

**Q1.** One factor that may affect body mass is *metabolic rate*.

(a) (i) What is meant by *metabolic rate* ?

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.....

(1)

(ii) Metabolic rate is affected by the amount of activity a person does.

Give **two** other factors that may affect a person's metabolic rate.

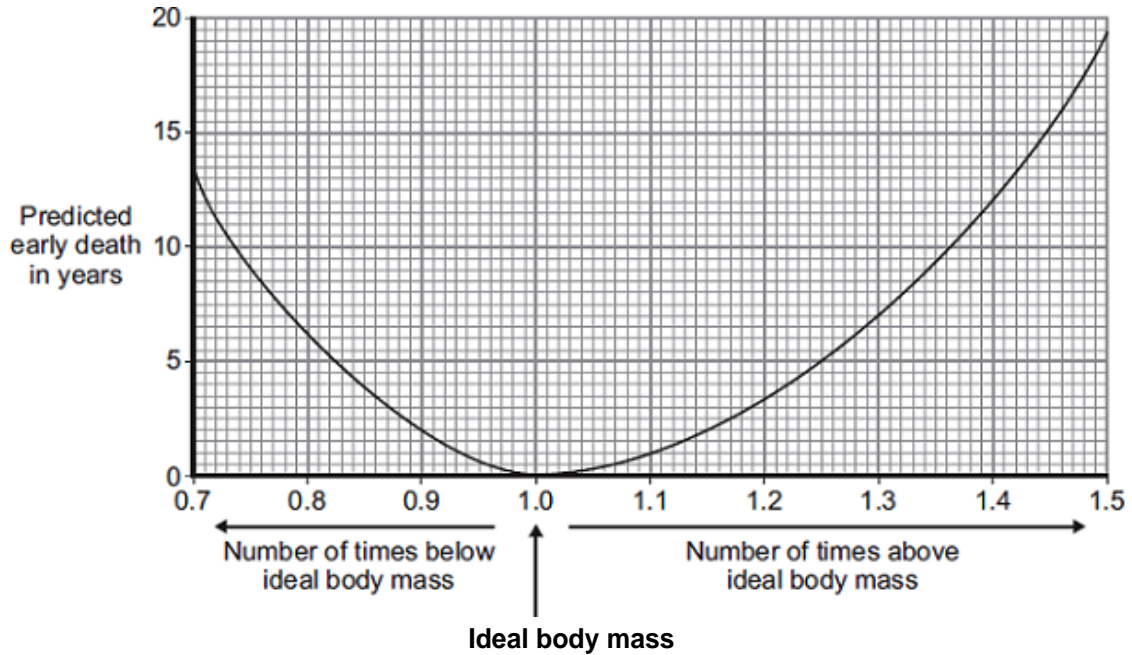
1.....  
.....  
2.....  
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(2)

- (b) Predicted early death is the number of years that a person will die before the mean age of death for the whole population. The predicted early death of a person is affected by their body mass.

Scientists have calculated the effect of body mass on predicted early death.

The graph shows the results of the scientists' calculations.



The number of times above or below ideal body mass is given by the equation:

$$\frac{\text{Actual body mass}}{\text{Ideal body mass}}$$

In the UK the mean age of death for women is 82.

A woman has a body mass of 70 kg. The woman's ideal body mass is 56 kg.

- (i) Use the information from the graph to predict the age of this woman when she dies.

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 .....  
 .....

Age at death = ..... years

(2)

(ii) The woman could live longer by changing her lifestyle.

Give **two** changes she should make.

1.....

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2.....

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(2)  
(Total 7 marks)

**Q2.** A popular diet book claims that a low-carbohydrate diet results in quicker weight loss and a more healthy body than a low-fat diet.

Scientists carried out an investigation to see if this claim is true.

- They used 120 overweight volunteers divided into two equal groups.
- **Group 1** was given a diet containing less than 20 g of carbohydrate per day.
- **Group 2** was given a low-fat diet. This contained less than 30% of energy from fat and less than 300 mg of cholesterol per day.
- Both groups were given the same exercise programmes and a weekly information meeting.
- Both groups were allowed only 2000 kilocalories per day.

