UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

21ST CENTURY SCIENCE **0608/02**

Paper 2 **For Examination from 2009**

SPECIMEN PAPER

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)
Data Booklet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will **not** be deducted for a wrong answer.
Any rough working should be done in this booklet.

This document consists of **14** printed pages.

1 Which of these formulae represent the two gases produced when petrol burns comple

A CO and H_2O **B** CO_2 and H_2O **C** NO_2 and H_2O **D** SO_2 and H_2O

2 The number of cars driving on the streets of a city reaches a maximum during the early morning and early evening.

The concentration of carbon monoxide in the air of a city reaches a maximum during the early morning and early evening.

Which of these is the best conclusion to draw from these data?

A driving cars causes the rise in concentration of carbon monoxide

B there is a correlation between the number of cars driven and the concentration of carbon monoxide

C an increase in the number of cars results in an increase in concentration of carbon monoxide

D there is no connection between the number of cars and concentration of carbon monoxide

3 Which statement describes how nitrogen monoxide is made in a car engine?

A nitrogen in the petrol reacts with oxygen from the air

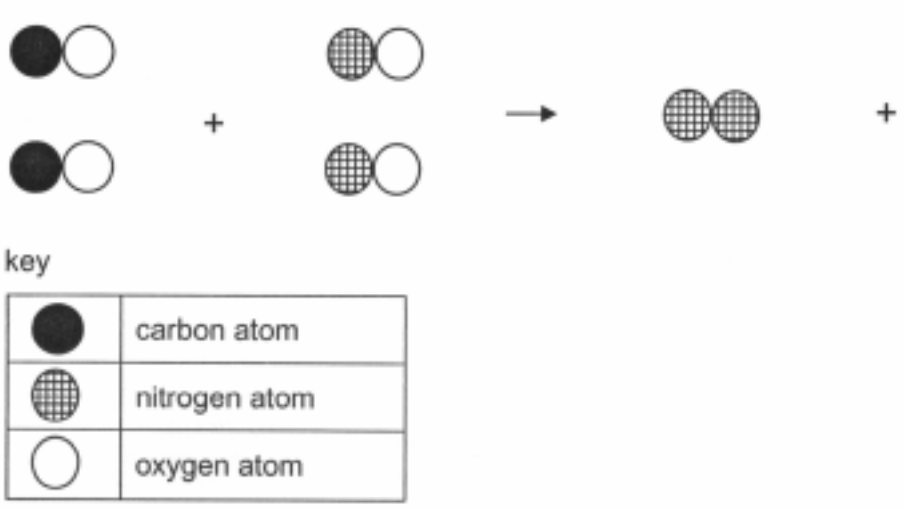
B nitrogen and oxygen in the petrol react with each other

C oxygen in the petrol reacts with nitrogen in the air

D nitrogen and oxygen in the air react with each other

4 A catalytic converter reduces the carbon monoxide and nitrogen monoxide released in car exhaust by reacting these two gases together to make carbon dioxide and nitrogen.

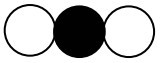
The reaction is represented in the diagram, but carbon dioxide is missing.

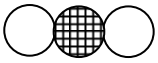


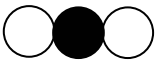
key

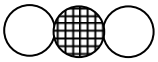
●	carbon atom
▦	nitrogen atom
○	oxygen atom

Which of these should be added to complete the diagram.

A 

B 

C 

D 

5 Some of the carbon dioxide released from car exhausts is removed from the air.

Which of these statements describes how this carbon dioxide is removed?

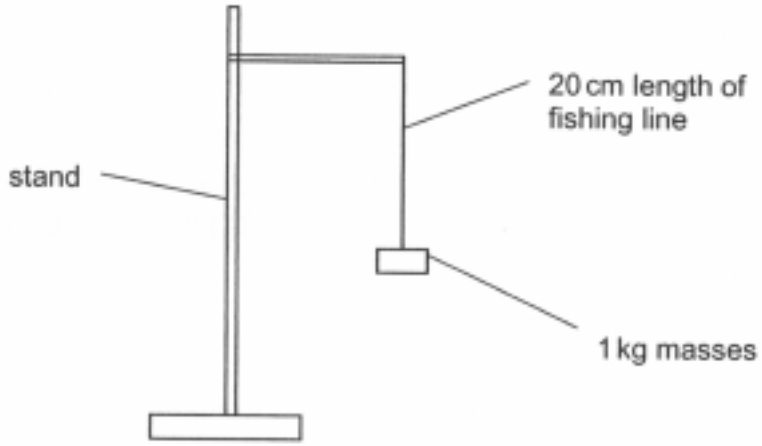
A It is used by plants in the process of photosynthesis.

