OCR
RECOGNISING ACHIEVEMENT

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A212/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
SCIENCE A
Unit 2 Modules B2 C2 P2 (Higher Tier)

FRIDAY 18 JANUARY 2008

Afternoon
Time: 40 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T44365

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	9	
2	6	
3	7	
4	6	
5	8	
6	6	
TOTAL	42	

This document consists of **21** printed pages and **3** blank pages.

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Answer **all** the questions.

1 Poly(ethene) is a plastic material.

There are **two** types of poly(ethene), Low Density Poly(ethene) (**LDPE**) and High Density Poly(ethene) (**HDPE**).

The table shows some information about the properties of the two types.

property		**LDPE**	**HDPE**
1	stiffness	flexible	stiff
2	density in g/cm^3	0.92	0.96
3	strength when pulled in MN/m^2	15	29
4	stretch before breaking	6 times normal length	3 times normal length
5	effect of heat	softens at 90 °C	softens at 200 °C
6	comparative price	cheaper	more expensive

(a) Which of the statements about the properties of the two types of poly(ethene) are **true** and which are **false**?

Put a tick (✓) in the correct box for each statement.

	true	**false**
LDPE is more easily bent, stronger and stretches more than HDPE.	☐	☐
HDPE is less easily bent, withstands high temperature better than LDPE but costs more to buy.	☐	☐
LDPE is several times denser than HDPE and stretches twice as much.	☐	☐
HDPE stretches less than LDPE but is stronger.	☐	☐

[2]

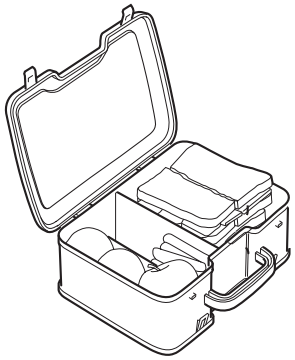
(b) The information cards show some uses for **LDPE** and **HDPE** and the most important **advantages** and **disadvantages** of each type of poly(ethene).

Use information from the table to complete the cards.

The first one has been done for you.

information card **A**

HDPE is better than LDPE for making plastic boxes for storing food.

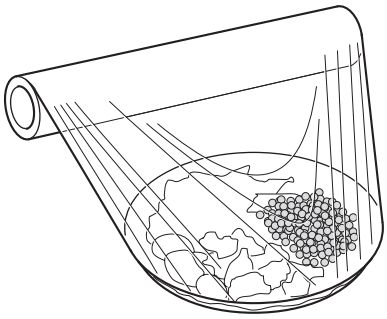


The most important **advantage** of using HDPE is property ....1..... .

The most important **disadvantage** of using HDPE is property ....6..... .

information card **B**

LDPE is better than HDPE for making thin plastic film for wrapping food.

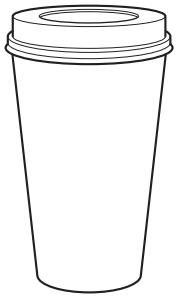


The most important **advantages** of using LDPE are properties ....., ... and ..... .

The most important **disadvantage** of using LDPE rather than HDPE is property ..... .

information card **C**

HDPE is better than LDPE for making plastic coffee cups for vending machines.



The most important **advantages** of using HDPE are properties ..... and ..... .

The most important **disadvantage** of using HDPE is property ..... .

[3]

(c) Joe works in a factory that makes carrier bags from LDPE.

His job is to check the strength of the bags.

He cuts strips from the bags and finds out the force needed to break them.

Here are Joe's results for **two** bags, **A** and **B**.

bag A		**bag B**	
strip number	**force needed to break the sample in Newtons**	**strip number**	**force needed to break the sample in Newtons**
1A	690	1B	720
2A	700	2B	715
3A	695	3B	705
4A	569	4B	720
5A	695	5B	690
best estimate of force needed		**best estimate of force needed**	**710**

(i) Complete the table by calculating the best estimate for **bag A**. [2]

(ii) Which of the following statements about Joe's results are **true** and which are **false**?

