Q1. (2020)

1 What is meant by the term cell differentiation?

A Cells become organs

B Cells become organ systems

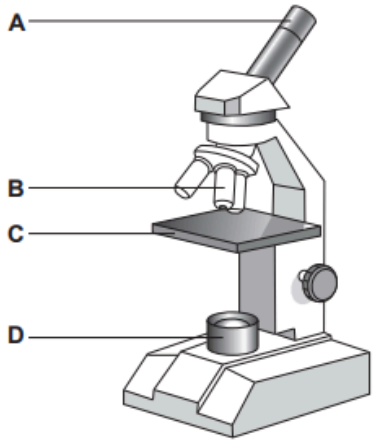
C Cells become specialised

D Cells become tissues

Your answer ☐ **[1]**

Q2. (2020)

2 The diagram shows a light microscope.



Which label is pointing to the eyepiece lens?

Your answer ☐ **[1]**

Q3. (2020)

4 Which monomer is used to make proteins?

A Amino acid

B Fatty acid

C Glucose

D Glycerol

Your answer ☐ **[1]**

Q4. (2020)

5 Which type of cell can divide to produce a range of different cell types?

A Heart cell

B Neurone cell

C Sperm cell

D Stem cell

Your answer ☐ **[1]**

Q5. (2020)

10 A student models the process of mitosis using cookies and sprinkles.

Mitosis is part of the cell cycle.

Which part of the cell cycle has the student modelled?

A Cell division

B Chromosome movement

C DNA replication

D Growth of cell

Your answer ☐ **[1]**

Q6. (2020)

12 A light microscope resolution is 0.2 μm. An electron microscope resolution is 0.0001 μm.

How many times closer can two objects be seen as separate objects by using an electron microscope compared to using a light microscope?

A 2x

B 20x

C 200x

D 2000x

Your answer ☐ **[1]**

Q7. (2020)

A)

16 **(a)** Cells contain structures that have different features.

Complete the table using structures from this list.

cell membrane **chloroplast** **mitochondria**

nucleus **ribosomes**

Feature	Structure
Contains chlorophyll for photosynthesis	
Contains enzymes for respiration	
Has receptor molecules for communication	

[3]

B)

(b) A student uses a light microscope to see cheek cells.

One cell is shown in **Fig. 16.1**.

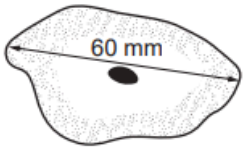


Fig. 16.1

(i) The actual size of the cheek cell is 0.03 mm.

Calculate the magnification of the drawing.

Use the equation: magnification = measured size ÷ actual size

Magnification = × ..... **[2]**

C)

(ii) Which type of substance is used to make structures inside the cell easier to see when using a light microscope?

..... **[1]**

D)

(c) Some students make a model of DNA.

They use four different colours of round sweets to represent the bases and attach them to two candy laces. **Fig. 16.2** shows their model.

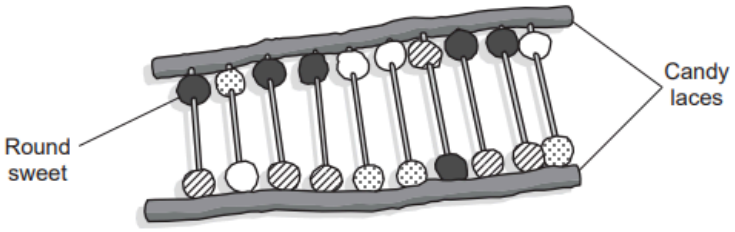


Fig. 16.2

(i) Why did the students use four different colours of round sweets in their model of DNA?

.....

..... **[1]**

E)

(ii) Write down the names of the **two** types of chemical group represented by the candy laces.

1 .....

2 .....

[2]

Q8. (2021)

1 Base pairs are found in a molecule of DNA.

Which base pairs with cytosine?

