

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

BIOL 101 – Foundations Biology
PARTIAL Final Exam – Spring 2011 – Dr. Hardy

Instructions:

1. Please do not turn this page over until Prof. Hardy has instructed you to do so.
2. Put your cell phone away.
3. Take out a scientific calculator. If you don't have one, use your pencil and paper for calculations when needed.
4. Scantron answer bubbles should be completely filled in with a number 2 pencil.
5. Start by filling in your complete last name and both first and middle name initials.
6. Fill in your MU number in the Social Security number slot.
7. Read ALL possible answers, then choose THE BEST answer.

©CR Hardy

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

- 1) The two major groups of extant cetaceans are
 - A) toothed whales, baleen whales
 - B) dolphins and whales
 - C) porpoises plus dolphins, then whales
 - D) sperm whales, blue whales

- 2) According to phylogenetic data, the closest extant relative of cetaceans is
 - A) the horse
 - B) basilosaurus
 - C) the frog
 - D) the hippopotamus
 - E) dorudon

- 3) A whale tail moves _____, whereas a fish tail moves _____.
 - A) side-to-side, up-and-down
 - B) back-and-forth, up-and-down
 - C) up-and-down, side-to-side
 - D) in a circular fashion, spirally

- 4) How do whales breathe?
 - A) via gills
 - B) oxygen diffuses in through the body like with frogs
 - C) via lungs
 - D) via a special air chamber located just beneath the flippers

- 5) *Basilosaurus* was a whale with...
 - A) gills
 - B) more fish-like fins
 - C) legs
 - D) baleen
 - E) no lungs

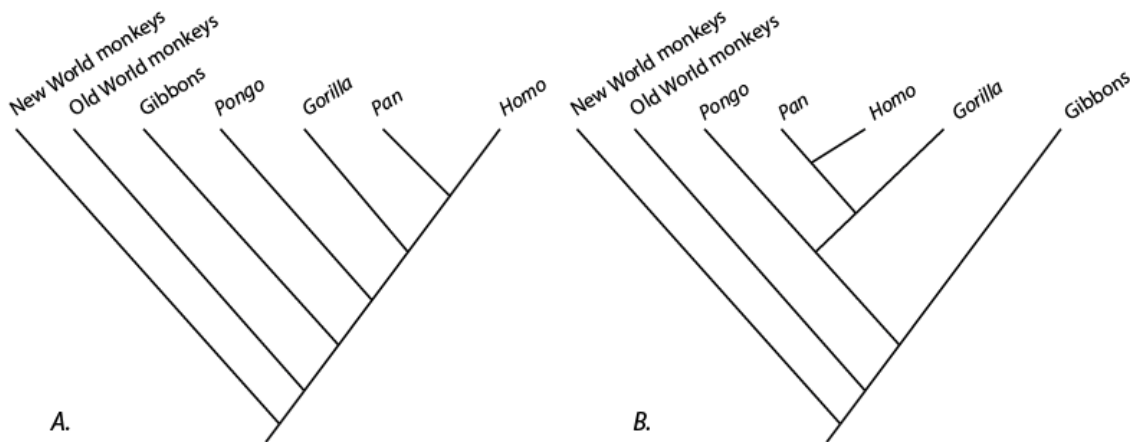
- 6) Other marine animals that have evolved from terrestrial ancestors independently of cetaceans include
 - A) sea otters
 - B) penguins
 - C) sea lions & seals
 - D) manatees
 - E) all of the above

- 7) Some modern whales today have
 - A) vestigial pelvic & leg bones
 - B) developed gills
 - C) functioning legs
 - D) developed scales like fish

