

1. **DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO.**
2. Write the multiple-choice answers on your Scantron form.
3. Make sure to mark your test form, name, and UIN on your form. I do not need your social security number.
4. Answer *ALL* of the questions. There is no penalty for guessing.
5. Don't get stalled on any one question.
6. Choose the **best** answer for each problem.

DO NOT FORGET TO FILL IN "TEST FORM" A

Final Exam: Version A

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Which of the following is a good fact to use when estimating f_p ?
 - A) All planets found to date are bigger than Jupiter.
 - B) Extrasolar planet searches have never detected a single Earth-like planet yet.
 - C) Circumstellar disks are common.
 - D) The mass of the star.
 - E) The location of the Habitable Zone depends on the mass of the star.
- 2) A typical known exoplanet is as massive as or more massive than Jupiter and unEarth-like because
 - A) theory suggests that the majority of planets should be Jupiter-like
 - B) we just haven't observed enough stars yet.
 - C) most stars do not have a Habitable Zone where Earth-like planets can form.
 - D) theory suggests that planets with one Earth mass are exceedingly rare.
 - E) the available search techniques are relatively insensitive to detecting Earth-like planets.
- 3) Which of the following is evidence of Dark Energy?
 - A) The weight of the Universe.
 - B) The Universe is expanding.
 - C) Dark Matter, since $E = mc^2$.
 - D) CMB measurements that show we live in an open Universe.
 - E) The Universe expansion is accelerating.
- 4) Why is carbon important to life?
 - A) It's the only element with 4 bonding sites.
 - B) It's a solvent.
 - C) It's an amino acid.
 - D) It's a polymer.
 - E) It's electronic structure allows long molecular chains.
- 5) Which of the following is **NOT** evidence of the Big Bang?
 - A) Hubble's Law.
 - B) Cosmic microwave background.
 - C) Big Bang Nucleosynthesis.
 - D) Inflation of the Early Universe.
- 6) Nearly all galaxies are moving away from our Galaxy. What does this mean?
 - A) No one wants to play with us
 - B) All particles are repelling each other.
 - C) We are actually the only moving galaxy
 - D) We are the center of the Universe
 - E) The Universe is expanding.
- 7) A star, during its main sequence, does not collapse in on itself, nor does it explode violently. Why?
 - A) Law of internal pressures.
 - B) Hydrostatic equilibrium.
 - C) Electromagnetic repulsion.
 - D) Newton's second law.
 - E) Fermi exclusion principle.

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- 8) "We are star stuff" means
- A) that the orbits of stars determine our lives.
 - B) that we are made-up of elements mostly forged inside stars.
 - C) that we are made out of the same stuff as stars and the same proportions.
 - D) that panspermia is the most likely answer for life.
 - E) that we are doomed to die when our star dies.
- 9) Which statement about stellar evolution is the most correct?
- A) When a star arrives on the main sequence it is fusing He into Carbon.
 - B) Very massive stars use up their fuel slowly.
 - C) Very massive stars end their lives as red giants.
 - D) Most of the heavy elements on Earth were produced by the death of low-mass stars.
 - E) Iron is the last element to be produced by fusion, after that stars must collapse.
- 10) Although there is no proof of ET life, it can be said that
- A) only a very small number of people think that aliens are a possibility in the Universe.
 - B) about 50% of the US population believes in aliens.
 - C) cows are scared.
 - D) aliens walk amongst us.
 - E) everyone feels a deep connection with the night sky, suggesting that we are from space.
- 11) In class, we did not discuss life on planets around the first stars because
- A) life could never exist on the cold, rocky planets surrounding them.
 - B) the first stars didn't live long enough for life to evolve on the rocky planets surrounding them.
 - C) life could never exist on the hot, rocky planets surrounding them.
 - D) it is impossible for life to exist at that time.
 - E) the planets would have been gas giants containing only helium.
- 12) Which of these statements is true?
- A) The early Universe had a defined center.
 - B) The early Universe was cooler than today.
 - C) The early Universe had a distinct edge.
 - D) The early Universe was mostly energy.
 - E) The early Universe was less dense than today.
- 13) The seeds of Galaxies were due to?
- A) We don't yet know.
 - B) Large super structures in the early Universe.
 - C) Nuclear strong force fields.
 - D) Gravitational instabilities in the fabric of space-time.
 - E) Quantum fluctuations in quark density.
- 14) About 1 millisecond after the Big Bang, why did elementary particles, such as quarks, begin to form more complex particles?
- A) The First Stars forged them due to hydrostatic equilibrium.
 - B) The Universe cooled, which allowed them to coalesce.
 - C) Dark Energy.
 - D) Intense heat and pressure forced them together.
 - E) The Cosmic Microwave Background radiation forced them together.

