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

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

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

Ames, IA: latitude = 42° 2' N   longitude = 93° 37' W

$$F_t \sim h/d^3 \qquad E = m c^2 \qquad N = R_* \times f_p \times n_e \times f_l \times f_i \times f_c \times L$$

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?
   a) In the outer regions, because only there can liquid water exist
   b)) In the inner regions, where heavy elements can condense but ices are vaporized
   c) In the outer regions, because it was hotter there
   d) In the inner regions, because Jupiter gobbled up most of the outer nebula
   e) 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?
   a) It is ejected from the Sun in flare activity
   b) It reappears later as neutrinos.
   c) It is resupplied to the Sun by meteoroid impacts.
   d) It is converted to energy.
   e) It is sold as Spam.

10) The composition of most of the Universe is
   a) water
   b) helium
   c) hydrogen
   d) carbon dioxide
   e) amino acids

11) The most successful technique (so far) to find planets around other stars has been
   a) photometry of stars to look for variations caused by planets blocking some starlight
   b) gravitational microlensing
   c) precision spectroscopy to detect reflex orbital motion of the star caused by planets orbiting
        around it
   d) direct infrared imaging of planets around nearby star
   e) 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
   a) density of craters.
   b) distance from the Sun
   c) temperature.
   d) color of feldspar inclusions.
   e) 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 <u>confirm</u> it?
   a) precision spectroscopy detected reflex orbital motion of the star caused by the planet
   b) gravitational microlensing
   c) radio broadcasts were heard from an intelligent species on the planet
   d) the brightness of the star dropped as the planet transited between us and the star
   e) 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?
   a) Ursa Major and Cassiopeia
   b) Leo and Gemini
   c) Orion and Sagittarius
   d) Gemini and Auriga
   e) Andromeda and Pegasus

15) Short period comets most likely are:
   a) long-period comets trapped in the inner solar system by a chance "close encounter" with a major
        planet, such as Jupiter or Saturn
   b) giant potatoes placed in the inner solar system by Aliens in a far-off time
   c) asteroid miss-classified as comets
   d) comets which formed in the inner solar system and are very different in nature from their long
        period cousin
   e) 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?
   a) 5000 years ago
   b) 1 million years ago
   c) 3.5 million years ago
   d) 1 billion years ago
   e) 3.5 billion years ago

17) The solar system
   a) reached more or less its present form in just more than one billion years
   b) took several billion years to form
   c) formed about 5 million years ago.
   d) formed in much less than one billion years
   e) underwent several intervals of planet formation separated by billions of years.

18) A total lunar eclipse occurs when
   a) the Moon passes into the penumbral shadow of the Earth
   b) the Earth passes into the penumbral shadow of the Moon
   c) the Earth passes into the umbral shadow of the Moon
   d) the Moon passes into the umbral shadow of the Earth
   e) 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?
   a) all orbits are clockwise
   b) the outer planets have rings
   c) all orbits are nearly in the same plane
   d) the inner planets are rocky, but the outer planets are gassy or icy
   e) 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?
   a) 5,798 years
   b) 4.6 billion years
   c) 460 million years
   d) 46 million years
   e) 4.6 million years

21) The occurrence of seasons on the Earth results from
    a) the Earth changing its rotation rate during the year.
    b) the Earth's axis pointing in different directions during the year.
    c) the Earth being closer to the Sun in summer.
    d) the Earth's axis being inclined to the ecliptic.
    e) 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) a small asteroid that exploded in our atmosphere this year
    b) global warming of the Earth by the greenhouse effect accelerated by human activity
    c) new close-up images of the planet Mercury
    d) the actual detection of an Mars-like planet orbiting another star
    e) all of the above were discussed in lecture this term

23) Astrology and astronomy
    a) can both make you incredibly rich
    b) differ in that astrology is a testable science that is applied to people, not stars
    c) differ in that astronomy is a true science, but astrology is a belief system that has failed all
      rigorous tests
    d) differ in that astrology is not based on physical theory, but has been proven by rigorous tests to
      work
    e) are pretty much the same thing

24) Why is Pluto not considered a Jovian planet?
    a) Its mass and radius are so small, and it lacks the thick atmosphere of hydrogen seen on the other
      Jovian planets
    b) It is so far out in the solar system.
    c) Its interior is mostly rock and iron.
    d) It is definitely not even a planet
    e) It is not really orbiting the Sun, but is simply drifting through the solar system.

25) Why do sunspots appear dark?
    a) They are transparent and let us see deeper, darker layers
    b) They are cooler than their surroundings
    c) They emit no light
    d) Sunspots? The Sun never has any spots!
    e) They are shadows.

26) Approximately how often is the Earth struck by an asteroid large enough to cause mass extinctions?
    a) every 1 to 5 billion years
    b) every 10 to 100 million years
    c) every 10 to 100 thousand years
    d) every 1 to 10 thousand years
    e) every Thursday