READING PASSAGE 2

*You should spend about 20 minutes on **Questions 14–26**, which are based on Reading Passage 2 below.*

New filter promises clean water for millions

An ingenious invention is set to bring clean water to developing countries, and while the science may be cutting edge, the materials are extremely down to earth.

A handful of clay, yesterday's coffee grounds and some cow manure are the ingredients that could bring clean, safe drinking water to many developing countries. The simple new technology, developed by Australian National University (ANU) materials scientist and potter Tony Flynn, allows water filters to be made from commonly available materials and fired (or baked) using cow manure as the source of heat, without the need for a kiln (an oven for baking or drying pottery). The filters have been tested and shown to remove common pathogens (disease-producing organisms) including E. coli.

The invention was born out of a project involving the Manatuto community in East Timor. A charity operating there wanted to help set up a small industrial site manufacturing water filters, but initial research found the local clay to be too fine — a problem solved by the addition of organic material. While the problems of producing a working ceramic filter in East Timor were overcome, the solution was kiln-based and particular to that community's materials and couldn't be applied elsewhere. Flynn's technique for manure firing, with no requirement for a kiln, has made this zero-technology approach available anywhere it is needed.

Other commercial clay filters do exist, but, even if available, with prices starting at US$5 each, they are often outside the budgets of most people in the developing world. Unlike other water filtering devices, Flynn's filters are inexpensive and simple to produce. Take a handful of clay, mix it with a handful of organic material such as used tea leaves, coffee grounds or rice hulls, add water in a sufficient quantity to make a stiff mixture and form a cylindrical pot that has one end closed, then dry it in the sun. According to Flynn, used coffee grounds have given the best results to date. The walls of the filter can be measured using the width of an adult finger as the standard. Next, surround the pots with straw, put them in a mound of cow manure, light the straw and then top up the burning manure as required. The filters are finished in 45 to 60 minutes.

The properties of cow manure are vital, as the fuel can reach a temperature of 700 degrees in half an hour, and will be up to 950 degrees after another 20 to 30 minutes. The manure makes a good fuel because it is very high in organic material that burns readily and quickly. The manure has to be dry and is best used exactly as found in the field; there is no need to break it up or process it any further. In contrast, a potter's kiln is an expensive item and can take up to four or five hours to get up to 800 degrees. It needs expensive, scarce fuel, such as gas or wood to heat it, and experience to use it. With no technology, no insulation and nothing other than a pile of cow manure and a match, none of these requirements apply.

It is also helpful that, like clay and organic material, cow manure is freely available across the developing world. A cow is a natural fuel factory. Manure is a mixture of vegetable materials of different sizes, and cow manure as a fuel is the same wherever it is found.

Just as using manure as a fuel for domestic use is not a new idea, the fact that liquid can pass through clay objects is something that potters have always known, and clay's porous nature is something that, as a former ceramics lecturer in the ANU School of Art, Flynn is well aware of. The difference is that, rather than viewing the porous nature of the material as a problem — after all, not many people want a pot that won't hold water — his filters capitalize on this property.

The filtration process is simple, but effective. The basic principle is that there are passages through the filter that are wide enough for water droplets to pass through, but too narrow for pathogens. Tests with the deadly E. coli bacterium have seen the filters remove 96.4 to 99.8 per cent of the pathogen — well within safe levels. The thickness of the clay container needs to be the same thickness as an adult finger for the process to be effective. If this is the case, using only one filter, a liter of water can be obtained in two hours.

The use of organic material, which burns away leaving cavities after firing, helps produce the structure in which pathogens will become trapped. It overcomes the potential problems of finer clays that may not let water through and also means that cracks are soon halted. And like clay and cow manure, organic material is universally available in the developing communities that need the most assistance, as tea, coffee and rice are grown in these areas.

With all the components being widely available, Flynn says there is no reason the technology couldn't be applied throughout the developing world. He has no plans to exploit his idea financially by registering ownership through a patent. If he did, any commercial copying would legally entitle him to a share in any profits made. Without a patent, there will be no illegality in it being adopted in any community that needs it. "Everyone has a right to clean water, and these filters have the potential to enable anyone in the world to drink water safely," says Flynn.

Questions 14–19

Complete the flow-chart below.

*Write **NO MORE THAN TWO WORDS AND/OR A NUMBER** from the passage for each answer.*

Write your answers in boxes 14-19 on your answer sheet.

Step-by-step guide to making Flynn's water filters

Make the mixture for the filter from organic material (e.g., tea, coffee, rice), **14** _____ and **15** _____

↓

Shape into pots and place them in a fire made from **16** _____ and **17** _____

↓

Fuel the fire to reach a maximum temperature of **18** _____

↓

Remove the filters from the fire.

↓

Bake the filters in the fire for a maximum period of **19** _____

Questions 20–23

Do the following statements agree with the information given in Reading Passage 2?

In boxes 20–23 on your answer sheet, 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*

20 The clay in the Manatuto project was initially unsuitable for the purpose of the project.

21 Coffee grounds produce filters that are twice as efficient as those using other organic materials.

22 It takes half an hour for a cow manure fire to reach 950 degrees.

23 E. coli is the most difficult bacterium to remove from water by filtration.

Questions 24—26

*Choose the correct letter, **A**, **B**, **C** or **D**.*

Write the correct letter in boxes 24–26 on your answer sheet.