A Adenine (A)

B Cytosine (C)

C Guanine (G)

D Thymine (T)

Your answer ☐ **[1]**

Q9. (2021)

10 Which molecule is joined to fatty acids to make a lipid?

A Amino acid

B Glucose

C Glycerol

D Starch

Your answer ☐ **[1]**

Q10 (2021)
A)

16 (a) Eukaryotic and prokaryotic cells have sub-cellular structures.

Complete the table to show which type of cell contains each sub-cellular structure.
Each row should have **one** tick (✓).

The first row has been done for you.

Sub-cellular structure	Only in eukaryotic cells	Only in prokaryotic cells	In both eukaryotic and prokaryotic cells
Cell membrane			✓
Nucleus			
Mitochondria			
Plasmid			

[3]

B)

(b) (i) A student looks at plant cells using a light microscope, as shown in **Fig. 16.1**.

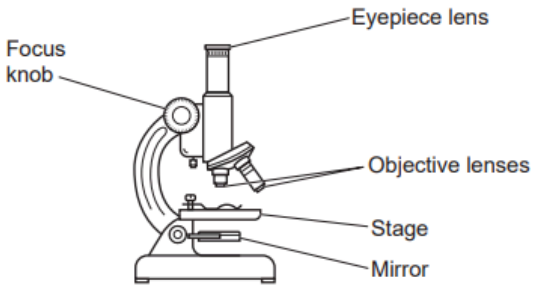


Fig. 16.1

Write **1** to **5** in the boxes to show the correct order of steps in using a light microscope to view the cells.

One has been done for you.

Adjust the focus knob to see the image.	
Place the plant cells onto a microscope slide.	
Place microscope slide on stage.	
Place a coverslip over the plant cells.	
Select low power objective lens.	**3**

[2]

C)

(ii) The microscope shown in **Fig. 16.1** has a ×10 eyepiece and a ×40 objective lens.

Calculate the magnification of the image of the plant cells that the student sees using the microscope.

Magnification = × ..... **[1]**

D)

(iii) A chloroplast in one of the plant cells is 5 μm in diameter.

Use your answer from **(b)(ii)** to calculate the diameter of the chloroplast image seen under the microscope.

Diameter = ... μm **[1]**

E)

(v) The cell wall in the plant cell is made from a carbohydrate called cellulose. Cellulose is a polymer.

Explain why sugars are needed to make the cell wall.

.....

.....

..... **[2]**

Q11. (2021)

A)

18 (a) (i) **Fig. 18.1** shows the cell cycle. The letters represent different stages.

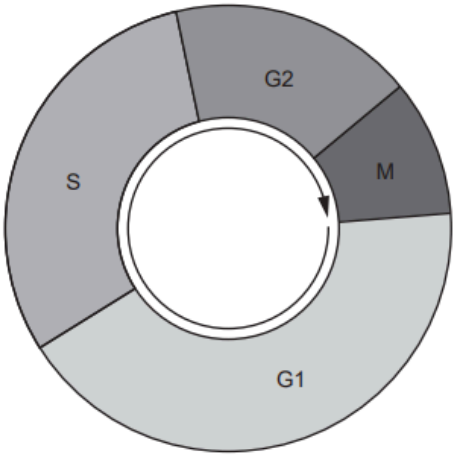


Fig. 18.1

Complete the table to identify the stages from the description of what happens during the cell cycle.
One stage has been done for you.

Stage	Description of what happens
	DNA replication
G2	growth and preparation for mitosis
	movement of chromosomes
	cell growth

[2]

B)

(ii) DNA replication produces a new DNA molecule.

What name describes the shape of a DNA molecule?

..... **[1]**

C)

(b) (i) Cell differentiation occurs during growth in multicellular organisms.

Explain why cell differentiation is important.

.....

.....

..... **[2]**

D)

(ii) Stem cells are found in embryonic and adult tissue in animals.

Where are stem cells found in plants?

Put a (ring) around the correct answer.

meristem **phloem** **stomata** **xylem**

[1]

Q12. (2021)

A)

20 (a) (i) **Fig. 20.1** shows a cell from the nervous system. This cell helps control the body by transmitting impulses away from receptors.

Fig. 20.1

What is the name of this cell?

