Final Exam

ⓘ This is a preview of the published version of the quiz

Started: Aug 16 at 1:18pm

Quiz Instructions

Question 1 — 1.5 pts

Which of the following are associated with the eutrophication of water (***more than one answer may be correct***)?

- [ ] Algal blooms
- [ ] Increased biological oxygen demand (BOD)
- [ ] Elevated nitrogen/phosphorus concentrations in water
- [ ] Improved fish habitat

Question 2 — 1.5 pts

Which of the following factors were identified in class as significantly contributing to variation in greenhouse gas footprints among different types of foods? (more than one answer may be correct)

- [ ] Differences in emissions of ultraviolet and infrared radiation among foods
- [ ] Differences in the energy needed to transport, process, store, and package different foods
- [ ] Methane production by microbes that may live in agricultural soil and the guts of animals
- [ ] The efficiency by which different animals convert feed (i.e. crops) to biomass (i.e., meat or eggs)

Question 3 — 1.5 pts

Which of the following represents a promising potential feedstock for ***advanced*** bioethanol?

- ○ Sugarcane
- ○ Corn grain
- ○ Perennial prairie grasses, including switchgrass
- ○ Soybeans

Question 4 — 1.5 pts

Which are examples of effective practices that could be used to limit climate change even after CO2 has been released into the atmosphere, as discussed in class? (***multiple answers may be correct***)

- ☐ Capture carbon dioxide from the air and store it deep under ground
- ☐ Convert forests to pasture to increase albedo
- ☐ Reflect sunlight away from Earth by intentionally increasing planetary albedo
- ☐ Add nitrogen to the oceans to enhance eutrophication

Question 5 — 1.5 pts

According to Howarth et al. (2011), how do total greenhouse gas emissions from "fracked" natural gas (i.e., shale gas) compare with coal used as an energy source, and why?

- ○ Greenhouse gas emissions from shale gas are greater than coal because of greater

nitrous oxide emissions

- Greenhouse gas emissions from shale gas are greater than coal because of greater CO2 emissions
- Greenhouse gas emissions from shale gas are lower than coal because of lower CO2 emissions
- Greenhouse gas emissions from shale gas are greater than coal because shale gas leads to greater methane emissions

Question 6 — 1.5 pts

Based on the three main ingredients needed to produce tropospheric ozone, when are tropospheric ozone concentrations likely to be greatest (as discussed in class)?

- Mid-day to afternoon
- Early morning
- Just after sunset
- Morning
- Nighttime

Question 7 — 1.5 pts

What three greenhouse gases produced by human activities have most contributed to increased radiative forcing over recent decades?

- carbon dioxide, methane, nitric oxide
- carbon dioxide, dinitrogen, nitrous oxide
- carbon dioxide, sulfur dioxide, methane

- carbon dioxide, methane, nitrous oxide
- carbon dioxide, methane, dinitrogen

Question 8 — 1.5 pts

Which of the following statements about biofuels is TRUE?

- The fuel to energy ratio is similar for biofuels produced from similar feedstocks
- Fossil fuel energy inputs are associated with many aspects of the biofuel life cycle
- Biofuels have no net effect on atmospheric CO2 but they do involve release of other greenhouse gases
- Biofuel production is beneficial because it decreases nitrous oxide emissions relative to fossil fuels
- Biofuels have net zero greenhouse gas emissions when considering their full life cycle

Question 9 — 1.5 pts

What factor has contributed most to the changes in radiative forcing (i.e., the difference in energy absorbed by the Earth system and the energy radiated back to space) observed over the last several decades?

- Anthropogenic greenhouse gas emissions
- Stratospheric ozone depletion
- Increased solar activity
- Deforestation and altered planetary albedo
- Tropospheric ozone and fine particulate matter production

Question 10 — 1.5 pts

Which of the following best explains the relationship between global food production and global undernourishment (hunger) as discussed in class?