B It is used by animals in the process of respiration.

C It is oxidised in the air.

D It is lost into space.

The diagram shows apparatus used to test the strength of fishing line. The mass is in[illegible]il the line breaks. Use this diagram to help you answer questions 6 and 7.



6 Scientists test six samples of each fishing line, and take an average.

Why do they test six samples instead of just one?

A to make sure it is a fair test

B so that they can improve with practice

C to make the result more reliable

D they have lots of fishing line available

7 The table shows the mass needed to break each of six samples of one type of fishing line.

sample	1	2	3	4	5	6
mass needed/kg	12	5	12	11	9	11

One of these results is an outlier.

To get a best estimate ignore the outlier and work out the mean (average) of the other five results.

This best estimate is

A 9 kg **B** 10 kg **C** 11 kg **D** 12 kg

Read this information about making polymers from plants. Use it to help you answer questions 8 and 9.

Polymers from Plants

Most of the polymers we use, for example polyester and nylon, are made from monomer molecules obtained from crude oil. Now a company has developed a way to polymerise ethanol molecules produced by the fermentation of corn starch.

Sorona® is a polymer of ethanol. The structure of this monomer molecule makes softer fibres than either polyester of nylon. Sorona® fibres can also be dyed at a lower temperature.

8 Why is the development of Sorona® sustainable?

A The starch that is fermented is obtained from corn.

B The fibres can be dyed at a lower temperature.

C The new polymer is made from ethanol.

D The fibres are softer than polyester.

9 The effects of a material on the environment can be considered by using a Life Cycle Assessment (LCA).

Which of these parts of their LCAs are most likely to be the same for both Sorona® and polyester?

A energy used to refine crude oil

B energy used to convert monomer into polymer

C energy used in recycling the polymer

D energy used to transport the polymer

10 Polymers can be modified to produce changes to their properties.

Which of these modifications causes a polymer to become less stiff?

A increase chain length

B increase cross-linking

C increase plasticiser

D increase crytallinity

11 Which additive is added to food to prevent the growth of harmful microbes?

A antioxidant **B** flavouring **C** preservative **D** sweetener

12 An emulsifier is added to certain foods to help mix the ingredients and prevent them separating.

Which ingredients are these?