Put a tick (✓) in the correct box for each statement.

	true	**false**
There is a real difference in breaking strength between the two bags.	☐	☐
The range for the true value of the result for Bag B is between 690 and 720.	☐	☐
There is a positive correlation between the breaking strengths of the two bags.	☐	☐

[1]

(iii) Why does Joe repeat his test several times?

Put a tick (✓) in the box next to **each** correct reason.

Repeating the test makes it a fair test.	☐
The more often he repeats the test, the closer the results will get.	☐
The more results Joe collects, the better estimate he can make.	☐
Repeating the test makes sure the right range is being tested.	☐
Repeating the test helps Joe to check for reliability.	☐

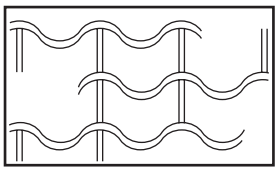
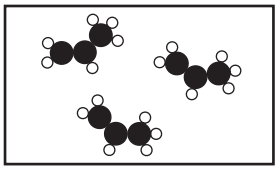
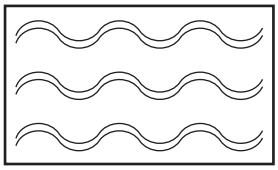
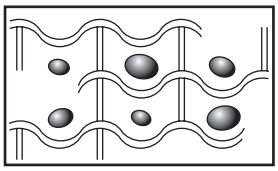
[1]

[Total: 9]

2 Rubber for making car tyres is made from small molecules from crude oil.

(a) The boxes below describe the process for making rubber for car tyres.

Draw a straight line from each **description** to its correct **diagram**.

description	diagram
Small molecules from crude oil are needed to make rubber.	
The small molecules polymerise.	
Sulfur is used to form cross links.	
Oils and resins are used to make the rubber more flexible.	

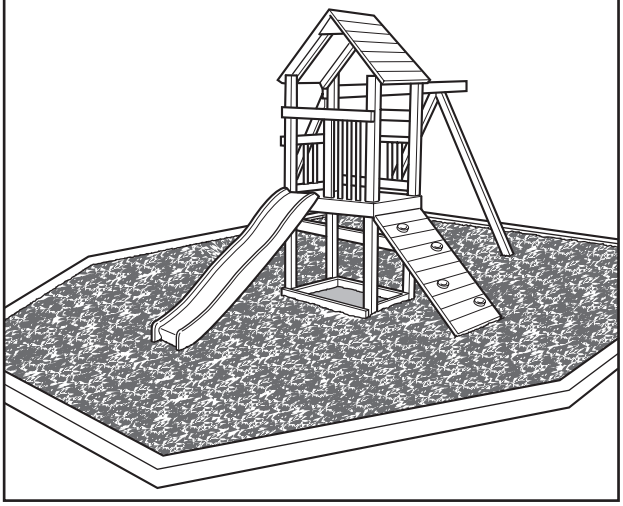
[2]

(b) Until recently, old car tyres were usually buried in landfill sites.

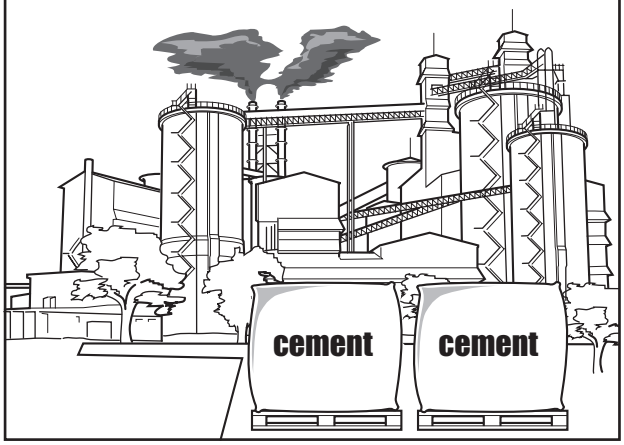
This is now against the law, and new uses for old tyres must be found.