- Trends in food production and global hunger were strongly related, except during periods of major disasters
- Global hunger was approximately stable despite increased global food production over recent decades
- Increased global food production decreased global hunger over the last two decades
- Global hunger is more strongly linked to global food production than poverty rates

Question 11 — 1.5 pts

Which of the following is an impact of current climate change?

- Decreased urban mortality rates due to temperature extremes
- Decreased air temperature variability
- Increasing drought in many already dry regions
- Increased food access in developing countries

Question 12 — 1.5 pts

According to Grimm et al. (2008) and as discussed in class, which of the following statements about urban ecology is FALSE?

- Human interactions with urban nature provide an essential educational tool that may ultimtely promote conservation of global biodiversity

- Dense cities have a disproportionately negative impact on the environment relative to suburbs
- Green infrastructure projects can diminish the impacts of the "urban stream syndrome"
- Planting trees can help mitigate urban "heat islands"

Question 13 — 1.5 pts

In the lecture on human population growth, we discussed a figure that plotted the relationship between Ecological Footprint and Human Development Index (a measure of human well-being) for different countries. Which of the following statements best summarizes these data?

- Lowering the ecological footprint of a given country necessarily requires lowering the Human Development Index, as illustrated by sub-saharan Africa
- Ecological footprint size always decreases with the human development index,
- It is possible for a country to achieve a lower ecological footprint while maintaining a high Human Development Index, as illustrated by comparing the United States with Japan and Italy
- Ecological footprint size always increases linearly with the human development index, indicated by comparing Haiti and Japan

Question 14 — 1.5 pts

Which of the following represent mechanism(s) discussed in class by which plastics have been shown to harm humans, wildlife, or ecosystems? (***more than one answer may be correct***)

- [ ] Many plastics contain compounds that mimic hormones (endocrine disruptors)
- [ ] Some plastics contain trace radioactive materials that are harmful to organisms
- [ ] Plastics absorb and concentrate other environmental toxins, which are then consumed by

animals carried up the food chain

- [ ] Plastics are choking or digestion hazards for wildlife

Question 15 — 1.5 pts

Which of the following represents a sustainability advantage of cities relative to rural or suburban areas?

- ○ Combustion of urban waste materials can in principle supply most energy used by cities
- ○ Cities have decreased vulnerability to natural disasters and sea level rise
- ○ Cities have lower total greenhouse gas emissions than rural areas
- ○ Economies of scale and spatial proximity decrease per-person environmental impacts

Question 16 — 1.5 pts

What best describes the pattern of gross world product (global economic activity) and global carbon dioxide (CO_2) emissions over the last few decades?

- ○ Gross world product has remained steady as CO_2 emissions have increased
- ○ Gross world product and CO_2 emissions have increased at the same rate
- ○ Gross world product has tended to increase faster than CO_2 emissions
- ○ Gross world product has increased as CO_2 emissions have remained steady

Question 17 — 1.5 pts

Which of the following represent common strategies for restoring ecosystems (i.e.,

parts of the "toolbox" for ecological restoration) discussed in class (***more than one answer may be correct***)?

- [ ] Change the species composition (introduce or remove species)
- [ ] Sterilize the soil to eliminate microbial communities
- [ ] Change the disturbance regime (e.g., introduce fire or appropriate grazing)
- [ ] Change the geomorphology of a site

Question 18 — 1.5 pts

Which of the following statements about phthalates and BPA is/are TRUE (***more than one answer may be correct***)?

- [ ] These compounds are present in many consumer products
- [ ] They are leached from some kinds of plastics
- [ ] These compounds are highly regulated by the US government
- [ ] They are always required to be labeled in consumer products
- [ ] These are endocrine-disrupting compounds

Question 19 — 1.5 pts

Human population A has more middle-aged people than young people or old people. Human population B has more young people than middle-aged or old people. Human population C has equal numbers of young, middle-aged, and old people. Which population is growing fastest?

- ○ Impossible to tell from the data provided
- ○ C

- A
- B

Question 20 — 1.5 pts

Positive feedbacks tend to...

