

1.1 Assessment

Match each term on the left with the best description on the right. Each description may be used only once.

Term	Description
1. <u>C</u> DNA	A. requires two parents and produces genetically different offspring
2. <u>D</u> chromosome	B. requires only one parent to produce genetically identical offspring
3. <u>A</u> sexual reproduction	C. is a double-stranded molecule carrying an organism's genetic information
4. <u>B</u> asexual reproduction	D. is a condensed structure that is passed on from the parents to the offspring during reproduction

Circle the letter of the best answer for questions 5 to 17.

5. The Vancouver Aquarium introduced the Ocean Wise program to educate and promote sustainable seafood choices. Which of the following do you think a program like this would help reduce?

I	the extinction of marine species
II	the depletion of natural resources
III	the amount of seafood people ate

- A. I and II only
 B. I and III only
 C. II and III only
 D. I, II, and III
6. Which of the following is an example of a sustainable practice?
- A. cutting down trees without planting new seedlings
 B. growing and harvesting of crops that allow future crop yields
 C. clearing land and making the soil unsuitable for agriculture use
 D. fishing methods that will diminish the entire population of salmon
7. Sustainability of organisms is dependent on the ability of the organisms to
- A. obtain nutrients.
 B. grow and develop.
 C. migrate to different habitat.
 D. pass on their genetic information to future generations.

8. "Continuity" is dependent on whether living things

A. grow.

C. use energy.

☒ B. reproduce.

D. respond to stimuli.

9. If continuity did not occur for a species, then that species would face the threat of

A. isolation.

C. habitat loss.

☒ B. extinction.

D. propagation.

10. Which of the following is associated with asexual reproduction?

I	one parent
II	genetic variation between offspring
III	offspring have the exact genetic makeup as the parent

A. I and II only

C. II and III only

☒ B. I and III only

D. I, II, and III

11. Which of the following is an example of asexual reproduction?

☒ A. a *paramecium* splits into two new organisms

B. a black-capped chickadee uses a variety of songs to attract mates

C. a checkerspot butterfly transfers pollen from one wildflower to another

D. a male red fox successfully courts a vixen, resulting in a litter of four kits

12. A horse has 64 chromosomes. During sexual reproduction, how many chromosomes does each of the parents contribute to the offspring?

	Male Horse	Female Horse
☒ A.	32	32
B.	32	64
C.	64	32
D.	64	64

13. What are the building blocks of DNA called?

A. sugars

☒ C. nucleotides

B. chromatins

D. chromosomes

14. What do asexual reproduction and sexual reproduction have in common?

- A. They both require the individual finding a mate.
- B. They both result in genetically identical individuals.
- C. They both involve the parent inheriting DNA from the offspring.
- ☒ D. They both involve the passing on of genetic material to future generations.

15. Which of the following describes the results of most cases of sexual reproduction?

I	offspring are genetically different from parents
II	offspring are genetically identical to both parents
III	offspring are genetically different from each other

- A. I and II only
- ☒ B. I and III only
- C. II and III only
- D. I, II, and III

16. Chromosomes consist of which of the following?

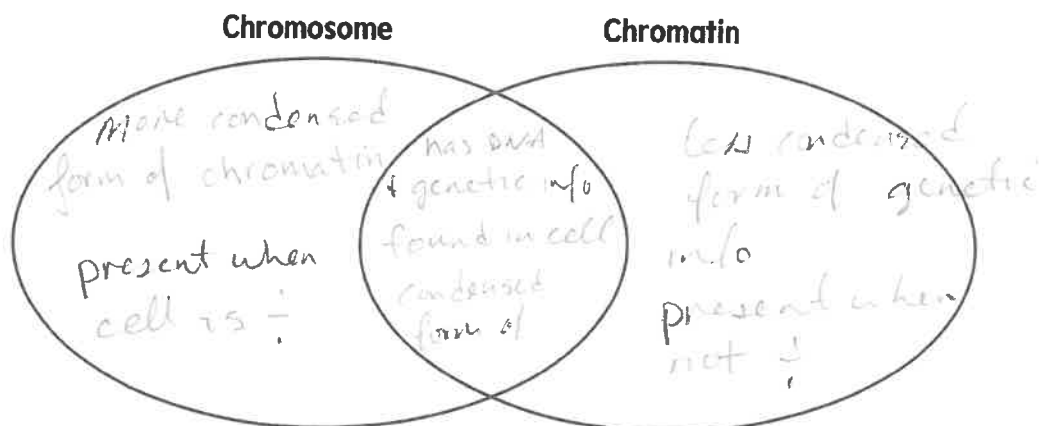
I	DNA
II	nucleotides
III	A, C, T, and G

- A. I and II only
- B. I and III only
- C. II and III only
- ☒ D. I, II, and III

17. What determines the colour of a grizzly bear's fur?

- ☒ A. the DNA sequence
- B. the type of nucleotides
- C. the size of the chromatin
- D. the number of chromosomes

18. Complete the Venn diagram to compare and contrast chromosome and chromatin.



1.2 Assessment

Match each term on the left with the best description on the right. Each description may be used only once.

