1 Read the passage below and answer the questions about it. Choose the most appropriate answers based on what is stated or implied in the passage. Choose ONE answer unless other instructions are given. Boxes ([ ]) in the passage indicate missing information.

One of the greatest concerns facing the introduction of a worldwide 100 percent clean, renewable energy and storage system is whether electricity, heat, cold, and hydrogen will be available when they are needed. In other words, can a 100 percent WWS (wind, water, and solar) power network avoid power failures?

The electric power network in a 100 percent WWS world will be very different from that today. Today, <1>electricity makes up about 20 percent of all end-use energy (or 40 percent of primary energy). End-use energy is the energy directly consumed by the user, [2] primary energy, which is the energy harvested directly from natural resources. In a 100 percent WWS world, electricity will account for nearly 100 percent of all end-use energy, which itself will equal primary energy minus transmission and distribution [3]. The rest of the end-use energy will come from *1geothermal or solar heat.

The sectors that will change to using electricity (transport, buildings, industry, <2>agriculture/forestry/fishing, and the military) will use more energy-efficient technologies than their fossil-fuel counterparts, such as coal, oil, or gas. Such technologies include battery-electric vehicles, <3>hydrogen fuel-cell vehicles, and heat pumps, among others. The reduction in energy use due to using more efficient technologies will substantially reduce overall energy demand. Demand will also decrease because no more energy will be used to mine, transport, or process fossil fuels, bioenergy, or uranium for energy. End-use energy efficiency will increase, and policies will encourage less energy use. A future electric power network will also be coupled with electricity, heat, cold, and hydrogen storage. Finally, a future power network will have more long-distance electrical transmission lines instead of fossil-fuel pipelines.

Thus, the main challenge in a future power network will be to match electricity, heat, cold, and hydrogen demand with 100 percent WWS electricity and heat supply plus storage while using demand response.

Variable versus Intermittent Resources

Winds, waves, and sunlight produce electricity that varies over short timescales (seconds to minutes) and over long timescales (months to seasons to years) owing to continuous changes in the weather and climate. Thus, these energy sources are variable resources. Another term commonly used to describe a variable resource is an intermittent (i.e., not regular or continuous) resource. However, all energy resources, even those not affected by the weather, are intermittent owing to the fact they are shut down during scheduled and unscheduled maintenance. Variable resources are those affected by both the weather and maintenance.

One concern with the use of variable WWS resources is whether they can provide electricity, heating, and cooling [4] such energy is needed. Any electricity system must respond to changes in electricity demand over periods of seconds, minutes, hours, seasons, and years, and to unanticipated changes in the availability of electricity generation. It is not possible to control the weather; thus, a sudden change in demand often cannot be met by a variable WWS resource [5] storage, demand response, or long-distance transmission, or all three, are coupled with electricity production.

The concern about matching demand with supply applies to all energy sources, not just to the variable ones. For example, because geothermal, tidal, coal, and nuclear resources can provide relatively constant (baseload) supplies of electricity during the day, they rarely match energy demand, which varies continuously and significantly. In addition, all baseload electricity generators are down for maintenance anywhere from 3 to 40 percent of all hours of a year. As a result, gap-filling resources, such as natural gas, *2hydropower, pumped hydropower, and now batteries, are currently used to meet peaks in demand with power networks dominated by baseload resources.

Even nuclear power, which has been designed in some countries to allow for gradual adjustments in electricity production, does not match demand. In France, for example, nuclear power reaches 100 percent of its power in 20 to 100 minutes. However, this is 40 to 400 times slower than the rate of hydropower or pumped hydropower storage (100 percent in 15 to 30 seconds), far slower than that of a battery, and 4 to 20 times slower than that of a natural gas power station (100 percent in 5 minutes).

