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EDEXCEL COMBINED SCIENCE BIOLOGY: QUESTIONS BY TOPIC

Animal Coordination, Control and Homeostasis (7)

Combined Science Biology (Higher) Topic 7

8 questions · 85 marks · Mark schemes included

Pearson Edexcel Combined Science (9-1) Biology 1SC0, Higher Tier, June 2018 - June 2025

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 info@guidemygrades.com

 Piccadilly Business Centre, Unit C, Aldow Enterprise Park
Blackett Street, Manchester, M12 6AE

HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.
Click any row below to jump straight to that question.
On every question page, click ANSWER in the top-right corner to jump to its mark scheme.
Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

QUESTION	SOURCE	MARKS	PAGE
1. Q1 <i>also Topic 1</i>	Paper 2 June 2023	9	4
2. Q5	Paper 2 June 2023	9	6
3. Q4	Paper 2 June 2022	10	9
4. Q6	Paper 2 June 2018	11	12
5. Q4	Paper 2 November 2021	11	14
6. Q5 <i>also Topic 5</i>	Paper 2 November 2021	11	16
7. Q6	Paper 2 June 2024	12	20
8. Q6	Paper 2 June 2025	12	22



QUESTIONS

8 questions · 85 marks · lowest tariff first



9-MARK QUESTIONS

2 questions in this booklet



- 1 People with diabetes cannot always control the concentration of glucose in their blood.

(a) Two people eat identical meals.

One person has diabetes, the other person does not have diabetes.

Figure 1 shows the concentration of glucose in the blood of these two people after eating the meals.

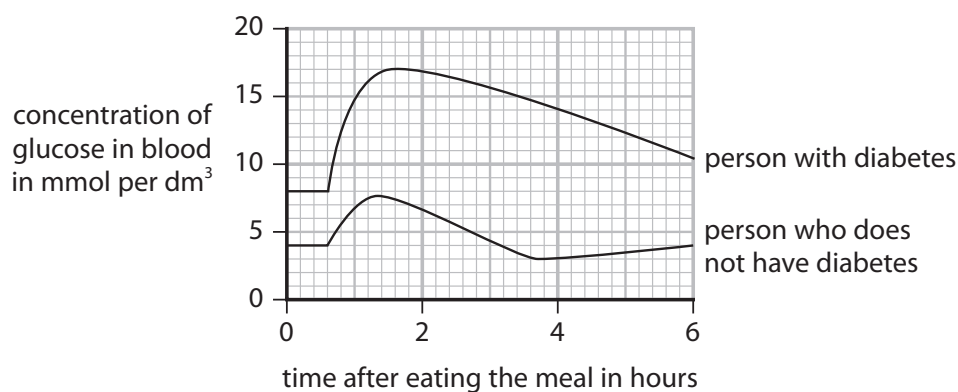


Figure 1

- (i) Calculate the maximum increase in the concentration of glucose in the blood of the person with diabetes.

(1)

..... mmol per dm³

- (ii) Water moved out of the red blood cells of the person with diabetes when the concentration of glucose in the blood was above 15 mmol per dm³.

Explain why water moved out of the red blood cells of the person with diabetes.

(2)

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(b) The pancreas produces a hormone that causes the concentration of glucose in the blood to decrease.

(i) Name this hormone.

(1)

(ii) State how this hormone is transported from the pancreas to its target organs.

(1)

(iii) Which is the target organ for the hormone that controls the concentration of glucose in the blood?

(1)

- ☐ A kidney
- ☐ B pancreas
- ☐ C liver
- ☐ D lung

(c) Explain how type 2 diabetes can be controlled.

(3)

(Total for Question 1 = 9 marks)



