Follow instructions in sections A-C and answer the following items. Ensure that your choices correspond to the correct number on the marksheet.

(A) Complete the following sentences with the best word.

Knowing how much I love books, my friend went out (1) his way to find a rare edition of my favorite novel as a birthday gift.
(1) ア on　イ of　ウ to　エ with

A: "Have you heard about the new environmental regulations?"
B: "Yes, I have. The government believes that they will bring (2) a significant reduction in pollution levels."
(2) ア up　イ to　ウ down　エ about

The manager (3) the most experienced team with the project.
(3) ア assigned　イ entrusted　ウ allocated　エ transferred

He (4) his success to his supportive family and hard work.
(4) ア ensures　イ immerses　ウ witnesses　エ attributes

(B) Choose the answer that is closest in meaning to the <u>underlined</u> word or phrase.

(5) The company increased profits, but did so <u>by sacrificing</u> employee morale.
ア at the end of
イ at the mercy of
ウ at the expense of
エ at the insistence of

(6) The manager <u>addressed</u> his team regarding the project deadlines.
ア spoke to
イ called on
ウ brought up
エ pointed out

(C) Complete the following paragraphs with the best word.

There is a Spanish idiom—"sin maíz no hay país"; meaning that "without corn, there is no country"—a tribute to the legacy and treasure of this agricultural (7). Mexico is home to the most genetically (8) repository of corn in the world, hosting more than 59 unique varieties. What began as a wild grass called teosinte nearly 10,000 years ago in present-day Mexico has (9) through millennia of domestication and selective breeding to yield the corn that we know today. The native varieties are well-adapted to the local environment.

(7) ア soil　イ asset　ウ model　エ application
(8) ア diverse　イ standard　ウ accessible　エ specialized
(9) ア faded　イ evolved　ウ presented　エ established

This fossil mammal, *Ectoconus,* lived a mere 380,000 years after the worst day in Earth history, when a six-mile-wide asteroid ended the Age of Dinosaurs in fire and fury, ushering in a new world. Textbooks often tell a simple tale: the dinosaurs died, but mammals survived and quickly took (10). Yet this account has glossed over a troubling reality: we actually know very little about the mammals that (11) the extinction and (12) during the next 10 million years, during the Paleocene epoch. How were they able to persist when 75 percent of species died, and how did they set the foundation for the more than 6,000 species of placental mammals that (13) today, from the aerial bats to the aquatic whales to humans?

(10) ア away　イ down　ウ over　エ along
(11) ア caused　イ endured　ウ prevented　エ facilitated
(12) ア preceded　イ perceived　ウ preserved　エ persevered
(13) ア enable　イ perish　ウ thrive　エ mediate

Japan's (14) to developing the use of hydrogen as an energy source, and its larger ambitions to act as a global leader in this field, can be seen in the fact that the country accounted (15) an estimated 24% of all hydrogen-related plant applications filed between 2011 and 2022.

(14) ア committee　イ commodity　ウ commission　エ commitment
(15) ア in　イ of　ウ for　エ with

Read the passage below and follow instructions in sections D and E. Ensure that your choices correspond to the correct number on the marksheet.

P1: "Deepfake" refers to (16)synthetic media, including images, videos, and audio, generated by artificial intelligence (AI) technology that portray something that does not exist in reality or events that have never occurred. The term "deepfake" combines "deep," taken from AI deep-learning technology (a type of machine learning that involves multiple levels of processing), and "fake," addressing that the content is not real.

P2: Deepfakes are produced using two different AI deep-learning algorithms: one that creates the best possible replica of a real image or video and another that detects whether the replica is fake and, if it is, reports on the differences between it and the original. The first algorithm produces a synthetic image and receives feedback on it from the second algorithm and then adjusts it to make it appear more real; the process is repeated as many times as it takes until the second algorithm does not detect any false imagery.

P3: In deepfake videos, a specific person's voice may be replicated by feeding an AI model real audio data from the person, thereby training it to mimic them. Often, deepfake videos are produced by overdubbing existing footage of a person speaking with new AI-generated audio mimicking the voice of that person. Deepfakes have been used to (17)demean, intimidate, and harass and have targeted not only celebrities, politicians, and CEOs, but ordinary citizens as well.

P4: Some positive uses for deepfakes have also (18)emerged, however. One is spreading awareness about social issues. For example, soccer player David Beckham participated in a campaign to increase awareness about malaria in which videos were produced that appeared to show him speaking in nine different languages, broadening the reach of the message.

