

NAME: \_\_\_\_\_ ID NO: \_\_\_\_\_ TUTORIAL SEC: \_\_\_\_\_

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS**

**BIO F111 (GENERAL BIOLOGY)**

**FIRST SEMESTER (2022-2023)**

**COMPREHENSIVE EXAMINATION: PART-I (CLOSED BOOK)**

**DATE: 13/02/2023**

**TIME: 1 HOUR (PART-I)**

**MARKS: 40 (20% WEIGHTAGE)**

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY:** (1) The exam is divided into Part-I (Closed Book) and Part-II (Open Book). You are now having the Part-I of the question paper. (2) **You have a maximum of 1 hour to answer Part-I, but you can submit your answer sheet any time to the invigilator to collect Part-II.** (3) **There are a total of 40 MCQs each carrying 1 marks (1X40=40 marks). Choose the most appropriate option and write your answer in the answer sheet only. When you are finished, detach and return only the answer sheet.** (4) Please write your **NAME, ID No. and TUTORIAL SECTION** in capital letters on the question paper and answer sheet without fail.

1. \_\_\_\_\_ is a specialized cell division process consisting of reductional and equational division.  
(A) Budding in *Saccharomyces cerevisiae* (B) Mitosis in vertebrates  
(C) Meiosis in sexually reproducing organisms (D) Binary fission in *E. coli*
2. Term used to define any chromosome other than the sex chromosome is  
(A) X-linked (B) Autosome (C) Centrosome (D) Genome
3. The frequency of two alleles in a gene pool is 0.19 (A) and 0.81 (a). Assume that the population is in Hardy-Weinberg equilibrium. Calculate the percentage of heterozygous individuals in the population.  
(A) 66% (B) 31% (C) 3% (D) 100%
4. Cell plate formation during cytokinesis is a feature of  
(A) Cells of rose plant (B) Cells of human liver (C) Cells of malarial parasite (D) COVID-19 virus
5. Albinism is a recessive disorder in human beings. If two affected individuals mate, what is the probability of them producing normal (non-albino) children.  
(A) 25% (B) 100% (C) 0% (D) Cannot be determined
6. Identify the right reasoning for the statement given - When two pureline homozygotes mate, the F1 generation is a heterozygote because (i) They inherit one allele from each parent (ii) Both alleles of the gene are different.  
(A) Only (i) is true (B) Only (ii) is true (C) Both (i) and (ii) are true (D) Neither (i) nor (ii) is true
7. Carriers of dominant X-linked disorders can be usually (i) Mothers (ii) Fathers (iii) Grandfathers (iv) Grandmothers  
(A) All four (i), (ii), (iii) and (iv) (B) Only (i) and (iv)  
(C) Only (ii) and (iii) (D) X-linked disorders cannot have carriers
8. Which blood group shows the co-dominant pattern of expression?  
(A) Group B (B) Group A (C) Group O (D) Group AB
9. In Mendel's experiments on monohybrid crosses for the 7 characteristics, the phenotypic ratio seen in F2 generation was:  
(A) 9:3:3:1 (B) 9:7 (C) 3:1 (D) 1:2:1
10. \_\_\_\_\_ tissue covers the surface of the body and constitutes the periphery of the organs in mammals.  
(A) Nervous (B) Connective (C) Muscle (D) Epithelial

**11.** Which of the following statement about allele frequency in population genetics is false?

- (A) Frequency of specific allele may vary from one local population to another
- (B) Allele frequency by definition means how often an allele is found in a population
- (C) Allele frequency of the dominant allele is always higher in populations
- (D) Allele frequency is commonly stated in terms of percentage or decimal fraction

**12.** The functional unit of nervous system is \_\_\_\_\_.

- (A) Nephron          (B) Neuron          (C) Axon          (D) Dendrite

**13.** Atherosclerosis is predominantly associated with the blockade of:

- (A) Veins          (B) Arteries          (C) Capillaries          (D) Veins and capillaries

**14.** \_\_\_\_ (i) \_\_\_\_ counters the effect of neurotransmitters that suppress nerve signals, while \_\_\_\_ (ii) \_\_\_\_ directly activates the neurotransmitters by binding to them respectively.

- (A) (i) Caffeine; (ii) Nicotine          (B) (i) Nicotine; (ii) Caffeine
- (C) (i) Alcohol; (ii) Nicotine          (D) (i) Alcohol; (ii) Caffeine

**15.** Converting a chemical stimulus to an electrical signal in a human taste bud involves the below given steps:

- I. Action potential to brain          II. Signal transduction
- III. Small molecule interaction with the surface receptor on sensory cell
- IV. Neurotransmitter release and activation of sensory neuron

Identify the correct sequence of events.

