

Model Answers: Easy

1

The correct answer is **C**

- During **anaphase** the microtubules contract pulling the chromosomes apart, separating them into **chromatids**
- One chromatid per chromosome gets pulled to each **pole**
- The microtubule attaches to the **centromere** which is a small pinched section of the chromatid, hence the centromere leads the way towards the poles

A & D are incorrect as the diagrams illustrate the chromosomes lining up at the **equator** which occurs during **metaphase**

B is incorrect as the diagram illustrates chromosomes separated to the poles which is **late anaphase**

2

The correct answer is **C** because:

- The order for mitosis is **PMAT** (prophase, metaphase, anaphase and telophase)
- In **prophase** the individual chromosomes (that have been replicated to form sister chromatids) become obvious as the chromatin (DNA + histones) condenses
- In **metaphase** the chromosomes align at the equator
- In **anaphase** the chromosomes are separated into chromatids as the spindle microtubules contract pulling the attached centromeres (and therefore chromatids) to the poles
- In **telophase** there are two distinct areas of chromatids

A & D are incorrect as the first diagram in the sequence suggested shows two distinct areas of chromatids which shows that division has already occurred.

B is incorrect as the first diagram in the sequence suggested shows chromatids separated to the poles which is late anaphase.

3

The correct answer is **B** because

- During **prophase** the chromosomes **condense** showing the replicated DNA in the form of **sister chromatids**
- During the remaining stages of mitosis the sister chromatids separate to produce two genetically identical daughter cells

A & C are incorrect as during mitosis the sister chromatids are separated allowing for the formation of two genetically identical daughter cells.

D is incorrect as this suggests that the genetic material did not separate into two nuclei.

4

The correct answer is **B** because during

- **Interphase** - the nuclear envelope is present as cells are undergoing protein synthesis, growing and replicating the DNA so the nuclear envelope is needed to protect the genetic material
- **Telophase** - a nuclear envelope has reformed around the chromatids at each pole of the cell, ready for cytokinesis and the formation of two separate cells

A is incorrect as a nuclear envelope is also present during telophase

C & D are incorrect as during prophase the nuclear envelope breaks down and is therefore also not present in anaphase

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The correct answer is **D** because:

- During DNA replication in interphase (S phase), all genetic material is cloned so there are two identical chromatids per chromosome
- In order for the sister chromatids to be separated they must align at the equator and their centromeres must attach to the spindle microtubules

A is incorrect as the replication of DNA occurs during interphase (S phase) and therefore this is when each chromosome forms the sister chromatids

B is incorrect as chromatids reach the poles of the mitotic spindle during anaphase

C is incorrect as the condensing of the chromatin occurs during prophase

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The correct answer is **B** because:

- Centromeres are the narrow (pinched) region of chromosomes that contain no genes and which attach sister chromatids together
- The mitotic spindle attached to the centromere
- During **anaphase** the centromeres within chromosomes separate to form two separate sister chromatids and get pulled towards the poles as the spindle microtubules contract
- During **prophase** the chromatin (DNA and histones) condenses

A & D are incorrect as during metaphase the chromosomes align themselves at the equator and the centromeres attach to the spindle microtubules

C is incorrect as during telophase the condensed DNA uncoils and a nuclear envelope reforms around them

7

The correct answer is **D** because

- DNA is replicated during the S (synthesis) phase of interphase
- Each DNA molecule is replicated so there are two versions (chromatids) of the same molecule of DNA
- A chromosome consists of two identical sister chromatids and therefore consists of 2 molecules of DNA

A is incorrect as prophase is where the chromosomes start to coil

B is incorrect as metaphase is when the chromosomes line up on the equator

C is incorrect as anaphase is when the chromatid centromeres divide separating the chromatids and the contracting spindle microtubules move the chromatids to the poles.

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The correct answer is **A** because

- **Cytokinesis** is the division of cytoplasm into two separate cells
- The nuclear envelope reforms during **telophase**
- Cell structures replicate during **interphase**

9

The correct answer is **D** because:

- DNA replication occurs during the S phase of **interphase**
- DNA replication must occur before the cell enters the mitotic (nuclear division) stages

Answers **A**, **B** and **C** are all stages of mitosis; during these phases the DNA has already been replicated. During metaphase the chromatids are separated but this does not involve the DNA double helix uncoiling and separating.

10

The correct answer is **C** because:

- During **interphase** (S phase) the DNA molecules have replicated to form sister chromatids
- Each chromatid contains one DNA molecule (therefore a chromosome contains 2 identical DNA molecules as it contains 2 identical sister chromatids)

- As human cells have a diploid number of 46 this replication results in 92 molecules

A is incorrect as cell 1 could not divide into 2 daughter cells with the **same** number of DNA molecules

B & D are incorrect as this would involve cells undergoing meiosis **not** mitosis as 23 is the haploid number for human gametes