

Key

## Space Exploration Final Exam Review

1. What are the two frames of reference we use on the Earth to identify locations?

Latitude

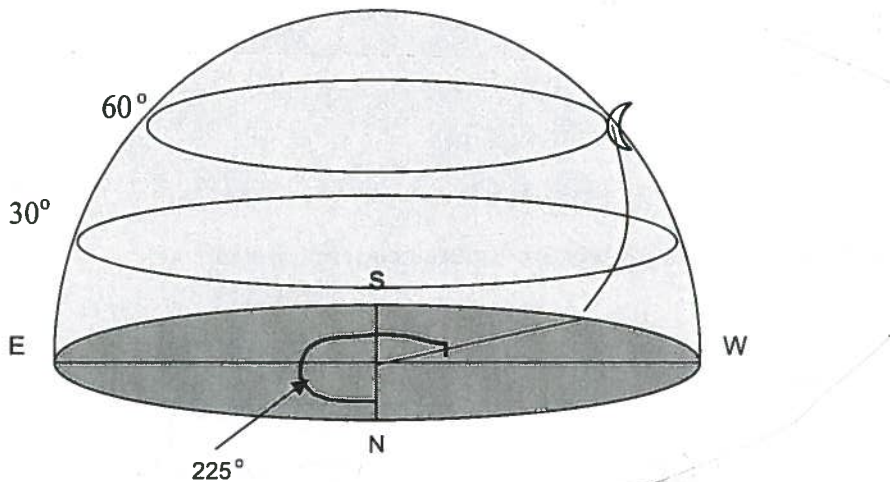
Longitude

2. Explain what each of the following mean in describing position from a frame of reference on the Earth.

**Altitude** - angle measured above the horizon in degrees.

**Azimuth** - angle measured clockwise from north.

**Zenith** - imaginary point directly above an object, directly opposite to the gravitational pull.



3. What are the sky co-ordinates for the moon in the illustration above?

altitude =  $60^\circ$       azimuth =  $225^\circ$

4. How can you use the stars as a frame of reference?

1. Find the "planet" in the sky at night.
2. Find a few bright stars near the "planet"
3. Mark the planet's position relative to the bright stars.

5. Explain the different models of the solar system identified below.

**Geocentric**

- Earth centered Model

- Earth is in the centre of the solar system. All other celestial bodies revolve around the Earth in perfect spheres/circles.

**Heliocentric**

- Sun centered Model

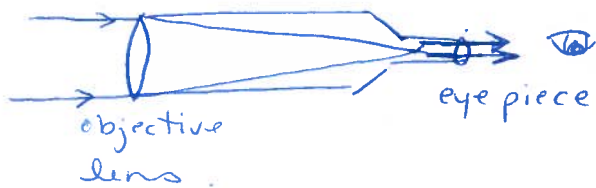
- Sun is in the centre of the solar system. All other celestial bodies revolve around the Sun, in ellipses.

6. Using his telescope, describe 5 observations Galileo made that nobody else had made.

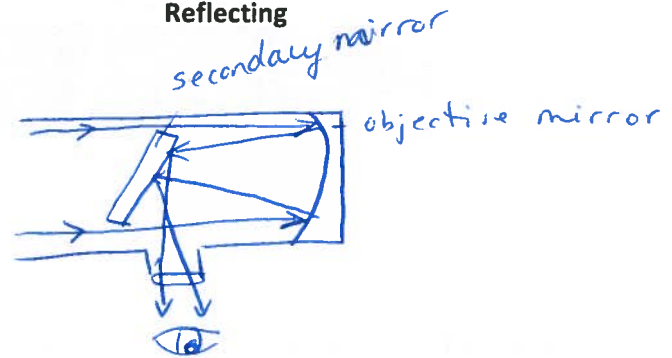
1. Moon's blemishes, (mountains / craters)
2. Sun had spots on it that moved across the surface, disappeared & reappeared. (Sun rotates on its axis)
3. Jupiter had 4 small "stars" that move back and forth across it. (Orbited by 4 moons.)
4. Planets were disk shaped.
5. Observations concluded Earth centered model was incorrect.

7. Illustrate with light rays, how each type of optical telescope works:

**Refracting**



**Reflecting**



8. How can the resolving power of a telescope be increased?

Increase the diameter of the objective lens.

9. How do combination telescopes work?

They have a lens at the front and an objective mirror at the back.