Old tyres are now reused or recycled.

The rubber from old tyres can be shredded and used as a surface for children's playgrounds.



The rubber from old tyres can be burnt and used as a fuel for making cement.



(i) Explain why reusing and recycling old tyres improves the life cycle assessment of a car tyre.

Put a tick (✓) in each correct box.

When tyres are burnt, the energy they contain is put to good use. ☐

Children's playgrounds improve the quality of life for children. ☐

Shredded car tyre surfacing lasts for many years. ☐

Putting tyres in landfill used up energy and space. ☐

Cement making usually uses fossil fuels for energy. ☐

[2]

(ii) What else do you need to know to make a full life cycle assessment of the car tyre?

Put a tick (✓) in the box next to each correct answer.

what raw materials are used to make the tyre	☐
whether there is another material that is biodegradable that could be used to make car tyres	☐
what methods of disposal are used for the metal parts of the tyre that cannot be used for playgrounds or fuel	☐
the average time that the car tyres are used on the car	☐
the average cost per tyre when the tyres are fitted	☐

[2]

[Total: 6]

3 **(a)** Here are four statements about electromagnetic radiation.

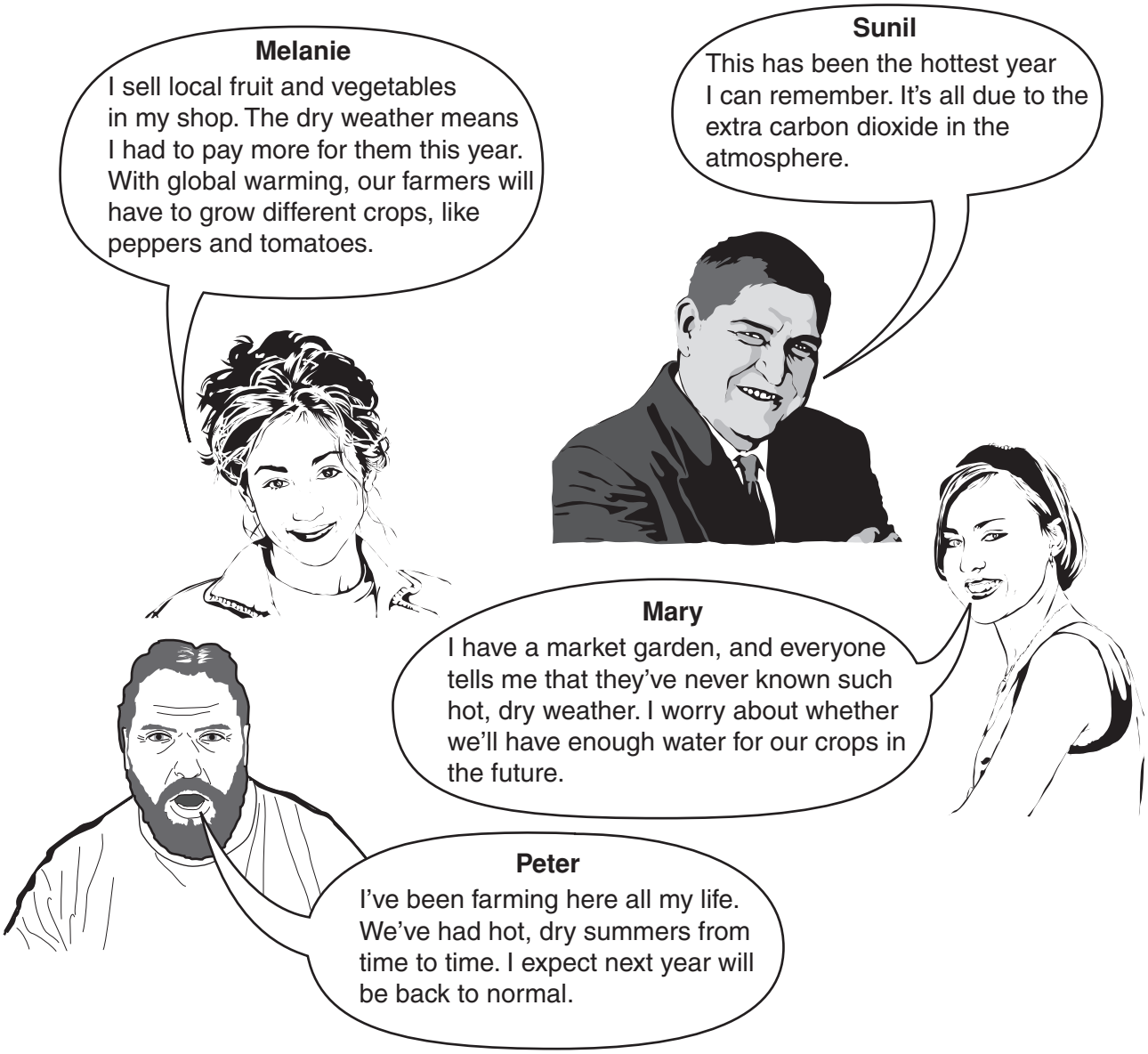
Write **T** in the box next to each **true** statement and **F** in the box next to each **false** one.

