**ES486 Lecture Review Exercise Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**University of Delft Lecture Review Questions: Carbon Cycle-Origin of Hydrocarbons**

Watch the video lecture at the following URL: <https://ocw.tudelft.nl/course-lectures/pgeo-l2-carbon-cycle-maturation/> and review the following related lecture slides:

<https://people.wou.edu/~taylors/es486_petro/PGeo_L2_Petroleum_Geology_-_Lecture_2_08.pdf>

Answer the review questions below. Use internet search resources as needed to augment your answers. Provide sketches or image-capture diagrams where required.

1. In terms of chemical composition, define the term “organic chemistry” and how it is connected to the chemistry of life on planet Earth.
2. What type of life forms are the main source of organic carbon for the generation of oil and gas in the geologic environment?
3. Based on the slide 6 diagram presented on the Mass Balance of Carbon in Nature, which part of the carbon cycle provides the greatest influx of carbon contribution to the origin of hydrocarbons?
4. True or False: carbon bearing minerals and compounds are only found in sedimentary rocks.
5. True or False: meteorites from extraterrestrial space can include up to 6% organic matter.
6. Examine slide 12 from the lecture entitled “Biomolecultes in Living Organisms”. This the three predominant organic composed that comprise plant and animal life on planet Earth.
7. Examine slide 13 entitled “Abundances of Biomolecules”, true or false marine fish are the most abundant source of organic carbon in the oceans on planet Earth.
8. Examine slide 14 entitled “Average Composition of Biomolecules”, in decreasing order, list elements that are most abundant in hydrocarbon compounds in living tissue and petroleum fossil fuels.
9. Examine slide 15, True or False: most organic biomass production occurs in the deep ocean, not in the shallow ocean within photic zone of sunlight penetration.
10. Examine slide 17, True or False: for preservation of organic matter in the sediments, and thus petroleum generation over geologic time, shallow oceans with well oxygenated water are the best environment.
11. Examine Slide 20, true or false, clay rich, carbonaceous organic bearing sediments in deep water are the best source of organic carbon leading to the production of petroleum and natural gas.
12. Exam slide 23, entitled “TOC Types”, define the difference between Bitumen and Kerogen as organic carbon sources. Which is the primary source of petroleum hydrocarbon?
13. Examine Slide 25: True or False – organic carbon content of Kerogen increases with increasing temperature and depth of burial in the subsurface environment..
14. Describe the concept of “thermal maturation” in the context of petroleum generation.
15. True or False: thermal maturation of organic sediment increases with depth of burial in sedimentary basins over geologic time frames of 100,000’s to millions of years.
16. Examine slide 31, describe the relationship between depth of burial, geothermal temperature, and oil-gas generation.
17. Examine slide 32, based on geologic time in Ma (millions of years before present), which time period of geologic history is associated with the peak generation of petroleum hydrocarbons.
18. What is the index of Vitrinite Reflectance in terms of source rock maturation, and how is it used?
19. Examine Slide 37, “Oil and Gas Windows”, in terms of subsurface cooking temperatures at burial depths, what is the optimal geothermal temperature for the production of natural gas? What is the optimum temperature for the productions of “oil”?
20. True or False: Natural gas forms at thermal maturation temperatures lower than liquid oil.
21. True or False: petroleum geology is a really deep subject, and relatively speaking, a hot topic.