

**Instructions:** This test is divided into two parts. Part A is entitled short answer questions where you are to pick the best word, phrase or choice of answers which best answers or, in some cases, defines the statement. Please be careful to read the entire set of answers for multiple choice questions. Part B is entitled longer answer questions. Make your answers clear and concise. If you need more room turn over the test paper and continue on the back, but please write "over" on the test. For problems, it is the procedure that will be checked, not only the answer so please try to make it clear. Be sure to include units in answering problems (such as we've done in class). For problems that include underlined precision digits, be sure to use the corresponding precision rule or significant figure rule, accordingly. Point weighing is indicated in parentheses. So for this, the third quiz of the fall poets' course, Good Luck!

Here are some recipes:  $d = vt$   $v = at$   $d = \frac{1}{2} at^2$   $F = m \frac{v^2}{R}$   $F = ma$   $w = mg$   $F = G \frac{mM}{r^2}$

Use  $g = 9.8 \text{ m/s}^2 = 32 \text{ ft/s}^2$  for the surface of the earth. Not needed:  $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$

A. Short Answer Questions (1 Point each question except as marked. Questions 1 through 14 are multiple choice.)

C 1. In the Law of Universal Gravitation, the force increases as the mass increases and decreases as the distance increases.  
(a) increases...increases (b) decreases...increases (c) increases...decreases (d) decreases...decreases

a 2. If an astronaut with a weight of 800 N on Earth steps on a bathroom scale while she is in Earth orbit, the scale will read (a) zero. (b) less than 800 N but more than zero. (c) 800 N. (d) more than 800 N.

e 3. Al the astronaut has a mass of 90 kg and a weight of 900 N when he is standing on the Earth's surface. What is his mass when he is in a space station orbiting Earth with a radius of three Earth radii? (a) zero (b) less than 800 N but more than zero. (c) 800 N (d) more than 800 N (e) none of the previous.

d 4. You are standing on a bathroom scale in an elevator that is moving upward at constant speed, when suddenly the cable breaks. From just before to just after the cable breaks, the reading on the scale (a) increases by a little bit. (b) decreases by a little bit. (c) remains the same. (d) decreases to zero.

b 5. Communications satellites are synchronous satellites that orbit the Earth each (a) 90 minutes (b) 24 hours (c) 28 days. (d) They don't orbit the Earth; they just stay in one place.

d 6. In a typical 24 hour day, there are (a) one high tide and one low tide. (b) one high tide and two low tides. (c) two high tides and one low tide. (d) two high tides and two low tides.

C 7. An equinox occurs when (a) the sun shines equally on both northern and southern hemispheres, (b) the day and night are both 12 hours for both northern and southern hemispheres. (c) both a and b (d) neither a nor b.

e 8. Our galaxy is a ? galaxy. Choose from (a) globular (b) elliptical (c) spiral (d) Kepler

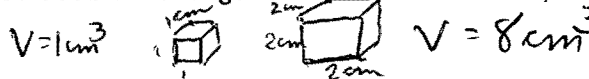
C 9. The Earth is held in its orbit by the gravitational force of the Sun. Therefore, the force that the Sun exerts on the Earth is ? the force that the Earth exerts on the Sun. (a) greater than (b) smaller than (c) the same as

a 10. Which of the following forces are exerted on a satellite that is in orbit around the Earth? (a) an attractive gravitational force directed toward the center of the Earth (b) a force in the direction of the satellite's motion (c) an outward force directed away from the center of the Earth (d) a and b (e) a, b, and c

a 11. What value is closest to the acceleration due to the Earth's gravity at a distance of one Earth Radius above the Earth's surface? (a) 2.5 m/s<sup>2</sup> (b) 5 m/s<sup>2</sup> (c) 10 m/s<sup>2</sup> (d) 20 m/s<sup>2</sup> (e) 40 m/s<sup>2</sup>  
 $F_N = \frac{(1)(1)}{2^2} F_E = \frac{1}{4} F_E = \frac{1}{4} w = mg$   
 $g_N = \frac{1}{4} g_E$

d 12. Al the astronaut has a weight of 800 N when he is standing on the surface of the Earth (4,000 mi radius). What is the force of gravity acting on him when he is in a space station orbiting the Earth at a distance of three Earth radii above the surface (or 16,000 mi from the center of the Earth)? (a) 800 N (b) 200 N (c) 100 N (d) 50 N

d 13. If you double the length of each side of a cube, its volume increases by what factor? (a) 2 (b) 4 (c) 6 (d) 8



14. A summer solstice occurs when (a) the axis of the earth is pointed away from the sun and most of the sunlight is shining on the southern hemisphere, (b) the axis of the earth is pointed towards the sun and most of the sunlight is shining on the northern hemisphere, (c) the earth is closest to the sun. (d) the sun is shining equally on both northern and southern hemispheres.

Earth 15. REVIEW: The model of Ptolemy placed the ? at the center of the Universe

light-year 16. The distance that light travels in one year is an astronomical distance unit called ?.

Polaris (or North Star) 17. As night progresses, all the constellations move around which star?

Rotation of Earth about its axis 18. Why is it that all the constellations appear to move around in a circle as night progresses?

