# PART ONE: LISTENING COMPREHENSION (20 points)

**I. You will hear an interview about airplane emissions. As you listen, complete the notes. Write NO MORE than TWO WORDS in each gap. Transfer your answers to the table on the right. You will hear the recording twice. (10 points)**

1) At the present time, flying produces about 2% of all carbon dioxide emissions, and this is likely to _____ in the near future.
2) At ground level, the particles emitted by planes can have a detrimental impact on _____ and people's healths.
3) When planes are flying, the particles they emit help to form contrails, which are clouds of _____.
4) If the contrails remain in the air, they spread out leading to a cloud formation called contrail cirrus, which has a _____.
5) The aviation industry, like many others, is trying to find ways to reduce its carbon dioxide emissions, however, replacing the current power supply is not so _____.
6) Aircraft engines are already extremely efficient, therefore it is not easy to make them more _____.
7) Planes are dependent upon liquid fuel, which comes from oil extracted from under the ground, however, plant or _____ could also be used to produce it.
8) Growing the materials to produce such biofuels would use up the carbon in the atmosphere, thereby _____ the net carbon dioxide emissions of these biofuels when they are burnt.
9) Past research on the effects of using a mix of regular jet engine fuel and biofuel has focused on the impact on air quality on the ground, but there has been no research under real _____ conditions.
10) Studies conducted on aircraft engine emissions during flight have measured a reduction in particle emissions of approximately _____ when biofuel and petroleum fuel are used at a ratio of 50/50.

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| **1.** | |
| **2.** | |
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| **8.** | |
| **9.** | |
| **10.** | |

(Listening extract from nature.com/nature/podcast/index-2017-03-16.html)

**II. You will hear an interview about city trees. Read statements 1-10 below and decide whether they are true (T), false (F), or the information is not given (NO INFO). You will hear the recording twice. (10 points)**

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| 1 | City trees have been built throughout the world to clean the air in urban areas. | T / F /NO INFO |
| 2 | Football can be played on the panels of city trees. | T / F /NO INFO |
| 3 | Inhabitants of the cities where city trees have been installed are delighted with them. | T / F /NO INFO |
| 4 | The moss on each city tree structure absorbs air pollution. | T / F /NO INFO |
| 5 | Moss, which is not typically found in cities, does not need soil to grow. | T / F /NO INFO |
| 6 | Moss is more efficient at absorbing pollutants than regular trees because it has a larger leaf surface area. | T / F /NO INFO |
| 7 | The high cost of building and maintaining a city tree is always covered by advertising revenue. | T / F /NO INFO |
| 8 | Scientists doubt that moss can be effective in cities simply because there are too many factories. | T / F /NO INFO |
| 9 | Dr Gary Fuller, a pollution scientist at King's College London, commends the concept of city trees as it helps raise awareness of the problem of urban pollution. | T / F /NO INFO |
| 10 | Although city trees appear to be good value for money when compared with typical urban trees, the presenter wonders whether tax-payers should contribute more towards the expense. | T / F /NO INFO |

(Listening extract from bbc.co.uk/programmes/p05d1d8w)

# PART TWO: READING COMPREHENSION (20 points)

**I. Read the text about the flexitarian diet. For questions 1-10, decide which of the statements are true (T), false (F), or the information is not given (NO INFO). (10 points)**

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|---|---|---|
| 1 | The connection between human health and eco-friendliness has been known in the US for almost half a century. | T / F /NO INFO |
| 2 | People in their late twenties have an impact on the type of food available in supermarkets and restaurants. | T / F /NO INFO |
| 3 | Recently, people have been buying more almond milk than regular milk. | T / F /NO INFO |
| 4 | In the US, the amount of meat consumed annually has fallen by twenty percent over the past ten years. | T / F /NO INFO |
| 5 | According to a recent survey, vegetarian dishes are considered tasteless by almost forty percent of Americans. | T / F /NO INFO |
| 6 | Flexitarianism is the perfect diet for environmentally-conscious meat lovers. | T / F /NO INFO |
| 7 | Flexitarians must follow a set of five simple steps. | T / F /NO INFO |
| 8 | Vegetarians are half as likely to develop Type 2 diabetes as flexitarians. | T / F /NO INFO |
| 9 | Even partial removal of meat from your diet can extend your lifespan. | T / F /NO INFO |
| 10 | The author of the text believes that flexitarianism is only a fad. | T / F /NO INFO |

**CAN'T DO VEGETARIAN? HOW ABOUT FLEXITARIAN?**

By Cara Rosenbloom

From black bean burgers on restaurant menus to eight varieties of hummus at the supermarket, the meatless movement shows no signs of slowing down.