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- 15) If a dust cloud that is collapsing has any rotation at all, it will form a
- A) star that is not in hydrostatic equilibrium.
 - B) planetary nebula.
 - C) protoplanetary or circumstellar disk.
 - D) star without planets.
 - E) planetary systems with rings.
- 16) An interesting aspect (from the point of view of this class) of molecules in space is that
- A) we can find molecules containing HONC nearly everywhere.
 - B) Trick question. Molecules are not ET life.
 - C) we can find molecules with greater than 50 atoms.
 - D) life in space could be a large molecular cloud.
 - E) molecules are used for life and used by molecular clouds.
- 17) Which of the following forces is responsible for holding atomic nuclei together?
- A) electromagnetism
 - B) dark energy
 - C) gravity
 - D) strong nuclear
 - E) weak nuclear
- 18) Which of the following is not a biological attribute for life?
- A) Engaged in metabolism– exchange of matter and energy.
 - B) Obtain energy for metabolism from the Sun (directly or indirectly).
 - C) Comprised of organic molecules
 - D) Engage in reproduction– sex in space!
 - E) Able to mutate- offspring are not always identical to parents.
- 19) If the Sun were the size of a softball, the nearest star would be in
- A) north Prospect avenue.
 - B) Venus.
 - C) Colorado.
 - D) California.
 - E) the student Union.
- 20) Which of the following does **NOT** well describe the very early Earth?
- A) The surface kept getting hit by really, really big rocks.
 - B) No chance of life at this stage.
 - C) So hot that the surface was molten rock.
 - D) The oxygen rich atmosphere caused quick oxidation (rusting) of iron-rich rocks.
 - E) There was no water.
- 21) What was the order of appearance in the Universe of the 4 most important elements of life?
- A) HNC
 - B) HONC
 - C) H_2O , N, CO_2 , O
 - D) HCON
 - E) COHC

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- 22) The rise of mammals, and eventually humans, is now attributed to
- A) a specific niche for tree dwellers.
 - B) a mass extinction event about 65 Myrs ago.
 - C) their superior fighting ability.
 - D) their ability to eat a variety of foods.
 - E) their superior intelligence.
- 23) What do we mean by polymer synthesis?
- A) How to build polymers of carbon.
 - B) How clay layers might have been the first type of lifeform, pre-biotic.
 - C) How the first polymers were created from the first monomers on the early Earth.
 - D) How to create amino acids out of the first proteins.
 - E) How the hot vents may have arranged for amino acid formation in a hot environment.
- 24) What is the Chicken and Egg problem discussed in class?
- A) Nucleic acids need proteins to create proteins.
 - B) The fossil record does not determine if a chicken was hatched from an egg or if a chicken laid an egg first.
 - C) Proteins need nucleic acids to create enzymes.
 - D) The domestication of chickens solved the nutrition problem of early farmers.
 - E) Enzymes need nucleic acids to create nucleic acids.
- 25) What was the key for intelligence to evolve on Earth?
- A) It is the peak of evolution.
 - B) Warfare and conflict.
 - C) Impacts of Mass Extinction.
 - D) Trees.
 - E) Genetic diversity of life.
- 26) Overall, the evolution of H. Sapiens was
- A) probably initiated by aliens.
 - B) a smooth and direct path.
 - C) an awkward path of evolution with many surprises.
 - D) simple and inevitable, after the extinction of the dinosaurs.
 - E) depended only upon the local environment in Africa.
- 27) The most likely path for life on Earth was
- A) Life first started as a nucleic acid (DNA world).
 - B) Life first started as a protein world.
 - C) Life first started as a nucleic acid (RNA world).
 - D) Life first started as an amino acid world
 - E) Life just arose with nucleic acid and proteins working together (protolife).
- 28) Which of the following is **not** a monomer of life?
- A) base
 - B) amino acid
 - C) sugar
 - D) enzyme
 - E) phosphate