- Make a system more resilient to future changes
- Amplify the effects of an initial change in a system
- Generate beneficial change in a system
- Maintain a system in the initial state in spite of a perturbation

Question 21 — 1.5 pts

Fossil fuel combustion is ultimately related to which of the following environmental impacts (***multiple answers may be correct***):

- [ ] Increasted fine particulate matter air pollution (PM2.5)
- [ ] Increased ocean acidification
- [ ] Increased atmospheric carbon dioxide concentrations
- [ ] Increased atmospheric nitrogen deposition
- [ ] Increased tropospheric (ground-level) ozone production

Question 22 — 1.5 pts

Which of the following statements about renewable energy is **FALSE**?

- ○ Iowa is a national leader in wind power, and wind could soon represent our dominant energy source
- ○ Renewable sources (e.g. wind and solar) are currently the fastest growing global energy sources
- ○ Electricity generation from wind and solar power at a given location tends to be highly stable and consistent over time
- ○ Wind and solar power production have much lower life cycle greenhouse gas emissions than any form of fossil fuel

Question 23 — 1.5 pts

Which of the following factors is NOT a likely impact of climate change related to water:

- ☐ Increased evaporation
- ☐ Decreased occurence of heavy precipitation events
- ☐ Increased loss of glaciers
- ☐ Increased water use for agriculture in arid regions

Question 24 — 1.5 pts

Which of the following statements about ecological restoration is **FALSE**?

- ○ Ecological restoration can involve the use of heavy machinery to modify site geomorphology
- ○ Ecological restoration often generates economically important ecosystem services

- ○ Ecological restoration is a highly predictable process
- ○ The success of ecological restoration often depends on the landscape context of a given site

Question 25 — 1.5 pts

Which of the following were discussed in class and/or the Crist et al. (2017) reading as factors that contribute to decreased human population growth (***multiple answers may be correct***)?

- ☐ Increased educational access for women
- ☐ Empowerment of women as a cultural norm
- ☐ Poverty and economic insecurity
- ☐ Access to contraception and reproductive health services
- ☐ Increased agricultural expansion

Question 26 — 1.5 pts

Johnson et al. (2017) provide a case study (discussed in the class on biodiversity) where large-bodied frugivores were removed from a tropical forest. How did this impact the ecosystem?

- [ ] Invasive species effectively replicated the function of the native frugivores
- [ ] Due to a lack of seed dispersal, tree diversity decreased, leading to decreased carbon storage
- [ ] Tree diversity and carbon storage increased due to decreased seed consumption
- [ ] There was no change in tree species composition or carbon storage due to inherent biological resilience

Question 27 — 1.5 pts

Which of the following best describes trends in groundwater as discussed in class:

- ○ The major sources of groundwater nitrate pollution are regulated by the US government
- ○ Groundwater extraction sustains a minor portion of the US agricultural output
- ○ Ames relies mostly on surface water, making it less vulnerable to nitrate contamination
- ○ Groundwater levels have measurably declined in many global regions over recent years

Question 28 — 1.5 pts

Which of the following represents a likely POSITIVE feedback loop associated with climate change:

- ○ temperature rises, tree growth decreases, temperature decreases
- ○ temperature rises, atmospheric CO_2 concentration decreases, temperature decreases

- temperature rises, evaporation decreases, temperature rises
- temperature rises, sea ice melts, albedo decreases, temperature rises

Question 29 — 1.5 pts

Which of the following factors (discussed in class) can best explain the difference in aquatic biological oxygen demand (BOD) from **household** sources, between "more developed" and "developing" countries?

- Developing countries often have inadequate sewage treatment systems
- Developing countries typically use more household water than developed countries
- Developing countries typically consume less meat than developed countries
- Developing countries have a greater use of consumer products with potentially harmful leachates

Question 30 — 1.5 pts

How do Johnson et al. (2017) characterize global conservation efforts (as discussed in the class on biodiversity)?

- [ ] Protected areas have been globally effective in slowing rates of species loss
- [ ] Funding for conservation efforts is generally targeted to regions with greatest conservation need
- [ ] Most protected areas co-occur with biodiversity hotspots
- [ ] Conservation does not have a mainstream role in economic and social policy

Question 31 — 1.5 pts

What is the "carbon debt," as defined in the paper on biofuels (Duke et al. 2013) and discussed in class?