- (A) III, II, IV, I          (B) II, IV, I, III          (C) IV, III, I, II          (D) I, II, III, IV

**16.** Identify the incorrect statement from the statements given below.

- (A) Innate immunity exists by birth          (B) Adaptive immunity is acquired after birth
- (C) RBCs constitute immune cells          (D) Natural killer cells recognize virus-infected cells

**17.** Identify the incorrect statement with respect to human reproductive system.

- (A) Male gametes develop in the seminiferous tubules          (B) Luteinizing hormone from pituitary triggers ovulation
- (C) Four functional gametes result from one parent cell in females          (D) Egg cells are nutrient rich relative to sperm cells

**18.** \_\_\_\_ (i) \_\_\_\_ and \_\_\_\_ (ii) \_\_\_\_ cause bacterial and virus infected sexually transmitted diseases (STD) in humans respectively.

- (A) (i) *E. coli*, (ii) influenza          (B) (i) *Chlamydia*, (ii) influenza
- (C) (i) *Chlamydia*, (ii) herpes          (D) (i) Herpes, (ii) *E. coli*

**19.** \_\_\_\_ (i) \_\_\_\_ and \_\_\_\_ (ii) \_\_\_\_ secreted by \_\_\_\_ (iii) \_\_\_\_ regulates blood sugar level in a healthy individual.

- (A) (i) ADH, (ii) Glucagon, (iii) Pituitary          (B) (i) Glucagon, (ii) Insulin, (iii) Pituitary
- (C) (i) Insulin, (ii) Glucagon, (iii) Pancreas          (D) (i) Insulin, (ii) ADH, (iii) Pituitary

**20.** \_\_\_\_ (i) \_\_\_\_ and \_\_\_\_ (ii) \_\_\_\_ hormones produced by \_\_\_\_ (iii) \_\_\_\_ gland during stress are collectively called as 'fight-or-flight' hormones.

- (A) (i) Adrenaline, (ii) Noradrenaline, (iii) Adrenal          (B) (i) Epinephrine, (ii) Insulin, (iii) Adrenal
- (C) (i) Epinephrine, (ii) Insulin, (iii) Pancreas          (D) (i) Adrenaline, (ii) Noradrenaline, (iii) Pancreas

**21.** This cell organelle does not contain DNA

- (A) Nucleus          (B) Mitochondria          (C) Lysosome          (D) Chloroplast

**22.** By definition, what type of fatty acid has double bonds?

- (A) Steroid      (B) Triglyceride      (C) Unsaturated      (D) Saturated

**23.** A cell's cytoskeleton is a network of protein fibers that help a cell keep its shape. What other important function does the cytoskeleton serve?

- (A) The cytoskeleton contains and protects the cell's DNA  
(B) The cytoskeleton is the location where transcription occurs  
(C) The cytoskeleton guides organelles that must move from place to place within the cell  
(D) The cytoskeleton allows the cell to regulate what material enters and leaves the cell

**24.** While sucrose biosynthesis involves \_\_\_\_\_(i)\_\_\_\_\_ process, its breakdown involves \_\_\_\_\_(ii)\_\_\_\_\_ process.

- (A) (i) dehydration (ii) hydrolysis      (B) (i) hydrolysis (ii) dehydration  
(C) (i) hydration (ii) hydrolysis      (D) (i) hydration (ii) dehydration

**25.** The number of peptide bonds in a linear polypeptide having 421 amino acids is \_\_\_\_\_.

- (A) 421      (B) 420      (C) 419      (D) 124

**26.** Pick the correct option:

- (A) Mitochondria are surrounded by two membranes      (B) Ribosomes are surrounded by three membranes  
(C) Nucleus is surrounded by a single membrane      (D) Prion are surrounded by four membranes

**27.** The organelle serving as a primary packaging area for molecules that will be distributed throughout the cell is

- (A) Vacuole      (B) Plastids      (C) Mitochondria      (D) Golgi apparatus

**28.** The organelle whose membrane is folded and has a large surface area to carry out chemical activities like detoxification is

- (A) Nucleus      (B) Lysosomes      (C) Nuclear membrane      (D) Endoplasmic reticulum

**29.** The main difference between human cheek cells and onion peel cells is

- (A) Presence of cell wall in onion peel cells      (B) Presence of mitochondria in onion peel cells  
(C) Absence of endoplasmic reticulum in cheek cells      (D) Absence of the plasma membrane in cheek cells

**30.** Gases such as oxygen and carbon dioxide cross the cell membrane by

- (A) passive diffusion through the lipid bilayer      (B) primary active transport  
(C) specific gas transport proteins      (D) secondary active transport

**31.** During photosynthesis:

- (A) Carbon dioxide is reduced, and oxygen is consumed      (B) Carbon dioxide is oxidized, and oxygen is consumed  
(C) Carbon dioxide is reduced, and oxygen is released      (D) Carbon dioxide is oxidized, and oxygen is released

