



Topics for this weeks class:

Cell Cycle
 Mitosis
 Gene mutations
 Meiosis
 Genetic Variation

Playlist of videos to take notes on before the web class:

AQA VIDEOS	OCR VIDEOS	EDEXCEL VIDEOS
Mitosis	Cell Cycle & Mitosis	Gene Mutations
Mitosis & Cancer	Mitosis	Cell Division
Binary Fission	Gene Mutations	Before Meiosis
Before Meiosis	Meiosis Key Terms	Meiosis & Genetic Variation
Introduction to Meiosis	Before Meiosis	Mitosis
Meiosis	Meiosis	
Meiosis & Genetic Variation	Meiosis & Genetic Variation	
Gene Mutations		
Chromosome Mutation		



Q1.

(a) The following statements describe stages of mitosis.

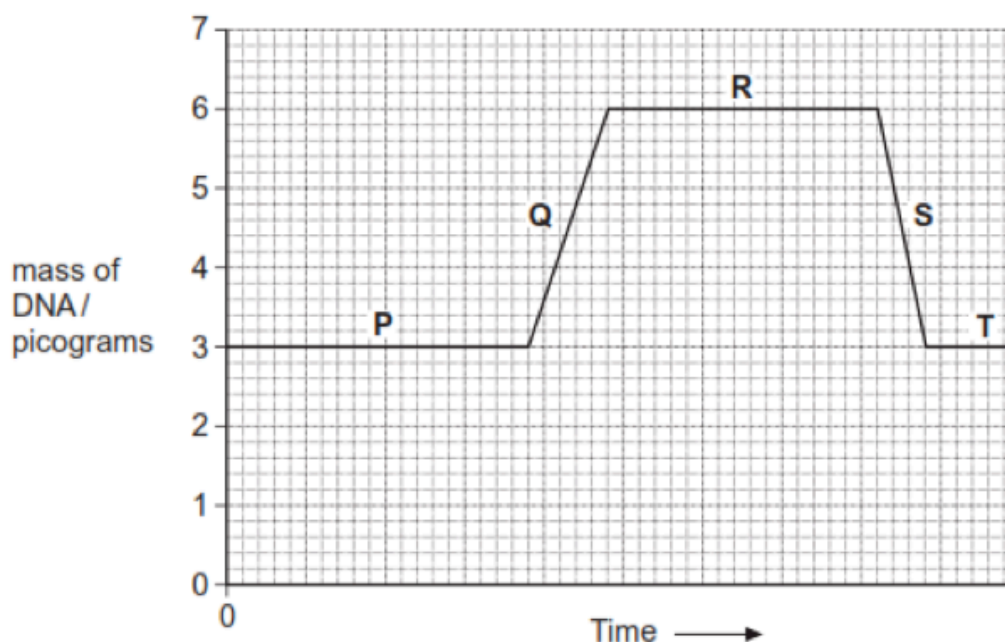
- A** chromosomes align at the centre of the cell attached to spindle fibres
- B** chromatids are in groups at the poles
- C** chromosomes become visible
- D** chromatids move towards the poles

Complete the table by entering the appropriate letter.

Stage of mitosis	Letter of description of the stage
Prophase	
Metaphase	
Anaphase	
Telophase	

(3)

(b) The graph shows changes in the mass of DNA in a cell during one cell cycle. Five stages have been identified on the graph.



(i) Which letter represents the stage when DNA is replicating?

(1)

(ii) Explain the change in the DNA content during stage S.

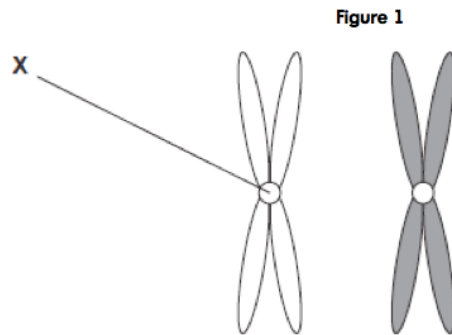
(1)

(Total 5 marks)



Q2.

- (a) **Figure 1** shows one pair of homologous chromosomes.



- (i) Name **X**.

(1)

- (ii) Describe the role of **X** in mitosis.