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

- 8) Cetaceans share with most other mammals the following..
- A) mammary glands, hair, warm-bloodedness, birth to eggged young
 - B) mammary glands, hair, warm-bloodedness, opposable thumbs, live birth
 - C) salivary glands, hair, warm-bloodedness, birth to eggged young
 - D) live birth, hair, warm-bloodedness, mammary glands
- 10) The marine mammal group that shows the smallest degree of streamlining adaptations for a marine existence & swimming is...
- A) sea otters
 - B) penguins
 - C) sea lions & seals
 - D) manatees
 - E) dolphins
- 11) Place the following whales and whale relatives in order of their appearance over evolutionary time, beginning with the earliest followed by the latest.
- A) Dorudon, Basilosaurus, Ambulocetus, Rhodocetus
 - B) Basilosaurus, Dorudon, Ambulocetus, Rhodocetus
 - C) Ambulocetus, Rhodocetus, Dorudon, Basilosaurus
 - D) Ambulocetus, Dorudon, Rhodocetus, Basilosaurus
 - E) Basilosaurus, Rhodocetus, Ambulocetus, Dorudon
- 13) How far back do the first swimming whale ancestors reach?
- A) About 5 million years
 - B) About 10 million years
 - C) About 20 million years
 - D) About 50 million years
 - E) About 100 million years

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.



19) Does cladogram A above depict humans sharing a most recent common ancestor with the other apes?

- A. Yes** B. No

20) Which of the statements below is accurate based on the cladograms shown above?

- A) there are no differences in the phylogenetic relationships depicted by the two cladograms.**
- B) A shows gibbons more closely related than orangutans to humans, chimps and gorillas.
- C) A shows that chimps and humans are most closely related to one another, whereas B says that humans and gorillas are closest relatives.
- D) A shows Gibbons more closely related to monkeys, whereas B shows them more closely related to gorillas.
- E) A shows that chimps and humans are most closely related to Gorilla, whereas B shows they are more closely related to Pongo.

21) If a species is extant, then it is

- A) no longer living
- B) still living**
- C) still living but endangered

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

23) **Dimples.** The presence or absence of dimples is controlled by two alleles in a dominant/recessive manner. Having dimples is the dominant phenotype.

If 40 out of 100 people have dimples and 60 do not, assume that this population is at Hardy-Weinberg Equilibrium and estimate the frequency of heterozygotes in this and future generations.

- A) 0.60
 - B) 0.35**
 - C) 0.40
 - D) 0.75
 - E) 0.05
- 26) In Hardy-Weinberg notation, p represents the...
- A) The number of dominant alleles in a population
 - B) The frequency of the dominant allele in a population**
 - C) The number of recessive alleles in a population
 - D) The frequency recessive alleles in a population.
- 27) Genetic differences between two populations tend to be reduced by
- A) gene flow (i.e., migration or mating between the populations).**
 - B) mutation.
 - C) the founder effect.
 - D) the bottleneck effect.
 - E) none of the above.
- 28) Which of the following types of natural selection selects against extremes?
- A) Directional selection
 - B) Stabilizing selection**
 - C) Disruptive selection
- 29) The selection for higher frequencies of darker pepper moths in Britain during the early Industrial Age is an example of
- A) Directional selection**
 - B) Stabilizing selection
 - C) Disruptive selection
- 30) The increase in antibiotic resistance in a pathogenic bacterial population caused by the use of that antibiotic against that bacterium is an example of
- A) Directional selection**
 - B) Stabilizing selection
 - C) Disruptive selection
- 31) The selection against organisms of intermediate heights in a species is an example of ...
- A) Directional selection
 - B) Stabilizing selection
 - C) Disruptive selection**

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

- 32) The continued selection for larger and bluer tail feathers in male peacocks by female peacocks is an example of...
- A) Directional selection
 - B) Stabilizing selection
 - C) Sexual selection
 - D) both A and C**
 - E) both B and C
- 33) A change in the relative frequencies of alleles in the gene pool of a population is an example of....
- A) genetic drift.
 - B) evolution or microevolution.**
 - C) mutation.
 - D) natural selection
- 34) The reproductive success of one organism relative to another is known as....
- A) Sexual reproduction
 - B) Darwinian fitness**
 - C) Sexual selection
 - D) Disruptive selection

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

35) A population of 1,000 birds exists on a small Pacific island. Some of the birds are yellow, a characteristic that is recessive. The others are green, a characteristic determined by a dominant allele. A hurricane on the island kills most of the birds from this population. Only ten remain, and all of those birds have green feathers. Which of the following statements is accurate? Assume that no new birds come to the island and no mutations have or will occur.

