APES Review Worksheet- Fall Final Exam
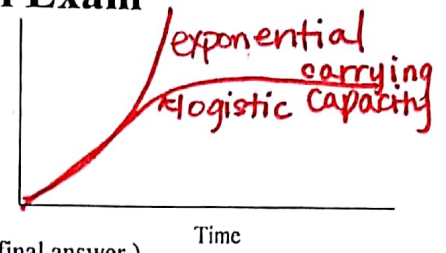
1. Use the axes to the right for the following: *logistic*
   a. Draw and label a line that represents ~~linear~~ growth.
   b. Draw and label a line that represents exponential growth. Label carrying capacity.

(26)

2. Define the term ecological footprint
   amount of biologically productive land + water needed to supply pop. with resources + absorb waste

3. Write an equation for the rule of 70: Doubling Time = $\frac{70\%}{growth\ rate}$

4. Perform the following calculations: (Show all of your work in a logical progression to the final answer.)
   a. A city has a population of 50,000 in 2012. If the population of the city grows at an annual rate of 2%, the year in which the population will reach 100,000 is __2047__ and the year it will reach 200,000 is __2082__.

   Show work:
   $DT = \frac{70}{2\%} = 35\ yrs$ $50,000 \rightarrow 100,000 = 35\ yrs$ $50,000 \rightarrow 200,000 = 35\ yrs\ (2) = 70\ yrs$

   b. A country's population was 50,000 and experiences 100 births, 40 deaths, 10 immigrants, and 30 emigrants. What is the growth rate?

   Show work: $GR = \frac{(B+I) - (D+E)}{Total\ Pop.} \times 100\%$ $\frac{(100+10) - (40+30)}{50,000} \times 100\% = .08\%\ growth$

5. Complete the following table by writing "high" or "low" in each box below.

Characteristic	More Economically Developed Counties	Less Economically Developed Countries
per capita GDP	HIGH	LOW
degree of industrialization	HIGH	LOW
infant mortality rate	LOW	HIGH
per capita fossil fuel use	HIGH	LOW
ecological footprint	HIGH	LOW
greenhouse gas emissions	HIGH	LOW
risk from heart disease	HIGH	LOW
risk from infectious diseases	LOW	HIGH

6. Identify three examples of renewable resources and three examples of nonrenewable resources.
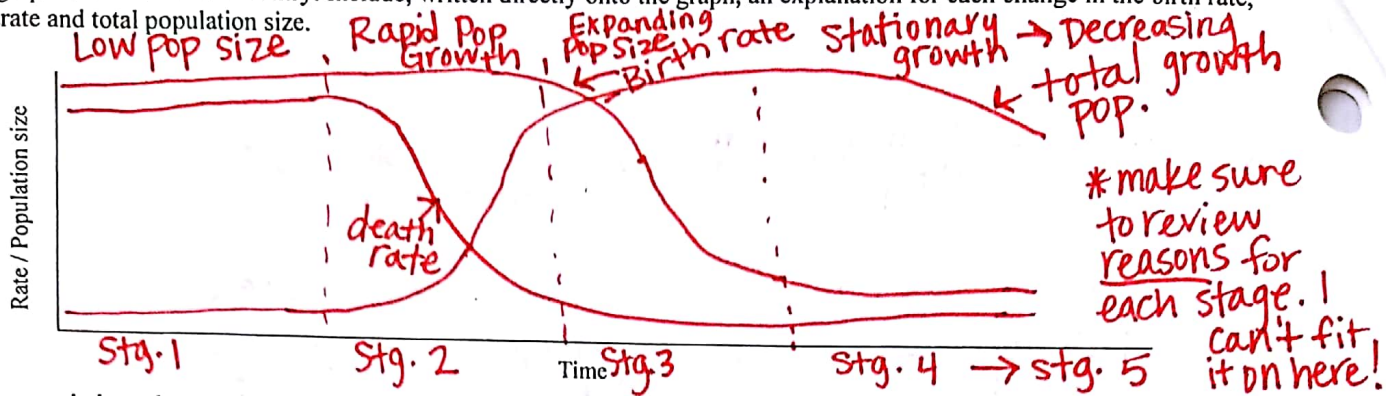
   Renewable: (1) trees (2) solar (3) wind