..... **[1]**

B)

(ii) Opsin is a protein needed to detect different wavelengths of visible light. Opsin is a protein made inside cells in the light sensitive part of the eye.

Which substance is used by the cells to make the protein opsin?

Put a (ring) around the correct answer.

amino acids **fatty acids** **glucose** **nucleotides**

[1]

Q13. (2021) – 21b

21 Polymenorrhea is a condition which affects the menstrual cycle.

Symptoms of the condition include the time between ovulation and the next period being shorter than usual.

A)

(b) Stem cells can be obtained from embryos. Stem cells can also be extracted from menstrual blood. These two types of cells are different.

(i) Embryo stem cells can be used to treat a wider range of disorders than menstrual blood stem cells.

Explain why.

.....

.....

..... **[2]**

B)

(ii) The time it takes for a population to double in size is called the **doubling time**.
For menstrual blood stem cells, doubling time is 19.4 hours.

Starting with 1 stem cell, assuming a constant growth rate, it is possible to work out how long a population takes to grow.

Calculate the time it takes for the population to reach 16 cells.

Time to reach 16 cells = ... hours **[2]**

C)

(iii) The doubling time for umbilical cord stem cells is 48 hours.

How many times faster is the growth of menstrual blood stem cells?

..... **[1]**

D)

(iv) Discuss why scientists think menstrual blood stem cell extraction is a positive development.

.....

.....

.....

..... **[2]**

Q14. (2022)

1 What does one DNA nucleotide consist of?

A A phosphate and sugar backbone

B A sugar, a phosphate and a base

C Four bases, A, C, T and G

D Two different sugars and a base

Your answer ☐ [1]

Q15. (2022)

3 What do electron microscopes have that allow scientists to see cells in greater detail?

A A high magnification and a high resolution

B A high magnification and a low resolution

C A low magnification and a high resolution

D A low magnification and a low resolution

Your answer ☐ [1]

Q16. (2022)

5 When one cell divides by mitosis, how many new cells are produced?

A 1

B 2

C 4

D 8

Your answer ☐ [1]

Q17. (2022)

6 What word describes the amino acids that join to make a protein molecule?

A Enzymes

B Monomers

C Nucleotides

D Polymers

Your answer ☐ [1]

Q18. (2022)

8 DNA consists of two strands.
This is the base sequence found in one strand:

ATT

Which is the complementary base sequence of the second strand?

A ATT

B CAG

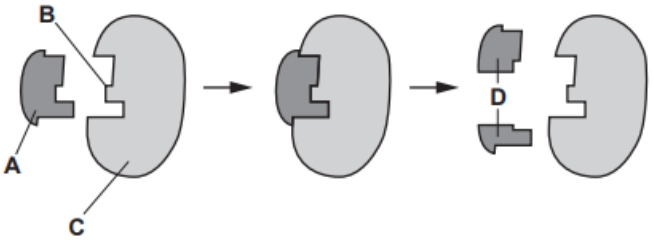
C CGG

D TAA

Your answer ☐ **[1]**

Q19. (2022)

13 The diagram shows the lock and key hypothesis of how enzymes work.



Which letter, **A**, **B**, **C** or **D** represents the active site of the enzyme?

Your answer ☐ **[1]**

Q20. (2022)
A)

16 A student observes the stages of cell division in cells taken from the root tips of garlic.

They cut a small amount of root tip and squash it onto a microscope slide.

(a) Complete each sentence to describe what they do next. Use words from the list.

coverslip	**eyepiece**	**focus**	**light**
objective	**stage**	**stain**	**water**

To make the chromosomes more visible, the student adds a few drops of ..... .

The slide is then placed on the microscope ..... .

