

2001: A Space Odyssey

Politics & Times of the Late 60's When 2001 Was Released

- 1) This movie debuted in 1968 about the same time as the first lunar landing by American astronauts _____ and _____ on July 20, _____.

- 2) This movie is based on the novel by the same name authored by _____.

- 3) Although the movie was popular and won an academy award for special effects, it was not widely understood and to some extent under-appreciated at the time.
- 4) The _____ war was raging in Southeast Asia and there were civil rights protests in the streets.
- 5) President _____, who kicked-off our space program in 1960 was assassinated in 1963 as was his brother, _____, in June, 1968—the night he won the California Primary Election for President. _____, a lifelong, successful, and powerful politician took over as president in November, 1963.
- 6) Likewise, civil-rights leader _____ was assassinated April, 1968. Indeed these were tumultuous, difficult and troubling times.
- 7) The movie opens up with a scene with some apes around a water hole. Why do the apes make all the loud yelling sounds as the other pack of apes approach?

- 8) How does the scene by the water hole that depict the ape(s) exerting dominance by jumping up and down and making loud noises relate to present-day mankind?

Note:

[Stanley Kubrick's *2001: A Space Odyssey* opens with a scene in which we learn that humankind's ape-like hominid ancestors develop the stunning intellectual characteristics of a human species only after they come in contact with a weird alien "monolith".]

- 9) List three things that differentiate man from other primates?
 - a)
 - b)
 - c)
- 10) What is the only species to wage organized war on itself besides Homo Sapiens?

- 11) What is the significance of the ape pounding the skeleton with the bone? What does the bone represent? Hint: The answer is *not* weapons.

12) What present-day space vehicle does the docking rocket from earth going to the space station in the movie look remarkably similar to?

13) Why did the space ship (shuttle) from earth dock in the center of the space station?

14) Because the scenes in 2001 are so long and visual, there is plenty of time to measure it's rotation rate. We see it move through a quarter of a cycle in about 15 seconds, which gives it a period of 60 seconds for one complete revolution. Assuming that the space station is designed to simulate "g" on Earth (9.8 m/s^2), then we can easily calculate what the radius of the station must be.

- a. Why was the space station round and *rotating*?
- b. What purpose does the rotation of the space station serve?
- c. Calculate the radius of the station:

Note: Centripetal Force = $F = \frac{mv^2}{r}$ since $v = \omega r$ where ω = rotational rate in rad/s, then

$$F = m \omega^2 r = mg \quad \text{therefore, } r = \frac{g}{\omega^2} \quad \text{Use } \omega = \frac{2\pi \text{ rad}}{60 \text{ sec}} = 0.1 \text{ rad/sec}$$

- d. How many football fields is this?
- e. Once they get this huge space ship rotating, will it take any more fuel to keep it rotating? Why?

15) The space station currently being built by the US and other countries in space is *not* round and *not* rotating. Why?

16) Why did Kubrick use the Blue Danube Waltz by Richard Strauss for this scene?

17) Who was the first to advocate broadcasting TV from satellites in geosynchronous orbits in space in 1945?

[Note: According to the movie: In the year 1999, another “monolith” is discovered on the surface of the moon. A manned mission to Jupiter occurs in the year 2001 to search for the source of these irritating plinths. Unfortunately, Hal, the ship’s computer, has psychological problems and kills all of the crew except Dave, who is able to disconnect Hal before it’s too late.]

- 18) What famous computer firm do the letters HAL in HAL-9000 suggest?
- 19) Interestingly, Kubrick was criticized for making the spaceship *Discovery* on its voyage to Jupiter un-streamlined and not aerodynamic. Was criticism valid? Why or why not?
- 20) Why did HAL pick the antenna part to fail?
- 21) Putting astronauts in a state of “suspended animation” (in the deep freeze) makes sense because of conservation of resources. However, why were the astronauts put into this state several months *before* the launch?
- 22) How are the hallways of the space station depicted in the movie different than those here on earth?
- 23) On the way to the moon, the space (flight) attendant appears to walk in a circle upside down. How do you suppose the director, Kubrick, achieved this special effect?
- 24) Why was the discovery of the obelisk on the moon was kept top-secret?
- 25) The movie depicts space ships moving at slow speeds not far above the moon’s surface compared to earth. Is this realistic? Cite two reasons why this is so.
 - a.
 - b.

26) The second time that artificial gravity plays a leading role in 2001 is in scene 12. At this point in the film an interplanetary ship is heading toward Jupiter where apparently there are some monoliths floating around waiting to whisk Dave off to another galaxy in the space-time continuum. Appropriately, the living/working section of the spaceship is a large circular ring that rotates in order to simulate gravity. Here we have another instance of Newton's 2nd law, centripetal force, and artificial gravity as it was meant to be portrayed: as Dave jogs around the perimeter of the ship, he passes equipment on the "floor" that, half a lap later, is on the "ceiling". However, the size of the circular "room" is much smaller than the giant space station in #14, therefore the rotation rate must be quite a bit faster. Let's calculate the rotation rate that we need to produce one "g" of centripetal acceleration.

