Reading 31

Radon

Radon is a radioactive gas that is invisible and odorless. It forms during the decay of uranium-238, and in decaying, itself produces solid heavy metal radioactive particles of polonium, lead, and bismuth. The parent element, uranium, is distributed in rocks and soils in many regions of the world, although usually in negligible* amounts. However, concentrations of **this element** occur in certain rocks, and under certain conditions it is dissolved by underground water and carried over great distances before **seeping** into other rocks and soils.

Since radon is a gas, it can move from the ground into the air, where it is dispersed by the winds. If it infiltrates buildings, however, it can build up over time and lead to serious health problems. In fact, the radon itself is chemically inert and so does not enter into chemical reactions with other substances. It is readily dissolved in blood and circulates through the body until it is expelled, usually before it has had time to decay. The health problems associated with radon activity arise from the radioactive products of its **disintegration**, mentioned above.

The products of the decay process, especially polonium-218 and polonium-214, emit radiation, which kills or damages living cells, causing genetic mutations and cancer. **These radon progeny are not dispersed harmlessly like radon itself but accumulate as the radon decays.** Outside the body, these solid materials can attach themselves to dust particles and surfaces throughout a building and then be inhaled. The decay products can also stick to tobacco leaves during growth and then enter the body when the tobacco is smoked. Inside the body these dangerous by-products of radon become lodged in lung tissue and the bronchial tubes. As these decay, they emit alpha and beta particles and gamma rays. Of these, the alpha particles can do the most damage since they are the bulkiest of the three and therefore cannot penetrate very far into living tissue. Because of this relative immobility, concentrations of the particle form and damage cells in the immediate area. Beta particles and gamma rays are less dangerous since they travel further and are less concentrated in the tissues.

The primary way that radon penetrates buildings is through foundations. It enters through cracks in basement floors, drains, loose-fitting pipes, and exposed soil areas. Radon also

finds its way into water, although if the water is exposed to the atmosphere or agitated, the radon disperses into the air. Because of this, concentrations of this **uranium daughter** are not high in rivers, but water drawn from underground sources into homes can have elevated levels.

The chief health risk from inhaling radon or its daughter products is lung cancer. A Scientists have concluded that exposure to this carcinogen is the second leading cause of this disease in the United States. B Major scientific organizations believe it contributes to approximately 12 percent of the incidence in the United States alone. It is true that some research has cast doubt on the likelihood of residential radon accumulations contributing to cancer rates. C Other larger scale studies contradict the neutral findings. For example, a recent study of 68,000 underground miners who were exposed to high levels of radon shows that they are five times more likely to die of lung cancer than the general population. D Smokers, whose incidence of lung cancer is significantly higher than the nonsmoking population, are even more at risk if they are exposed to high levels of radon.

It is now possible to have buildings tested for radon accumulation. In an average home, this is about 1.3 picocuries* per liter, which is considered an acceptable although not a totally safe level. If these levels are above 4 picocuries per liter of air, then homeowners are advised to reduce the amount seeping into the living space. This can be achieved through various means including concrete sealing and the installation of active ventilation systems. It is not possible to completely eradicate traces of radon since the natural outdoors level averages 0.4 picocuries per liter, but minimizing the amount is a **prudent** preventative measure.

*negligible: too small to be important
*picocurie: a level of radiation activity

1 The phrase "this element" in the passage refers to
- A. lead
- B. radon
- C. uranium
- D. polonium

2 The word "seeping" in the passage is closest in meaning to
- A. leaking
- B. spilling
- C. releasing
- D. erupting

3 In paragraph 2, what can be inferred about the relationship of radon and health problems?

A. The gas has to have time to decay in order to cause health problems.
B. Since radon is chemically inert, it cannot lead to health problems.
C. As a gas, radon disperses in the wind and consequently isn't a health problem.
D. The gas has to disintegrate before it can seep into buildings.

