THE MOON

→ main properties

→ theories of its origin

Visually and by telescope, we can see that the Moon has smoother, dark regions ('maria') and brighter highlands

Entire surface is heavily cratered

$\boxed{Q}$ What are 2 reasons for this?

Density of Moon is $3.3\ g/cm^3$, much less than that of Earth ($5.5\ g\ cm^{-3}$)

A

Moon's surface is heavily cratered because

___ it has no plate tectonics to resurface it

___ it has no atmosphere to burn up small meteorites

TABLE 8–5

The Earth and Moon: A Comparison

	Earth	Moon
Orbital data		
Orbit shape	nearly circular	nearly circular
Orbit inclination to ecliptic (°)	0	5.1
Rotation period	24 hours	27.32 days
Axial tilt (°)	23.5	6.7
Orbital period	$365^d6^h8^m24^s$	$27^d7^h43^m12^s$
Physical data		
Diameter (km; Earth units)	12,756	3,476; 0.273
Mass (gm; Earth units)	5.974×10^{27}	7.35×10^{25}; 0.0123
Average density (gm/cm^3)	5.518	3.34
Surface gravity (cm/sec^2; Earth units)	980	162; 0.165
Escape speed (km/sec)	11.2	2.4
Temperature (surface)	200 to 300 K	100 to 400 K
Surface features		
Craters	few	many
Impact basins	perhaps one	many
Continental-sized areas	yes	no
Mountains	yes	yes
Ancient lava flows	?	yes
Active volcanism	yes	no
Plate tectonics	yes	no
Surface composition	silicates	silicates; iron deficient; deficient in volatile elements
Other characteristics		
Atmosphere	nitrogen, oxygen	none
Magnetic field	yes	no
Differentiated core	yes	no?

The Moon's mean density is so low that it cannot have an iron core like the Earth's. Thus it cannot have a liquid Fe core. This makes sense with the Moon's lack of a magnetic field and plate tectonics.

$\boxed{Q}$ Can we use this lack of an iron core to infer that the Moon has constant density?

$\boxed{Q}$ What determines the cooling rate of planets & moons?

→ atmosphere (& greenhouse effect)
→ ratio of surface area ($\propto r^2$) to volume ($\propto r^3$)

So smaller objects cool <u>faster</u>

Q.

How would you work out the mean density of the Moon?

Q. The condensation theory of planet formation says that distance from the Sun (temperature of nebula) will determine composition ($\Rightarrow$ density) of a planet.

Why are the Earth & Moon of such different density

??

A

Work out the mean density by getting its mass via a spacecraft orbit and its size

A If Earth & Moon formed in same region (and there would have to be a huge difference in distance from Sun to give this diff. in density) something must have happened later to change density

— like a giant impact