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- 29) Which of the following did we **not** discuss as alternative exotic life forms?
- A) Horta life-- life that uses silicon instead of carbon.
 - B) Dragon's Egg-- life that lives on a neutron star, using the nuclear strong force.
 - C) Galaxy Life-- life that uses stars as the monomers of life.
 - D) Flying Spaghetti Monster-- life that uses long strands of carbohydrates instead of proteins
 - E) The black cloud-- a molecular cloud life form.
- 30) Which of the following is **not** considered an option for how life may have begun on Earth?
- A) Complex chemical reactions of organic molecules in "primordial soup".
 - B) Complex chemical reactions in the circumstellar disk that surrounded the young Sun.
 - C) Chemical reactions powered by lightning.
 - D) Formation of life deep inside the rock.
 - E) Panspermia.
- 31) Which moon is thought to have a possibility for life around hot vents from tidal interactions.
- A) Our Moon
 - B) Titan
 - C) Phoebe
 - D) Io
 - E) Europa
- 32) Where does the carbon-14 in your body come from?
- A) your mother
 - B) plants
 - C) outer space
 - D) you breathe it in
 - E) your father
- 33) Which of the following was a result of Earth becoming oxygen-rich, atmospherically speaking?
- A) Lifeforms evolve into less complex creatures.
 - B) Lifeforms could evolve with non-aerobic metabolism for the first time.
 - C) The ozone layer formed.
 - D) Rust played a role in evolution.
 - E) A mass extinction was avoided.
- 34) Which of the following is **not** important when considering f_g ?
- A) Fraction of wide binary systems.
 - B) Fraction of stars that are young (not on the main sequence).
 - C) Fraction of stars with Jupiter-like planets.
 - D) Fraction of stars that are metal rich.
 - E) Fraction of stars that have masses less than 1.25 solar masses.
- 35) You are in Antarctica looking for microbes 1km under the ice. You are looking for
- A) archaea.
 - B) extremophiles.
 - C) iceophiles
 - D) the first life on Earth.
 - E) Martian meteorites.

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- 36) After the period of bombardment of the early solar system ceased,
- A) the proto-Earth was hit by a Mars-sized object, which created the Moon.
 - B) the nearby supernova finally became a neutron star.
 - C) life arose very quickly.
 - D) oxygen was present in the Earth's atmosphere for the first time.
 - E) the Sun reached the main sequence.
- 37) DNA orchestrates the process of life by
- A) the direct production of amino acids.
 - B) the transcription of proteins by the order of the nitrogenous base pairs.
 - C) the direct production of proteins.
 - D) assisting in cell fusion.
 - E) using the codon report.
- 38) Is it likely that we will encounter ETs that look like us?
- A) Of course, aliens must perform similar functions.
 - B) Like many things in this class, we don't know.
 - C) It is nearly impossible that ETs will follow an evolutionary path similar to ours.
 - D) The conclusion of this class is that there can not be any ETs.
 - E) It is likely. Recent studies suggest that the human form is probably the preferred evolutionary path.
- 39) The early Earth had no oxygen. Where did it all come from?
- A) With a reducing atmosphere, UV radiation could react with the early Earth chemistry, creating oxygen.
 - B) Cyanobacteria created it as a by-product.
 - C) The oxygen was frozen at the poles, which eventually evaporated into the atmosphere every summer.
 - D) Probably an oxygen-rich comet collided with the Earth.
 - E) The oxygen in the soil was released by plate tectonics.
- 40) Sex in space, or on Earth, is important because
- A) it allows the genetic material of the better organisms to survive.
 - B) sex, although fun, also stimulates gene mutations.
 - C) it is the only way for life to replicate.
 - D) it leads to an increase of positive mutations in the offspring.
 - E) mutations best occur after sexual reproduction.
- 41) DNA uses 4 possible bases in combinations of three to encode an amino acid because
- A) there are only 3 amino acids in a typical protein.
 - B) three is more stable than two or four, so evolution chose it.
 - C) three is the general chain of carbohydrate groups to make lipids.
 - D) three bases in a row allow one to encode up to 64 amino acids; two bases would only allow 16 amino acids.
 - E) three is the nearest integer to pi.
- 42) Imagine that we receive our first ET visitor, and they can eat our food with no side effects. What can we learn from this?
- A) Nothing.
 - B) McDonalds is the one true universal constant, or soon will be.
 - C) Maybe the chirality of life is universal.
 - D) That food is the same no matter where you are in the Universe.
 - E) Increases the likelihood of interstellar panspermia being true.

