



## **2023 Botany (Ph.D.) - Entrance Test**

### **1. Who discovered electron microscopy?**

- (A) Ruska and Knoll      (B) Mullis and Boyer  
(C) Sanger and Cohn      (D) Smith and Nathans

### **2. In Column chromatography, the stationary phase is made of \_\_\_\_\_ and the mobile phase is made of \_\_\_\_\_.**

- (A) Solid, liquid      (B) Liquid, liquid  
(C) Liquid, gas      (D) Solid, gas

### **3. Chromatogram is**

- (A) Solute concentration vs Elution time      (B) Solute concentration vs Elution volume  
(C) Both A and B      (D) A only

### **4. Which of the following techniques would be most useful to identify as well as quantify the presence of a known impurity in a drug substance?**

- (A) NMR      (B) LCMS/MS      (C) IR      (D) HPLC

### **5. Which of the following is a protein specific florescent dye?**

- (A) DAPI      (B) Acridine orange  
(C) Ethidium bromide      (D) Rhodamine

### **6. Which technique is also known as colour writing?**

- (A) NMR      (B) Mass spectroscopy  
(C) Chromatography      (D) PCR

### **7. Which of the following is a common nuclear stain?**

- (A) Safaranin      (B) Fast Green      (C) Hematoxylin      (D) Erythrosine

**8. The properties of integral membrane proteins can be studied by**

- (A) Atomic force microscopy
- (B) Cryo-sectioning and electron microscopy
- (C) Freeze-fracture technique and electron microscopy
- (D) NMR spectroscopy

**9. What is the wavelength range of the UV spectrum?**

- (A) 100 nm to 500 nm
- (B) 200 nm to 800 nm
- (C) 300 nm to 1000 nm
- (D) 400 nm to 1600 nm

**10. Which among the following is the physical method for direct transfer of genes into the cell cytoplasm without lysosomal degradation?**

- (A) PEG mediated
- (B) Dextran mediated
- (C) Electroporation
- (D) Liposome fusion

**11. Southern blotting is**

- (A) Attachment of probes to DNA fragments
- (B) Transfer of DNA fragments from electrophoretic gel to a nitrocellulose sheet
- (C) Comparison of DNA fragments to two sources
- (D) Transfer of DNA fragments to electrophoretic gel from cellulose membrane

**12. In which type of chromatography, the stationary phase is held in a narrow tube and the mobile phase is forced through it under pressure?**

- (A) Column chromatography
- (B) Planar chromatography
- (C) Liquid chromatography
- (D) Gas chromatography

**13. ELISA is**

- (A) Using radiolabelled second antibody
- (B) Usage of RBCs
- (C) Using complement-mediated cell lysis
- (D) Addition of substrate that is converted into a coloured end product

**14. Some floral characters and their taxonomic status are shown below**

Floral Characters	Taxonomic status
i) Actinomorphic	a. Advanced
ii) Elongated thalamus and cyclic whorls	b. Advanced
iii) Resupination	c. Primitive
iv) Gynobasic style	d. Primitive
(A) i-a, ii-c, iii-b, iv-d	(B) i-c, ii-a, iii-b, iv-d
(C) i-b, ii-c, iii-a, iv-d	(D) i-c, ii-d, iii-a, iv-b

**15. Plasmids are used as cloning vectors for which of the following reasons?**

- (A) Can be multiplied in culture
- (B) Self-replication in bacterial cells
- (C) Can be multiplied in laboratories with the help of enzymes
- (D) Replicate freely outside bacterial cells

**16. The electron microscopy gives higher magnification than an optical microscope because**

- (A) The wavelength of electron used is smaller compared to that of visible light
- (B) The electron microscope use more powerful lenses
- (C) The velocity of electron is less than that of light
- (D) The electron has more energy than light particles

**17. Which bacterium is used in the production of insulin by genetic engineering?**

- (A) Saccharomyces (B) Rhizobium (C) Escherichia (D) Mycobacterium

**18. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using**

- (A) Taq polymerase (B) Polymerase III (C) Ligase (D) Eco RI

**19. Agarose extracted from sea weeds finds use in**

- (A) Spectrophotometry
- (B) Gel electrophoresis
- (C) PCR
- (D) Fungal culture

**20. Which of the following centrifuges works against the gravitational acceleration**

- (A) Conical disc centrifuge                      (B) Continuous horizontal centrifuge  
(C) Perforated basket centrifuge              (D) Semi-continuous centrifuge

**21. Which of the following is (are) the application of lyophilization?**

**i. To process microorganisms like bacteria for storage**

**ii. To concentrate enzyme**

**iii. To process molds, protozoa, and most viruses for storage**

- (A) i and ii only                      (B) ii and iii only                      (C) i and iii only                      (D) iii only

**22. Following are the processes used for extraction of plant material except**

- (A) Maceration                      (B) Sublimation                      (C) Digestion                      (D) Percolation

**23. In electron microscopy, to detect specific macromolecule or structure such as spindle pole body, the frequently used procedure is to couple secondary antibody with**

- (A) Alexa 568                      (B) Cy5                      (C) Gold particle                      (D) Osmium tetroxide

**24. Developer of Backcross method is**

- (A) Johannsen                      (B) Jenkins                      (C) Flor                      (D) Harlan and Pope

**25. Klenow fragment is derived from**

- (A) DNA Ligase                      (B) DNA Pol-I                      (C) DNA Pol-II                      (D) Reverse Transcriptase