- A) future generations of this population may possibly contain both green and yellow birds.
- B) future generations of this population may possibly contain only green birds.
- C) future generations of this population may possibly contain only yellow birds.
- D) Both A and B are possible.
- E) All are possible.

36) A population of 1,000 birds exists on a small Pacific island. Some of the birds are yellow, a recessive characteristic. The others are green, a characteristic determined by a dominant allele. A hurricane on the island kills most of the birds from this population. Only ten remain, and those birds all have yellow feathers. Which of the following statements is *true*? Assume that no new birds come to the island and no mutations occur.

- A) future generations of this population may contain both green and yellow birds.
- B) future generations of this population may contain only green birds.
- C) future generations of this population may contain only yellow birds.
- D) Both A and C are possible.
- E) All are possible.

37) Thirty people are assigned to live in a spaceship that is exploring other galaxies. The journey will take several hundred years and will be completed by the descendants of these crew members. At the start of the journey, the allele frequencies for a given trait in the spaceship population are the same as that for the whole-Earth population. However, when this ship returns the allele frequencies in the spaceship population may not be representative of those on Earth due to a phenomenon known as

- A) allelic inversion
- B) genetic drift
- C) gene flow between Earth and the spaceship.

38) From question 37 above, which of the assumptions of Hardy-Weinberg Equilibrium was definitely violated?

- A) No effective mutation.
- B) Random mating
- C) Natural selection
- D) The population is very large.
- E) No migration.

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

39) The degree of adaptation (i.e., natural selection-driven evolution) that can occur in a population is limited by

- A) Whether or not it is an animal or plant species
- B) the amount and kind of genetic variation in a population.**
- C) whether or not there is sexual dimorphism.
- D) None of the choices are correct.

40) Apply your understanding of evolution: True or False: An individual who completes 10 days of a 10 day dose of antibiotics is more likely to encourage the evolution of antibiotic resistance in his/her resident bacterial flora than a similarly infected individual who completes 5 days of the 10 day dose.

- A) True
- B) False**

41) What is the result of natural selection?

- A) a chance change in the gene pool of a small population
- B) the entry of alleles into a population due to immigration
- C) a change in the gene pool of a population due to differential reproductive success**
- D) a change in allelic frequencies due to mutation
- E) the loss of alleles from a population due to emigration

44) All else being equal, an animal or plant with more successful mating opportunities than another will

- A) produce more offspring
- B) produce fewer offspring
- C) will be more successful at passing copies of his/her genes to the next generation.
- D) both A and C.**
- E) both B and C.

46) If the common ancestor of a future group of species disperses to an isolated oceanic island and then diversifies into the many species through evolutionary time, then, not knowing any other facts about these species, you would expect that most of the newly formed species in that group to be.....

- A) restricted to that island**
- B) distributed throughout the globe

50. What is the expected frequency of the red-flowered phenotype in the immediate offspring generation following a cross between two parents that are heterozygous for red and white alleles that are incompletely dominant?

- A. 0.00
- B. 0.25**
- C. 0.50

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

- D. 0.75
- E. 1.00

51. What is the expected frequency of the red-flowered phenotype in the immediate offspring generation following a cross between two parents that are heterozygous for red and white alleles where the white allele is recessive?

- A. 0.00
- B. 0.25
- C. 0.50
- D. 0.75**
- E. 1.00

52. A person with AB bloodtype...

- A. ...only has "A" antigens on their red blood cells.
- B. ...only has "B" antigens on their red blood cells.
- C. ...has neither "A" or "B" antigens on their red blood cells.
- D. ...has both "A" and "B" antigens on their red blood cells.**

53. Protein is made from an RNA template in which process?

- A. Translation**
- B. Replication
- C. Transcription
- D. Mutation
- E. None of the above.

54. DNA replication builds polymers of...

- A. Monosaccharides
- B. Glucose
- C. Deoxyribonucleotides**
- D. Ribonucleotides
- E. Amino acids

55. What is the sequence of the new DNA strand copied from the following template?

Template: 5' -AGGCTATA-3'

- A. 5' -TATAGCCT-3'**
- B. 5' -TCCGATAT-3'
- C. 5' -UCCGAUUAU-3'
- D. 5' -UAUAGCCT-3'
- E. 5' -AGGCTATA-3'

56. What would be the polypeptide copied from the following hypothetical DNA?

Assume that the bottom strand is used as the transcription template. (Use

Appendix 1 on last page if need be.)

