PDHonline Course M558 (10 PDH)

Oil & Gas – Essential Quiz Questions – Major Concepts

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I. INTRODUCTION:

Quiz questions are, undoubtedly, the best way to learn the concepts and definitions and to pass a test in any specific area. These quiz questions are based totally in several oil & gas training courses and brought here to help the students interested in advanced learning, even for specific areas. These questions are commonly used on applicants to a job, operations, maintenance and in inspection, as part of the global energy businesses.

These quiz questions and answers provide the resources to develop competent engineers, operators and technicians for today's advanced oil and gas industry. The questions follow strict instructional design protocols that ensure students to understand all relevant theories, plant processes, equipment and component operations that are necessary to drive efficiencies, promote safety, and achieve operational excellence. The answers are presented at the end of the quiz questions.

A glossary, also known as a vocabulary, or clavis, is also presented with an alphabetical list of terms, considering the definitions for onshore, offshore and refinery terms. Traditionally, a glossary appears at the end of a book and includes terms within that book, however, in this handbook the glossary is presented before each sector of oil & gas quiz questions, to show a guideline to students, that enables definition of major concepts, especially for newcomers to this field of study.

This series of quiz questions and answers is suitable for all kinds of professionals or students looking for opportunities in Oil and Gas Industry, from upstream to downstream, including production and process operations, processing, refining, transportation and distribution. These studies can also determine learning needs, deliver a streamlined set of practical skills, and ensure competency developments using hands-on with assessment processes.

To get your Professional Development Hours, this course includes a multiple-choice quiz at the end, based on the glossaries and consecutively in all questions concepts, defined to enhance the understanding of the course materials.

PDHONLINE courses references:

M535 - Oil & Gas Production and Processes – Fundamentals
M544 - Underwater Welding Technology – Cutting & Inspection
M548 - Oil & Gas Drilling Technology – General Overview – Part 1
M549 - Oil & Gas Drilling Technology – Onshore Rigs – Part 2
M550 - Oil & Gas Drilling Technology – Offshore Rigs – Part 3
M557 - Oil & Gas Refining - Production and Processes

II. ONSHORE DRILLING RIGS – BASIC TERMS AND DEFINITIONS:

Abandonment: To stop production of a well and plug the wellbore to prevent any possible future leakage into fresh water.

Acidizing a Well: Increasing the flow of oil from a well by pumping hydrochloric acid into the well under high pressure. This re-opens and enlarges the pores in the oil-bearing limestone formation.

Air Drilling: A form of rotary drilling that uses compressed air instead of mud. Used predominantly in shallow, low pressure areas.

Annular Space: The space between a well's casing and the wall of the borehole.

Annular Blowout: The space between the surface casing and the inner, producing wellbore casing. A large valve, usually installed above the ram preventers, that forms a seal in the annular space between the pipe and well bore or, if no pipe is present, on the well bore itself.

Anticline: A geological term describing a fold in the earth's surface with strata sloping downward on both sides from a common crest. Anticlines frequently have surface manifestations like hills, knobs and ridges. At least 80 percent of the world's oil and gas has been found in anticlines.

API: American Petroleum Institute, a petroleum industry association that sets standards for oil field equipment and operations.

API Gravity: The gravity (weight per unit of volume) of crude oil expressed in degrees according to an American Petroleum Institute recommended system. The higher the API gravity, the higher the crude. High gravity crudes are generally considered more valuable.

Associated Gas: The gas that occurs with the oil either as free gas or in a solution. When occurring alone, it is referred to as unassociated gas.

Bailing: To recover bottomhole fluids, samples, or drill cuttings by lowering a cylindrical vessel called a bailer to the bottom of a well, filling it, and retrieving it.

Barrel Standard (BBL): Unit of measurement in the petroleum industry. One barrel of oil equals 42 U.S. gallons.

Basement Rock: Igneous or metamorphic rock lying below sedimentary formation in the earth's crust. Basement rock does not contain petroleum deposits.

Basin: A depression in the earth's crust in which sedimentary materials have accumulated. Such a basin may contain oil or gas fields.

Behind Pipe: If a well drills through several pay zones and is completed in the deepest productive reservoir, casing is set all the way down to the producing zone. Viewed from (a perspective) inside the borehole, reserves in the shallower pay zones up the hole are behind the casing.

BHP (Bottom Hole Pressure): The pressure of the reservoir or formation at the bottom of the hole. A decline in pressure indicates some depletion of the reservoir.

