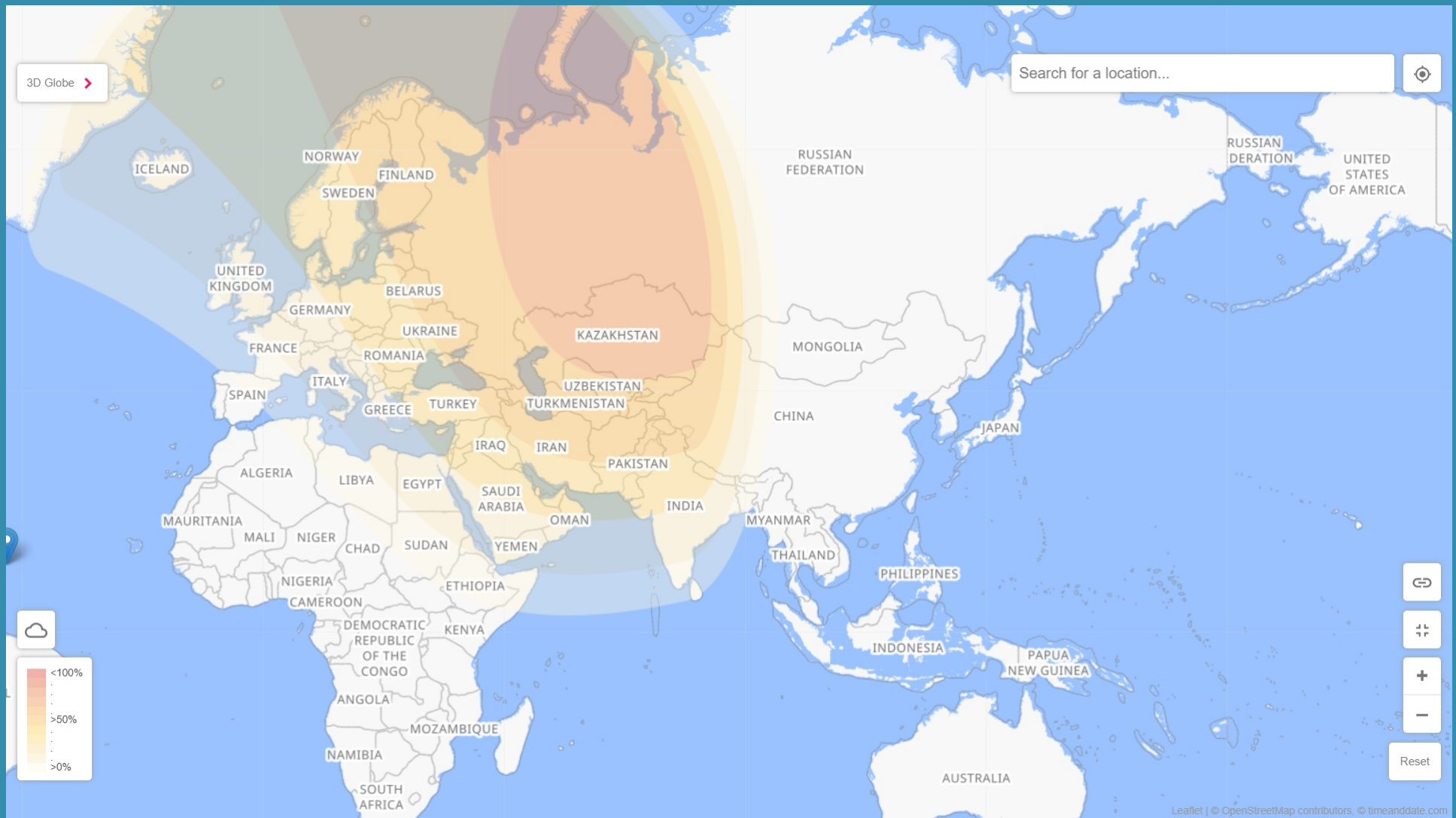
Don'ts



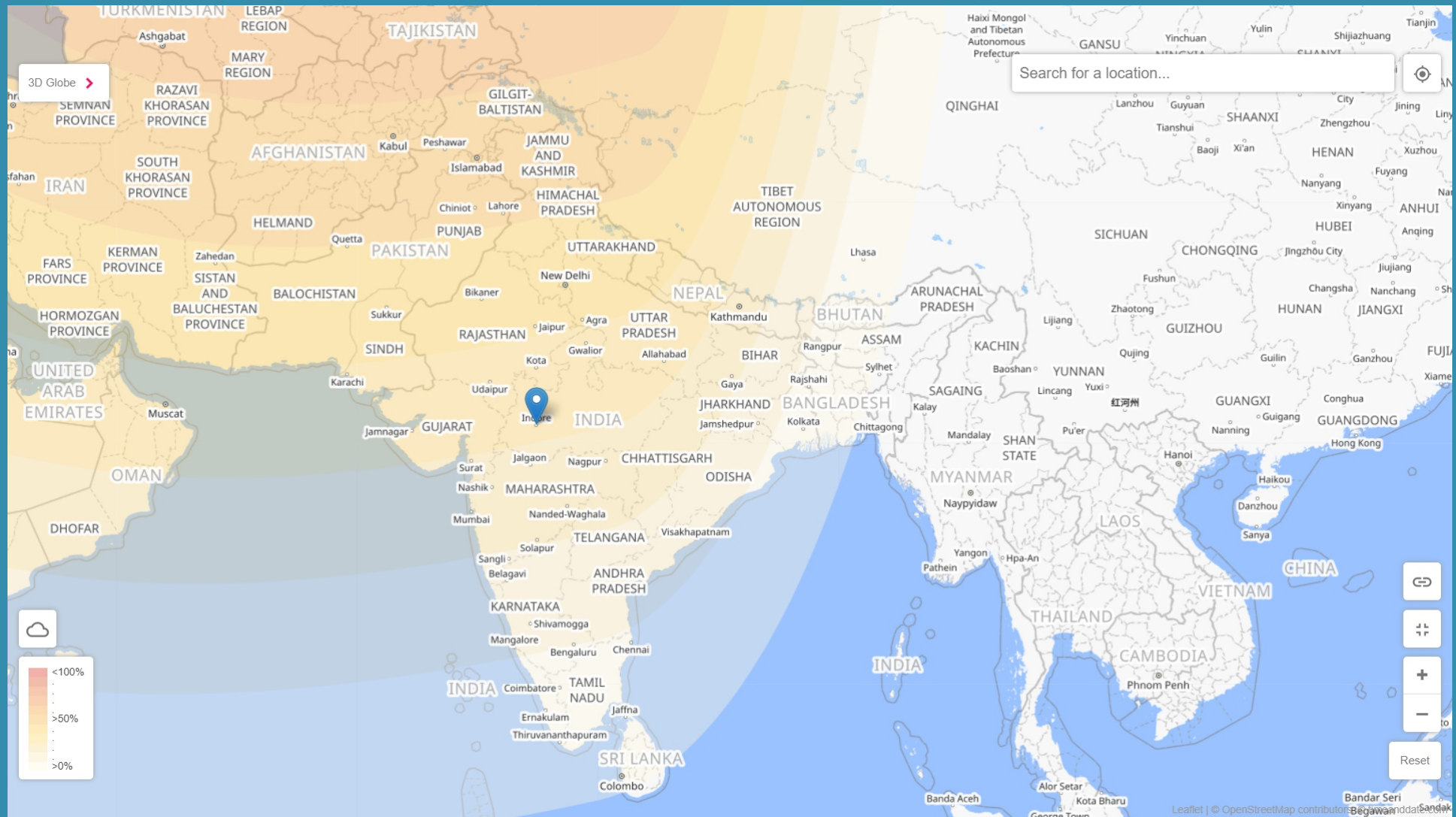
Paste the cutouts in the appropriate boxes of do's and don'ts. Try to find the do's and don'ts related to eclipses and fill the remaining squares appropriately.



VISIBILITY MAP OF SOLAR ECLIPSE - OCTOBER 2022



VISIBILITY MAP OF SOLAR ECLIPSE - OCTOBER 2022





HAPPY SOLAR ECLIPSE VIEWING



Department of
Science & Technology
Government of Gujarat



GUJCOST
Gujarat Council on
Science & Technology

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