Jupiter 19. Which planet is known for its "great red spot."

Jupiter 20. (1 1/2) What three planets currently are known to have 20 or more moons?

Saturn  
Uranus

21. (2) The physical quantity "density" is defined as  $\frac{\text{mass}}{\text{volume}}$  and, of all the planets in our solar system, the one that is the most dense is the planet Earth.

22. (2) The particular astronomical term that designates the time that it takes for a planet to make one complete trip around the sun is called the period of ?, while the term that designates the time that it takes for a planet to undergo one complete turn about its axis is called the period of ?.

Revolution  
Rotation  
Saturn 23. (2) A planet whose rings can be seen through telescopes here on earth is ? while the most eccentric orbit of all planets in our solar system is ?.

Pluto  
200 lb 24. (2) A person weighing 100 lb here on earth goes to planet X having a radius twice that of the earth and a mass eight times as large. The person will weigh ? on the surface of that planet.

$$F_x = \frac{(1)(8)(100\text{lb})}{(2)^2} = 200\text{lb}$$

800 lb 25. (2) A person weighing 100 lb here on earth goes to planet Y having a radius one-half that of the earth and a mass 2 times greater than the earth. The person will weigh ? on the surface of that planet.

25 lb 26. (2) A person 4000 mi from the center of the earth weighs 100 lb. How much will she weigh at a distance of 8000 mi from the center?

O<sub>2</sub> (Oxygen) 27. The present atmosphere of the earth consists of about 20% ? and about 79% ?.

N<sub>2</sub> (Nitrogen)  
Milky Way 28. The galaxy of which our solar system is a part is called ?.

92,000 cm<sup>3</sup> 29. (2) REVIEW QUESTION: A box measuring 1.05 m by .25 m by .35 m contains ? cm<sup>3</sup>.

$$(105\text{cm})(25\text{cm})(35\text{cm}) = 92,000\text{cm}^3$$

980N 30. (2) REVIEW QUESTION: The weight of a 100 kg object is ? while its mass is ?.

$$W = mg = (100\text{kg})(9.8\frac{\text{m}}{\text{s}^2}) = 980\text{N}$$

4.6 Billion 31. According to astronomical data, the age of the earth is approximately ? years old; surprisingly the earliest known fossils of "life" as defined in class were dated ? years old.

3.5 Billion



4. Please answer the following questions in this part by choosing your answer from the following list of possible choices: (½ point each blank.) (Note: The terms that follow can be used more than once.)

- |                     |                     |                  |            |
|---------------------|---------------------|------------------|------------|
| Acropol             | Helium              | Mercury          | Pluto      |
| Carbon Dioxide      | Hydrogen            | Neptune          | Revolution |
| Earth               | Inclination of Axes | Nitrogen         | Rotation   |
| Eccentricity        | Jupiter             | Oblateness       | Saturn     |
| Ecliptic            | Mars                | Orbital velocity | Uranus     |
| Equatorial diameter | Methane             | Oxygen           | Venus      |

- a) The planet taking the shortest time to make one complete trip around the sun is?
- b) The term which can be used to best explain why we have night and day.
- c) Is the closest planet to the sun.
- d) The planet having the greatest orbital velocity is?
- e) The planet with the hottest surface is?
- f) A term designating the plane of the earth's orbit.
- g) All other planets lie very nearly in the plane of the earth's orbit except for one. What planet is it?
- h) A measure of how "pancake-like" a planet (or object) is?
- i) The planets which have mostly carbon dioxide in their atmosphere are?
- j) The fact that, for the Earth, the distance from the North Pole to the South Pole is less than the equatorial diameter is expressed by which physical quantity?

Mercury  
Rotation  
Mercury  
Mercury  
Venus  
Ecliptic  
Pluto  
Oblateness  
Venus  
Mars  
Oblateness

5. REVIEW QUESTION: An object is given an initial velocity of 96 ft per sec straight up into the air at t = 0 sec. The acceleration due to gravity is 32 ft/sec<sup>2</sup> or 9.8 m/sec<sup>2</sup>. Neglect air friction.

(a) Find its velocity at the following times:

$64 \frac{ft}{s} \uparrow$  (1)(i) t = 1 sec  
 $0 \frac{ft}{s}$  (1)(ii) t = 3 sec  
 $64 \frac{ft}{s} \downarrow$  (1)(iii) t = 5 sec

t = 0     $96 \frac{ft}{s} \uparrow$     t = 6s ↓  
           -32  
 t = 1s     $64 \frac{ft}{s} \uparrow$     t = 5s ↓  
           -32  
 t = 2s     $32 \frac{ft}{s} \uparrow$     t = 4s ↓  
           -32  
 t = 3s     $0 \frac{ft}{s}$

(b) (1) How long does the object take to return to the thrower's hand?

$3s + 3s = 6s$

(c) (2) How high did the object go? Again, it takes 3s to travel from the very top of the path (when the speed is 0) back to hand.

$d = \frac{1}{2}at^2 = \frac{1}{2}(32 \frac{ft}{s^2})(3s)(3s) = 144ft$

(d) (1) The acceleration at the top of the path is what?

$g = 32 \frac{ft}{s^2}$