

HOMework #2

NOTES:

You will need a calculator, a pencil, and a standard scantron.

Each question has one correct answer. Choose the best answer for each. Mark your answer on the scantron.

This homework is due at the beginning of class on March 15. Late homeworks will not be accepted.

1. It is true that
 - a) the denser planets tend to have larger orbits in the Solar System.
 - b) the denser planets tend to have smaller orbits in the Solar System.
 - c) all the planets have the same density.
 - d) all the planets have densities close to that of rock.
 - e) all the planets have densities close to that of water.
2. Which of the following is not a gas giant world?
 - a) Jupiter
 - b) Uranus
 - c) Saturn
 - d) Pluto
 - e) Neptune
3. Why do all of the planets orbit in the same direction and in nearly the same plane?
 - a) Gravity from the Sun forced them to orbit in the same plane.
 - b) The Sun's magnetic fields forced them to orbit in the same direction.
 - c) Darn lucky.
 - d) They formed out of an accretion disk.
4. The Earth's orbital speed around the Sun is about 30 km/sec. At 0.3 AU, what is Mercury's orbital speed? Use the fact that for circular orbits, the speed goes like $v \propto 1/\sqrt{r}$ for r the orbital radius.
 - a) 9 km/sec
 - b) 16 km/sec
 - c) 55 km/sec
 - d) 100 km/sec

5. The atmospheric layer of the Earth that protects us from harmful solar ultraviolet light is
 - a) the hydrosphere.
 - b) the ozone layer.
 - c) the ionosphere.
 - d) the ochre zone.
 - e) the exolayer.

6. The region around the Earth where magnetic fields trap solar plasma particles is called
 - a) the Van Allen Belts.
 - b) the exosphere.
 - c) the corona.
 - d) the aurorae.
 - e) the Goddard Loops.

7. The glow of the Sun is powered by
 - a) its hot corona.
 - b) slow gravitational contraction.
 - c) chemical combustion.
 - d) nuclear fusion in its core.
 - e) the dynamo mechanism.

8. Earth has life, and the other Terrestrial worlds do not. What else does Earth possess that none of the other worlds have?
 - a) A water ocean.
 - b) A runaway greenhouse effect.
 - c) Weather.
 - d) Past volcanic activity.

9. Why doesn't the Sun collapse under its own weight?
 - a) Neutrinos.
 - b) Gas pressure.
 - c) Magnetic fields.
 - d) Rotation.
 - e) Explosive events like flares.

10. Planets are round, and so every planet with an atmosphere will have a basic weather pattern, even in the absence of rotation, described by
 - a) the Coriolis force.
 - b) the brainstorm.
 - c) the Hadley cell.
 - d) the centripetal force.
 - e) Hooke's law.

11. A rocket is fired from the equator directly south over land. How will its motion appear if mapped by a satellite overhead?
- a) The rocket will appear to curve eastward.
 - b) The rocket will appear to curve westward.
 - c) The rocket will appear to slow up.
 - d) The rocket will appear to speed up.
12. For a Hohmann orbit, an object that wants to get from Mars to Earth would travel along an ellipse of what semi-major axis value?
- a) 1.25 AU
 - b) 1 AU
 - c) 2.5 AU
 - d) 1.5 AU
 - e) 0.5 AU
13. Which is the preferred model for the formation of the Moon?
- a) Fission theory
 - b) Binary theory
 - c) Capture theory
 - d) Impact theory
 - e) Tidal theory
14. You are out watching a meteor shower, and you notice the Moon is on the local meridian. If it is 3am, what is the phase of the Moon?
- a) 1st Quarter
 - b) Waxing Gibbous
 - c) 3rd Quarter
 - d) Waning Gibbous
 - e) Waxing Crescent
15. You see a Waxing Crescent Moon rising at the Eastern horizon. What time must it be?
- a) 9am
 - b) Noon
 - c) 3pm
 - d) 9pm
 - e) Midnight
16. Venus has large old craters but few small or new ones. This is because
- a) of resurfacing.
 - b) no small craters were made.
 - c) Venus formed much later than the Moon did.
 - d) Venus is a world of sulfuric acid oceans.

17. The tilt of Mars is very like that of the Earth, but Mars has more severe seasonal changes during its year. Why is this?
- a) The rotation of Mars is much faster.
 - b) The orbit of Mars is much more eccentric.
 - c) The rotation of Mars is much slower.
 - d) The atmosphere of Mars is much cloudier.
 - e) The orbit of Mars is almost perfectly circular.
18. On what world is the largest volcano in the Solar System found?
- a) Venus
 - b) Earth
 - c) Mars
 - d) Mercury
 - e) Moon
19. The volume of a sphere is $V = 4\pi R^3/3$, and the density is the ratio of mass to volume, or $\rho = M/V$. If a world has 25% the mass of the Earth and is 80% as large in radius, how does its density compare to the Earth's (as a percentage)?
- a) 0.005%
 - b) 1000%
 - c) 205%
 - d) 10%
 - e) 49%
20. Let's combine some sci-fi with some economics. In the "The Red Planet", scientists had sent algae to Mars to establish an oxygen-rich atmosphere there. Suppose that $h = 1$ mm thick layer of algae is needed all across Mars. The volume of algae is then $4\pi R^2 h$, where R is the radius of Mars. If it costs \$100 to get a single kilogram of mass off the Earth and into space, and if the density of the algae were only 100 kg/m^3 (about 10% of water), estimate the cost of "terraforming" the atmosphere of Mars. (Hint: Make sure h and R are in meters. Find the volume of algae. Multiply by density to get the mass in kg. Take it from there.)
- a) $\$1.5 \times 10^{18}$ (or 1.5 million trillion dollars)
 - b) $\$1.5 \times 10^{15}$ (or 1500 trillion dollars)
 - c) $\$1.5 \times 10^{13}$ (or 15 trillion dollars)
 - d) $\$1.5 \times 10^{11}$ (or 150 billion dollars)