



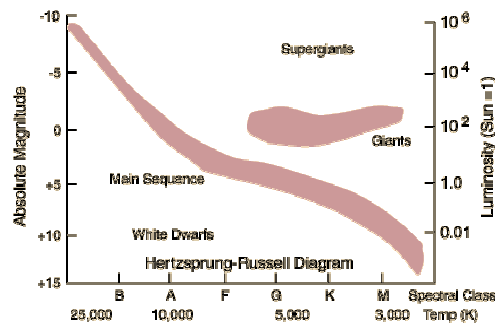
# Space Exploration

Name \_\_\_\_\_

Class \_\_\_\_\_

The first two questions are **NUMERICAL RESPONSE** questions. Complete these on this page.

The **Hertzsprung - Russell** diagram (which includes data from thousands of stars) graphs the brightness and temperature of each class of star. Rank the stars from hottest to coolest.



White Dwarf
Giant
Supergiant
Sun (main sequence)

	.	.	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Place these events that represent a small part of the early achievements of space science in the order they happened, beginning with the earliest.

- 1 – Sputnik 1
- 2 – International Space Station
- 3 – Goddard’s liquid fuel
- 4 – Archytas’s pigeon

←
→
  
 Earliest Most Recent

	.	.	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

**1.1 Early Views About The Cosmos**

1. Many dates in the celestial calendar are marked by the amount of daylight. In the Northern Hemisphere the longest day occurs on June 21 and is called ...
  - A. Vernal equinox
  - B. Autumnal equinox
  - C. Summer solstice
  - D. Winter solstice
2. The width of a mitt was used by the **Inuit** peoples in the high Arctic to gauge the height of the Sun above the horizon. When it rose to one mitt-width high it meant ...
  - A. The days would get longer and warmer
  - B. The nights would get colder and shorter
  - C. Seal pups would be born in two lunar cycles
  - D. The Northern Lights would shine their brightest
3. Copernicus proposed a different model to explain planetary motion. His model, called the Heliocentric model. Galileo Galilei later confirmed his model, in his observations with one of the first telescope. But it was this Johannes Kepler, who put in place what was missing from Copernicus' model. He realized that the orbits of the planets were ...
  - A. circular
  - B. geocentric
  - C. intersecting
  - D. ellipses

**1.2 Discovery Through Technology**

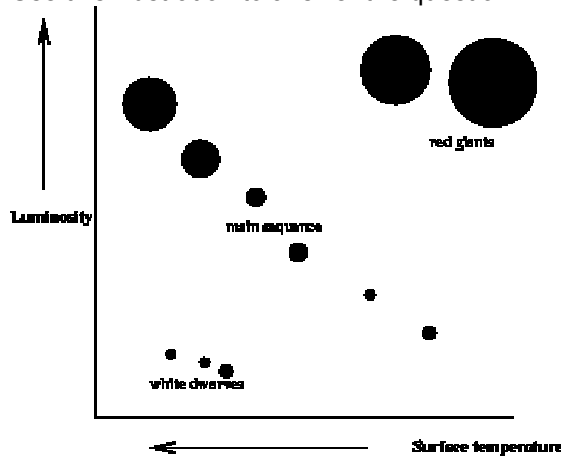
4. In the 2<sup>nd</sup> Century A.D. Egyptian astronomers used an instrument, called a **quadrant** to ...
  - A. measure the angle between the Moon and any given star
  - B. identify details in the far reaches of the night sky
  - C. chart astronomical position and predict the movement of stars
  - D. measure a star's height above the horizon
5. Arabian Astronomers used an instrument, called an **astrolabe** to ...
  - A. measure the angle between the Moon and any given star
  - B. identify details in the far reaches of the night sky
  - C. Make accurate charts of star positions predict the movement of stars
  - D. measure a star's height above the horizon
6. When measuring the diameter of the sun, we use an indirect method, so that we can determine the diameter without actually measuring it directly. To calculate the accuracy of your measured value, this is calculated to show how far from the real value your measured value is ...
  - A. actual error
  - B. estimated error
  - C. percent error
  - D. adjusted error

**1.3 The Distribution Of Matter In Space**

7. In the 1920's two scientists began comparing the surface temperature of stars with the star's luminosity. They graphed their results in what is referred to as the ...
  - A. Solar Shift Model
  - B. Hertzsprung-Russell Diagram
  - C. Wegener-Darwin Illustration
  - D. Helio-Solar Diagram



Use this illustration to answer the question ...