**26. Karnal bunt is caused by:**

- (A) Neovossia indica                      (B) Ustilago nuda  
(C) Puccinia graminis                      (D) Claviceps purpurea

**27. Which type of polyploidy is bread wheat?**

- (A) Autopolyploid                      (B) Allopolyploid  
(C) Auto-allopolyploid                      (D) Segmental allopolyploid

**28. Perianth is represented by small scaly lodicules in:**

- (A) Asteraceae                      (B) Apiaceae                      (C) Gentianaceae                      (D) Poaceae

**29. Phycobillins are found in:**

- (A) Cyanophyta and Dinophyta                      (B) Rhodophyta and Dinophyta  
(C) Rhodophyta and Cryptophyta                      (D) Cyanophyta and Chlorophyta

**30. Which of the following is not bound by a membrane?**

- (A) Mitochondria                      (B) Peroxisome                      (C) Ribosome                      (D) Chloroplast

**31. Gamma radiations are:**

- (A) Corpuscular                      (B) Non-ionizing                      (C) Particulate                      (D) Electromagnetic

**32. Cycocel is the inhibitor of:**

- (A) Auxin translocation                      (B) Gibberellin biosynthesis  
(C) Gibberellin translocation                      (D) Ethylene biosynthesis

**33. The tropane alkaloids are obtained from the members of:**

- (A) Convolvulaceae                      (B) Solanaceae                      (C) Apocynaceae                      (D) Cactaceae

**34. The heaviest wood is obtained from:**

- (A) Hardwickia binata                      (B) Tectona grandis                      (C) Erythrina suberosa                      (D) Krugiodendron ferrum

**35. Mutualism occurs between**

- (A) Butterfly and Flower                      (B) Escherichia coli and man  
(C) Zoochlorellae and Hydra                      (D) Hermit crab and Sea Anemone

**36. Regions of roots from base to root tips are**

- (A) Maturation zone---Cell division zone---Elongation zone  
(B) Maturation zone---Elongation zone---Cell division zone  
(C) Cell division zone---Elongation zone---Maturation zone  
(D) Elongation zone---Cell division zone---Maturation zone

**37. Which one of these is a thermophilic algae?**

- (A) *Chlamydomonas nivalis*                      (B) *Mastigocladus laminosus*  
(C) *Spirulina platensis*                      (D) *Oscillatoria prenceps*

**38. The sex organs of hypodermal origin are characteristics of**

- (A) Marchantiales      (B) Metzgeriales      (C) Jungermanniales      (D) Anthocerotales

**39. Morchella belongs to**

- (A) Mycomycotina      (B) Deuteromycotina      (C) Ascomycotina      (D) Basidiomycotina

**40. The fern gametophyte is known as a prothallus because**

- (A) It is internally differentiated      (B) It is internally not differentiated  
(C) It bears both the sex organs      (D) It is small

**41. The innermost layer of anther wall, the tapetum, attains its maximum development at**

- (A) Pollen grain stage      (B) Tetrad stage of microsporangium  
(C) Dyad stage of microsporangium      (D) Initial stage of microsporangium

**42. Swimming spermatozoids are found in**

- (A) *Araucaria*      (B) *Gnetum*      (C) *Welwitschia*      (D) *Ginkgo*

**43. Nucleolus is the site of**

- (A) Protein synthesis      (B) DNA synthesis  
(C) Ribosomal assembly      (D) Lipid synthesis

**44. Three-point test cross is used for**

- (A) Gene regulation      (B) Gene cloning  
(C) Gene mapping      (D) Gene conversion

**45. The geotropic response is mainly attributed to**

- (A) IAA and Calcium      (B) ABA and IAA  
(C) ABA and Calcium      (D) GA3 and Calcium

**46. Which one of the following mineral elements does not appear to be structurally bound in plants**

- (A) Nitrogen                      (B) Calcium                      (C) Phosphorus                      (D) Potassium

**47. The wood seasoning is a process of**

- (A) Cutting wood in a particular season                      (B) Chemical treatment of wood  
(C) Painting of wood                      (D) Controlled removal of water from wood

**48. The fossil Palmoxyton belongs to**

- (A) Angiosperm                      (B) Gymnosperms                      (C) Pteridophyte                      (D) Bryophyte

**49. The production of ATP by oxidative phosphorylation is driven by energy from**

- (A) Co-enzyme A  
(B) Isomerization of the cytochrome  
(C) The formation of NADH  
(D) The differentiation of protons from the intermembrane space to the matrix of the mitochondria

**50. When a plant is not reproducing, most of its cytokinins are produced in its**

- (A) Leaves                      (B) Lateral buds                      (C) Shoot apex                      (D) Roots

**Panjab University, Chandigarh**

**Ph.D. - 2023**

**ANSWERS / KEY**

**Subject: Botany(Ph.D.)**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
A	A	C	D	D	C	C	X	X	D
<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>
B	A	D	D	B	A	C	C	B	A
<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>
A	B	C	D	B	A	D	D	C	C
<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>37</b>	<b>38</b>	<b>39</b>	<b>40</b>
D	B	B	D	C	B	B	D	C	B
<b>41</b>	<b>42</b>	<b>43</b>	<b>44</b>	<b>45</b>	<b>46</b>	<b>47</b>	<b>48</b>	<b>49</b>	<b>50</b>
B	D	C	C	A	D	D	A	D	D

**Note:** An 'X' (if any) in the key indicates that either the question is ambiguous or it has printing mistake. All candidates will be given credit for this question