   Nonrenewable: (1) coal (2) oil (3) natural gas

7. Define the following:
   a. total fertility rate _average # of children born to a woman *know the 10 factors that affect TFR*_
   b. replacement level fertility _# of children needed (on average) to replace mom + dad_
   c. infant mortality rate _# of children that die before their 1st birthday_
   d. crude birth rate _# births per 1,000_
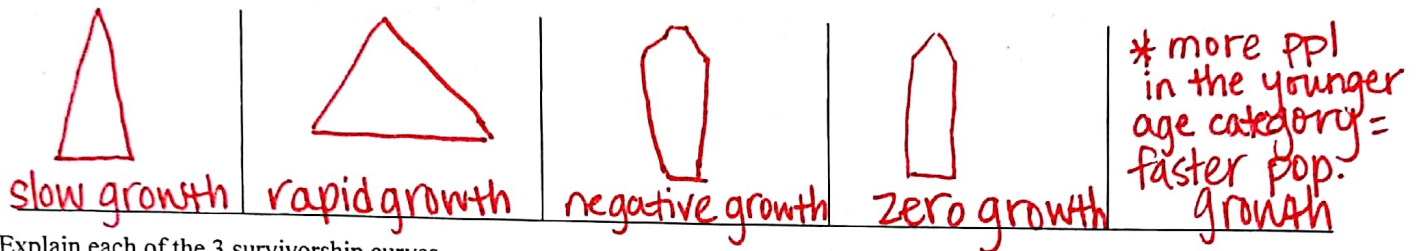   e. crude death rate _# deaths per 1,000_

8. Describe the circumstances that will result in a Tragedy of the Commons. Give an example.
   depletion of an open access/public resource
   - overfishing in open ocean
   - air pollution

9. Describe an example of a positive feedback loop and an example of a negative feedback loop.
   Positive Feedback - melting of ice releases CH_4 which heats up atmosphere which melts more ice
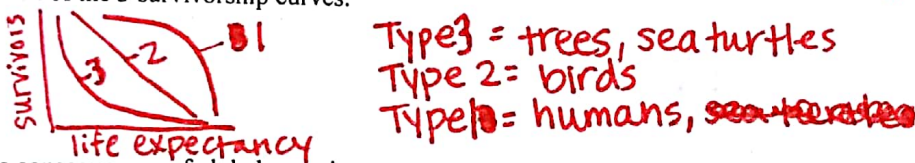   _Negative Feedback - stabilizing effect sweating (homeostasis)_

10. Use the axes below to draw and label lines representing the birth rate, death rate and total population size during the idealized demographic transition of a country. Include, written directly onto the graph, an explanation for each change in the birth rate, death rate and total population size.

Low Pop size, *Rapid Pop Growth*, *Expanding Pop size*, *Birth rate*, *stationary growth → Decreasing total growth*, *total pop.*

make sure to review reasons for each stage.! can't fit it on here!

death rate

Stg.1   Stg. 2   Time Stg. 3   Stg. 4 → stg. 5

11. On the axes below, draw and label an age-structure diagram that represents slow growth, rapid growth, negative growth, and zero population growth.

slow growth | rapid growth | negative growth | zero growth

more ppl in the younger age category = faster pop. growth

12. Explain each of the 3 survivorship curves.

survivors

life expectancy

Type 3 = trees, sea turtles
Type 2 = birds
Type 1 = humans, ~~sea-turtles~~

13. List three consequences of global warming.
   (1) increased temperature of air + ocean
   (2) changing precipitation patterns
   (3) sea level rise (thermal expansion) = flooding

14. List four greenhouse gases.
   (1) CO_2 (3) H_2O vapor
   (2) CH_4 (4) N_2O

15. Identify three examples of biotic components of an ecosystem and three examples of abiotic components of an ecosystem.