Final Exam: Version A

- 43) What is a Dyson Sphere?
- A) A large spherical protein.
 - B) A technique to move comets away from the Earth using a large spherical asteroid.
 - C) A large fusion reactor that could be our ticket to free energy.
 - D) A large space mirror that could melt the Martian polar caps.
 - E) A space structure that collects sunlight and beams the power to Earth.
- 44) The main problem with an Earth centered Solar System is the unexpected motions of the planets. The problem was solved by
- A) allowing the planets to move on orbits on orbits.
 - B) elliptical orbits.
 - C) perfectly circular orbits.
 - D) Galileo and the telescope.
 - E) moving the Earth off the center a little bit.
- 45) Our Drake Equation result was 39,700, this number
- A) can only be off by the square root.
 - B) makes many assumptions about how aliens will arrive here.
 - C) is probably very close to the correct answer, but we may never know.
 - D) although interesting, is still a fake result in some ways.
 - E) well constrains the number of alien civilizations within 100 light years to around 100.
- 46) Today, what can we say about ET visitations?
- A) Some objects in ancient or old paintings are best understood as ET visitations, although it does not prove it.
 - B) We have no reliable evidence to support actual ET visits to Earth.
 - C) They must have been here already.
 - D) Many of the world's ancient, large-scale monuments, i.e. pyramids, Nazca lines, can best be described as inspired by ancient visitors.
 - E) Although most UFO sighting are hoaxed or misidentification, some of them must be right.
- 47) In class, we tried to decode the Frank Drake radio signal, we found
- A) that the code is very difficult, if not impossible, to decode.
 - B) by using simple binary code, we can probably communicate with aliens.
 - C) that once you realize to put it into a 23 x 73 square, it is easy to decode.
 - D) that once you realize it is an artificial signal, it is easy to reconstruct using a correlation between the zero and one transmission rate.
 - E) that the frequency of the message may be the most important aspect of the transmission.
- 48) In class, we used the term "Copernican Revolution" generally to mean
- A) that the Sun is the center of the Solar System.
 - B) that we are not the center of the Universe.
 - C) a change in the way that humankind thinks of themselves.
 - D) that we are not alone.
 - E) that the Earth is the center of the Solar System.

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- 49) Assume that you have a Drake equation result and you want to estimate the distance to the nearest alien civilization, does it depend on the number of civilizations that you estimated?
- A) Yes, for large numbers of civilizations one can use a spherical search, but for small numbers, one must take into account the density of stars in the local neighborhood.
 - B) It can not be done. The Galaxy is too irregular.
 - C) No, the nearest neighbor will always be in the plane of the Galaxy, so a cylindrical search must be used.
 - D) Yes, if the number of civilizations is large, then one uses a spherical search, and if the number of civilizations is small, then one uses a cylindrical search.
 - E) No, for this basic calculation, we assume a spherical Universe to make it do-able. This is astronomy after all.
- 50) What is happening to our leakage signals?
- A) As the internet is mostly through cables, it is decreasing.
 - B) As computers use more WIFI, it is increasing.
 - C) Due to two wars, the military radar signals have dramatically increased,
 - D) As we depend more on cell phones, 3G networks, etc., it is increasing.
 - E) As we move to fiber optics, microwave links, etc. it is decreasing.
- 51) What was the Condon report?
- A) A description of the first SETI experiment.
 - B) A scientific study of UFOs that concluded that further scientific study was not necessary.
 - C) A discussion about viable spacecraft for the Mars mission.
 - D) The report investigating the famous "Wow" signal.
 - E) A panel that oversees all UFO sightings.
- 52) Which one of these is **not** useful in determining L?
- A) Technological civilization collapses.
 - B) Catastrophe! Nuclear war or various natural problems.
 - C) Communication efforts stop. Bored with lack of success or funding issues.
 - D) Civilization evolves away from interest or capability.
 - E) The rise and fall of civilizations.
- 53) What was the importance of the supernova in 1054?
- A) It showed the link between distance and brightness.
 - B) It was not important, as it was not close enough to damage the ozone layer.
 - C) It allowed astronomers to estimate the frequency of supernova in our Galaxy.
 - D) It proved that x-rays were light.
 - E) It demonstrated the power of an incorrect worldview.
- 54) Galactic colonization
- A) will spark conflicts between colonies.
 - B) requires 90% the speed of light travel.
 - C) can never happen, as interstellar travel is impossible.
 - D) should happen much faster than the evolution of intelligence.
 - E) is the summit of evolution.
- 55) Jocelyn Bell noticed a regularly repeating radio signal, which was first dubbed as LGM (Little Green Men), but was actually
- A) blackholes feeding.
 - B) white dwarfs spinning rapidly.
 - C) We still don't know. It was a signal that lasted for exactly 72 seconds.
 - D) pulsars.
 - E) it allows the genetic material of the better organisms to survive

