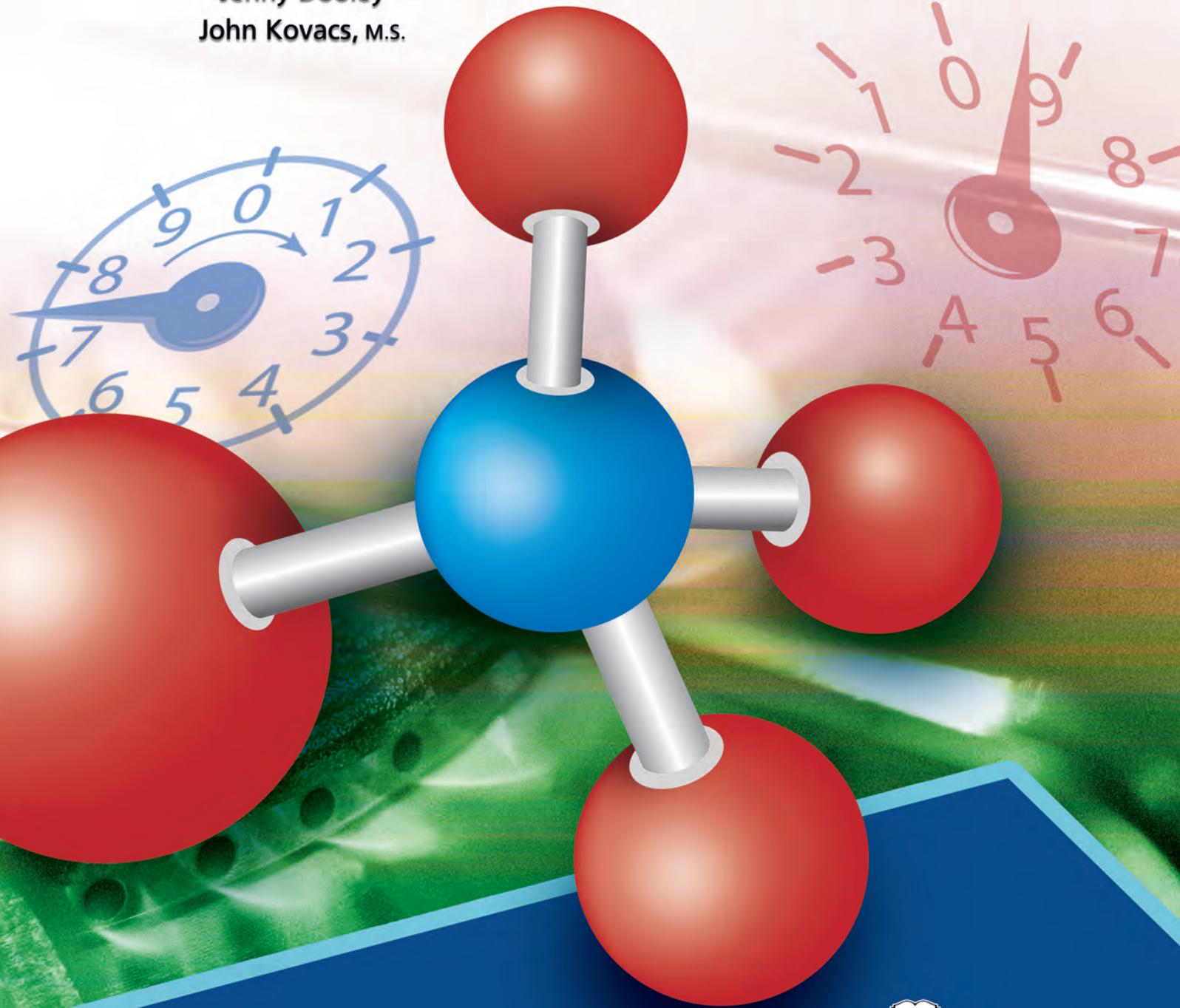




# Natural Gas II

Virginia Evans  
Jenny Dooley  
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Express Publishing



# Natural Gas II

Book  
**1**

Virginia Evans  
Jenny Dooley  
John Kovacs, M.S.