Biotic: (1) trees
         (2) bacteria
         (3) animals

Abiotic: (1) temperature
         (2) rocks
         (3) water

16. Complete the following table for these biogeochemical cycles:

Trait	energy Carbon	Nitrogen	Phosphorus	Water
Importance to life	Photosyn + resp. Plant growth	nutrients - plant growth	nutrients - plant growth	everything
Largest reservoir	Ocean, Sediments	Atmosphere	Rocks, Sediments	Oceans, Atmosphere
Major "Steps"	Photosynthesis, Respiration, Decomposition Fossil Fuels, ocean Absorption	N. Fixation Nitrification Assimilation Denitrification Ammonification	Weathering, erosion, runoff, food chain -never in atmosphere	Runoff, precipitation, evaporation, transpiration, Condensation

17. Match the following:
   a. generalist species   C Zebra mussel
   b. specialist species   F Galapagos tortoise
   c. invasive species   D American Alligator
   d. keystone species   E Tiger salamander
   e. indicator species   A Norway rat
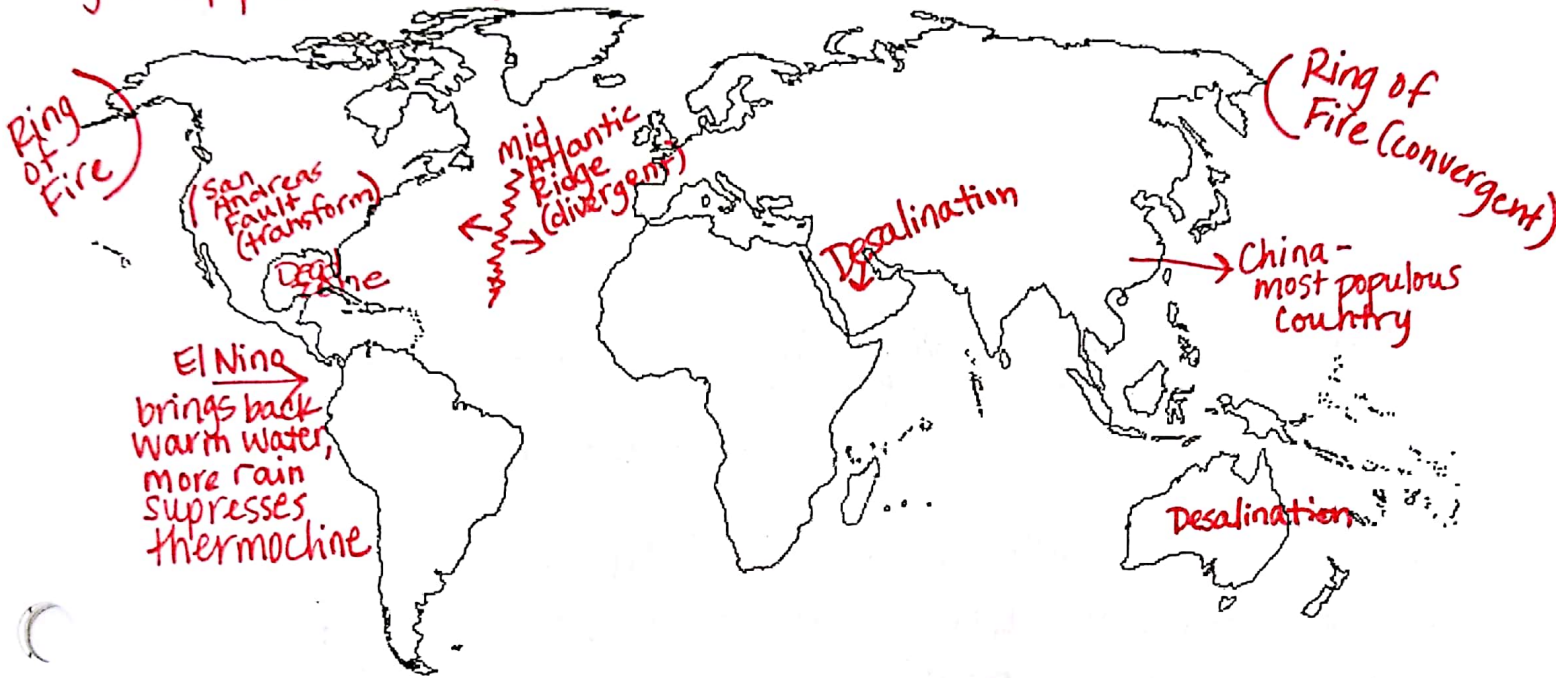   f. endemic Species   B Giant Panda

