



## Försättsblad Prov Original

Kurskod	Provkod	Tentamensdatum
M Ö 0 0 3 A	T E N T	2 0 1 9 - 0 3 - 0 8
Kursnamn	Miljöteknik AV, Klimatförändringar, påverkan och åtgärdss...	
Provnamn	Tentamen	
Ort	Östersund	
Termin		
Ämne		



**Course examination** M0003 A

Course name:	Climate change, impact and action strategies, 7,5 ECTS
Subject:	Environmental engineering
Date and duration:	2019-03-08, 5 hours
Course director:	Anders Jonsson
Support:	English dictionary allowed. No other books, calculators or other support are allowed during the examination.
Questions:	During the first hour of examination, Anders Jonsson can be contacted on telephone: 070-5852972
<b>Please note:</b>	Your personal code must be written on each sheet of paper. Clearly state the number of each question!

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- 1) a) Explain the difference between weather and climate? (3p)  
b) Climate and climate impacts are usually divided into 3 different scales with respect to geographic size. Name these three scales and a process for each scale that affect the climate. (3p)
- 2) Explain, using a conceptual drawing (simple schematic picture showing the earth surface, atmosphere and sun), the natural greenhouse effect. For full score the significance of short- and long-wave radiation and atmospheric greenhouse gasses must be clarified in your drawing. (6p)
- 3) Give a brief description of the global climate system. For full score your description should include the main components of the climate system and you should give examples of significant external forcing factors (natural and/or anthropogenic) which influences the climate system. For each forcing factor explain whether it is mainly anthropogenic or mainly natural (10 p)
- 4) Where are the largest storages of freshwater found? Explain how changes to these storages are related to climate change! (4p)
- 5) Explain why temperatures and sea level will continue to rise even if emissions and radiative forcing are stabilised? (4p)
- 6) Explain in your own words the following terms (12p):
  - a) Global warming potential (GWP)
  - b) Global temperature potential (GTP)
  - b) Radiative forcing
  - c) Effective radiative forcing
  - d) Climate



- e) Climate change. ‘
- 7) Long term predictions indicate that a likely range for sea level increase from 2081-2100 is between 0.32 m to 0.63 m for the RCP4.5 scenario. This value has *medium confidence*. Give four examples of potential uncertainties which could explain why the confidence level is not “high” for this prediction. (4p)
  - 8) Key concepts in understanding impacts, adaptation, and vulnerability include the use of the terms hazards and risks. Explain the terms, and provide an example of each. (4p)
  - 9) Give your comment to the following statement: “A *mitigation strategy can include efforts to limit specific impacts of climate change upon human settlements.*” Do you agree? Explain your answer. (4p)
  - 10) Adaptive capacity is associated with a number of key factors in society. Name a minimum of five such key factors. (5p)
  - 11) Oceans and freshwater are also affected by non-climatic stressors. Give two examples of non-climatic stressors that affect the ocean. (2p)
  - 12) Give two examples of intra-regional interactions among adaptation, mitigation and sustainable development. (4p)
  - 13) Explain what is meant by co-benefits of mitigating climate change and give two examples of such co-benefits! (4p)
  - 14) What are the two most important drivers of increasing GHG emissions? (2p)
  - 15) In what sectors has GHG emissions stopped growing? (3p)
  - 16) State two geoengineering technologies which are important for mitigation. (2p)
  - 17) What are the four criteria (according to the IPCC reports) policies are evaluated from? (4p)
  - 18) On climate modeling (8p).
    - a. What are the main differences between an NWP model and climate models?(4p)
    - b. In climate modeling there is always a tradeoff between resolution and computational power. In order to run a climate model more effective two key concept are used. Name and explain these two. (4p)



19) On air-water gas exchange (12p).

- a. You have a friend that knows nothing about air-sea gas exchange. How would you describe the gas transfer velocity to your friend? (3p)
- b. In many climate models single wind speed parameterizations are used to describe the gas transfer velocity. Discuss on the advantages and disadvantages of that approach. (4p)
- c. Briefly describe three processes that can affect the magnitude of the gas transfer velocity. (3p)
- d. In rivers and streams the processes affecting the magnitude of the gas transfer velocity over sea are considered to be less important. Instead studies have shown that other factors are likely to play a major role in regulating the magnitude of gas transfer velocity. Name and explain one of these. (2p)

*Good luck!*

*Anders and Andreas*