Term	Description
1. <u>A</u> clone	A. identical copy of a cell
2. <u>C</u> spore	B. series of events that make up the life cycle of a cell
3. <u>D</u> budding	C. structure released by a sporangium during asexual reproduction
4. <u>B</u> cell cycle	D. type of asexual reproduction where a bud forms from the parent
5. <u>F</u> binary fission	E. type of asexual reproduction where plants grow from parts of its roots, stems, or leaves
6. <u>E</u> vegetative propagation	F. type of asexual reproduction where the parent cell splits into two identical daughter cells

Circle the letter of the best answer for questions 7 to 23.

7. In which of the following methods of reproduction are the parent cells genetically identical to the daughter cells?

I	budding
II	binary fission
III	spore formation

- A. I and II only
 B. I and III only
 C. II and III only
D. I, II, and III
8. What do budding, binary fission, and spore formation have in common?
 A. They require two parent cells.
B. They require only one parent cell.
 C. They produce only one daughter cell.
 D. They are all forms of sexual reproduction.
9. Which of the following methods do bacteria that cause tooth decay use to reproduce?
 A. budding
B. binary fission
 C. spore formation
 D. vegetative propagation

10. What are the end products of binary fission?

- ☒ A. two independent daughter cells that are identical to each other
- B. one daughter cell that is genetically different from the parent cell
- C. two independent daughter cells that are different from each other
- D. two daughter cells that are genetically different from the parent cell

11. Yeast reproduce by

- ☒ A. budding.
- B. binary fission.
- C. spore formation.
- D. vegetative propagation.

12. During budding, what is usually formed?

- A. a bud from the daughter cell
- B. new DNA from the parent cell
- ☒ C. an outgrowth from the parent cell
- D. new stems and roots from the parent cell

13. Which method does mould use to produce more mould on a piece of cheese?

- A. budding
- B. binary fission
- ☒ C. spore formation
- D. vegetative propagation

14. Which of the following describes when spores will grow and divide?

- A. when they are encased in a sporangium
- B. when they are in an environment with harsh conditions
- ☒ C. when they are in an environment with favourable conditions
- D. when leaves from the existing plant provide nutrients for the spores

15. Which of the following types of reproduction involve the cell cycle?

I	budding
II	binary fission
III	spore formation

- A. I and II only
- ☒ B. I and III only
- C. II and III only
- D. I, II, and III

16. Daffodil and tulip bulbs are planted in the fall. In the spring, these flowers grow from the bulbs. This is an example of

- A. budding.
- B. binary fission.
- C. spore formation.
- D. vegetative propagation.

17. How are potato tubers and strawberry runners similar?

- A. They are not clones of the parent plant.
- B. They are like stems that produce new plants.
- C. They are used by plants to reproduce sexually.
- D. They are like leaves that develop the roots of the new plant.