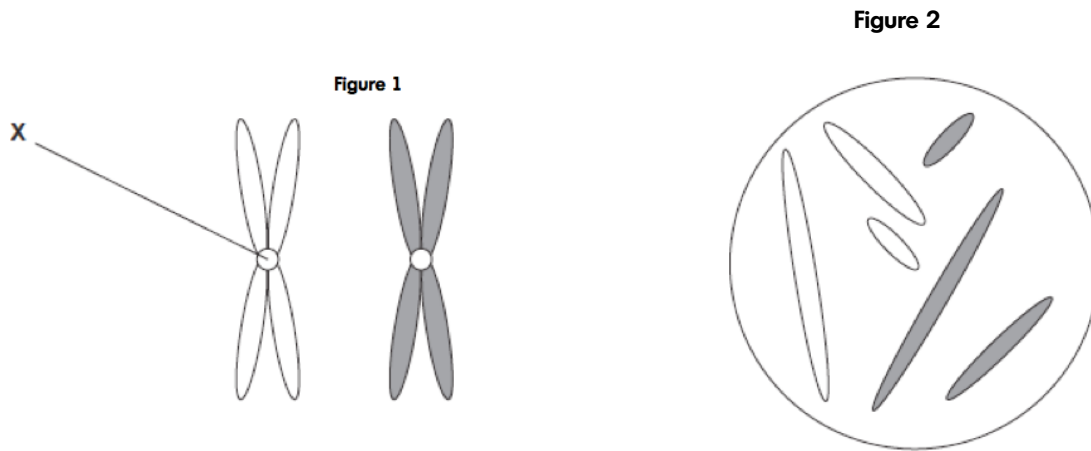
(2)

- (iii) Homologous chromosomes carry the same genes but they are **not** genetically identical. Explain why.

(1)



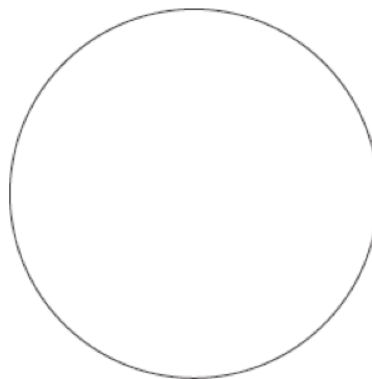
- (b) **Figure 2** shows three pairs of homologous chromosomes in a cell at the end of cell division.



- (i) The appearance of each chromosome in **Figure 2** is different from those shown in **Figure 1**. Explain why.

(1)

- (ii) Complete the diagram to show the chromosomes in one cell that could be produced from the cell in **Figure 2** as a result of meiosis.



(2)

- (iii) Other than independent segregation, give **one** way in which meiosis allows the production of genetically different cells.

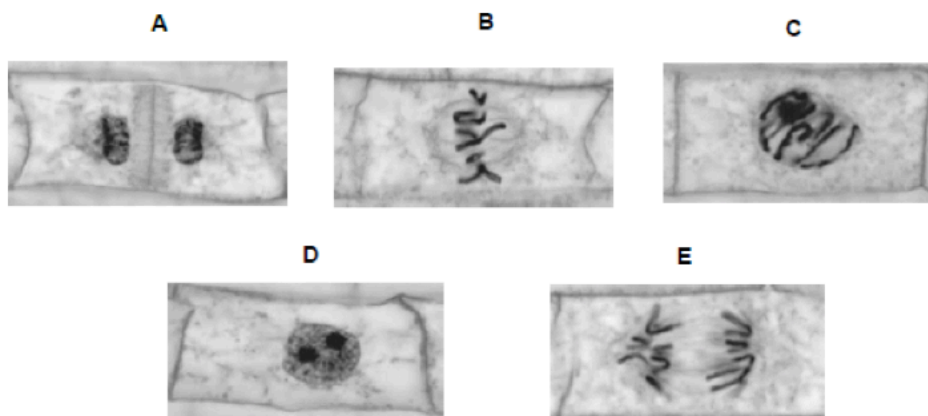
(1)

(Total 8 marks)



Q3.

The figure below shows some cells from an onion root tip at different stages of the cell cycle.



© Ed Reschke/Oxford Scientific/Getty Images

(a) Place stages **A** to **E** in the correct order. Start with stage **D**.

D

(1)

To obtain these images, the onion root tip was cut off, stained and put on a microscope slide. A cover slip was placed on top. The root tip was then firmly squashed and viewed under an optical microscope.

