

ASTRO 120 -- FALL 2030

EXAM 3 - December 12, 2030

Name: _____ Section: _____

This examination is closed book. Please keep your answer sheet covered during the exam. Use a soft pencil when completing the computer answer sheet.

When you are finished, hand in your computer answer sheet AND this exam. **Be sure to put your name on both**

* In the NAME portion, enter your *last* name, a space, then your first name.

* Enter your ID number (not your SS number) in the IDENTIFICATION NUMBER boxes of the answer sheet.

* Write your Section Number in spaces K and L of the SPECIAL CODE

Friday	8:00AM	Section 01	(H. Harry)
	9:00AM	Section 02	(Ray. N. Deer)
	10:00AM	Section 03	(Ray. N. Deer)
	11:00AM	Section 04	(B. Good)
	12:10PM	Section 05	(B. Good)
	1:10PM	Section 06	(H. Harry)

Monday	8:00AM	Section 09	(Ray. N. Deer)
	9:00AM	Section 10	(C. Kane)
	10:00AM	Section 11	(C. Kane)
	11:00AM	Section 12	(H. Harry)
	12:10PM	Section 13	(H. Harry)
	1:10PM	Section 14	(B. Good)

* Fill in all circles corresponding to the letters/numbers of your name, ID number, and section.

GOOD LUCK --- and RTFQ

USEFUL FORMULAE

$$d^3/p^2 = M_s + M_p \quad M_p/M_s = d_s/d_p \quad F = GMm/d^2 \quad v_e^2 = 2 \times v_c^2 \quad 1 \text{ a.u.} = 1.5 \times 10^8 \text{ km}$$

$$\text{angle of Earth's obliquity} = 23.5 \text{ degrees} \quad \text{density} = \text{mass/volume} \quad D_{\text{Roche}} = 2.5 R_{\text{planet}}$$

$$\text{Ames, IA: latitude} = 42^\circ 2' \text{ N} \quad \text{longitude} = 93^\circ 37' \text{ W}$$

$$F_t \sim h/d^3 \quad E = m c^2 \quad N = R * \times f_p \times n_c \times f_1 \times f_1 \times f_c \times L$$

Multiple Choice: 26 questions, 3 points each. Select the *best* answer to each of the questions below. Place your answer on the computer answer sheet provided.

- 1) The approximate dimensions of the frozen nucleus of a typical comet is
 - a) 1-2 millimeters (pinhead-sized)
 - b) 1-20 km (city-sized)
 - c) 300 – 500 km (asteroid-sized)
 - d) 3000 – 5000 km (Earth-sized)
 - e) 10,000 – 20,000 km (Jupiter-sized)
- 2) The straight (and frequently blue) tail of a comet, which usually points away from the Sun is due to:
 - a) ice crystals which gleam brightly in the sunlight
 - b) dust particles which are accelerated by the "solar wind" from the Sun
 - c) charged particles (ions) which fall faster towards the Sun than the comet
 - d) charged particle (ions) which are strongly accelerated by the action of the solar wind
 - e) dust clouds emitted in straight "jets" from the cometary nucleus
- 3) How do we know that the stream beds of Mars are relatively ancient?
 - a) There are islands in them.
 - b) They all begin on the flanks of Martian volcanoes.
 - c) The water in them is frozen solid
 - d) There are impact craters on their floors.
 - e) Potholes. Lots of potholes.
- 4) Most of the planets discovered orbiting other solar-type stars have masses that are similar to that of
 - a) the Sun.
 - b) Geoff Marcy
 - c) Jupiter.
 - d) Earth.
 - e) the Moon.
- 5) Which of the following processes is *not* important in shaping planetary surfaces?
 - a) volcanism
 - b) impact cratering
 - c) photosynthesis
 - d) weathering
 - e) plate tectonics
- 6) Venus and Earth are similar in size and mass. they are sometimes called "sister planets", but they differ strikingly in their:
 - a) rotation
 - b) atmospheric surface pressure
 - c) surface temperatur
 - d) atmospheric chemical composition
 - e) all of the above
- 7) What process is responsible for starting the formation of a new star?
 - a) the collision of one or more stars
 - b) the right script at the right time and a lot of luck.
 - c) the gravitational collapse of part of a cloud of interstellar material
 - d) the collision of massive planets
 - e) the gathering of material around a black hole interstellar space