*1geothermal = produced by the internal heat of the earth
*2hydropower = the production of electricity using water

1. Which is the most stressed syllable in the following word?

[1] <1>electricity　　e-lec-tric-i-ty
①② ③④⑤

2. Choose the most appropriate answer.

[2]	① regardless of	② in consideration of	③ together with	④ in accordance with	⑤ as opposed to
[3]	① losses	② loses	③ lost	④ to lose	⑤ of losing
[4]	① whereas	② of which	③ in which	④ whenever	⑤ whichever
[5]	① unless	② instead of	③ despite	④ because of	⑤ along with

3. Identify the most stressed vowel and then choose one word for each that has the same vowel pronunciation.

[6] <2>agriculture
[7] <3>hydrogen

① feet ② kick ③ head ④ cat ⑤ earth ⑥ shut ⑦ fool ⑧ pull ⑨ hate ⑩ bite ⑪ cow ⑫ sure

4. [8] Which of the following best expresses the essential information in paragraph 1?

① The main problem with a worldwide clean energy system is not having enough electricity, food, and water.
② Making a global renewable energy system brings up questions about the availability of enough solar panels.
③ A big issue in setting up a universal clean energy and storage system is the reliability of our power supplies.
④ Bringing in 100 percent renewable energy worldwide makes people worry about transportation needs.
⑤ Setting up a global renewable energy system is not possible because of the impact on climate change.

5. [9] Overall energy demand is expected to decrease in the future as a result of reduced energy use thanks to _____.

① more efficient technologies
② an increase in the availability of fossil fuels
③ greater access to low-energy transportation
④ a decrease in the number of end-users
⑤ the construction of long-distance pipelines

6. [10] According to the section subtitled **Variable versus Intermittent Resources**, why are geothermal, tidal, coal, and nuclear resources considered intermittent?

① They are affected by unpredictable weather changes.
② They rely on variable WWS resources with different timescales.
③ They will always need scheduled and unscheduled maintenance.
④ They are unable to provide baseload supplies of electricity.
⑤ They have continuous and consistent availability.

7. [11] – [13] In what order do the power sources mentioned in the last paragraph reach 100 percent power output?

Slowest ←			→ Fastest
[11]	[12]	[13]	Battery power

Power sources
① Nuclear power
② Hydropower
③ Tidal power
④ Network power
⑤ WWS power
⑥ Natural gas power

2 Read the passage below and answer the questions about it. Choose the most appropriate answers based on what is stated or implied in the passage. Choose ONE answer unless other instructions are given. Boxes ([ ]) in the passage indicate missing information.

Epidemiology is the scientific study of how and why diseases occur in the population, and Scandinavian countries are a dream for epidemiologists. This is because everyone in those countries has a personal identity number which is used when registering for health care, education, tax, and so on, and this allows researchers to link all these different aspects of people's lives together in a way that would be impossible in other countries. For example, a study was conducted on over 4 million Swedish men and women whose tax and health records were linked over eighteen years, which enabled the researchers to report that men with a higher socioeconomic position had a slightly increased rate of being diagnosed with a brain tumor. This was one of those valuable but rather unexciting studies that would typically not attract much attention, so a university communications officer thought it would be more interesting to say in a press release that "High Levels of Education are Linked to Heightened Brain Tumor Risk," even though the study was about socioeconomic position rather than education. By the time this got to the general public, a subeditor in a newspaper produced the classic headline, "Why Going to University Increases the Risk of Getting a Brain Tumor."

For people who have spent time building up academic qualifications, this newspaper headline could have been shocking. Should we be [14]? This is a huge study based on registration of the complete target population, not a sample, so we can confidently conclude that slightly more brain tumors really were found in people with higher levels of education. Did all that sweating in the library overheat the brain and lead to some strange cell changes? In spite of the newspaper headline, I doubt it. To give <1>them credit, the authors of the paper doubted it too, adding, "Completeness of cancer registration and detection bias are <2>potential explanations for the findings." In other words, wealthy people with higher education are more likely to be diagnosed and get their tumor registered, an example of what is known as ascertainment bias (sample selection bias) in epidemiology.

