

Earth Science Semester 1 Exam Review

Name: Mills

The Earth Science Semester 1 Exam consists of 100- multiple choice questions. The exam is a major part (20%) of your overall semester grade. YOU SHOULD PREPARE AHEAD OF TIME. The questions below will help get you ready. Each question must be completed in detail (NO PHRASES OR 1-WORD ANSWERS!) and show an honest effort. High Effort = High Achievement

Earth System Science/Metrics and Measurement

1. Identify the appropriate tools and metric unit used to for each specific measurement:

- | | | | |
|---------------------|-----------|----------------|-----------------|
| a. Length | b. Mass | c. Liq. Vol. | d. Air Pressure |
| ruler, meter stick, | scale | graduated cyl. | barometer / |
| odometer... | g, kg, mg | ml, l | mb |
| mm, cm, m, km | | | |

2. Calculate the average and the range when given data. (show work)

	January	April	July	October
	45	53	77	65

$$\begin{array}{r} 45 \\ 53 \\ 77 \\ + 65 \\ \hline 240 \end{array}$$

$$4 \overline{)240} \quad \begin{array}{r} 60 \\ 77 \\ \hline 45 \\ 32 \end{array}$$
 ave = 60%
 range = 77 - 45 = 32%

3. Calculate volume (mL) and density (g/mL) of an object given the following information:

- a. A piece of galena has a mass of 30g. When carefully slid into a graduated cylinder filled with 63-mL of water, the object raises the water level to 67-mL.

$$\begin{array}{r} 67 \\ - 63 \\ \hline 4 \text{ mL} \end{array}$$

$$D = \frac{m}{V} = \frac{30g}{4 \text{ mL}} = 7.5 \text{ g/mL}$$

Sky Observations & Motions

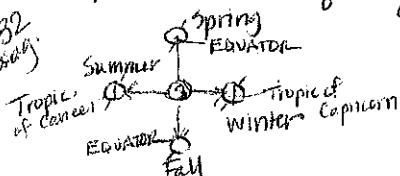
4. Describe how a star's spectrum can be used to determine that stars composition.

A spectroscope helps us determine what elements are present a star by splitting starlight into a spectrum of diff. colors & wavelengths. By comparing the spectrum produced by each star w/ the spectra of known elements, we can determine the chem. make up of the star.

5. Explain what a Doppler shift is and what a spectrum shifting towards the red end tells us versus what a shift towards the blue end tells us.

The Doppler Effect is the apparent shift in the wavelengths of energy emitted by an energy source moving away from or toward an observer. The spectral lines shift towards the blue/violet end of the spectrum when the source is moving towards, & shifts towards the red end of spectrum when the source is moving away.

6. Describe/draw the relationship between Earth tilted axis and seasons (winter vs. summer).
 Changes in the angle at which the sun's rays strike the earth's surface & changes in the amount of daylight cause the seasons.



angles at Equator, Tropic of Canc, Tropic of Cap = 90° most direct
 angles at higher latitudes = less than 90° less direct

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p. 15
p. 15
p. 30
p. 32 (diag)

Milankovitch Theory = Sm. veg. changes in the shape of earth's orbit (ev. 100,000 yrs) & the tilt (ev. 41,000 yrs) caused the ice ages. & precession/wobble, every 26,000 yrs

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7. Describe how a planet can retrograde in its revolution around the Sun.

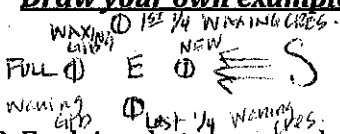
As a faster planet, such as earth, passes a slower planet, such as Mars, the slower planet appears to move backward.

8. Explain what causes the Moon to appear as different phases during the month.

As the moon revolves around earth, diff. parts of the lighted side of the moon face earth. The shape of the visible portion varies. These shapes are called phases.