P5: Education and medicine are two fields that may benefit from deepfake technology. Educators may use deepfakes of historical speeches to offer immersive and engaging lessons. Using deepfake technology in health care

can improve the accuracy with which tumours are spotted on magnetic resonance imaging (MRI) scans, making them easier to treat. Deepfake images allow such AI programs to be trained to recognize a greater number of abnormalities, hence improving their long-term accuracy.

(D) Find the underlined words in the passage and choose the best substitute.

(16) Which choice is closest in meaning to synthetic in paragraph 1 (P1)?

ア similar　イ consumed　ウ improved
エ simulated　オ non-existent

(17) Which choice is closest in meaning to demean in paragraph 3 (P3)?

ア define　イ expose　ウ reveal
エ explore　オ humiliate

(18) Which choice is closest in meaning to emerged in paragraph 4 (P4)?

ア joined　イ released　ウ uncovered
エ benefitted　オ materialized

(E) Choose the best answer to the following:

(19) According to the passage, what combination of technologies is central to the creation of deepfakes?

ア image generation and detection
イ computer graphics and animation
ウ real-time rendering and video encoding
エ facial recognition and biometric analysis
オ voice recognition and natural language processing

(20) In what way does the feedback mechanism of the second AI algorithm affect the deepfake creation process, according to the passage?

ア It archives the process for future use.
イ It accelerates the rendering of the deepfake.
ウ It randomizes the generated content for diversity.
エ It fine-tunes the fabricated image until it appears real.
オ It introduces intentional errors to make detection more difficult.

(21) According to the passage, which of the following describes the potential harm caused by deepfakes?

ア They could be used unintentionally in medicine.
イ They could be used to devalue or persecute individuals.
ウ They could be used as a tool for legitimate media production.
エ They could be used primarily in positive ways in various media.
オ They could be used to replace human actors in films and entertainment.

(22) According to the passage, how might deepfake technology potentially benefit educational practices?

ア by eliminating the need for physical textbooks
イ by offering realistic experiences of historical events
ウ by simultaneously increasing efficiency in two fields
エ by replacing human teachers with AI-generated instructors
オ by producing images of possible future events with which students can engage

(23) According to the passage, in what way can deepfake technology improve MRI scanning?

ア by speeding up the MRI process
イ by reducing the costs of MRI procedures
ウ by creating images for enhanced AI training
エ by generating animated simulations of new diseases
オ by replacing radiologists and technicians with AI models

Read the passage below and follow instructions in sections F and G. Ensure that your choices correspond to the correct number on the marksheet.

P1: Charles Darwin conceived of evolution by natural selection without knowing that genes exist. Now mainstream evolutionary theory has come to focus almost exclusively on genetic inheritance and processes that change gene frequencies. Yet new data pouring out of adjacent (24)fields are starting to undermine this narrow stance. An alternative vision of evolution is beginning to crystallize, in which the processes by which organisms grow and develop are recognized as causes of evolution.

P2: Some of us first met to discuss these advances six years ago. In the time since, as members of an interdisciplinary team, we have worked intensively to develop a broader framework, termed the extended evolutionary synthesis (EES), and to flesh out its structure, assumptions and predictions. In essence, this synthesis maintains that important (25)drivers of evolution, ones that cannot be reduced to genes, must be woven into the very fabric of evolutionary theory. We believe that the EES will shed new light on how evolution works. We hold that organisms are constructed in development, not simply 'programmed' to develop by genes. Living things do not evolve to fit into pre-existing environments, but co-construct and coevolve with their environments, in the process changing the structure of ecosystems.

P3: The number of biologists calling for change in how evolution is conceptualized is growing rapidly. Strong support comes from allied disciplines, particularly developmental biology, but also genomics, epigenetics, ecology and social science. We contend that evolutionary biology needs revision if it is to benefit fully from these other disciplines. The data supporting our (26)position gets stronger every day.

P4: Yet the mere mention of the EES often evokes an emotional, even hostile, reaction among evolutionary biologists. Too often, vital discussions descend into acrimony, with accusations of muddle or misrepresentation. Perhaps haunted by the spectre of intelligent design, evolutionary biologists wish to show a united front to those hostile to science. Some might fear that they will

receive less funding and recognition if outsiders—such as physiologists or developmental biologists—flood into their field.

(F) Find the underlined words in the passage and choose the best substitute.

(24) Which choice is closest in meaning to fields in paragraph 1 (P1)?

ア plots　イ ranges　ウ terrains
エ districts　オ disciplines

(25) Which choice is closest in meaning to drivers in paragraph 2 (P2)?

