Student Name: **Register Number:**

Total Marks: 30 **Time: 8.30 -9.15 am**

[I] Each question carry one mark. **(1x20)**

(1) A nucleotide consists of
(A) a sugar, a protein, and adenine.
(B) a sugar, an amino acid, a phosphate group and a nitrogenous base.
(C) a sugar, a phosphate group, and a nitrogenous base.
(D) a starch, a phosphate group, and a nitrogenous base.

ANSWER:C

(2) ATTG:TAAC ::

(A) AAAT : TTTG (B) TCGG : AGAT (C) CGAA : TGCG (D) GTCC : CAGG

ANSWER:D

(3) RNA contains which of bases.

(A) adenine, thymine, guanine, cytosine, uracil (B) adenine, thymine, guanine, cytosine
(C) adenine, guanine, cytosine, uracil (D) thymine, guanine, cytosine, uracil

ANSWER:C

(4) Which of the following best demonstrates the unity among all organisms?
(A) matching DNA nucleotide sequences
(B) descent with modification
(C) emergent properties
(D) natural selection
(E) the structure and function of DNA

ANSWER:E

(5) Which choice represents a possible pair of alleles?

(A) c & f (B) C & c (C) C & F (D) C & f

ANSWER:B

(6) In the cross "Tt x Tt", what per cent of offspring would have the same phenotype as the parents?

(A) 25 % (B) 33.3 % (C) 50% (D) 75% (E) 100%

ANSWER:D

(7) A gamete is a **haploid germ cell that fuses with that of the opposite sex during fertilization.**

(8) A bacterial gene has 810 nucleotides. The number of amino acids in the corresponding protein will be **269.** [Stop codon does not code for an amino acid so 810-3=807/3=269]

(9) RNA is synthesised in the **5' to 3'** direction from DNA.

(10) The DNA of an organism has 20% T bases. What per cent of its bases would be G bases?
ANSWER:30 %

(11) The rigidity and movement of cell and cell organelle depends on **cytoskeleton protein.**

(12) All the organisms on IIT-Bombay campus make up
(A) an ecosystem.
(B) a community.
(C) a population.
(D) an experimental group.
(E) a taxonomic domain.

ANSWER:B

(13) Protists and bacteria are grouped into different domains because
(A) protists eat bacteria.
(B) Unlike protists, bacteria are not multicellular.
(C) protists have a membrane-bounded nucleus, which bacterial cells lack.
(D) bacteria decompose protists.
(E) protists are photosynthetic.

ANSWER:C

(14) When biologists wish to study the internal ultrastructure of cells, they can achieve the finest resolution by using
(A) a phase-contrast light microscope.
(B) a scanning electron microscope.
(C) a transmission electronic microscope.
(D) a confocal fluorescence microscope.
(E) a super-resolution fluorescence microscope.

ANSWER:C

(15) All of the following are part of a prokaryotic cell *except*
(A) DNA.
(B) a cell wall.
(C) a plasma membrane.
(D) ribosomes.
(E) an endoplasmic reticulum.

ANSWER: E

(16) If radioactive deoxythymidine triphosphate (dTTP) is added to a culture of rapidly growing bacterial cells, where in the cell would you expect to find the greatest concentration of radioactivity?
(A) nucleus
(B) cytoplasm
(C) endoplasmic reticulum
(D) nucleoid
(E) ribosomes

ANSWER: D

(17) Vinblastine, a drug that inhibits microtubule polymerization, is used to treat some forms of cancer. Cancer cells given vinblastine would be unable to

(A) form cleavage furrows during cell division.
(B) migrate by amoeboid movement.
(C) separate chromosomes during cell division.
(D) extend pseudopods.
(E) maintain the shape of the nucleus.

ANSWER:C

(18) Which of the following is true for the signalling system in an animal cell that lacks the ability to produce GTP?

(A) It would not be able to activate and inactivate the G protein on the cytoplasmic side of the plasma membrane.
(B) It could activate only the epinephrine system.
(C) It would be able to carry out reception and transduction but would not be able to respond to a signal.
(D) It would use ATP instead of GTP to activate and inactivate the G protein on the cytoplasmic side of the plasma membrane.
(E) It would employ a transduction pathway directly from an external messenger.

ANSWER:A

(19) Starting with a fertilized egg (zygote), a series of seven cell divisions would produce an early embryo with how many cells?

(A) 8 (B) 32 (C) 64 (D) 128 (E) 256

ANSWER:D

(20) A group of cells is assayed for DNA content immediately following mitosis and is found to have an average of 8 picograms of DNA per nucleus. How many picograms would be found at the end of S and the end of G2?

(A) 8 & 8 (B) 8&16 (C) 16& 8 (D) 16&16 (E) 12&16

ANSWER:D_

[II] Each question carries two marks. **(2x5)**

(1) Match the items in <u>I</u> with items in <u>II</u>.

I	**II**
(P) Operon	(I) Calcium
(Q) Allele	(II) Transcription
(R) DNA polymerase	(III) Replication
(S) secondary messenger	(IV) eukaryotic mRNA
(T) 5' capping	(V) set of genes
	(VI) variants of a gene

ANSWER: P-V, Q-VI, R-III, S-I, T-IV

(2) Considering independent segregation of all factors, how many types of gametes does a VvXXWw individual produce?

ANSWER: 4 (VXW, VXw, vXW, vXw)

(3) The data were obtained from a study of the length of time spent (in minutes) in each phase of the cell cycle by cells of three eukaryotic organisms designated beta, delta, and gamma.

Cell Type	G_1	S	G_2	M
Beta	18	24	12	16
Delta	100	0	0	0
Gamma	18	48	14	20

(3a) Of the following, the best conclusion concerning the difference between the S phases for beta and gamma is that

(A) gamma contains more DNA than beta.
(B) beta and gamma contain the same amount of DNA.
(C) beta cells reproduce asexually.
(D) gamma contains 48 times more DNA and RNA than beta.
(E) beta is a plant cell and gamma is an animal cell.

(3b) The best conclusion concerning delta is that the cells

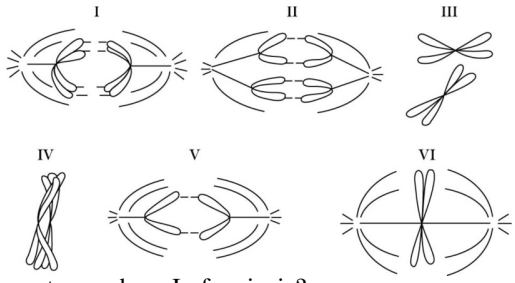
(A) contain no DNA.
(B) contain no RNA.
(C) contain only one chromosome that is very short.
(D) are actually in the G_0 phase.
(E) divide in the G_1 phase.

Answers (3a):A (3b):D

(4) Mention two differences between a normal cell and a cancerous cell.

Normal cells	***Cancer cells***
Undergo cell cycle regulation	*Do not undergo cell cycle regulation*
Stop dividing in case of errors induced in DNA	*Do not stop dividing incase of errors induced in DNA*
Exibit contact inhibition	*Do no exibit contact inhibition*
Most are anchorage dependent	*Anchorage independent*

(5) Refer to the drawings in the figure below of a single pair of homologous chromosomes as they might appear during various stages of either mitosis or meiosis, and answer the following two questions



(5a) Which diagram represents anaphase I of meiosis?

(A) I (B) II (C) III (D) V (E) VI

(5b) Which diagram(s) represents anaphase II of meiosis?

(A) II only (B) III only (C) IV only (D) V only (E) either II or V

Answers (5a): A (5b): D

_____End of Quiz paper_____