- 8) Where in the solar nebula would you expect to find planets like the Earth form, and why?
- In the outer regions, because only there can liquid water exist
 - In the inner regions, where heavy elements can condense but ices are vaporized
 - In the outer regions, because it was hotter there
 - In the inner regions, because Jupiter gobbled up most of the outer nebula
 - Nowhere; the Earth and Moon were captured by the Sun from the Oort cloud.
- 9) During fusion reactions in the Sun, the four hydrogen nuclei which are fused together are more massive than the helium nucleus that they make. What happens to the missing mass?
- It is ejected from the Sun in flare activity
 - It reappears later as neutrinos.
 - It is resupplied to the Sun by meteoroid impacts.
 - It is converted to energy.
 - It is sold as Spam.
- 10) The composition of most of the Universe is
- water
 - helium
 - hydrogen
 - carbon dioxide
 - amino acids
- 11) The most successful technique (so far) to find planets around other stars has been
- photometry of stars to look for variations caused by planets blocking some starlight
 - gravitational microlensing
 - precision spectroscopy to detect reflex orbital motion of the star caused by planets orbiting around it
 - direct infrared imaging of planets around nearby star
 - interviews with people who have been abducted by aliens
- 12) Analysis of samples returned from the Moon provided a means to estimate the ages of the surfaces of planets and satellites because the samples allowed us to determine the relationship between age and
- density of craters.
 - distance from the Sun
 - temperature.
 - color of feldspar inclusions.
 - amount of atmosphere retained
- 13) In 1999, an extrasolar planet detection was made in the same way as the others, but was then confirmed by a different technique. What technique was used to confirm it?
- precision spectroscopy detected reflex orbital motion of the star caused by the planet
 - gravitational microlensing
 - radio broadcasts were heard from an intelligent species on the planet
 - the brightness of the star dropped as the planet transited between us and the star
 - direct infrared imaging of the planet

- 14) Which pair of constellations would you *not* expect to see in the same sky at the same time?
- Ursa Major and Cassiopeia
 - Leo and Gemini
 - Orion and Sagittarius
 - Gemini and Auriga
 - Andromeda and Pegasus
- 15) Short period comets most likely are:
- long-period comets trapped in the inner solar system by a chance "close encounter" with a major planet, such as Jupiter or Saturn
 - giant potatoes placed in the inner solar system by Aliens in a far-off time
 - asteroid miss-classified as comets
 - comets which formed in the inner solar system and are very different in nature from their long period cousin
 - rock objects similar in nature to Jupiter's moon Io
- 16) According to fossil evidence, how long ago did the first life forms develop on Earth?
- 5000 years ago
 - 1 million years ago
 - 3.5 million years ago
 - 1 billion years ago
 - 3.5 billion years ago
- 17) The solar system
- reached more or less its present form in just more than one billion years
 - took several billion years to form
 - formed about 5 million years ago.
 - formed in much less than one billion years
 - underwent several intervals of planet formation separated by billions of years.
- 18) A total lunar eclipse occurs when
- the Moon passes into the penumbral shadow of the Earth
 - the Earth passes into the penumbral shadow of the Moon
 - the Earth passes into the umbral shadow of the Moon
 - the Moon passes into the umbral shadow of the Earth
 - the small shadow of the Earth passes over the Moon's surface, creating a small disk of darkness which moves across the moon. Anyone in the path of the dark spot will see a total lunar eclipse.
- 19) Which of the following is the *least* important clue about the formation of the planets?
- all orbits are clockwise
 - the outer planets have rings
 - all orbits are nearly in the same plane
 - the inner planets are rocky, but the outer planets are gassy or icy
 - the orbits of the planets are nearly circular
- 20) Approximately how old are the oldest of the lunar samples returned to Earth by the Apollo astronauts?
- 5,798 years
 - 4.6 billion years
 - 460 million years
 - 46 million years
 - 4.6 million years

- 21) The occurrence of seasons on the Earth results from
- the Earth changing its rotation rate during the year.
 - the Earth's axis pointing in different directions during the year.
 - the Earth being closer to the Sun in summer.
 - the Earth's axis being inclined to the ecliptic.
 - the appearance of Sirius rising above the Nile.
- 22) During this past few years, several news events concerned Astro 120 topics. Which of the following events did we not discuss in lecture?
- a small asteroid that exploded in our atmosphere this year
 - global warming of the Earth by the greenhouse effect accelerated by human activity
 - new close-up images of the planet Mercury
 - the actual detection of an Mars-like planet orbiting another star
 - all of the above were discussed in lecture this term
- 23) Astrology and astronomy
- can both make you incredibly rich
 - differ in that astrology is a testable science that is applied to people, not stars
 - differ in that astronomy is a true science, but astrology is a belief system that has failed all rigorous tests
 - differ in that astrology is not based on physical theory, but has been proven by rigorous tests to work
 - are pretty much the same thing
- 24) Why is Pluto not considered a Jovian planet?
- Its mass and radius are so small, and it lacks the thick atmosphere of hydrogen seen on the other Jovian planets
 - It is so far out in the solar system.
 - Its interior is mostly rock and iron.
 - It is definitely not even a planet
 - It is not really orbiting the Sun, but is simply drifting through the solar system.
- 25) Why do sunspots appear dark?
- They are transparent and let us see deeper, darker layers
 - They are cooler than their surroundings
 - They emit no light
 - Sunspots? The Sun never has any spots!
 - They are shadows.
- 26) Approximately how often is the Earth struck by an asteroid large enough to cause mass extinctions?
- every 1 to 5 billion years
 - every 10 to 100 million years
 - every 10 to 100 thousand years
 - every 1 to 10 thousand years
 - every Thursday