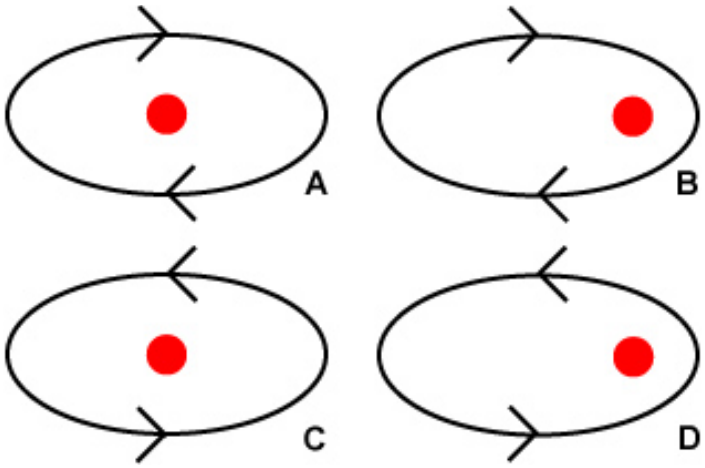
PTYS/ASTR 206 – Section 3 – Practice for Mid-Term Exam 1

1. Planetary orbits are ellipses. If you were looking down on the solar system from far above the north pole of the Earth then how would an elliptical orbit look? Arrows here indicate the direction of the planet along its orbit and the red circle is the Sun.



2. According to Kepler's 2nd Law, when does a planet move slowest?

a) When it's closest to the Sun

b) When its moons are perfectly aligned in a straight line, causing massive tides

c) When it's farthest from the Sun

d) Planets travel at the same speed at all points along its orbit.

3. Infrared radiation travels

a) Slower than the speed of sound

b) Faster than sound, but slower than light

c) At the speed of light

d) Faster than the speed of light

e) It depends on the exact wavelength

4. Which part of the Sun has the lowest temperature?

a) The core

b) The radiative zone

c) The convective zone

d) The photosphere

e) The corona

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5. The dark patches on the Moon (lunar mare) are concentrated on the side nearest the Earth because…

a) The crust is thinner there and volcanoes were easier to form

b) That side of the Moon is shielded from impacts by the Earth

c) The tidal effects of the Earth are stronger there

d) The extra sunlight reflected by the Earth onto that side of the Moon caused the surface to heat up

e) It's a coincidence

6. The moon is slowly spiraling away from the Earth because…

a) The Moon is losing energy as it cools down

b) Impacts of asteroids onto the Moon are pushing it away

c) The gravitational attraction of the Sun is pulling it away

d) It's speeding up due to gravitational attraction with the Earth's tidal bulge

e) The pressure of light reflected from the Earth onto the Moon pushes it away

7. How do we know the Earth's outer core is liquid iron?

a) We can drill down to retrieve samples

b) It must be liquid to generate a magnetic field

c) It must be liquid or the planet would stop spinning

d) S-waves from earthquakes are not passing through this region.

e) Both B & D

8. The total amount of power coming from one square meter of the sun is $\sigma * T^4$ (where σ is a constant number and T is the Sun's temperature). If we double the temperature the sun emits

a) The same amount of energy at a shorter wavelength

b) Twice as much energy at a longer wavelength

c) Twice as much energy at a shorter wavelength

d) 8 times as much energy at a longer wavelength

e) 16 times as much energy at a shorter wavelength

9. When does the full Moon set?

a) At dawn

b) At sunset

c) At noon

d) At midnight

e) Either dawn or sunset

10. If the Moon is full, what time is low-tide?

a) At dawn

b) At sunset

c) At noon

d) At midnight

e) Either dawn or sunset

11. Newton's Law of Universal gravitation is $F=G*M_p*m/r^2$ (where M_p is the mass of the planet, m is the objects mass and r is the planet's radius). You're standing on a planet that is 8 times the mass of the Earth, with a radius 2 times that of Earth's radius. How much would you weigh on this planet compared to your weight on Earth?

a) your weight would be ¼ of your Earth weight

b) your weight would be ½ of your Earth weight

c) your weight would be the same

d) your weight would be twice your Earth weight

e) your weight would be 4x your Earth weight

Solutions are on the next page…. Don't look before you try the questions yourself

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1. D. Object orbit anticlockwise when viewed from above the solar system. The Sun is at one of the ellipse foci – not in the center of the ellipse (unless it's a circular orbit when the foci are also in the center).

2. C. Planets move slowest when the gravitational attraction to the Sun is the lowest i.e. when they're furthest away

3. C. The speed of electromagnetic radiation is the same at all wavelengths

4. D. The photosphere has a lower temperature than the interior layers of the core, radiative zone and convective zone. The Corona (atmosphere) is hotter due to heating by magnetic field effects.

5. A. The thinner crust allowed magma to reach the surface in this location.

6. D. The Moon is pulled forward by the elongated shape of Earth's tidal bulge causing it to speed up and so spiral out.

7. E. The convection of liquid iron in the core is necessary to produce our magnetic field. Seismic studies show a zone where s-waves cannot pass, also indicating that it's liquid.

8. E. The hotter surface has its peak emission at shorter wavelengths (more blue light than red light). The original flux is σT^4, the new flux is $\sigma(2*T)^4$. This is 2^4 times the original and 2^4 is 2*2*2*2=16.

9. A. The Moon must be opposite the sun in the sky when it's fully illuminated. So, if the full Moon is setting then the sun must be rising. Draw a sketch for this one.

10. E. High tide is right beneath the Moon and on the opposite side of the Earth. Since the Moon is full it is opposite the sun in the sky so the point on the Earth beneath the Moon is at midnight and the point opposite is at noon. If high tides are at mid-night and noon then low tides are half-way between these times i.e. dawn and sunset.

11. D. Your original weight is $G*M_p*m/r^2$, your new weight is $G*(8*M_p)*m/(2*r)^2$. We can write it a different way as $(8/2^2)*\ G*M_p*m/r^2$ which is just $(8/2^2)$ times your original weight. $(8/2^2)$ is equal to 8/4 which is 2. So your new weight is 2 times your original weight.