The results after 24 weeks are shown in the table.

	<b>Group 1 Low-carbohydrate diet</b>	<b>Group 2 Low-fat diet</b>
Proportion of volunteers who completed the trial	76%	57%
Mean change in body mass	-12.9%	-6.7%
Mean change in body fat mass	-9.4 kg	-4.8 kg
Mean change in blood HDL concentration	+55 mg per litre	-16 mg per litre
Mean change in blood LDL concentration	+16 mg per litre	-74 mg per litre

(a) What was the independent variable in this investigation?

.....

(1)

(b) Give **one** variable that the scientists tried to control in this investigation.

.....

(1)

(c) Give **two** ways in which the method used by the scientists could have led to unreliable data.

1 .....

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2 .....

.....

(2)

(d) Does the data support the claim in the book?

Draw a ring around your answer.      **Yes / No**

Give **two** reasons for your answer.

1 .....

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2 .....

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(2)

(Total 6 marks)

**Q3.** (a) Explain how vaccination makes a person immune to a disease.

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(4)

(b) Scientists are trialling a 'nicotine vaccine' that might help **wean smokers off** the drug nicotine.  
The trials so far have produced very mixed results.  
Nicotine molecules are very small and can get through the protective layers around the brain.

(i) How does nicotine cause a person to become addicted?

.....  
.....

(1)

(ii) The 'nicotine vaccine' is made by attaching proteins to nicotine molecules. After 'vaccination' the body reacts to the nicotine in the same way as it reacts to pathogens.

Suggest how the 'nicotine vaccine' might help wean a smoker off nicotine.

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.....  
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(2)

(Total 7 marks)

**Q4.** Some students investigated the effect of pH on the growth of one species of bacterium.

They transferred samples of bacteria from a culture of this species to each of eight flasks. Each flask contained a solution of nutrients but at a different pH.

After 24 hours, the students measured the amount of bacterial growth.

(a) It was important that the flasks in which the bacteria grew were not contaminated with other microorganisms.

Describe **two** precautions the students should have taken to prevent this contamination.

1 .....

.....

2 .....

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(2)

- (b) To see the effect of pH on the growth of the bacteria, other conditions should be kept constant.

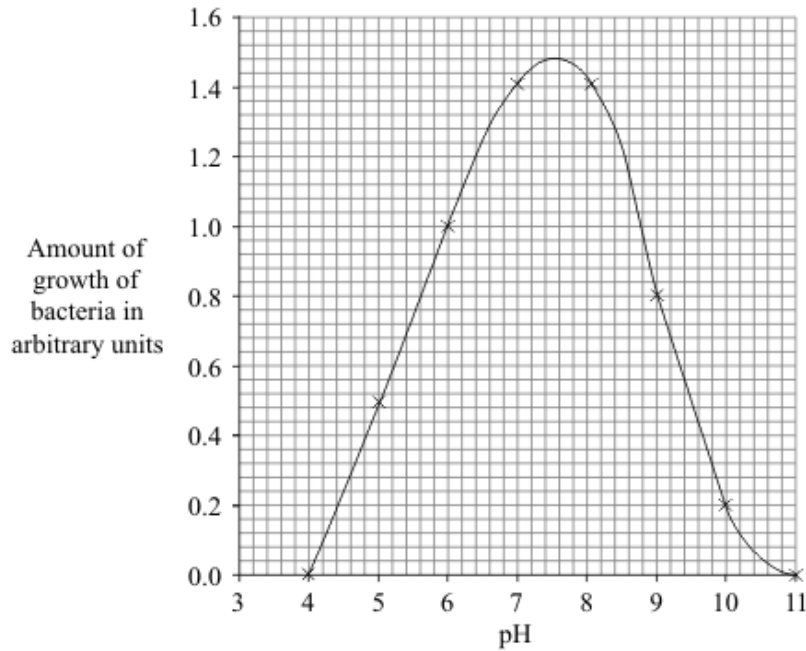
Suggest **two** conditions which should have been kept constant for all eight flasks.

