HACKERS TEST

READING PASSAGE

*You should spend about 20 minutes on **Questions 1-14**, which are based on Reading Passage below.*

3D Printers and Human Tissue

Is 3D printing the future of medicine?

Although the technology for 3D printers has been around since the 1980s, it hasn't been so long that 3D printers became widely available commercially. The practice of producing three-dimensional solid objects of almost any shape from a digital model has since taken off exponentially, with virtually every sector of the economy eager to find ways to apply this technological breakthrough. While most people expect that 3D printing would be useful in fields such as architecture, construction, industrial design, and aerospace, few consider the implications of this technology for biotechnology and medical research. But, in fact, the ability to create live human tissue, and potentially even whole organs, is what has the medical community so excited.

For the last 20 years, medical researchers have been experimenting with ways to use the technology to create three-dimensional biological structures for medical purposes. To understand how this is possible, it's important to grasp how 3D printing works. The first step is to create a 3D image of the desired item using a computer-aided design software programme. The programme then slices the digital object into hundreds or even thousands of horizontal layers that become the blueprint for the printing stage. The actual printing is achieved using an additive process, in which the printer lays down successive layers of liquid, powder, paper or other material, from the bottom up to build the model from a series of cross sections. It then combines these layers to produce the final shape.

As soon as this technology came out, medical researchers thought, why not layer living cells just as with any other material, and thereby engineer biological structures such as tissue? Since the mid-2000s, biotech firms have taken up this question. In only a few years, they achieved significant success in producing human tissues that preserve cell function and viability. The types of human tissue that have thus far been successfully produced include bits of lung and heart muscles, as well as valves, and even a human ear. Experiments transplanting these tissues into laboratory animals have produced overwhelmingly positive results. Surgeons have also been able to implant some of this bioprinted* tissue - including skin and muscle - into human patients.

* bioprint: to 3D print a biological structure (a tissue, an organ, etc.) using a bioprinter

LIVEWORKSHEETS

While these advances are encouraging, the ultimate goal remains printing internal organs for humans in need of a transplant. Developing complex organs is a major challenge, especially in regard to creating one that has enough oxygen to survive until it can integrate with the body. One recent breakthrough at Harvard University's Jennifer Lewis lab has brought this closer to reality by creating the first 3D printed kidney tissues. Researchers at the lab came up with an innovative bioprinting process that allows them to print both the complex structures from which the kidney tissue is made, and the vascular systems which are necessary to keep the tissue alive. Using this system they were able to create a proximal tubule, a fundamental part of the kidney and the element responsible for filtering blood. The Jennifer Lewis team hopes to be able to manufacture a kidney in its entirety in a matter of years. Since around 10 per cent of the world's population suffers from chronic kidney disease, with many relying on machines to survive until they get a transplant, this could be a life-changing medical advance for millions of people. Scientists now believe that other 3D printed organs could also be available in less than a decade.

Aside from organ replacement, bioprinted tissue can also be used for medical research and drug development. For example, scientists have found that bioprinted slivers of the liver, although extremely tiny, respond to drugs in ways that are very similar to the full-grown human liver. This has allowed researchers to test the toxicity of new drugs before approving expensive clinical trials with patients. The potential to save billions of dollars in clinical research each year has caught the attention of investors. There are other possibilities on the horizon as well. Several laboratories are currently developing bioprinters that could apply skin cells directly onto wounds. Working in conjunction with a laser, the printer would scan the size and depth of an injury and then produce a topological 3D map of the wound that would be used to determine how much material to deposit on the wound site. The same technology could be used to close wounds of the elderly or people with diabetes, whose bodies don't heal well. It could even eventually be a solution to simple surgeries such as stitches for large cuts. With all the ways that the bioprinting of tissues could be useful, it's no wonder that it's taking the medical community by storm.

LIVEWORKSHEETS

Questions 1-5

*Complete each sentence with the correct ending, **A-G**, below.*

1 Medical researchers have been conducting tests to

2 The eventual goal of bioprinting technology is to

3 A difficult task is making organs with sufficient oxygen until they can

4 Harvard researchers developed a process for creating structures that can

5 A laser and printer could possibly scan an injury and then

A	make medical equipment.
B	keep tissues alive.
C	perform surgery unassisted.
D	provide organs for transplants in humans.
E	make 3D biological structures for use in medicine.
F	fuse with the body.
G	create a 3D map of the wound.

LIVEWORKSHEETS

Questions 6-10

Complete the sentences below.

*Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

6 In recent years, the practice of creating various 3D objects based on a ..... has exploded.

7 Before printing, a computer programme makes a blueprint by cutting a 3D image into numerous .....

8 In a short time, biotech firms made human tissues that maintained the ..... and viability of cells.

9 A team at Harvard aims to produce a complete ..... in the near future.

10 Researchers can now test the ..... of drugs prior to human trials.

Questions 11-14

Do the following statements agree with the information given in Reading Passage?

Write

TRUE	*if the statement agrees with the information*
FALSE	*if the statement contradicts the information*
NOT GIVEN	*if there is no information on this*

11 Most people understand the usefulness of 3D printing for medical research.

12 Tests of bioprinted tissue in animals have shown promising results.

13 Using 3D printed organs could reduce the cost of transplantation within 10 years.

14 Drugs affect small bioprinted pieces of liver as they do a whole liver.

Đáp án - Dịch nghĩa - Chú giải trang 422

LIVEWORKSHEETS