**Express Publishing**

## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Shale Gas	Article	channel, chemical additive, cost-effective, hydraulic fracturing (fracking), hydrochloric acid, marginal, rock bed, shale formations, shale gas, substantial	Agreeing
2	Coal Seam Gas	Employee manual excerpt	absorption, byproduct, cleat, coal seam, coal seam gas, coal seam water, conduit, gradually, matrix, store, treatment	Making a proposal
3	Biogas	Webpage	anaerobic digestion, biogas, decomposition, emission, landfill, livestock, manure, organic matter, sewage, waste	Expressing surprise
4	Methane Hydrate	Article	clathrate, crystalline, dissociation, feasible, future, harvest, ignite, immense, lattice, methane hydrate, permafrost	Expressing lack of knowledge
5	Mapping Natural Gas Deposits	Textbook excerpt	contour lines, cross section, geologic map, gross thickness, isopach map, map, net pay thickness, orientation, pay zone, plunge, scale, slope, topographic map, trend, spacing	Speculating
6	Types of Well Logs	Training website	calibration, conductor, dash, dot, formation waters, header, induction log, interval, logarithm, nonconductive, record, resistivity, resistivity log, spontaneous potential (SP) log	Asking for repetition
7	Indicators of Natural Gas – Seismic Data	Email	accelerated weight drop (AWD) truck, background noise, bounce, direct hydrocarbon indicator (DHI), dynamite, geophone, open area, recording truck, reflection, signal, sound wave, subsurface, vibroseis	Asking for an opinion
8	Indicators of Natural Gas – Marine Seismic Data	Textbook excerpt	air gun, analog signal, chirp, digital signal, fire, hydrophone, pulse, rhythmic repetition, sea floor, secondary pulse, streamer, vessel, water gun	Giving a reminder
9	Natural Gas Pipelines	Article	city gate, compressor station, control station, cross-country, distribution line, gathering line, main line, mercaptan, metering station, processing plant, transmission line, valve	Giving instructions
10	Distribution of Natural Gas	Brochure	delivery point, end user, infrastructure, investor, local distribution company (LDC), market center, meter, network, public, service pipeline, utility	Talking about plans
11	Lease Agreements for Private Property	Article	cash bonus, delay rental, held by production, primary term, royalty, secondary term, share, shut-in royalty, standard lease, termination	Confirming information
12	Acquiring Leases	Email	bid process, deplete, discover, government-owned, land owner, obtain, private, profit, sequester, tract	Describing progress
13	Exploration Damages	Pamphlet	access road, accountable, compensate, condition, crops, damage settlement, damages, livestock, personal property, prior, provision, restore	Providing reassurance
14	Natural Gas Supply and Demand	Article	abundant, consumer, domestic production, export, import, proven reserve, reliable, reliant, shipment, supply and demand	Asking for clarification
15	Construction and Maintenance Employees	Advertisement	carpenter, crane operator, electrician, instrument technician, machinist, mechanic, millwright, pipe fitter, plumber	Talking about prior experience

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# Natural Gas II

Book  
**2**

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John Kovacs, M.S.



