

## **BOT2A10 - PLANT ANATOMY AND CYTOLOGY SUPPLEMENTARY**

**JULY 2016**

### **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. Pollen grain (1)
- 1.4. Haploid (2)
- 1.5. Sporopollenin (2)
- 1.6. Magnification = length of scale bar (24 mm= 24000  $\mu\text{m}$ )/scale bar value (10  $\mu\text{m}$ ) = 2400. (2)

**[9]**

#### **QUESTION 2**

Study the micrograph of a cell (Fig. B)

- 2.1. Plant cell (1). Cell wall (1): (2)
- 2.2. Transmission electron microscope (1)
- 2.3.
  - a – primary cell wall (1)
  - b – plasmodesmata (1)
  - c – mitochondrion (1)
  - d – nucleus (euchromatin) (1)
  - e – nucleolus (1)
  - f – nuclear envelope (1)
  - g – intercellular space (1)
  - h – central vacuole (1)
  - i – secondary cell wall (1) (9)
- 2.4. Give *one* main function of (2)
  - 2.4.1 c – producing energy (synthesis of ATP) (1)
  - 2.4.2 e – synthesis of ribosomal RNA (assembly of ribosomes) (1)
- 2.5. Irregular arrangement of cellulose microfibrils, lack of lignin or suberin in the primary cell wall (a) vs regular pattern of cellulose microfibrils and the presence of lignin or suberin in the secondary cell wall (i) (2)
- 2.6. No. Unlike meristematic cells, this cell has large central vacuole and secondary cell wall (3)

**[19]**

### QUESTION 3

Study microphoto (Figure C) 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)

3.3.1 Chromoplast (undulating membrane, plasmoglobuli), and chloroplast (grana) (4)

3.3.2 E.g. during ripening of fruits (2)

3.4 E.g. magnification ( $\times 32\,000$ ) = plastid length in micrograph divided by actual length of chloroplast. Length of chloroplast in micrograph = ca. 11 cm (110 000  $\mu\text{m}$ ). Therefore, actual length of chloroplast is 110 000 divided by 32 000 = **3- 4  $\mu\text{m}$**  (4)

3.5. E.g. double membrane, small ribosomes, circular DNA (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 wreath-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 position of xylem in conductive bundle. (4)

[11]

### QUESTION 5

5.1 Tangential section (1)

5.2 Dicotyledon. Presence of vessels in wood. Monocotyledons do not form wood. (2)

5.3. Vessels, rays, (libriform) fibers are correctly labeled (4)

5.4. Vessels – water conduction, libriform fibers – support, ray parenchyma - storage (3)

[10]

### QUESTION 6

6.1.1 - 15 (1)

6.1.2 - 21 (1)

6.1.3 - 22 (1)

6.1.4 - 8 (1)

6.1.5 - 3 (1)

- 6.2. 0,2 mm (3)
- 6.3. Three years (= number of the growth ring boundaries). (2)
- [11]

#### QUESTION 7

- 7.1 Nucleus, vacuole, also ribosomes, dictyosomes (2)
- 7.2. Female gametophyte of gymnosperms consists of few thousands cell and has archegonia, whereas female gametophyte of angiosperms (embryo sac) made of few cells, and it has no archegonia. (2)
- 7.3. Double fertilization is the fusion of egg and sperm (resulting in a diploid fertilized egg, the zygote, that gives rise to the embryo) and the fusion of the second sperm with two polar nuclei of central cell of the embryo sac (resulting in a triploid nucleus that gives rise to endosperm) (4)
- 7.4. In angiosperms, also in gymnosperms *Gnetum* and *Ephedra* (1)
- [9]

#### QUESTION 8

8.1. Diagrams (a) – (d) represent various seeds. For each of these diagrams, write down the number of the label line pointing to

8.1.1 - **3, 7, 12, 19**

8.1.2 – **1, -, -, 18.** (8)

8.2 Epigeal; cotyledons are lifted above ground (2)

[10]

#### QUESTION 9

- 9.1. Companion cell (1)
- 9.2. Fusiform initial (1)
- 9.3. Calyptrogen (1)
- 9.4. Plasmodesma (1)
- 9.5. Perforation plate (1)
- 9.6. Sporophyte (1)
- [6]