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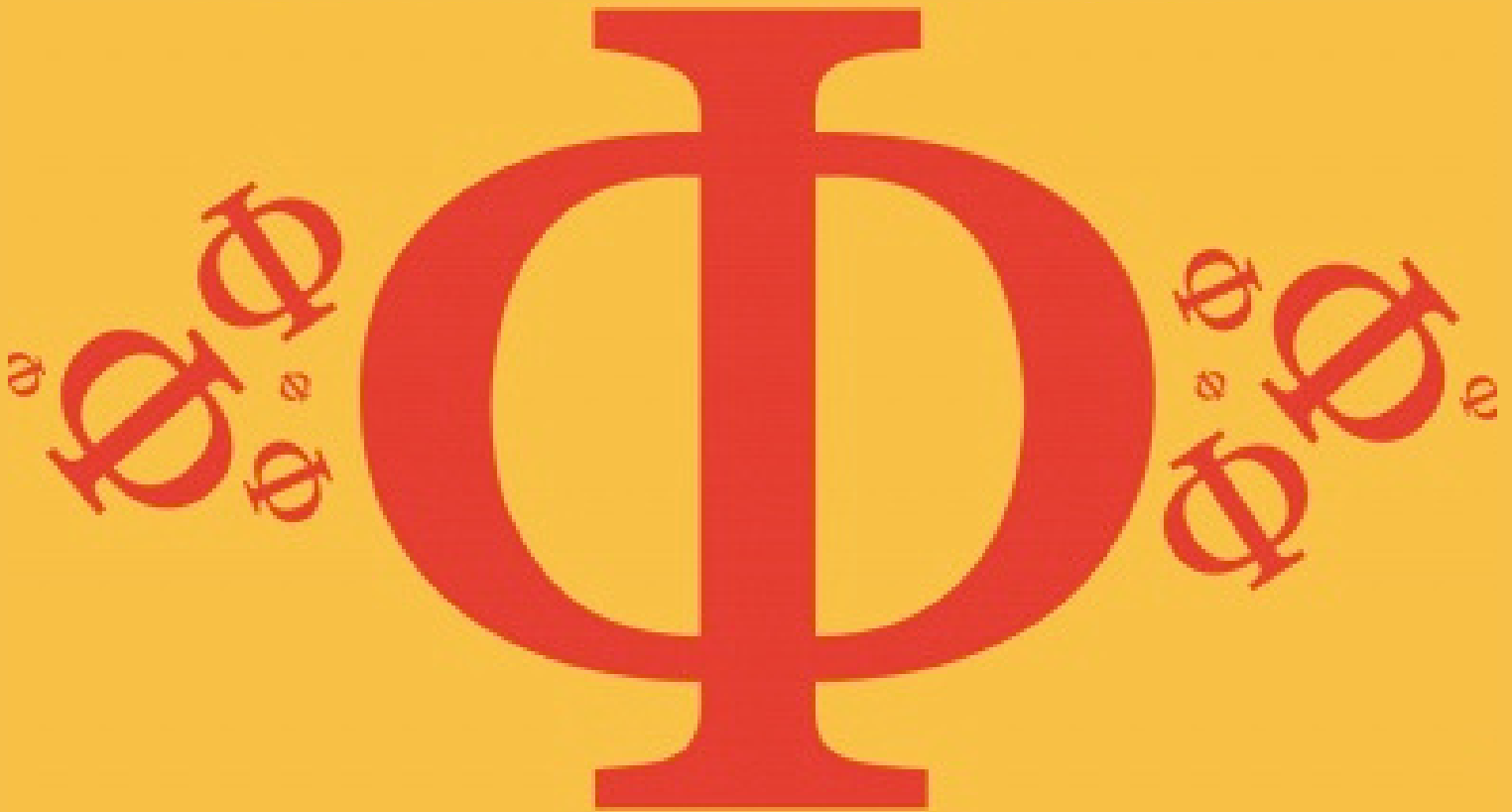Detailed mark scheme

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10.1 Meiosis

Medium

BIOLOGY

IB HL

10.1 Meiosis

Question Paper

Course	DP IB Biology
Section	10. Genetics & Evolution (HL Only)
Topic	10.1 Meiosis
Difficulty	Medium

Time allowed: 20

Score: /10

Percentage: /100

Question 1

Which of the following statements about meiosis are **incorrect**?