**Express Publishing**

## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Wildcat Drilling	Email	business venture, exploratory, high-risk, independent, invest, partnership, prospect, return, speculate, vicinity, wildcat well, wildcatter	Asking for information
2	Natural Gas Fuel Cells	Article	combustion, compact, convert, dependable, electrode, electrolyte, enclosed, fuel cell, oxidant, reaction, recapture, surge	Asking for an opinion
3	Core Samples	Email	accurate, core, core barrel, core catcher, core plug, coring bit, full diameter core, hollow, native state core, oriented core, potential, sidewall coring	Discussing results
4	Fluid Samples	Instructions	carry out, continuous, drillstem testing, fluid sample, jack, lower, perforation gun, point of interest, portion, production testing, sufficient, wireline formation testing	Giving a reminder
5	Well Problems	Report	brush, collapse, coning, gravel pack, mechanical failure, plug back, plugging, scale, scraper, soluble, temporary, water bearing interval, water out, wax	Delivering bad news
6	Licensing Process	Memo	annual fee, appraise, authority, define, development, exploration, financial bid, license, ministry, revert, technical bid	Asking for more information
7	Licensed Areas	Email	alphanumeric coding system, block, boundary, concession, grid, hierarchical coding system, latitude, longitude, numerical coding system, quadrant, settlement	Asking for clarification
8	Natural Gas Boom	Article	boom, boost, demand, economic impact, goods, plentiful, revitalize, services, stimulate, supply chain, unemployment, wealth	Expressing enthusiasm
9	Boomtowns	Article	accommodate, boomtown, community, economic growth, expansion, lodging, population, prosperity, resident, rural	Talking about plans
10	Natural Gas Bust	Blog article	bust, close down, cycle, decline, desert, ghost town, glut, move on, plunge, pull back, repercussion, unprofitable, vacancy	Discussing possibilities
11	Cold Exposure	Pamphlet	blister, constrict, delirious, deteriorate, dilate, extremity, frostbite, hypothermia, lethargy, numbness, sensation, superficial, throb, tingling, tissue	Describing possible consequences
12	Heatstroke	Employee manual excerpt	coma, cramp, dehydration, fever, heat exhaustion, heat stroke, humidity, life-threatening, lightheaded, nausea, seizure, sweat, vomit, weakness	Describing symptoms
13	Fatigue	Safety poster	accident, balance, cognitive fatigue, consecutive, extended, fatigue, implement, mental fatigue, overtime, physical fatigue, risk, risk management	Discussing risk
14	First Aid	First aid manual excerpt	bandage, bone fracture, burn, certified, CPR, cut, defibrillator, first aid, first aid kit, heart attack, medical emergency, scrape, splint, sprain, treat	Explaining a process
15	Hydrogen Sulfide Exposure	Brochure	asphyxiation, dizziness, exposure, flammable, headache, hydrogen sulfide (H <sub>2</sub> S), inhale, odorless, self-contained breathing apparatus (SCBA), sour gas, toxic, unconscious	Giving advice