18. Define the term biodiversity.

variety of species, genes, ecosystems, + functions

19. Sketch and/or label the following on the map of the world below:
    a. the Mid-Atlantic Ridge (label the type of plate movement involved)
    b. the location of suppressed upwelling characteristic of the occurrence of El Niño
    c. the Ring of Fire (label the type of plate movement involved
    d. Location that heavily relies on desalination- know the two types of desalination also
    e. Gulf of Mexico Dead Zone- know why this happens
    f. San Andreas Fault (label the type of plate movement)

g. most populous country

Ring of Fire
San Andreas Fault (transform)
Mid Atlantic Ridge (divergent)
Desalination
Ring of Fire (convergent)
China - most populous country
Dead zone
El Nina brings back warm water, more rain supresses thermocline
Desalination

20. Complete the following table:

| Type of Biome	Typical Location	Typical Climate	Characteristic adaptations for survival
Tropical Rain Forest *nutrient poor soil*	*tropics - equator*	*high temps a lot of rain*	Plants – *broadleaf plants, dense canopy* Animals – *camouflage, cheetahs, frogs*
Temperate Deciduous Forest	*outside tropics - Georgia*	*4 distinct seasons*	Plants – *deciduous trees* Animals – *deer, foxes, owls*
Taiga (Boreal) Forest	*Russia*	*cold temps lower rainfall*	Plants – *coniferous trees* Animals – *moose, fox, lynx*
Tropical Grasslands (Savanna) *maintained by fire*	*tropics, parts of Africa, Australia*	*high temps distinct rainy/ dry seasons*	Plants – *tall grasses* Animals – *lions, giraffes*
Temperate Grassland (Prairie)	*SKIP*		Plants – Animals –
Tundra (Cold Grassland) *Permafrost*	*N. Canada, Eurasia*	*cold, low rainfall*	Plants – *short grasses, no trees* Animals – *cold-tolerant, camouflage w/ snow*
Desert	*tropical, temp., polar deserts*	*tropical= hot/dry temperate= moderate cold= polar*	Plants – *succulents - conserve H₂O* Animals – *heat tolerant*

21. Describe the circumstances that will result in cultural eutrophication as well as how it leads to reduced DO.
① *Increased nitrates + phosphates lead to algal blooms.*
② *Reduction in photosynthesis due to blocked sunlight*
③ *Death of plants*
④ *Aerobic decomposers use up DO to decompose dead stuff*

22. Explain the increasing concentration of carbon dioxide in the atmosphere leads to ocean acidification.
ocean absorbs extra CO_2 turning it into carbonic acid

World Animal Protein Production Per Person, 1961-2009

Pork
Poultry
Beef
Farmed Fish
Sheep and Goats
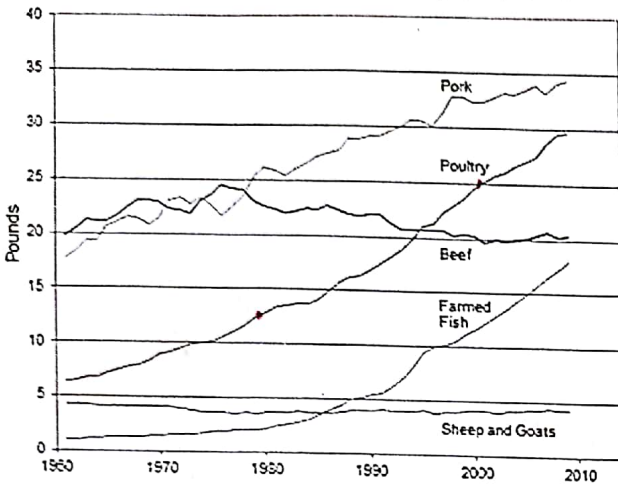
Use the information in the diagram on the left, to answer the following:
The percent change in the per capita global production of protein from poultry between 1980 and 2000 was approximately **100%** .

$$\% \text{ change} = \frac{F-0}{0} \times 100\% \qquad \frac{25-12.5}{12.5} \times 100\% = 100\%$$

23. Rachel Carson wrote the book **Silent Spring** to raise people's awareness of the harmful effects of the pesticide **DDT** .