5' -ATGACCAGACGTGGT-3'

3' -TACTGGTCTGCACCA-5'

- A. Met-Gln-Arg-Arg-Gly

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

- B. Met-Gln-Arg-Gly-Glu
- C. Met-Thr-Arg-Arg-Gly**
- D. Leu-Gln-Arg-Gly-Glu
- E. Leu-Leu-Arg-Gly-Glu

57. Research in fruit flies suggest that what percentage of spontaneously occurring mutations may be disadvantageous?
- A. 70%**
 - B. Less than 30%
58. How many sex chromosomes does a typical human skin cell have?
- A. Twenty-three
 - B. Two**
 - C. Forty-six
 - D. One
59. If two carriers of the sickle cell allele (heterozygotes) had 15 children, about how many of those children would be expected to have sickle cell disease?
- A. One.
 - B. Two.
 - C. Four.**
 - D. Five.
 - E. Seven.
60. Your somatic cells are...
- A. haploid
 - B. pentaploid
 - C. tetraploid
 - D. diploid**
 - E. triploid
61. Which of the following increases the risk of having a Down Syndrome baby more?
- A. An error during meiotic chromosomal segregation in your ovary or testis.**
 - B. An error during mitotic chromosomal segregation in one of your liver cells.

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

62. A(n) _____ forms when two atoms share electrons.

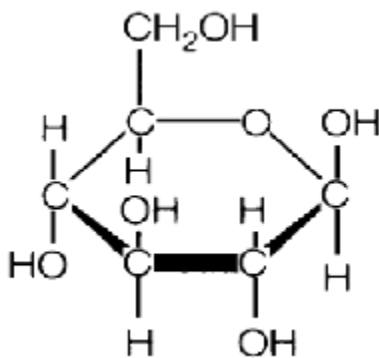
- A) ion
- B) element
- C) **covalent bond**
- D) ionic bond
- E) hydrogen bond

63. Small insects are able to walk on water because of the cohesion of neighboring water molecules. This cohesion is caused by

- A) **Hydrogen bonding.**
- B) Ionic bonding.
- C) Covalent bonding.

64. Which type of polymer did the following monomer come from?

- A. DNA
- B. RNA
- C. a polypeptide or protein
- D. **starch (a polysaccharide)**
- E. a fat (a triglyceride)



65. Cells typically make all of their macromolecules from a set of 40-50 common monomers and a few other rare ingredients via dehydration (or condensation) reactions. Which of the following statements is/are *true* about dehydration reactions?

- A) One monomer loses a hydrogen atom, and the other loses a hydroxyl (-OH) group.
- B) Electrons are shared between atoms of the joined monomers.
- C) H₂O is formed as the monomers are joined.
- D) Covalent bonds are formed between the monomers.
- E) **All of the choices are correct.**

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

66. Which type of cell(s) have a nucleus?
- A) a eukaryotic cell
 - B) a bacterial cell
 - C) a prokaryotic cell
 - D) both A and B
 - E) both B and C
67. Organisms belonging to the plant kingdom
- A) have cells containing plastids.
 - B) have cells with cell walls.
 - C) have cells with both plastids and cell walls.
 - D) contain chloroplasts and are all unicellular.
 - E) lack a nucleus.
68. Osmosis is
- A) The net flow of water across a differentially permeable membrane from high to low water concentration.
 - B) The diffusion of any substance across a membrane.
 - C) The diffusion of osmium-tetroxide across a membrane.
69. Most of a cell's enzymes are
- A) RNA molecules.
 - B) proteins.
 - C) amino acids.
 - D) nucleic acids.
 - E) carbohydrates.
70. Which pigment makes photosynthesis possible?
- A) Eumelanin
 - B) Pheomelanin
 - C) chlorophyll
71. Photosynthesis is a process that naturally takes which of the following greenhouse gasses out of our atmosphere?
- A) CH₄
 - B) CO₂
 - C) CO
 - D) CH₄
 - E) O₂