Final Exam: Version A

- 56) What is the most efficient way to get energy from mass for space travel?
- A) Fusion it.
 - B) Chemically burn it.
 - C) Expel it with magnetic fields.
 - D) Annihilate it.
 - E) Fission it
- 57) Which of the following does **not** make a radio telescope more sensitive?
- A) increasing the voltage
 - B) increasing the size
 - C) increasing the bandwidth
 - D) increasing the observing time
 - E) increasing the number of antenna
- 58) What cultural breakthrough sparked humankind's cultural evolution?
- A) writing
 - B) agriculture
 - C) inventions like the wheel
 - D) language
 - E) telescopes
- 59) Although an asteroid can cause significant damage,
- A) its orbit can be modified at the last minute with the right spacecraft interaction.
 - B) its orbit can be modified with enough warning.
 - C) it's made from ice, so it can be blasted into water with enough applied heat.
 - D) it would easily be destroyed by a nuclear warhead.
 - E) the atmosphere of Earth deflects all asteroids bigger than 5 meters in size.
- 60) In about 1-2 billion years, the Sun
- A) will move into the interstellar void.
 - B) will evolve on the main sequence, getting hotter, and boiling away the oceans.
 - C) will evolve getting larger in size, but cooling off, making no real difference in the amount of light we receive from the Sun.
 - D) will be more or less the same as it is now, with only a small change in brightness and temperature, not really affecting the Earth, but frying all of our satellites.
 - E) will begin to turn into a red giant.
- 61) If you watch Mars every night over long periods, it will sometimes
- A) display odd motions, rising in the West.
 - B) display retrograde motion,
 - C) rotate backwards.
 - D) orbit backwards around the Sun.
 - E) be impossible to see without a telescope.
- 62) What rocket quantity is **not** important for understanding its capability?
- A) The mass ratio.
 - B) The thrust.
 - C) The velocity of the exhaust.
 - D) The specific impulse.
 - E) The escape velocity of Earth.

Final Exam: Version A

- 63) Which of the following frequency of light is probably best to communicate with ETs?
- A) 1.4 GHz
 - B) 1.4 KHz
 - C) 1.4 Hz
 - D) 1.4 MHz.
 - E) Lasers
- 64) If humankind can survive the death of our Sun, in trillions of years
- A) the Big Rip will kill the Universe.
 - B) asteroids will still be our most dangerous threat.
 - C) we will figure out how to make new stars with all the left over hydrogen from our Sun.
 - D) all the stars in our Galaxy will burn out, leaving only dead stars.
 - E) we will turn into disembodied forms.
- 65) Although sometimes mentioned as our best evidence of a SETI detection,
- A) the Wow signal was probably a hoax.
 - B) the Wow signal was not really that significant.
 - C) the Wow signal was only detected twice.
 - D) the Wow signal practically proves a high number for the Drake Equation.
 - E) the Arecibo message detection was not encoded, so likely just an astronomy signal from some physical process we don't understand.
- 66) Which of the following is **not** a problem of interstellar travel?
- A) The speed limit.
 - B) Time.
 - C) Polarization
 - D) Space is freaky big.
 - E) Cost.
- 67) In 1974, Frank Drake sent a message towards the globular cluster M13, this message was created by
- A) recording information on a gold record and shot into space.
 - B) encoding information in a laser beam.
 - C) periodically changing the signal frequency (frequency modulation).
 - D) video encoding the message (like TV) and sending it with the Arecibo radio telescope.
 - E) pulsing a radio signal on/off (amplitude modulation).
- 68) Which choice would seem most likely to have life of human intelligence or better?
- A) A planet near a recently exploded supernova.
 - B) A planet in a wide binary star system.
 - C) A newly formed planet within the habitable zone of its star.
 - D) A large temperate moon without an atmosphere.
 - E) A planet orbiting a star near the center of our Galaxy.
- 69) Which of the following is **not** important for the determination of f_c ?
- A) Cultural evolution.
 - B) Worldview.
 - C) The internet.
 - D) Development of technology.
 - E) The evolution of hominids.

