Surname	Centre Number	Candidate Number
Other Names		2

WJEC CBAC

GCE A level

1075/01

BIOLOGY/HUMAN BIOLOGY – BY5

P.M. MONDAY, 17 June 2013

1 ¾ hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**16**	
3.	**12**	
4.	**15**	
5.	**11**	
6.	**8**	
7.	**10**	
Total	**80**	

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INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.
The quality of written communication will affect the awarding of marks.

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1. Distinguish between the following pairs of biological terms.

(a) seminiferous tubule and seminal vesicle; [2]

(b) DNA ligase and DNA polymerase; [2]

(c) gene and allele; [2]

(d) primary succession and secondary succession. [2]

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2. The Grand Banks is an area of sea off the coast of Newfoundland in Canada. It was once one of the most productive fishing grounds in the world for Atlantic cod.

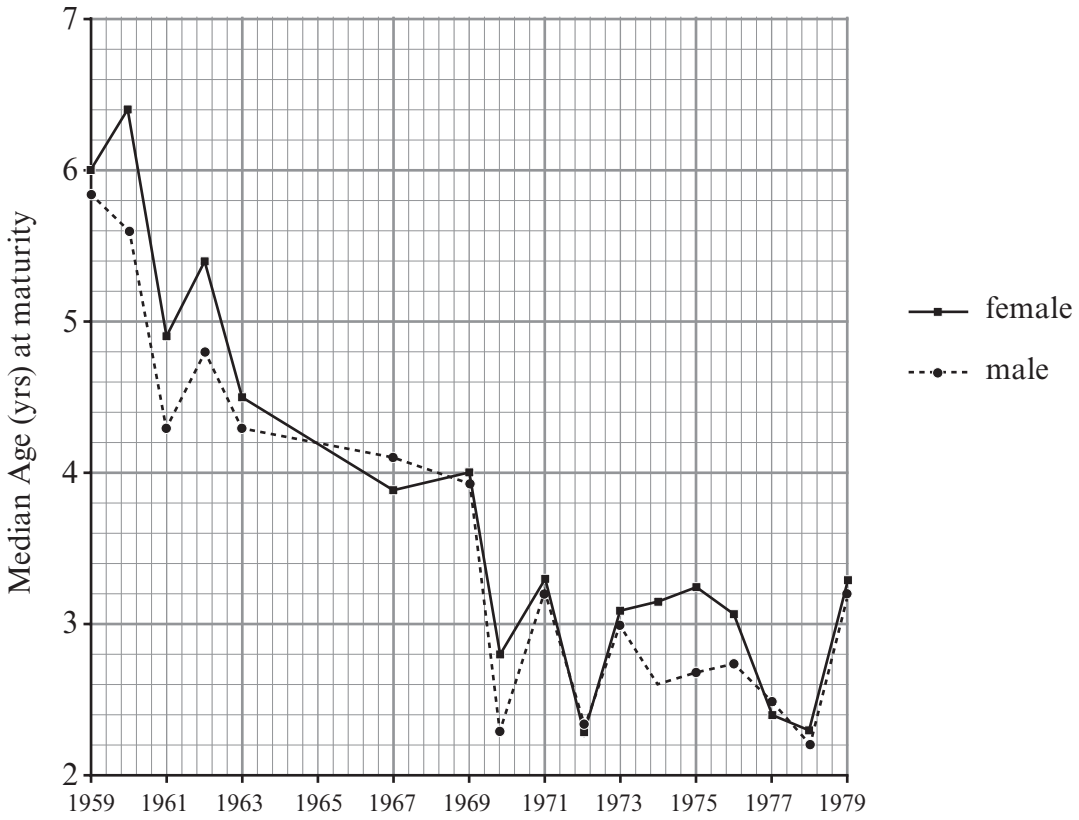
The cod was fished heavily for about 50 years.

About 60% of the total cod population of reproductive age was harvested annually.

Cod fishing in the Grand Banks was closed in 1992 but by then the population was less than 1% of what it had been.

Cod grow evenly throughout their life.