24. Strengthen this weak statement: "Fossil fuel use releases pollution, which warms the earth."
Fossil fuels release CO_2 which is a greenhouse gas that leads to a warmer atmosphere.

25. What is the equation for finding Net Primary Productivity? **NPP = GPP - R**

26. Briefly describe each:

Clean Air Act: **regulates allowable pollution in the air**

Clean Water Act: **regulates allowable pollution in the water (point source pollution is illegal)**

Endangered Species Act: **US law protecting habitat + trade of endangered species**

CITES: **International law protecting the sale and trade of endangered species**

27. The box to the right contains a crude depiction of a mountain, use it to sketch and label the essential atributes of a rain shadow. Include labels for the direction of the prevailing winds and nearest ocean.

wind
ocean
green plants
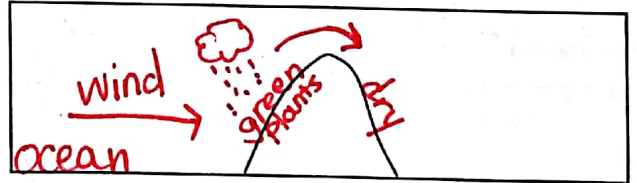
28. List two characteristics of an r-selected species.
    (1) **short lifespan**   (2) **many offspring w/ low parental care**
29. List two characteristics of a K-selected species.
    (1) **long lifespan**   (2) **very few offspring, larger in size**
30. Complete the following table:

Ecosystem Component	An economically valuable ecosystem services it provides
honey bee	Pollinator
water cycle	rain, water crops, water filtration, groundwater recharge
forest	absorbs CO_2 to reduce greenhouse gases, habitat space, protects from soil erosion
bacteria	decomposer, return nutrients to soil, some convert N_2 gas for N cycle
coral reef	Protects from storm surge, very high biodiversity - Habitat and breeding grounds
wetland	flood control, filters pollutants before runoff reaches ocean, breeding grounds, groundwater recharge

5 1. Two islands, different distances from the mainland have different rates of extinction, this is explained by the theory of island **Biogeography**.

12 32. Arrange the following particles in order of smallest to largest; clay, sand, silt

(1) **clay** (2) **silt** (3) **sand**

What is the relationship between porosity and permeability? **the more space b/w the particles, the faster the water flows; High porosity = High Permeability; Clay has highest water holding Capacity Sand has lowest**

33. List four 4 components of the Green revolution.

(1) **more fertilizer** (3) **monocultures**
(2) **more pesticides** (4) **more fossil fuels**

34. Match the following:

a. anemia   **A** iron deficiency
b. goiter   **D** vitamin A deficiency
c. protein   **C** Kwashiokors
d. blindness **B** iodine deficiency

35. Describe the pesticide treadmill.
Natural selection: strongest pests survive pesticide and are able to reproduce + pass on traits to offspring; farmers must apply more pesticide each year

36. Explain how the biomagnification of DDT led to the (near) demise of the Bald Eagle population in the US.
toxins increase in concentration as it moves up the food chain; top consumer most affected DDT affected Bald Eagles b/c their eggs couldn't form hard shell

37. List three things you could do to conserve water.
(1) **low flow faucets**
(2) **turn off water when brushing teeth**
(3) **install grey water systems (recycles water at home)**

38. Complete the following chart.

Mining Technique	Description	Environmental consequences
Open-Pit mining	removal of gravel, sand, metals from large hole	erosion, runoff, acid mine drainage, habitat destruction
Subsurface mining	extraction of a metal ore from deep underground, vertical shafts	can cave in, subsidence, fires, black lung
Strip mining (Area and Contour)	surface mining, use ~~draglines~~ power shovels to remove seams of coal	leaves behind spoils, erosion, acid mine drainage
Mountaintop removal	top of mountain exposes + layers of coal removed	overburden dumped, buries streams, arsenic + mercury exposure

39. Strengthen this weak statement: "Mining causes pollution that may disrupt the environment."
mining causes major air pollution from the release of CO_2, SO_2, NO_2, CH_4, and particulates which leads to increased greenhouse gases, acid rain, and respiratory problems. Mining also releases mercury, arsenic, cyanide, + sulfuric acid into the soil + water.

