BOT02A2 - PLANT ANATOMY AND CYTOLOGY
EXAMINATION JULY 2018

MEMORANDUM **TOTAL 100**

QUESTION 1
Study the micrograph of a plant structure (Fig. A)

1.1. Scanning electron microscope (1)

1.2. One of the advantages (large samples, showing 3D-structure); low resolution as an disadvantage (2)

1.3. (Multicellular branched) trichome (2)

1.4. Epidermis (1)

1.5. Magnification = length of scale bar (19 mm= 19000 µm)/scale bar value (100 µm) = x190. (2)

[8]

QUESTION 2
Study the micrograph of a cell (Fig. B)

2.1. Plant cell (1). Cell wall or chloroplasts (1): (2)

2.2. Transmission electron microscope (1)

2.3. **a** – (central) vacuole (1)
b – nucleus (chromatin) (1)
c – nuclear envelope (1)
d – mitochondrion (1)
e – cell wall (1)
f – intercellular space (1)
g – chloroplast (1)
h – nucleolus (1)
(8)

2.4. Give *one* main function of (4)
2.4.1 **g –** photosynthesis (2)
2.4.2 **h –** synthesis of ribosomal RNA (assembly of ribosomes) (2)

2.5. No. Unlike meristematic cells, this cell has chloroplasts (3)

2.6. Drawn size of **b** = 56 mm. Length of scale bar = 19 mm. Scale bar value = 1 µm.
Size of f = 56 mm / 19 mm x 1 µm = **2,9 µm = ca. 3 µm** (2)
[20]

QUESTION 3

Study microphoto (Figure 3) of a portion of a cell with a complete plastid and then answer the following questions relating to it.

3.1. Transmission electron microscope (1)

3.2. Advantage: high resolution. Disadvantages: only dead specimens can be studied, time-consuming preparation of samples (2)

3.3. (3)
a – plasmodesmata (1)
b – (rough) endoplasmatic reticulum (1)
c – mitochondrion (1)

3.4. Desmotubule (2)

3.5. There is no secondary cell wall: no traits of layering (S_1-S_3) pattern (3).

3.6. Producing energy (synthesis of ATP) (2)

3.7 Magnification (x 20 000) = diameter of **c** in micrograph divded by actual length of **c.** Diameter of **c** in micrograph = ca. 22 mm (22 000 μm). Therefore, actual diameter of **c** is 22 000 divided by 20 000 = **1,1 μm** = **ca. 1 μm** (2)

[15]

QUESTION 4

4.1 C4. Two types of mesophyll cells (bundle sheath cells and ordinary mesophyll cells), Kranz anatomy (conspicuous bundle sheaths and mesophyll cells forming a whreath-like structure) (3)

4.2 Bundle sheath extension, bulliform cells, xylem, phloem and epidermis are correctly labeled. (4)

4.3 Adaxial (upper) side and abaxial (lower) side of the leaf are correctly labeled. Adaxial side of leaf can be recognized by the presence of bulliform cells or by the postion of xylem in conductive bundle. (4)

[11]

QUESTION 5

5.1 Transverse (cross-) section (2)

5.2 Gymnosperm. Absence of vessels in wood. Monocotyledons do not form wood. (2)

5.3. Tracheids (2). Water conduction (1) and support (1) (4)

5.4.
a – growth ring (boundary) (1)
b – axial parenchyma (1) (3)
c – rays (1)

[11]

QUESTION 6

6.1 (9)
6.1.1 - **i** (1)
6.1.2 - f (1)
6.1.3 - h (1)
6.1.4 - g (1)
6.1.5 - c (1)
6.1.6 - d (1)
6.1.7 - b (1)
6.1.8 - e (1)
6.1.9 - a (1)

6.2. (4)
6.2.1 – diploid (1)
6.2.2 – diploid (1)
6.2.3 – haploid (1)
6.2.4 – haploid (1)

[**13**]

QUESTION 7

7.1 Root apical meristem: root cap, no primordia of lateral organs, no tunica-corpus organization. Shoot apical meristem: no "cap", leaf primordia, tunica-corpus organization (6)

7.2. Double fertilization is the fusion of egg and sperm (resulting in a diploid fertilized egg, the zygothe, that gives rise to the embrio) and the fusion of the second sperm with two polar nuclei of cental cell of the embryo sac (resulting in a triploid nucleus that gives rise to endosperm) (4)

[**10**]

QUESTION 8

8.1. (6)
8.1.1
A – 1 (1)
B – 9 (1)
C – 12 (1)
8.1.2
A – no (1)
B – 10 (1)
C – 11 (1)

8.2 Epigeal; cotyledons are lifted above ground (2)

[**8]**

QUESTION 9

9.1. Companion cell (1)

9.2. Phellem (cork) (1)

9.3. Secondary tissues (1)

9.4. Sporophyte (1)

[4]