Bleeding Core: Is a core sample of rock, so highly permeable and saturated that oil drips from it.

Block: Any assembly of pulleys on a common framework; in mechanics, one or more pulleys mounted to rotate on a common axis. The crown block is an assembly of pulleys mounted on beams at the top of the derrick or mast. The drilling line is passed through the grooved wheel on the pulley of the crown block, which is raised and lowered in the derrick or mast by the drilling line.

Blowout: An uncontrolled expulsion of oil, natural gas or water (usually brine) from a well into the atmosphere. The Blowout Preventer (BOP) is a stack of heavy-duty valves placed on top of the casing to control well pressure during drilling.

BOEPD: Barrels of Oil Equivalent per Day.

Bottomhole Pressure: Pressure exerted upward by the reservoir formation.

Cantilever Jack-ups: Jack-ups that have the derrick package mounted on steel arms and can be extended out from the hull of the rig. Extension allows for the positioning adjacent to a platform rig for development drilling.

Cased Hole: A wellbore in which casing has been installed and cemented.

Casing: Is large diameter pipe that is inserted into a recently drilled section of a borehole and held into place with cement. The steel pipe is installed in the wellbore to protect from cave-in and the migration of formation fluids into the wellbore, or communication between zones.

Casing Pipe: Used in oil wells to reinforce the borehole. Sometimes several casings are used, one inside the other. The outer casing, called the “surface pipe”, shuts out water and serves as a foundation for subsequent drilling.

Casinghead: The portion of the casing that protrudes above the surface and to which control valves and flow pipes are attached.

Casinghead Gas: Natural Gas from an oil well, as opposed to gas produced from a gas well.

Cement (CMT): Fluid cement is mixed at the surface, pumped to the bottom of a cased well, forced to flow around the lower end of the casing and up into the space between the casing and the borehole. When cement solidifies (sets), it holds the casing in place and provides support.

Cementing: Filling the space between the casing and the wellbore walls with cement to support the casing, and seal between zones.

Cement Squeeze: Forcing cement into the perforations, large cracks and fissures in the wall of a borehole to seal them off.

Chain Tongs: A tool consisting of a handle and a releasable chain that is used for turning pipe or fittings. The chain is tightened around the pipe or fitting.

Christmas Tree: An assembly of valves for flow control of production fluids or gasses installed at the top of the casing.

Choke: An orifice installed in a pipeline at the well surface to control the rate of flow.

Completion: To finish a well and prepare it for production.

Completed Well: A well-made ready to produce Oil or Natural Gas. The completion also involves cleaning out the well, running steel casing and tubing into the hole, surface control equipment and perforating the casing, so, oil or gas can flow into the well and be brought to the surface.

Conductor Casing or Conductor Pipe: Wide-diameter casing installed at the surface prior to rigging up to prevent caving.

CO2 Injection: A secondary recovery technique in which carbon dioxide (CO2) is injected into wells as part of a miscible recovery program.

Coring: Taking a sample of the formation or rock to determine its geologic properties.

Crown Block: Stationary pulley system used to raise or lower drilling equipment for the derrick. Supports the traveling block.

Crude Oil: Unrefined petroleum, as it comes out of the ground. Crude Oils range from very light (high in gasoline) to very heavy (high in residual oils). “Sour Crude” is high in sulfur content. “Sweet Crude” is low in sulfur and therefore often more valuable.

Cuttings: Chips and small rock fragments brought to the surface by the flow of drilling mud as it is circulated and examined by geologists for oil or gas content.

Derrick: A steel mast used to support the drill string or drilling equipment such as casing.

Directional Drilling: Drilling at an angle, instead of on the perpendicular, by using a whip stock to bend the pipe until it is going in the desired direction, used to reach the oil beneath rocks or some other location which cannot be drilled directly. Is deviating a wellbore along a planned path to a target located a given lateral distance and direction from vertical.

Downhole: Refers to equipment or operations that take place down inside a borehole.

Downstream: All operations taking place after crude oil is produced, such as transportation, refining and marketing.

Drawworks: Equipment used for hoisting the drilling string via the derrick. It consists of a spool wrapped with wire ropes positioned to the side of the derrick, with the wire ropes traveling up the crown block.

Drill Bit: A tool located at the end of the drill string used for cutting or boring.

Drill Collars: Heavy walled steel pipe added to the drill string between the drill pipe and drill bit for additional downward pressure.

