

2901/303  
PETROLEUM EXPLORATION  
AND DRILLING  
June/July 2022  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN PETROLEUM GEOSCIENCE

MODULE III

PETROLEUM EXPLORATION AND DRILLING

3 hours

#### INSTRUCTIONS TO CANDIDATES

*You should have the following for this examination:*

*A non-programmable scientific calculator;*

*An answer booklet.*

*This paper consists of EIGHT questions.*

*Answer any FIVE questions in the answer booklet provided.*

*Maximum marks for each part of a question are indicated.*

*Candidates should answer the questions in English.*

**This paper consists of 4 printed pages.**

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

1. (a) Explain the following rights to land which may need to be obtained by contractors over the course of a petroleum exploration and development activities:
- (i) right of access for passage;
  - (ii) temporary occupation;
  - (iii) permanent occupation;
  - (iv) right of way.

(10 marks)

- (b) When the results of exploration and appraisal activities confirm that the extraction of a petroleum resource and the construction of associated infrastructure for its development and production are viable, the contractor proceeds with obtaining the necessary development permits. Describe any **two** permits required by the contractor.

(7 marks)

- (c) Outline the following terms associated with acquisition of exploration acreage:

- (i) open acreage;
- (ii) farm-in.

(3 marks)

2. (a) Describe the following types of drilling rigs:

- (i) jack-ups;
- (ii) semi-submersibles.

(7 marks)

- (b) (i) Define an abandoned well.

(2 marks)

- (ii) Explain the operations for plugging and abandoning an oil or gas well.

(8 marks)

- (c) Explain the well test for oil and gas.

(5 marks)

3. (a) With reference to safety in oil drilling activities, state **two** hazards and **three** solutions for each of the following processes:

- (i) removing the horse head;
- (ii) removing the well head, pulling and running rods;
- (iii) drilling.

(15 marks)

- (b) State five precautions to be taken in order to avoid slipping hazards in oil drilling operations. (5 marks)
4. (a) Explain four environmental effects of oil drilling in the ocean. (12 marks)
- (b) (i) Describe oil well planning.
- (ii) State five checklist considerations for a well drilling program. (8 marks)
5. Figure 1 shows a rotary drilling rig.
- (a) Name the parts labelled A, B, C, D, E, F, G, H, I and J. (5 marks)
- (b) State six functions of the drilling fluid used in rotary drilling. (6 marks)
- (c) State six factors responsible for well deviation. (6 marks)
- (d) State three benefits of rotary drilling. (3 marks)

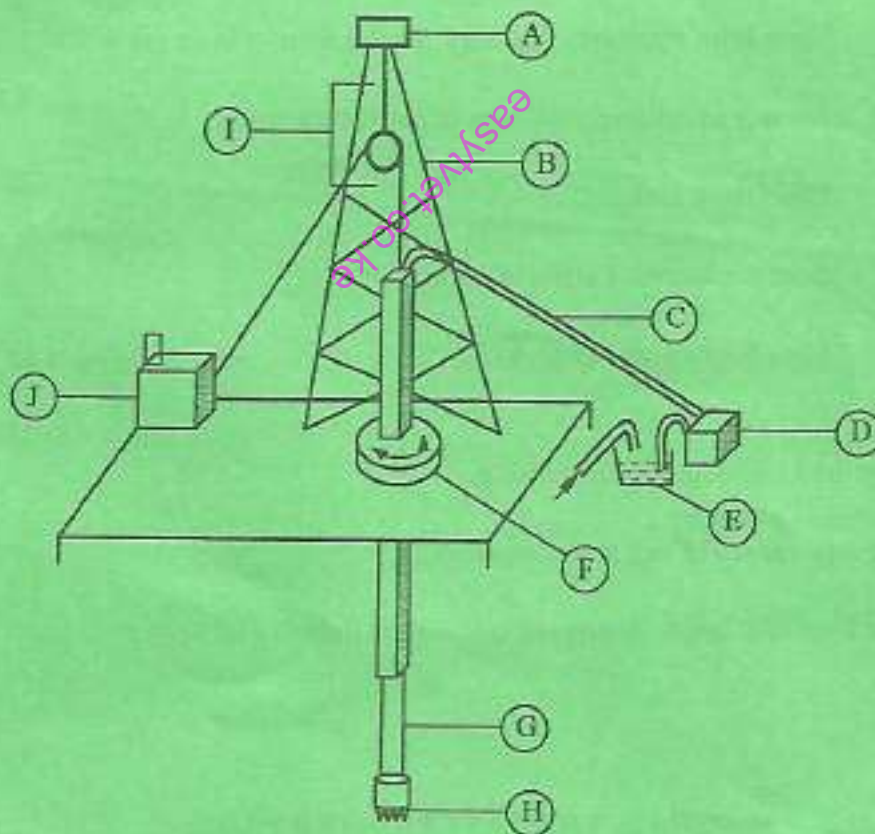


Fig. 1

6. (a) In oil well drilling, horizontal drilling is sometimes adopted.
- (i) Describe horizontal drilling.
  - (ii) State four purposes for horizontal drilling.
  - (iii) State four categories of reservoir rocks which may be exploited through horizontal drilling.
- (12 marks)
- (b) With the aid of a sketch, explain the stages for horizontal well drilling. (8 marks)
7. (a) (i) Describe well completion.- (ii) State five expectations for a successfully completed well.

(9 marks)

(b) Explain the procedure for oil well abandonment. (6 marks)

(c) (i) Define 'fishing' in oil wells.- (ii) State four situations that may require fishing in an oil well.

(5 marks)

8. (a) With reference to drilling problems in petroleum wells:

  - (i) Describe a kick;
  - (ii) State six warning signs of kicks;
  - (iii) State four causes of kicks.

(8 marks)

(b) Describe a blowout in well drilling. (3 marks)

(c) State five causes of dry holes in oil wells. (5 marks)

(d) State four challenges facing the oil and gas industry in Kenya. (4 marks)

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