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# Natural Gas II

Book  
**3**

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**Express Publishing**

## Scope and Sequence

Unit	Topic	Reading context	Vocabulary	Function
1	Drillships	Email	anchor, current, design specification, drillship, dynamic positioning system (DPS), fleet, mobility, modified, mooring, outfit, riser pipe, seabed, thruster	Confirming information
2	Floating Production Storage and Offloading	Article	deck, double-hull, float, floating production storage and offloading (FPSO), module, mooring buoy, offload, rotate, shuttle tanker, topside, turret, weathervane	Disagreeing with an opinion
3	Liquid Loading	Textbook excerpt	bottomhole, carry out, condense, cool, critical velocity, decrease, deplete, droplet, eventually, flow stream, gravity, hydrostatic pressure, liquid loading, velocity	Clarifying information
4	Well Deliquification: Foam Lift	Employee manual	advantage, artificial lift, batch, capillary string, combine, continuous injection, cyclic injection, foam, foam injection, inject, limitation, soap stick, well deliquification	Expressing intention
5	Well Deliquification: Plunger Lift	Brochure	bumper spring, continuous flow plunger, conventional plunger, expand, free-traveling, lubricator, motor valve, piston, plunger, plunger lift, portion, pressure build-up period, production rate, shut-in period	Describing order of events
6	Well Deliquification: Beam Pumping	Website article	barrel, beam pumping, dewater, downstroke, gas lock, pump jack, standing valve, subsurface positive displacement pump, sucker rod, traveling valve, upstroke	Asking for an opinion
7	Natural Gas Reservoir Estimates	Employee handbook excerpt	assumption, decline, diversity, equation, gas in place (GIP), graph, materials balance method, production data, production decline curve method, recovery factor, reserve number, reserves growth, statistically significant, volumetric method	Asking for details
8	Reservoir Modeling	Article	commercial software, computer model, costly, forecast, geological model, one-dimensional, porous, predict, reservoir modeling, reservoir simulation, resolution, shared earth model, three-dimensional, time-consuming, two dimensional	Setting a timeframe
9	Natural Reservoir Drive Mechanisms	Textbook excerpt	artificial, bubble point, compressed, drive mechanism, gas cap, gas cap drive, maintain, pressure point, push down, push up, solution gas drive, sustain, virgin reservoir, water drive	Expressing confusion
10	Pipeline Pigging	Work order	buildup, conjunction, flow assurance, gel pig, inspection pig, launcher, magnetic flux leakage, pig trap, pigging, receiver, sealing pig, specialty pig, ultrasonics, utility pig, wear and tear	Assuming
11	Off-shore Pipeline Installation	Webpage	bottom tow, buckle, J-lay installation, mid-depth tow, off-bottom tow, pipelay vessel, S-lay installation, stern, stinger, surface tow, tension, touchdown point, tow-in installation	Discussing options
12	Remotely Operated Vehicles	Email	communication cable, grabber, heavy work class vehicle, high capability electric vehicle, horsepower, information transfer, manipulator, observation, payload, remotely operated vehicle (ROV), small electric vehicle, umbilical link, video, work class vehicle	Explaining functions
13	Disposal of Drilling Waste 1	Memo	biodegrade, bioreactor, bioremediation, burial, composting, drilling waste, land farming, land treatment, landfill, microorganism, nontoxic, pit, reserve pit, vermiculture	Agreeing to a suggestion
14	Disposal of Drilling Waste 2	Brochure	annular injection, brine, combust, convert, disposal well injection, incineration, regulatory agency, salt cavern, slurry, slurry injection, solution mining, subfracture injection, thermal desorption, thermal treatment, vaporize	Expressing an opinion
15	Emergency Action Plans	Article	clear out, contact number, disseminate, document, emergency action plan (EAP), escape route, muster point, notify, out-of-date, phenomenon, review, rig down, trigger event, update	Asking for information

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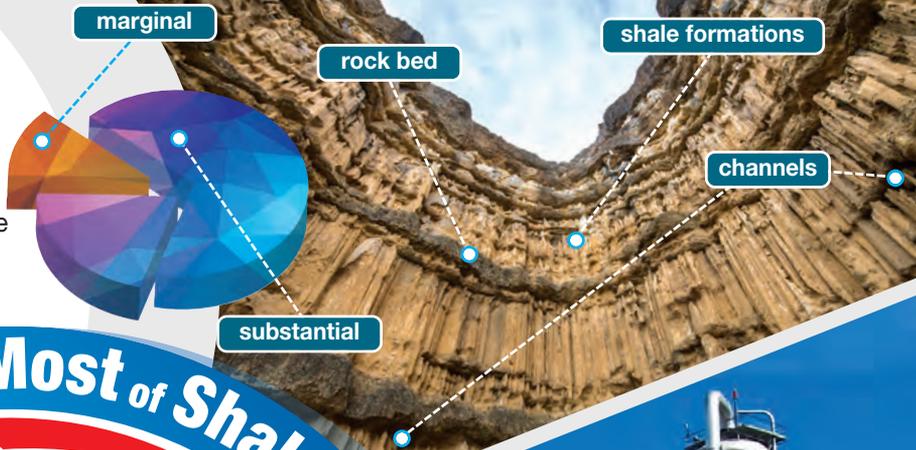
# 1