5 Figure 8 shows the changes in the levels of the hormones of the menstrual cycle.

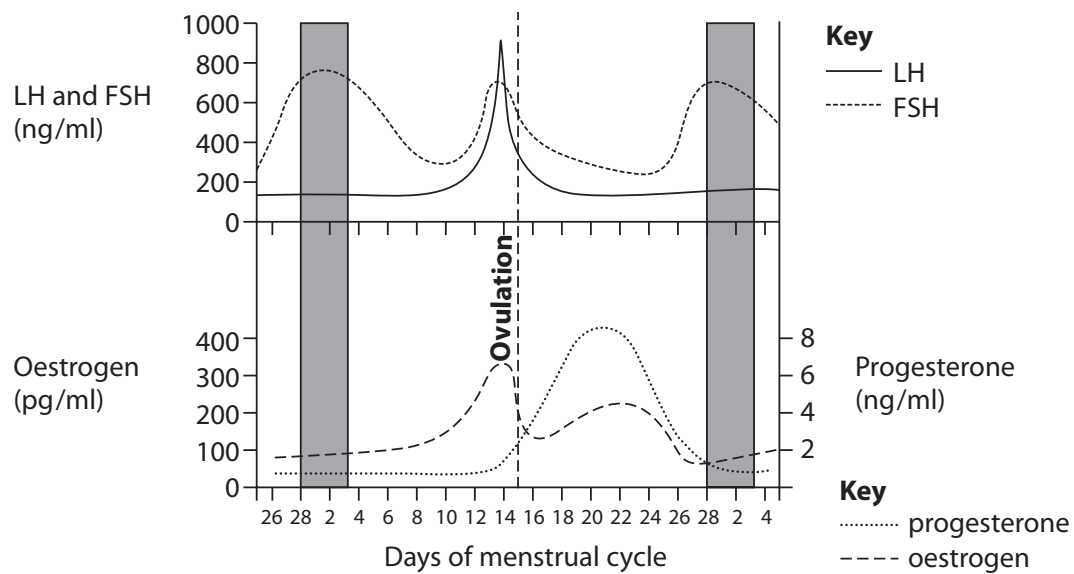


Figure 8

(a) (i) The maximum concentration of oestrogen is just before ovulation.

Which is the maximum concentration of oestrogen?

(1)

- ☐ A 8 ng/ml
- ☐ B 210 pg/ml
- ☐ C 320 pg/ml
- ☐ D 900 ng/ml

(ii) Explain how **two** of the hormones shown in Figure 8 cause ovulation.

(3)

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(iii) State the number of days for the first menstruation shown in Figure 8.

(1)

(iv) Explain how the levels of each hormone in the woman shown in Figure 8 would be different, if she was pregnant.

(4)

(Total for Question 5 = 9 marks)

10-MARK QUESTIONS

1 question in this booklet



4 (a) The combined contraceptive pill contains artificial versions of oestrogen and progesterone.

(i) Explain how the combined contraceptive pill prevents pregnancy.

(2)

(ii) When taken correctly, the combined pill can be over 99% effective.

Taking the combined pill can lead to weight gain.

Give **one** other disadvantage of using the combined pill as the only method of contraception.

(1)

(b) Excessive weight gain and obesity increase the likelihood of developing type 2 diabetes.

Explain the effect of type 2 diabetes on the body.

(3)



- (c) A woman had unexplained weight loss and fatigue. She had blood tests to investigate the cause of these symptoms.

Figure 6 shows the results.

blood test	woman's result	normal range
TSH level	5.6 mU/l	0.4 to 4.9 mU/l
thyroxine level	27.5 pmol/l	9.0 to 21.0 pmol/l
red blood cell count	5.2×10^6 cells/ μ l	4.2 to 5.4×10^6 cells/ μ l
glucose level	82.0 mg/dl	72.0 to 99.0 mg/dl

Figure 6

Comment on the results of these blood tests and the possible causes of the woman's weight loss and fatigue.

(4)

(Total for Question 4 = 10 marks)

11-MARK QUESTIONS

3 questions in this booklet



- 6 (a) Figure 10 shows the concentration of the hormones oestrogen and progesterone in the blood of women of different ages.