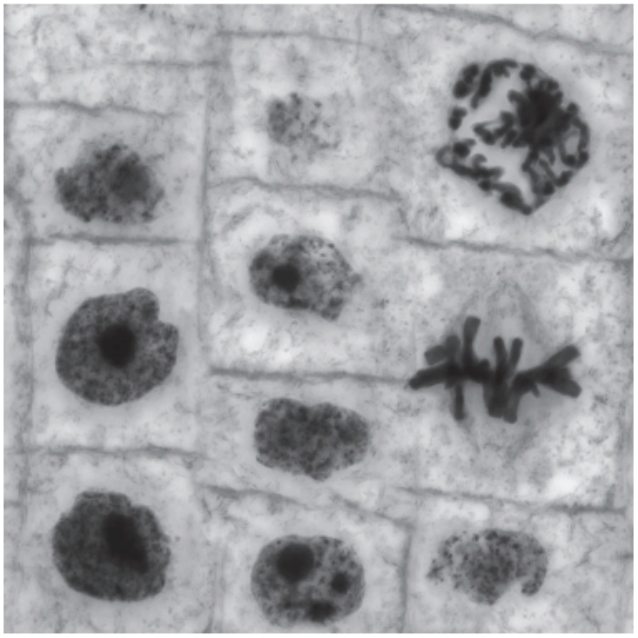
The student first chooses the low power ..... lens.

The student twists a knob on the side of the microscope to bring the image into ..... .

[4]

B)

(b) The image shows some of the cells observed by the student.



(i) Identify one cell in the image that shows the chromosomes starting to move apart.

Draw an arrow to this cell on the image. Label the arrow **A**. **[1]**

C)

(ii) Draw a second arrow to identify one nucleus in the image. Label this arrow **N**. **[1]**

D)

(c) Give **one** reason why the tissue for the sample was taken from root tips.

.....

..... **[1]**

Q21. (2022) – 18c

(c) Plant cells are eukaryotic cells and bacteria are prokaryotic cells.

Plant cells and bacterial cells have similarities and differences between their structures.

Give **one** similarity and **one** difference.

Similarity .....

Difference .....

[2]

Q22. (2022) – 20c

(c) A condition called dry eye can be caused by damage to the corneal cells in the eye.

- Dry eye can now be treated using stem cells.
- The stem cells are taken from the patient's own tissues and not from a donor.

Suggest why the stem cells used in this treatment are taken from the patient's own tissues.

.....

..... **[1]**

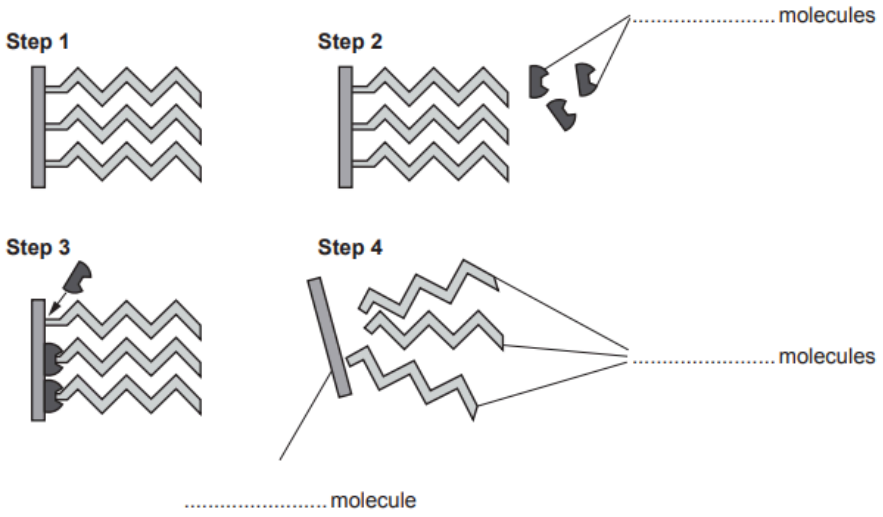
Q23. (2022)

A)

23 Lipase is an enzyme produced in the human digestive system. It breaks down lipids.

(a) **Fig. 23.1** shows the steps in lipid digestion.

