



INTRODUCTION TO PETROLEUM GEOLOGY

INSTITUTE FOR PROFESSIONAL AND EXECUTIVE DEVELOPMENT

United Kingdom

UNIT SPECIFICATION

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Unit Title

Introduction to Petroleum Geology

Credit value

The credit value for this unit is 30

30 credits equivalent to 300 hours of teaching and learning
(10 hours is equivalent to 1 credit)

Guided learning hours (GLH) = 50 hours

GLH includes lectures, tutorials and supervised study. This may vary to suit the needs and requirements of the learner and/or the approved centre of study.

Directed learning = 50 hours: This includes advance reading and preparation, group study, and undertaking research tasks.

Self-managed learning = 200 hours: This includes completing assignments and working through the core and additional reading texts. It also includes personal research reading via other physical and/or electronic resources.

Learning outcome Learner will:	Assessment criteria Learner can:
1.0 Understand the nature of the earth's crust	1.1 Use an appropriate diagram to describe the earth's crust 1.1.1 Describe the characteristics of the inner and outer cores, mantle, oceanic and continental crusts of the earth 1.2 Examine the types of rocks that make up the earth's crust <ul style="list-style-type: none"> ○ Igneous rocks (plutonic and volcanic) ○ Sedimentary rocks (clastic sedimentary rocks, organic sedimentary rocks, chemical or crystalline sedimentary rocks) <ul style="list-style-type: none"> - Examine the process of cementation and compaction of unconsolidated sediments - Examine the parts of a clastic sedimentary rock as viewed under a microscope (sediment grains, natural cement, pores) ○ Metamorphic rocks (foliated and non-foliated) 1.3 Examine types of minerals that make up rocks (e.g. calcite, halite, quartz, gypsum, pyrite, galena)
2.0 Understand the nature of porosity and permeability of sedimentary rocks	2.1 Explain what is meant by porosity of a sedimentary rock 2.2 Examine the relevance of a rock's porosity to the accumulation of petroleum 2.3 Differentiate between well sorted sand grains and poorly sorted sand grains 2.4 Compare the porosity of sedimentary rocks such as clay, shale, mud, limestone, dolomite etc. 2.5 Explain what is meant by the permeability of a sedimentary rock 2.6 Evaluate the relevance of permeability of a sedimentary rock to the migration of petroleum

<p>3.0 Understand the deformation of sedimentary rocks</p>	<p>2.7 Examine how the arrangement of rock particles such as well sorted and poorly sorted) influences permeability</p> <p>3.1 Explain the cause of distortion(s) in the earth's structure</p> <p>3.2 Describe the characteristics of monoclines, anticlines, synclines and domes</p> <p>3.2.1 Explain why anticlines and domes are of greater interest to petroleum prospectors</p> <p>3.3 Examine the phenomenon of faulting and describe the various types of faults:</p> <ul style="list-style-type: none"> ○ Normal faults ○ Reverse faults (thrust faults) ○ Strike-slip faults <p>3.3.1 Explain why faults are of interest to petroleum prospectors</p> <p>3.4 Describe how an unconformity is formed</p> <p>3.4.1 Examine an angular unconformity and a disconformity</p> <p>3.4.2 Explain why unconformities are of interest to petroleum prospectors</p> <p>3.5 Give an account on the evolution of a sedimentary basins</p>
<p>4.0 Understand the phenomenon of plate tectonics</p>	<p>4.1 Explain the meaning of plate tectonics</p> <p>4.2 Describe the reshaping of the earth's continents from the movement of a single landmass (pangea) to the creation of today's continents (Permian, Triassic, Jurassic, Cretaceous, Present day)</p> <p>4.3 Give an account on the seafloor spreading theory</p>

<p>5.0 Understand the geologic timescale and important events in the earth's history</p>	<p>5.1 Explain the meaning of geological timescale</p> <p>5.2 Analyse the geologic timescale:</p> <ul style="list-style-type: none"> ○ Phanerozoic (Paleozoic, Mesozoic, Cenozoic) ○ Proterozoic ○ Archean <p>5.3 Discuss the 2 methods used for dating the formation of rocks and events</p> <ul style="list-style-type: none"> ○ Absolute age dating (radioactive age dating) ○ Relative age dating <p>5.3.1 Examine the importance of fossils to relative age dating</p> <p>5.3.2 Describe guide or index fossils, fossil assemblage and microfossils (foraminifera, radiolaria, coccoliths and diatoms)</p>
<p>6.0 Understand the petroleum systems processes</p>	<p>6.1 Examine the conditions necessary for the accumulation of petroleum (presence of a source rock, reservoir rock, trap, overburden rock)</p> <p>6.2 Explain what is meant by a kerogen and examine the types (Type 1,2,3 and 4)</p> <p>6.3 Examine the following stages of petroleum maturation:</p> <ul style="list-style-type: none"> ○ Diagenesis ○ Catagenesis ○ Metagenesis <p>6.4 Examine the essential features that a reservoir must possess for it to be effective</p> <p>6.5 Describe the characteristics of carbonate and sandstone (or clastic) reservoirs</p> <p>6.6 Give an account on primary and secondary migration of petroleum</p> <p>6.7 Give an account on how petroleum traps are formed</p>

<p>7.0 Understand the nature and properties of petroleum</p>	<p>6.8 Describe structural, stratigraphic, combination and hydrodynamic traps</p> <p>7.1 Examine the chemical composition by weight of a typical crude oil and natural gas</p> <p>7.2 Examine the types of hydrocarbon molecules that occur in crude oil and natural gas</p> <p>7.3 Examine how different crude oils are compared using their API°</p> <p>7.4 Examine the various benchmark crude oils</p> <p>7.5 Explain what is meant by the pour point, cloud point and viscosity of crude oil</p> <p>7.6 Analyse the typical natural gas hydrocarbon composition</p> <p>7.7 Examine the impurities that can be present in both crude oil and natural gas</p>
<p>8.0 Understand the oil and gas value chain</p>	<p>8.1 Explain the meaning of the oil and gas value chain</p> <p>8.2 Describe the upstream, midstream and downstream parts of the value chain</p>
<p>9.0 Understand the origins of hydrocarbons</p>	<p>9.1 Evaluate the two contemporary theories that deal with the origin of hydrocarbons:</p> <ul style="list-style-type: none"> ○ Biogenic ○ Abiogenic

Recommended learning resources

Indicative reading	Hydrocarbon exploration and production by Graham et al (2008). ISBN: 978-0444532367 <ul style="list-style-type: none">• For a full list of textbooks and publications relevant to this unit, please contact IPED - UK.
Learning Aid	<ul style="list-style-type: none">• A comprehensive IPED study material is available to aid in learning and research of this unit.• We supply IPED course materials free of charge. Our study materials, which offer quick learning start, are comprehensive, use simple English, and are easy to read and understand. The contents are so sufficient and self-explanatory; that in majority of cases readers do not require further support; although support is always available when you need it.