The cod that remained when fishing was finally closed were much smaller and grew more slowly than the cod that lived in the Grand Banks several decades previously.



Graph to show the median age of cod at sexual maturity in the same location during the time of heaviest fishing.

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(a) (i) Use the information provided opposite and your own knowledge of natural selection to describe and explain how the phenotype of the cod has changed since 1960. [5]

(ii) The cod fisheries have been closed for nearly 20 years but there has been little change in the phenotype and no population recovery. Suggest why there has been little change in the phenotype and no population recovery. [3]

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(b) Other than restricting the mesh size of nets, give **two** other methods which are used to prevent overfishing. [2]

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(c) (i) One solution to overfishing is aquaculture or fish farming.
Give **two** problems associated with producing fish in this way. [2]

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(ii) Wild trout are diploid **(2n)**. Some trout used in fish farming are triploid **(3n)**.
Suggest why triploid trout are infertile. [4]

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3. Haemophilia is caused by a sex linked gene.

(a) (i) What is meant by the term *'sex linkage'*? [1]

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(ii) Complete the following genetic diagram to show how parents who did not suffer from haemophilia, could have a son with haemophilia but also other children who did not suffer from haemophilia. Use the symbols $\mathbf{X^H}$ for the normal allele and $\mathbf{X^h}$ for the allele which causes haemophilia. [4]

Phenotype of parents	Normal male		Normal female	
Genotype of parents	.....		.....	
Genotype of gametes	.....	.....	.....	.....

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Genotype of offspring	.....	.....	.....	.....
Phenotype of offspring	.....	.....	.....	.....

(iii) What is the probability of the couple having a daughter with haemophilia? [1]

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(iv) What is the probability of the couple having another son with haemophilia? [1]

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(b) An organism has two genes A and B which are found on the same chromosome.

Complete the following genetic diagram for a cross between two individuals with genotype Aa Bb but where no crossing over occurs (complete linkage). [3]

Genotype AaBb AaBb

Genotype of gametes ....

Genotype of offspring ....

Ratio of Phenotype .....

(c) In another cross between two individuals with the genotype DdEe, where the genes D and E are on the same chromosome, the offspring showed four different types of phenotype. The phenotype of some of the offspring were far more common than expected and some phenotypes were very rare. Explain these observations. [2]

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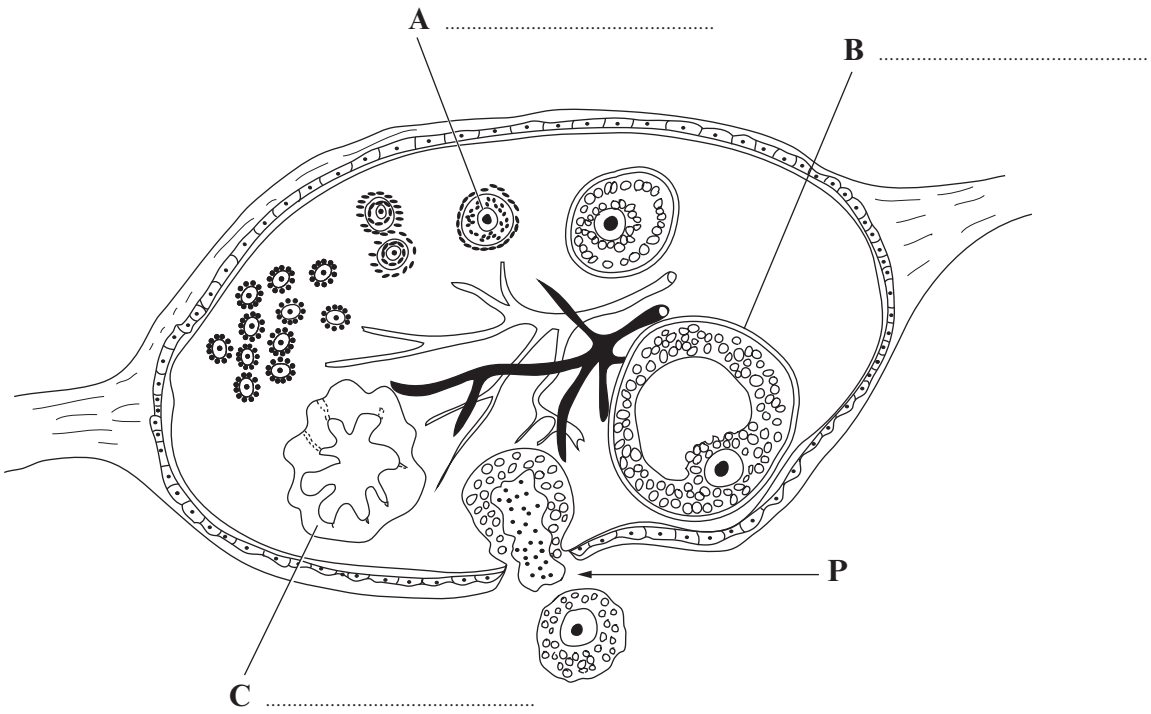
4. The diagram below represents a section through a human ovary showing the developmental stages which lead to ovulation.



