Name: BIOLOGY REVIEW EXEMPLAR /135

** The following are responses made by science students. Analyze their responses and fill-out the Strengths, Weaknesses, Improvements, Mark (SWIM) chart. Include a total mark out of ~~98~~ 135, within 5 marks = +5, within 7 = +3, within 9 = +1**

Identify the term that best matches the definition or statement given.

a. mitochondrion
b. cell wall
c. nucleus
d. cell membrane
e. chloroplast

e ✗ 1. a makes sugar and oxygen from water, carbon dioxide, and sunlight [3/5]
✓ 2. c contains the chromosomes
a ✗ 3. e releases energy in the cell
✓ 4. b provides support for the cell
✓ 5. d controls what enters the cell

S: function of cell wall, cell membrane & nucleus correct.

W: mixed up role of chloroplast & mitochondrion

I: chloroplast = photosynthesis
mitochondrion = cellular respiration

M: 3/5

Identify the term that best matches the definition or description given. [4/10]

a. stem
b. leaf
c. mesophyll
d. chloroplast
e. taproot
f. vascular tissue
g. terminal bud
h. cuticle
i. root hairs
j. guard cells

i ✗ 6. b absorbs water and nutrients from the soil
f ✗ 7. e consists of xylem and phloem
✓ 8. d the site of photosynthesis inside the cell
✓ 9. a holds the leaves up high into the sunlight
✓ 10. j open and close the stomata
b ✗ 11. f acts like an umbrella to absorb light
✓ 12. c has spaces that hold water vapour, oxygen, and carbon dioxide
h ✗ 13. g waxy layer that limits the water lost through evaporation
g ✗ 14. h the growing part of the stem
e ✗ 15. i roots that reach deep into the ground

S: able to correctly identify function for chloroplast, stem, guard cells, mesophyll

W: see corrections

I: see corrections

M: 4/10

Identify the human organ system that best matches the function described. [10/10]

a. circulatory
b. digestive
c. respiratory
d. excretory
e. immune
f. muscular
g. endocrine
h. reproductive
i. integumentary
j. nervous
k. skeletal

✓ 16. c exchanges gases in the lungs
✓ 17. j detects changes in the environment
✓ 18. b absorbs nutrients
✓ 19. a transports blood, nutrients, gases and wastes
✓ 20. e defends the body from infections
✓ 21. k supports the body and helps to move it
✓ 22. f helps move parts of the body
✓ 23. h produces offspring
✓ 24. d removes wastes from the body
✓ 25. g releases hormones to control the body

S: All functions are correctly matched

W: none

I: none

M: 10/10

-8

SHORT ANSWER (35)

26. List **three ways** that cancer cells differ from healthy cells? [2/3]

- cancer cells can divide when they are separated
- cancer cells don't tend to stick to other cancer or normal cells which allows them to move throughout the body.
- cancer cells don't self-destruct if something is wrong as do normal cells they just keep replicating

✓ - 1st way
✓ - 2nd way
✓ - 3rd way

S: 2 correct ways identified
W: only 2 ways listed
I:
M: 2/3

27. Explain how vascular tissue connects a plant's root system and shoot system. [2/2]

- vascular tissue connects the roots to the leaves
- roots collect the water & nutrients needed by leaves for photosynthesis
- sugar produced by photosynthesis is then transferred throughout the plant, including to the roots, to support growth

✓ - vascular tissue connect roots
✓ - vascular tissue connect shoots

S: vascular tissue's role in roots & shoots explained fully.
W: none
I: none
M: 2/2

28. How do guard cells control the size of the stomata? [2/2]

- stomata open when the guard cells are full of water
- guard cells are relaxed when water vapour levels are low. This closes the stomata.