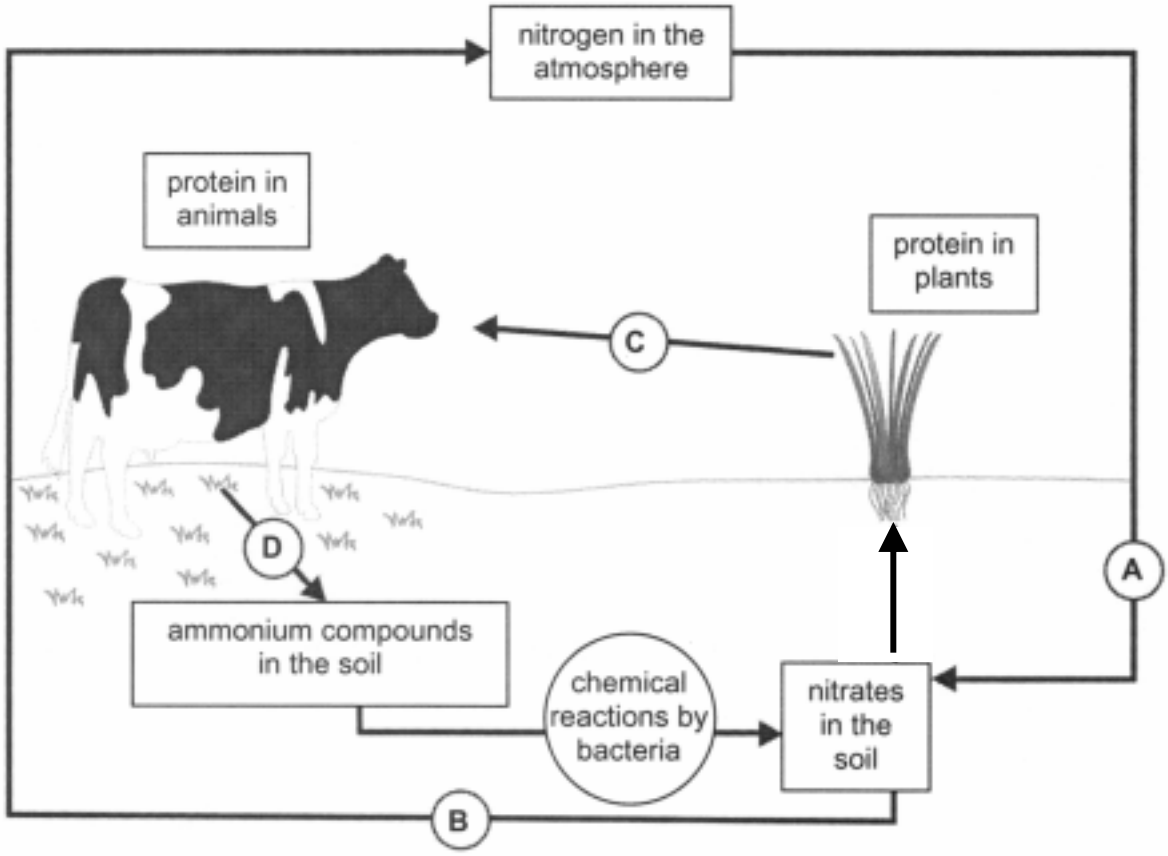
A vinegar and water

B oil and water

C flour and sugar

D solids and liquids

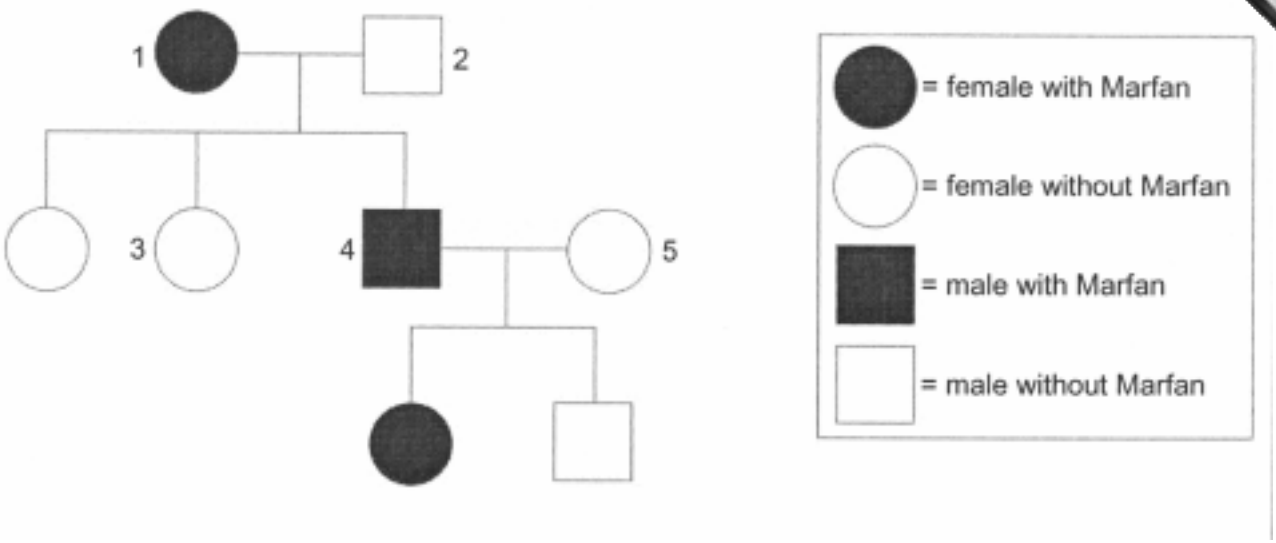
The diagram shows part of the nitrogen cycle. Use this diagram to help you answer questions 13 and 14.