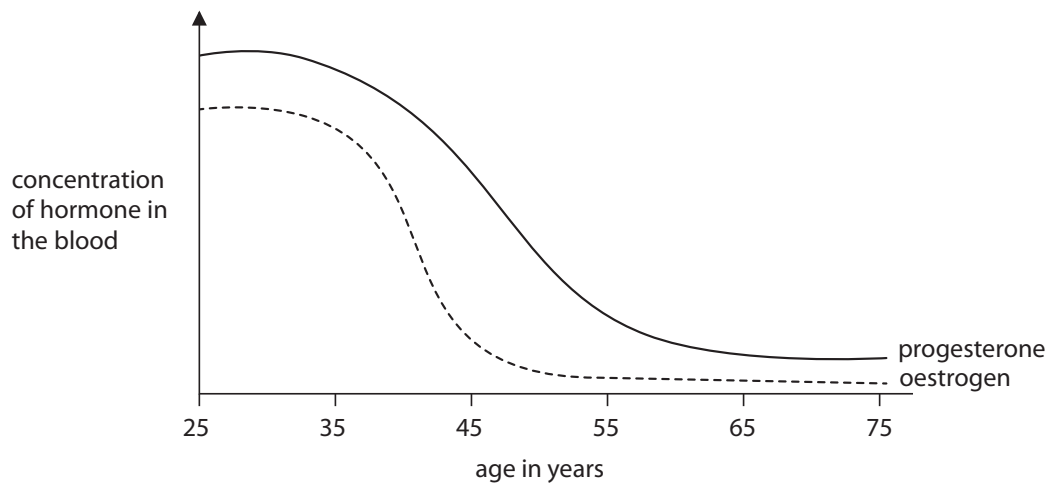


Figure 10

- (i) Use information from Figure 10 to explain why women over the age of 50 are less likely to ovulate.

(2)

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- (ii) Use information from Figure 10 to explain why women are less likely to menstruate after the age of 60.

(2)

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DO NOT WRITE IN THIS AREA

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(iii) Explain how clomifene therapy may increase the chance of a woman over the age of 50 becoming pregnant.

(2)

(iv) The hormone progesterone is produced by the

(1)

- ☐ **A** corpus luteum
- ☐ **B** pituitary
- ☐ **C** thyroid
- ☐ **D** uterus

(b) Explain how the release of adrenalin can result in the improved performance of an athlete.

(4)

(Total for Question 6 = 11 marks)



4 (a) Methods of contraception include use of hormones and barrier methods.

(i) Which form of contraception is a barrier method?

(1)

- ☐ A oral contraception
- ☐ B female condom
- ☐ C rhythm (calendar) method
- ☐ D contraceptive implant

(ii) State why a barrier method of contraception may be used in addition to a hormonal method.

(1)

(b) The combined contraceptive pill contains the hormones oestrogen and progesterone.

(i) State the endocrine gland that releases oestrogen.

(1)

(ii) Explain how high levels of oestrogen and progesterone in the combined contraceptive pill work together to prevent pregnancy.

(4)



(c) Hormones can also be used to treat infertility.

Explain how clomifene therapy and IVF can improve female fertility.

(4)

clomifene therapy.....

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IVF.....

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(Total for Question 4 = 11 marks)



- 5 (a) A hospital patient was tested for diabetes.

A nurse recorded his mass and height.

Figure 7 shows these measurements.

mass in kg	height in metres
124	1.8

Figure 7

Calculate the BMI of this patient using the information in Figure 7.

(2)

BMI = ...



(b) Blood samples were taken from this patient every four hours.

The glucose concentrations were recorded in Figure 8.

time in hours	blood glucose concentration in milligrams per decilitre
0	100
4	131
8	139
12	90
16	92
20	134
24	137

Figure 8

(i) Describe the trends shown in this data.

(3)

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(ii) This patient was diagnosed as being type 2 diabetic.

Explain why the blood glucose concentration of this patient remained high from 4 hours to 8 hours.

(3)

(iii) This patient did some exercise during these 24 hours.

Explain how the data in Figure 8 shows that this exercise occurred after 8 hours but before 12 hours.

(3)

(Total for Question 5 = 11 marks)



12-MARK QUESTIONS

2 questions in this booklet



6 (a) The female contraceptive pill contains hormones to prevent pregnancy.

(i) Which hormones are in the female combined contraceptive pill?

(1)

- ☐ **A** FSH and oestrogen
- ☐ **B** oestrogen and progesterone
- ☐ **C** progesterone and LH
- ☐ **D** LH and FSH

(ii) Explain how the hormones in contraceptive pills prevent ovulation.

(3)

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(iii) Explain how a barrier method of contraception prevents pregnancy.

(2)

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*(b) Hormones can be used as part of assisted reproductive technology.

Explain how assisted reproductive technology (ART) can be used to increase the chances of a woman becoming pregnant.

