LVE 5

Session **2002**

ANGLAIS

- GROUPE 14 -

	Durée	*Coefficient*
BTS Chimiste	***2 heures***	*1*
BTS Techniques physiques pour l'industrie et le laboratoire	***2 heures***	*2*

DICTIONNAIRE BILINGUE AUTORISÉ.
L'USAGE DE LA CALCULATRICE EST INTERDIT.

Avant de composer, le candidat s'assurera que le sujet comporte bien 3 pages numérotées de 1/3 à 3/3.

I - TRANSLATE INTO FRENCH **(8 points)**

Translate the article from line 14 *"**PCMS are capable of storing**..."* to line 24 *"...**dumped outside the building**"*.

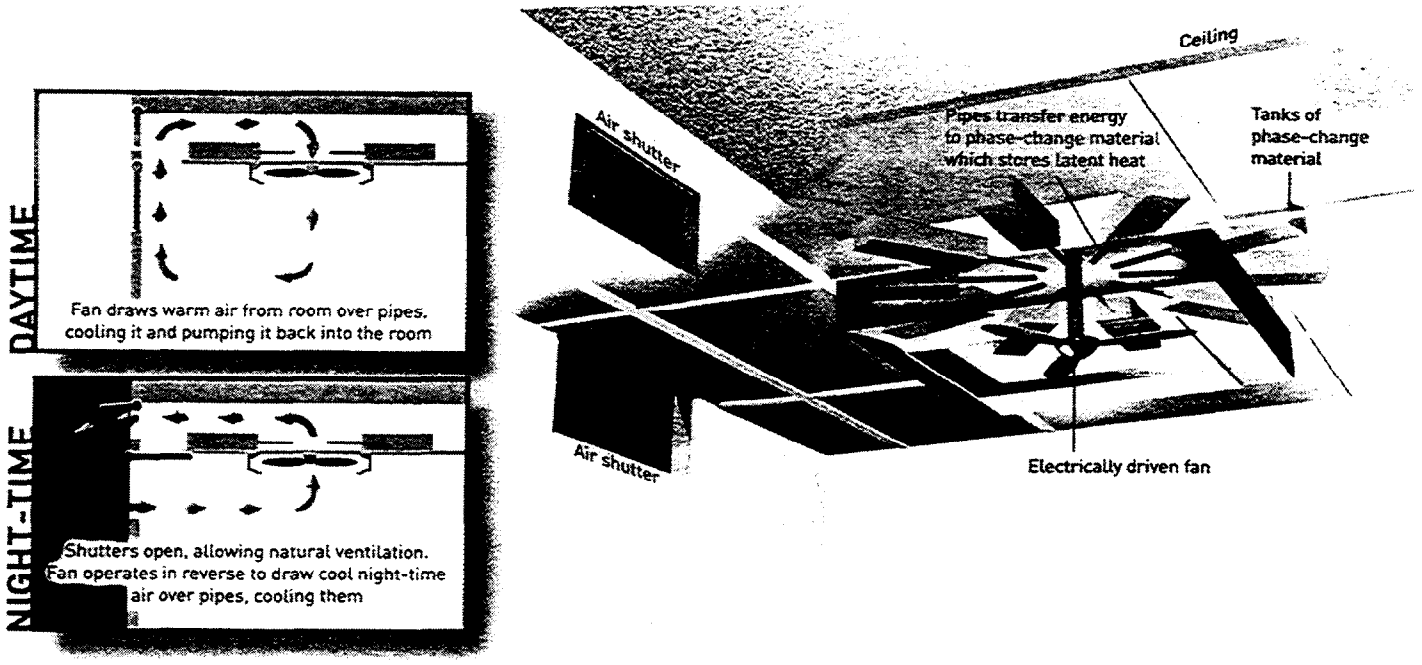
II - ANSWER IN ENGLISH **(12 points)**

a) Explain, **in your own words**, and as completely as possible, what the advantages of the system presented here are over traditional air conditioning.
(80 mots minimum) *(6 points)*

b) In your opinion, is this system likely to be a commercial success?
(80 mots minimum) *(6 points)*

FRONTIERS

EMERGING TECHNOLOGIES



Chill out

There's a way to cool down your office without warming up the planet.

A CHEAP and green ventilation system could give office air conditioning the cold shoulder. The system, which has been developed by researchers at the University of Nottingham, uses a chemical heat sink to soak up warm air, pumping cool air back into the building. It uses only a fraction of the energy of conventional air conditioning and consequently vastly reduces emissions of carbon dioxide.

"It could remove the need for air conditioning provided the climate isn't too severe," says David Etheridge of Nottingham's Institute of Building Technology. He says that the system is suited to countries with a climate like that of northern Europe, where air conditioning is widely used despite the relatively mild summers. "You're talking about a two or three-degree temperature reduction," says Etheridge, "which in comfort terms is quite significant."

Etheridge and his colleague David Rae invented the system, which couples natural ventilation with compounds known as phase-change materials[1] (PCMs), which cool the air. PCMs are capable of storing vast quantities of latent heat–the heat that is required to turn a solid into a liquid.

During the day, a fan draws warm air over an array of fluid-filled pipes. These "heat pipes" use a cycle of evaporation and condensation to conduct the heat along the pipe to a series of storage tanks containing a solid PCM. The PCM absorbs the heat and slowly melts during the day. The cooled air is then pumped back into the room.

At night the process is put into reverse. Ventilator shutters open, allowing cool night air to enter the room. The fan reverses direction and the cold air is sucked up past the heat pipes. The PCM cools and solidifies, warming up the air inside the room, which is then dumped outside the building.

The energy is stored as latent heat, says Etheridge. "The PCM's temperature isn't changing much, it's the latent heat capacity that's important." For their PCM, Etheridge and Rae chose sodium sulphate, which is also known as Glauber's salt. Adding additives to the PCM changes its melting point, says Etheridge, so the system can be fine-tuned according to the needs of the local climate.

There are other ways of cooling buildings with natural ventilation. But they depend on increasing the thermal mass of the building, for example, by using a large mass of concrete to soak up the heat. PCMs are ideal for cooling systems, says Jonathan Gates, a researcher at the School of the Environment at Brighton University. They massively increase the thermal mass of the building without the need to add vast quantities of concrete, he says.

In tests, the researchers found that the system cooled the air just as effectively as air conditioning but cost only one-sixteenth as much to run. This lower cost is largely because the Nottingham system uses less energy to cool the air. So power generators burn less fossil fuel, which cuts emissions of CO_2. "The main incentive behind this is not the cost but a reduction in CO_2 emissions," says Etheridge.

A number of studies have linked poor maintenance of ventilation systems to sick building syndrome, so natural ventilation could have other health benefits. People like to open windows in hot weather, but this prevents air conditioning from working properly. Office workers in buildings that have been fitted with Etheridge's system will be able to open windows without affecting its performance.

Another advantage of the system is that people who have dressed in light summer clothes because of the hot weather won't end up freezing in a chilly office. "The whole point of natural ventilation is that people will modify their clothing according to the weather conditions," says Etheridge. He now wants to run a year-long trial of the system in a real office.

Duncan Graham-Rowe

7 July 2001 - New Scientist - www.newscientist.com

(1) *phase-change materials (ligne 13) : matériaux permettant un changement de phase*