## Shale Gas

### Get ready!

1 Before you read the passage, talk about these questions.

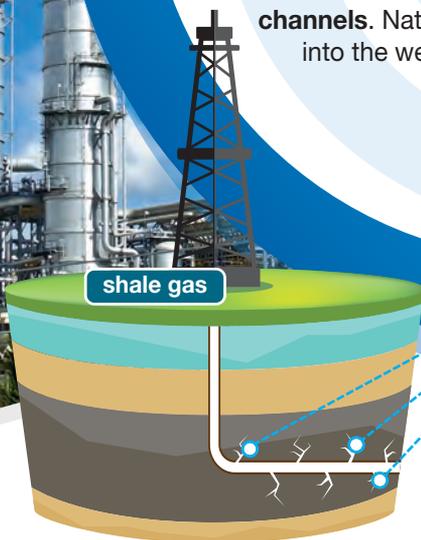
- 1 What is shale gas?
- 2 How does fracturing rock beds make it easier to extract natural gas?



### Making the Most of Shale Gas

The natural gas industry is at an all-time high. This is largely due to **shale gas**. Before, extracting gas from **shale formations** was expensive. Also, shale gas was considered a **marginal** source of natural gas.

However, **hydraulic fracturing** (fracking) combined with horizontal drilling has changed that. Shale gas is now a **substantial** source of natural gas. Drilling for shale gas is more **cost-effective** than before. Fracking takes place in a drilled well. **Chemical additives** like **hydrochloric acid** are injected under high pressure into the **rock bed**. The pressure cracks the rock. The chemicals widen the cracks and create **channels**. Natural gas escapes through the channels into the well. From there, it is extracted to the surface.



### Vocabulary

3 Read the sentence pairs. Choose the sentence that uses the underlined part correctly.

- 1 A Accessing rock beds requires costly drilling.  
B The used up channels need to be disposed of.
- 2 A Hydrochloric acid exists underground in large formations.  
B Chemical additives were injected into the rock bed.
- 3 A Shale gas is no longer a marginal energy source.  
B The cost of the chemical additives is fracking.

### Reading

2 Read the article. Then, mark the following statements as true (T) or false (F).

- 1 \_\_\_ In the past, shale gas was not cost-effective to extract.
- 2 \_\_\_ Fracking is another name for hydrochloric fracturing.
- 3 \_\_\_ A drill creates channels in the shale rock bed.

**4 Match the words or phrases (1-7) with the definitions (A-G).**

- |                            |                        |
|----------------------------|------------------------|
| 1 ___ hydrochloric acid    | 5 ___ substantial      |
| 2 ___ hydraulic fracturing | 6 ___ shale formations |
| 3 ___ shale gas            | 7 ___ channel          |
| 4 ___ cost-effective       |                        |
- A something that is inexpensive in regards to the money spent on it to obtain a result  
 B a collection of fine grained sedimentary rock that traps natural gas  
 C a corrosive liquid used to create wider channels in rock beds  
 D being very important  
 E an opening that runs through something  
 F natural gas that is trapped in shale formations  
 G a drilling process that uses chemicals and water to break up rock

**5 Listen and read the article on shale gas again. What two methods are used to extract shale gas?**

**Listening**

**6 Listen to a conversation between two executives. Mark the following statements as true (T) or false (F).**

- \_\_\_ The drawback to shale gas is that it is not a reliable source of natural gas.
- \_\_\_ Exploratory gas drilling costs less than drilling shale.
- \_\_\_ Shale gas is a good choice because finding ordinary natural gas is difficult.

**7 Listen again and complete the conversation.**

**Executive 1:** So, I've been reading about 1 \_\_\_\_\_

**Executive 2:** This country actually has a lot of it.

**Executive 1:** It does. 2 \_\_\_\_\_ and horizontal drilling has made it easier to extract.

**Executive 2:** There are some 3 \_\_\_\_\_ to extracting shale gas, though.

**Executive 1:** Like what?

**Executive 2:** It's still more 4 \_\_\_\_\_ to extract than ordinary natural gas.

**Executive 1:** You're right ... using the chemicals does 5 \_\_\_\_\_ the costs.

**Executive 2:** But the amount of gas extracted from shale formations makes it 6 \_\_\_\_\_.

**Speaking**

**8 With a partner, act out the roles below based on Task 7. Then, switch roles.**

**USE LANGUAGE SUCH AS:**

*So, I've been reading about ...*  
*There are some drawbacks to ...*  
*You're right ...*