Fig. 23.1



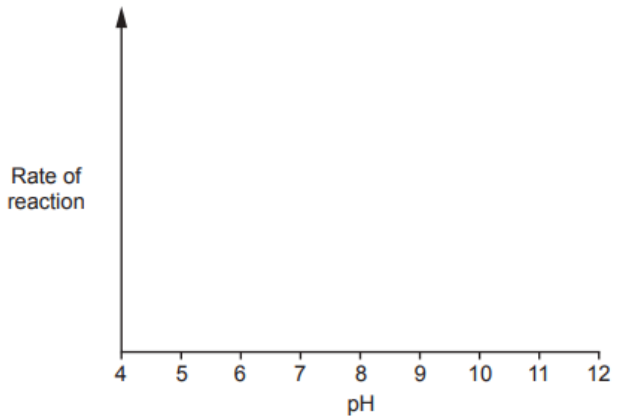
(i) Complete the labels in **Fig. 23.1**. **[3]**

B)

(ii) Lipase is found in the small intestine where the pH is alkaline.

Draw a curve on **Fig. 23.2** to show the effect the pH will have on the rate of reaction for the digestion of lipids by lipase.

Fig. 23.2



[2]

Q24. (2023)

A)

16 **(a)** Put ticks in the table to show whether each statement is **true** or **false** about the structure of DNA.

Tick (✓) **one** box in each row.

Statement about DNA	True	False
DNA is a polymer.		
DNA is made of 4 strands.		
The strands in DNA form a double helix.		
A DNA nucleotide is made of a sugar, a phosphate group and a base.		
The 4 bases found in DNA are A, C, G and U.		

[3]

B)

(b) DNA is found in both eukaryotic and prokaryotic cells.

Draw lines to connect the **cell type** to the **form its DNA takes** then to the **part of the cell where the DNA is found**.

Cell type	Form its DNA takes	Part of the cell where the DNA is found
eukaryote	chromosomes	cytoplasm
prokaryote	plasmids	nucleus

[2]

C)

(c) A light microscope is used to see structures in cells.

Complete these sentences about the parts of a light microscope.

Use words from the list.

clips	**eyepiece**	**focusing knob**	**light**
objective	**stage**	**stain**	

(i) The microscope slide is placed on the ..... of the microscope. **[1]**

D)

(ii) The ..... lens is used to change the magnification of the object being viewed. **[1]**

E)

(iii) The part of the microscope that moves the lens to see the image more clearly is called the ..... . **[1]**

Q24. (2023)

A)

23 (a) The contents of sub-cellular structures found in eukaryotic cells enable the structure to perform its function.

Draw lines to connect each **sub-cellular structure** to its **contents**.
Then draw lines to join each of the **contents** to its correct **function** within the cell.

Sub-cellular structure	Contents	Function
cell membrane	chlorophyll	allows communication with other cells
chloroplast	enzymes	catalyses reactions in aerobic respiration
mitochondria	receptors	needed for photosynthesis

[4]

B)

(b) The image is of a mitochondrion.

(i) Draw the mitochondrion in the box. Your drawing should be a scientific drawing.

[2]

C)

(ii) What type of microscope was used to create the image of the mitochondrion?

Explain your answer.

Type of microscope .....

Reason .....

.....

[2]

D)

(c) Name **one** structure found in both an animal cell and a prokaryotic cell.

..... **[1]**

Q25. (2024)

1 Which structures are found in plant cells but **not** in animal cells?

A Chloroplasts

B Mitochondria

C Nuclei

D Ribosomes

Your answer ☐ **[1]**

Q26. (2024)

2 Which structures are found in prokaryotic cells but **not** in the eukaryotic cells of animals?

A Cell membranes

B Mitochondria

C Nuclei

D Plasmids

Your answer ☐ **[1]**

Q27. (2024)

13 The diagram shows the order of bases in one strand of DNA.

T	C	A	G	G	A	C

What is the base sequence of the complementary strand of DNA?

A A G T C C T G

B C T G A A G T

C G A C T T C G

D T C A G G A C

Your answer ☐ **[1]**

Q28. (2024)

14 Cellulose is a complex carbohydrate.

Which monomers is cellulose made from?

A Amino acids

B Fatty acids

C Glycerol

D Simple sugars

Your answer ☐ **[1]**

Q29. (2024)

A)

16 A light microscope is used to view a specimen.

(a) Draw lines to connect each **part of the microscope** to its **role** in viewing the specimen.