(a) (i) Label the structures **A** – **C** shown on the diagram above. [3]

(ii) What process is taking place at **P**? [1]

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(iii) Name the hormone produced by the developing embryo which prevents the breakdown of structure **C**. [1]

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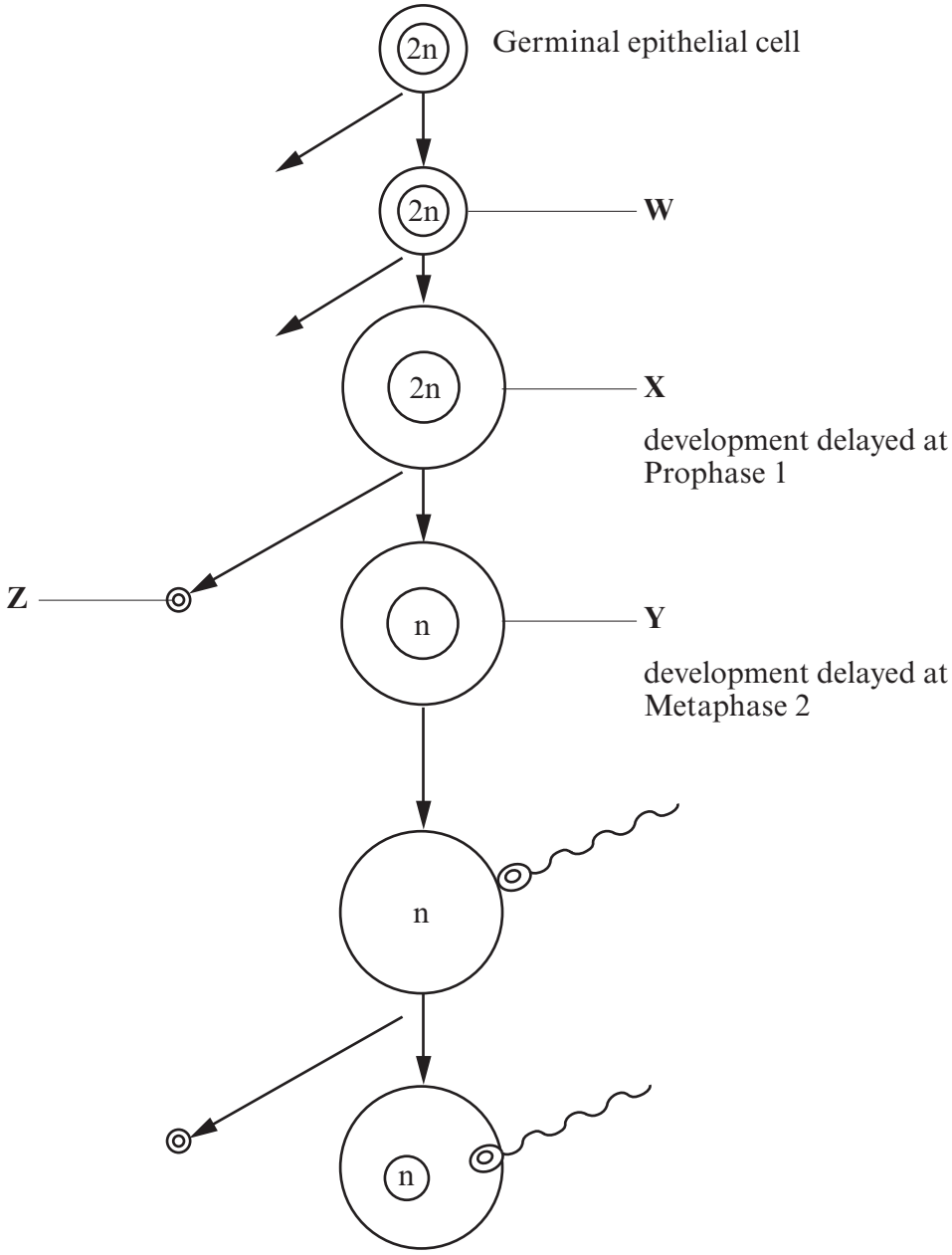
(b) The diagram below represents the stages of oogenesis and fertilisation.



