BITS PILANI DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY

SECOND SEMESTER 2012-2013

COMPREHENSIVE EXAMINATION

Course NO: BIO F111 Maximum Marks: 80

Course Title: General Biology Weightage: 40%

Date: 3.05.2013(AN)

- **Answer all the questions in the given sequence only**
- **Answer Part A,B & C in separate Answer sheets**

PART-A

Q1 (i) When a person gets an infection for the second time, why does the immune system respond quicker?
(ii) In which way natural Killer cells and Complement proteins help in controlling the Infection? Explain.
(iii) Cholesterol is harmful as well as useful for animals, Justify [2+3+2=7]

Q2.(i) Classify proteins on the basis of their functions and give example of each .
(ii)What is the difference between coordination and regulation, explain with an example?
(iii) In Humans tongue rolling & twisting are interesting dominant characteristics.
When a man capable of rolling and twisting (Both heterozygous) his tongue marries to a woman who neither can roll her tongue nor twist, what could be the phenotypic and genotypic ratio in the offsprings. [2+2+4=8]

Q3. A change in a segment of template strand of dsDNA caused the base sequence
5'CTT -3' to change to 5' CAT -3'.
(a) State 2 ways by which this could have occurred.
(b) What is the name given to this kind of change?
(c) If this change would affect the peptide sequence coded by the gene, write down the amino acid change that would take place. [3+1+2= 6]

Q4.Gretta's father is colorblind, as is her maternal grandfather (her mother's father).Gretta herself has a normal color vision .Gretta and her Husband Garry, who is also color blind, have just had their first child, a son they have named Mickey .Answer the following questions about this small family. (Colorblind is an X-linked trait controlled by recessive allele) [2+2+2=6]

(i) What is the probability that this child would be colorblind?

(ii) Three sources of colorblind alleles are mentioned in this family .If Mickey is color blind , from which of these three men(Gretta's grandfather,Gretta's father or Garry) did he inherit the allele?

(iii) If Garry were not colorblind, how would this affect the prediction about Mickey? Justify your answer)

PART-B

Q5. (a). Why the glucose results in varying number of total ATP produced in electron transport chain in prokaryotes and in eukaryotes? Briefly explain.
(b). Carbohydrates are considered as immediate source of energy? Explain
(c) List out the major (any 4) points each for light capturing, and light-dependent reactions
[3+2+3=8]

Q6. (a) How enzyme activity is influenced by the environmental factors? Explain with any two examples.
(b) Briefly explain any two types of enzyme inhibition and mention how it is used in disease control.
(c) Why the Hardy-Weinberg conditions rarely exists? Explain. [3+2+4=9]

Q7. (a) How cDNA libraries are made and mention the application of cDNA library. [2+2+3=7]
(b) How recombinant colonies are selected by using X-gal? Write the principle and application of the method.
(c) How the herbicide resistance in plants is used in agricultural biotechnology? Briefly explain.

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PART-C

Q8 (a) Explain how cells detect specific signals and how they transmit this signal to the cell's interior.
(b) What type of endoplasmic reticulum is found in the liver cells? Mention its functions.
(c) Mention two negative effects of chemotherapy in the cancer treatment? [4+2+2=8]

Q9 (a) How does the nondisjunction occur during gametogenesis? Indicate its consequences with one example.
(b) How does the study of fossils help scientists? Explain (any two points).
(c) List out the various activities involved in the nerve impulse. [4+2+3=9]

Q 10 Choose the related parts of the organs / system and group them appropriately in the table as mentioned below: [4.0]
Organ of corti, distal convoluted tubule, pericardium, cochlea, rectum, tympanum, incus, semicircular canals, chordate tendineae, collecting duct, cecum, glomerulus tubules, gall bladder, mitral valve, parotid gland, Bowman's capsule, coronary sinus, ilium, Loop of Henle, Tricuscipd valve

S No.	Name of the system / organ	Parts of the system / organ
a)		
b)		
c)		
d)		

Q 11 (a) Write a note on respiratory mechanism in human
(b)Name the hormones produced by adenohypophysis and neurohypophysis.
(c) Write two differences for the following:

i. Lysosome and phagosome
ii. Nephron and neuron
iii. Ureter and urethra
iv. Yellow spot and blind spot. [2+2+4=8]

**********GOOD LUCK **********

Genetic code: Amino acid nucleic acid dictionary and 20 common acids and their abbreviations:

Second Letter

1st letter	U	C	A	G	3rd letter
U	UUU Phe UUC UUA Leu UUG	UCU UCC UCA Ser UCG	UAU Tyr UAC UAA Stop UAG Stop	UGU Cys UGC UGA Stop UGG Trp	U C A G
C	CUU CUC CUA Leu CUG	CCU CCC CCA Pro CCG	CAU His CAC CAA Gln CAG	CGU CGC CGA Arg CGG	U C A G
A	AUU AUC AUA Ile AUG Met	ACU ACC ACA Thr ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
G	GUU GUC GUA Val GUG	GCU GCC GCA Ala GCG	GAU Asp GAC GAA Glu GAG	GGU GGC GGA Gly GGG	U C A G