1 .....

2 .....

(2)

- (c) The graph shows the results of the investigation.



The students wanted to find the best pH for the growth of this species of bacterium.

- (i) Use the graph to estimate the pH at which the bacteria would grow best.

pH .....

(1)

- (ii) What could the students do to find a more accurate value for the best pH for growth of the bacteria?

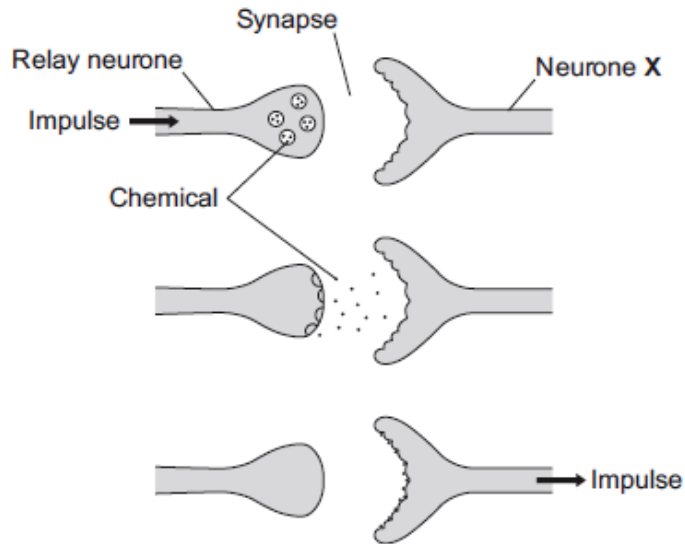
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(1)

(Total 6 marks)

**Q5.** The diagram below shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone X.



(a) What type of neurone is neurone X?

.....

(1)

(b) Describe how information passes from the relay neurone to neurone X. Use the diagram to help you.

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 .....  
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 .....  
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(3)

(c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. The table below shows the results.

Toxin	Effect at the synapse
Curare	Decreases the effect of the chemical on neurone X
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

Curare .....

.....

.....

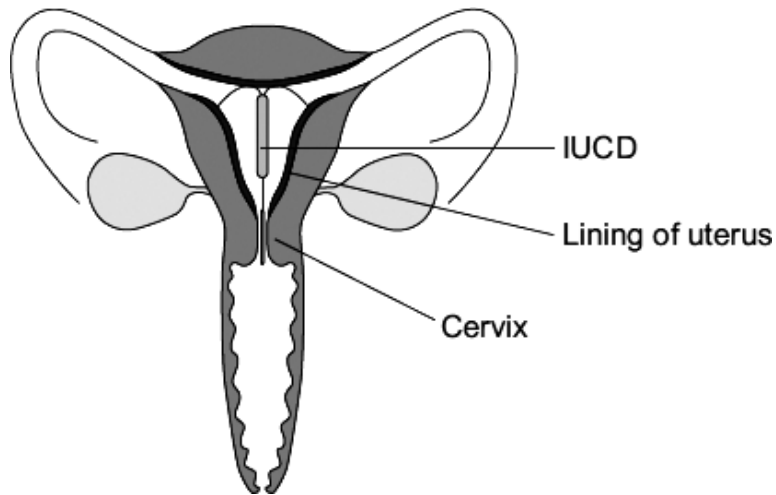
Strychnine .....

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(2)  
(Total 6 marks)

**Q6.** The diagram shows an intra-uterine contraceptive device (IUCD).



The IUCD is put inside the uterus (womb). The IUCD contains a hormone. The hormone diffuses directly into the uterus. The supply of hormone in the IUCD lasts for about five years.

The hormone works by:

- causing the cervix to produce a thick plug of mucus
- causing the lining of the uterus to become very thin.

For every 1000 women using the IUCD for one year about 2 women become pregnant. There are about 10 pregnancies for every 1000 women using the contraceptive pill for one year.

