Sample Question Paper for PhD Biotechnology

Format of the Entrance Test Paper:

The computer based Entrance Test will be of 2 hours duration. Questions will be asked at MSc level from all the areas of Biological sciences including Biochemistry, Cell Biology, Cancer Biology, Molecular Biology, Immunology, Animal Sciences, Plant Biotechnology, Genetics, Microbiology, Virology, Neurosciences, Biochemical Engineering, Biophysics and Biostatistics.

Part A: will have 70 multiple choice questions out of which any 50 Questions need to be answered. Each question carries one mark. If more than 50 questions are answered, the first 50 answers will be considered for evaluation.

Part B: will consist of a total of 40 questions of which 20 questions need to be answered. Each question carries one mark. If more than 20 questions are answered, the first 20 answers will be considered for evaluation.

- This is only a sample paper and meant to be indicative of the type of questions that will be asked.

1. Arf-1 is a monomeric G-protein that helps in the formation of COPI-coated vesicles at the golgi membrane by inserting a hydrophobic tail in the golgi membrane that then recruits other necessary adapter proteins to start bud formation. The hydrophobic tail of Arf-1 is exposed when Arf-1 is bound to GTP and is retracted when Arf-1 hydrolyses the bound GTP to GDP. If there is a mutation in Arf-1 so that it cannot hydrolyse GTP then all of the following can be expected to happen except

   a. COPI-coated vesicles will readily form but may form at places other than the golgi

   b. COPI-coated vesicles will disassemble quickly

   c. transport mediated by COPI-coated vesicles will be inhibited

   d. it would be lethal for the cell

2. X-ray diffraction and phase contrast microscopy both involve

   a. wave interference

b. observation of living specimens

c. differential stains

d. simple stains

3. Highly Active Antiretroviral Therapy is used for the treatment of

a. HBV infection

b. HCV infection

c. HIV infection

d. H1N1 infection

4. The drug Amantadine inhibits the influenza virus during

a. transcription

b. translation

c. uncoating of virus

d. virus entry

5. Which one of the following enzymes do (-) RNA viruses use during genome replication?

a. RNA dependent RNA Polymerase

b. DNA dependent RNA Polymerase

c. Reverse Transcriptase

d. RNA dependent DNA Polymerase

6. The speciation in which a population splits into two geographically isolated populations, experiences dissimilar selective pressure and undergoes genetic drift is known as

a. Sympatric speciation

b. Parapatric speciation

c. Peripatric speciation

d. Allopatric speciation

7. The ABO blood group system is based on the differences in the expression of

a. Glycerophospholipids

b. Glycosphingolipids

c. Glycoproteins

d.. Proteoglycans

8. Change in the order of genes located in a genetic map without altering their linkage group can be achieved through

a. translocation

b. transposition

c. inversion

d. recombination

9. Fluorouracil is used as a chemotherapeutic agent due to its ability to

a. inhibit folic acid regeneration

b. inhibit formation of dTMP from dUMP

c. convert UMP to dUMP

d. prevent synthesis of 5-phosphoribosyl-1-pyrophosphate (PRPP)

10. The phenomenon of position effect variegation is observed when a gene is

    a. present closer to the centromere

    b. present at the centre of the chromatid

    c. present within the inactivated X chromosome

    d. present within the plasmid

11. Polyploidy can be induced through colchicine which acts by interfering with which one of the following mechanisms?

    a. G0 to G1 transition

    b. G1 to S phase

    c. S phase

    d. Chromosomal segregation

12. Leber's hereditary optic neuropathy is a rare disease affecting the optic nerves causing bilateral loss of vision in early adulthood. The disease is caused by a single base change in the mitochondrial gene ND4 that results in a His residue, instead of Arg, in a polypeptide of complex I. The disease is acquired through

    a. autosomal dominant inheritance

    b. autosomal recessive inheritance

    c. spontaneous exposure to mutagens

    d. maternal inheritance

13. In order to study active transcription within a cell, which one of the following radioisotopes should be used that will allow its detection in the isolated mRNA?

    a. [α-P^{32}] ATP

b. [β-P^{32}] ATP

c. [γ-P^{32}] ATP

d. [γ -P32] GTP

14. The presence of nonspecific bands in a polymerase chain reaction (PCR) can be avoided by

a. reducing the denaturation temperature

b. increasing the annealing temperature

c. increasing the annealing time

d. increasing the number of cycles

15. Expression of a gene placed under the regulatory control of the *lac* operator will occur when

a. lactose and glucose are absent in the media

b. lactose is absent while glucose is present

c. lactose is present while glucose is absent

d. both lactose and glucose are present

16. Melting of the DNA refers to

a. disruption of ionic interactions between DNA and histones

b. disruption of non-covalent interactions between the bases of the DNA

c. disruption of covalent bonds between the sugar and phosphate groups

d. precipitation of DNA upon ethanol treatment

17. The design of primers for a polymerase chain reaction should NOT follow which one of the following conditions?

    a. primers should be 17-25 bases long

    b. primers should have a %GC content of 50-60

    c. primers should be self-complementary

    d. T_m should be in the range of 55-70°C

18. An example of a cationic detergent used for the isolation of DNA is

    a. Saponin

    b. Sodium deoxycholate

    c. CTAB

    d. CHAPS

19. Hyperpolarization of the neuron refers to

    a. increased [Na^+] influx

    b. increased [Na^+] efflux

    c. increased [K^+] influx

    d. increased [K^+] efflux

20. Which one of the following cellular compartments follows the transmembrane and vesicular transport system for protein trafficking?

    a. ER

    b. Nucleus

    c. Mitochondria

d. Golgi Apparatus