- ○ Loans acquired on the basis of expected future carbon sequestration in an agroecosystem
- ○ The amount of carbon released to the atmosphere as a result of land use change
- ○ Annual payments made to support biofuel production
- ○ Carbon emissions that can be traded among farmers and industry

Question 32 — 1.5 pts

Which of the following represents the most effective strategy to decrease impacts of agricultural nitrogen losses on water quality, as proposed by Davidson et al. (2012) and discussed in class ?

- ○ Substitute phosphorus or molybdenum for nitrogen as a limiting nutrient
- ○ Decrease rates of biological dinitrogen fixation
- ○ Decrease the depth of soil tillage
- ○ Construct or restore wetlands

Question 33 — 1.5 pts

Which of the following statements about nitrogen is/are **TRUE**? (***more than one answer may be correct***)

- ☐ Fossil fuel combustion generates reactive nitrogen gases such as NOx

- [ ] Nitrogen deposition generally increases plant diversity (the number of species in a given area)
- [ ] Dinitrogen gas can be used by most organisms to support growth
- [ ] Nitrogen pollution in the water and atmosphere negatively impacts human health

Question 34 — 1.5 pts

Which of the following best describes the United States' virtual water trade:

- ○ The US has a net zero balance of virtual water after accounting for exports and inports
- ○ The US is a net importer of virtual water
- ○ The US is a net exporter of virtual water
- ○ Economic activity in the US does not involve virtual water

Question 35 — 1.5 pts

By what mechanism is reactive nitrogen permanently removed from an ecosystem?

- ○ Denitrification
- ○ Nitrogen fixation
- ○ Nitrification
- ○ Plant uptake (assimilation)

Question 36 — 1.5 pts

The human population today is approximately X, and will most likely change to X by 2100

- 7.6 billion, 18-20 billion
- 7.6 billion, 10-12 billion
- 7.6 billion, 6-8 billion
- 760 million, 1-1.2 billion

Question 37 — 1.5 pts

What is the greatest uncertainty for predicting future climate change on Earth?

- Poor capacity to measure and predict changes in the physical properties of Earth's climate system
- Chaotic behavior of Earth's climate system, and related positive feedbacks
- Uncertainty in the inputs of solar radiation to the Earth system
- Uncertainty in measurements of atmospheric greenhouse gases
- Uncertainty in predicting future human behavior

Question 38 — 1.5 pts

Which of the following statements about global air temperature is **FALSE**:

- Global air temperature has tended to increase over the last century
- There is significant scientific disagreement about trends in air temperature over the last several decades
- Prior to the last century, global air temperature was relatively stable during the previous 10,000 years

- ○ Extremely hot weather events are more likely to occur as a consequence of climate change

Question 39 — 1.5 pts

Which of the following observations provide evidence of fracking impacts on water or air quality, as discussed in class (***more than one answer may be correct***)?

- ☐ Increased methane concentrations in the atmosphere near fracking sites
- ☐ Microbiological contamination of water near fracking sites
- ☐ Increased concentrations of harmful rare elements (e.g., arsenic) in groundwater near fracking sites
- ☐ Increased methane concentrations in groundwater near fracking sites

Question 40 — 1.5 pts

According to Foley et al. 2011, optimal strategies for increasing human food supply *without* impacting biodiversity include which of the following (***multiple answers may be correct***):

- ☐ Increasing agricultural expansion
- ☐ Reallocating grains from animal feed to direct human consumption
- ☐ Closing the yield gap
- ☐ Decreasing food waste
- ☐ Increasing the production of grain crops to feed animals

Question 41 — 1.5 pts

Approximately how much of an increase in food supply could addressing the yield gap, diet gap, and food waste deliver, combined, according to Foley et al. (2011) and discussed in class?

- ○ 100 - 180 %
- ○ 30 - 50 %
- ○ 10 - 20 %
- ○ 300 - 500 %