

Name _____

Vorname _____

Matrikel-Nr.: _____

Studiengang: _____

☐ Regulärer Versuch

☐ 1. Whlg.

☐ 2. Whlg.

Universität Rostock
Wirtschafts- und Sozialwissenschaftliche Fakultät
Lehrstuhl für VWL – Angewandte Wirtschaftsforschung –

Klausur

Introduction to Environmental and Resource Economics

SoSe 2024, 2. August 2024

- Beantworten Sie **zwei der drei** gestellten Aufgaben! Unterschreiben Sie die Klausur auf der letzten Seite. Alle Aufgaben sind gleich gewichtet.
- Erlaubte Hilfsmittel: keine.
- *Please answer **two out of three** questions! All questions are equally weighted.*
- *Additional materials allowed: none.*

Bearbeitungszeit: 90 Minuten

Time limit: 90 minutes

Two (and only two) out of three questions! If you attempt more than two questions, cross out the one you do NOT want counted. Otherwise, we will count the first two.

Question 1. (20 points) Suppose a government considers introducing a pollution tax, an abatement subsidy or a cap-and-trade system. The government wants to assess the likely performance of the three instruments.

Assume that all relevant functions are known with certainty. In your answers, use the tools of graphical analysis and relevant economic arguments you have studied on this topic.

a) (6 points) Consider a pollution tax at rate τ per ton of emissions and an abatement subsidy, with subsidy rate σ per ton of emissions. Assume that tax and subsidy rates are equivalent, i.e. $\tau = \sigma$. Compare and contrast the performance of the tax and subsidy with respect to abatement in the short run. Show graphically and discuss briefly.

b) (6 points) Compare and contrast the distributional effects of abatement subsidy and pollution tax, again in the short run. Again, assume that tax and subsidy rates are equivalent, i.e. $\tau = \sigma$. Show graphically and discuss briefly.

c) (2 points) Now consider dynamic effects, i.e. effects in the long run. Again, assume that tax and subsidy rates are equivalent, i.e. $\tau = \sigma$. What are dynamic effects of the pollution tax and abatement subsidy, first, on the regulated emitters and, second, on competing firms that offer substitute products which do not cause pollution? Discuss briefly.

d) (6 points) Consider the following statement by an economist from the government team: "A cap-and-trade system with free allocation can achieve the same outcomes as a pollution tax". Do you agree with this statement? In your answer, consider outcomes of the two instruments on abatement, the equilibrium cost of pollution and transfers from firms to the government and from the government to firms. Show graphically and discuss briefly.

Question 2. (20 points) Consider the static model of flow pollution. Damage from pollution depends on the flow of pollution, i.e. $D(M)$. Benefit from pollution also depends on the flow, i.e. $B(M)$. Assume that damage from pollution is increasing at an increasing rate, i.e. $D'(M) > 0$ and $D''(M) > 0$. Assume that benefits from pollution are also increasing, but at a decreasing rate, i.e. $B'(M) > 0$ and $B''(M) < 0$. In your answers, use the tools of graphical analysis and the relevant economic arguments you have studied on this topic.

- a) (7 points) What is the efficient level of pollution? Why? Show graphically and discuss briefly.
- b) (3 points) What is the social surplus from the efficient pollution level? Show graphically and discuss briefly.
- c) (3 points) Show that any other pollution target leads to losses in economic efficiency. Show graphically and discuss briefly.
- d) (7 points) Now consider two firms with different marginal abatement costs, i.e. MAC_1 and MAC_2 . Assume that for any level of abatement, the marginal abatement cost of firm 1 is higher than the marginal abatement cost of firm 2, i.e. $MAC_1 > MAC_2$. Show graphically and briefly discuss the loss in cost-effectiveness from setting the identical abatement target for both firms.

Question 3. (20 points) Suppose two countries, X and Y, are negotiating about an agreement to counter climate change.

a) The countries play a static game of perfect information, i.e. both countries move simultaneously and all payoffs are known to all players. Suppose the payoff matrix for the game is as follows:

X's strategy \ Y's strategy	Pollute	Abate
Pollute	0,0	5,-2
Abate	-2,5	3,3

a1) (2 points) What is a game with this kind of payoff matrix called? Why?

a2) (4 points) What are the Nash equilibria of this game? Why?

b) Suppose now that the payoffs to the players are as follows:

- Each country that abates incurs an abatement cost of 8. Being a public good, abatement by each country gives benefits of 6 to each player.
- If neither country abates, both countries receive a payoff of -5 each.

b1) (4 points) Fill in the payoff matrix for this game. What is a game with this kind of payoff matrix called? Why?

b2) (4 points) What are the Nash equilibria of this game? Why?

c) Consider now the issue of international environmental agreements (IEAs).

c1) (4 points) Explain the concept of a self-enforcing agreement. Are real-world IEAs likely to be self-enforcing agreements? Discuss briefly.

c2) (2 points) Name and briefly discuss one way of making IEAs effective even in the absence of the self-enforcing property.