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

72. Order the three main sets of reactions in cellular respiration in the order in which energy from glucose is harnessed.
- A) Electron Transport, Glycolysis, Krebs Cycle
 - B) Glycolysis, Electron Transport, Krebs Cycle
 - C) Citric Acid Cycle, Electron Transport, Glycolysis
 - D) Glycolysis, Electron Transport, Citric Acid Cycle
 - E) Glycolysis, Krebs Cycle, Electron Transport
73. What is ATP?
- A) Active Transport Protein.
 - B) The energy “currency” of the cell.
 - C) Adenosine Tri-Phosphate
 - D) Both A and B.
 - E) Both B and C.
74. Which of the reactions below best depicts aerobic cellular respiration?
- A) $6\text{CO}_2 + 6\text{H}_2\text{O} \Rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
 - B) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \Rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
 - C) $\text{C}_6\text{H}_{12}\text{O}_6 \Rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$
 - D) $6\text{CO}_2 + 6\text{O}_2 \Rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O}$
75. Which atom is the final electron acceptor in the electron transport chain of respiration?
- A) carbon
 - B) nitrogen
 - C) phosphorus
 - D) hydrogen
 - E) oxygen

The content of this document is the ©Christopher R. Hardy, 2011-onwards.
It may not be distributed or posted in any manner without his consent.

Appendix 1. The Genetic Code in RNA.

The table shows the 64 codons and the amino acid for each. The direction of the mRNA is 5' to 3'.

		2nd base			
		U	C	A	G
1st base	U	UUU (Phe/F)Phenylalanine	UCU (Ser/S)Serine	UAU (Tyr/Y)Tyrosine	UGU (Cys/C)Cysteine
		UUC (Phe/F)Phenylalanine	UCC (Ser/S)Serine	UAC (Tyr/Y)Tyrosine	UGC (Cys/C)Cysteine
		UUA (Leu/L)Leucine	UCA (Ser/S)Serine	UAA Ochre (Stop)	UGA Opal (Stop)
		UUG (Leu/L)Leucine	UCG (Ser/S)Serine	UAG Amber (Stop)	UGG (Trp/W)Tryptophan
	C	CUU (Leu/L)Leucine	CCU (Pro/P)Proline	CAU (His/H)Histidine	CGU (Arg/R)Arginine
		CUC (Leu/L)Leucine	CCC (Pro/P)Proline	CAC (His/H)Histidine	CGC (Arg/R)Arginine
		CUA (Leu/L)Leucine	CCA (Pro/P)Proline	CAA (Gln/Q)Glutamine	CGA (Arg/R)Arginine
		CUG (Leu/L)Leucine	CCG (Pro/P)Proline	CAG (Gln/Q)Glutamine	CGG (Arg/R)Arginine
	A	AUU (Ile/I)Isoleucine	ACU (Thr/T)Threonine	AAU (Asn/N)Asparagine	AGU (Ser/S)Serine
		AUC (Ile/I)Isoleucine	ACC (Thr/T)Threonine	AAC (Asn/N)Asparagine	AGC (Ser/S)Serine
		AUA (Ile/I)Isoleucine	ACA (Thr/T)Threonine	AAA (Lys/K)Lysine	AGA (Arg/R)Arginine
		AUG (Met/M)Methionine, Start ^[1]	ACG (Thr/T)Threonine	AAG (Lys/K)Lysine	AGG (Arg/R)Arginine
	G	GUU (Val/V)Valine	GCU (Ala/A)Alanine	GAU (Asp/D)Aspartic acid	GGU (Gly/G)Glycine
		GUC (Val/V)Valine	GCC (Ala/A)Alanine	GAC (Asp/D)Aspartic acid	GGC (Gly/G)Glycine
		GUA (Val/V)Valine	GCA (Ala/A)Alanine	GAA (Glu/E)Glutamic acid	GGA (Gly/G)Glycine
		GUG (Val/V)Valine	GCG (Ala/A)Alanine	GAG (Glu/E)Glutamic acid	GGG (Gly/G)Glycine

©CHR