**Student A:** You are a natural gas executive. Talk to Student B about:

- what you have been reading about
- why shale gas is easier to extract now
- the drawbacks to extracting shale gas

**Student B:** You are a natural gas executive. Talk to Student A about shale gas.

**Writing**

**9 Use the conversation from Task 8 to write the executive's notes about shale gas.**

**Shale Gas Notes**

- Our country has \_\_\_\_\_
- Fracking and horizontal drilling has made shale gas \_\_\_\_\_
- One drawback to extracting shale gas is \_\_\_\_\_
- The amount of shale gas that is available makes it more \_\_\_\_\_ despite the \_\_\_\_\_

## Get ready!

1 Before you read the passage, talk about these questions.

- 1 What are the characteristics of hydrogen sulfide gas?
- 2 What effects can exposure to hydrogen sulfide have on a person's health?



## The Dangers of Hydrogen Sulfide

## What is hydrogen sulfide?

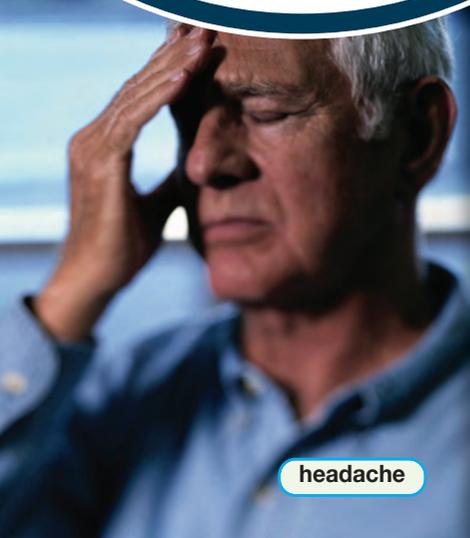
**Hydrogen sulfide**, or  $H_2S$ , is a **toxic** gas. It is often found with petroleum and natural gas. When natural gas contains large amounts of hydrogen sulfide, it is called **sour gas**. It is colorless, **flammable**, and smells like rotten eggs in low concentrations. However, at high concentrations, it can smell sweet or be completely **odorless**.

## What are the effects of exposure to hydrogen sulfide?

The health effects of hydrogen sulfide depend on its concentration. **Exposure** to low concentrations can cause irritation, **dizziness** and **headaches**. High concentrations of  $H_2S$  can render a person **unconscious**. **Inhaling** high concentrations of the gas can also result in **asphyxiation** and death.

## How can natural gas companies prevent exposure to hydrogen sulfide?

Companies should take a variety of precautions to prevent hydrogen sulfide exposure. Many places require gas field workers to certify in  $H_2S$  safety procedures. Workers should monitor air in potentially hazardous areas before entering. Whenever possible, companies should install ventilation systems in these areas. If ventilation is impossible, workers should wear **self-contained breathing apparatuses (SCBA)**.



## Vocabulary

3 Match the words (1-8) with the definitions (A-H).

- |                |                    |
|----------------|--------------------|
| 1 ___ toxic    | 5 ___ exposure     |
| 2 ___ inhale   | 6 ___ dizziness    |
| 3 ___ sour gas | 7 ___ unconscious  |
| 4 ___ headache | 8 ___ asphyxiation |

- A a pain in a person's head  
 B poisonous to organisms  
 C natural gas with high  $H_2S$  amounts  
 D unaware and unable to sense anything  
 E to breathe something in  
 F the inability to breathe due to lack of oxygen  
 G a state of being in contact with something  
 H a condition that makes people think they are falling

## Reading

2 Read the brochure. Then, mark the following statements as true (T) or false (F).

- 1 \_\_\_ Hydrogen sulfide doesn't have a smell in low concentrations.
- 2 \_\_\_ A small concentration of  $H_2S$  can make a person lose consciousness.
- 3 \_\_\_ Many gas field workers are required to learn  $H_2S$  safety procedures.