Part of the microscope	Role
Stage	Moves the lenses up and down so the specimen can be seen clearly.
Objective lens	Makes the image bigger.
Focusing knob	Shines a light onto the specimen so that it can be seen.
Lamp	The part where the slide is placed.

[3]

B)

(b) A student uses a light microscope to look at pollen grains.

(i) The total magnification of the microscope is ×400.

The magnification of the eyepiece lens is ×10.

Calculate the magnification of the objective lens used by the student.

Magnification = ... **[2]**

C)

(ii) **Fig. 16.1** shows the image the student sees.

Fig. 16.1

The student was asked to produce a drawing of the pollen cells.

Describe to the student how a scientific drawing is produced.

.....

.....

.....

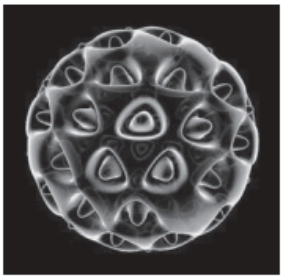
.....

..... **[3]**

D)

(c) **Fig. 16.2** shows an image of a pollen grain taken using an electron microscope.

Fig. 16.2



Give **two** reasons why the image shows more detail with the electron microscope than the image produced by the light microscope.

1 .....

.....

2 .....

.....

[2]

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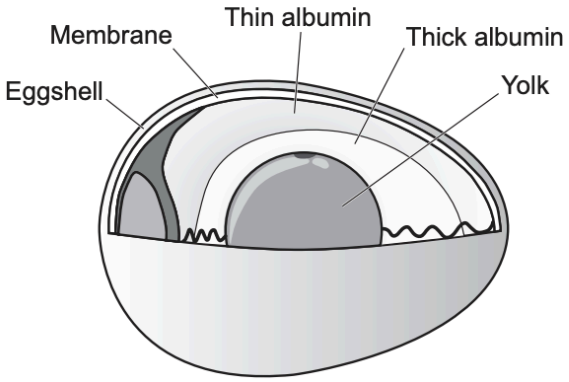
Q30. (2024)

18 The diagram shows a hen's egg.

A chick can develop inside the egg.



A)

(c) As a chick develops, it makes new cells.

These are the stages of the cell cycle. They are **not** in the correct order.

A Movement of the chromosomes

B Cell division

C Cell growth

D DNA replication

E More cell growth

Write the letters in the boxes to show the correct order of the stages in one cell cycle.
Two have been done for you.

C		E		

[2]

B)

(d) The size of a large hen's egg is approximately 40 mm.
The size of a bee's egg is 0.4 mm

How many orders of magnitude are there between the hen's egg and the bee's egg?

Orders of magnitude = ... **[1]**

Q31. (2024)

A)

23 In 2013, scientists researched the use of stem cells to reverse hearing loss.
The scientists used 18 individual rodents for this research.

- They used a chemical to cause deafness in one ear of each rodent.
- They used stem cells to grow nerve cells in the lab.
- They transferred approximately 50 000 nerve cells into each rodent's ear.
- After 10 weeks they tested the rodents' hearing.

(a)
(i) What type of stem cell will the scientists have used?

..... **[1]**

B)

(ii) Why will the scientists have used this type of stem cell?
Tick (✓) **one** box.

Can differentiate into any type of cell	☐
Can differentiate into some types of cells	☐
Easy to collect	☐

[1]

C)

(b) Results from the research showed that the 18 rodents regained an average of 46% of their hearing.

(i) One of the scientists claims 'this research shows that our method will cure people who have a similar hearing problem'.

State **three** reasons why this scientist's claim is **incorrect**.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

D)

(ii) Suggest **one** way the scientists could extend their research.

.....

..... **[1]**

E)

(c) The scientists discover that a different technique could one day be used to successfully treat 15% of the 10 million people who have hearing loss.

Calculate how many of the 10 million people with hearing loss could benefit from this technique.

Number of people = ... million **[2]**