9. Identify moon phases based on diagrams (either space-view or Earth-view).

Draw your own examples



new moon

waxing crescent

1st quarter

waxing gibbous

full

waning gibbous

last quarter (3rd quarter)

waning crescent

10. Explain what causes solar and lunar eclipses on Earth, and why they are so rare.

Solar eclipse = when the moon is between the earth & the sun & the moon's shadow falls upon the earth (in umbra = total solar eclipse)

Lunar eclipse = earth's shadow crosses the moon

*Rare b/c the moon crosses the plane of Earth's orbit only 2x in ea. rev - ~~at the same time~~

11. Describe the high tides and low tides that form during the following moon phases: full moon, waxing crescent, 1st quarter. Explain how the Moon and Sun interact.

full moon/new moon: E-M-S aligned \Rightarrow Spring tides \Rightarrow higher high tides & lower low tides (m & sun's gravity combined)

During 1st/3rd Quarter: E-M-S (@ rt. angle) \Rightarrow Neap tides \Rightarrow lower high tides, higher low tides (m & sun's gravity offset ea. other)

12. Explain the difference between a planet's rotation, revolution, and its precession as well as the time it takes to complete each. Rotation = the spinning of planet around its axis = night & day; Revolution = movement of a planet around its "sun" (years); Precession = a circular motion of a planet's axis (much like a spinning top)

Earth's: rotation = 24 hrs; rev'n = 365.24 days (1 yr); precession = 26,000 yrs.

Earth In Space

13. Describe the nebula theory on how our solar system formed:

That the sun & planets condensed out of the same spinning nebula, or cloud of gas & dust, & that the entire solar system formed at approx. same time. Large, rocky material near the center of the solar nebula cooled to become the terrestrial planets (Merc, Venus, Mars, E.)

14. Explain what the "Big Bang" theory helps explain vs. what it does not.

The "Big Bang" is an explanation of the origin of the universe. Proposed to explain the expansion of the universe (the red-shifts from most of the galaxies & that the furthest away galaxies are moving the fastest)... (Before the BB, all matter & energy was compressed into an extremely small volume.) red shift & background radiation support this theory.

Stellar Evolution

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p. 62p
p. 627
p. 623
L = S + M
S = S + M + E
p. 439
p. 29-30
p. 32 (prac)
p. 580
p. 16

see diff. constellations @ diff. times of yr. b/c of Earth's tilt
 Polaris never chgs. positions in the Northern Sky (North Star)

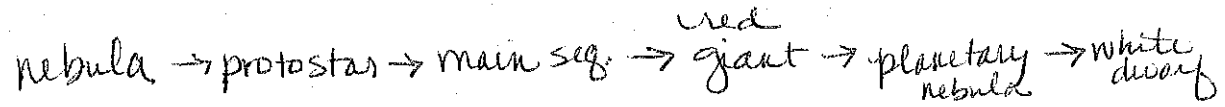
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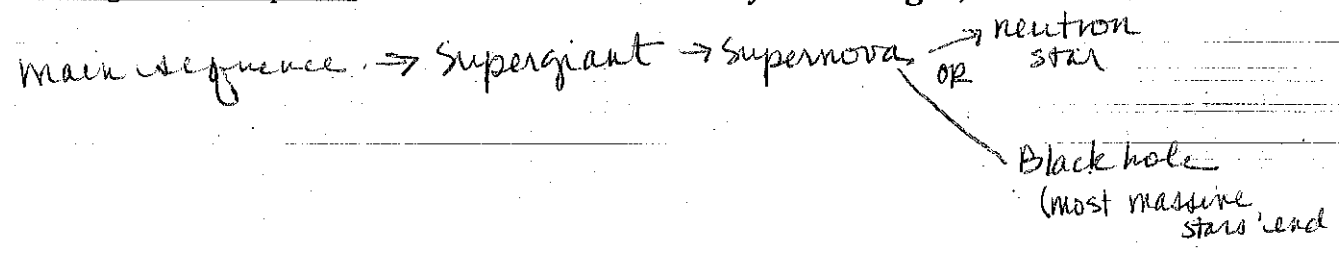
15. Describe physical characteristics for the 3 main groupings on the H-R diagram:

- a. Main Sequence
 - 2nd & longest stage (90% of life)
 - H → He fusion
 - fusion energy = gravity = stable
- b. Red Giants
 - 3rd stage - almost all H is gone
 - contracts, core heats up & ignites the He → C.
 - outer shell expands
 - giants = 10x + bigger than sun
- c. White Dwarfs
 - final stage → star close at its outer shell & hot, dense core is left.