(i) Name cells **W**, **X**, **Y** and **Z** shown on the diagram above. [4]

W .....

X .....

Y .....

Z .....

(ii) What process is involved in the production of cell **W**? [1]

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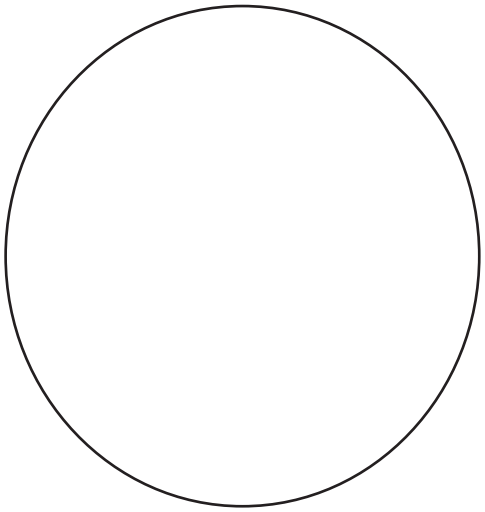
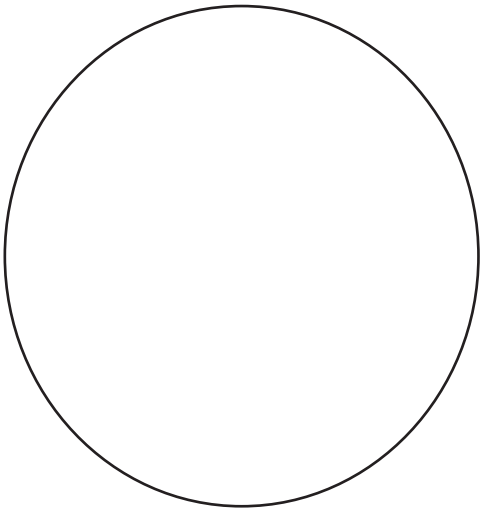
(iii) In the circles below draw diagrams showing **two pairs** of homologous chromosomes as they would appear in cell **X** on the diagram opposite (Prophase 1) and the appearance of the chromosomes following cell division to form cell **Y** on the diagram opposite (Metaphase 2). [3]

Cell **X**



Cell **Y**



(c) Suggest why only one functional female gamete is produced as a result of meiosis. [2]

