

Drugs in sport

Legal and illegal  
drugs

Drugs

## B1.3 Medicine and Drugs

Cannabis and hard  
drugs

How effective are  
medicines

Developing new  
medicines

Without using your notes, match the description to the stage of drug development

- 1) Stage 1
  - a) Testing on a small group of healthy volunteers
  - b) Testing on animals
- 2) Stage 2
  - c) Testing on cells cultured in the lab
- 3) Stage 3
  - d) Testing on patients who are suffering from the condition

**Push yourself:** Why might a drug not pass stage 1 of testing?



# Developing new medicines

A good medicine is:

- Effective – *prevent / cure a disease / ease symptoms*
- Safe – *not toxic or unacceptable side effects*
- Stable – *use the medicine in normal conditions and able to be stored*
- Successfully taken into and removed from body



Developing drugs can take 12 years and cost around £350million

They are **tested** on cells, tissues and organs before animal testing and human trials

**Placebo** – pill that does not contain the drug  
**Double blind trial** – neither doctor or patient knows who has the real drug

## **Thalidomide**

Used in 1950s as treatment for morning sickness

Tests on pregnant animals not carried out until 1968

Affected fetuses – born with severe limb deformities

# *How effective are medicines?*

**Statins**: drugs that lower *cholesterol* in the blood and stop the *liver* producing too much cholesterol. Patients should also have a healthy diet. This reduces the risk of heart disease

## **Prescribed and non-prescribed drugs**

Prescribed drugs have been tested in double blind trials and many of the most effective ones come from living organisms. Non-prescribed drugs may not have been evaluated the same way due to expense.

St John's Wort is a non-prescribed herbal remedy for depression – it has been found to be an effective medicine and more effective than placebo

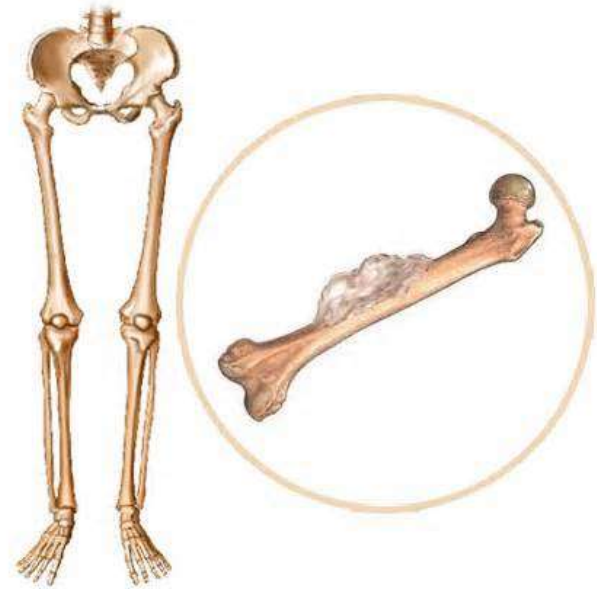
# Thalidomide

- Thalidomide was developed as a sleeping pill given to pregnant women to reduce morning sickness. **Unfortunately, it had not been tested for use in this way.**
- By 1960 thalidomide was found to damage the development of unborn babies.
- The drug led to the arms or legs of the babies being very short or incompletely formed. More than 10,000 babies were affected around the world.
- As a result of this disaster, thalidomide was banned. Drug testing was also made more rigorous than before.



# Thalidomide today

- Thalidomide is now used as a treatment for leprosy and bone cancer.
- Its use is heavily regulated, however, to prevent a repeat of the problems it caused in the last century.



# Drugs



**Drug**: alters the way the body works

**Legal**: coffee, cigarettes, alcohol

- Millions of people take these so health impact is much bigger than for illegal drugs

**Illegal**: cocaine, ecstasy, heroin

- Affect nervous system

**Cannabis**:

Trigger mental illness  
Higher risk of depression

Gateway drug?

Almost all heroin users were originally using cannabis – people in touch with drug dealers



***Withdrawal symptoms*** – cravings, aches, sweating etc

**Addiction**: dependent – cant function without the drug. More and more is needed for same effects

Addicts may turn to crime to fund drug habits, more likely to get STDs, mental / physical health problems



# Drugs in sport

**Random drugs tests.** Athletes that are caught are **banned**. Some medicines contain banned substances so they need to be careful. Some drugs are found naturally in the body as levels vary it can be difficult to find cheaters

Sport	Drug type	Why use them?	Problems
Bodybuilding	Painkillers	Compete when injured	Exacerbates injury
Archery	Beta blockers	Steady hands	Insomnia, depression
Cycling	Erythropoietin	More RBC - oxygen to legs	Kidney disease
Sprinting	Anabolic steroids	Muscle growth	Sexual characteristic change

## Ethics:

- People should be able to do what they want with their body regardless of risk
- Only the richest / most sponsored people can cheat
- Desire to win and be the best
- Other athletes are using them
- Claim they didn't know they were cheating, coaches gave them 'supplements'





# ***Exam questions***

1 Scientists at a drug company developed a new pain-killing drug, drug **X**.

1 (a) Painkillers do **not** cure infectious diseases.