Drill Pipe: Steel pipe used to conduct fluids and torque down to the drill bit. Typically 30 feet in length.

Drill Stem: All members in the assembly used for rotary drilling from the swivel to the bit, including the kelly, the drill pipe and tool joints, the drill collars, the stabilizers, and various specialty items.

Drill Stem Test (DST): A test through the drill pipe prior to completion to determine if oil or gas is present in a formation.

Drill String (Drill Pipe or Drill Stem): An assembly consisting of drill pipe, drill collars and a drill bit. The drill string serves as a conduit for fluid circulation and torque from the power source. Thirty-foot lengths of steel tubing screwed together to form a pipe connecting the drill bit to the drilling rig. The string is rotated to drill the hole and also serves as a conduit for drilling mud.

Drilling Mud: A mixture of clay, water, chemical additives and weighting materials that flushes rock cuttings from a well, lubricates and cools the drill bit, maintains the required pressure at the bottom of the well, prevents the wall of the borehole from crumbing or collapsing and prevents other fluids from entering the well bore.

Drilling Rig: The surface equipment used to drill for oil or gas, consisting chiefly of a derrick, a winch for lifting and lowering drill pipe, a rotary table to turn the drill pipe and engines to drive the winch and rotary table.

Dry Hole: An exploratory well that, although reaching target depths, does not result in the production of hydrocarbons.

Dry Natural Gas: Natural gas containing few or no natural gas liquids (liquid petroleum mixed with gas).

Electric Rig (SCR): A drilling rig that uses diesel generators to supply power to separate electric motors to power each of the rig's components (silicon-controlled rectifier).

Electrical Well Logging: A method of oil exploration that originated with Conrad Schlumberger, who first tested it in 1927 on a 1,500-meter well in France. As used today, the process is very simple. Current passes into the ground, through the resistive medium and into the instrumentation sonde. The resulting charts show the varying resistance, the conductance and the self-potential of the strata surrounding the well at entry level, and geophysicists use them to assay whether petroleum is present in a formation.

Enhanced Oil Recovery: Injection of water, steam, gas or chemicals into underground reservoirs to cause oil to flow toward producing wells, permitting more recovery that would have been possible from natural pressure or pumping alone.

Exploration: The search for oil and gas. Exploration and operations include; aerial surveys, geophysical surveys, geophysical studies, core testing and the drilling of test wells.

Exploratory Well: A well drilled to either search for an undiscovered pool of hydrocarbons or to define the limits of the hydrocarbon-bearing formation.

External Casing Packer: A device used on the inside of the well casing to seal off formations or to protect certain zones. The packer is run on the casing and expanded against the wall of the borehole at the proper depth by hydraulic pressure or fluid pressure from the well.

Field: A geographical area under which one or more oil or gas reservoirs lie, all of them related to the same geological structure.

Filter Cake: A plastic-like coating that builds up inside the borehole. Such buildup can cause serious drilling problems, including sticking of the drill pipe.

Fishing: Recovering the tools or pipe that have been accidentally lost down the borehole by using specially designed tools that screw into or grab the missing equipment.

Fishing Tools: Special instruments equipped with the means for recovering objects lost while drilling the well.

Flaring: The burning of gas vented through a pipe or stack at a refinery, or a method of disposing of gas while a well is being drilled. Flaring is regulated by state agencies. Venting (gas escape unburned) is generally prohibited.

Flooding: One of the methods of enhanced oil recovery. Water Flooding or Gas Flooding might be considered secondary recovery methods.

Footage Contracts: A contract under which the operator and contract driller agree to a fixed price per foot drilled. Contractor carries more of the operating risk than in a Daily Contract.

Formation: A geological term that describes a succession of strata similar enough to form a distinctive geological unit useful for mapping or description.

Fossil Fuels: Fuels that originate from the remains of living things, such as coal, oil, natural gas ancient plants and animals.

Fracturing (FRAC): A well stimulation technique in which fluids are pumped into a formation under extremely high pressure to create or enlarge fractures for oil and gas to flow through. Proppants such as sand are injected with the liquid to hold the fractures open.

Gamma-Ray Logging: A technique of exploration for oil in which a well's borehole is irradiated with gamma rays. The varying emission of these rays indicates to geologists the relative density of the rock formation at different levels.

Gas Cap: The gas that exists in a free state above the oil in the reservoir.