(6)

(Total for Question 6 = 12 marks)



6 (a) The menopause occurs when the menstrual cycle stops.

Figure 11 shows the hormone concentrations in the blood before the menopause and after the menopause.

hormone	mean hormone concentration before the menopause	mean hormone concentration after the menopause
oestrogen	33 pg/mL	23 pg/mL
progesterone	11 ng/mL	0.4 ng/mL
testosterone	35 ng/dL	16 ng/dL

Figure 11

(i) Compare and contrast the hormone concentrations before and after the menopause.

(3)

(ii) Explain the roles of FSH and LH in the menstrual cycle.

(3)

*(b) Figure 12 shows the blood glucose concentrations for a person who has type 2 diabetes and a person who does not have type 2 diabetes.

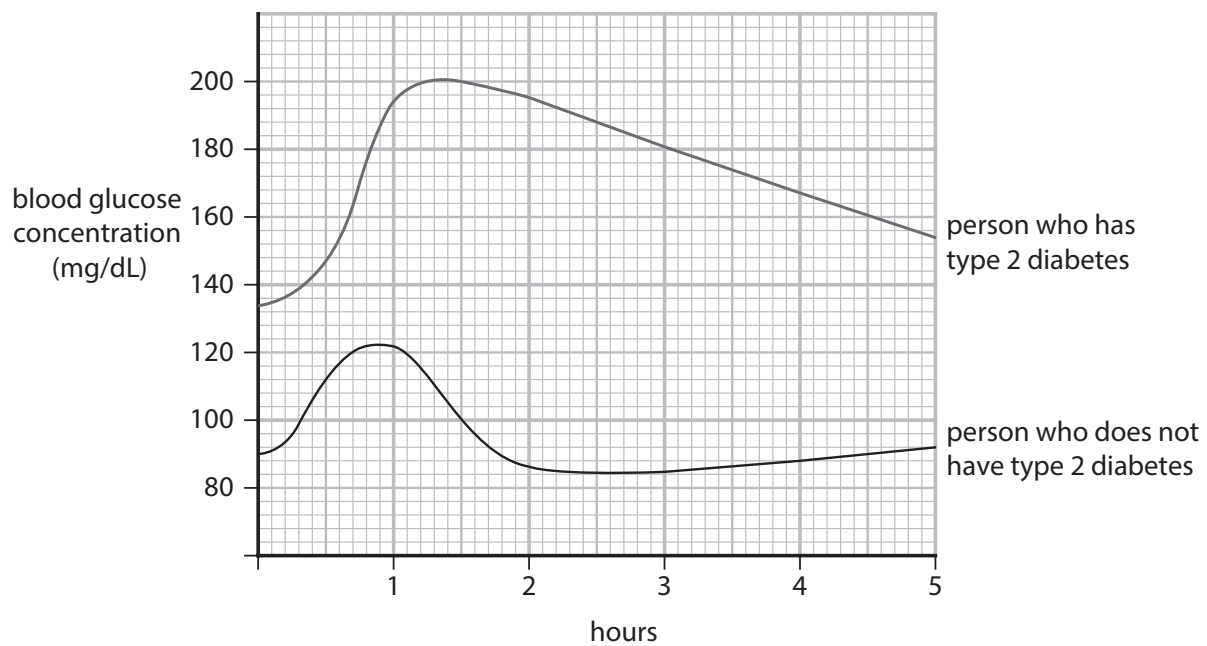


Figure 12

Explain how glucose concentrations are controlled for a person with type 2 diabetes and a person who does not have type 2 diabetes.

Include information from Figure 12 in your answer.

(6)

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(Total for Question 6 = 12 marks)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question number	Answer	Mark
1(a)(i)	9 (mmol per dm ³)	(1)

Question number	Answer	Additional guidance	Mark
1(a)(ii)	An explanation including: • (water moves out) by osmosis (1) • because the concentration of glucose is higher in the blood (plasma) (1) • across a partially permeable membrane (1)	accept from a high water potential inside the cell to a low water potential outside the cell	(2)

Question number	Answer	Mark
1(b)(i)	insulin	(1)

Question number	Answer	Additional guidance	Mark
1(b)(ii)	in the blood / plasma	accept dissolved / in solution	(1)