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Answer Scheme

BITS PILANI DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2012-2013
COMPREHENSIVE EXAMINATION

Course NO: BIO F111 Maximum Marks: 80
Course Title: General Biology Weightage: 40%
Date: 3.05.2013(ANSWER KEY)

- Answer all the questions in the given sequence only
- Answer Part A,B & C in separate Answer sheets

PART-A

Q1 (i) When a person gets an infection for the second time, why does the immune system respond quicker?
Ans. Because after the first attack individual acquires immunity to the pathogen upon ,it keeps in its memory the ID of the pathogen , so response is quicker upon second attack.

(ii) In which way natural Killer cells and Complement proteins help in controlling the Infection? Explain.
Ans. Natural Killer Cells – they do not attack invading microbes directly, but they kill cells of the body that have been infected with virus. They do not kill by phagocytosis, but by creating a hole in the plasma membrane of the target cell. Proteins called perforins are released from the natural killer cells, inserted into the membrane of the target cell, forming a pore.

Complement Proteins - complement system prevents establishment of pathogens in the human body. it consists of 20 different proteins that circulate freely in the blood plasma. When they encounter bacterial or fungal cell wall, these proteins aggregate to form a membrane attack complex that inserts itself into foreign cell's plasma membrane forming a pore. Fluids enter the cell through the pores and cause the cells the swell and burst.

(iii) Cholesterol is harmful as well as useful for animals, Justify
Ans. Bad cholesterol –LDL - Harmful – can lead Atherosclerosis,
Good Cholesterol – Synthesis of Bile acids, Vitamin D [2+3+2=7]

Q2.(i) Classify proteins on the basis of their functions and give example of each .
Ans.

- Structural Proteins- Colllagen
- Regulatory/Functional Proteins – Enzymes
- Transport /Carrier Proteins- Lipoproteins, hemoglobin

(ii)What is the difference between coordination and regulation, explain with an example?
Ans: Mechanisms that ensures an organism will carry out all metabolic activities in Proper sequence is Coordination (Cemical reactions are sequenced in a metabolic pathway- Stepwise handling of nutrients) and at proper rate –Regulation (Enzymes)

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(iii) In Humans tongue rolling & twisting are interesting dominant characteristics. When a man capable of rolling and twisting (Both heterozygous) his tongue marries to a woman who neither can roll her tongue nor twist, what could be the phenotypic and genotypic ratio in the offsprings. [2+2+4=8]

Ans.:

(i) R - Rolling r, Non Rolling T, twisting t, Non twisting

(ii) RrTt **X** rrtt

(iii) (RT) (Rt) (rT) (rt) / (rt)

(iv) RrTt, Rrtt, rrTt, rrtt

(v) 1 : 1 : 1 : 1 Genotypic

Phenotypic: Roll Twist, Roll Non Twist, No Rolling Twisting, No rolling, No twisting

1 : 1 : 1 : 1

Q3. A change in a segment of template strand of dsDNA caused the base sequence

5'CTT -3' to change to 5' CAT -3'.

(a) State 2 ways by which this could have occurred.

Ans. Substitution or addition of nucleotide A before T

(b) What is the name given to this kind of change?

Ans. Point Mutation

(c) If this change would affect the peptide sequence coded by the gene, write down the amino acid change that would take place. [3+1+2= 6]

Ans. Template 5' CTT -3' 5'CAT-3'

Codon on mRNA 3'GAA-5' 3'GUA-5'

Amino Acid **Lysine** – changed to **Methionine**

Q4. Gretta's father is colorblind ,as is her maternal grandfather(her mother's father).Gretta herself has a normal color vision .Gretta and her Husband Garry, who is also color blind , have just had their first child , a Son they have named Mickey .Answer the following questions about this small family.(Colorblind is an X-linked trait controlled by recessive allele)

(i) What is the probability that this child would be colorblind?

Ans. There is 50% probability that the child born is colorblind.

(ii) Three sources of colorblind alleles are mentioned in this family .If Mickey is color blind , from which of these three men(Gretta's grandfather,Gretta's father or Garry) did he inherit the allele?

Ans.: Gretta's father ,Gretta is normal but carrier

(iii) If Garry were not colorblind, how would this affect the prediction about Mickey? Justify your answer)

Ans.: No it would not affect the prediction about Mickey (MALE) .Because Mickey has inherited X chromosome from the mother and Y from father. [2+2+2=6]

PART-B

Q5. (a). Why the glucose results in varying number of total ATP produced in electron transport chain in prokaryotes and in eukaryotes? Briefly explain.