The first real blip of vegetarianism in the United States started in 1971 when Frances Moore Lappé published "Diet for a Small Planet," and explained that meat-based diets can be harmful for our planet and our health. Lappé wrote about ways to reduce food waste and enhance sustainability, but her ideas weren't widely acted upon; she was ahead of her time.

Fast-forward 45 years, and these same issues routinely make headline news as worries about our food supply escalate. Lappé's ideas are now being recycled as a new wave of concerned citizens, especially millennials, turn to meat-free eating for better health – both for ourselves and the planet. But this time, the momentum may be strong enough to make some changes.

Lappé was only 27 when she wrote "Diet for a Small Planet." If you're 27 these days, you're considered a millennial, the generation known for being socially aware, civic-minded and environmentally conscious. Their buying power is affecting what we see on restaurant menus and in supermarkets.

Sales are soaring for once fringe items such as veggie burgers and almond milk. The number of new vegetarian product launches has doubled over the past five years.

The trend toward avoiding meat occurs at a time when the toll that meat production takes on the planet is becoming clearer. As people become aware that meat production requires unsustainable levels of water, land and energy use, more Americans are choosing to leave meat off their plates. Annual meat consumption per person has fallen 15 percent in the past 10 years, and when we do eat meat, it's often environmentally-friendly, organic, grass-fed, antibiotic-free and hormone-free (all areas in which sales have increased).

But let's face it. If you love perfectly seared steaks or covet your beer-can chicken, the idea of eating tofu hotdogs may not be all that appealing. What if you're concerned about the environment but still want to eat a burger once in a while? Meat-free eating has expanded into something more flexible and inclusive, giving everyone a chance to choose healthful and sustainable meals without giving up meat entirely. It's called the "flexitarian" diet.

While 7.3 million Americans are vegetarian, an additional 22.8 million are flexitarian, meaning they primarily eat a vegetarian diet, but enjoy meat occasionally. This part-time vegetarian diet has broader appeal because it helps us balance food cravings with health and global sustainability.

There are no rules for flexitarianism, which is part of the appeal. The basic idea is to eat more vegetables, whole grains, beans, nuts and seeds, while reducing intake of animal-based foods such as meat, poultry and dairy. And it's easier to choose meatless meals when food tastes so good! Tasty dishes such as chickpea fritters and lentil soup add mass appeal to the semi-vegetarian lifestyle.

The health and environmental benefits of flexitarianism aren't as pronounced as they are with strict vegetarian diets, but there is still merit in eating meatless meals more often.

A study published last month found that although a strict vegetarian diet can help reduce the risk of developing Type 2 diabetes by 34 percent, a flexitarian diet is associated with a 20 percent reduced risk. Other studies show that a flexitarian diet can help reduce cholesterol and triglyceride levels, as well as the risk of becoming overweight or obese. Bottom line: You don't need to eliminate meat entirely to reap the health benefits of a vegetarian diet.

Mixing the advantages of environmental and personal health is a big driver of the flexitarian movement. A recent study predicted that a flexitarian diet could reduce global mortality by up to 10 percent and food-related greenhouse gas emissions by up to 70 percent. And because this diet is more flexible, there's a good chance that people can stick to it in the long run. So maybe the part-time vegetarian movement is here to stay.

Are you new to tempeh and falafel? Experiment with vegetarian meals by starting with Meatless Monday, because skipping meat one day a week is an easy transition. If you're feeling inspired, try adding black bean salad with mango sauce and Korean-style tofu, vegetable and noodle stir-fry to your menu.

Source: https://www.washingtonpost.com/lifestyle/wellness/cant-do-vegetarian-how-about-flexitarian/2016/07/07/9d2610aa-3d57-11e6-80bc-d06711fd2125_story.html?utm_term=.4cac92c4dcee

**II. Complete the text about flexible solar panels with the missing clauses (A-L) in the gaps marked 1-10. There are two extra clauses you do not need to use. Transfer your answers to the table. (10 points)**

In the very near future, recycling light energy may be easier than recycling any other item in your house.

Led by Shashank Priya, a team of mechanical and materials engineers and chemists at Virginia Tech, including post-doctoral researchers Xiaojia Zheng and Congcong Wu, as well as College of Science chemistry Professor Robert Moore and Assistant Professor Amanda Morris, is producing flexible solar panels that can become part of window shades or wallpaper (1) _____.