ア factors　イ outputs　ウ motorists
エ operators　オ programs

(26) Which choice is closest in meaning to position in paragraph 3 (P3)?

ア area　イ role　ウ belief
エ location　オ standing

(G) Choose the best answer to the following:

(27) According to the passage, what was the purpose of establishing EES?

ア to ease the tension between evolutionary biologists
イ to encourage collaborations among biologists across disciplines
ウ to disprove Darwin's assertion that evolution occurs through natural selection
エ to demonstrate that genetic change and the environment are complementary to evolution
オ to develop a theory that demonstrates that evolution is solely dependent on genetic inheritance

(28) Which of the following statements is best supported by the information provided in the passage?

ア EES was first proposed by Darwin.
イ EES is unanimously accepted by scientists.
ウ EES was conceived by Darwin in just six years.
エ EES will give new insight into the process of evolution.
オ EES has cemented itself as the mainstream evolutionary theory.

(29) According to the passage, why does the current thinking of evolutionary biology need to be revised?

ア The present theory is based on a limited viewpoint.

イ The current scientific evidence does not support Darwin's theory.

ウ The revision of every scientific theory is necessary every six years.

エ Each new generation of scientists must contribute to science in its own way.

オ Darwin conceived the idea of evolution by natural selection without realizing that genes existed.

(30) According to the passage, what is the relative importance of EES?

ア It will ensure funding for evolutionary biologists.

イ It alleviates acrimony and accusations between fellow scientists.

ウ It predicts how environmental changes contribute to the natural selection of ecosystems.

エ It uses modern tools to explain how epigenetics contributes to the changing evolution of ecosystems.

オ It examines previous assumptions of the earlier synthesis and augments it with additional causative factors.

(31) What does the author mean by "…organisms are constructed in development, not simply 'programmed' to develop by genes" in paragraph 2 (P2)?

ア Living things can evolve because of their genetic 'programming.'

イ Genetic 'programming' is essential for the natural evolution of all living things.

ウ The evolution of living things is not solely dependent on their genetic 'programming.'

エ Genetic 'programming' is an inherent mechanism for changing the structure of ecosystems.

オ Genetic 'programming' is an intrinsic process for allowing organisms to preserve pre-existing environments.

Read the article below and follow instructions in section H. Ensure that your choices correspond to the correct number on the marksheet.

P1: In Munich, engineers at the European aerospace firm Airbus showed off what might be the future of clean energy. They collected sunlight with solar panels, transformed it into microwaves, and beamed the energy across an aircraft hangar, where it was turned back to electricity that, among other things, lit up a model of a city. The demo delivered just 2 kilowatts over 36 meters, but it raised a serious question: Is it time to resurrect a scheme long derided as science fiction and launch giant satellites to collect solar energy in space? In a high orbit, liberated from clouds and nighttime, they could generate power 24 hours a day and beam it down to Earth.

P2: "It's not new science, it's an engineering problem," says Airbus engineer Jean-Dominique Coste. "But it's never been done at large scale." The urgent need for green energy, cheaper access to space, and improvements in technology could finally change that, proponents of space solar power believe. "Once someone makes the commercial investment, it will bloom. It could be a trillion-dollar industry," says former NASA researcher John Mankins.

P3: Major investments are likely far in the future, and myriad questions remain including whether beaming gigawatts of power down to the planet can be done efficiently—and without frying birds, if not people. But the idea is moving from concept papers to an increasing number of tests on the ground and in space. The European Space Agency (ESA)—which sponsored the Munich demo—will next month propose to its member states a program of ground experiments to assess the viability of the scheme. The U.K., Chinese, Japanese, South Korean, and U.S. agencies all have small efforts underway.

P4: NASA first investigated the concept of space solar power during the mid-1970s fuel crisis. But a proposed space demonstration mission—with '70s technology lofted in the Space Shuttle and assembled by astronauts—would have cost about $1 trillion. The idea was shelved and, according to Mankins, remains a taboo subject for many at the agency. Today, both space and solar power technology have changed beyond recognition. According to space policy

analyst Karen Jones, the efficiency of photovoltaic (PV) solar cells has increased 25% over the past decade, while costs have plummeted. Microwave transmitters and receivers are a well-developed technology in the telecoms industry. Robots being developed to repair and refuel satellites in orbit could be turned to building giant solar arrays.

P5: But the biggest boost for the idea has come from falling launch costs. A solar power satellite big enough to replace a typical nuclear or coal-powered station will need to be kilometers across, demanding hundreds of launches. "It would require a large-scale construction site in orbit," says ESA space scientist Sanjay Vijendran. Private space company SpaceX has made the notion seem less outlandish. "It's changing the equation," Jones says. "Economics is everything."