16. Outline and describe the life cycle of a smaller, less massive (Sun-like) star.



17. Starting at Main Sequence, outline and describe the life cycle of a larger, more massive star.

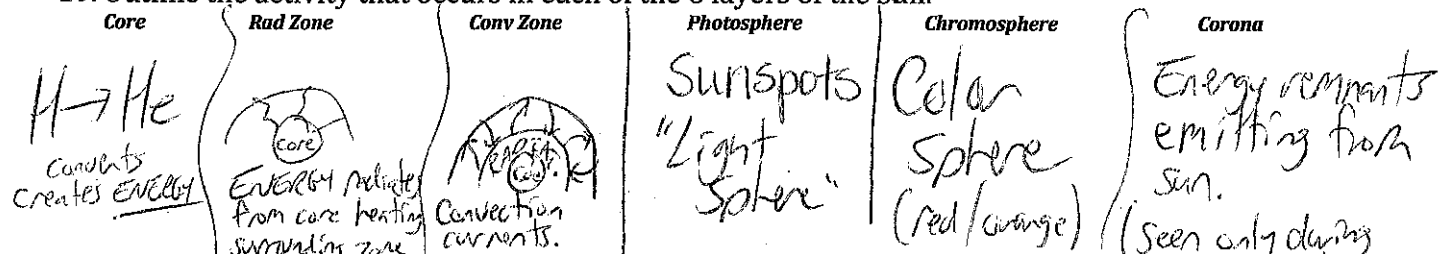


18. Describe the process of nuclear fusion and how fusion in main sequence stars differs from fusion in red giant stars.

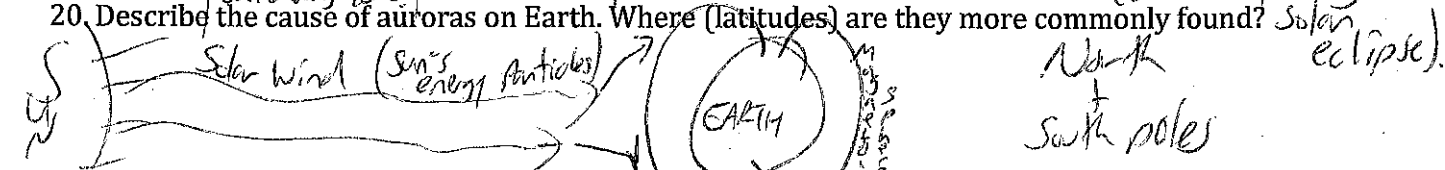
main seq. stars = H → He fusion
 red giant stars = He → C fusion (+ some H → He fusion in the outer layers still)

The Sun

19. Outline the activity that occurs in each of the 6 layers of the Sun.



20. Describe the cause of auroras on Earth. Where (latitudes) are they more commonly found?



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N, O, C, etc. are found in their distinct reservoirs ~~but also move between & thru diff. element reservoirs~~ and ~~are~~ always changing state.

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Intro to the Atmosphere

21. Explain the difference between weather and climate.

Weather = current conditions, Climate = historical (typical) records of weather.

22. Define air pressure and identify where it is highest and lowest.

Force of air particles pushing down. at sea level high elevations.

23. List (with %) the 2 main gases of Earth's present atmosphere.

Nitrogen 78%, Oxygen = 16%

24. Describe the importance of 3 minor atmospheric components:

a. H₂O vapor
Water vapor in air.
(causes sky to be blue)

b. Ozone
O₃, left over Oxygen particles gathered in the stratosphere

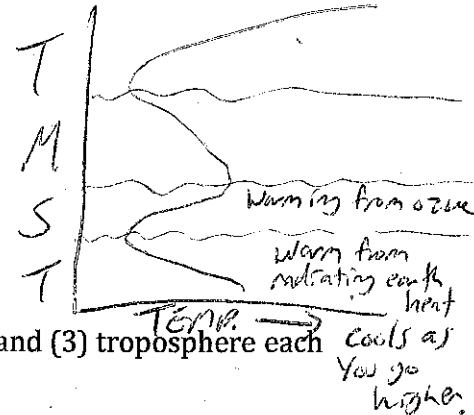
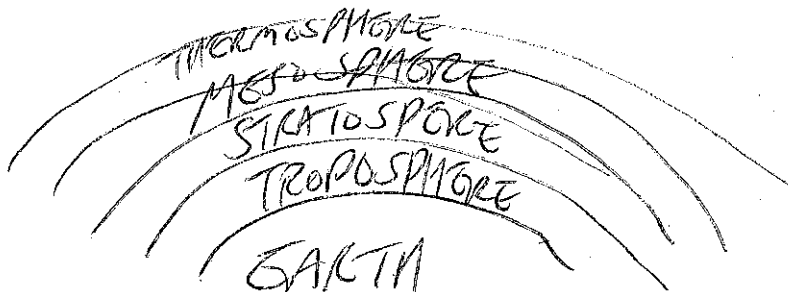
c. Atmo. Dust
Tiny dust particles, help reflect sun's rays.

