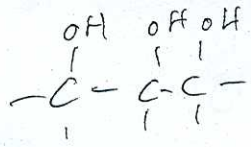

Petroleum Geology ta3450
Written Examination - January 20, 2003

The following questions should be answered as concisely as possible. Each question counts the same towards the final score. The bonus question can add 10% to the total.

1. The history of petroleum exploration shows a trend from shallow, easily producible fields to deeper fields whose oil and gas is difficult to produce. List some key events that document this. Explain how you think this will continue in the next 20-50 years.

2. Draw a sketch of the carbon cycle of the Earth and indicate approximately how much of the total carbon is in each part of the cycle. Name and describe briefly other, non-carbon-based life cycles that occur on the Earth.

3. Name the four principal biomolecule groups that are the source material for fossil hydrocarbons. Indicate for each one where they occur predominantly. What are the principal conditions for them to be preserved?

4. Make a simpe sketch of the various stages in hydrocarbon maturation. What are the simplest metrics for quantifying the degree of maturation? What is a by-product of the maturation process? Name the two principal parameters controlling maturation.

5. Name the four naturally occurring groups of fossil hydrocarbons and list some examples for each, including their use. How does their distribution change with the various distillation fractions? General chemical formulas give *bonus points*.

6. List all the evidence supporting migration. Which two different kinds of migration do we distinguish? You can make a sketch to illustrate this.

7. Name the principal geological factors influencing the permeability of a reservoir rock. What is the unit of permeability, and how does it relate to reservoir quality, expressed in classes?

8. Make a list of the most relevant pore types and list their importance for sandstone and carbonate reservoirs. Why do these two reservoir lithologies differ so much in their pore types?

9. Make a cross-section through the Viking graben in the North Sea and illustrate the migration paths and accumulation conditions.

10. Name the main factors why the Arabian platform is such a prolific hydrocarbon province. Then explain why the oil- and gas fields decrease in volume and numbers towards the four directions NW (Turkey), NE (Iran), SE (Oman), SW (Interior of Saudi Arabia).

Bonus Question

11. Discuss evidence for and against an organic origin of fossil hydrocarbons. Where and why is the theory of an inorganic origin of hydrocarbons most popular?