Solar modules less than half-a-millimeter thick are being created through a screen-printing process using low-temperature titanium oxide paste as part of a five-layer structure that creates thin, flexible panels similar to tiles in one's bathroom. These tiles can be combined together to cover large areas; (2) _____.

Most silicon-based panels can absorb only sunlight, but the flexible panels (3) _____ , according to Priya, the Robert E. Hord Jr. Professor of Mechanical Engineering in the College of Engineering.

"There are several elements that make the technology very appealing," said Priya. "First, it can be manufactured easily at low temperature, so the equipment to fabricate the panels is relatively inexpensive and easy to operate. Second, the scalability of being able to create the panels in sheet rolls means (4) _____."

The panels, Priya said, can also be made to any design, so (5) _____. "The properties of the panels are such that there are really few limitations in terms of light source," Priya said. "And the fact that we are dealing with an emerging technology, means we will be able to expand the utility of the panels as we go forward."

Currently, the efficiency of the cells is nearly on par with the heavier, rigid silicon structures, but, Priya said, at panel-level there is some research required. Still, (6) _____.

"Amorphous silicon is a fairly mature technology running at about 13-15 percent efficiency," he said. "Our panels right now operate around 10 percent at the panel size. (7) _____."

The flexible panels, as they approach the conversion efficiency of rigid silicon and glass, can also be incorporated into products that the older technology cannot compete with -- such as military uniforms and backpacks, items Priya's lab is working on now with the U.S. Army's Communications-Electronics Research, Development, and Engineering Center. By adding flexible panels to these items, (8) _____ , as well as the weight each individual soldier must carry on his or her back.

"Right now we are at the cutting edge of this technology," Priya said. "Our edge is in the ability to fabricate large-area modules with high efficiency. We are actively working to integrate the product with the market and we see a wide variety of uses for the technology, (9) _____."

The work of Priya and his team is detailed in the papers, The Controlling Mechanism for Potential Loss in CH3NH3PbBr3 Hybrid Solar Cells, published in the July issue of ACS Energy Letters, and Scaling of the Flexible Dye Sensitized Solar Cell Module, available online now in the journal Solar Energy Materials and Solar Cells. The article will be published in the journal's December edition.

By creating panels that capture a wide variety of light wavelengths, Virginia Tech engineers are opening (10) _____. Another paper demonstrating the stability of the cells will be published by *ACS Energy Letters* later in October under the title, "Improved Phase Stability of Formamidinium Lead Triiodide Perovskite by Strain Relaxation."

Source: https://www.sciencedaily.com/releases/2016/11/161101133758.htm

A …it is likely the new flexible panels will overtake their rigid cousins soon.

B …soldiers will become their own recharging stations, resulting in reduction of the logistical footprint of a fighting force in the field…

C …you could wallpaper your home in these panels to run everything from your alarm system, to recharging your devices, to powering your LED lights.

D …developing organic solar cells from polymers, however, is a cheap and potentially simpler alternative…

E …from clothing to windows, to smart buildings to UAVs to mobile charging stations.

F …an individual panel, roughly the size of a person's palm, provides about 75 milliwatts of power, meaning a panel the size of a standard sheet of paper could easily recharge a typical smart phone…

G …at smaller, less-useful sizes, the efficiency increases, and so we can see a potential for much greater energy collection efficiencies.

H …homeowners will even be able to print sheets of these solar cells with inexpensive home-based inkjet printers…

I …they could become window shades and curtains as well, absorbing sunlight through windows.

J …a door to an entirely new area of light and energy recycling that could make saving energy as easy as hanging a curtain.

K …that will capture light from the sun as well as light from sources inside buildings.

L …are constructed to be able to absorb diffused light, such as that produced by LED, incandescent, and fluorescent fixtures…

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## PART THREE: GRAMMAR AND VOCABULARY (20 points)

**I. For each sentence below, write a new sentence as similar in meaning as possible. The words provided below must be used in your sentences and must not be altered in any way. Use between two and six words. (10 points)**

1. John was sorry to have made such a fuss at the party. **REGRETTED**

John ……. such a fuss at the party.

2. The organizers disregarded the former president's presence at the ceremony. **NOTICE**

The organizers …….. the former president's presence at the ceremony

3. Alfred put on his raincoat because he didn't want to get soaked. **FEAR**

For ……. Alfred put on his raincoat.