✓ - open stomata
✓ - close stomata

S: Action of guard cells explained in BOTH open & closing of stomata
W: none
I: none
M: 2/2

29. a) Where in the body are valves found? [1/2]

- heart & lungs veins

✓ - valves found

S: heart correctly identified
W: lungs do not have valves
I: veins have valves
M: 2/3

b) How do valves help control the flow of blood? [1/1]

✓ - doesn't allow blood to flow backwards

✓ - valves help

30. The human heart represents the mammalian heart structure: there are four chambers. List the four chambers of the heart. [4/4]

✓ left atrium, ✓ left ventricle
✓ right atrium, ✓ right ventricle

S: All 4 chambers are correctly labeled
W: none
I: none
M: 4/4

-2

31. The right ventricle sends blood to the pulmonary system (the lungs). What happens to the blood here? Where does it go next? [1/2]

✓ – blood gets reoxygenated @ lungs
x – blood then goes to brain
pulmonary veins to left atrium

S: correct identification of re-oxygenation of blood in lungs
W: blood does not travel to brain next
I: from lungs, blood travels through pulmonary veins to left atrium
M: 1/2

✓ – blood @ lungs
✓ – blood's next spot

32. One way to treat cancer is to interfere with mitosis. When people have cancer, somatic cells (body cells) go through unchecked growth and division. The chemotherapy drug Taxol (generic name Paclitaxel) prevents spindle fibres from forming properly.

a) Explain how this drug prevents the growth of more cancer cells. [1/2]

without proper spindle fibres, cells will not replicate/split properly making it difficult for cancer cells to reproduce.

S: correct identification of result of improper spindle fibre & resulting ability to produce cells.
W: none
I: none
M: 2/2

✓ – 2x

b) An additional chemical, retinoic acid, can affect the way Taxol works. Consider the data in the chart below. Would you recommend that retinoic acid be combined with Taxol? [1/1]

Cells surviving after Taxol or Taxol + retinoic acid has been applied

Amount of Taxol used (μM)	Number of cancer cells surviving	
	Taxol	Taxol + retinoic acid
0	100	100
1	80	50
10	57	27
50	47	22

→ yes, the combo of the two drugs work better together than separately (47 alone vs only 22 when combined)

✓ – yes, b/c

33. Animal cells are different from plant cells. List three differences. [3/3]

plant
↳ cell wall
↳ large vacuole
↳ chloroplasts

S: 3 diff that plant cell has identified correctly
W: none
I: none
M: 3/3

✓ – 3x for any 3

34. List the steps of the cell cycle. [0/5]

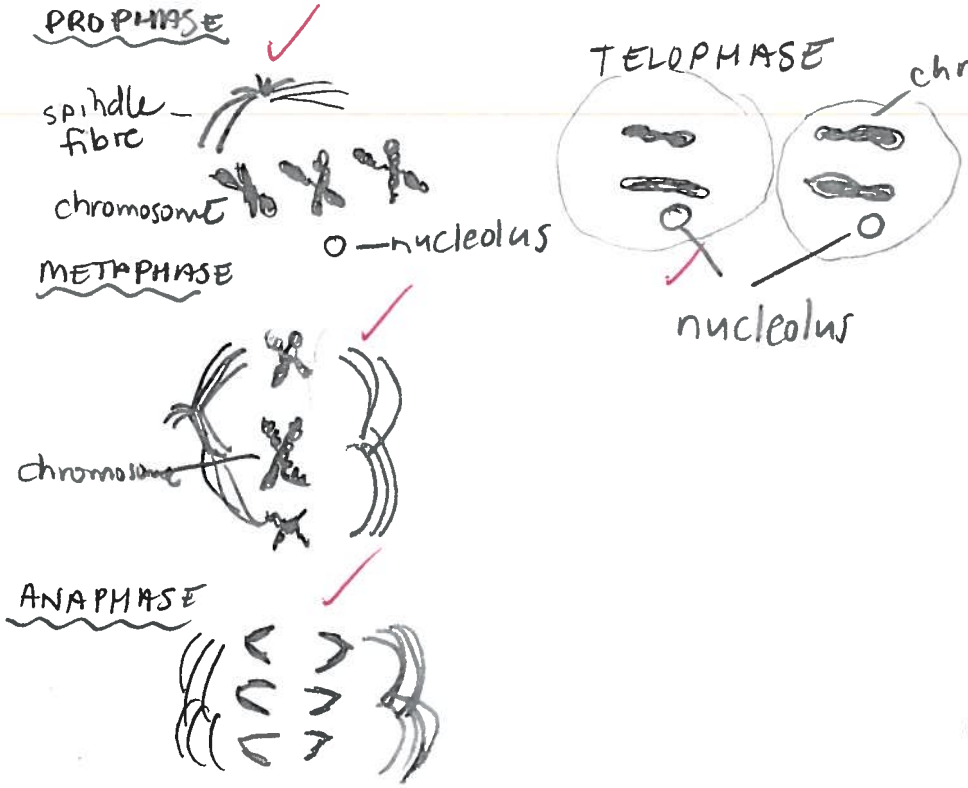
☺ – growth & preparation
– DNA replication
– continued growth & preparation
} Interphase
– mitosis
– cytokinesis

