UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY, 2018

COURSE NO: PE 172
COURSE NAME: PETROLEUM GEOLOGY
CLASS: PE I TIME: 3 HRS

Name: _____ Index Number: _____

INSTRUCTIONS

This exam consists of **sections A and B.**
Attempt **Section A and two (2) questions in Section B (Q1 to Q3** and **either Q4 or Q5)**.
Write **all** your answers in the answer booklets provided.
Show **all** the necessary workings and state any assumptions made on your answer sheets.
Each correct answer under **section A** carries **1 mark** except 26 – 30 which carry **0.5 marks each**.
The marks for each question under **Section B** are indicated in brackets at the end of the question.

SECTION A

1. The literal meaning of petroleum is ……..…….
2. The invention of …….. (transport) and distillation of …… (fluid) out of oil were extremely important factors in spurring the growth in petroleum production in the beginning.
3. OPEC stands for ……..…….
4. The first theory of petroleum exploration was ……..……..…….
5. The three types of sedimentary rocks are ……..., chemical and …… sedimentary rocks.
6. Unconventional oil is so called because ……....
7. Beside in-situ extraction, some unconventional oil may be produced by ……
8. …… is the set of processes that act on sediments to convert them to sedimentary rocks.
9. …….. is the degree of smoothness of the surface of rock grains is called while that of the uniformity of grains is called …….
10. There are ……(relative quantity) carbonate reservoirs than sandstone reservoirs but there is …….. (relative quantity) production of oil from carbonate reservoirs than sandstone reservoirs
11. …….. porosity is the appropriate porosity to use for petroleum reserve estimations.
12. …… the most common depositional barriers in reservoirs.
13. The commonest type of porosity in sandstones is ……
14. The main cause of the loss of porosity and permeability with depth is ……..
15. The natural gas from a certain field is obtained out of produced oil, therefore, it is… natural gas.

16. The commonest metal in crude oil is ……

17. Crude oil with more paraffins is termed as ……

18. ……. crude is used for price referencing and a common one on the London oil market is ……

19. …… is the main condition necessary for the preservation of organic matter in sediments.

20. Almost all the organic matter that forms crude oil is produced in the ……

21. Higher order plants contain lignin and generates ……

22. ……..….is the primary factor that determines source rock quality.

23. The most important factor that controls the thermal maturation of organic matter is …… and the period (stage) in which oil is generated is called ……

24. The depth range within which oil is normally generated from organic matter is called …… For gas, this depth is normally up to …… km

25. When petroleum migrates before trap formation, it may end up as ……..

Answer True or False

26. Stratigraphic traps are the most common.

27. Wet gas has high water content.

28. As gas is lighter, it is the hydrocarbon first formed during the thermal maturation of kerogen.

29. Old deeper oil usually has higher quality than young shallow oil.

30. All traps contain petroleum.

SECTION B

Question 1

a. State three of the five conditions necessary for commercial petroleum accumulation **(3)**

b. Briefly explain how grain size affects permeability with the help of a diagram. **(4)**

c. Explain why there is better correlation between porosity and permeability in a sandstone reservoir than in a limestone reservoir. **(4)**

d. Give two reasons why oil in two reservoirs in the same field have different composition. **(2)**

e. Oil is mostly found in black shale. Explain why this is so. **(3)**

Question 2

a. Briefly explain why gas be formed at shallower and deeper depths than oil. **(4)**

b. i. How do we know that petroleum migrates? Enumerate three evidences. **(3)**

ii. List two mechanisms and two pathways in secondary migration. **(2)**

c. i. Differentiate between stratigraphic and structural traps in two ways. **(3)**

ii. Complete the table below: **(5)**

(1)…… Traps			(6)…… Traps	
Examples	Anticlinal or (2)…….. (another name) Traps		Sub Classification	1. Depositional (lithologic) 2. (7)……
	(3)……Traps: usually salt but also (4)……		Examples	Barrier bars (8)…… (9)…….. (10)……..
	(5)…… Traps			

d. In a field, a full, upright anticlinal trap has a gross pay of 50 m and net-to-gross of 0.75.

i. What is the closure of the trap? **(1)**

ii. What is the thickness of the unproductive intervals in this reservoir and what will these unproductive intervals be likely made of? **(3)**

Question 3

a. List two of the most widely exploited unconventional hydrocarbons except shale gas and state one country for each, where these resources listed above are currently widely exploited. **(2)**

b. State the two main factors that control the exploitation of unconventional hydrocarbons. **(2)**

c. Briefly describe how shale gas may be produced, stating two environmental concerns associated with it. **(5)**

d. On a sketch map, show the documented sedimentary basins in Ghana, paying attention to sizes but not to scale. **(4)**

e. State two producing petroleum fields in Ghana and the basins in which they are located. **(2)**

Question 4

You witnessed an argument between two students about the origin of petroleum in which both students were wrong. As a petroleum engineering student, clarify the situation by offering a detailed discussion on the theories about the origin of petroleum. **(12)**

Question 5

Narrate how carbon molecules in the atmosphere may end up in a car as diesel and return back into the atmosphere, briefly describing stages and processes in this journey and the necessary conditions. **(12)**

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(Examiners)