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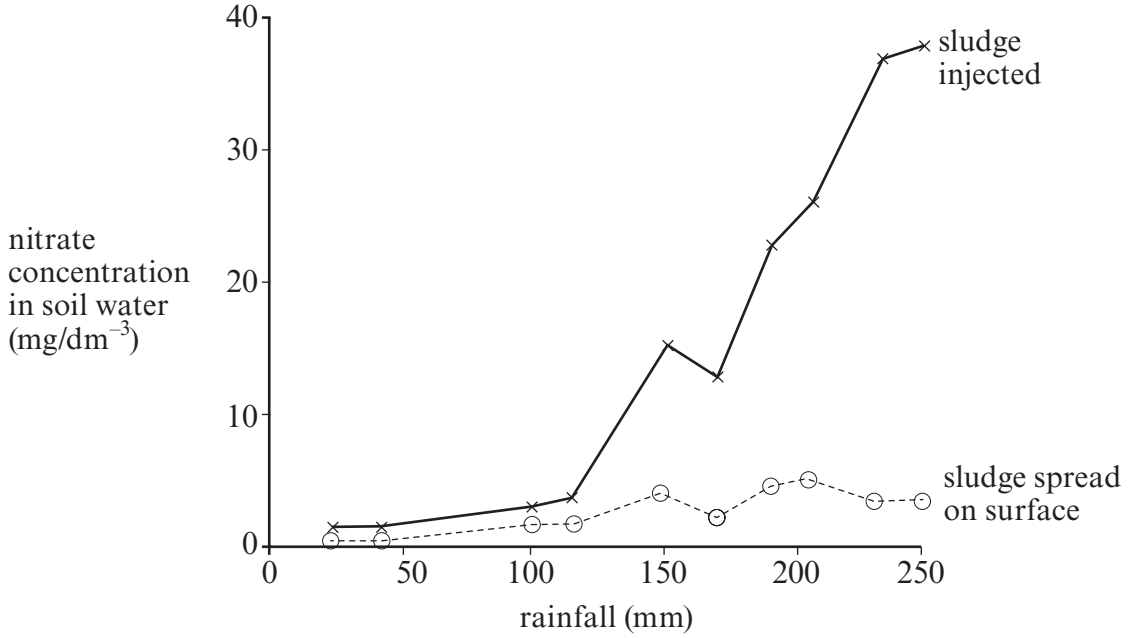
5. The treatment of sewage produces sludge as a product. This sludge contains high concentrations of nitrogen compounds such as nitrates and ammonia.

Experiments have been carried out into the leaching of nitrate from grassland to which sludge has been applied. The sludge was applied to two areas of grassland. On one area it was spread onto the surface whilst in the other it was injected at various points across the area.

The rate of leaching was measured by taking samples from the water flowing through the soil and measuring the concentration of nitrate in them after different volumes of rainfall had fallen.

The graph below shows the results obtained.



(a) (i) State **two** precautions that should be taken to ensure that the results are reliable. [2]

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(ii) Using the information in the graph describe fully the relationship between the leaching of nitrate and rainfall. [2]

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(iii) Using the data from the graph opposite, what advice would you give to a farmer as to the best time to apply sludge to the farmer's field for maximum benefit? [1]

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(b) The presence of high nitrate levels in rivers can lead to eutrophication. Briefly describe why eutrophication can result in the death of fish and many invertebrates in a river. [3]

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(c) Describe and explain what type of crops a farmer could grow to increase the nitrate level in the soil without using fertilisers, such as sludge. [3]

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6. *(a)* Explain what is meant by the term *gross primary productivity*. [1]

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(b) It has been found that an increase in temperature has a greater effect on the rate of respiration in a plant than on the rate of photosynthesis.
Using this information, explain what effect an increase in temperature has on the net primary productivity. [2]

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(c) (i) Give **two** ways by which energy is lost as it passes from one trophic level to the next. [2]

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(ii) Consumption efficiency is defined as the percentage of net production at one trophic level that is consumed by the next.
Suggest why the consumption efficiency of herbivores is much lower than that of carnivores. [2]

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(d) Tropical marine or tropical lake ecosystems generally have one or two more trophic levels than terrestrial ecosystems. Suggest **one** reason why this is the case. [1]

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7. Answer **one** of the following questions.
Any diagrams included in your answers must be fully annotated.

Either, *(a)* Describe how a nucleotide sequence on a DNA molecule results in the production of a polypeptide.

Or *(b)* Describe the principles and techniques involved in the cloning of plants. Give the advantages and disadvantages of this process. [10]

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END OF PAPER