In prokaryotes: Total net energy gain 38 ATPs

In eukaryotes: Total net energy gain 36 ATPs

The electrons released during glycolysis are carried by NADH and converted to $2FADH_2$ in order to shuttle them into the mitochondria

The difference in ATP due to the electrons carried by NADH enter reactions in complex I, where they lose some energy and are eventually transferred to Coenzyme Q. Electrons from $FADH_2$ enter complex II and are also transferred to Coenzyme Q.

(b). Carbohydrates are considered as immediate source of energy? Explain.

Carbohydrates are hydrolysed to simple sugars and enter glycolysis and provide ATP immediately.

carbohydrates: simple sugars to glucose to ATP, pyruvate and NADH and provide ATP

(c) List out the major (any 4) points each for light capturing, and light-dependent reactions [3+2+3=8]

light capturing events: antenna complex is a network of hundreds of chlorophyll and accessory pigments molecules whose main role is to capture photons of light energy and transfer the energy to the reaction center. chlorophyll molecule is get excited to a higher energy level. electron is passed to a primary electron acceptor molecule, oxidizing chlorophyll and reducing the acceptor.

light-dependent reactions: PS II occurs first and feeds its excited electrons to PS I; splitting of water molecules to hydrogen (2H) and Oxygen. the electrons of the hydrogens are used to replace the electrons that previously had been lost by the chlorophyll. the light energy captured by the antenna complex water into H and O. the electrons are being transported, protons are pumped from the stroma into the space inside the thylakoid and ATPase produce ATP. Thus, energy of sunlight produce ATP. In PS I, light is trapped and the energy is as in PS II. in *PS I no splitting of water into oxygen.* The high energy electrons leaving the reaction center of PS I through series of oxidation-reduction and electrons and $NADP^+$ is reduced to NADPH. the primary result of PS I is the production of NADPH.

Q6. (a) How enzyme activity is influenced by the environmental factors? Explain with any two examples.

Ans. Temperature: change the rate of molecular motion, change in the shape of an enzyme. The temperature at which the rate of formation of enzyme-substrate complex is fastest is termed the *Optimum temperature.* As the temperature decreases below the optimum, the molecular motion slows and the rate of formation of enzyme-substrate complex decreases. temperature is raised above the optimum, some enzyme molecules are changed such that they no longer form the enzyme-substrate complex, thus the reaction slows. higher temperatures may cause permanent changes in the 3-D shape of the enzyme molecule. Eg. egg white, high fevers cause damage to proteins in the brain.

pH: The 3-D structure of the protein has some side chains exposed, change in the H^+ ions influence the change in shape of the enzyme, enzyme have optimal pH at which the activation energy is the least. Eg. Pepsin, trypsin

Enzyme substrate concentration: substrate molecules is large, the active sites of the enzyme could get saturated, if the substrate molecules are less, conversion into product is appropriately low. Thus, concentration of the substrate also influences the rate of the reaction.

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(b) Briefly explain any two types of enzyme inhibition and mention how it is used in disease control.

Ans. Competitive inhibition inhibitors have a shape that closely resembles to substrate hence the enzyme cannot differentiate. the active site of the enzyme is not available for the substrate. inhibitor competes with the substrate for the active site. drugs to control herpes viruses. Negative feedback inhibition is another method of controlling the synthesis of many molecules within the cell. This control occurs within enzyme controlled reaction sequence. As the number of the end products increases, some product molecules feed back to one of the previous reactions and have a negative effect on the enzyme controlling that reaction. **ie**: they inhibit or prevent that enzyme from performing at its best. after inhibition when the end product molecules are few in number, they fail to have a negative effect and hence the enzyme resumes its original activity, enzyme function and normal metabolism.

(c) Why the Hardy-Weinberg conditions rarely exists? Explain. [3+2+4=9]

Ans. a. random mating does not occur; b. spontaeneous mutations occur; c. immigration and emigration of individual organisms are common; d. populations are not infinitely large; e. genes are not all equally likely to be passed to the next generation. (with one example for each).

Q7. (a) How cDNA libraries are made and mention the application of cDNA library.

Ans. Expressed genes - cDNA libraries, made with the help of reverse transcriptase, DNA from a mRNA. DNA copies of mRNA are called cDNA or complementary DNA. cDNA libraries are useful for genes expressed in specific tissues or cells.

(b) How recombinant colonies are selected by using X-gal? Write the principle and application of the method.

Ans. Lac Z' produce beta galactosidase, The presence of Lac Z' gene can be detected by plating on medium containing **X-gal**, substrate for the enzyme encoded by LacZ'. cells with the active Lac Z' gene will produce the enzyme and will be blue in colour, while cells lacking the active Lac Z' gene will be colorless. Screening/selection for recombinants.

