UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, DECEMBER, 2017

COURSE NO: PE 279
COURSE NAME: GEOL. METHODS OF PETROLEUM EXPLORATION
CLASS: PE II TIME: 3 HRS

Name**:** _____ Index Number: _____

INSTRUCTIONS
Attempt **Section A, questions 1 and 2 of Section B and either question 3 or 4 of Section B**.
Write **all** your answers in the answer booklets provided.
The mark for each question in Section B is indicated in brackets above or beside the question.

SECTION A (1 mark for each correct sentence completion answer and 0.5 marks for each true or false answer)

Complete the sentences with the most appropriate phrase(s)

1. Two of the earliest methods of petroleum exploration before modern petroleum geology were closeology and ……, while ……..…… theory marked the beginning of application of geology to petroleum exploration.

2. Throughs are formed ……which happen to be at compressive margins.

3. ……. basins are the most petroliferous basins in the world and while …….. basins make up the largest percentage of basin surface area in the world.

4. Lying wholly on the continental crust, ……... basins also usually lie on the stable parts of the continental crust, making them generally lack ……, therefore, their petroleum potential is generally low.

5. …… is the most prolific petroleum province for conventional oil and gas in the world. While it is very attractive explore in such a traditional province, some new or less known areas, frequently referred to as …….. do receive attention. A good example of such areas in recent time in Africa is ……..

6. The North Sea province is cited as a famous example of ……..……basins. In that regard, it is similar to ……. province. Meanwhile, the nearby Offshore West Africa province is dominated by …… basins.

7. Crustal loading, which forms …….. adjacent mountains is also a major factor in forming ……. basins where sediments loaded on the …… at inactive plate boundaries provides further subsidence for sedimentation.

8. Normally, …….. hydrocarbons are found at the edges/flanks of a basin while…….. are found in the inner parts.

9. A tilted fault block play means a group of …… formed by …….

10. A correlation panel hung on a marker horizon is called a ……..…….. cross-section and a typical

11. Missing formations on cross-sections are usually indications of ……..……...(anyone)

12. The use of a well in the vicinity of a seismic line to guide seismic interpretation is called …….….....

13. …… shows the configuration of a particular horizon with respect to a particular datum.

14. The initial stage of petroleum exploration up to the drilling of the first well is known as ……..

15. Bitumen, ammonia, iodine and micro bacterial oxidation potential are all …….…...…

16. The most advanced and widely used geophysical method of petroleum exploration is ……..…….…….

17. A seismic anomaly on a seismic section which points to the presence of petroleum is called ……

18. A domal seismic signature on a seismic section without internal layering is an indication of a …… while discontinuities in seismic events on seismic sections are usually interpreted as …….……

19. ……..….. is a solid cylinder of rock taken from a well for analysis.

20. Two different prospect appraisals exist; …….. appraisal and economic appraisal with ……being one main economic criteria used to appraise a prospect.

21. …….…… is the costliest component of petroleum exploration and while ……..……. is usually the costliest during prospecting phase.

22. A typical onshore well costs …… USD while a typical offshore well costs …….

23. A ……..…….. is an area covered by a particular petroleum agreement.

24. ……. is a type of agreement in which a party agrees to make a cash contribution to the party drilling of a well to a certain depth in return for geological and drilling information on that well.

25. …… is a company who carries the day to day activities of exploration on behalf of parties in a joint operating agreement.

26. ……. is a legal document that grants the right to explore and drill for gas and oil for a specific time.

27. In a ……. petroleum agreement, the contractor and host government bear the cost and risk, contractor takes cost oil to recover costs and profit oil is shared according to contributions.

28. The most notorious environmental and safety accident in the oil and gas industry in recent times is the ……..

29. To mitigate environmental problems, an …….. usually required by regulators prior licensing/permitting petroleum companies to work.

30. ……..….. are regions around petroleum deposits with unusual concentrations of hydrocarbons than surrounding areas.

Answer True or False

31. Due to current advances in seismic technology and presence of direct hydrocarbon indicators, petroleum can be discovered without drilling.

32. Mud logging is an example of wireline logging

33. Seepage mapping is a direct geochemical mapping technique.

34. A dryhole contains no petroleum.

35. Isopachs depict stratigraphic thickness while isochores depict vertical thickness.

SECTION B

Question 1 **(16)**

a. Briefly describe some advances in petroleum exploration from past to present. (4)

b. Briefly define/explain the following:

i. Chance of success (2)

ii. Reconnaissance license (2)

iii. Delineation well (2)

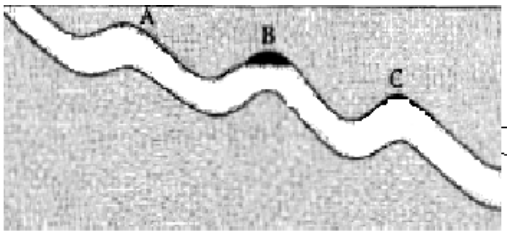

Fig. 1

c. i. For the three traps in Fig. 1, trap B has been found not to be full upon drilling. As an exploration geologist, advise which trap should be drilled and briefly explain your choice.
(4)

ii. List two factors that may disrupt the normal pattern of petroleum distribution in a basin (2)

Question 2 **(20)**

a. Give one geologic and two other criteria you would use to select a country/area for exploration. (3)

b. List the main activities undertaken in a concession to find petroleum in the right order
(3)

c. i. For the prospects with the information in Table 1, rank them in the order you would drill. (4)

Table 1

	Prospects			
Probabilities	Odum	Wawa	Teak	Hyedua
Probability of a source rock	1.0	0.6	0.7	0.9
Probability of a reservoir	0.5	0.7	0.5	1.0
Probability of a trap	0.5	0.6	0.8	0.7
Probability of a seal	0.6	0.5	0.6	0.8
Probability of correct maturation level	0.0	0.4	0.9	0.6

ii. Which prospect would you not drill at all? (1)

iii. Re-rank the prospects if the following additional information is made available assuming the prospects are oil prospects.
(5)

Table 2

Reservoir Properties	**Prospects**			
	Odum	Wawa	Teak	Hyedua
Area (acre)	300	500	400	300
Thickness (ft)	100	90	90	100
Porosity	0.3	0.25	0.3	0.2
Water saturation	0.3	0.2	0.25	0.35
Recovery Factor	0.4	0.4	0.35	0.25

d. State two common environmental and safety problems each in petroleum exploration.
(4)

Question 3 **(14)**

a. State two factors that make Aulacogens very petroliferous (2)

b. State two ways in which the following can be used to aid petroleum exploration.

i. Gravity methods (2)

ii. Geochemical Prospecting (2)

c. i. List the two commonest direct hydrocarbon indicators on seismic sections. (2)

ii List four examples of well logs and give one main use of any two (4)

d. Give one use of each of structural and stratigraphic cross sections (2)

Question 4 **(14)**

a. List two famous petroleum provinces in Africa and four others elsewhere in the world apart from those given to you or supplied by you in questions 5 and 6 of Section A.
(3)

b. State two ways in which the following can be used to aid petroleum exploration.

i. Visual remote sensing (2)

ii. The petroleum system concept (2)

c. i. State three uses of wireline logging. (3)

ii. State two ways through which well drilling may provide information for petroleum appraisal.
(2)

d. List four types of maps used in petroleum exploration. (2)

Samuel Tawiah / Assoc Prof M. Affam
(Examiners)