40. What is different about growing plants hydroponically?
Soil is not used; plants are grown in a nutrient-rich trough of water

41. Explain what a watershed is and why it is significant.
Watershed = a drainage basin based on the topography ↳ Important b/c all pollution will drain to one area; controls; recharges flooding; surface water
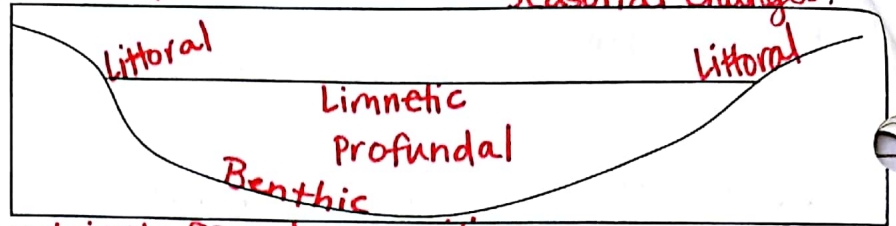
42. List two environmental benefits of wetlands.
1) **flood control**
2) **filters out pollutants in runoff**

43. Explain what an El Niño event is and why it is significant.
Trade winds in the equitorial Pacific weaken and bring back warm ocean water increasing rain in the east and drought in the West Pacific

44. What was the GENE Revolution (1st and 2nd) and why is it important?
1st = cross breeding + artificial selection   2nd = GMDs

45. Label the four major zones of life in the appropriate areas on the diagram representing a temperate lake in the box to the right. Give 1 major characteristic of each zone.

Littoral- high nutrients from runoff, many plants
Limnetic- high DO
Profundal - Cold   Benthic-high nutrients from decomposition

What happens as the lake turns over during seasonal changes?

Littoral

Limnetic
Profundal
Benthic

Littoral

46. What is the difference between oligotrophic and eutrophic lakes?

Oligotrophic Lake- no nutrients, cold H2O, low DO, very clear H2O
Eutrophic Lake-high nutrients, high DO, lots of algae + plant growth, murky water

47. What is the relationship between temperature and density of air, water, and magma. What does this have to do with air currents, ocean currents, and magma convection?

Cold (more dense) sinks
hot (less dense) rises > applies to air, water, + magma

48. Draw and label the four major zones of the ocean with 1 important characteristic of each.

coastal] euphotic (high DO, low NPP)
bathy[
abyssal (high nutrients) low DO

Coastal= high NPP, most diverse, high nutrients
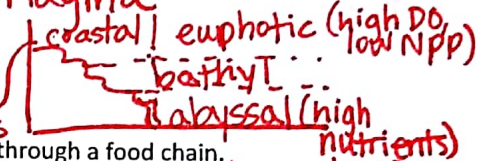
49. Explain the relationship between the 1st and 2nd Law of Thermodynamics and Energy Flow through a food chain.

1st Law-energy can't be created or destroyed, changes form
2nd Law-loses quality as energy changes form; only 10% of energy passed b/w trophic levels; most lost as heat

50. Give advantages and disadvantages to the following:

Advantages	Topic	Disadvantages
High yield, lowers price, reduced land use	Feedlots (CAFOs)	fed corn diets, high conc. of animal waste →runoff, ethical?
highly efficient, can reduce overfishing of wild pops.	Aquaculture	large waste output, vulnerable to disease, high input of antibiotics
high yield, reduced fertilizer, reduced land use	GMOs	reduces natural gene pool, potential health effects,→allergies labeling requirements
Reduced pesticide + fertilizer use, less CO2 emissions, increases biodiversity	Organic Agriculture	lower yield, expensive, more time
reduction in the use of chemical pesticides, reduced resistance, supports natural ecosystem	IPM	potentially less efficient
Supports local economy, reduced transportation + greenhouse gas emissions	Locavore	Sometimes higher prices