Evaluate the use of the IUCD compared with the contraceptive pill.

Use the information in this question and your own knowledge and understanding.

Remember to give a conclusion to your evaluation.

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**(4)**  
**(Total 4 marks)**

**Q7.** Some *recreational* drugs are dangerous.

Class A drugs include heroin and cocaine. Class A drugs are very addictive.

(a) It is difficult to stop using addictive drugs.

Explain why.

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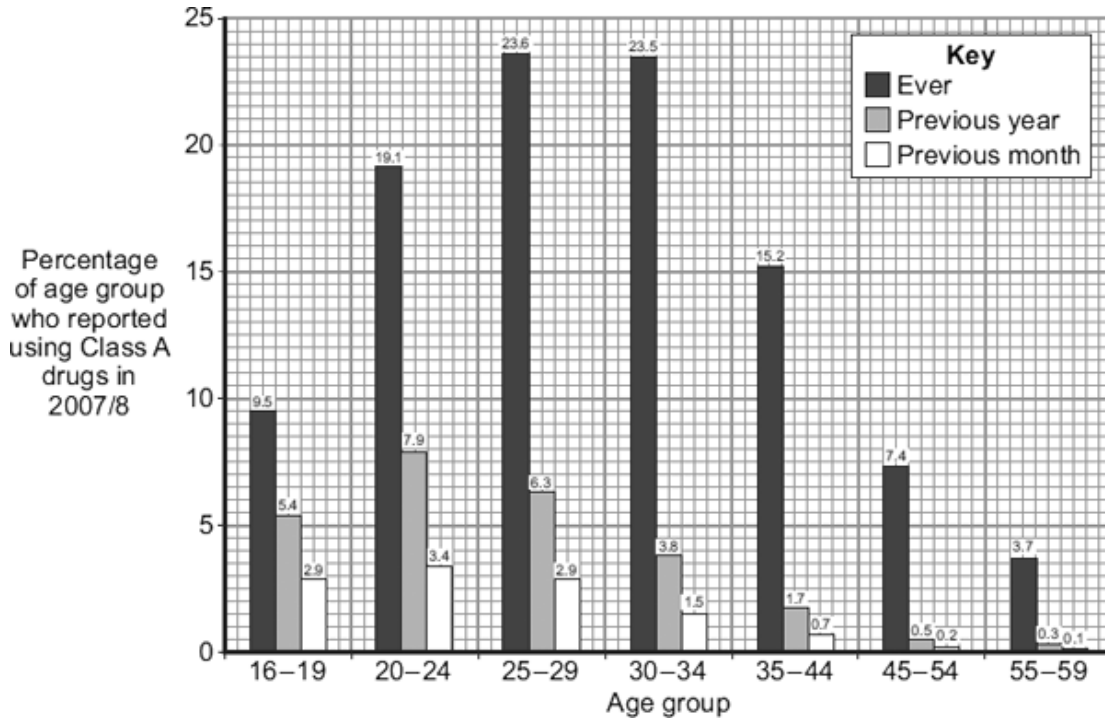
**(2)**

- (b) As part of the British Crime Survey, a large, random selection of the UK population is interviewed in their own home about drug use.

People in the sample:

- answer questions about drug use
- answer questions on a lap top
- do not give their names.

The bar chart shows the percentages of people aged 16-59 by age group who reported using any Class A drug ever, in the previous year and in the previous month.



- (i) Describe how the percentage of people who have ever used Class A drugs is related to age.

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(2)

- (ii) The percentage of people who reported using Class A drugs in the previous month is highest amongst 16 -29 year-olds.

Suggest **two** reasons for this.

1 .....

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2 .....

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(2)

- (iii) The data in the bar chart is unlikely to be completely accurate.

Explain why.

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(2)

(Total 8 marks)

**Q8.** Drugs may harm the human body.

- (a) The drug thalidomide was originally developed in the 1950s.

- (i) What was the drug thalidomide originally developed to treat?

.....

(1)

- (ii) Soon after it was developed, thalidomide was found to be useful in treating another condition.