13 Which letter labels the process carried out by denitrifying bacteria?

14 Which letter could involve the action of lightning?

Marfan syndrome is an inherited disorder caused by a single gene. It is caused by a dom
The diagram shows a family tree. Use this diagram to help you answer questions 15 to 18.



A is used to represent the dominant allele for Marfan, and **a** is used to represent the recessive allele for normal.

15 What is the genotype of the person labelled 5?

A **AA** **B** **Aa** **C** **aA** **D** **aa**

16 Which number represents a female with the genotype **Aa**?

A 1 **B** 2 **C** 3 **D** 4

17 If individuals 4 and 5 have another child, what is the probability that it will have Marfan syndrome?

A 25% **B** 50% **C** 75% **D** 100%

18 Which allele or alleles are in each sex cell produced by the person labelled 3?

A a **B** A **C** aa **D** AA

19 The death rate from heart disease in the United Kingdom fell from 1987 to 2007.
The number of people in the United Kingdom who smoke cigarettes fell from 1987 to 2007.

What can be concluded from this data.

A smoking causes heart disease

B there is a correlation between the decrease in smoking and the decrease in heart disease

C people with heart disease smoke more than those without heart disease

D there is no connection between smoking and heart disease

20 In non-industrialised countries the rates of death from heart disease are lower than th… United Kingdom.

Which statement gives the best reason why these people have less heart disease?

A they earn less money

B they have fewer medicines

C they eat less fatty food

D they live mainly outdoors

21 Scientists are trying to develop a vaccine against the HIV virus, which causes AIDS.

Why is it difficult to develop a virus that is effective against the HIV virus?

A the HIV virus is very tough

B it is difficult to detect whether someone is infected with HIV

C it may take many years for someone infected with HIV to develop AIDS

D the HIV virus has a high mutation rate

22 When an HIV vaccine has been developed it will probably be used in the USA and UK before it is used in the non-industrialised countries.

Which statement gives the best reason for this?

A it will be difficult to transport the vaccine

B the vaccine will be produced in small quantities at first

C there are fewer HIV positive people in the non-industrialised countries

D more HIV positive people go on to develop AIDS in the USA and UK

23 When testing new drugs doctors often use a ‘double blind’ trial on volunteer patients.

In this type of trail who knows which patient is receiving the ‘real’ treatment?

A doctor only **B** patient only **C** both **D** neither

24 Which type of cell is **not** part of the nervous system?

A sensor **B** neurone **C** effector **D** muscle

25 These statements give both data about and part of the explanation for evolution.

Which of the statements is part of the explanation for evolution?