Question number	Answer	Mark
1(b)(iii)	The only correct answer is C liver A is incorrect because the target organ is not the kidney B is incorrect because the pancreas produces insulin D is incorrect because the target organ is not the lungs	(1)

Question number	Answer	Additional guidance	Mark
1(c)	An explanation including three from: • exercise (1) • control diet / lose weight (1) • to {reduce / control} blood glucose (1)	accept avoid {sugar / carbohydrate} in your diet accept methods of testing blood for signs of diabetes (1) accept take {medication / metformin / insulin} (1)	(3)

(Total for question 1 = 9 marks)

Question number	Answer	Mark
5(a)(i)	The only correct answer is C 320 pg/ml A is incorrect because this is the reading for progesterone B is incorrect because this is the second peak reading for oestrogen D is incorrect because this is the reading for LH	(1)

Question number	Answer	Mark
5(a)(ii)	An explanation including three of the following: • FSH causes the {egg / follicle} to mature (1) • FSH stimulates oestrogen (1) • high levels of oestrogen (1) • LH / LH surge (1) • causes the egg to be released (1)	(3)

Question number	Answer	Mark
5(a)(iii)	3 / three (days)	(1)

Question number	Answer	Mark
5(a)(iv)	An explanation including the following: • FSH levels remain low as no {egg / follicle} would mature (1) • LH levels remain low so ovulation would not occur (1) • progesterone inhibits {FSH / LH} / oestrogen inhibits FSH (1) • progesterone levels remain high to maintain the lining of the uterus (1) • high levels of oestrogen {build up / maintain} the lining of the uterus (1)	(4)

(Total for question 5 = 9 marks)



Question Number	Answer	Additional Guidance	Mark
4(a)(i)	An explanation linking: • inhibits {FSH / LH} (1) • which prevents {maturation of a follicle / ovulation} (1)	ignore prevents production of eggs accept thickens cervical mucus (1) accept thickens cervical mucus blocks the sperm / stops them reaching the egg for 2 marks	(2) AO2

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	doesn't prevent STI	Accept STDs for STIs Accept named STIs accept still a chance of pregnancy	(1) AO1

Question Number	Answer	Additional Guidance	Mark
4(b)	An explanation linking: • blood glucose levels are not regulated / high (1) • because cells are resistant to insulin (1) • (so the liver) does not convert glucose to glycogen (1)	accept blood sugar levels accept there is insulin resistance / unresponsive to insulin reject immune accept hyperglycaemia / symptoms of hyperglycaemia (1)	(3) AO1

Question Number	Answer	Additional Guidance	Mark
4(c)	An answer including four from: • {TSH / thyroxine} levels are higher than normal (1) • TSH stimulates the thyroid gland / TSH stimulates the release of thyroxine (1) • increases metabolic rate (1) • {red blood cells / glucose} are within the normal range (1) • suggesting oxygen is carried as normal (1) • the symptoms are not due to diabetes (1)	accept the hormones levels are high / above average accept digests / breaks down food faster accept hyperthyroidism / overactive thyroid accept RBC / glucose are not high accept is not anaemic	(4) AO3 1a, 1b, 2a, 2b

(Total for question 4 = 10 marks)



Question number	Answer	Mark
6(a)(i)	An explanation linking two of the following: - women over the age of 50 have low levels of oestrogen (1) (high levels of) oestrogen are needed for LH to be released / levels of oestrogen are too low for LH to be released (1) (a surge of) LH is needed for ovulation to occur (1)	(2) AO 3 1a AO 3 1b

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation linking: - low levels of oestrogen (1) (low levels of oestrogen) stops the lining of the uterus building up / so no lining to be lost (1)	reject progesterone	(2) AO 3 2a AO 3 2b

Question number	Answer	Additional guidance	Mark
6(a)(iii)	An explanation linking the following: - causes the release of FSH (1) - stimulating eggs to develop (in the follicles/ovary) (1) OR - causes the release of LH (1) - stimulating ovulation (1)	accept stimulates follicles to mature	(2) AO 2 1

Question number	Answer	Mark
6(a)(iv)	A corpus luteum 1. The only correct answer is A <i>B is not correct because The pituitary gland releases the hormones LH and FSH not progesterone</i> <i>C is not correct because the thyroid gland releases TSH and thyroxine not progesterone</i> <i>D is not correct because the uterus does not release any hormones it is the site of the action of progesterone</i>	(1) AO 1 1