What was this other condition?

.....

(1)

- (iii) Describe **one** harmful effect of thalidomide.

.....

(1)

(iv) Suggest why this harmful effect had **not** been detected during clinical drug trials on thalidomide.

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(1)

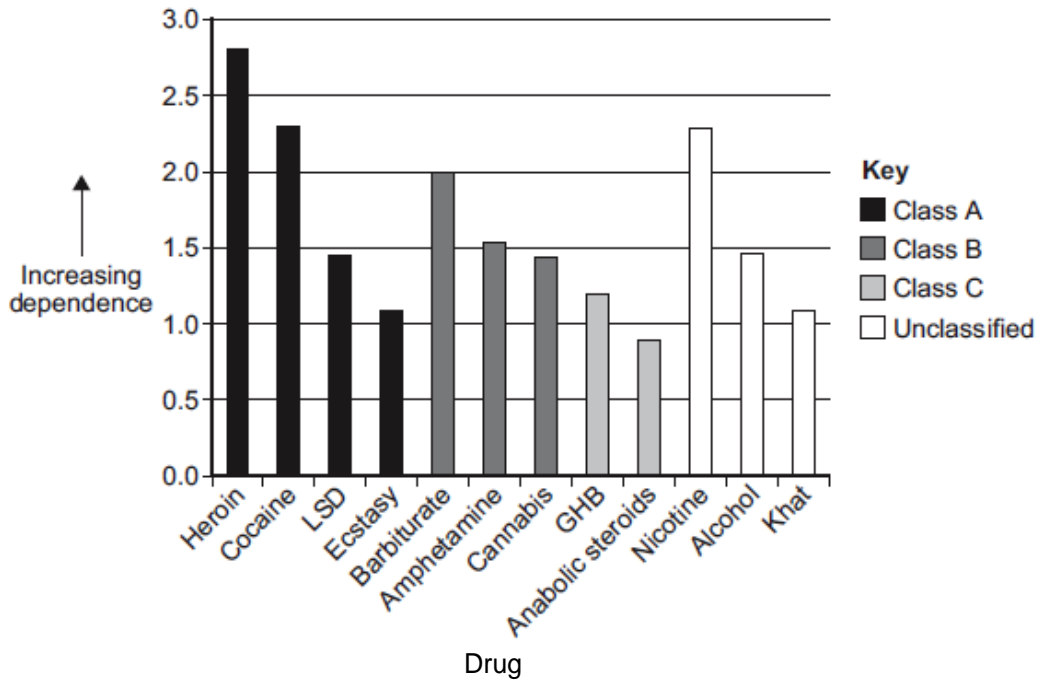
(b) Using a recreational drug may cause a person to become dependent on the drug.

(i) What happens in the body to make someone dependent on a drug?

.....  
.....

(1)

(ii) Doctors rated different recreational drugs according to how dependent users had become on them. The graph below shows the results.



It is illegal (against the law) to take Class A, B or C drugs.  
Unclassified drugs are legal.

Some people think that some legal drugs should be made illegal.  
What evidence is there in the graph above to support this view?

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(2)

(iii) Suggest **one** other piece of information about legal drugs that would need to be considered before the classification of these drugs was changed.

.....

(1)  
(Total 8 marks)

**Q9.** External human fertilisation (*in vitro* fertilisation) may be done to help a woman with blocked oviducts to become pregnant.

(i) Suggest **one** reason why the blockage of the oviducts would cause infertility.

.....

(1)

(ii) Some of the main stages of *in vitro* fertilisation are:

- the woman is given an injection of follicle-stimulating hormone (FSH) shortly after menstruation;
- she is also given an injection of luteinizing hormone (LH);
- several eggs are then removed from her body;
- the eggs are placed in a solution very similar in composition to the fluid inside the female reproductive tract before the sperm are added to them.

Suggest the reasons for the inclusion of each of these stages in external fertilisation.