24 The Manatuto project aimed to set up a

A charitable trust.
B filtration experiment.
C water filter factory.
D community kiln.

25 To be effective, the Flynn filters must

A remove all dangerous pathogens.
B be a particular thickness.
C filter water as quickly as possible.
D be made from 100 per cent clay.

26 Flynn does not intend to patent his filter because he

A wants it to be freely available.
B has produced a very simple design.
C cannot make a profit in poor countries.
D has already given the idea to a charity.

Questions 14–19（流程图填空）

题号	答案	题干翻译	精确定位（原文）	定位句翻译	详细解释
14	**clay**	用有机材料（如茶、咖啡、稻米）与 **14** 和 **15** 制成混合物	“**Take a handful of clay**, mix it with a handful of organic material… **add water**…”（第 4 段）	“取一把**黏土**，与一把有机材料混合……**再加水**……”	题干要两项材料；第 4 段先说 “clay”，后说 “add water”。因此 14=clay。
15	**water**	同上	同上（第 4 段）	同上	与 14 成对出现；“add water” 即加入 **water**。
16	**straw**	把做好的陶器放入由 **16** 和 **17** 制成的火里	“**surround the pots with straw**, put them in a mound of cow manure, **light the straw** …”（第 4 段）	“用稻草把陶器包围，把它们放进一堆牛粪里，**点燃稻草**……”	火的材料来自文中明确的两种：straw 与 cow manure。
17	**cow manure**	同上	同上（第 4 段）	同上	第二种燃料材料为 **cow manure**。
18	**950 degrees**	把火力加到最高温度 **18**	“the fuel can reach **700 degrees in half an hour**, and will be **up to 950 degrees** after another 20 to 30 minutes.”（第 5 段）	“燃料**半小时**可达 **700 度**，再过 20–30 分钟可上到 **950 度**。”	题干问 “最高温度”，对应 “up to **950 degrees**”。
19	**60 minutes**	在火中烘烤的**最长**时间为 **19**	“**The filters are finished in 45 to 60 minutes.**”（第 4 段）	“这些滤器在 **45 到 60 分钟**内就能完成。”	题干强调 “maximum period（最长时长）”，故取区间上限 **60 minutes**。

Questions 20–23（T/F/NG）

题号	答案	题干翻译	精确定位（原文）	定位句翻译	详细解释
20	**TRUE**	马纳图托项目中使用的黏土**最初**不适合该项目目的。	“initial research **found the local clay to be too fine** — a problem solved by the addition of organic material.”（第 3 段）	“最初的研究发现，当地黏土**过于细腻**——通过加入有机材料才得到解决。”	“太细” 意味着**初始不适用**，与题干一致，故 TRUE。
21	**NOT GIVEN**	使用咖啡渣制作的滤器效率是其它有机材料的**两倍**。	“According to Flynn, **used coffee grounds have given the best results to date**.”（第 4 段）	“据弗林称，**用过的咖啡渣**到目前为止**效果最好**。”	文中只说 “效果最好”，**没有** “两倍效率” 的量化比较，信息缺失，故 NOT GIVEN。
22	**FALSE**	牛粪火在**半小时**内可达 **950 度**。	“reach **700 degrees in half an hour**, and … **up to 950 degrees after another 20 to 30 minutes**.”（第 5 段）	“**半小时**到 **700 度**，再过 **20–30 分钟**到 **950 度**。”	半小时只能到 700 度；到 950 度需再 20–30 分钟，因此与题干相反，FALSE。
23	**NOT GIVEN**	**E. coli** 是最难通过过滤去除的细菌。	“The filters have been tested… including **E. coli**.”（第 2 段）；“Tests… remove **96.4 to 99.8 per cent** of the pathogen.”（第 8 段）	“滤器已被测试…包括**大肠杆菌**”；“测试显示可去除 **96.4–99.8%**。”	文中未声称 “最难去除”，仅给出去除比例；缺乏比较对象，故 NOT GIVEN。

Questions 24–26（单选）

题号	答案	题干翻译	精确定位（原文）	定位句翻译	详细解释
24	**C**	马纳图托项目旨在建立一家……	“A charity… wanted to help set up **a small industrial site manufacturing water filters**.”（第 3 段）	“一家慈善机构希望帮助建立**一个生产净水滤器的小型工业点**。”	“small industrial site manufacturing water filters” 等同于 “**water filter factory**”（工厂/生产点），对应 C。
25	**B**	为了有效，弗林滤器必须……	“The **thickness** of the clay container needs to be the **same thickness as an adult finger** for the process to be effective.”（第 8 段）	“为保证有效，陶器的**厚度**需要与**成人手指**一样厚。”	明确要求**特定厚度**，对应 B。A/D 与原文不符；C “越快越好” 亦无依据。
26	**A**	弗林不打算为其滤器申请专利，因为他……	“He has **no plans to exploit** his idea financially… **Without a patent… adopted in any community**… ‘**Everyone has a right to**	“他不打算通过专利**获利**……**没有专利**就可被**任何需要的社区采用**……‘人人都有权获得清洁水’。”	核心原因是**希望自由传播、免费可用**，对应 A。“简单设计/无法盈利/已捐出” 均非文意。