Question number	Answer	Additional guidance	Mark
6(b)	An explanation linking four of the following: - adrenalin acts to increase heart rate / blood pressure (1) - so there is increased blood flow (1) - causes the release of glucose from glycogen (1) - so increased {oxygen/glucose} (1) - increased the rate of respiration (1) - to release energy (for the working muscles/body) (1)	accept more glucose released from liver/muscles accept ATP for energy	(4) AO 2 1

Total for Question 6 = 11 marks



Question Number	Answer	Mark
4(a)(i)	B female condom The only correct answer is B <i>A is incorrect because oral contraception contains hormones</i> <i>C is incorrect because the rhythm (calendar) method does not involve a barrier</i> <i>D is incorrect because the contraceptive implant contains hormones</i>	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	barrier methods prevent the transmission of STIs	accept STDs / accept named STIs accept for extra protection against pregnancy	(1) AO2 1

Question Number	Answer	Mark
4(b)(i)	ovary / ovaries	(1) AO1 1

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation linking four from: • inhibits the production of FSH (1) • FSH causes eggs to mature in the follicle / (no FSH means) no eggs will be matured (1) • high levels of progesterone inhibit the production of LH (1) • LH causes ovulation / (no LH) prevents ovulation (1) • if eggs are not matured and released they cannot be fertilised (1)	accept thicker cervical mucus to prevent the sperm from reaching the egg (2)	(4) AO1 1

Question Number	Answer	Additional guidance	Mark
4(c)	An explanation linking four from: Clomifene (maximum two marks) • clomifene therapy introduces hormones into the body / stimulates hormones {LH / FSH} (1) • to allow (more) eggs to {develop / be released} (1) IVF (maximum two marks) • IVF involves fertilisation outside the body (1) • so a fertilised egg cell can be implanted directly into the uterus (1) • so if Fallopian tubes are blocked there can still be pregnancy (1)	accept womb for uterus accept alternative reasons for using IVF	(4) AO1 1

(Total for question 4 = 11 marks)



Question Number	Answer	Additional guidance	Mark
5(a)	substitution $124 \div 1.8^2$ (1) evaluation $BMI = 38.27$	award 2 marks for correct answer with no working accept 38 / 38.3 accept 68.9 / 68.89 for 1 mark accept answers correctly rounded to any number of decimal places	(2) AO1 1

Question Number	Answer	Additional guidance	Mark
5(b)(i)	A description including: • blood glucose concentration increased from {0 – 8 hours / from 100 to 139 / by 39 mg/dL} (1) • then blood glucose concentration decreased [at 12 hours / to 90 mg/dL / by 49 mg/dL] (1) • blood glucose concentration increased {at 20 hours / after 12 hours / to 134 mg/dL / by 44 mg/dL} (1)	accept blood glucose concentration increased {at 24 hours / to 137 mg/dL / by 47 mg/dL} accept other calculated increases between 12 and 24 hours	(3) AO3 1 a + b

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation linking: - the pancreas produced insulin (1) - but the cells in the {liver / muscles} were resistant to insulin (1) - so glucose was not taken up by the {liver / muscles / cells} (1)	accept but there is insulin resistance accept so the glucose is not converted to glycogen in the {liver / muscles}	(3) AO2 1

Question Number	Answer	Additional guidance	Mark
5(b)(iii)	An explanation linking: - the blood glucose concentration decreased (at 12 hours) (1) - because the patient has used up the glucose in his blood (1) - due to increased respiration (during exercise) (1)	accept glucose used by {muscles / cells}	(3) AO3 2ab

(Total for question 5 = 11 marks)

Question number	Answer	Mark
6(a)(i)	The only correct answer is B oestrogen and progesterone A is incorrect FSH causes the egg to develop in the follicle C is not correct because LH causes ovulation D is not correct because FSH causes the egg to develop in the follicle and LH causes ovulation	(1) AO1 1

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation linking: - oestrogen inhibits FSH (1) - so the {egg / follicle} cannot mature (1) - progesterone inhibits {LH / FSH} (1)	reject oestrogen inhibits LH accept FSH causes the {egg / follicle} to mature ignore no eggs are released / ovulation	(3) AO1 1