(c) How the herbicide resistance in plants is used in agricultural biotechnology? Briefly explain. [2+2+3=7]

Ans. Glyphosate is an active ingredient in biodegradable herbicide which works by inhibiting an enzyme EPSP synthetase, which plants require to produce aromatic amino acids. glyphosate resistance in plants.

PART-C

Q 8(a) **Explains how cells detect specific signals and how they transmit these signals to the cell's interior. (2+2)**

Signal transduction in the cell - A basic process which involves the conversion of a signal from outside the cell to a functional change within the cell. In this course of action the cascade of developments take place wherein an extracellular signal (typically a hormone or neurotransmitter) interacts with a receptor at the cell surface, causing a change in the level of a second messenger (for example calcium or cyclic AMP) and ultimately effects a change in the cells functioning (for example: triggering glucose uptake or initiating cell division) (pp 74)

(b) What type of endoplasmic reticulum is found in the liver cells? Mention its functions. (2)

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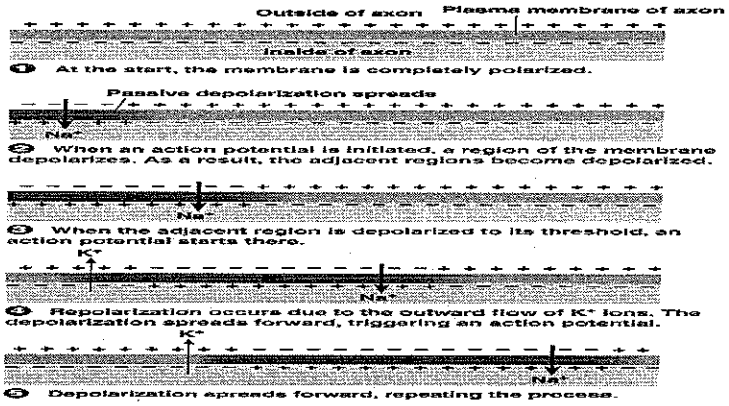
Liver cells contain extensively smooth endoplasmic reticulum.
They involve in important cellular chemical activities including fat metabolism and detoxification reactions that are involved in the destruction of toxic substances such as alcohol and drugs.

(C) Mention two negative effects of chemotherapy in the cancer treatment? (2)
Chemotherapy lowers the body's immune reaction because it decreases the body's ability to reproduce new WBCs by mitosis. Chemotherapy interferes with the body's defense mechanism. Side effects include intestinal disorders and loss of hair, which are caused by damage to healthy cells in the intestinal tract and the skin that divides by mitosis.

Q 9 (a) How does the nondisjunction occur during gametogenesis. Indicate its consequences with one Example. (2+2)
During meiosis I, when a pair of homologous chromosomes fails to separate properly results in the formation of faulty gametes. These gametes will have abnormal number of chromosomes (monosomy and trisomy). This usually results in the death of the cells. Some of these abnormal cells however do live and develop into sperm or eggs. If one of these abnormal sperm or egg unites with the normal gametes, the offspring will have abnormal no of chromosomes. There will be three of one of the kinds of chromosomes instead of normal two.
Sown syndrome is one of the illustrations of the trisomy. The trisomic conditions could display a variety of physical characteristic, including slightly slanted eyes, flattened facial features, a large tongue, and a tendency towards short stature and fingers. Most individuals also display mental retardation.

(b) How does the study of fossils help scientists? (2)
Fossils helps scientist to study the evolution and phylogeny. And also helps them to establish the geological periods.
(c)Explain various activities involved in the nerve impulse (3)



Q 10 Choose the related parts of the organs / system and group them appropriately in the table as mentioned below: (4)
Organ of corti, distal convoluted tubule, pericardium, cochlea, rectum, tympanum, incus, semicircular canals, chordate tendineae, collecting duct, cecum, glomerulus tubules, gall bladder, mitral valve, parotid gland, Bowman's capsule, coronary sinus, ilium, Loop of Henle, Tricuscipd valve

S No	Name of the system / organ	Parts of the system / organ
a)	Digestive system	parotid gland, gall bladder, cecum, ilium, rectum
b)	Circulatory system / Heart	Tricuscpid, mitral valve, pericardium, chordia tendineae, coronary sinus

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c)	Excretory System / Nephron	Loop of Henle, distal convoluted tubule, glomerulus tubules, Bowman's capsule, collecting duct
d)	Nervous system / ear	Organ of corti; cochlea, tympanum, incus, semicircular canals

Q 11 (a) Write a note on respiratory mechanism in human (2)

Two stages

Inhalation – contraction of intercostals muscles and lowering of diaphragms – volume increases – pressure decreases – air from outside get into the lungs

Exhalation – relaxation of intercostals muscles and raising of diaphragms – volume decreases – pressure increases – air from lungs goes out

(b)Name the hormones produced by adenohypophysis and neurohypophysis. (2)

Adenohypophysis-

Growth Hormone, Adrino cartico trophic hormone, Thyroid stimulating Hormone, Prolactin, Leutinizing Hormone, Leuteotrophic Hormone, Melanocyte trophic hormone.