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(4)  
(Total 5 marks)

<b>M1.</b>	(a) (i) <u>rate of chemical reactions</u> (in the body)	1
	(ii) any <b>two</b> from:	
	<ul style="list-style-type: none"> <li>• heredity / inheritance / genetics</li> <li>• proportion of muscle to fat <b>or</b> (body) mass <i>allow (body) weight / BMI</i></li> <li>• age / growth rate</li> <li>• gender <i>accept hormone balance or <u>environmental</u> temperature ignore exercise / activity</i></li> </ul>	2
	(b) (i) 77	
	<i>correct answer with or without working gains 2 marks allow 1 mark for 70 / 56 <b>or</b> 1.25 <b>or</b> 5</i>	2
	(ii) increase exercise	
	<i>accept a way of increasing exercise</i>	1
	reduce food intake	
	<i>accept examples such as eat less fat / sugar allow go on a diet <b>or</b> take in fewer calories ignore lose weight ignore medical treatments such as gastric band / liposuction</i>	1
		<b>[7]</b>
<b>M2.</b>	(a) diet <b>or</b> description	1
	(b) exercise <b>or</b> group meetings <b>or</b> same number of kilocalories per day <b>or</b> time <b>or</b> group size	1

(c) any **two** from: eg

- scientists didn't observe amount of exercise  
**or** volunteers cheated on exercise(\*)
- scientists didn't observe the amount of food  
**or** volunteers cheated on food(\*)  
*(\*if no marks awarded for first 2 bullet points allow don't stick to plan **or** cheated for 1 mark*
- mass of subjects not controlled
- age of subjects not controlled
- gender of subjects not controlled
- occupation of subjects not controlled
- different proportions of subjects completed course  
*allow not all completed course*
- low number of subjects  
*ignore not repeated*

2

(d) any **two** from: (yes)

- low carbohydrate / Group 1 / people / they lost more mass  
*ignore more people lost weight  
allow greater change in mass*
- low carbohydrate / Group 1 / people / they lost more body fat  
*ignore more people lost body fat  
allow greater change in body fat*
- low carbohydrate diet / Group 1 / people / they resulted in more HDL  
*allow better HDL to LDL balance  
allow greater change in HDL*

2

[6]

**M3.** (a) dead or inactive or weak form of pathogen / bacterium /  
virus / microorganism introduced  
*ignore disease / germ*

1

(stimulates) white cells / lymphocytes / leucocytes  
*accept B and T cells  
ignore phagocytes*

1

to produce antibodies  
*ignore antitoxins / antigens*

1

antibodies made quickly on re-infection / idea of memory cells

*ignore already has antibodies*

*ignore 'body remembers'*

1

(b) (i) alters / causes chemical processes / body chemistry

*ignore craving / withdrawal symptoms*

1

(ii) any **two** from:

- combined molecule / vaccine stimulates antibody production
- if nicotine taken, antibodies bind to nicotine molecules  
*ignore destroys nicotine*
- making them too large to get to brain / making them ineffective  
*allow prevents nicotine entering brain*

2

[7]

**M4.** (a) any **two** from:

- sterilise / kill microorganisms  
*ignore 'cleaning' / 'disinfect'*  
*ignore 'germs'*
- method of sterilisation eg apparatus / media sterilised in oven / autoclave  
*allow pressure cooker / boiling water*
- pass flask mouth / pipette tip / loop / test tube mouth through flame
- work near a flame
- minimise opening of flask / test tube **or** hold non-vertical  
*allow idea of sealing / covering **or** prevent entry of air*

2

(b) any **two** from:

- temperature  
*ignore references to time / type of bacterium*
- concentration / amount of nutrients / ions
- type of nutrient
- volume / amount of solution
- amount of bacteria added
- agitation **or** amount of oxygen

2

- (c) (i) 7.5  
*accept in range 7.4 – 7.6* 1
- (ii) use more pH values around / close to pH 7.5 / between 7 and 8 1
- [6]