Why?

.....  
*(1 mark)*

1 (b) The scientists compared drug **X** with two other pain-killing drugs, drug **A** and drug **B**.  
In their investigation the scientists:

- chose 600 volunteers. The volunteers were all in pain
- gave 200 of the volunteers a standard dose of drug **A**
- gave 200 of the volunteers a standard dose of drug **B**
- gave 200 of the volunteers a standard dose of drug **X**.

Over the next seven hours the volunteers recorded how much pain they felt.

To get valid results the three groups of volunteers should be matched for as many factors as possible.

Suggest **two** of the factors that should be matched.

.....  
.....  
*(2 marks)*



question	answers	extra information	mark
1 (a)	don't kill pathogens / bacteria / viruses / microbes / microorganisms	allow don't contain antibiotics ignore antibodies / attack / fight  allow <u>only</u> treat symptoms / pain ignore kill disease / germs	1
1 (b)	any two from:  <ul style="list-style-type: none"> <li>age</li> <li>gender</li> <li>extent / severity of pain or how long had pain <u>before trial</u></li> <li>type of pain / illness / site of pain</li> <li>(body) mass / weight / height</li> <li>other medical issues / drugs taken / health / fitness</li> <li>ethnicity</li> </ul>	accept 'the pain' for 1 mark, if neither extent or type given  ignore pain threshold  allow body size / physique	2
1 (c)(i)	75	ignore calculations / %	1
1 (c)(ii)	faster pain relief / decrease	allow pain relief sooner or it works quicker or more pain relief at start / in first hour / $1\frac{3}{4}$ hours	1
1 (c)(iii)	decrease of pain higher / more  decrease of pain is longer lasting	ignore more effective unless qualified by time $>1\frac{3}{4}$ hours  allow effect lasts longer	1  1

question	answers	extra information	mark
1 (d)	any three from:  (Yes because) <ul style="list-style-type: none"> <li>rapid pain relief (from A)</li> <li>long lasting pain relief (from B)</li> <li>and it costs less</li> <li>the sum of the pain relief (from A + B) is greater (than X)</li> </ul> (No because) <ul style="list-style-type: none"> <li>drug X gives more pain relief</li> <li>(A + B / they ) might interact with each other</li> <li>could result in overdose</li> <li>could be more / new side effects</li> </ul>	ignore yes or no           if neither points gained allow (more) dangerous	3
Total			10

6 Drugs must be trialled before the drugs can be used on patients.

6 (a) (i) Before the clinical trials, drugs are tested in the laboratory.  
The laboratory trials are **not** trials on people.

What is the drug tested on in these laboratory trials?

.....  
(1 mark)

6 (a) (ii) Drugs must be trialled before the drugs can be used on patients.

Give **three** reasons why.

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.....  
(3 marks)

6 (b)

Read the information about cholesterol and ways of treating high cholesterol levels.

Diet and inherited factors affect the level of cholesterol in a person's blood.

Too much cholesterol may cause deposits of fat to build up in blood vessels and reduce the flow of blood. This may cause the person to have a heart attack.

Some drugs can lower the amount of cholesterol in the blood.

The body needs cholesterol. Cells use cholesterol to make new cell membranes and some hormones. The liver makes cholesterol for the body.

Some drugs can help people with high cholesterol levels.

**Statins** block the enzyme in the liver that is used to produce cholesterol.

People will normally have to take statins for the rest of their lives. Statins can lead to muscle damage and kidney problems. Using some statins for a long time has caused high numbers of deaths.

**Cholesterol blockers** reduce the absorption of cholesterol from the intestine into the blood.

Cholesterol blockers can sometimes cause problems if the person is using other drugs.

Evaluate the use of the two types of drug for a person with high cholesterol levels.

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.....

[6 marks]

6(a)(i)	any one from: <ul style="list-style-type: none"> <li>• cells</li> <li>• tissues</li> <li>• (live) animals / named</li> </ul>	allow mammals	1
6(a)(ii)	any three from: (to test for) <ul style="list-style-type: none"> <li>• toxicity / check not poisonous / not harmful</li> <li>• interaction with other drugs</li> <li>• efficacy or to see if they work or check if they treat the disease</li> <li>• dosage or how much is needed</li> </ul>	allow side-effect allow converse  allow converse	3