4 The word "disintegration" in the passage is closest in meaning to

A. breakdown
B. collapse
C. corrosion
D. failure

5 Health problems associated with radon are caused by

A. radioactive uranium
B. certain heavy metals
C. decaying gases
D. some chemical reactions

6 Which of the sentences below best expresses the essential information in the highlighted sentence (paragraph 3)? Incorrect choices change the meaning in important ways or leave out essential information.

A. Unlike the radon, which is scattered without danger, its products accumulate as the radon disintegrates.
B. Like the radon itself, the decay products are scattered safely and accumulate as the radon decays.
C. Like the decaying radon, the progeny are dispersed in accumulations, which can cause harm.
D. Unlike the dispersed radon, which accumulates safely, the products of decay are dangerous.

7 According to paragraph 3, some products of decay cause damage because they

A. emit gamma rays
B. cannot penetrate living tissue very deeply
C. are highly mobile
D. seep into houses and form concentrations of radiation

8 The phrase “uranium daughter” in the passage refers to

A. water
B. radon
C. particles
D. air

9 According to paragraph 4, all of the following are true about radon EXCEPT

A. it is invisible
B. it cannot be detected
C. it cannot be smelled
D. it is radioactive

10 It can be understood from paragraph 6 that

A. reducing the amount of radon in your home is pointless because of the amount of radon outside
B. even though it is possible to test buildings for radon accumulation, it is not possible to minimize the level of radiation activity
C. the use of concrete sealing and active ventilation systems can reduce the amount of radon to an acceptable level
D. using concrete sealing and installing active ventilation systems reduces the amount of usable living space

11 The word "prudent" in the passage is closest in meaning to

A. sensible
B. necessary
C. practical
D. realistic

12 Look at the four squares that indicate where the following sentence could be added to the passage.

But this research has been criticized for being based on too few subjects.

Where would the sentence best fit?
Choose the letter of the square that shows where the sentence should be added.

13 An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage.

Radon can seep into a building, where its decay products can lead to health problems.

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-
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Answer Choices

A Although radon can enter a building in many different ways, it also escapes through cracks in the foundations.
B Concentrations of the radon by-products attach themselves to particles in the air inside buildings and are breathed into the lungs.
C People who smoke or work in mines are at greater risks of getting lung cancer that is related to alpha particles than those who work in buildings.
D The by-product alpha particles are too heavy to disperse through the tissues, so they accumulate in the lungs where they kill or damage lung cells.
E Radon does not cause lung cancer because it is chemically inert and therefore readily dissolves in the blood, where it eventually is expelled from the body.
F Preventative measures can be taken to reduce the amount of exposure to radon in living spaces, but it is not possible to completely eliminate the gas from the atmosphere.

Источник задания: Cambridge Preparation to the TOEFL

Reading 31 — Keys

1 C
The phrase "this element" refers to the parent element, uranium, mentioned in the previous sentence.
2 A
liquid or gas "seeps" or "leaks" through holes or cracks.
3 A
According to paragraph 2, the health problems are caused by radon after it decays into its radioactive particles. If it has not had time to decay, radon is harmless.
4 A
When a substance "disintegrates" or "breaks down," it changes from one state into its simpler component parts.
5 B
According to the passage, heavy metals such as polonium, lead, and bismuth, which are products of the decay process of radon, are what cause health problems.
6 A
The ration progeny are the products that gather together as the radon disperses.
7 B
According to paragraph 3, products of decay, especially alpha particles, arc dangerous because they accumulate into concentrations instead of dispersing throughout the body. In these concentrations, they damage nearby cells.
8 B
Radon is described as a decay product of uranium and, therefore, is a uranium daughter.
9 B
It can be understood that radon is detectable because buildings are tested for the amount of radon that has accumulated.
10 C
According to paragraph 6, a reduction of radex can be achieved by using concrete sealing and active ventilation systems.
11 A
A "prudent" or "sensible" action is one which is wise under the circumstances.
12 C
The phrase "But this research" refers back to the research on radon accumulation and cancer rates.
13
B After radon enters a building, its decay products form particles that can be breathed into the lungs
D The alpha particles, in particular, accumulate in the lung tissue and damage cells.
F It is possible to reduce radon exposure, but some: of the gas stays in the atmosphere.