18. Which of the following techniques takes a section of the root and joins it to another plant?

- A. cutting
- B. grafting
- C. splitting
- D. air layering

19. The cell cycle consists of which of the following?

I	mitosis
II	interphase
III	cytokinesis

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III

20. During which phase of mitosis do the chromosomes line up in the middle of the cell?

- A. telophase
- B. anaphase
- C. prophase
- D. metaphase

21. Copies of DNA are made during

A. prophase.

B. anaphase.

C. telophase.

D. interphase.

22. Which of the following occurs during anaphase?

A. spindle fibres form

B. nuclear membrane disappears

C. chromosomes are pulled to the opposite ends of the cell

D. nuclear membrane reappears around the two new sets of chromosomes

23. The cytoplasm is divided to produce two new cells during

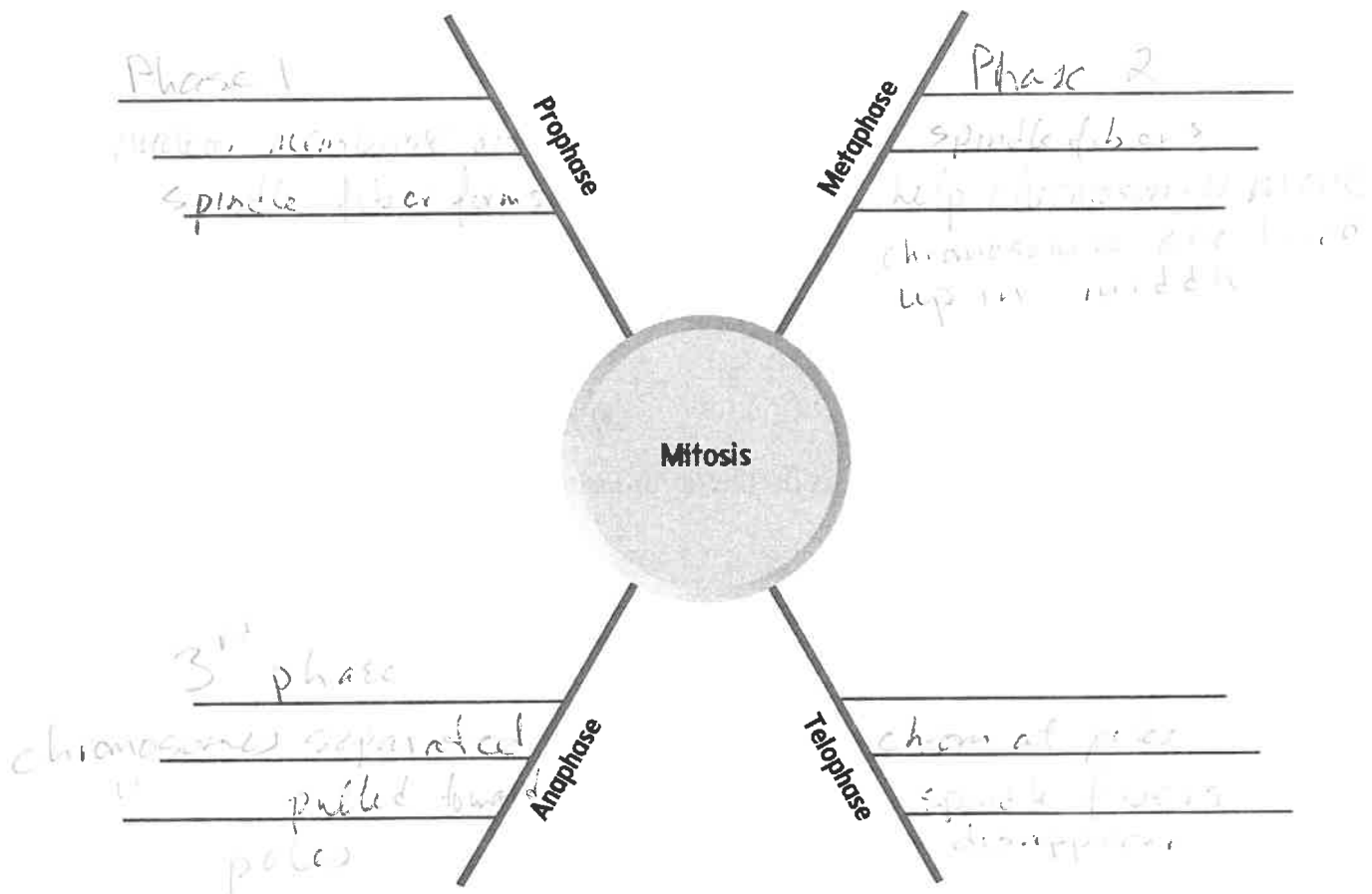
A. prophase.

B. anaphase.

C. interphase.

D. cytokinesis.

24. Complete the following spider map for the phases of mitosis. Describe what happens during each phase of mitosis.



Topic 1.3

1.3 Assessment

Match each term on the left with the best description on the right. Each description may be used only once.

Term	Description
1. <u>C</u> diploid	A. a sex cell
2. <u>A</u> gamete	B. union of the egg and sperm
3. <u>E</u> haploid	C. has a full set of chromosomes
4. <u>D</u> meiosis	D. process that produces haploid cells
5. <u>B</u> fertilization	E. has half the number of chromosomes

Circle the letter of the best answer for questions 6 to 20.