Neurohypophysis

Anti-diuretic Hormone, Oxytocin

(c) Write two differences for the following: (4)

a) **Lysosome and phagosome**: Lysosome is an cell organelle, referred as suicidal body, secretes enzymes helps in digestion and destruction of pathogens. Phagosomes are not organelles. They are formed during phagocytosis.

b) **Nephron and neuron**- Nephron smallest structural and functional unit of kidney helps in excretion, Neuron smallest structural and functional unit of nervous system, helps in nerve conduction, impulse.

c) **Ureter and urethra** – ureter is the connecting tube between kidney and urinary bladder, helps in draining the urine into urinary bladder, urethra is an external opening through which urine is voided.

d) **Yellow spot and blind spot**: found in the retina also referred as fovea centralis where the cone density will be maximum in number and the light falls in this region. Blind spot is also found in the retina where the visual cells will be very few and it is the converging point from where the optic nerve is formed.

BITS PILANI DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2012-2013
Test 2 (OPEN BOOK)

Course NO: BIO F111 **Maximum Marks: 40**
CourseTitle: General Biology **Weightage: 20%**

Date: 28.04.2013

Answer all the questions in the given sequence

1a. (i) Differentiate between with phosphorylation (at the substrate level) and oxidative phosphorylation with two examples.
(ii) Why the cells carryout substrate level phosphorylation when electron transport chain generate much of the energy requirements of a cell.

[3+3=6]

b. (i) Why light independent reactions in photosynthesis are called dark reactions?

(ii) Justify, whether such reaction can occur in the dark? Briefly outline the functions of this reaction in photosynthesis.
(iii) Enzyme catalyzed reactions are more effective than inorganic catalysts. How this is achieved in a living cell without the input of additional energy from external sources?

[1+3+4=8]

2a. Why is it important for chromosomes to be condensed during mitosis and decondensed during interphase?
b. How are prokaryotic cell division and eukaryotic mitosis different?
c. Why do brothers and sisters look different from each other even though they have the same mother and father?

[5+4+4=13]

3a. What are the major differences with respect to transcription in prokaryotes and eukaryotes?
b. In eukaryotes the concept of one gene and one protein/ enzyme holds untrue. Justify your answer.
c. Following is the sequence of a double stranded DNA
5'-TCT GATGATTGGGCATTTAATCCGTACTCATTAGAC-3'
3'-AGACTACTAACCCGTAAATTAGGCATGAGTAATCTG-5'

i. Write the RNA transcript for the sequence
ii. Determine the order of the amino acids in the polypeptide formed.
iii. A mutation occurred in the DNA such that the new DNA formed had the following sequence. Locate the mutation and name the type of mutation
5'-TCT GATGATTGGGCAGTTTAATCCGTACTCATTAGAC-3'
3'-AGACTACTAACCCGTCAAATTAGGCATGAGTAATCTG-5'

[4+3+6=13]

**********GOOD LUCK **********

Answer key

BITS PILANI DUBAI CAMPUS
DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2012-2013
Test 2 (OPEN BOOK)

Course NO: BIO F111 **Maximum Marks: 40**
CourseTitle: General Biology **Weightage: 20%**

Date: 28.04.2013

Answer all the questions in the given sequence

1a. (i) Differentiate between with phosphorylation (at the substrate level) and oxidative phosphorylation with two examples.

Ans: glycolysis, 1,3-bisphosphoglycerate to 3-phosphoglycerate; TCA cycle, succinyl CoA to succinate; proton pump- ATP synthesis, presence of oxygen, photosynthesis-ATP formation

(ii) Why the cells carryout substrate level phosphorylation when electron transport chain generate much of the energy requirements of a cell.

Ans. Recycling of NADH for ATP synthesis; lack of oxygen, anaerobes, fermentation products

[3+3=6]

b. (i) Why light independent reactions in photosynthesis are called dark reactions?

Ans. Does not require photons/light energy, dependent on ATP and NADPH synthesized in light dependant reactions.

(ii) Justify, whether such reaction can occur in the dark? Briefly outline the functions of this reaction in photosynthesis.

Ans. Does not occur in the dark as it depends on ATP and NADPH production; the dark reaction is to synthesize the carbohydrates by fixing CO2

(iii) Enzyme catalyzed reactions are more effective than inorganic catalysts. How this is achieved in a living cell without the input of additional energy from external sources?

Ans. Enzymes bring together the substrates and the reactant and lower activation energy; most of the enzyme catalyzed reactions are coupled with ATP or electron donors or acceptor molecules. (Energy transfer from Energy releasing to Energy requiring reactions)

[1+3+4=8]

2a. Why is it important for chromosomes to be condensed during mitosis and decondensed during interphase?