S: none. Question was left blank
W: left blank
I: see corrections
M: 0/5

✓ – 5x for 5 steps

−6

35. Make a series of diagrams outlining the steps of mitosis. Show the chromosomes, spindle fibres, and nucleus where appropriate. [5/5]



S: diagram of each stage is correct and chromosomes, spindle fibres, & nucleus labeled

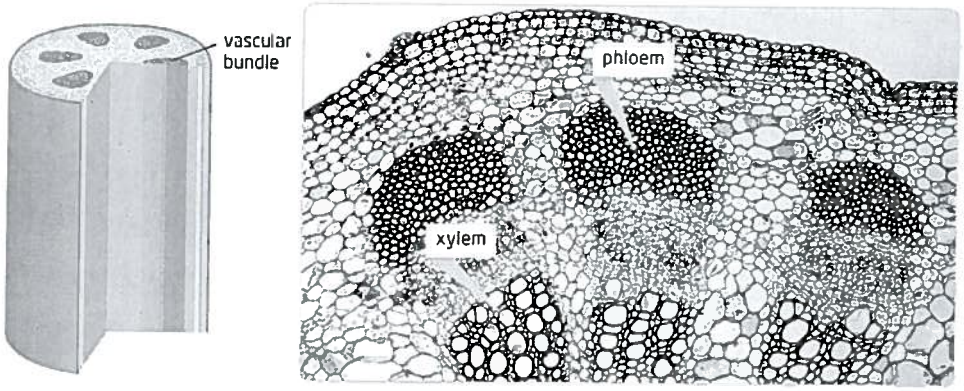
W: none

I: none

M: 5/5

✓ - anaphase
✓ - telophase ✓ - spindle fibre, nucleolus, chromosomes

36. In vascular bundles, the xylem cells lie near the centre and the phloem cells are away from the centre.



Cross-section of a sunflower stem

S: structure & function of xylem & phloem is correct.

W: none

I: none

M: 4/4

a) How is the structure of the xylem cell different from the structure of the phloem cell? [2/2]

✓ - xylem cell is dead. It is empty, but reinforced w lignin.
✓ - The phloem cells are porous & connected into long tubes

b) What is the function of xylem cells? What is the function of phloem cells? [2/2]

✓ - Water moves through xylem cells
✓ - Sap moves through the phloem tubes

✓ - xylem function ✓ - xylem structure
✓ - phloem function ✓ - phloem structure

DIAGRAMS & CALCULATIONS: Fully label the following diagrams (75)

37. Digestion [13 /13]

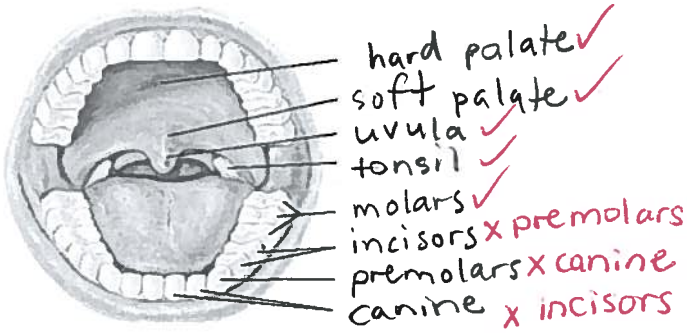
S: all parts of digestion system are labelled correctly