51. What impact does the Coriolis Effect have on major air currents and cyclone-winds? equator moves faster than poles; air moves clockwise in northern hemisphere and counter clockwise in the southern hemisphere

52. Design a simple experiment and determine the independent and dependent variable. effect of fertilizer on plant growth; Independent= fertilizer Dependent= plant growth

53. Describe or sketch the events of primary succession. Label the pioneer species and climax community.

Rock → pioneer species → soil → grass/shrubs → sun tolerant → shade tolerant trees
(lichen, moss)   trees   trees   ↑Climax comm.

54. Describe or sketch the events of secondary succession. Label the climax community.

Soil/Grass → shrubs → sun tolerant → shade tolerant trees
                      trees   trees
                                ↑ Climax Comm.

55. Determine the type of soil from the following info: 50% silt, 30% clay, 20% sand= **Loam/Silt Loam**

Percent clay / Percent silt / Percent sand (soil texture triangle)
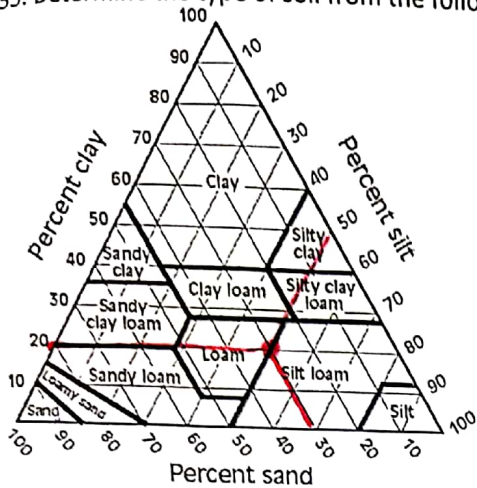
56. Describe each of the types of agriculture and soil conservation methods:

High Input	Industrialized, high input of fertilizers, pesticides, etc. =high yield
Plantation	tropical regions; cash crops grown for export
Subsistence	low input; farming for family needs
No-Till	Planting in undisturbed soil, best practice for ↓ erosion
Terracing	farming on steep slopes by making "steps" to help hold water
Alley Cropping	alternating rows of crops with trees to ↓ wind erosion
Windbreaks	surround the perimeter of crops with trees

57. List 3 alternatives to synthetic chemical pesticides that could be used as part of an IPM plan.

1. natural predators
2. pheromones/hormones
3. scalding water

*Last Resort = small amts of narrow spectrum pesticide

58. Describe how each rock would turn into the other with the Rock Cycle.

The Rock Cycle
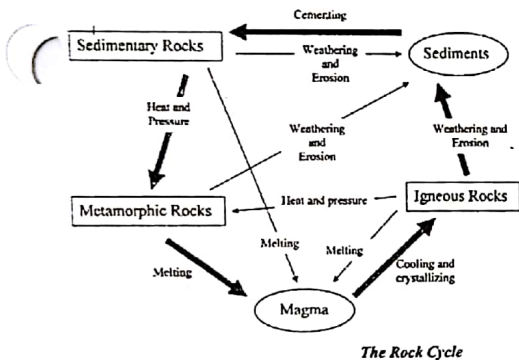
Weathering/Erosion + Compaction = Sedimentary

Heat + pressure = metamorphic

Melting + Cooling Lava = Igneous

59. Match each of the following

_E_. Density Dependent Limiting Factor Example
_A_. Density Independent Limiting Factor Example
_C_. Mutualism
_D_. Commensalism
_B_. Parasitism

a. Natural Disasters
b. 1 benefits, the other is harmed
c. both organisms benefit
d. 1 benefits, the other is unaffected
e. Disease, Resources

60. Explain how soil salinization occurs and how waterlogging can help.

Repeated irrigation with freshwater leaves behind small amts of salt in soil; Waterlogging is a way to try + flush out the salts by adding large amts of water

61. Geologic Timescale: Cenozoic (current), mesozoic, paleozoic, precambrian
↳ Anthropocene - human impact has altered natural landscape