**4** Read the sentence pairs. Choose which word or phrase best fits each blank.

**1 hydrogen sulfide / self-contained breathing apparatus**

- A** Before entering an enclosed space workers should test it for \_\_\_\_\_.
- B** A \_\_\_\_\_ can provide a worker with a decent supply of air.

**2 flammable / odorless**

- A** Before gas companies add a scent to it, natural gas is \_\_\_\_\_.
- B** People should not smoke near natural gas because it is \_\_\_\_\_.

**5** Listen and read the brochure again. What should companies do in potentially hazardous areas?

## Listening

**6** Listen to a conversation between two rig workers. Choose the correct answers.

- 1** What is the conversation mainly about?
- A** proper procedures regarding H<sub>2</sub>S  
**B** how hydrogen sulfide forms  
**C** ways of safely ventilating H<sub>2</sub>S  
**D** why hydrogen sulfide is harmful
- 2** What does the woman tell the man to do if H<sub>2</sub>S is present?
- A** try to reduce its concentration  
**B** check other areas for it  
**C** install ventilation systems  
**D** wear a SCBA in the area

**7** Listen again and complete the conversation.

**Worker 2:** **1** \_\_\_\_\_! You need to check that area for H<sub>2</sub>S first.

**Worker 1:** You mean **2** \_\_\_\_\_, right? Wouldn't I be able to smell it?

**Worker 2:** At low concentrations you might, but at high concentrations it's **3** \_\_\_\_\_.

**Worker 1:** I had no idea. Is it really that dangerous?

**Worker 2:** It can be. If **4** \_\_\_\_\_ enough of it you could die within a matter of seconds.

**Worker 1:** What **5** \_\_\_\_\_ if I find that H<sub>2</sub>S is present in the area?

**Worker 2:** Since that area is **6** \_\_\_\_\_, you would need some sort of respiratory protection.

## Speaking

**8** With a partner, act out the roles below based on Task 7. Then, switch roles.

**USE LANGUAGE SUCH AS:**

*At low concentrations ...*  
*If you inhale ...*  
*You should ...*

**Student A:** You are a rig worker. Talk to Student B about:

- whether or not hydrogen sulfide has an odor
- how dangerous hydrogen sulfide is
- what you should do if hydrogen sulfide is present

**Student B:** You are a rig worker. Talk to Student A about hydrogen sulfide.

## Writing

**9** Use the conversation from Task 8 to complete the workers notes on hydrogen sulfide.

# Notes: Hydrogen Sulfide

Apparently, exposure to hydrogen sulfide \_\_\_\_\_. Although you can smell it in low concentrations, \_\_\_\_\_. This makes it very dangerous, \_\_\_\_\_. Thus, it is important \_\_\_\_\_. If it is present and there isn't sufficient ventilation, \_\_\_\_\_.

# Glossary

**prospect** [V-I-U1] To **prospect** is to search for a valuable substance.

**prosperity** [N-UNCOUNT-U9] **Prosperity** is the state of being successful and having a lot of money.

**pull back** [V PHRASE-U10] To **pull back** is to decide not to do something or become involved with something that will probably have a bad outcome.

**quadrant** [N-COUNT-U7] A **quadrant** is a division of an area that covers one degree of longitude and one degree of latitude.

**reaction** [N-COUNT-U2] A **reaction** is a process that causes two or more substances to change into different substances.