P6: Better engineering could make those economics more favorable. Coste says Airbus's demo in Munich was 5% efficient overall, comparing the input of solar energy with the output of electricity. Ground-based solar arrays do better, but only when the Sun shines. If space solar can achieve 20% efficiency, recent studies say it could compete with existing energy sources on price. Lower weight components will also improve the cost calculus. "Sandwich panels," pizza box-size devices with PV cells on one side, electronics in the middle, and a microwave transmitter on the other, could help. Put thousands of these together like a tiled floor and they form the basis of a space solar satellite without a lot of heavy cabling to shift power around.

P7: The drawback of sandwich panels is that the microwave side must always face toward Earth so, as the satellite orbits, the PV side sometimes turns away from the Sun. To maintain 24-hour power, a satellite will need mirrors to keep that side illuminated, with the added benefit that the mirrors can also concentrate light onto the PV cells. A 2012 NASA study by Mankins put forward a design in which a bowl-shaped structure with thousands of individually steerable thin-film mirrors directs light onto the PV array.

P8: If a space-based power station ever does fly, the power it generates will need to get to the ground efficiently and safely. In a recent ground-based test, Paul Jaffe's team at the U.S. Naval Research Laboratory beamed 1.6

kilowatts over 1 kilometer, and teams in Japan, China, and South Korea have similar efforts. But current transmitters and receivers lose half their input power. For space solar, power beaming needs 75% efficiency, Vijendran says, "ideally 90%."

P9: The safety of beaming gigawatts through the atmosphere also needs testing. Most designs aim to produce a beam kilometers wide so that any spacecraft, plane, person, or bird that strays into it only receives a tiny—hopefully harmless—portion of the 2-gigawatt transmission. Receiving antennas are cheap to build but they "need a lot of real estate," Jones says, although she says you could grow crops under them or site them offshore.

(H) Choose the best answer to the following:

(32) What technology did Airbus engineers demonstrate in Munich that could shape the future of clean energy?
- ア beaming of energy converted from sunlight
- イ using solar energy to launch giant satellites
- ウ generation of energy using an aircraft hangar in space
- エ utilizing turbines to generate microwaves for an aircraft hangar
- オ collection of microwaves with ground-based solar panels to generate sunlight

(33) What are two main concepts discussed in paragraph 2 (P2)?
- ア old ideas and new ideas
- イ old science and problems in engineering
- ウ clean energy and technological approaches
- エ modern developments and sufficient funding
- オ traditional solar power and space solar power

(34) According to paragraph 3 (P3), what safety concern is associated with beaming large amounts of power from space to Earth?

ア overloading the power grid on Earth
イ risk of harmful exposure to microwaves
ウ high probability of power loss during transmission
エ potential for disrupting global communications networks
オ difficulty in maintaining the viable alignment of satellites

(35) According to paragraphs 4 (P4) and 5 (P5), what have been the primary practical challenges regarding space solar power historically?

ア increases in PV solar cell efficiency
イ engineering complexity and high costs
ウ lack of interest from space agencies and governments
エ inability to store and retrieve energy generated in space
オ difficulty in building and transporting solar panels to space

(36) According to the article, what advantage does space solar power have over ground-based solar arrays?

ア lower construction costs
イ ease of maintenance and repair
ウ increase in environmental impact
エ ability to generate power continuously
オ reduction of need for energy storage systems

(37) What is the rhetorical purpose of paragraph 7 (P7)?

ア to explain how solar panel arrays use their orbits as sources of energy
イ to explain how light reflection can optimize satellite-mounted solar panels
ウ to explain why orienting the photovoltaic array towards earth is more efficient
エ to explain a previous study on the use of manually-controlled bowl-shaped structures
オ to explain the particular advantages offered by the use of so-called “sandwich panels”

(38) What is one current limitation of beaming power from space, as mentioned in paragraph 8 (P8)?

ア beaming power over 1 kilometer
イ competition by numerous countries
ウ efficient generation of power on the ground
エ doubt whether a power station can fly safely into space
オ loss of around 50% input power by transmitters and receivers

(39) What point is made in paragraph 9 (P9) regarding the devices used to collect solar energy beamed from space?

ア They are of prodigious dimensions.
イ They transmit considerable gigawatts.
ウ They are highly dangerous to life on earth.
エ They can be used as sources of agriculture.
オ They require significant financial resources to construct.