- What does the female parent contribute in sexual reproduction?
☒ A. an egg
B. a sperm
C. a zygote
D. an ovary
- Where are sperm produced?
A. in the brain
B. in the uterus
☒ C. in the testes
D. in the ovaries
- How are eggs and sperm similar?
A. They are diploid cells.
☒ B. They are haploid cells.
C. They are produced by mitosis.
D. They are produced by fertilization.
- What is formed when a sperm fertilizes an egg?
☒ A. a zygote
B. a gamete
C. a haploid cell
D. a homologous chromosome
- The Vancouver Island marmot has 40 chromosomes in its body cells. How many chromosomes would you expect a male marmot to have in its sperm cells?
A. 10 chromosomes
☒ B. 20 chromosomes
C. 40 chromosomes
D. 80 chromosomes

11. The gametes of a white-tailed deer have 35 chromosomes. When the sperm of a white-tailed buck combines with the egg of a white-tailed doe, how many chromosomes would the zygote have?
- A. 17.5 chromosomes
B. 35 chromosomes
C. 70 chromosomes
D. 140 chromosomes
12. What usually combines during fertilization?
- A. zygotes
B. embryos
C. gametes
D. diploid cells
13. Which of the following shows the series of events in human development?
- A. embryo → zygote → sperm + egg → fetus
B. sperm + egg → fetus → zygote → embryo
C. zygote → fetus → embryo → sperm + egg
D. sperm + egg → zygote → embryo → fetus
14. What allows a zygote to develop into an embryo?
- A. the zygote dividing by mitosis over several weeks
B. the zygote dividing by meiosis over several weeks
C. the zygote developing into gametes through mitosis over several weeks
D. the zygote fusing with another zygote and then dividing by meiosis over several weeks
15. Which of the following is associated with sexual reproduction?

I	meiosis
II	pollination
III	fertilization

- A. I and II only
B. I and III only
C. II and III only
D. I, II, and III

16. Which of the following applies to meiosis?

	Number of Cell Divisions	Number of Daughter Cells
A.	2	4
B.	2	2
C.	1	4
D.	1	2

17. Paired chromosomes are called

A. diploid.

C. asexual.

B. haploid.

D. homologous.

18. During which phase of meiosis are the homologous chromosome pairs lined up in the middle of the cell?

A. prophase I

C. telophase I

B. anaphase I

D. metaphase I

19. Four nuclei form around the sets of chromosomes during

A. prophase II.

C. telophase II.

B. anaphase II.

D. metaphase II.

20. When is the nuclear membrane disappearing during meiosis?

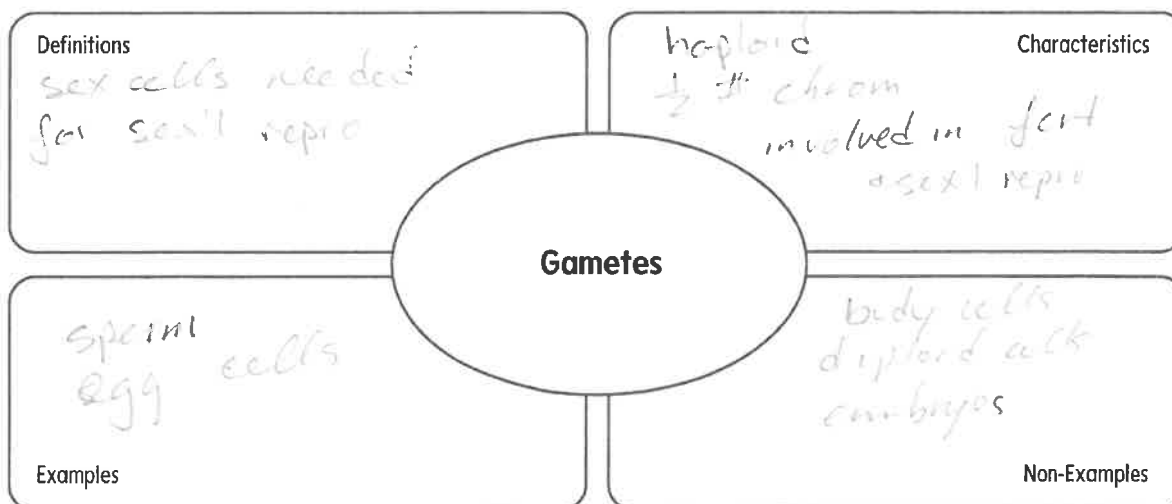
A. interphase and prophase I

C. telophase I and telophase II

B. prophase I and prophase II

D. metaphase I and anaphase II

21. Complete the following Frayer model for gametes.



1.4 Assessment

Match each term on the left with the best description on the right. Each description may be used only once.