	T (true) or **F** (false)
Electromagnetic radiation is weaker when you are further from the source because photons lose energy as they travel further.	
Ionising radiation can make molecules take part in chemical reactions.	
Non-ionising radiation can break up molecules.	
X-rays are the electromagnetic radiation with the most energetic photons.	

[4]

(b) The hot, dry summer in 2006 meant that crops like peas and beans did not grow well in Britain.

Four people in one farming village were talking about this.



(i) Who talks about a possible **consequence** of global warming?

Put ticks (✓) in the boxes next to the **two** correct names.

Melanie ☐

Sunil ☐

Peter ☐

Mary ☐

[2]

(ii) Who talks about a possible **cause** of global warming?

Put a tick (✓) in the box next to the correct name.

Melanie ☐

Sunil ☐

Peter ☐

Mary ☐

[1]

[Total: 7]

4 **(a)** The list shows different regions of the electromagnetic spectrum.

gamma rays

infrared

visible light

microwaves

radio waves

ultraviolet

X-rays

(i) Which region has the most energetic photons?

.....

[1]

(ii) Which regions are types of ionising radiation?

.....

[1]

(iii) Which region causes chemical changes in the ozone layer of the atmosphere?

.....

[1]

(b) Sheila is thinking about buying a microwave oven, but she is afraid they may be dangerous. Her daughter Nicky is trying to explain how they work.

Nicky's ideas are not all correct.

Nicky

Microwaves cannot pass through the metal case.

Microwave radiation makes water in food vibrate. This heats the food up.

The word "radiation" makes people think of nuclear radiation, but microwaves are quite different.

Microwaves can't damage living tissue at all, so there is no way they can cause cancer.

Draw a straight line from each of **Nicky's statements** to its correct **description**.

Nicky's statements	description
Microwaves cannot pass through the metal case.	This statement is incorrect.
Microwave radiation makes water in food vibrate. This heats the food up.	This statement explains why microwave ovens are not dangerous.
The word 'radiation' makes people think of nuclear radiation, but microwaves are quite different.	This statement suggests why actual risk may be different from perceived risk.
Microwaves can't damage living tissue at all, so there is no way they can cause cancer.	This statement describes absorption of radiation.

[3]

[Total: 6]

5 Philip is reading a leaflet on Tuberculosis. He reads the following information.

> Tuberculosis (TB) is an infectious disease; it usually affects the lungs, although it can affect any part of the body.
>
> TB is not easily caught – you have to be in close and lengthy contact with someone with TB, for example living in the same house.

(a) A person who has breathed in TB microorganisms may not catch TB.

TB microorganisms collect in mucus at the back of the throat where it is swallowed.

Put a tick (✓) in the box next to the **best** explanation of how this process reduces the chance of catching TB.