6(b)	<b>argued evaluation</b>  any six from: <ul style="list-style-type: none"> <li>• statin can damage / muscles / kidneys / organs but cholesterol blockers don't</li> <li>• statins can cause death but cholesterol blockers don't</li> <li>• cholesterol blockers can interfere with action of other drugs but statins don't</li> <li>• statins are for a life time but cholesterol blockers are not</li> <li>• statins (might) reduce cholesterol to zero but cholesterol blockers only reduce it or statins reduce cholesterol more</li> <li>• statins better for people with inherited high cholesterol</li> <li>• cholesterol blockers better for people with dietary cholesterol problems</li> <li>• taking/using statins/cholesterol blockers is better than dying from heart attack or build up of fat in blood vessels or reduced blood flow</li> </ul>	comparison can be written anywhere in evaluation allow use of 'only' for implied comparison for each point eg only statins damage muscles / kidneys / organs  ignore liver  if neither of the first 2 points are given accept for 1 mark statins are more dangerous than cholesterol blockers or statins have more side effects  allow statins (might) stop membrane / hormone production but cholesterol blockers don't	6
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4

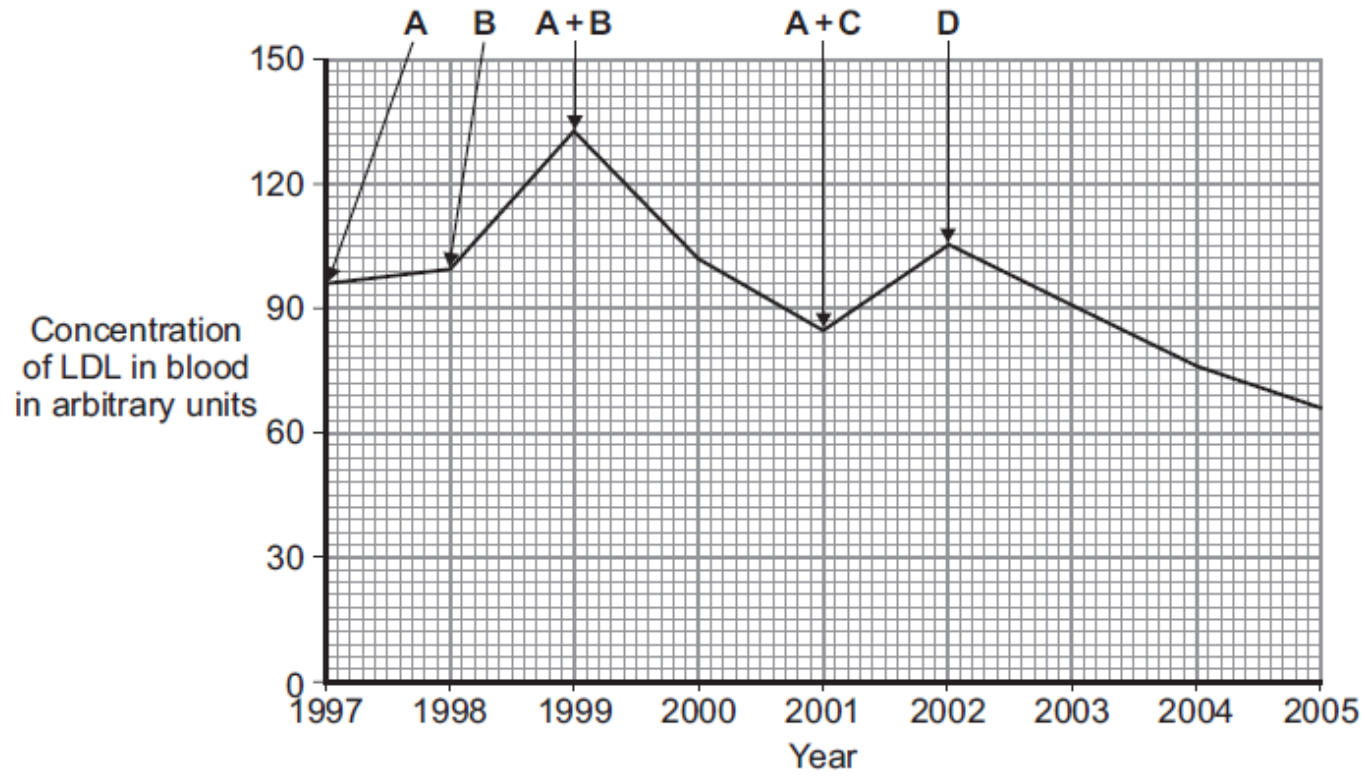
LDL is one form of cholesterol found in the blood.

People with a high concentration of LDL in their blood may be treated with drugs called statins.

A high concentration of LDL cholesterol in the blood may result in an increased risk of heart and circulatory diseases.

The graph shows the effects of the treatment of one person with four different statins, **A**, **B**, **C** and **D**, over a period of 8 years. The arrows show when each new treatment was started.

Each treatment was continued until the next treatment was started.



Compare the effectiveness of the five treatments in reducing the risk of heart and circulatory diseases for this person.

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.....

.....

[4 marks]

4	<p><u>A + B</u> most effective (treatment)</p> <p>D is (the most) effective (treatment)</p> <p>neither A nor B (alone) are effective</p> <p>can't tell if C is effective</p> <p><b>OR</b></p> <p><u>A + C</u> is not effective</p>	<p>ignore descriptions of LDL levels</p> <p>D is the best single (treatment)</p> <p>allow increase risk of heart disease instead of not effective</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
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