Question number	Answer	Additional guidance	Mark
6(a)(iii)	An explanation including: - stops the sperm and the egg from meeting (1) - so there will be no fertilisation (1)	accept gametes for sperm and ovum accept prevents sperm entering the vagina / cervix / uterus	(2) AO2 1

Question number	Indicative content	Mark
6*(b)	A01 6 marks Clomifene therapy • Clomifene is a fertility drug • that causes the pituitary gland • to release more FSH and LH • so more eggs are matured in the follicle • more chance of the egg being released IVF (<i>in vitro</i> fertilisation) • eggs are removed from the mother's ovary • sperm are taken from the father • the sperm and the eggs are mixed / the sperm is injected into the egg • in a <i>Petri</i> dish • the fertilised egg is allowed to divide • the {fertilised egg / ball of cells / zygote / embryo} is placed into the uterus	(6)

Level	Mark	Descriptor
	0	• no rewardable material.
Level 1	1-2	• demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. • presents an explanation with some structure and coherence.
Level 2	3-4	• demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. • presents an explanation that has a structure which is mostly clear, coherent and logical.



Level 3	5-6	- demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. - presents an explanation that has a well-developed structure which is clear, coherent and logical.
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Additional Guidance

Level 1	1-2	- A brief explanation of either IVF OR Clomifene therapy OR other ART techniques - The response links the method to a hormone, named process or the idea of external fertilisation
Level 2	3-4	- A brief explanation of how IVF AND Clomifene therapy work OR a detailed explanation of one method - The response links one method to the type of ART either Clomifene OR IVF
Level 3	5-6	- A detailed explanation of BOTH IVF and Clomifene therapy - The response links both methods to the type of ART, Clomifene AND IVF

(Total for question 6 = 12 marks)

Question number	Answer	Additional guidance	Mark
6(a)(i)	An answer including three from - all three hormones are lower after the menopause (1) - oestrogen levels went down by 10pg/mL (1) - progesterone levels went down by 10.6ng/mL (1) - testosterone levels went down by 19 ng/dL (1)	oestrogen down by 30% progesterone down by 96% testosterone down by 54%	(3)

Question number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation linking three from: FSH linked to - stimulates the follicle (to mature) (1) - causes the ovum to mature (1) - stimulates the production of oestrogen (1) LH linked to - causes ovulation (1) - corpus luteum (1)	accept egg for ovum accept causes the egg to be released	(3)

Question number	Indicative content	Mark
6 *(b)	AO1 and AO3 6 marks Healthy person • glucose is regulated insulin and glucagon • insulin released from the pancreas • lowers blood glucose • by converting glucose to glycogen • to be stored in the liver • glucagon released from the pancreas • raises blood glucose • by converting glycogen to glucose Type 2 diabetic • cells are resistant to insulin • so blood glucose levels remain high • control through diet and exercise • medication (metformin) given • inject insulin • to lower blood glucose concentration • Graph • glucose concentrations are higher for the person with type 2 diabetes • the range for a person who does not have type 2 diabetes is 90 – 125 mg/dL • the range for a person with type 2 diabetes is 135 – 200 mg/dL • there is a steeper rise in glucose concentrations for the person with type 2 diabetes • takes longer for glucose concentrations to drop in the person with type 2 diabetes	(6)

Level	Mark	Descriptor
	0	no rewardable material.
Level 1	1-2	- demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. - presents an explanation with some structure and coherence.
Level 2	3-4	- demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed. - presents an explanation that has a structure which is mostly clear, coherent and logical.
Level 3	5-6	- demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. - presents an explanation that has a well-developed structure which is clear, coherent and logical.

Additional Guidance

Level 1	1-2	- A brief comment of how blood glucose is regulated in either type 2 or a healthy person or a valid comment from the graph - At least 2 comments from the graph OR a comment on glucose regulation and a comment on the graph
Level 2	3-4	- A brief description of either healthy blood glucose regulation OR Type 2 diabetes blood glucose regulation OR a comment on both - The response links to data on the graph
Level 3	5-6	- A detailed explanation of the control of blood glucose for both people including the role of either insulin or glucagon - The response links this to data on glucose levels on the graph and both insulin and glucagon

Total for Question 6 = 12 marks