The microorganisms are passed through the digestive system and out of the body.	☐
The digestive system is a physical barrier to microorganisms.	☐
The stomach produces white blood cells that destroy microorganisms.	☐
The acid in the stomach destroys microorganisms.	☐

[1]

(b) **(i)** The leaflet suggests that anyone who has a persistent cough, loses weight or coughs up blood ought to talk to a doctor or nurse.

The feelings of illness listed above may indicate that you have TB. These feelings of illness are called the ..... of TB. [1]

(ii) About 70% of people who are infected with TB microorganisms will not develop TB.

Worldwide, many of the new cases of TB are in people who are also infected with HIV.

Which of the following statements, **A**, **B**, **C** or **D**, explains why people with HIV are more likely to develop TB?

A HIV can be transmitted in blood or other body fluids.

B HIV kills some types of white blood cells.

C It is difficult to make a vaccine against HIV.

D HIV mutates rapidly.

answer ..... [1]

(c) The leaflet continues with some information about how death rates from TB have changed.

> 100 years ago, TB caused about 150 deaths in every thousand deaths.
>
> Nowadays, TB can be prevented using vaccinations, and is curable by using antibiotics. The death rate is now much lower.

(i) What percentage of the population in the UK died from TB 100 years ago?

Put a (ring) around the correct answer.

150% **15%** **1.5%** **0.15%**

[1]

(ii) When you take antibiotics against TB, you must continue to take the antibiotics for at least six months, otherwise a resistant strain of TB microorganisms may develop.

Here are some statements about antibiotic resistance.

Write **T** in the box next to each **true** statement and **F** in the box next to each **false** one.

	T (true) or **F** (false)
Using antibiotics slows the spread of resistance.	
Using antibiotics causes every TB microorganism to become resistant.	
Resistance to antibiotics occurs as a result of mutations.	
Using antibiotics can increase the spread of resistance.	

[1]

(iii) TB is caused by a bacterium. Antibiotics are effective against bacteria and one other group of microorganisms. Write down the name of this other group of microorganisms.

answer ..... [1]

(d) In 1953, a vaccination programme against TB was introduced.

All school children were vaccinated.

Recently, it was decided to **stop** vaccinating school children against TB.

Read the statements below.

Which statements help explain why vaccination was stopped?

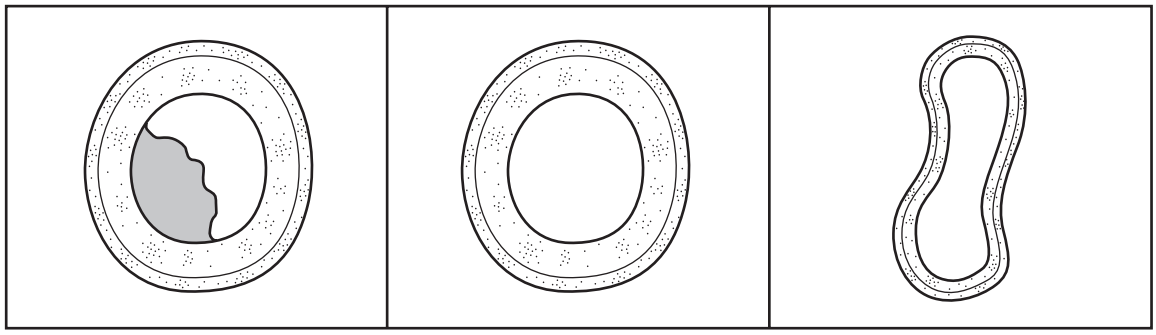
Put ticks (✓) in the **two** correct boxes.

The vaccine prevents the most serious forms of TB.	☐
The vaccine has no serious side effects.	☐
In the UK, TB in children is rare and does not spread easily.	☐
Across the world, TB kills around 2 million people a year.	☐
Most people living in the UK will never encounter a case of TB.	☐

[2]

[Total: 8]

6 **(a)** The diagrams **A**, **B** and **C** below show three blood vessels.