Correlation Does Not Imply Causation

We previously looked at how *Pearson's correlation coefficient measures how close the points on a scatter-plot [15] to a straight line. When considering English hospitals conducting children's heart surgery in the 1990s, and plotting the number of cases against their survival, the high correlation showed that bigger hospitals were associated with lower death rates. [16] we could not conclude that bigger hospitals caused the lower death rates.

This cautious attitude has a long history. When Karl Pearson's newly developed correlation coefficient was being discussed in the journal *Nature* in 1900, a commentator warned that "correlation does not imply causation." Since then, this phrase has been repeatedly uttered by statisticians when confronted by claims based on simply observing that two things tend to vary together. There is even a website that automatically creates ridiculous associations, such as the delightful correlation of 0.96 between the annual per-person consumption of mozzarella cheese in the U.S. between 2000 and 2009, and the number of engineering degrees awarded in each of those years.

There seems to be a deep human need to explain things that happen in terms of simple cause-effect relationships. I am sure we could all construct a good story about all those new engineers eating pizzas. There is even a word for the tendency to construct reasons for a connection between what are actually unrelated events: *apophenia*. The most extreme case is when simple misfortune or bad luck is blamed on others' ill-will or even witchcraft (the practice of evil magic). Unfortunately, or perhaps fortunately, the world is a bit more complicated than simple witchcraft. The first complication comes in trying to <3>work out what we mean by "cause."

What is "Causation" Anyway?

Causation is a deeply debated subject, which is perhaps surprising as it seems rather simple in real life: we do something, and that leads to something else. I jammed my thumb in the car door, and now it hurts.

How do we know that my thumb would not have hurt anyway? Perhaps we can think of what is known as a counterfactual (i.e., thoughts about alternative possibilities for past events). If I [17] my thumb stuck in the door, then my thumb would not hurt. Doing this will always need an assumption, requiring the rewriting of history, since we can never really know for certain what I might have felt (although in this case I might be fairly confident that my thumb would not suddenly start hurting <4>on its own).

[23] [24] [25] [26] All we can say is that you are more likely to get lung cancer if you smoke than if you do not smoke, which is one reason why it took so long for laws to be passed to <5>restrict smoking.

Our statistical idea of causation is not strictly conclusive. When we say that X causes Y, we do not mean that every time X occurs, Y will, too, or that Y will only occur if X occurs. We simply mean that if we control the event and force X to occur, then Y tends to happen more often. We can never say that X caused Y in a specific case, only that X increases the proportion of times that Y happens. This has two vital consequences for what we have to do if we want to know what causes what. First, in order to draw conclusions about causation with real confidence, we ideally need to get involved and perform experiments. Second, since this is a statistical world, we need to control and repeat the event more than once in order to build up evidence.

*Pearson's correlation coefficient = ピアソンの積率相関係数

1. Choose the most appropriate answer.

[14]	① astonishing	② alarming	③ considered	④ acknowledged	⑤ concerned
[15]	① is	② are	③ be	④ to be	⑤ being
[16]	① Because	② However,	③ In addition,	④ In other words,	⑤ Therefore,
[17]	① cannot get	② will not get	③ must not have got	④ had not got	⑤ did not have to get

2. [18] What does <1>them refer to?

① researchers ② brain tumors ③ people with higher levels of education ④ cell changes
⑤ newspaper headline ⑥ authors ⑦ explanations ⑧ findings

3. Choose the answer that is closest in meaning.

[19]	<2>potential	① temporal	② significant	③ contradicting	④ possible	⑤ confident
[20]	<3>work out	① exercise	② determine	③ appreciate	④ develop	⑤ adjust
[21]	<4>on its own	① being alone	② solidly	③ one another	④ separately	⑤ by itself
[22]	<5>restrict	① confirm	② ban	③ limit	④ conduct	⑤ disagree

4. [23]-[26] The following four sentences are taken from the passage. Arrange the sentences so that they are in the most appropriate order.