- M5.** (a) motor  
*allow efferent / postsynaptic*  
*allow **another** relay (neurone)* 1
- (b) release of chemical (from relay neurone)  
*allow ecf for 'motor' neurone from (a)*  
*allow release of neurotransmitter / named example* 1
- chemical crosses gap / junction / synapse  
*allow diffuses across*  
*allow chemical moves to X* 1
- chemical attaches to X / motor / next neurone (causing impulse) 1
- (c) (curare) decrease / no contraction  
*accept (muscle) relaxes* 1
- (strychnine) increase / more contraction  
*if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response* 1
- [6]

**M6.** any **three** from:

*max 2 if only advantages or only disadvantages discussed*  
*ignore 'side effects' unqualified*  
*ignore side effects produced by hormones*

**advantages of IUCD over pill eg**

- can't forget to take it / have to take pill every day  
*do not allow last 5 years unless qualified*
- effect much longer than pill
- more effective in preventing pregnancy  
*do not allow reference to figures unless qualified*
- stops sperm entering uterus

**disadvantages of IUCD over pill eg**

- pain / uncomfortable / risk of infection / may damage uterus
- prevents fertilised egg developing / 'embryo rights'  
*allow kills embryo*
- needs replacement by doctor / nurse / professional  
**or** access to IUCD is more difficult than pill  
**or** IUCD is harder to come off than pill

3

argued conclusion

*must include a preference and a reference to both advantages and disadvantages*  
**or** *one is better in a given situation but the other is better in a different situation*

1

[4]

- M7.** (a) alters chemical reaction in the body  
**or** changes brain / body functioning  
**or** brain / body does not function correctly without drug  
*ignore references to dependence*

1

withdrawal symptoms

*allow crave / craving*

1

- (b) (i) (rises to a) maximum at 25-29 / 30-34 / 25-34

1

(falls to) minimum at 55-59

*if neither mark gained allow 1 mark for indicating high usage anywhere in the 20-44 range*

1

- (ii) any **two** from reference to eg:  
*ignore references to maturity / disposable income / stress*
- (peer) pressure / fashionable
  - experiment / try new things
  - ease of obtaining drugs
- 2
- (iii) some people will be dishonest / afraid to admit use  
*ignore sample not accurate*
- 1
- (because) class A drugs illegal  
**or** because they will get into trouble
- 1

[8]

- M8.** (a) (i) idea of poor sleeping  
*allow as a sleeping pill*
- 1
- (ii) (for) morning sickness (in pregnant women)  
*ignore sickness unqualified*  
*ignore leprosy*
- 1
- (iii) limb abnormalities / defects  
*accept description e.g. short / no arms / legs*  
*ignore disabled / deformed*
- 1
- (iv) drug not tested / trialled on pregnant animals / women  
*allow not tested for treatment of morning sickness*
- 1
- (b) (i) changes to chemical processes  
*ignore addiction*
- 1
- (ii) dependency on (some) legal drugs is more than / equal to on (some) illegal drugs  
*allow idea of no / little consistency between dependency and classification*
- 1
- example of a named legal drug for which dependency is equal to **or** greater than a named illegal drug  
*allow two pairs of named examples for 2 marks*
- 1

(iii) any **one** from:

- the harm it does / harmfulness  
*ignore cost / addiction / dependency*
- effect on health  
*accept (severity of) withdrawal symptoms*
- side effects  
*accept named health effects e.g. mental illness **or** effect on heart / circulatory system*

1

[8]

**M9.** (i) egg cannot pass down **or** sperm cannot pass up **or** egg and sperm cannot meet;  
*Accept egg cannot reach uterus **or** sperm cannot fertilise egg*

1

(ii) (increased FSH)

causes several eggs to be formed **or** released;  
*Accept causes several follicles to form*

(LH ensures)

yellow body forms or follicles remain;  
*Accept eggs mature **or** causes production of progesterone*

4

(several eggs used)-

to ensure at least one egg is fertilised;  
*Accept ensures at least one zygote formed **or** increases chance of fertilisation*

(fluids similar)

so fertilisation occurs or eggs have more chance of survival or eggs don't die;  
*Accept supplies nutrients for sperm **or** eggs **or** zygote*

[5]