Gas Condensate: Liquid hydrocarbons present in casinghead gas that condense when brought to the surface.

Gas Lift: A recovery method that brings oil from the bottom of a well to the surface by using compressed gas. Gas pumped to the bottom of the reservoir mixes with fluid, expands it and lifts it to the surface.

Gas-Cut Mud: Drilling mud permeated with bubbles of gas from down hole. The circulation of such mud can be severely impaired, seriously affecting drilling operations.

Geophones: The sound-detecting instruments used to measure sound waves created by explosions, set off during seismic exploration work.

Gun Perforation: A method of creating holes in a well casing down hole by exploding charges to propel steel projectiles through the casing well. Such holes allow oil or gas from the formation to enter the well.

Heavy Oil: A type of crude petroleum characterized by high viscosity and a high carbon-to-hydrogen ratio. It is usually difficult and costly to produce by conventional techniques.

Hook: A large, hook-shaped device from which the swivel is suspended. It is designed to carry maximum loads ranging from 100 to 650 tons and turns on bearings in its supporting housing. The hook load is the weight of the drill stem that is suspended from the hook.

Horizontal Drilling: The newer and developing technology that makes it possible to drill a well from the surface, vertically down to a certain level. Deviation of the wellbore at least 80° from vertical so that the wellbore penetrates a productive formation in a manner parallel to the formation.

Horsehead: The curved guide or head piece on the well end of a pumping jack's walking beam. The guide holds the short loop of cable, called the bridle, attached to the well's pump rods.

Hydraulic Fracturing: A method of stimulating production from a low-permeability formation by creating fractures and fissures by applying very high fluid pressure.

Hydrocarbons: A large class of organic compound of hydrogen and carbon. Crude Oil, Natural Gas and Natural Gas Condensate are all mixtures of various hydrocarbons, among which methane is the simplest.

Hydrostatic Head: The height of a column of liquid, or the difference in height between two points in a body of liquid.

Injection Well: A well employed for the introduction into an underground stratum of water, gas or other fluid under pressure. Injection Wells are employed for the disposal of salt water produced with oil or other waste, also used for a variety of other purposes, as below:

- Pressure maintenance, introduces a fluid into a producing formation to reduce underground pressures, due the production of oil or gas;
- Secondary recovery operations, introduce a fluid to decrease the viscosity of oil, reduce its surface tension, lighten its specific gravity and drive oil into producing wells, resulting in the greater production of oil.

Kelly: A four- or six-sided pipe at the top of the drill string, through which the rotation is started.

Kelly System: A cage with V & square faced rollers, which fit the Kelly during departure rotation, while slowing up and down movement. The kelly pipe fits inside the kelly bushing, which fits inside the master bushing, which fits inside the rotary table. The rotary table creates the torque that is transmitted through the kelly down the drill pipe to the drill bit (versus a top drive system which foregoes all of such components).

Kerogen: The hydrocarbon in oil shale. Scientists believe that kerogen was the precursor of petroleum and that petroleum development in shale was somehow prematurely arrested.

Key-seating: A condition in which the drill collar of another part of the drill string becomes wedged in a section of crooked hole.

Kick: When the pressure encountered in a formation exceeds the pressure exerted by the column of drilling mud circulating through the hole. If uncontrolled, a kick leads to a blowout.

Kill a Well: To overcome down hole pressure by adding weighting elements to the drilling mud or wellbore.

Liner: A string of pipe used to case an open hole below an existing casing.

Limestone: Sedimentary rock largely consisting of calcite. On a world-wide scale, limestone reservoirs probably contain more oil and gas reserves than all other types of reservoir rock combined.

LNG (Liquefied Natural Gas): Natural gas that has been converted to a liquid through the cooling process (~260º F) at atmospheric pressure.

Load Water: Fluid (water) pumped into a well, usually during a fracture treatment of a producing formation.

Logs: Records made from data-gathering devices lowered into the wellbore. The devices transmit signals to the surface which are then recorded on film, paper or computer and used to make the record describing the formation's porosity, fluid saturation and lithology. The filing of a log is required by the Federal Government if the drill site is on federal land.

LPG (Liquefied Petroleum Gas): Hydrocarbon fractions lighter than gasoline, such as ethane, propane and butane, kept in a liquid state through compression and/or refrigeration commonly referred to as “bottled gas”.

Mechanical Rig: A drilling rig where the power generated from combustion engines (diesel) is distributed mechanically (shafts, sprockets, chains and clutches) to various components of the rig.