8. What they discovered when plotting their data was that ...
- star temperature and brightness was not random
  - star temperature and size were related
  - star brightness and size were related
  - star size and shape were related to brightness
9. At the end of the life cycle of a star it explodes in a catastrophic event called a ...
- massive
  - supergiant
  - black hole
  - supernova

#### 1.4 Our Solar Neighborhood

10. Constellations are groupings of stars that we see as patterns. The International Astronomical Union recognizes 88 officially. There are other patterns that are unofficially recognized, such as The Big Dipper, and are known as ...
- anomalies
  - asterisms
  - asteroids
  - aspergummies
11. Solar winds pass the Earth at an average speed of 400 km/s. This protects us from the devastating effects of the solar winds ...
- Earth's atmosphere
  - Earth's gravity
  - Earth's magnetic field
  - Earth's ozone
12. During a solar eclipse this is visible ...
- the sun's core
  - the sun's electromagnetic shield
  - the sun's atmosphere
  - the sun's corona

#### 1.5 Describing The position of Objects In Space

13. The direction directly overhead is called ...
- azimuth
  - altitude
  - zenith
  - astroplane



14. To locate an object in the sky, two questions must be solved. How high is it in the sky? and in what direction is it? The term that identifies the **compass direction** is ...
- A. azimuth
  - B. altitude
  - C. zenith
  - D. astroplane
15. When constructing an astrolabe to locate the position of a star in the night sky, the **protractor** is used to determine the ...
- A. azimuth
  - B. altitude
  - C. zenith
  - D. astroplane

### 2.1 Getting There: Technologies for Space Transport

16. Getting a rocket into space was the first hurdle to overcome in order to be successful with space exploration. The speed that is needed is 28,000 km/h. This speed is referred to as the ...
- A. Maximum thrust
  - B. Speed of sound
  - C. Escape velocity
  - D. Speed of light
17. What did the Chinese of the 1<sup>st</sup> Century build to demonstrate their understanding and use of rockets?
- A. a 'pigeon'
  - B. a satellite
  - C. steam
  - D. arrows
18. Rocketry relies on a fundamental law of physics, ...
- A. Force is relative to distance
  - B. For every action there is an equal and opposite reaction
  - C. Gravity is a force that relates to rockets
  - D. Speed is equal to the force of gravity in the opposite direction

### 2.2 Surviving There: Technologies for Living In Space

19. The damaging effects of cosmic radiation is considered to be ...
- A. An environmental hazard
  - B. A psychological challenge
  - C. A confinement problem
  - D. A microgravity threat
20. There are several harmful effects to the body when living in microgravity for extended periods of time. Muscles ...
- A. lose their color
  - B. expand
  - C. get brittle
  - D. shrink
21. This is how oxygen is produced on the International Space Station.
- A. Recycled water
  - B. Filtering CO<sub>2</sub>
  - C. Heated air
  - D. Nitrogen control

**2.3 Using Space Technology to Meet Human Needs on Earth**

22. **LANDSAT** and **RADARSAT** are Canadian satellites that monitor ships at sea, soil quality, track forest fires, report on environmental change & search for natural resources. These satellites are **NOT** in ...
- A. Earth orbit
  - B. geosynchronous orbit
  - C. use 24 hours a day
  - D. alignment with radar stations on the Earth
23. **GPS** satellites enable you to find out your exact position on the Earth at any time. 24 GPS satellites are orbiting the Earth at all times. To use the GPS system you need to get a signal from ...
- A. 2 of them
  - B. 3 of them
  - C. 4 of them
  - D. 6 of them
24. Space Age materials are used on the Earth as well as in space. The improvement of **traction** on car winter tires is the result of an application originally developed for ...
- A. parachute material for the Viking space mission
  - B. voice-controlled wheelchairs
  - C. structural analysis of a spacecraft
  - D. microlasers for communication

**3.1 Using Technology To See the Visible**

25. **Interferometry** is a technique of using telescopes in combination. The advantage of using two or more telescopes together is that astronomers are able to ...
- A. work together
  - B. see more detail
  - C. hypothesize about images
  - D. create more colorful images
26. One of the newest innovations for ground-based optical reflecting telescopes is the use of ...
- A. metal instead of glass
  - B. liquid instead of glass
  - C. segmented mirrors
  - D. mirror arrays
27. The **Hubble Space Telescope** offers a solution to the problems faced by astronomers on the Earth. Despite the remote mountain locations of ground-based telescopes to get away from light and air pollution, astronomers on the Earth still have to deal with interference caused by ...
- A. noise
  - B. aircraft
  - C. weather
  - D. earthquakes