Ans. The correct separation of chromosome sets between daughter cells during mitosis is the main issue. If chromosomes were not condensed, long tiny fibers of DNA would be dispersed in cytoplasm. Cleavage of chromosomes could not be easily organized and pulled by the spindle fibers.

During interphase the function of chromosomes, i.e, of DNA molecules, is the synthesis of RNA and thus of proteins. For this task it is necessary for functional molecular regions to be decondensed. During interphase in addition DNA replication occurs as a preparatory step for cell division. In this process it is fundamental for the exposition of DNA molecules to serve as templates to new DNA chains under production

b. How are prokaryotic cell division and eukaryotic mitosis different?

Ans. Prokaryotic cell division, a process known as binary fission, is fast. The chromosome is duplicated prior to division. Eukaryotic cells divide by separating the duplicated chromosomes through movements directed by microtubles. Prokaryotes are much simpler in their organization than are eukaryotes. There are a great many more organelles in eukaryotes, also more chromosomes.

c. Why do brothers and sisters look different from each other even though they have the same mother and father?

Ans. Five factors contribute to genetic variation in offsprings

1. Mutation
2. Crossing- Over
3. Segregation
4. Independent Assortment
5. Fertilization

[5+4+4=13]

3a. What are the major differences with respect to transcription in prokaryotes and eukaryotes?

Ans.(i) In Eukaryotes transcription occurs in nucleus whereas in PK it takes place in Cytoplasm

(ii) Splicing in Eukaryotes

b. In eukaryotes the concept of one gene and one protein/ enzyme holds untrue. Justify your answer.

Ans. Due to the splicing of introns in Eukaryotes, there is no splicing in PK

c. Following is the sequence of a double stranded DNA

5'-TCTGATGATTGGGCATTTAATCCGTACTCATTAGAC-3'

3'-AGACTACTAACCCGTAAATTAGGCATGAGTAATCTG-5'

i. Write the RNA transcript for the sequence

5'-UCUG**AUG**AUUGGGCAUUUAAUCCGUACUCAU**UAG**AC-3'

Start Stop

ii. Determine the order of the amino acids in the peptide formed.

Met –Ile-Gly-His-Leu-Ile-Arg-Thr-His-stop

iii. A mutation occurred in the DNA such that the new DNA formed had the following sequence. Locate the mutation and name the type of mutation

5'-TCT GATGATTGGGCAGTTTAATCCGTACTCATTAGAC-3'

3'-AGACTACTAACCCGTCAAATTAGGCATGAGTAATCTG-5'

An addition of a GC basepair at the 16th position has lead to a frame shift mutation in the DNA strand.

[4+3+6=13]

**********GOOD LUCK **********

BITS PILANI, DUBAI CAMPUS
DUBAI INTERNATIONAL ACDEMIC CITY
SECOND SEMESTER 2012-2013
TEST -1 (CLOSED BOOK) Answer Key

COURSE NO. BIOF 111 10-3-2013(Weightage25%) MAXIMUM MARKS: 50
COURSE NAME; GENERAL BIOLOGY DURATION: 50 Mins

Q1. (a) Differentiate between the following
(i) Chromatin and Chromosome (1 major différence)
Ans. Chromatin – Long, thin helical strands of DNA
Chromosomes : thicknend, shortened condensed, supercoiled DNA before cell division
(ii) Lysosomes & Peroxisomes (2 major differences)
Ans. Lysosomes : vesicles that contain enzymes (lipases, Proteases, Nucleases) ,origin from Golgi . Function - **digestion and destruction**
Peroxisomes: enzymes (peroxidases, Catalases) . Catalase, that breaks down Hydrogen peroxide – release water & oxygen. Origin from ER , oxidize harmful microbes

(ii) DNA & RNA (2major differences)
Ans. DNA: deoxyribonucleic acid, Deoxyribose sugar, ATGC base pairs, A=T, G= C
RNA: ribose sugar, AUGC, A=U (6Marks)
(b) What factors are important in deciding the permeability of the plasma membrane? Explain. (3 Marks)
Ans. Size of the molecule, Solubility in the membrane and ionic charge (with example)

(c) Structure and function of proteins are interrelated, justify the statement with 2 examples. (6 Marks)
Ans. Sickle cell anemia, prion related diseases result of distortion of protein structure /misfolding of protein. Enzyme activity lost with change in 3Dshape of enzyme
(d) How an organism is able to differentiate between what belongs to its body and what is foreign? Explain with an example. (3 Marks)
Ans. By means of proteins on the outside of plasma membrane. Histocompatibility antigens, Glycoproteins .Immune cells are able to differentiate between self and non self with the help of these proteins.
Q2. (a) As an Engineering student justify how the study of biology is helpful in raising the living standard and contributing in future developments? (Answer in Points only) (4 marks)
Ans. (i) Designing new equipments /Machines in Agriculture sector and medical sector.
(ii) In improving technology and design of low cost machines /equipments. (Glucometer)
(iii) Improved varieties of crops, superior breeds of animals, treatment plants for sewage and drinking water.