25. Describe 1) the composition of a CFC, 2) its destructive nature in the stratosphere, and 3) what effect less ozone would have on our surface.

Chloro Fluoro Carbons

- Breaks down O₃ (ozone)
- Less ozone = more of sun's UV (ultra violet rays) reaching earth's atmosphere.

26. Identify the 4 layers of Earth's atmosphere from bottom to top, and then explain why there are different temperature trends in the lowest 2 layers.

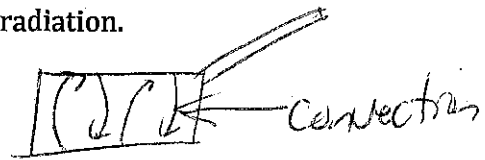
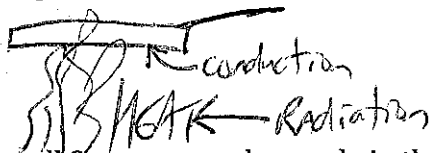


27. Explain how the (1) thermosphere + mesosphere, (2) stratosphere, and (3) troposphere each filter out a part of the electromagnetic (EM) spectrum.

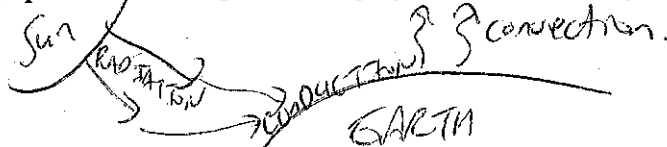
- thermo/meso → solar ions & meteorites
- strato → (ozone) ultraviolet radiation
- tropo → heat / solar radiation (clouds)

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28. Describe the processes of conduction, convection, and radiation.



Explain how all 3 processes play a role in the daily heating of Earth's troposphere.



29. Define albedo, and describe how different surface albedos influence temperature.

↳ Amount of sun's rays reflected off surface of EARTH.
 Snow = High Albedo, roads = Low albedo.

30. Describe how each factor listed below influences surface temperature:

a. latitude
 closer to equator = more intense rays = ↑ temps.

b. elevation
 ↑ elevation = lower temps.

c. location by water
 Water holds temp. longer, keeps areas of land warmer.
 (e) San Francisco.

Water in the Atmosphere

31. Define what humidity, relative humidity, and dew point temperature are.

↳ Amount of H₂O vapor in air → ratio of H₂O vapor to air in a mass.
 Dew Point = temp. @ air = saturation

32. Explain and describe the main conditions and ingredients needed for clouds to form.

Low Pressure
 Condensation Nuclei
 High water vapor.

33. Draw and describe the structure of the following cloud types:

a. stratus

Low

c. cirrus

High

e. nimbostratus

rainy low

b. cumulus

"Fluffy"

d. cumulonimbus

Thunderstorms

f. cirrostratus

Midlevel

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34. Describe the difference between the cloud forming processes of

- a. convective cooling — Tropics
- b. forceful lifting by mountains — places w/ mtns (duh)
↳ RAINSHADOW — caused by adiabatic warming as air sinks
- c. forceful lifting by air masses. — places like Michigan
(a.k.a. "frontal wedging")

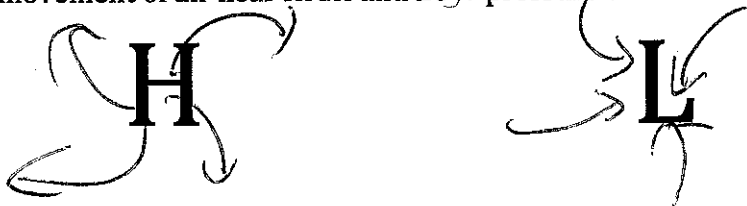
these all provide a LIFTING mechanism.

Weather Forecasting and Severe Weather

35. Describe the 4 main air masses that affect the U.S., and where each forms.

a. mT	b. cP	c. cT	d. mP
Maritime Tropical	Continental Polar	Continental Tropical	Maritime Polar
Warm, close to ocean	Cold, land	Warm, land	Cold, water
⊗ Gulf of Mexico	Canada	Mexico	Pacific by Alaska

36. Describe the movement of air near HIGH and LOW pressure centers.



Explain why Michigan has clearer skies with HIGH pressure than with LOW pressure.