A 98% of human genes are the same as those of a chimpanzee

B 85% of human genes are the same as those of a mouse

C life on Earth started from a few simple living things

D there are gaps in the evolutionary record

26 Which of these statements is **not** true for the process of natural selection?

A there is competition between species

B a change in the environment causes change in an individual

C this individual has a better chance to survive and reproduce

D the change is passed on the the individuals offspring

27 Which body system or systems are involved in maintaining a constant internal environment?

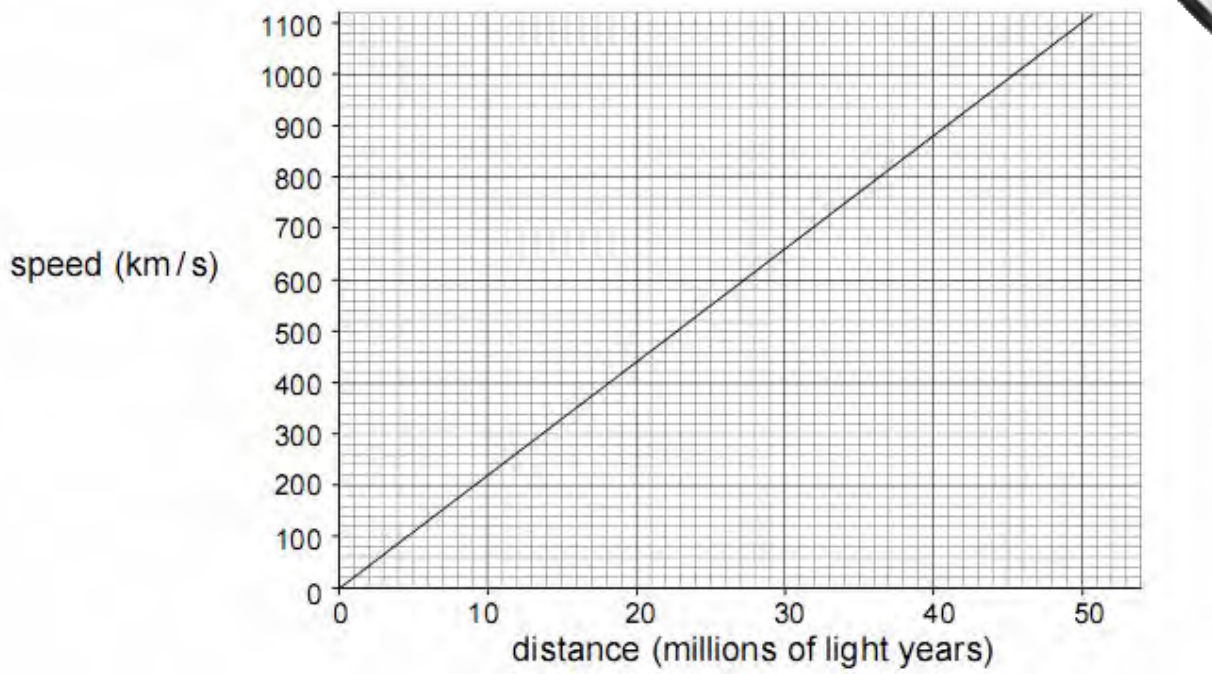
A nervous system

B hormonal system

C both nervous and hormonal systems

D neither nervous nor hormonal systems

28 Recent work by astronomers shows that galaxies are moving relative to us with spe… this graph:

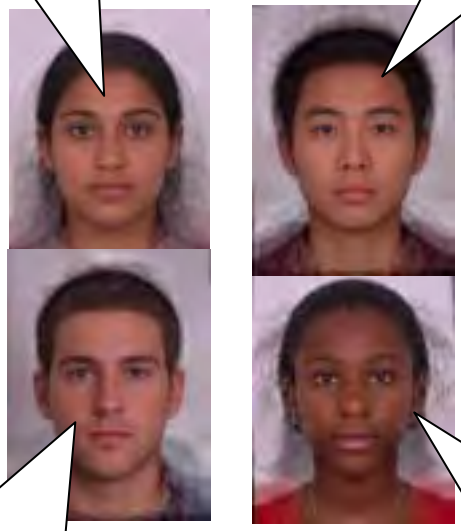


galaxy	speed (km/s)
A	500
B	1100
C	600
D	300

Which one of the galaxies in the table is 23 million light years away from us?

A **B** **C** **D**

Use this information to help you answer questions 29 and 30.
Four people find out that a new mobile phone (cell phone) transmitter is planned for their ar
what they say:



A

I think that mobile phones cause cancer, but I don't know how.

B

We should keep the number of phone masts down to the smallest number needed, just in case there is a real problem.

B

I don't think we should take any risks with our health.

D

I saw on television that there are more cases of cancer in places near these transmitters.

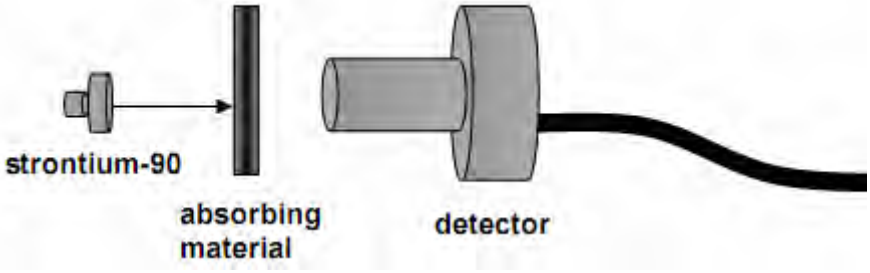
29 Which person is referring to a **correlation** between a risk and an outcome?

A **B** **C** **D**

30 Which person is referring to a risk being the **cause** of an outcome?

A **B** **C** **D**

31 Strontium-90 is radioactive. It emits beta radiation.
One way of classifying different types of radioactive emission is by their penetration prop
An experiment was done to confirm that strontium-90 is emitting beta radiation.