Mud: The liquid circulated through the wellbore during rotary drilling operations. In addition, the function of bringing cuttings to the surface, the drilling mud cools and lubricates the drill bit and the drill stem, protects against blowouts by holding back subsurface pressures, and deposits a mud cake on the wall of the wellbore to prevent loss of fluids to the formation.

Mud Engineer: A technician responsible for proper maintenance of the mud system.

Mud Logging: The recording of information derived from examination and analysis of formation cuttings made by the bit and of mud circulated out of the hole.

Mud Logger: A technician who uses chemical analysis, microscopic examination of the cuttings and an assortment of electronic instruments to monitor the mud system for possible indications of hydrocarbons.

Mud Pump: A large high-pressure pump used to circulate the mud on a drilling rig.

Mud Tank: One of a series of open tanks usually made of steel plate, through which the drilling mud is cycled to remove sand and fine sediments. Also called mud pits.

Natural Gas: A mixture of hydrocarbon compounds and small amounts of various non-hydrocarbons (such as carbon dioxide, helium, hydrogen sulfide and nitrogen) existing in the gaseous phase or in solution with Crude Oil in natural underground reservoirs.

NGL (Natural Gas Liquids): Portions of natural gas that are liquefied at the surface in lease separators, field facilities or gas processing plants. Natural gas includes, but not limited to: ethane, propane, butane, natural gasoline and condensate.

Offset Well: A well drilled near the discovery well. Also a well drilled to prevent oil and gas from draining from one tract of land to another where a well is being drilled or is already producing.

Oil Column: The vertical height (thickness) of an oil accumulation above the oil-water contact.

Oil Gravity: The density of liquid hydrocarbons, generally measured in API degrees.

Oil Pool: An underground reservoir containing oil. An oil field may contain one or more pools, each of which has its own pressure system.

Oil Rig: Oil platform or offshore platform, is a large structure with facilities in land and overseas, to drill wells, to extract and process oil and natural gas, or store product for refining and marketing.

Oil Shale: A fine-grained sedimentary rock that contains kerogen partially formed oil. Kerogen can be extracted by heating the shale but at a very high cost.

Oil Production: The phase which petroleum industry has to do with bringing the well fluids to the surface and separating, storage, gauging, and otherwise preparing the product for the pipeline, also the amount of oil or gas produced in a given period.

Operator: Organization that obtains (buys or leases) the right to drill and produce oil and/or natural gas from the owner of a specified location. The operator of an oil or gas well or field.

Operator – Independent: A person or a small organization that engages in the drilling, producing and selling of oil and gas, but has no pipeline or other means of transportation or refining.

Operator – Integrated (Majors): A larger organization typically engaged in drilling, production, transportation and refining of oil and natural gas, as well as the retail sales of oil and gas products.

Operator – National Oil Company: State-owned organization typically engaged in the drilling, production, transportation and refining of oil and natural gas, as well as the retail sales of oil and gas refined products.

Organization of Petroleum Exporting Countries (OPEC): An organization formed in 1960 for the intent of negotiating the price and production levels of oil. There are currently twelve members including Saudi Arabia, Kuwait, Iran, Qatar, United Arab Emirates, Algeria, Libya, Nigeria, Venezuela, Indonesia, the Neutral Zone (the area between Saudi Arabia and Kuwait) and Iraq.

Perforating Gun: An instrument lowered at the end of a wire line into a cased well. It contains explosive charges that can be electronically detonated from the surface.

Permeability: The measure of conductivity of fluids through the pores of rock.

Petroleum: A natural occurring solid, liquid or gaseous substance in the earth containing hydrogen and carbon in various mixtures. Term often refers to oil and does not include natural gas or gas liquids such as propane or butane.

Pipeline: A tube or system of tubes for the transportation of oil or gas, which includes: lead lines-form pumping well to a storage tank; flow lines-from flowing well to a storage tank; lease lines-extending from the wells to lease tanks; gathering lines-extending from lease tanks to a central accumulation point; feeder lines-extending from lease to trunk lines; and trunk lines-extending from a producing area to refineries or terminals.

Platform: A drilling and production platform that is supported by a truss of steel members (a jacket) secured to the ocean floor.

Platform Rig: Mobile drilling rig packages mounted on production platforms.

Plugging a Well: To stop the flow of hydrocarbons and/or water by filling the wellbore with cement when the well is abandoned.