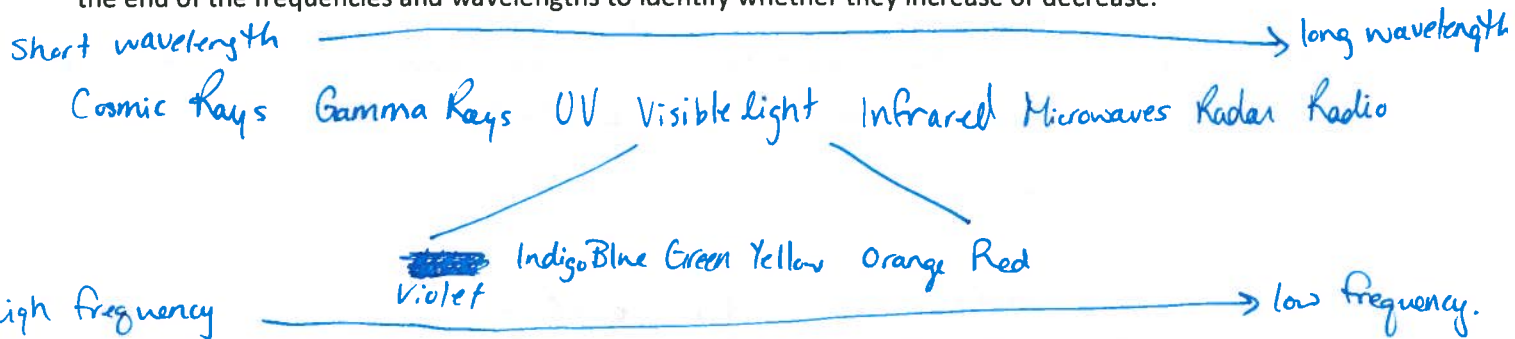
10. Explain Newton's Universal Law of Gravitation.

There is a gravitational force between all objects that pulls them together. When no forces act on an object, it will move in a straight line at a constant speed. The force of gravity pulls them in toward the Sun,

11. What did Newton discover using a prism? *which balances their tendency to move in a straight line.*

The spectrum of light.  
(colours)

12. Identify the different forms of energy present in the electromagnetic spectrum and put arrows at the end of the frequencies and wavelengths to identify whether they increase or decrease.



15. Explain how spectral lines can be formed and observed and what device is used to achieve this effect.

A spectroscope is used to observe spectral lines. They are formed by passing a beam of light through very fine prisms. Dark lines (spectral lines) would be observed.

16. How do astronomers use a spectrometer to determine a star's composition?

They attach spectroscopes to their telescopes and look at the spectral lines made by the star. They match the pattern to that of known elements to know what a star is composed of.

17. How does a diffraction grating work? Why is it used?

A diffraction grating passes light through thousands of closely spaced slits. It causes a spectrum with much better detail than one produced by a prism.

18. Identify what elements are present in each mystery star in the think and link investigation on page 381.

Mystery Star 1: H, Ca,

Mystery Star 2: H, He,

Mystery Star 3: H, He, Na, Hg

19. Describe the Doppler Effect and identify 3 applications for its use.

When the observed frequency of a wave changes if the source of the wave is moving towards or away from an observer.

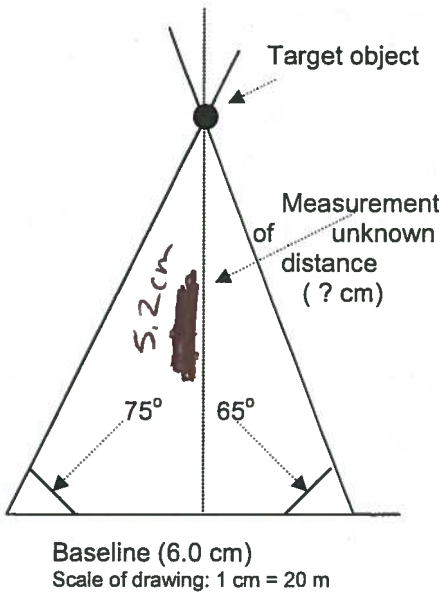
20. Explain the difference between a red shift and a blue shift star.

A Blue shift star's spectral pattern is shifted towards the blue end. This happens when a star is approaching.  
 A Red shift star's spectral pattern is shifted towards the red end. This happens when a star is moving away.

21. What is adaptive optic technology able to do and how is it possible?

It cancels out the twinkling of the stars caused by Earth's atmosphere. Computers distort the objective mirror.

22. Measure the "unknown distance" in the illustration using triangulation.



$$\frac{1\text{cm}}{5.2\text{cm}} \neq \frac{20\text{m}}{x}$$

$$x = 104\text{m}$$

23. What is the difference between an astronomical unit, a light year and a parsec?

AU is the distance from the Earth to the Sun. (150 million km)  
 A light year is the distance light travels in one year, (63 240 AU)  
 A parsec is the distance from Earth to which a parallax is one second of travel, ~~the~~  $\approx 3$  light years.

24. What is the advantage of radio telescopes?

Radio telescopes are not affected by weather.  
 The Radio waves go "through" most mediums.