**3.2 Using Technology to See Beyond the Visible**

28. Optical telescopes give us information based on visible light. However, objects in space, such as stars and galaxies, also emit many forms of electromagnetic energy. The energy form that has the longest wavelength is ...
- A. infrared
  - B. gamma
  - C. x-ray
  - D. radio



29. Although **neutral hydrogen** (which makes up a large bulk of matter in space) emits no light, it does emit energy at a specific wavelength. Astronomers are able to map out this neutral hydrogen in our Milky Way galaxy by using these type of telescopes ...
- A. radio telescopes
  - B. infrared telescopes
  - C. refracting telescopes
  - D. interferometry telescopes
30. **Radio Interferometry**, the combinations of many radio telescopes enables astronomers to improve performance and accuracy of images. They can more accurately measure position if they are ...
- A. at a higher altitude
  - B. closer to sea level
  - C. closer together
  - D. further apart

### 3.3 Using Technology to Interpret Space

31. If you have a baseline and know the angles to an object - an unknown distance away - you can accurately determine its actual distance away by using this method ...
- A. trigonometry
  - B. interferometry
  - C. triangulation
  - D. base ten math
32. **Parallax** is the *apparent shift in position of a nearby object when the object is viewed from two different positions*. Astronomers use a star's parallax to determine ...
- A. what angles to use when they triangulate the star's distance from Earth
  - B. it's orbital velocity and rotation compared to the Earth
  - C. it's actual distance from our Sun, measured in parsecs
  - D. the degree of shift that will account for its relative position in the night sky
33. A police officer might pull you over because you were speeding. The officer can prove you were traveling at a certain speed because the radar device that is used sends out a radio signal that reflects off your vehicle. The difference in wavelength is the speed you are traveling. This is a practical everyday application of this scientific principle - the ...
- A. parallax effect
  - B. spectrometer effect
  - C. ripple effect
  - D. doppler effect

### 4.1 The Risks and Dangers of Space Exploration

34. There are risks to sending astronauts to the moon. During a routine mission to the moon, Apollo 11 had to readjust their landing site, when the original site was found to be too rocky. Their precise fuel supply restricted them to ....
- A. try 1 more landing
  - B. try 2 additional landings
  - C. try 3 additional landings
  - D. scrub their mission and return to Earth.
35. A hazard for satellites in space is the Sun. Without adequate protection from a surge of electrically charged particles (a '*coronal mass ejection*' – also called '*solar flares*') this could occur ...
- A. misdirection of signals
  - B. fried electrical circuits
  - C. orbital failure
  - D. system software glitches



36. One hazard to us on Earth is the re-entry of a satellite. Most of the satellite will burn up, but this type of debris can cause us great harm ...
- A. reflective
  - B. radioactive
  - C. reactive
  - D. re-entry

#### 4.2 Canadian Contributions to Space Exploration and Observation

37. There are three main systems of the *Canadarm 2* used on the *International Space Station*. The part that travels along a rail system to move into different positions on the station is called ...
- A. Monorail Repair Unit
  - B. Mobile Base System
  - C. Remote Manipulator System
  - D. Special Purpose Dexterous Manipulator
38. Canada launched a satellite in 1972 making it the 1<sup>st</sup> nation to use a satellite for ...
- A. GPS locator beacons
  - B. finding natural resources
  - C. broadcasting television signals
  - D. military use
38. The 1<sup>st</sup> Canadian to go into space was ...
- A. Sir Edward Sabine
  - B. Chris Hadfield
  - C. Robert Thirsk
  - D. Marc Garneau

#### 4.3 Issues Related to Space Exploration

40. One of the benefits to spending all that money on space exploration is the potential for 'mining' natural resources. The place where these natural resources hold the greatest promise is on the ...
- A. Moon
  - B. Mars
  - C. Jupiter
  - D. Asteroid Belt
41. Although space exploration holds great promise and potential, there are political, ethical, economic and environmental issues associated with continued exploration endeavors. ***Do we have the right to spend money on space exploration rather than fixing our problems here on Earth?*** This issue would be classified as ...
- A. ethical
  - B. political
  - C. economic
  - D. environmental
42. ***Who owns space?*** In order to establish an answer to a question such as this, it must be discussed and reflected upon. This type of question is considered to be ...
- A. a decision
  - B. an issue
  - C. rhetorical
  - D. a solution