Engineering English Test

READING

Read the text below and then answer the questions on the following page.

New 'cooling glass' sends heat into space

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Researchers have developed a new *'cooling glass'* that can lower indoor heat without electricity by drawing on the cold environment of space.

Developed at the University of Maryland, the microporous glass coating can lower the temperature of the material **beneath** it by 3.5°C at noon, and has the potential to reduce a **mid-rise** apartment building's yearly carbon emissions by 10 per cent, according to the research team **led** by Distinguished University Professor Liangbing Hu in the Department of Materials Science and Engineering. The team's findings are detailed in a paper published in *Science*.

In use, the coating first **reflects** up to 99 per cent of solar radiation to stop buildings from **absorbing** heat. It then emits heat in the form of longwave infrared radiation into the cold universe, where the temperature is generally around −270°C.

In a phenomenon called 'radiative cooling', space acts as a **heat sink** for the buildings; they take advantage of the new cooling glass design along with the so-called atmospheric transparency window — a part of the electromagnetic spectrum that passes through the atmosphere without increasing its temperature — to deposit large amounts of heat into the cold universe.

According to UMD, the new glass can withstand exposure to water, ultraviolet radiation, dirt and flames, enduring temperatures of up to 1,000°C. Furthermore, the glass can be applied to surfaces including tile, brick and metal.

The team used finely ground glass particles as a **binder**, allowing them to avoid polymers and so enhance its long-term durability outdoors. They chose the particle size to maximise emission of infrared heat while simultaneously reflecting sunlight.

"It's a game-changing technology that simplifies how we keep buildings cool and energy-efficient," said Assistant Research Scientist Xinpeng Zhao, first author of the study. "This could change the way we live and help us take better care of our home and our planet."

"This 'cooling glass' is more than a new material — it's a key part of the solution to climate change," said Professor Hu. "By cutting down on air conditioning use, we're taking big steps toward using less energy and reducing our carbon footprint. It shows how new technology can help us build a cooler, greener world."

Question 1 – Synonyms

The words listed (i – vii) appear in the text. For each, find a synonym from the box below. There are extra options you will **not** need.

A. midnight	B. midday	C. near	D. intermediate height
E. passes	F. enables	G. using	H. reduce
I. cooling system	J. under	K. lesser	L. headed
M. sends back	N. medium size	O. taking in	P. that becomes colder
Q. adhesive			

Example: cooling = ***P***

i. beneath = _____

ii. mid-rise = _____

iii. led = _____

iv. reflects = _____

v. absorbing = _____

vi. heat sink = _____

vii. binder = _____

Question 2 – Reference Words

What do the underlined words refer to?

Example: **beneath it** by = *glass coating*

I. **where** the temperature =

II. **they** take advantage =

III. **its** temperature =

Question 3 – True / False / Not Given

Indicate if each statement is **True (T)**, **False (F)**, or **Not enough information (N)** based only on the text.

Example: This text is taken from the Internet. = **T**

i. The coating is able to reflect more than 3/4 of the sun's radiation.	**T / F / N**
ii. The cold universe averages a temperature below 250°C.	**T / F / N**
iii. The new material is not at all water and flame resistant.	**T / F / N**
iv. The new material should last well outside because it uses glass as a binder.	**T / F / N**
v. This material can help reduce people's carbon footprint because it employs cost-effective technology.	**T / F / N**

Question 4 – Interview Questions

Write **4 questions** you would like to ask Professor Liangbing Hu (see text).

i.

ii.

iii.

iv.

USE OF ENGLISH

Part A – Word Formation: Jobs in the Future

Use the word in **CAPITALS** at the end of each line to form a word that fits the gap. There is an example at the beginning (0).

0	*In twenty years' time, which jobs will people still be doing, and which is (0) REASONABLE*	**REASON**
	to assume will have gone forever? Today's young people should give the question	
1	careful (1) _____ before choosing a career. Clearly, there will continue	**CONSIDER**
2	to be a need for staff in (2) _____ professions such as medicine that	**EXIST**
	involve caring for others, and also for people able to persuade like	
3	(3) _____ and lawyers.	**POLITICS**
4	There will of course be no (4) _____ of jobs in science and technology,	**SHORT**
5	particularly for individuals able to (5) _____ in newer fields such as	**SPECIAL**
	biotechnology and microbiology.	
6	On the other hand, the already rapid (6) _____ of jobs to robots will	**LOSE**
	speed up even further, as they replace workers not only in manufacturing but also	
7	in the (7) _____ industry. And as robots learn how to stack shelves,	**CONSTRUCT**
	take over at check-outs or send us our online shopping, it won't be long before	
8	most supermarket jobs have (8) _____, too.	**APPEAR**

Part B – Open Cloze: Load

Read the text and think of the word which best fits each gap. Use **only one word** in each space. There is an example at the beginning (0).

When engineers (0) *design* a machine or structure, (1) _____ need to know what forces (2) _____ be exerted on it. In engineering, forces are called *loads*. Usually, several different loads will (3) _____ on the components in a machine, or the members (parts) of a structure. A component or member which (4) _____ designed to carry (or bear) a load is called a load-bearing component or member.

To predict what will happen when components (5) _____ loaded, engineers calculate the magnitude (size) of each load, and also (6) _____ out the direction of the load — for example, vertically downwards. Load is therefore a *vector quantity* — that is, a measurement with (7) _____ both a magnitude and a direction. This is different to a *scalar quantity* which has a magnitude only.

LISTENING

You will hear a consultant engineer specialising in rail technology talking about the **TGV train world speed record**. Complete the sentences below with the words you hear *(maximum one word per space)*.

1–2.	The TGV world record exceeded the standard operating speed by a _____ margin. However, it wasn't heavily _____.
3.	One of the biggest modifications was its _____, which was reduced by 50%.
4.	Some _____ were taken out of the coaches to make more space for testing equipment.
5–6.	Its _____ was adapted to make it more aerodynamic, thus reducing its drag coefficient by _____ %.
7–8.	The _____ of the wheels was increased by 19% so that revolution speed was reduced and friction and _____ forces were limited.
9.	The power of the electric motors was increased by _____ %.
10.	The engineer's conclusion is that it is possible to make standard high-speed trains _____.

WRITING

Answer **one** of the following questions.

Option A

You are applying to a university engineering programme. Write an **email** to the admissions office explaining why you want to study engineering and why you chose this university.

In your email, you should:

- Introduce yourself and your background
- Explain your interest in engineering (e.g. experiences, projects, or inspirations)
- Describe why you chose this university
- Mention your future career goals

Write approximately 120–150 words.

Option B

The diagram below shows the stages and equipment used in the **cement-making process** and how cement is used to produce concrete for building purposes.

Summarise the information by reporting the main features and make comparisons where relevant.

Write approximately 120–150 words.