4. I don't agree with the conclusions you have put forward. **ALONG**

I ……. the conclusions you have put forward.

5. The ambassador was amazed at the structure of the Royal Palace. **IMPACT**

The structure of the Royal Palace ……. the ambassador.

6. I suddenly realized that I had strayed from the main route. **DAWNED**

It …… I had strayed from the main route.

7. We were all shocked by the rude response that the boy gave to his loving mother. **ABACK**

We ……. the rude response that the boy gave to his loving mother.

8. You shouldn't forget about your grandmother's birthday in any circumstances. **NO**

Under ……. your grandmother's birthday.

9. It was a pity nobody voted in favour of our party. **WISHED**

I …… in favour of our party.

10. No such idea has ever occurred to me before. **CROSSED**

No such idea ……. before.

**II. Circle the correct option, A, B, C or D. (10 points)**

1. In automotive safety, the _____ plays an essential role in elevating young passengers to ensure seatbelts are positioned correctly. This device is a legal requirement in many countries for children under a certain height or weight. Proper usage significantly reduces the risk of injury in the event of a collision.

A. booster car seat
B. child restraint
C. harness belt
D. safety strap

2. In measurement systems, a(n) _____ is utilized to convert physical quantities like temperature or pressure into electrical signals. This process enables more precise monitoring of changing conditions. The accuracy of the signal can directly impact system performance.

A. capacitor
B. actuator
C. transducer
D. generator

3. The _____ of a vehicle, defined as the distance between the front and rear axles, affects both stability and maneuverability. Longer versions generally provide a smoother ride, while shorter ones allow for tighter turning. This measurement is a critical design consideration in vehicle engineering.

A. chassis
B. wheelbase
C. axle length
D. track width

4. In the oil and gas industry, a _____ performs general maintenance duties on rigs and platforms, often under challenging conditions. This position is typically entry-level and requires physical endurance. The role supports the smooth functioning of operations at sea or remote locations.

A. roughneck
B. roustabout
C. foreman
D. deckhand

5. The _____ mechanism is commonly employed in tools and machinery to allow motion in one direction while preventing it in the opposite direction. This system is crucial in applications where controlled movement is essential. It is frequently used in mechanical lifting equipment.

A. camshaft
B. clutch
C. ratchet and pawl
D. flywheel

6. In structural engineering, a _____ provides crucial support by resisting compressive forces. It is often installed in frameworks to enhance stability and prevent deformation. Material selection for this component depends on load requirements and environmental conditions.

A. girder
B. beam
C. strut
D. rod

7. A _____ is incorporated into building designs to resist lateral forces, such as those caused by wind or seismic activity. This component is essential in maintaining the structure's integrity under extreme conditions. Its position and thickness are strategically chosen for maximum effect.

A. foundation
B. partition
C. cladding
D. shear wall

8. During metal refining, _____ forms as a by-product when impurities separate from the molten metal. This material, often discarded or repurposed, affects the purity of the final product. Efficient removal is necessary to ensure high-quality metal output.

A. alloy
B. flux
C. slag
D. dross

9. In internal combustion engines, _____ is the point at which the piston reaches its highest position within the cylinder. This position is critical in timing processes such as fuel injection and ignition. Precision at this point enhances engine efficiency and performance.

A. crankshaft angle
B. maximum lift
C. head clearance
D. top dead centre

10. In fluid mechanics, _____ is the upward force exerted by a fluid on an object placed within it. This force counteracts gravity, allowing objects to float. Engineers must calculate this force when designing marine vessels and other buoyant structures.

A. upthrust
B. lift
C. drag
D. compression

## PART FOUR: WRITING (20 points)

**Choose ONE of the following topics. Write between 200 and 250 words.**

**I. Write an argumentative essay. Discuss the following topic:**

The future of engineering should focus solely on automation and artificial intelligence.

**II. As part of your research, you have come across an article that is relevant to your field of study. To keep track of key ideas and findings, you need to write a summary that captures the main points of the article in a clear and concise way. This will help you refer back to the information later and share it with others who may not have time to read the full text.**

**Write a summary of the article in Reading Comprehension Task 1 (**Can't do vegetarian? How about flexitarian?**) in your own words, ensuring that it reflects the most important aspects of the original text.**

**TASK no. …….**

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**How many words have you written? …….**

| Task Achievement<br>0-5points | Coherence & Cohesion<br>0-5points | Vocabulary<br>0-5 points | Grammar<br>0-5 points | Total |
|---|---|---|---|---|
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