A **B** **C**

(i) Which diagram, **A**, **B** or **C**, shows a blood vessel which carries blood at low pressure towards the heart?

answer ..... [1]

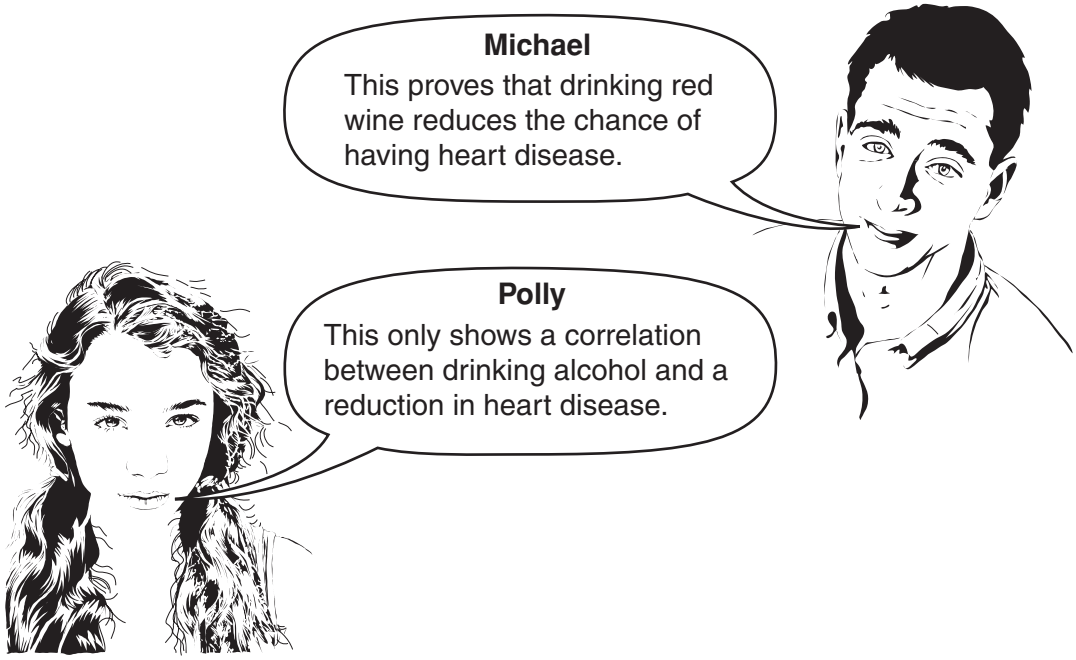
(ii) One of the blood vessels shows an abnormality. Put an X on the diagram to show the abnormality. [1]

(b) A heart attack happens when the heart is starved of a gas.

What is the name of this gas?

answer ..... [1]

(c) Two friends have been reading an article about the 'French Paradox'. The article explains that the French eat as much fatty food as other nations but they have a lower death rate from heart disease. The French drink red wine. Over the last ten years, many large scale studies have shown that drinking a small amount of alcohol each day reduces the risk of heart disease.



(i) Put a tick (✓) in the box next to **each** statement which **supports** Polly's idea.

These are large scale studies, so there is enough data to prove the link between the risk of heart disease and drinking alcohol. ☐

There is still a need to collect more data before we can be sure. Ten years is not a long time in scientific research. ☐

The studies are about drinking alcohol, not just red wine, so we would need to know more about the type of alcohol drunk. ☐

The individuals who drink a small amount of alcohol every day may have other factors in common. ☐

No mechanism has been suggested to give a causal link between alcohol consumption and reduced risk of heart disease. ☐

[2]

(ii) Polly and Michael find an article about a compound similar to compounds found in red wine.

The article has been peer reviewed.

Which of the following statements, **A**, **B**, **C** or **D**, best describes the process of peer review?

A Methods and results are written-up in a standard way so that other scientists can repeat the experiments and check the data.

B Results and methods are discussed by other scientists to confirm that the work is original and valid.

C After the work is published, reports are printed in other scientific journals and in newspapers.

D A panel of experts mark the work and recommend what studies should be done next.

answer ..... [1]

[Total: 6]

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