**32.** Choose the correct statement pertaining to photosynthesis:

- (A) Light reactions occur in stroma and dark reactions occur in thylakoid membranes of chloroplasts  
(B) Light reactions occur in thylakoid membranes and dark reactions occur in stroma of chloroplasts  
(C) Both light and dark reactions occur in thylakoid membranes of chloroplasts  
(D) Both light and dark reactions occur in stroma of chloroplasts

**33.** When a gene undergoes a single base substitution resulting in changing of one amino acid to another, then the mutation is called:

- (A) Silent mutation      (B) Nonsense mutation  
(C) Missense mutation      (D) Insertion or deletion

**34.** Suppose you wish to create a large batch of the protein lactase using recombinant DNA technology. Place the following steps in the order you would have to perform them.

- I. Find the clone with the gene for lactase
  - II. Insert the plasmids into bacteria and grow the bacteria into clones
  - III. Isolate the gene for lactase
  - IV. Create recombinant plasmids, including one that carries the gene for lactase
- (A) III, IV, II, I      (B) I, II, III, IV      (C) II, IV, I, III      (D) IV, III, II, I

**35.** In eukaryotes, DNA replication takes place in \_\_\_\_ (i) \_\_\_\_, transcription takes place in \_\_\_\_ (ii) \_\_\_\_ and translation takes place in \_\_\_\_ (iii) \_\_\_\_\_. The correct cellular compartments (i), (ii) and (iii) are:

- (A) (i) Nucleus, (ii) Cytoplasm, (iii) Nucleus
- (B) (i) Cytoplasm, (ii) Cytoplasm, (iii) Nucleus
- (C) (i) Nucleus, (ii) Nucleus, (iii) Cytoplasm
- (D) (i) Nucleus, (ii) Cytoplasm, (iii) Cytoplasm

**36.** Choose the correct statement:

- (A) The template strand and the coding strand in a gene are the same
- (B) As per the genetic code, each amino acid is coded by only one codon
- (C) RNA polymerase is involved in forming peptide bond between nucleotides
- (D) None of the above statements is correct

**37.** How many double-stranded DNA molecules are obtained from one double-stranded DNA molecule after 4 cycles of PCR?

- (A) 8      (B) 4      (C) 32      (D) 16

**38.** You transcribe mRNA from a DNA sample and purify it. You then separate the two strands of the DNA and analyse the base composition of each strand and of the mRNA. You obtain the data shown in the table below. Which strand of the DNA is serving as a template for mRNA synthesis?

DNA strand 1	A:19%, G:26%, C:31%, T:24%
DNA strand 2	A:24%, G:31%, C:26%, T:19%
mRNA	A:19%, G:26%, C:31%, U:24%

- (A) DNA Strand 1      (B) DNA Strand 2      (C) Both strands      (D) Neither strand

**39.** Assume that in bacteria the operon 'X' is involved in metabolizing lactose and the operon 'Y' is involved in synthesizing amino acid tryptophan. Then which of the following is correct?

- (A) The operon 'X' is turned on in the absence of lactose and the operon 'Y' is turned on in the presence of tryptophan
- (B) The operon 'X' is turned on in the presence of lactose and the operon 'Y' is turned on in the absence of tryptophan
- (C) The operon 'X' is turned on in the presence of lactose and the operon 'Y' is turned on in the presence of tryptophan
- (D) The operon 'X' is turned on in the absence of lactose and the operon 'Y' is turned on in the absence of tryptophan

**40.** Which of the following genes when undergo mutations, has the potential to cause cancer?

- (A) Proto-oncogenes
- (B) Tumor-suppressor genes
- (C) Both proto-oncogenes and tumor-suppressor genes
- (D) Neither proto-oncogenes nor tumor-suppressor genes

\*\*\*\*\*ALL THE BEST\*\*\*\*\*

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**INSTRUCTIONS:** Choose and write the most appropriate answer from the options given. Write your answers **ONLY** in the corresponding box provided, using a **PEN**. Write only in **CAPITAL LETTERS**. **DO NOT OVERWRITE**. If you need to change the answer, strike the previous option and write the new option. No negative marks for wrong answers. Each question carries **ONE** mark. Rough work if any can be done on the backside of this answer sheet.

**ID. No:** \_\_\_\_\_ **Name:** \_\_\_\_\_**Tutorial Section No.:** \_\_\_\_\_ **Tutorial Instructor Name:** \_\_\_\_\_

Q. No.	ANSWER	Q. No.	ANSWER	Q. No.	ANSWER
1		16		31	
2		17		32	
3		18		33	
4		19		34	
5		20		35	
6		21		36	
7		22		37	
8		23		38	
9		24		39	
10		25		40	
11		26			
12		27			
13		28			
14		29			
15		30			