① It is because most people who smoke do not get lung cancer, and some people who do not smoke do get lung cancer.
② This gets even trickier when we allow for the unavoidable variability that underlies everything interesting in real life.
③ Why did it take so long?
④ For example, the medical community now agrees that smoking cigarettes causes lung cancer, but it took decades for doctors to come to this conclusion.

5. [27] According to paragraph 1, Scandinavian countries are ideal for epidemiological studies because of the _____.

① presence of diverse populations in Scandinavian countries
② availability of a personal identity number used in various registrations
③ exciting and attention-grabbing studies conducted in those countries
④ efforts of communications officers in promoting research findings
⑤ absence of significant socioeconomic variations in the population

6. [28] In the section subtitled **Correlation Does Not Imply Causation**, why does the author mention the correlation between mozzarella cheese and the number of engineering degrees awarded?

① to argue against the cautious attitude of statisticians towards correlation
② to explain the connection between cheese consumption and engineering degrees
③ to demonstrate the lack of correlation between common events in the U.S.
④ to illustrate the tendency to construct reasons for connecting unrelated events
⑤ to highlight the importance of correlation in the statistical analysis of pizza customers

7. [29] According to the last paragraph, what are the essential requirements for determining causation? Choose TWO answers.

① observing the natural occurrence of two variables
② identifying the proportion of times an event occurs
③ actively taking part and conducting experiments
④ analyzing the data using new statistical models
⑤ using theory and historical data to predict outcomes
⑥ carrying out multiple tests to gather sufficient evidence

3 Read the passage below and answer the questions about it. Choose the most appropriate answers based on what is stated or implied in the passage. Choose ONE answer unless other instructions are given. Boxes ( ) in the passage indicate missing information.

著作権の都合上、省略します。

1. Choose the answer that is closest in meaning.

30	<1>moderate	① neglect	② cut up	③ warm up	④ cancel	⑤ soften
31	<2>set up	① designed	② intended	③ invested	④ matched	⑤ established
32	<3>piling up	① accumulating	② crashing	③ associating	④ proving	⑤ displaying

2. 33 What does <4>their refer to?

① Americans ② Gerard Hofstede and his colleagues ③ national cultural values
④ employees ⑤ significant impacts ⑥ workplace ⑦ organization

3. Choose the most appropriate answer.

34	① arose	② conflicted	③ lay	④ pushed	⑤ exhausted
35	① decided	② afforded	③ collapsed	④ excluded	⑤ failed
36	① exist	② existed	③ existing	④ to exist	⑤ to have existed
37	① Even if	② Although	③ Should	④ If	⑤ Such that

4. 38 Based on Laurent's research, which of the following could be inferred about French employees working for a multinational organization in America?

① They would have issues at work due to difficulties with pronunciation.
② They would gradually adopt American cultural values and work practices.
③ They would likely maintain or strengthen their French cultural values.
④ They would influence American coworkers to adopt French habits.
⑤ They would not experience any significant cultural differences at work.

5. 39 Alcatel-Lucent was unable to cut costs and secure government assistance due to ____.

① language barriers between the top executives
② conflicting strategies in product development
③ a lack of support from the French government
④ differing cultural responses to financial crises
⑤ local restrictions that had been overlooked

6. Based on the descriptions of cultural dimentions in the last two paragraphs, find the correct locations for (★) and (■) for Communication and Control in Figure 1.

40	Communication: U.S. Operations (★)	①A	②B	③C	④D	⑤E	⑥F
41	Communication: European Operations (■)	①A	②B	③C	④D	⑤E	⑥F
42	Control: U.S. Operations (★)	①A	②B	③C	④D	⑤E	⑥F
43	Control: European Operations (■)	①A	②B	③C	④D	⑤E	⑥F

7. 44 This passage is primarily about the ____.

① role of leadership in developing multinational corporations
② impact of national culture on organizational performance
③ process of globalization in American and European businesses
④ financial management strategies in multinational corporations
⑤ cultural perceptions held by American and French employees

出典

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