(b) Mention the mode of transport of the following molecules; Oxygen, Glucose, Sodium ions, across cell membrane in a tabular column and differentiate between the methods of transport.
(6 Marks)

Method.	Diffusion	Facilitated Diffusion	Active Transport
Molecule	Oxygen	Glucose	Sodium ions
Conc.	High to low	High to low	Low to high
Carrier	No	yes	yes
Active /Passive	passive	Passive	Active

(c) What is individual adaptation, Give three examples for Individual adaptation. (2+3=5Marks)
Ans. Refer to page no.13 text Book Enger and Ross. Responsive Processes

Q3 (a) Cellulose is an important polysaccharide used in constructing call walls of plant cells. In which way it is useful for humans? Explain. (2Marks)
Ans. Add bulk or fiber to our diet but no calories, help in controlling weight and reduces risk of colon cancer, Controls constipation and diarrhea.
(b) What will happen if Microtubules are removed from an animal cell? Explain (points). (4 Marks)
Ans. No spindle fibre formation, no separation of chromosomes and problem with formation of cilia & flagella

(c) List out the components of a bacterial cell and mention their function. (8 Marks)

1. Capsule or slime layer - Capsule helps the bacteria in adhering to surfaces and also evades phagocytosis.
2. Fimbriae, - help the cell to stick to objects.
3. Flagella ....movement through the environment.
4. Rigid cell wall made-up of carbohydrates and protein complex called peptidoglycan. The cell wall provides strength to resist osmotic pressure changes and gives it shape.
5. Beneath cell wall is the plasma membrane.....similar to that of eukaryotes....carrier out similar functions.
6. Genetic material is present in the cytoplasm ie the DNA, in the form of a loop.
7. Plasmid – antibiotic resistance
8. Ribosomes- protein synthesis

(d) In which way the process of phagocytosis is significant for an organism /cell? Explain with 2 examples. (Answer in points) (4 Marks)

Ans. Defense – example WBC.
Engulfing food and digestion - Paramecium

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BITS Pilani, Dubai Campus (SET -A)

DIAC, DUBAI

2nd Semester 2012- 2013

First Year (Sec 1.2.3) **General Biology (BIO F111)** **Quiz –2 (Closed book)**

Date: 19/05/13 Duration: 20 minutes Weightage: 7% (Max Marks 14)

Id No: _____ **Name:** _____ **Sec:** ____

1) Gene for right handedness is dominant over the gene for left handedness. Most probable genotypes of the two right handed parents with left hand child is [1]

a) Rr x Rr b) rr x Rr c) RR x Rr d) RR x rr

2) A woman with type A blood group has a child with type A blood group. Which of the following men could not be the father of this child? [1]

a) A b) B c) AB d) all of the above e) none of the above

3) Hemophilia is a X-linked trait and is controlled by a recessive allele

a. Give the genotypes of 1) a woman with normal blood clotting whose father had hemophilia and 2) a normal man whose father had hemophilia. [2]

b. What is the probability that a mating between these two individuals will produce a child, regardless of sex, that has hemophilia? [1]

c. If this couple has a daughter, what is the probability that the daughter will be a carrier of the hemophilia trait? [1]

d. What is the probability a daughter would have hemophilia? [1]

e. If this couple has a son, what is the probability he will have hemophilia? [1]

4) The phemonenon that the Restriction enzymes do not act on the host cells is called _____ _____. [1]

5) A good plasmid vectors must possess two important properties viz:_____ and _____. [2]

6) The presence of Lac Z' gene can be detected by plating on medium containing_____. [1]

7) A collection of DNA fragments representing all of the DNA from an organism is called _____ _____. [1]

8) Gene technology is used to produce _____ for treating high blood pressure and _____ for treating rare blood disorders. [1]

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

BITS Pilani, Dubai Campus (SET -A)

DIAC, DUBAI

2nd Semester 2012- 2013

First Year (Sec 1.2.3) | **General Biology (BIO F111)** | **Quiz –2 (Closed book)**

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a. Give the genotypes of 1) a woman with normal blood clotting whose father had hemophilia and 2) a normal man whose father had hemophilia. $X^H X^h$ $X^H Y$ [2]

b. What is the probability that a mating between these two individuals will produce a child, regardless of sex, that has hemophilia? 25 % [1]

c. If this couple has a daughter, what is the probability that the daughter will be a carrier of the hemophilia trait? 50 % [1]

d. What is the probability a daughter would have hemophilia? NIL [1]

e. If this couple has a son, what is the probability he will have hemophilia? 50 % [1]