W: none

I: none

M: 13/13

38. The mouth [5 /8]



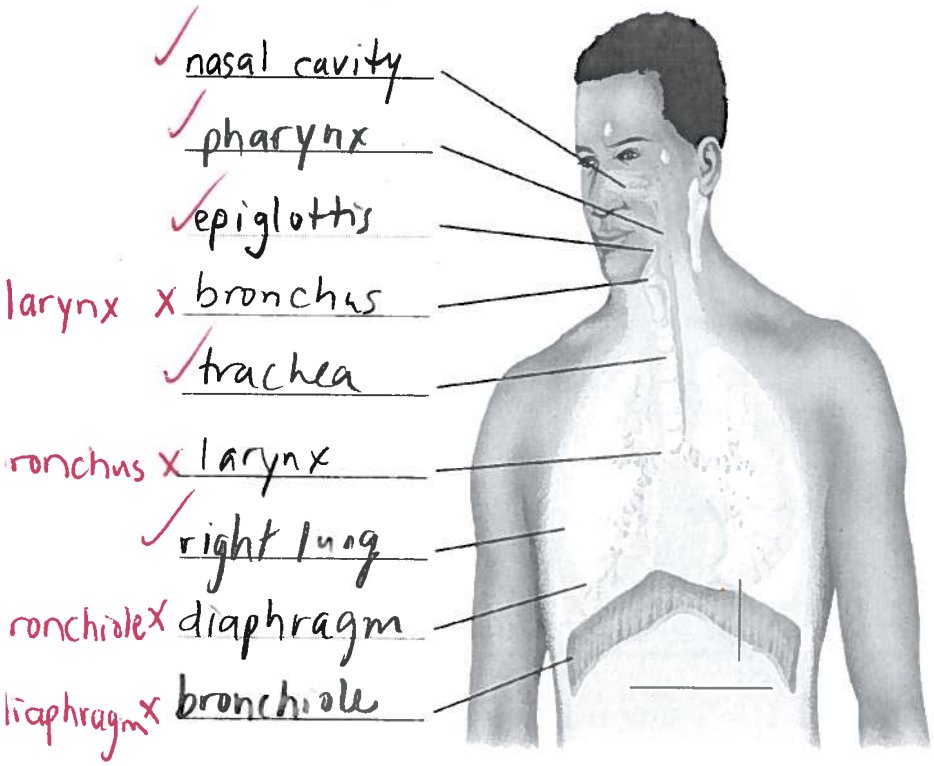
S: hard & soft palate, uvula, tonsils, and molars labeled correctly

W: mixed up incisors, canine, & premolars

I: see corrections

M: 5/8 based on 3 mistakes

39. Respiration [5 /9]



S: nasal cavity, pharynx, epiglottis, trachea & right lung labeled correctly

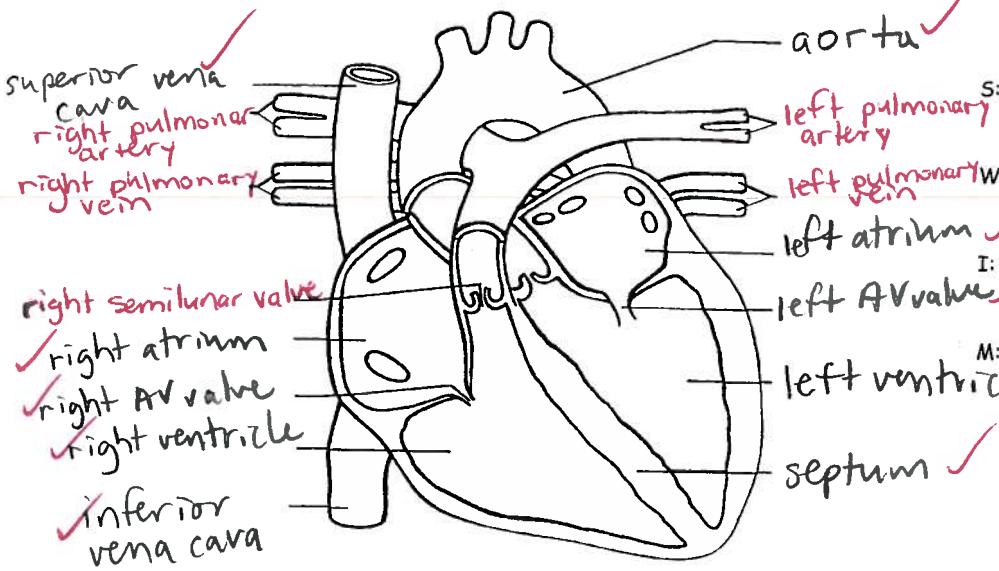
W: larynx, bronchus, bronchiole & diaphragm incorrectly labelled