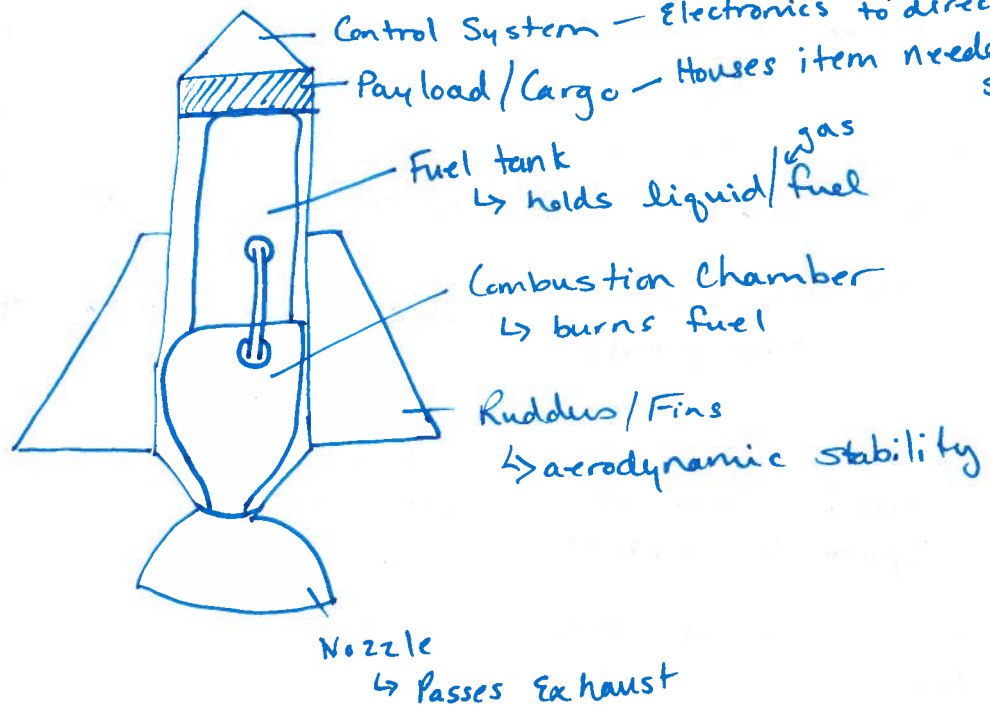
25. Explain radio interferometry.

Two radio telescopes are separated by a large distance but connected electronically; the signals are combined by computers.

26. What is VLBI and what advantage does it have?

Very Long Baseline Interferometry  
It produces images 100 times as detailed as the largest optical telescopes

27. Illustrate and label the parts of a rocket outlining in your illustration what the function of each part is.



28. What is gravitational escape velocity?

The speed at which an object, (rocket), will travel in order to break free from gravity, (Earth's, Moon's, Mer's).

29. What is a ballistic missile?

A missile that is initially powered, "fired", but hits its target by falling due to gravity.

30. Explain what gravitational assist is.

Enables a spacecraft to gain speed by using the gravity of another planet to "slingshot" it.

31. Explain the difference between natural and artificial satellites.

Natural - orbit the Sun/Earth etc. without human interference, (Moon, Earth)

Artificial - created by humans to orbit a celestial body.

32. How many GPS satellites are orbiting the Earth and how many are needed to pinpoint a specific location on Earth?

Approximately 30 GPS. At least 3 are needed to pinpoint a specific location on Earth.

33. What protects the Earth from the Sun's solar winds?

The Earth's magnetic field deflects Solar winds.

34. Give the names of the inner planets and the names of the outer planets.

Inner (Terrestrial): Mercury, Venus, Earth, and Mars.

Outer (Gas Giants / Jovian planets): Jupiter, Saturn, Uranus, Neptune.

35. What space probes are the most recent ones to land on Mars and explore the surface?

Curiosity Aug. 2012      Spirit Jan. 2004  
Opportunity Dec. 2004

36. How long does it take for light to reach us from the Sun?

About 8 min.

37. How long does it take for transmissions from Voyager 1 and 2 to reach the Earth?

Voyager 1: about 30 hours

Voyager 2: " 25 hours.

38. What factors affect the launch and flight of a spacecraft from the surface of the Earth and in space?

1. Earth's Gravity
2. Space Temperature
3. Space Pressure
4. Celestial Bodies Gravity

39. Briefly describe three tragedies that occurred during space travel.

Challenger - Space Shuttle explodes after lift off.

Columbia - Space Shuttle disintegrated during re-entry.

Apollo 1 - Fire inside of the spacecraft.

40. When and where, (country), did the following Space Achievements occur?

Sputnik - Soviet Union 1957

Vostok - Soviet Union 1961 (April)

Freedom 7 - United States 1961 (May)

Apollo 11 - United States 1969

Apollo/Soyuz joint mission - Soviets and U.S. 1975

41. What are 6 Canadian contributions to the space program?

Canadarm

Canadarm 2

Marc Garneau

Roberta Bondar

Chris Hadfield

42. How is oxygen produced on the International Space Station?

It is produced by an oxygen generator through electrolysis.

44. How does microgravity affect the human body?

Muscles and bones become weaker because they do not need to work as hard as with gravity.

45. Explain how an ion drive works.

- A gas is ionized (gain or lose electrons) and emitted at a high speed in order to propel a spacecraft.

46. Explain how solar sails work.

It uses the Sun's "power" in order to propel a spacecraft. The "sail" collects light particles from the Sun which reflects them away from the Sun.