Term	Description
1. <u>C</u> genetic variation	A. type of reproduction that requires one parent
2. <u>B</u> sexual reproduction	B. type of reproduction that requires two parents
3. <u>A</u> asexual reproduction	C. DNA sequences are different for each individual in a species

Circle the letter of the best answer for questions 4 to 10.

4. Asexual reproduction requires

- A. two parents. C. only one parent.
 B. two gametes. D. only one gamete.

5. Which of the following is an advantage of asexual reproduction?

- A. it occurs really slowly
B. it allows the population to grow rapidly
 C. it takes time for the offspring to mature before they can reproduce
 D. it allows the parents to pass on 50% of their genetic material to their offspring

6. A lack of genetic diversity from asexual reproduction means that

- A. all the gametes are clones of each other.
B. all the offspring are genetically identical to each other.
 C. the offspring did not inherit any genetic materials from the parents.
 D. the population have individuals with different combinations of DNA sequences.

7. A deadly fungal disease hit an apple orchard that was grown by asexual reproduction using grafting. What would you expect to happen to the rest of the crop if one apple tree was vulnerable to that disease?

- A. All the apple trees would grow rapidly, producing more apples.
 B. All the other apple trees would be resistant to the fungal disease.
 C. All the other apple trees would adapt so that they could survive the disease.
D. All the other apple trees would be equally vulnerable to the disease and could be wiped out.

8. Sexual reproduction promotes

☒ A. genetic diversity.

☐ B. susceptibility to disease.

☐ C. the production of clones.

☐ D. the same features in all the individuals.

9. Which of the following explains why finding a mate for sexual reproduction is a disadvantage?

I	It is time consuming to look for that mate.
II	It exposes the organism to potential predators.
III	It may involve competition with other organisms for that mate and result in injury or death.

☐ A. I and II only

☐ C. II and III only

☐ B. I and III only

☒ D. I, II, and III

10. Which of the following is a disadvantage of sexual reproduction?

☐ A. No gametes are required.

☒ B. Fewer offspring are produced.

☐ C. It is an energy efficient way to produce offspring.

☐ D. A shorter time is needed to produce the offspring.

11. Complete the T-chart for sexual reproduction showing its advantages and disadvantages.

Sexual Reproduction

Advantages	Disadvantages
promotes genetic diversity can withstand Δ's in environment more variation so less susceptible to disease	2 parents more time to find mate competition for mates more energy fewer offspring raising offspring more energy

What happens when there is an error in meiosis?

What's the Issue?

In humans, meiosis is the cell division that produces gametes with 23 chromosomes. If a mistake occurs during meiosis, a gamete may have an extra copy of an entire chromosome. When this gamete fuses with a normal gamete, the individual ends up with 47 chromosomes, instead of the typical 46 chromosomes. There will then be an extra chromosome in every cell in the body. In most cases, the incorrect number of chromosomes results in miscarriages in humans. In other cases, individuals with this chromosomal abnormality are born with birth defects, severe disabilities, and health problems.

The most common chromosomal abnormalities include trisomy 21, trisomy 13, trisomy 18, and sex-chromosome trisomies. Trisomy is the condition where a person has an extra copy of a chromosome. It can be detected by analyzing the individual's karyotype. Trisomies 13 and 18 are rare in humans because the fetuses have severe developmental problems. They usually end in miscarriages because the fetuses fail to develop to birth.

In trisomy 21, there are three copies of chromosome 21. This is the primary cause of Down syndrome. Individuals with this condition have birth defects, severe disabilities, and a shorter life expectancy. The risk of having a child with Down syndrome increases as the mother ages. Trisomy 21 is due to a mistake that occurs when the chromosomes fail to separate during meiosis. In most cases, an extra chromosome 21 ends up in the gamete, resulting in the gamete having 24 chromosomes. When this gamete undergoes fertilization, the resulting zygote has 47 chromosomes. As the zygote divides and becomes a fetus, all the body cells in the fetus will have an extra chromosome.

The other types of trisomies involve sex chromosomes. Humans typically have 23 pairs, or 46 chromosomes. The 23rd pair is known as the sex chromosomes. Females usually have XX and males usually have XY. In sex-chromosome trisomies (XXX, XXY, and XYY) a pair of sex chromosomes do not separate properly during gamete formation. Individuals with these chromosomal abnormalities have an extra sex chromosome in their gametes. Compared to the other chromosomal abnormalities, sex-chromosome trisomies have less severe results. Individuals with these conditions may experience reduced fertility or sterility.

A mistake in meiosis can cause a chromosomal imbalance. In some cases, the results are devastating and fatal. In other cases, the individuals may live relatively normal lives with some serious health consequences.