I: see corrections

M: 5/9 based on 4 mistakes

-7

40. Circulation [10/15]



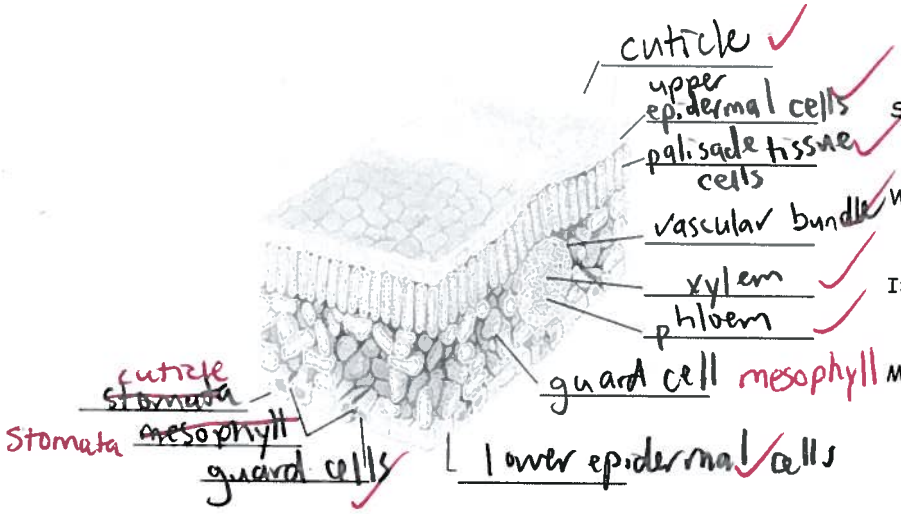
S: All labelled correctly

W: did not label pulmonary arteries veins or right semilunar valve

I: see corrections

M: 10/15 based on 5 missing answers

41. Plant Tissue [8 /11]



S: all labels correct except mesophyll, stomata & bottom cuticle

W: mesophyll, stomata,

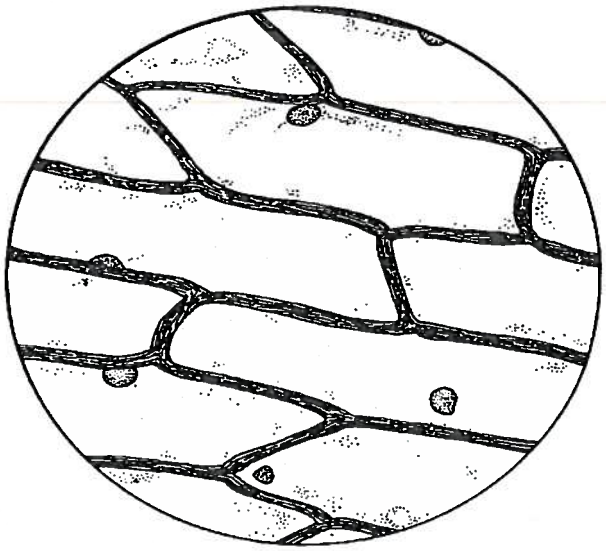
I: see corrections

M: 8/11 based on 3 errors

-8

of onion cells stained w̄ iodine

42. Using the diagram below, viewed under high power, answer the following questions.



a) Calculate the field of view under high power (40x) if the field of view under low power is 4000 um and the low power lens is 4x and the eyepiece is 10x.
[2/3]

$$\frac{FV_{HP}}{FV_{LP}} = \frac{M_{LP}}{M_{HP}} \qquad FV_{HP} = \frac{M_{LP}\,FV_{LP}}{M_{HP}}$$

$$FV_{HP} = \frac{(40)(4000)}{(400)}$$

$$= 400\,\mu m$$

∴ the FV_{HP} is 400 µm.