**recapture** [V-T-U2] To **recapture** something is to get it back after it escapes.

**repercussion** [N-COUNT-U10] A **repercussion** is the bad outcome or effect of an action, that lasts for some time.

**resident** [N-COUNT-U9] A **resident** is a person who lives in a specific place.

**return** [N-COUNT-U1] A **return** is a profit on money that has been invested.

**revert** [V-T-U6] To **revert** to somebody is to return to the ownership of the previous owner.

**revitalize** [V-T-U8] To **revitalize** something is to make it appear newer or fresher than before.

**risk** [V-T-U13] To **risk** something is to put it in danger of being lost or harmed.

**risk management** [N-UNCOUNT-U13] **Risk management** is a method of trying to minimize the losses and damages to a business.

**rural** [ADJ-U9] If something is **rural**, it is located away from cities, where the population is low.

**scale** [N-UNCOUNT-U5] **Scale** is a mineral deposit that accumulates on tubing.

**scrape** [N-COUNT-U14] A **scrape** is an injury caused by rubbing the skin across a hard surface.

**scraper** [N-COUNT-U5] A **scraper** is a tool with a sharp edge that is scraped against a surface to remove deposits.

**seizure** [N-COUNT-U12] A **seizure** is a sudden attack of an illness that make the body shake.

**self-contained breathing apparatus** [N-COUNT-U15] A **self-contained breathing apparatus**, or SCBA, is a device that provides breathable air to a person when the air in an environment is not breathable.

**sensation** [N-COUNT-U11] A **sensation** is a feeling that happens when something happens to or touches the body.

**services** [N-UNCOUNT-U8] **Services** are jobs performed to help others.

**settlement** [N-COUNT-U7] A **settlement** is a piece of land where people live.

**sidewall coring** [N-UNCOUNT-U3] **Sidewall coring** is a quicker and cheaper way of gathering rock samples. With this method, many smaller samples are collected. These are usually one inch wide and 1.75 inches long.

**soluble** [N-ADJ-U5] If something is **soluble**, it can be dissolved in a liquid.

**sour gas** [N-UNCOUNT-U15] **Sour gas** is a type of natural gas that contains a significant amount of hydrogen sulfide.

**speculate** [V-I-U1] To **speculate** is to invest in a risky venture in the hope of profiting from it.

**splint** [N-COUNT-U14] A **splint** is an object placed next to a broken bone to keep it in place until it recovers.

**sprain** [N-COUNT-U14] A **sprain** is an injury that occurs when a joint is stretched or turned too much.

**stimulate** [V-T-U8] To **stimulate** something is to encourage it to grow or be more active.

**sufficient** [ADJ-U4] If something is **sufficient**, there is enough of it to meet a specific goal.

**superficial** [ADJ-U11] If something is **superficial**, it only affects the skin.

**supply chain** [N-COUNT-U8] A **supply chain** is a network organized to produce products, then to move them from suppliers to customers.

**surge** [N-COUNT-U2] A **surge** is a sudden, harmful increase in electrical power.

**sweat** [V-I-U12] To **sweat** is to lose liquid from the skin in order to cool down.



## Natural Gas II

**Career Paths: Natural Gas II** is a new educational resource for petroleum and natural gas industry professionals who want to improve their English communication in a work environment. Incorporating career-specific vocabulary and contexts, each unit offers step-by-step instruction that immerses students in the four key language components: reading, listening, speaking, and writing. **Career Paths: Natural Gas II** addresses topics including jobs in the industry, types of rigs, gas storage and transport, safety procedures, and the drilling process.

The series is organized into three levels of difficulty and offers a minimum of 400 vocabulary terms and phrases. Every unit includes a test of reading comprehension, vocabulary, and listening skills, and leads students through written and oral production.

**Included Features:**

- A variety of realistic reading passages
- Career-specific dialogues
- 45 reading and listening comprehension checks
- Over 400 vocabulary terms and phrases
- Guided speaking and writing exercises
- Complete glossary of terms and phrases

The **Teacher's Book** contains a full answer key and audio scripts.

The **Teacher's Guide** contains detailed lesson plans, a full answer key and audio scripts.

The **audio CDs** contain all recorded material.



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