Final Exam: Version A

- 70) In 5 billion years, the Sun
- A) will begin to turn into a red giant.
 - B) will be dead.
 - C) will turn into a planetary nebula.
 - D) no longer be fusing.
 - E) will be a white dwarf.
- 71) The Fermi Paradox
- A) is not really a paradox at all, but rather a discussion on nuclear space travel.
 - B) argues that all lifeforms should have evolved around the same time.
 - C) argues against ET life based on the Drake equation.
 - D) argues that interstellar travel can never be accomplished by humans; we need bio-mechanical lifeforms.
 - E) argues that we should have been visited already.
- 72) Who "visited" class during the discussion of communication.
- A) Karl Jansky (The Father of Radio Astronomy)
 - B) Frank Drake (The Father of the Drake Equation)
 - C) Albert Einstein (The Father of the Photoelectric Effect)
 - D) Grote Weber (The Father of Radio Astronomy)
 - E) Carl Sagan (The Father of ET research and author of the book Contact)
- 73) What was the main result of this class?
- A) UFOs containing aliens have never landed on Earth.
 - B) ET intelligent life is possible based on scientific facts and guesses, but we do not really know.
 - C) Space is freaky big, so full of advanced civilizations.
 - D) Even if humans are alone in the Galaxy, we will probably colonize the Galaxy.
 - E) There are nearly 40,000 advanced civilizations in our Galaxy.
- 74) Which of the following proved a heliocentric worldview?
- A) The phases of Mars.
 - B) The higher accuracy of Mars' orbits.
 - C) The verification of the time it takes light to travel from one of Jupiter's moon to Earth.
 - D) The phases of Venus.
 - E) The motion of Mars.
- 75) Language is an example of
- A) extrasomatic storage.
 - B) how cultures are affected by others.
 - C) the FOXP2 gene.
 - D) culture.
 - E) biological evolution
- 76) In 50 years, you board a spaceship to travel to the nearest star system at 90% the speed of light. After a week, you realize you didn't pack enough underwear, so return back to Earth (taking another week). You find
- A) that you have entered a parallel Universe.
 - B) that the Earth has shrunk to the size of the Moon,
 - C) that less than 1 week has passed on Earth.
 - D) that over 30,000 years has passed on Earth.
 - E) that over a month has passed on Earth.

Final Exam: Version A

- 77) The main effect of a nearby supernova would be
- A) Two words: Total Destruction.
 - B) The disruption of the Earth's magnetic field.
 - C) The destruction of the Moon.
 - D) The disruption of the Sun's fusion cycle.
 - E) The destruction of the ozone layer.
- 78) In many ancient civilizations,
- A) aliens likely visited and made glorious structures.
 - B) the astronomy was advanced, but agriculture was failing.
 - C) the astronomy was advanced, but with an incorrect worldview.
 - D) language was never invented.
 - E) the astronomy was advanced, and the magic was advanced too.
- 79) The fastest spacecraft we could build today for interstellar travel
- A) would be similar to Project ICAN (antimatter drive).
 - B) would be similar to Project Daedalus (nuclear fusion powered).
 - C) would be similar to the Shuttle (chemical drive).
 - D) would be similar to Project DS1 (ion drive).
 - E) would be similar to Project Orion (nuclear fission powered).
- 80) For telescopes, the bigger the radio telescope
- A) the smaller the field of view.
 - B) the larger the field of view
 - C) the larger frequency range it can cover.
 - D) the less sensitive.
 - E) the lighter it is.
- 81) Which of the following is **not** a problem in our communication haystack?
- A) When to look.
 - B) Who to call first.
 - C) What frequency to use.
 - D) Where to look.
 - E) What channel size to use.
- 82) If we expect alien civilizations to be few, but transmitting bright, strong radio signals, then we should look for extraterrestrial intelligence using
- A) lasers.
 - B) a radio telescope, but size is not important.
 - C) a large radio telescope (~30 meter).
 - D) only radio telescopes in space or the Moon.
 - E) a small radio telescope (~10 meter).
- 83) What does a civilization **not** need to be considered able to communicate?
- A) Invent satellites and simple space travel
 - B) Create extrasomatic storage capabilities.
 - C) Accept the possibility of extraterrestrial life.
 - D) Understanding of quantum mechanics (e.g. radio/radar technology).
 - E) Development of agriculture.

Final Exam: Version A

- 84) Alien abductions have been scientifically studied by psychologists for years. In their opinion,
- A) it can be ignored.
 - B) it is well explained by a condition called sleep paralysis.
 - C) the odd surgically implanted items are unusual.
 - D) we should all wear helmets against thought-control.
 - E) there is evidence of something very unusual occurring to these people, but probably not ET related.