

ASTR 1010 Exam 3 Review Session

April 15, 2020

1 Planetary Geology

First, let's jot down some key features of the main rocky objects in our inner-solar system:

- Mercury and the Moon
 - Heavily cratered due to the period of _____.
 - Some volcanic plains, a few cliffs, and ridges
- Venus
 - Volcanoes and bulges
 - Few visible craters
- Mars
 - Volcanoes and canyons
 - Dry riverbeds that might be indicative of _____ in the past.
- Earth
 - Liquid water
 - Not much visible cratering

The Anatomy of a Planet:

- By composition:
 - Core: made of _____.
 - Mantle: made of medium-density rocks.
 - Crust: made of low-density rocks.
- By strength:
 - **Lithosphere** - _____.
 - Everything else: warmer, softer rock that lies beneath

Table of Densities:

Material	Density g/cm ³
Water ice	0.94
Liquid water	1.0
Rock	2.7 - 3.7
Metal	7.9

Note: you won't have to memorize these numbers, but you should probably know these categories of material in order of densities.

Explain in your own words how we use planetquakes to study the inside of planets:

What three things are required for a magnetic field?

1. _____
2. _____
3. _____

Differentiation -

For differentiation to have happened, we need all the material in the core and mantle to have once been _____.

Why is a significant portion of the core and mantle solid despite the extremely high temperatures?

What are the three main processes that heat planets?

1. _____
2. _____
3. _____

What are the three main processes of heat transportation?

1. _____
2. _____
3. _____

$$\text{Time to cool} \propto \frac{V}{A} \propto r$$

Remember: larger objects take longer to cool!

Explain in your own words why larger worlds have a thinner lithosphere:

What are the planets' three most fundamental properties? Rank our Solar System planets in order from largest to smallest for each one.

1. **size**

Rank: Jupiter, Saturn, Uranus, Neptune, Earth, Venus, Mars,
Mercury

2. distance

Rank: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus,
Neptune

3. rotation rate

Rank: Jupiter, Saturn, Neptune, Uranus, Earth, Mars, Mercury,
Venus

These three fundamental properties affect:

- gravity
- pressure
- internal and surface temperatures
- atmosphere/weather

Those, in turn, affect the four main geological processes. What are they?

1. _____
2. _____
3. _____
4. _____

Volcanic outgassing results in the creation of the _____.

What is the heat transport process (that occurs in the mantle) most responsible for volcanism and tectonics?
_____.

With regards to tectonics,

- _____ time-scale, _____ temperature \implies flows and bends
- _____ time-scale, _____ temperature \implies breaks and cracks

Erosion -

Weather is very important for erosion. What things are required for weather to occur?

- _____
- _____

Impact craterings were mainly created during the period of _____.

How do the number of small craters compare to the number of large craters?

How is volcanism affected by:

- size? _____
- distance? _____
- rotation rate? _____

How are tectonics affected by:

- size? _____
- distance? _____
- rotation rate? _____

How is erosion affected by:

- size? _____
- distance? _____
- rotation rate? _____

How is impact cratering affected by:

- size? _____
- distance? _____
- rotation rate? _____

Internal temperature is determined by _____ whereas surface temperature is determined by _____.

2 Light

What are the four ways electromagnetic waves can interact with matter? Describe each process briefly.

1. _____

2. _____

3. _____

4. _____

Wave-particle duality -

Wavelength -

Frequency -

Amplitude -

$$c = \lambda \times f$$

$$E = h \times f$$

But what does that mean?

$$E \propto f \propto 1/\lambda$$

What can we learn from a spectrum?

- composition
- temperature
- velocity

Explain in your own words how the energy levels in atoms correspond to spectral lines:

What are the three main types of spectra? For each one, describe in what physical situation they are seen.

1. _____

2. _____

3. _____

What law tells us that bluer stars are hotter than redder stars? _____

$$\lambda_{\text{peak}} \propto 1/T$$

3 Terrestrial Atmospheres

Briefly describe the atmospheric situation of each rock object in our inner-Solar System:

- Moon and Mercury: _____
- Mars and Venus: _____
- Earth: _____

What are the effects of atmosphere on a planet? Again, briefly describe each and exactly what affect it has.

- _____

- _____

- _____

- _____

$$P = F/A$$

What are the four major layers of the Earth's atmosphere?

- _____
- _____
- _____
- _____

In the troposphere, temperature drops with altitude and it is warmed by _____ light and convection.

In the stratosphere, temperature rises than drops and it is warmed by absorption of _____ light.

In the thermosphere, temperature rises with altitude and _____ heat and ionize gases.

In the absence of greenhouse gases, the surface temperature depends on _____ and _____.

Why do planets have a double hump in their spectrum?

Magnetosphere -

What are the three main sources of an atmosphere?

1. _____
2. _____
3. _____

Explain in your own words what caused Mars's atmosphere to look like the way it is today:

Explain in your own words what caused Venus's atmosphere to look like the way it is today:
