

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**TWENTY FIRST CENTURY SCIENCE**  
**BIOLOGY A**

UNIT 2 – Modules B4 B5 B6 (Higher Tier)

**SAMPLE ASSESSMENT MATERIAL**  
**(from 2010 onwards)**

Time: 40 minutes

Candidates answer on the question paper

**Additional materials (enclosed):**

None

Calculators may be used.

**Additional materials:** Pencil  
 Ruler (cm/mm)

Candidate Forename	<input type="text"/>	Candidate Surname	<input type="text"/>
Centre Number	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Candidate Number	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure 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	7	
2	6	
3	8	
4	7	
5	7	
6	7	
<b>TOTAL</b>	<b>42</b>	

This document consists of **8** printed pages.

Answer **all** the questions.

1 This question is about keeping things inside the body the same.

(a) Name the process which means **maintenance of a constant internal environment**.

..... [1]

(b) Which conditions inside the body need to be kept constant?

Put ticks (✓) in the boxes next to the **three** correct answers.

blood oxygen levels

skin pigmentation

water content of the body

salt content of the body

[1]

(c) The internal environment is often controlled by **negative feedback**.

Which **two** statements describe negative feedback?

Put ticks (✓) in the boxes next to the **two** best answers.

negative feedback increases rates of chemical reactions as body temperature rises

negative feedback works to change any steady state

negative feedback can be used to maintain a constant level

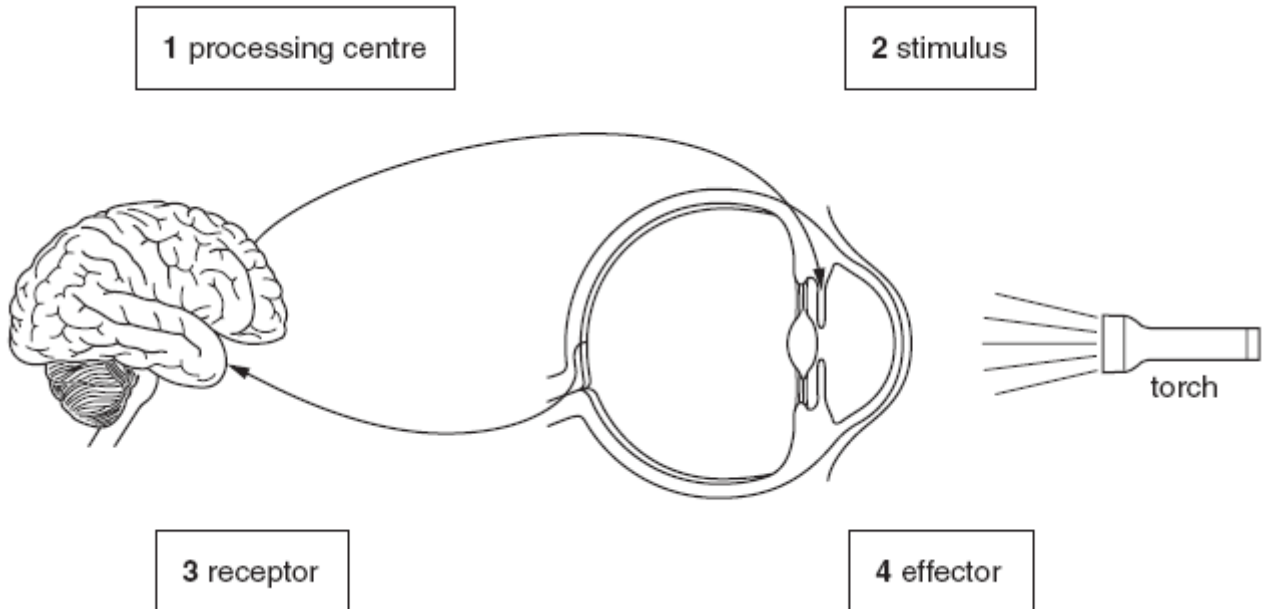
negative feedback between effectors and receptors reverses any changes that take place

negative feedback decreases rates of chemical reactions as body temperature rises

[2]

- (d) Negative feedback mechanisms are involved in controlling the amount of light entering the eye. The diagram shows negative feedback between the brain and the eye.

Draw **straight lines** to join each of the labels, **1**, **2**, **3** and **4**, to the correct part of the diagram.



[3]

[Total: 7]

2 This question is about processes in cells.

(a) Water enters and leaves cells by osmosis.

Explain what is meant by osmosis.

Use these words to help you.

**concentrated   dilute   membrane   water   partially permeable**

.....  
.....  
.....  
.....  
..... [3]

(b) Explain **one** difference between osmosis and diffusion.

.....  
..... [1]

(c) Enzymes are found in cells.

Which **one** of the following must remain constant for enzymes to work at their optimum?

Put a **ring** around the correct answer.

**number of cells   size of cell   temperature of cell   shape of cell**

[1]

(d) Which conditions will increase the rate of enzyme reactions?

Put a tick (✓) in the correct box.

fewer collisions between enzymes and other molecules

faster collisions between enzymes and other molecules

slower collisions between enzymes and other molecules

rapid changes of temperature

[1]

[Total: 6]

3 This question is about how organisms produce more cells.

(a) Write down the term which best fits each description.

(i) A section of DNA that codes for one protein.

answer .....

(ii) A long strand of DNA found in the nucleus of a cell.

answer .....

(iii) A type of cell division that produces identical copies of the cell.

answer .....

(iv) A type of cell division that produces a sex cell with half the number of chromosomes.

answer .....

(v) Another name for a sex cell such as a sperm or egg.

answer .....

[5]

(b) The statements describe how organisms produce new cells.

They are in the wrong order.

**A** The copies of chromosomes separate.

**B** The number of organelles in the cell increases.

**C** The cell divides into two cells.

**D** Each strand is copied to make two new strands (chromosomes).

**E** The two strands of each DNA molecule separate.

Put the statements into the correct order. The first one has been done for you.

B				
---	--	--	--	--

[3]

[Total: 8]

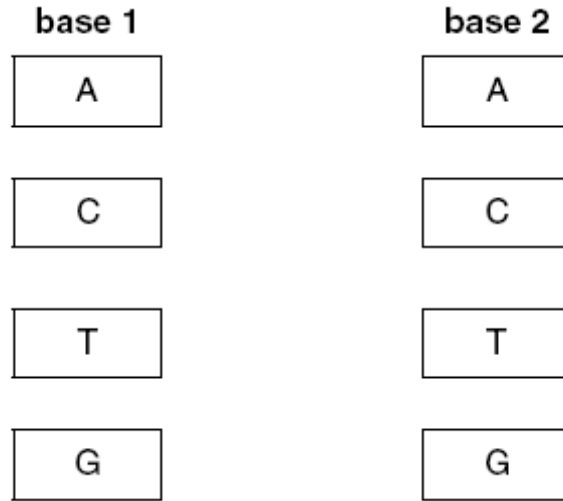
4 This question is about DNA.

(a) DNA is made from different bases.

(i) How many different types of bases are found in DNA?

answer ..... [1]

(ii) Draw **four** straight lines connecting the different bases in the left hand column with the correct bases in the right hand column to show which bases always pair up.



[1]

(b) Cells may divide by mitosis or meiosis.

Describe **two** differences between these two types of cell division.

.....  
.....  
..... [2]

(c) Cells in a human embryo up to the eight-cell stage are embryonic stem cells.

Explain how these embryonic stem cells have the potential to produce cells needed to replace damaged nervous tissue.

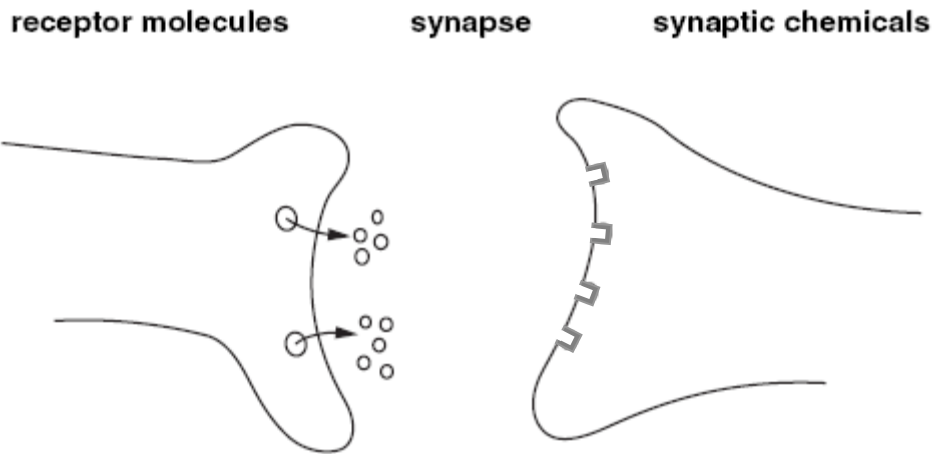
.....  
.....  
.....  
.....  
..... [3]

[Total: 7]

5 This is a question about the human nervous system.

(a) The diagram shows the endings of two nerve cells.

(i) Use these words to label the diagram.



[3]

(ii) Add an arrow to the diagram to show which way the impulse is travelling.

[1]

(b) Reflex actions are used by most animals.

Look at the statements about reflex actions.

Some are **true** and some are **false**.

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)**

Reflexes produce rapid, involuntary responses.

Only simple animals use simple reflexes.

Conditioning is when reflex responses are learnt.

Only complex reflexes are used to improve an animal's chances of survival.

Conditioned reflexes often increase the chances of survival.

[3]

[Total: 7]

6 Reflexes in human beings can be either **simple** or **conditioned**.

(a) Give one example of a conditioned reflex.

.....  
..... [1]

(b) Describe what is meant by a conditioned reflex.

.....  
.....  
.....  
..... [3]

(c) In some circumstances it is possible for the brain to modify a reflex response.

Which three statements are the best examples of how the brain can modify a reflex response?

Put ticks (✓) in the boxes next to the **three** best answers.

- being frightened of thunderstorms
- holding on to a hot plate
- holding your arm still while receiving an injection
- killing spiders
- salivating when you smell some delicious food
- not blinking when something comes close to your eyes
- hearing someone speak your name across a crowded room

[3]

[Total: 7]

**END OF QUESTION PAPER**

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**CONFIDENTIAL**

GCSE Unit

MARK SCHEME

SAMPLE ASSESSMENT MATERIAL  
(from 2010 onwards)

**Biology A (J633)**  
**Modules B4, B5 and B6**  
**Higher Tier**

**A222/02**

Maximum Mark: 42

## Guidance for Examiners

Additional Guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
<b>not/reject</b>	= answers which are not worthy of credit
<b>ignore</b>	= statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	= answers that can be accepted
(words)	= words which are not essential to gain credit
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

E.g. mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

5. If a candidate alters his/her response, examiners should accept the alteration.
6. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.
7. The list principle:  
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

8. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

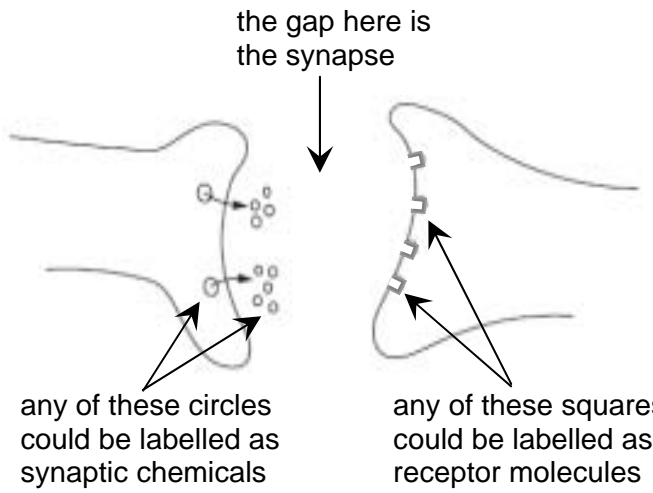
Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

Question		Expected Answers	Marks	Rationale
1	a	homeostasis (1)	1	<b>allow</b> any reasonable spelling
	b	blood oxygen levels <input checked="" type="checkbox"/> water content in the body <input checked="" type="checkbox"/> salt content in the body <input checked="" type="checkbox"/>	1	all three required for one mark - if less than 3 boxes ticked then no marks can be awarded <b>accept</b> any clear, unambiguous method of indicating correct boxes e.g. crosses, shading etc
	c	maintain a constant level <input type="checkbox"/> reverses any changes <input checked="" type="checkbox"/>	2	if more than 2 boxes ticked then deduct 1 mark for each additional answer candidate cannot score less than 0 marks <b>accept</b> any clear, unambiguous method of indicating correct boxes e.g. crosses, shading etc
	d	4 	3	4 correct = 3 marks 2 or 3 correct = 2 marks 1 correct = 1 mark  if 2 or more arrows drawn for 1 label, all arrows must point to the correct zone for the mark  processing Centre (brain) - arrow anywhere inside indicated zone  stimulus (torch) - arrow anywhere inside indicated zone  receptor (retina) – arrow touching any part of the inner layer at the back of the eye (thick line in mark scheme diagram)  effector (iris) – arrow(s) must point clearly to the iris <b>in front</b> of the lens only one arrow needed, to top or bottom segment <b>reject</b> arrow pointing to pupil (gap in between top and bottom iris)
		<b>Total</b>	<b>7</b>	

Question		Expected Answers	Marks	Rationale				
2	a	water moves (1) from high to low concentration (of water) / from dilute to concentrated solution (1) cross a (partially permeable) membrane (1)	3	<b>accept</b> water moves from low (dilute) to high (concentrated) concentration of dissolved solute (sugar)				
	b	osmosis only involves movement of molecules of water (solvent)/ORA / osmosis involves a (partially permeable) membrane/ORA (1)	1					
	c	temperature of cell (1)	1	if more than one answer ringed, 0 marks				
	d	faster collisions <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr><tr><td> </td></tr></table> (1)		✓			1	if more than 1 box ticked then 0 marks <b>accept</b> any clear, unambiguous method of indicating correct boxes e.g. crosses, shading etc
✓								
<b>Total</b>			<b>6</b>					

3	a	i	gene/allele (1)	1						
		ii	chromosome (1)	1						
		iii	mitosis (1)	1						
		iv	meiosis (1)	1						
		v	gamete (1)	1						
	b		<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>B</td><td>E</td><td>D</td><td>A</td><td>C</td></tr></table>	B	E	D	A	C	3	E before D (1) D before A (1) A before C (1)
B	E	D	A	C						
<b>Total</b>				<b>8</b>						

Question			Expected Answers	Marks	Rationale
4	a	i	4 (1)	1	
		ii		1	all correct for one mark
	b		<p><b>any two from:</b>  in meiosis the cells contain only half the number of chromosomes as parent cell / ORA;  meiosis produces gametes;  mitosis produces identical cells (to parent/each other) / ORA;</p>	2	
	c		<p>[3 marks] Candidate demonstrates a high level of understanding using ideas of specialisation, gene (re)activation and production of specific cell types. Answer is expressed clearly and logically.</p> <p>[2 marks] Candidate demonstrates incomplete understanding which partly explains the answer using some of the above ideas. Answer is expressed clearly and logically.</p> <p>[1 mark] Candidate demonstrates limited understanding by making a correct, relevant statement.</p>	3	
<b>Total</b>				<b>7</b>	

Question			Expected Answers	Marks	Rationale
5	a	i	<p>the gap here is the synapse</p>  <p>any of these circles could be labelled as synaptic chemicals</p> <p>any of these squares could be labelled as receptor molecules</p>	3	<p>one mark for each of the correct labels</p> <p><b>allow</b> synapse written in the gap but not above or below without an arrow</p> <p>arrows to receptor molecules and synaptic chemicals must touch or be obviously pointing to correct response</p>
		ii	direction of impulse from left to right, anywhere on the diagram (1)	1	
	b		<p>Reflexes produce rapid, involuntary ... <input type="checkbox"/> T</p> <p>Only simple animals use ... <input type="checkbox"/> F</p> <p>Conditioning is when ... <input type="checkbox"/> T</p> <p>Only complex reflexes ... <input type="checkbox"/> F</p> <p>Conditioned reflexes often increase ... <input type="checkbox"/> T</p>	3	<p>5 correct = 3 marks</p> <p>4 or 3 correct = 2 marks</p> <p>1 or 2 correct = 1 mark</p>
<b>Total</b>				<b>7</b>	

Question		Expected Answers	Marks	Rationale																		
6	a	any example of a conditioned reflex (1)	1	it must be an example where the final response has no direct connection to the stimulus e.g. fear of spiders <b>accept</b> examples in other animals e.g. Pavlov's dogs																		
	b	<p>[3 marks] Candidate demonstrates a high level of understanding using concepts of primary stimulus, secondary stimulus and the lack of a direct link between the final response and the primary stimulus. Answer is expressed clearly and logically.</p> <p>[2 marks] Candidate demonstrates partial understanding using concepts of primary and secondary stimuli, without referring to the lack of a direct link between the final response and the primary stimulus. Answer is expressed clearly.</p> <p>[1 mark] Candidate demonstrates limited understanding by making a correct, relevant statement.</p>	3																			
	c	<table style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding-right: 20px;">hot plate</td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td style="padding-left: 10px;">(1)</td> </tr> <tr> <td>injection</td> <td style="border: 1px solid black; width: 30px; height: 20px; text-align: center;">✓</td> <td style="padding-left: 10px;">(1)</td> </tr> <tr> <td></td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td></td> </tr> <tr> <td></td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td></td> </tr> <tr> <td style="padding-right: 20px;">not blinking</td> <td style="border: 1px solid black; width: 30px; height: 20px; text-align: center;">✓</td> <td style="padding-left: 10px;">(1)</td> </tr> <tr> <td></td> <td style="border: 1px solid black; width: 30px; height: 20px;"></td> <td></td> </tr> </table>	hot plate		(1)	injection	✓	(1)							not blinking	✓	(1)				3	if more than 3 boxes ticked then deduct 1 mark for each additional answer candidate cannot score less than 0 marks <b>accept</b> any clear, unambiguous method of indicating correct boxes e.g. crosses, shading etc
hot plate		(1)																				
injection	✓	(1)																				
not blinking	✓	(1)																				
		<b>Total</b>	<b>7</b>																			