4) The phemonenon that the Restriction enzymes do not act on the host cells is called Host Restriction. [1]

5) A good plasmid vectors must possess two important properties viz: Origin of Replication and antibiotic Resistance Marker (gene) [2]

6) The presence of Lac Z' gene can be detected by plating on medium containing X-gal. [1]

7) A collection of DNA fragments representing all of the DNA from an organism is called (Genomic Library). [1]

8) Gene technology is used to produce Atrial peptide for treating high blood pressure and Tissue plasminogen activator for treating rare blood disorders. [1]

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BITS Pilani, Dubai Campus (SET -A)

DIAC, DUBAI

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

B

BITS, PILANI, DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY

SECOND SEMESTER 2012-2013

QUIZ-1 [7.4.2013]

COURSE NO.: BIO F111 **MAXIMUM MARKS: 16**

TITLE: GENERAL BIOLOGY **DURATION: 20 min.**

Name: **ID NO.** **Section:**

.....

Q1.Organisms belonging to Domain Eubacteria reproduces by ---------- [1]

Q2. A group of similar orders is called a(n) ---------- [1]
(a) Phylum (b) Kingdom (c) Class (d) Domain

Q3. ----------kind of inhibitors attach to the allosteric site of an enzyme? [1]

Q4. What is the composition of cell wall in the following:

- Plant cell
- Fungal cell / Fungi

[1]

Q5. Viruses responsible for measles and mumps attaches respectively to ..... and that of HIV to ..... [1]

Q6. ----------is the classification system in which each species is assigned a two part scientific name. [1]

Q7.Name the te rm which refers to the classification of organism on the basis of evolutionary relatedness? [1]

Q8.Organisms found in Sewage and swamps are known as .....and belong to Domain ..... [1]

Q9. In the binomial nomenclature, which one of the following is correct scientific name of an organism?

(a) panthera tigris
(b) Panthera tigris
(c) Panthera tigris
(d) Panthera tigris

[1]

Q10. Trypsin works best at _____ pH, while _____ works well at an acidic pH. [1]

PTO

Q11.Which of the following enzymes would digest a fat?
(a) Sucrase (b) Fatase (c) Protease (d) Lipase [1]

Q12. Messengers that tell the cell to decrease the production of a certain protein are known as---------- [1]

Q13.The proton pump is responsible for the production of ----------and involves the movement /pumping of _____ [1]

Q14.The kingdom composed of heterotrophs with many obtaining energy from dead organic matter are
(a) Fungi (b) Plantae (c) Animalia (d) Protista. [1]

Q15. Name the electron carriers involved in the process of Cellular respiration and Photosynthesis. [1]

Q16.According to the induced-fit hyhypothesis
a) the presence of the substrate causes the enzyme to adjust itself to the substrate, this creates stress on substrate bonds.
b) enzymes and substrates fit perfectly together with "lock and key" precision.
c) coenzymes alter the shape of enzyme molecules.
d) inhibitors alter the shape of substrates [1]

All the best

Answering scheme

B

BITS, PILANI, DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY

SECOND SEMESTER 2012-2013

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Name: **ID NO.** **Section:**

.....

Q1.Organisms belonging to Domain Eubacteria reproduces by **binary fission** [1]

Q2. A group of similar orders is called a(n) ---------- [1]
(a) Phylum (b) Kingdom (c) **Class** (d) Domain

Q3. **Non Competitive Inhibitor** kind of inhibitors attach to the allosteric site of an enzyme? [1]

Q4. What is the composition of cell wall in the following?

- Plant cell : **Cellulose**
- Fungal cell / Fungi : **Chitin**

[1]

Q5. Viruses responsible for measles and mumps attaches respectively to **salivary gland** and that of HIV to **Brain cells, Immune cells** [1]

Q6. **Binomial Nomenclature** is the classification system in which each species is assigned a two part scientific name. [1]

Q7.Name the te rm which refers to the classification of organism on the basis of evolutionary relatedness? **Phylogeny** [1]

Q8.Organisms found in Sewage and swamps are known as **Methanogens** and belong to Domain **Archaea** [1]

Q9. In the binomial nomenclature, which one of the following is correct scientific name of an organism?

(a) panthera tigris
(b) Panthera tigris
(c) Panthera tigris
(d) Panthera tigris

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(a) Fungi (b) Plantae (c) Animalia (d) Protista. [1]

Q15. Name the electron carriers involved in the process of Cellular respiration and Photosynthesis. **NAD^+, FAD, $NADP^+$** [1]

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a) **the presence of the substrate causes the enzyme to adjust itself to the substrate, this creates stress on substrate bonds.**
b) enzymes and substrates fit perfectly together with "lock and key" precision.
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All the best