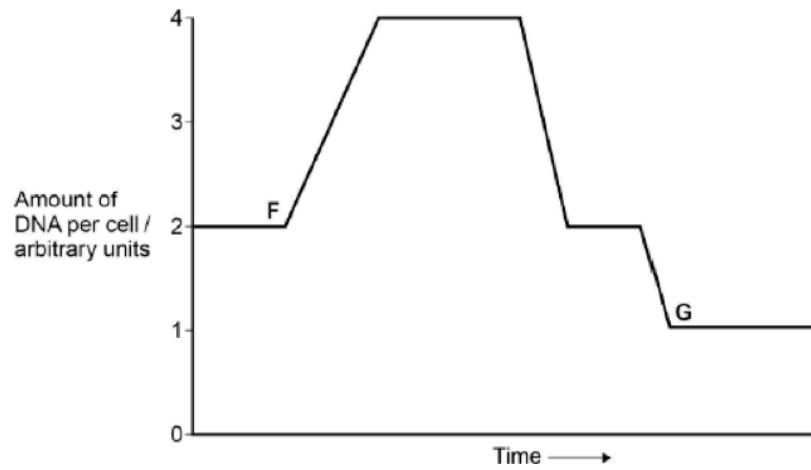
(b) Complete the table below to give **one** reason why each of these steps was necessary.

Step	Reason
Taking cells from the root tip	
Firmly squashing the root tip	

(2)



The figure below shows how the amount of DNA per cell changed during interphase and meiosis in an animal.



- (c) Explain how the behaviour of chromosomes causes these changes in the amount of DNA per cell between **F** and **G**.

(3)

- (d) What would happen to the amount of DNA per cell at fertilisation of cell **G**?

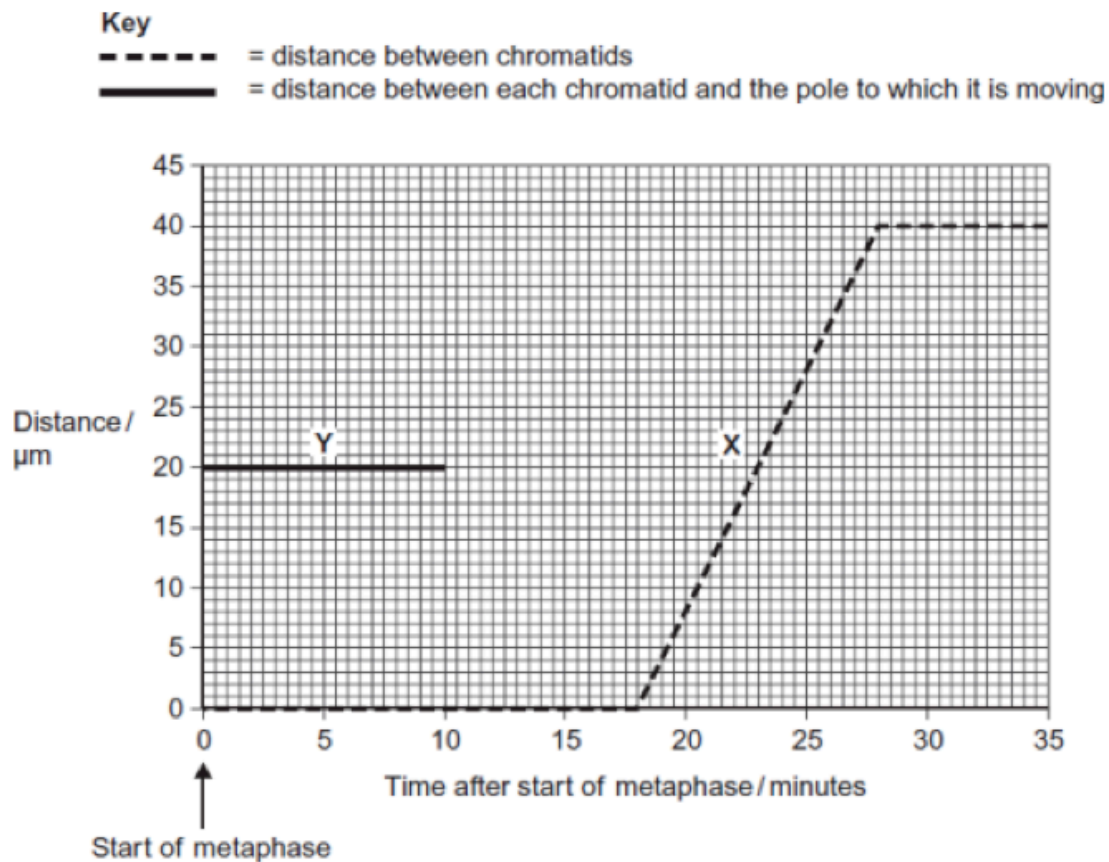
(1)

(Total 7 marks)



Q4.

