The Planets Mid-Term Exam Review Sheet

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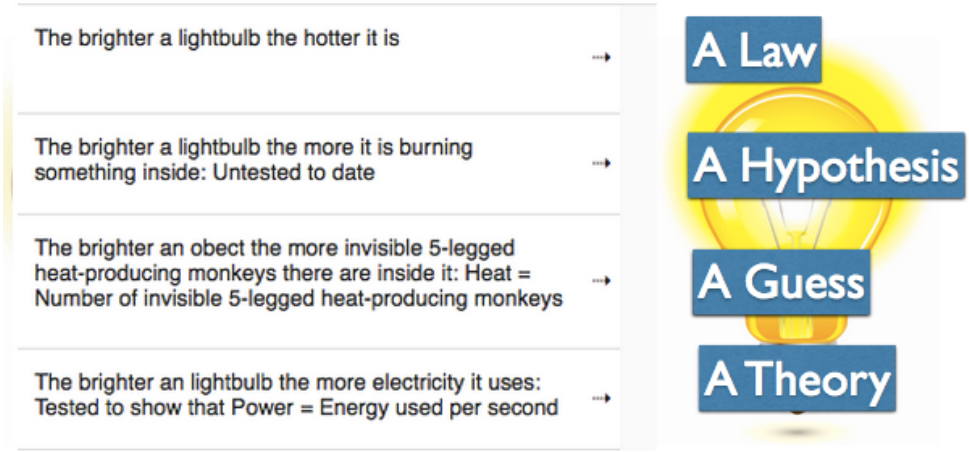
Module 1:

- Astrophysics is about taking what we know is true on Earth, and applying it elsewhere
- Characteristics of a planet depend on: distance from the sun (related to temperature) and mass of the planet
- Terrestrial (Mercury, Venus, Earth, Mars), Asteroid Belt, Jovian (Jupiter, Saturn, Uranus, Neptune). Know the order!
- Small hot rocky (rocks and metals) planets close to Sun and close to each other (similar composition to Sun minus H and He), large cold gaseous (hydrogen and helium) planets far away from Sun and far away from each other (similar composition to Sun)
- Dwarf planets: less dense than terrestrial, further than jovian
- Eccentricity, axial tilt, rotation period, orbital period
- Formation of solar system: Large, cold, randomly rotating, slow-rotating cloud of gas and dust, mostly H and He everywhere → Concentrated, hot, self-sustaining, fast-rotating Sun, ordered system of planets, no H or He in planets close to Sun. Conservation ang mom(spin faster, ordered), conserv. energy (hot material), gravity (condensed)
- Condensation, accretion, collision
- Order of official-ness: a guess, an opinion, a law, a hypothesis, a theory

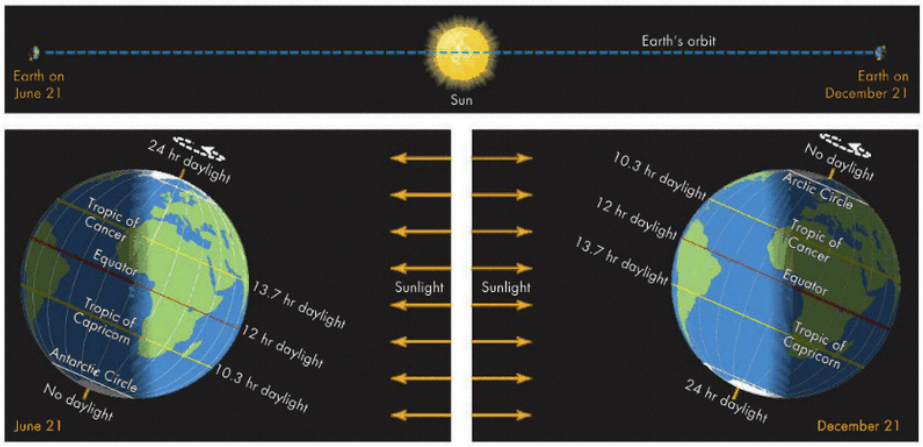


- Scientific Method: cycle of observation, hypothesis, prediction
- Four forces: strong nuclear (protons + neutrons -- nuclei), weak nuclear (proton transforms into neutron and vice versa, emits electron -- decay), gravity (mass), electromagnetic (electrons, charge - binds atom)

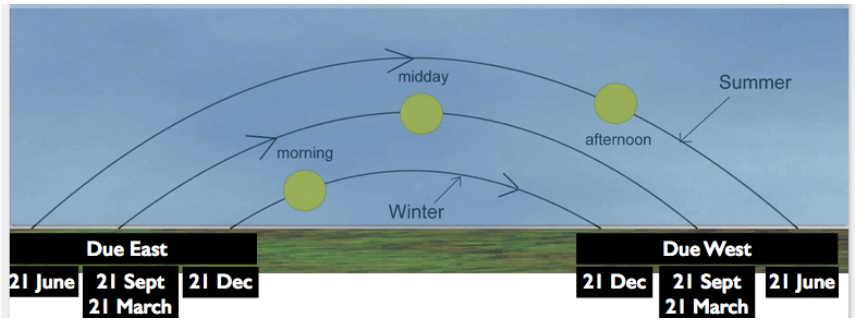
Module 2:

- Solar day: amount of time between successive noons (sun at highest point in path)
- Sidereal day: one rotation of earth measured by a distance star. Solar > Sidereal
- Solar day longer in January than in July → result of eccentricity. Mean solar day over whole year = 24 hours

- Hemispheres tilted toward sun will have more hours of sunlight → longer days



- At any one latitude, the number of daylight hours changes over the course of the year. At any one day, the number of daylight hours changes over latitude ← Earth is tilted
- Seven wanderers: Sun (Sunday), Moon (Monday), Mars (Tuesday), Mercury (Wednesday), Jupiter (Thursday), Venus (Friday), Saturn (Saturday)
- Only at the equator does the sun: rise vertically, rise due east, sit directly overhead at noon. -At other locations, these vary throughout the year: position of sunrise, peak height of Sun, amount of sunlight hours



- Tilt causes seasons: changes the number of daylight hours over the year, more in the summer and less in the winter. Changes the angle of sunlight over the year, higher in the summer and shallower in winter -- results in different surface area and temperature
- Depending on your position (latitude) on Earth and the time of year, you will see a different collection of stars/constellations
- The moon always receives the same amount of light. Depending on the Sun-Earth-Moon alignment, we see more or less of the moon's illuminated half throughout its orbit around Earth
- Current phase of moon can tell you what time it will rise and set, and vice versa (determine when it will be directly overhead, then add or subtract 6 hours)
- Solar eclipse: Moon and Sun are just the right sizes and just the right distances from Earth that the Moon perfectly blocks out the Sun. Earth is in Goldilocks point in time. Very narrow observing path
- Lunar eclipse: Earth's shadow on Moon; not every month, because of 5 degree tilt in Moon's orbit. Blue light is scattered in Earth's dayside atmosphere, diffracts red light -- falls on Moon

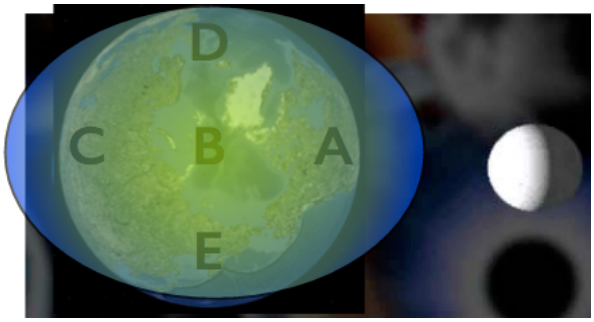
Module 3:

- Gravity: stops the universe running away to nothingness from the Big Bang; forms stars; causes supernova, releasing elements; forms planets
- Newton's First Law (of Inertia): an object in uniform motion will remain in that state of motion unless an external force is applied.
- Newton's Second Law: F=ma, F=dp/dt
- Scalar: number (speed). Vector: number and direction (velocity)
- Acceleration: rate of change of velocity (can be positive or negative) [car increasing speed, car decreasing speed, car turning corner at constant speed]
- Momentum: quantity of motion of moving body (Mass X Velocity). Can change momentum by applying force
- Inertia: resistance to change in motion (must apply a force to change momentum, overcome inertia
- Object in orbit: inertia keeps it moving straight, gravity pulls it down - balanced forces
- Two objects interacting create equal and opposite forces
- Newton's Universal Theory of Gravitation: Fg = GMm/d^2 → Must understand how changing particular values affects Fg -- directly proportional to mass, inversely proportional to distance^2
- Planets closer to the Sun experience larger force of gravity, and therefore travel faster in orbit than farther planets
- Manipulating equations can give relationships: M = dv^2/G. a=GM/R^2. escape velocity: v=sqrt(2GM/R)

- Moon never eroded because: low escape velocity, no weather/atmosphere, no volcanoes, no water
- Highlands: rough, lots of craters, older surface. Maria: smooth, few craters, younger surface. Caused by large impacts that puncture the surface, allowing molten lava to flow up, filling in area, removing evidence of previous impacts
- Far side of Moon has less Maria, more craters: far side is harder to crack (near side is thinner)
- Always view the same side of the Moon from Earth → rotational period = orbital period; Moon orbits Earth at 5 degree inclination; proportion to Earth is larger than other moons to their respective planets
- Capture Hypothesis (Moon would in no way resemble Earth), Twin Formation Hypothesis (Moon and Earth would be identical), Fission Hypothesis (Moon would be same as Earth's subsurface)
- Lunar samples are chemically similar to Earth's subsurface, but with no iron or water
- Catastrophe Hypothesis:

- Earth's iron is in core → impactor only breached surface. Impactor must have been large → Moon is large compared to Earth. Moon cooled in orbit → rotation and orbit are synched. Catastrophe created high temperature → evaporated water. Impactor came in at shallow angle (since it didn't obliterate Earth) → orbits at 5 degree inclination

- Tides: difference in gravitational pull of the Moon at different locations on Earth. Both sides bulge land and water, but water is more affected



- High tide: Moon is directly overhead or directly below you. Low tide: Moon is on horizon
- Spring tide: Sun-Moon-Earth aligned. Neap tide: not aligned
- Tug of the Moon on the tidal bulge slows the Earth's rotation; tug of the bulge on the Moon pulls it forward and speeds up the Moon's orbit -- moving away from Earth