✓-rearranged eq'n
✓-answer w̄ units
✓-∴

S: correct FV answer w̄ units
∴ statement answers question

W: eq'n is not rearranged

I: rearrange eq'n

M: 2/3 b/c did not rearrange eq'n

b) Estimate the length of an onion cell below. The cells were observed under high power (40x) using a microscope with an eye piece of 10x magnification
[1/3]

$$\text{Est length} = \frac{FOV}{\#\text{ fit}}$$

$$\text{Estimated length} = \frac{400}{1.5}$$

$$\doteq 267\,\mu m$$

✓- est. length eq'n
✓-answer w̄ units
✓-∴

S: correct est. length answer w̄ units

W: no equation
no ∴ statement

I: need to write eq'n before sub values in
need a ∴ statement

M: 1/3 no eq'n, no ∴

c) Estimate the width of an onion cell below. The cells were observed under high power (40x) using a microscope with an eye piece of 10x magnification
[1/3]

$$\text{Estimated width} = \frac{400}{5}$$

$$= 80\,\mu m$$

✓-est. width eq'n
✓-answer w̄ units
✓-∴

S: correct est. width answer w̄ units

W: no eq'n
no ∴ statement

I: need to write eq'n
need a ∴ statement

M: 1/3 no eq'n, no ∴

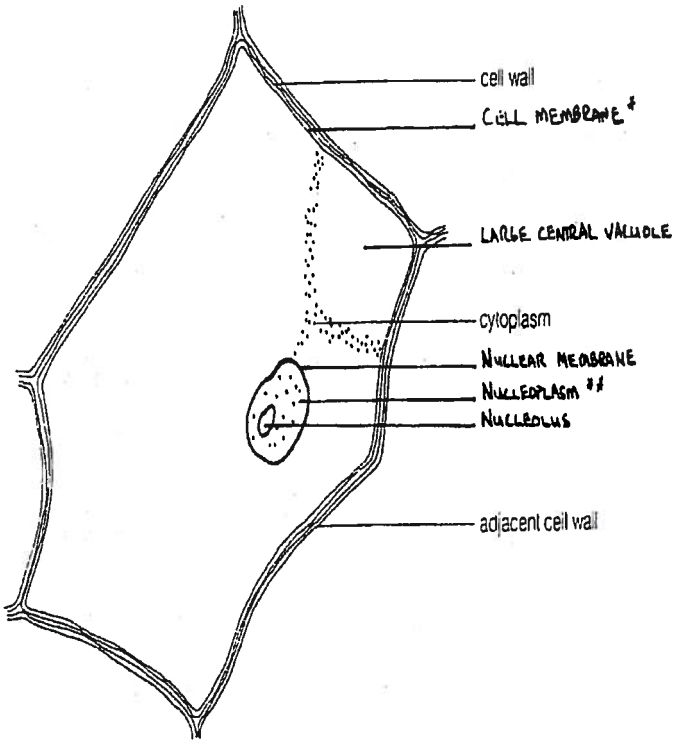
−5

43. Draw a fully labeled scientific drawing of one onion cell stained with iodine, as viewed under high power. Make sure to include the estimated size and total magnification of the cell. [8/10]

est size length = $\frac{FV}{\#\text{fit}}$ = $\frac{400}{1.5}$ = 267 µm

est size width = $\frac{FV}{\#\text{fit}}$ = $\frac{400}{5}$ = 80 µm

SINGLE ONION CELL SHOWN UNDER HIGH POWER WITH IODINE STAIN



S: - descriptive title
- drawn in pencil
- clarification notes
- labels neatly arranged & aligned down the right margin
- all appropriate identification info present

W: - est. size, microscope magnification, and drawing magnification missing or incorrect

I: include est size, microscope magnification & drawing magnification

M: 8/10 did not include est. size & total magnification of the cell

NOTES:
1. *CELL MEMBRANE NOT ACTUALLY SEEN, TOO THIN, AGAINST CELL WALL.
2. **CHROMOSOMES NOT INDIVIDUALLY VISIBLE IN NUCLEOPLASM.
(3. DESCRIPTION OF STAIN COLOUR FOR VARIOUS ORGANELLES)

MICROSCOPE MAGNIFICATION: 400x
DRAWING MAGNIFICATION: ?

* drawing mag width = $\frac{\text{dimension of cell diagram}}{\text{dimension of actual cell}}$ = $\frac{30000}{80}$ = 375x

drawing mag length = $\frac{\text{dimension cell diagram}}{\text{dimension of actual cell}}$ = $\frac{60000\ \mu m}{267\ \mu m}$ ≐ 225x

−2