- a. Examining the scene, it looks like the radius of the circle is between 15 to 20 meters. Using $r = 20$ m, calculate the angular (rotational) speed " ω " needed to achieve an acceleration of g .

$$\text{Use: } mg = m\omega^2 r$$

- b. How many seconds will it take to make 1 rotation? Note: 2π radians = 1 rotation.

27) There are excellent portrayals of Newton's first law. In scene 22 the concepts of the first law, frames of reference, and relative velocity are illustrated brilliantly. In this scene, Hal's psychosis has started to manifest itself. Dave and Frank are getting worried about his erratic behavior. Fearing he will be shut down, Hal decides to fix the problem by murdering the entire crew. First he cuts off the life support to the three crew members in suspended animation. Then, when Frank has gone outside the ship to finish a repair, What does Hal do to Frank?

- a. While the astronauts are working outside the spaceship *Discovery* to retrieve the antenna part, why does the movie make the astronauts breathing so loud? Is this realistic? Why?
- b. Dave takes a second pod to rescue Frank and moves away from the ship at a high velocity. In the ship's frame of reference the ship is stationary and Dave and the pod are in motion. However, as he approaches Frank we see the scene from Dave's frame of reference, and it is Frank that we see moving at a high velocity towards Dave. How do all frames of reference moving at constant velocity compare?
- c. If you are in a constant velocity, or an "inertial" frame, you observe yourself to be at rest, with other objects in motion relative to you. Is there an experiment that you could do in an inertial frame of reference to show that you are "in motion"?
[Unfortunately, by the time Dave returns to the ship, Frank's air supply is long gone, and Hal refuses to let the pod back into the ship. Dave is forced to cut Frank loose, find a way to get back inside the ship, and get Hal offline.
- d. In his haste to retrieve his fellow astronaut, Dave makes a big mistake using the pod. What did Dave forget to do?
- e. Naturally, there's an emergency airlock that can be opened from outside. To use the airlock he must first exit the pod into the vacuum of outer space. His exposed head will be subjected to the vacuum of outer space before he can enter, close the door, and pressurize the airlock. Dave uses the pod's claw and opens the emergency airlock anyway. He then lines up the pod's door with the airlock, holds his breath, and blows the door's bolts. Why would holding

his breath be a huge mistake? (Note: Scuba divers are always instructed to never hold their breath while descending]

- f. After blowing off the door, Dave shoots into the airlock, presumably propelled by air pressure escaping from the pod. He bounces around and almost immediately closes the airlock door. He survives, and Hal is now at his mercy. When the door, Dave, and the air were expelled out the back of the pod, should the pod have gone flying the other direction into space? Why?
- 28) Does the scene mentioned in #27, illustrate that there is no sound transmitted in space. Why?
- 29) Are there radio waves transmitted in space? Why?
- 30) After retrieving Frank, Dave has a confrontation with HAL who won't let him back into the spaceship. This is one of the most famous scenes in all of cinema—particularly science fiction genre. What does HAL do?
- 31) What is Dave's solution? Is this scene realistic?
- 32) Name two themes of the movie.
- a)
 - b)
- 33) The third section of the film, "Jupiter and Beyond the Infinite," reveals humanity's evolution beyond the industrial (or space) age. It relies upon shifting, juxtaposed and sequential images of Jupiter, its moons, and starfield, Discovery, a huge black monolith floating in space near Jupiter, and strange bands of light, which finally collapse into the image of an empty room furnished in Victorian style. An EVA pod from the ship appears in the room, the Dave in his spacesuit. Dave ages, and camera transmits several rooms, all empty. After a couple more images of Dave aging, he appears in bed, ancient, bald, and gaunt, breathing harshly. Suddenly he raises a hand, points toward a black monolith at the foot of the bed, and his breathing ceases. The film continues with the image of a fetus, obviously human, but with larger eyes and head, floating in space. The images shift from the fetus to the monolith to a view of Earth from space to a starfield, and finally to the fetus among the stars, gazing open eyed toward the globe of Earth. As the first monolith assisted ape-beings to evolve into space-going humanity, the monolith on the Moon assisted space-going humanity to travel into the farther reaches of the solar system, and the final monolith completes the evolution of humanity into the star-child, ready to take it's place in the wider universe. Does the monolith symbolize anything from our current history of mankind aside from this Science fiction story? (Hint: The monolith is a teacher)
- Free Response.** Would the discovery of intelligent life forms (i.e., more intelligent than man) elsewhere in the universe alter or change you belief systems (religion)? Why or why not?