Which correctly describes the penetration properties of beta radiation?

A It can pass through a few cm of lead, but not thick concrete.

B It can pass through a few cm of aluminium, but not a few cm of lead.

C It can pass though a sheet of paper, but not a few cm of aluminium.

D It can pass though a few cm of air, but not a sheet of paper.

Questions 32, 33 and 34 are about the development of Alfred Wegener's theory of the movement of the Earth's continents.

The following list gives the six stages in the development of new theories.

Four of them are labelled, **A**, **B**, **C** and **D**.

An old theory has been accepted for some time.	
Some observations do not fit the old theory well.	**A**
A new theory is thought of to explain these observations.	**B**
Many scientists are not willing to accept the new theory.	**C**
New observations, predicted by the new theory, are made.	**D**
The old theory is abandoned or modified.	

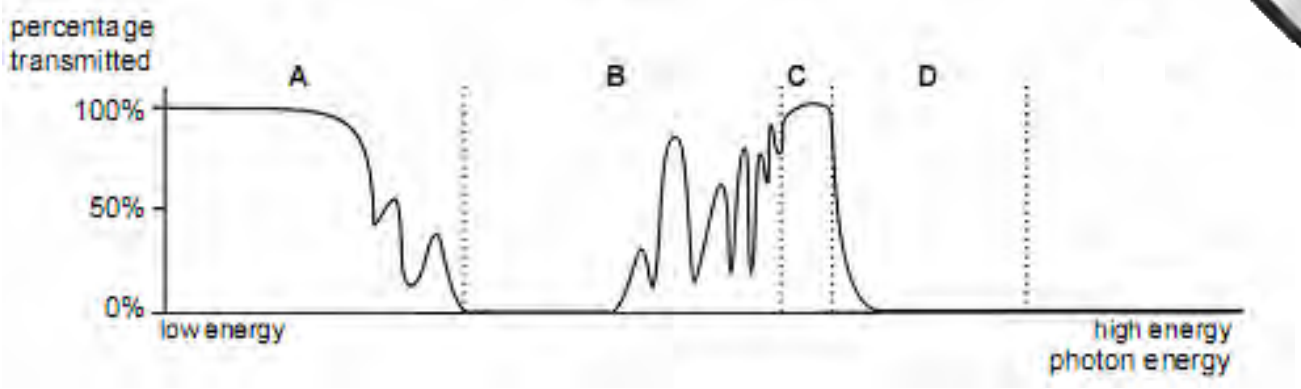
In questions 32, 33 and 34 you must identify which stage **A**, **B**, **C** or **D** is being described.

32 Scientists had not observed any movements of the continents.

33 Spreading of the sea floor was discovered after Wegener's death.

34 Wegener explained why there are fossils of similar animals on both sides of the Atlantic Ocean. B

Use this diagram to help you answer questions 35, 36 and 37. The diagram shows th… f different parts of the electromagnetic spectrum which are transmitted through the Earth's ath…



35 Which part of the spectrum produces reversible changes in ozone?

36 Which part of the spectrum provides the energy for photosynthesis?

37 Which part of the spectrum is an ionising radiation absorbed by sunscreens?

Questions 38 and 39 are about suggested ways of disposing of high-level radioactive waste produced by nuclear power stations.

A send it into space in rockets

B bury it in deep underground mines

C bury it under the ocean bed in places where the ocean is deep

D store it in tanks near the power station until it is no longer radioactive

38 Which method is too expensive to use?

A **B** **C** **D**

39 One problem which could occur is that the radioactive waste could leak out after it has been put in its final store.
Which method is most likely to result in radioactive material entering the food chain?

A **B** **C** **D**

40 Seema is a radiotherapist.
She treats people who have been diagnosed with cancer.

The following statements, **V**, **W**, **X**, **Y** and **Z**, explain how the cancer treatment works.

V	A source of gamma radiation is used to treat some kinds of cancer.
W	The patient lies on a table with the cancer cells positioned centrally.
X	The source of gamma radiation is rotated around the patient.
Y	The cancer cells are continuously exposed to gamma radiation.
Z	Healthy cells around the cancer cells receive a smaller dose.

Which two of these statements, taken together, explain how the risk to healthy cells is reduced?

A W and Y

B W and Z

C X and Y

D X and Z