- (a) The graph shows information about the movement of chromatids in a cell that has just started metaphase of mitosis.



- (i) What was the duration of metaphase in this cell?

----- minutes

(1)

- (ii) Use line X to calculate the duration of anaphase in this cell.

----- minutes

(1)

- (iii) Complete line Y on the graph.

(2)



- (b) A doctor investigated the number of cells in different stages of the cell cycle in two tissue samples, **C** and **D**. One tissue sample was taken from a cancerous tumour. The other was taken from non-cancerous tissue. The table shows his results.

	Percentage of cells in each stage of the cell cycle	
Stage of the cell cycle	Tissue sample C	Tissue sample D
Interphase	82	45
Prophase	4	16
Metaphase	5	18
Anaphase	5	12
Telophase	4	9

- (i) In tissue sample **C**, one cell cycle took 24 hours. Use the data in the table to calculate the time in which these cells were in interphase during one cell cycle. Show your working.

Time cells in interphase hours

(2)

- (ii) Explain how the doctor could have recognised which cells were in interphase when looking at the tissue samples.

.....

.....

.....

(1)

- (iii) Which tissue sample, **C** or **D**, was taken from a cancerous tumour? Use information in the table to explain your answer.

.....

.....

.....

.....

(2)

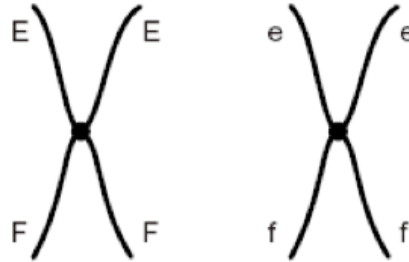
(Total 9 marks)



Q5.

Figure 1 shows a pair of chromosomes at the start of meiosis. The letters represent alleles.

Figure 1



- (a) What is an allele?

.....

.....

(1)

- (b) Explain the appearance of one of the chromosomes in **Figure 1**.

.....

.....

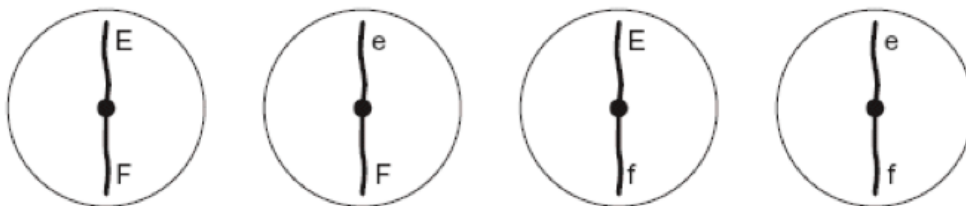
.....

.....

(2)

- (c) The cell containing this pair of chromosomes divided by meiosis. **Figure 2** shows the distribution of chromosomes from this pair in four of the gametes produced.

Figure 2



- (i) Some of the gametes formed during meiosis have new combinations of alleles.

Explain how the gametes with the combinations of alleles Ef and eF have been produced.

.....

.....

.....

.....

(2)



- (iii) Only a few gametes have the new combination of alleles Ef and eF. Most gametes have the combination of alleles EF and ef. Suggest why only a few gametes have the new combination of alleles, Ef and eF.

(1)

- (d) **Figure 3** shows a cell with six chromosomes.

Figure 3



- (i) This cell produces gametes by meiosis. Draw a diagram to show the chromosomes in one of the gametes.

(2)

- (ii) How many different types of gametes could be produced from this cell as a result of different combinations of maternal and paternal chromosomes?

(1)

(Total 9 marks)



Q6.

- (a) Describe the appearance and behaviour of chromosomes during mitosis.

(5)

- (b) Describe and explain the processes that occur during meiosis that increase genetic variation.

(5)

(Total 10 marks)



Q7.

- (a) Describe what happens to chromosomes in meiosis.

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings present.

(6)

- (b) Meiosis results in genetic variation in the gametes which leads to variation in the offspring formed by sexual reproduction. Describe how meiosis causes this variation and explain the advantage of variation to the species.

(5)

(Total 11 marks)