    I. The overall amount of DNA doubles just before meiosis
   II. Crossing over occurs between chromatids of non-homologous chromosomes
  III. Meiosis II is referred to as reduction division
  IV. Sister chromatids separate in anaphase I

  A. I, II and III

  B. I and IV

  C. All of them

  D. II, III and IV

[1 mark]

Question 2

The diploid number of a koala (*Phascolarctos cinereus*) is 16.

How many autosomes are there in a koala's egg cell?

  A. 7

  B. 8

  C. 14

  D. 32

[1 mark]

Question 3

Which of the following gives an accurate definition of genetic recombination?

  A. The orientation of homologous chromosomes as they align during metaphase I of meiosis

  B. The development of new alleles within a population through mutation

  C. The breaking and rejoining of DNA to create new combinations

  D. The loss of DNA telomeres through multiple cycles of replication

[1 mark]

Question 4

Which of the following most accurately describes the events that occur in meiosis I?

A.
Chromatids separate   Chiasmata form in prophase I

B.
Chromatids separate   Chiasmata form in metaphase I

C.
Homologous chromosomes separate   Chiasmata form in prophase I

D.
Homologous chromosomes separate   Chiasmata form in metaphase I

[1 mark]

Question 5

The diagram shows a pair of homologous chromosomes at the beginning of prophase I of meiosis and four possible examples of crossing over, **A – D**
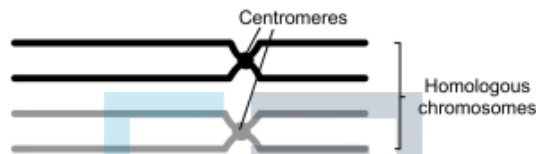
Which of the four representations of crossing over **cannot occur** in meiosis I?

A.

B.

C.

D.

Question 6

Mitosis has many similarities to **meiosis II**. Which of the following statements describe(s) **a difference** between the cellular processes of mitosis and meiosis II?

I. During prophase, the nuclear envelope disintegrates and the chromosomes condense

II. The ploidy of the cells entering the process

III. Replication occurs immediately before each process, to double the amount of genetic material

IV. During cytokinesis, the cytoplasm divides as new cell membranes are formed

    A. II only

    B. I, II and III

    C. III and IV

    D. II and III

[1 mark]

Question 7

Exchange of alleles is an important feature of meiosis. During which precise event of meiosis does the exchange of alleles take place?

    A. When a chiasma forms between two non-sister chromatids

    B. At the assortment of homologous chromosomes at the cell equator

    C. When gametes form in meiosis II

    D. During gene linkage

[1 mark]

Question 8

For a eukaryotic organism with a diploid number of 14, which calculation would be required to establish how many combinations of chromosomes can occur through independent assortment in meiosis? All the equations below are mathematically correct.

    A. $2 \times 7 = 14$

    B. $2^7 = 128$

    C. $2^{14} = 16\,384$

    D. $2^{14} \times 2^7 = 2\,097\,152$

Question 9

Which row of the table puts these DNA-containing structures into the correct order of size?

	Largest ←	Mid-sized	→ Smallest	
A	bivalent & tetrad the same size		chromosome	chromatid
B	bivalent	tetrad	chromatid	chromosome
C	tetrad	chromosome	bivalent	chromatid
D	chromosome	bivalent & tetrad the same size		chromatid

[1 mark]

Question 10

Which of the following cell types are haploid?

I. Primary spermatocyte

II. Oocyte

III. Spermatid

IV. Spermatozoon

   A. II, III and IV

   B. I and II

   C. I, III and IV

   D. All of them

[1 mark]