Air is pushing down in all directions, causes clouds to disappear.

37. Predict temperature and cloud changes as warm and cold fronts each approach.

Warm front → cirrus, cirrostratus, altostratus ... finally nimbostratus
— temps ↑

Cold front → large cumulus and cumulonimbus
— temps ↓

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38. Describe how an occluded front develops.

A cold front goes over a warm front, slow moving,

39. Describe how isobars can be used to indicate relative wind speed.

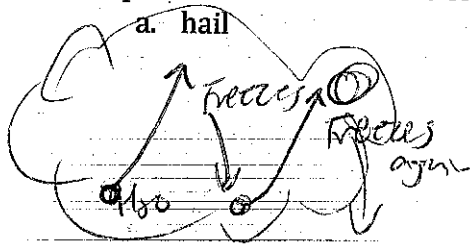
Follow areas of low pressure. Wind moves from H to L.

40. Describe the ingredients needed for thunderstorm and possibly tornado formation.

↑ Humidity, ↓ pressure, converging air masses.

Tornado season - Spring to end of summer / fall

41. Explain the scientific cause of the following:



b. lightning

clashing of particles in a cloud, causes friction to static electricity.
(rabbits socks on carpet)

c. thunder

Expansion of hot air from lightning.

42. Explain what makes the south-central US (tornado alley) a prime location for tornadoes.

Converging air masses CT → MT

43. Describe the following about hurricanes:

a. Hurricane formation → tropical depression - tropical storm, hurricane
(as it weakens over land, it does so b/c of lack of warm water & friction)

b. Hurricane movement

Trade winds / Westerlies - SEE NOTES!

c. Causes of hurricane destruction.

storm surge (water)

d. Peak of season + WHY

August - September b/c it takes the oceans awhile to warm up from summer temps

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* If Northern sea ice melts, there will be less albedo @ the poles, which will cause even more warming.

* A LIGHT YEAR = 9.5 Trillion Km / yr

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Earth's Spheres & Climate

44. Describe the normal greenhouse effect

The process where the atmosphere traps infrared radiation from Earth's SURFACE.

Describe the 5 main greenhouse gases responsible.

CO₂, (Water Vapor), CH₄, CFCs (Chloro flouro carbons), & N₂O
(also Ozone / O₃)

Rank them by concentration: H₂O → CO₂ → CH₄ → N₂O → CFC

Rank them by speed they cycle: H₂O → CO₂ → CH₄ → N₂O → CFC

Rank them by warming potential: CFC → N₂O → CH₄ → CO₂ → _____

* CO₂ - because of its abundance & stability, CO₂ is the "worst offender"

45. Describe the following causes of climate change.

a. Natural (multiple ways)

b. Man-Made (multiple ways)

Major volcanic eruptions (short term cooling)
meteorite impacts
Variations in solar energy output

See notes

46. Describe the MANY effects that a warmer atmosphere could have.

- sea levels rise
- coastal estuaries become flooded w/ salt water
- coral reef bleaching

47. List and describe evidence that scientists use to see if climate change has occurred in the past.

a. Tree Rings

b. Pollen Spores

c. Ice Cores/O₂

rings record temp/precip
- wide ⇒ warm/wet
- tiny ⇒ cool/dry

found in layers of Earth & give clues to ancient climates

high amts of ¹⁸O & low amt of ¹⁶O ⇒ time period of cooling

48. Create an example where each of these sphere will interact in the Earth System. INCLUDE A 3RD SPHERE THAT COULD BE AFFECTED BY THE INTERACTION.

a. Atmosphere & Hydrosphere — H₂O

c. Biosphere & Atmosphere

LAND/ROCK

Wind kicks up waves - this could affect humans on a boat! (Biosphere)

Human pollution has ↑ CO₂ - this could affect the temp. of the oceans (Hydrosphere)

b. Biosphere & Hydrosphere

SNOW/ICE

d. Cryosphere & Hydrosphere

Human oil drilling has polluted the ocean - this could wash to shore & pollute the beaches (geosphere)

Global Warming (Biosphere) will cause the ice sheets to melt & raise sea levels.

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* CARBON RESERVOIRS - limestone, CO₂, carbonic acid
(geosphere) (atmos) (hydrosphere)

* Climate change in Mich. is evident in the ancient ocean fossils found here (like coral & shells)

AIR