

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

- 1) If one strand of a DNA molecule has the sequence of bases 5'ATTGCA3', the other complementary strand would have the sequence \_\_\_\_\_. 3' T A A C G T 5'

- A) 5'TGCAAT3'  
 B) 3'UAACGU5'  
 C) 5'UGCAAU3'  
 D) 5'UAACGU3'  
 E) 5'TAACGT3'

5' T G C A A T 3'

- 2) When the atoms involved in a covalent bond have the same electronegativity, what type of bond results?

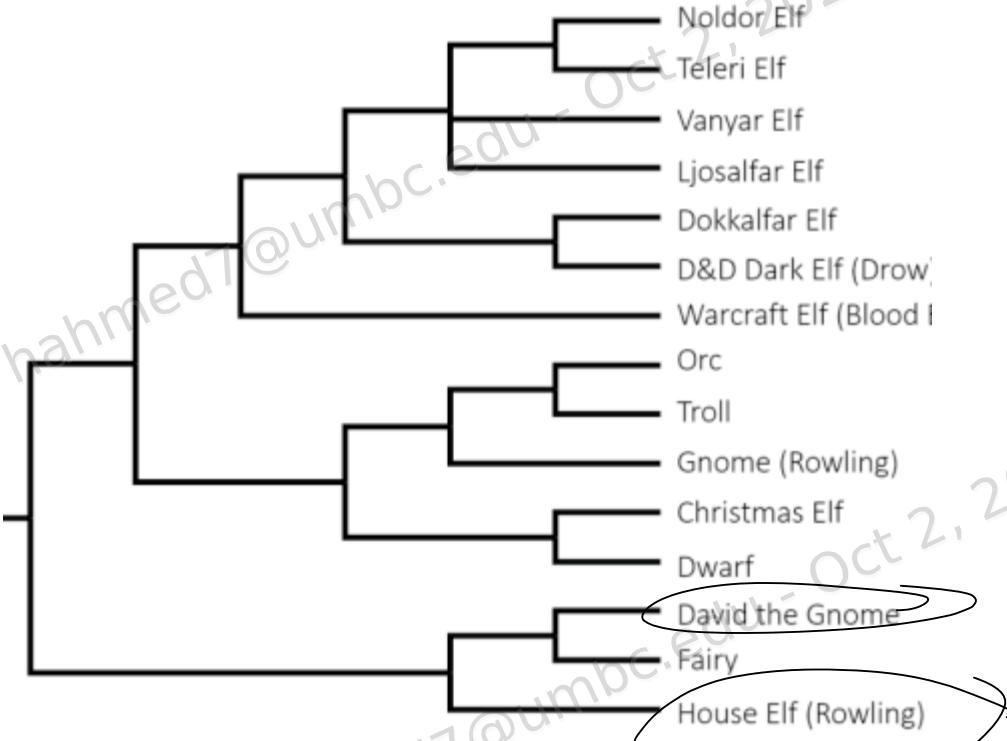
- A) A polar covalent bond  
 B) A hydrogen bond  
 C) A nonpolar covalent bond  
 D) An ionic bond

$$\frac{23}{34} = 67\%$$

(P)  
 yay!!

Things to review

- different types of bonds : humans are unable to break down beta-linkages → alpha linkages are next to each other while beta linkages are staggered
- carbohydrates : simple sugars carbohydrates → provide calories and energy  
 sugar = saccharide, fiber slows down the absorption of simple sugars
  - ↳ monosaccharides are linked together through glycosidic bonding
- lipids



3)

Given the phylogenetic tree of elves above, which of the following is most closely related to David the Gnome?

- A) House Elf (Rowling)
- B) Dwarf
- C) Gnome (Rowling)
- D) Christmas Elf
- E) Dwarf and Christmas Elf are equally and most closely related to the David the Gnome.

4)

Lipids that contain a high number of double bonds in their fatty acid chains will \_\_\_\_\_.

- A) pack very tightly together at room temperature
- B) have more carbons that rotate freely than lipids that contain few double bonds in their fatty acid chains
- C) likely be liquid at room temperature
- D) have a higher melting temperature than lipids that contain few double bonds in their fatty acid chains
- E) contain more hydrogens than lipids that contain few double bonds in their fatty acid chains

5)

Genotype is to \_\_\_\_\_ as phenotype is to \_\_\_\_\_.

- A) heredity; DNA base sequence
- B) gene regulation; translation
- C) transcription; amino acid sequence
- D) DNA base sequence; physical traits that are products of the proteins produced

- 6) A friend of yours calls to say that his car would not start this morning. He asks for your help. You say that you think the battery must be dead. If so, then jump-starting the car from a good battery will solve the problem. In doing so, you are \_\_\_\_\_.  
A) stating a hypothesis and using that hypothesis to make a testable prediction  
B) comparing multiple hypotheses for why the car will not start  
C) making observations to inspire a theory for why the car will not start  
D) testing a theory for why the car will not start
- 7) Which of the following is an observation?  
A) Twenty-five students enrolled in BIOL 141 during Summer 2022.  
B) More students enrolled in BIOL 141 during Fall 2022 than in Fall 2021.  
C) BIOL 141 enrollment in Fall 2023 will be higher than in Fall 2022.  
D) A and B  
E) All of the above
- 8) Which of the following are required for natural selection?  
A) Genetic engineering  
B) Heritable variation  
C) Differential reproduction  
D) A and C  
E) B and C
- 9) The best experimental design \_\_\_\_\_.  
A) alters only one condition between the controls and the experimental condition  
B) includes a control  
C) includes a large sample size for each condition  
D) all of the above
- 10) The amino acids of the protein keratin are arranged predominantly in an  $\alpha$ -helix. This secondary structure is stabilized by \_\_\_\_\_.  
A) peptide bonds  
B) ionic bonds ✗  
C) hydrogen bonds  
D) polar bonds  
E) covalent bonds
- 11) Transthyretin is a protein with a structure comprised of 4 individual polypeptide subunits, bound together by noncovalent interactions. What level of protein structure is formed when individual polypeptide chains come together to form a tetramer?  
A) primary structure  
B) quaternary structure  
C) tertiary structure  
D) no structure, just individual amino acids  
E) secondary structure

move through implies diffusion not active transport referring to a channel protein which does not require energy

12) Ions move through ion **channels**

- A) Against their electrochemical gradient
- B) Using an input of chemical energy stored in ATP
- C) From regions of high concentration to regions of low concentration
- D) A and B
- E) B and C

13) Steroids are considered to be lipids because they \_\_\_\_\_.

- A) are essential components of cell membranes
- B) are made of fatty acids
- C) contribute to atherosclerosis
- D) are hydrophilic compounds
- E) are not soluble in water

14) Consider Pasteur's experiment with swan-necked flasks. Which of the following could be considered a control for that experiment?

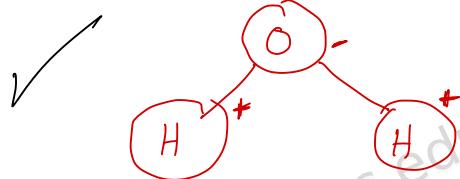
- A) Keeping the temperature constant
- B) Using the same type of nutrient broth throughout the experiment
- C) Doing the same experiment but not boiling the broth
- D) A and B
- E) All of the above

Independent variables

↳ this is a control because it is keeping everything the same

15) In a single molecule of water, two hydrogen atoms are bonded to a single oxygen atom by

- A) hydrogen bonds
- B) van der Waals interactions
- C) nonpolar covalent bonds
- D) polar covalent bonds
- E) ionic bonds



16) Which of the following are present in all carbohydrates (in their linear forms)?

- A) hydroxyl groups
- B) carboxyl groups
- C) carbonyl groups
- D) A and C
- E) A and B

Hydroxyl  
+  
Carbonyl

17) Nikki is studying the movement of glucose into and out of cells. She places her cells in a solution with 20 mM glucose, but she does not know the concentration of glucose inside her cells. Which of the following could be directly responsible for movement of glucose across the cell membrane in Nikki's system?

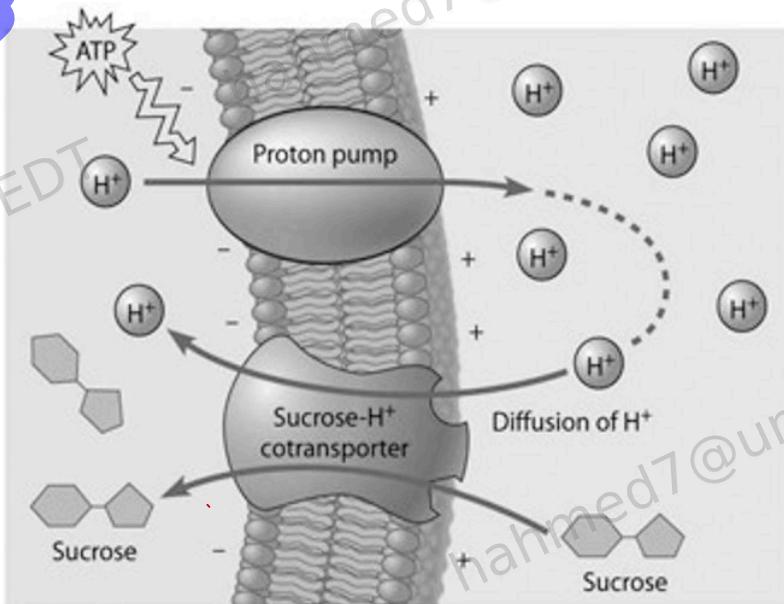
- A) GLUT1 glucose transporter
- B) sodium-potassium pump
- C) sodium-glucose cotransporter
- D) A and C
- E) all of the above

glucose is literally in the name of the pump

18) How does a scientific theory differ from a scientific hypothesis?

- A) Hypotheses are usually an explanation for a more general phenomenon; theories typically address more specific issues.
- B) Confirmed theories become scientific laws; hypotheses become theories.
- C) Theories are proposed to test scientific hypotheses.
- D) Theories are usually an explanation for a more general phenomenon; hypotheses typically address more specific issues.

19)

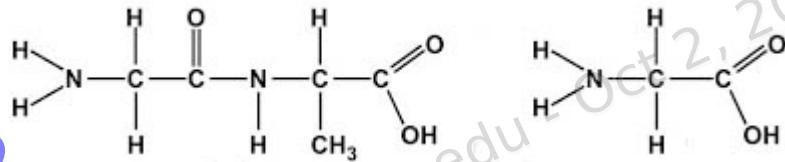


Based on the accompanying figure, which of these experimental treatments would increase the rate of sucrose transport into the cell? In this figure, sucrose is being imported into the cell.

- A) Adding an inhibitor that blocks the regeneration of ATP
- B) Decreasing extracellular sucrose concentration
- C) Decreasing extracellular pH
- D) Adding a substance that makes the membrane more permeable to hydrogen ions
- E) Decreasing cytoplasmic pH

If you lowered the pH then the sucrose would stay in the ECM because the pH would be the same inside and outside

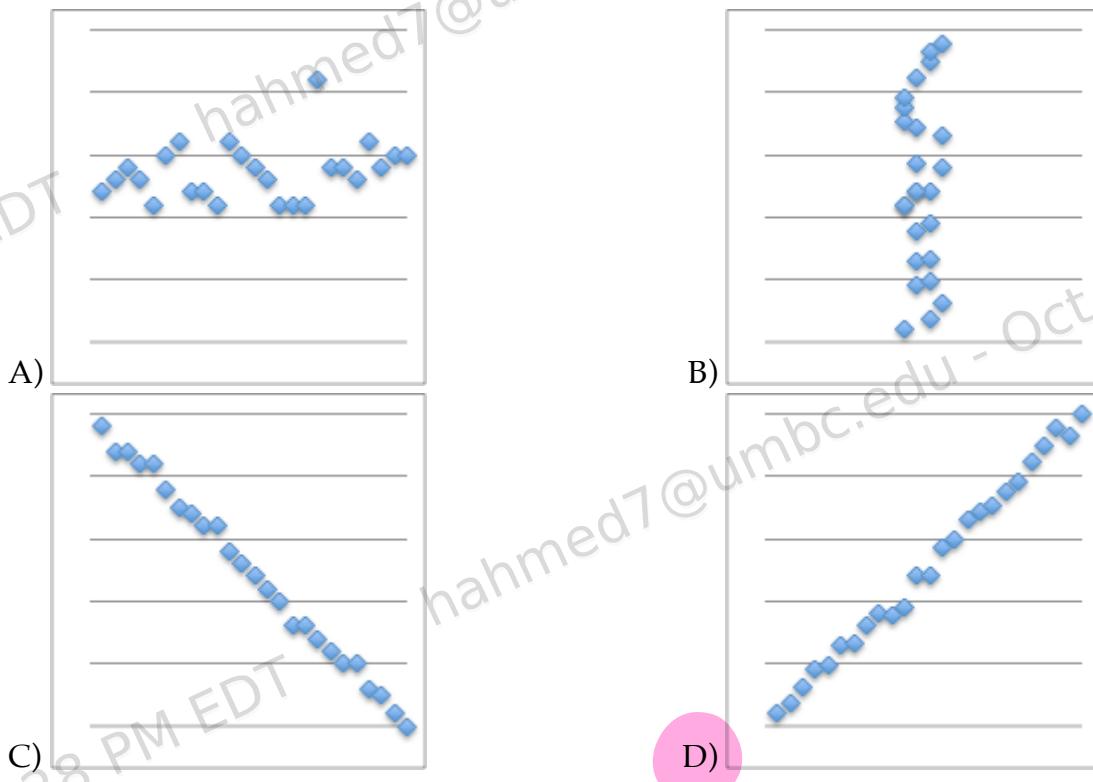
20)



You hydrolyze the peptide bond(s) in the sample shown above. What will be the product(s) of this reaction?

- A) two dipeptides
- B) three separate amino acids
- C) a tripeptide
- D) individual atoms
- E) one dipeptide and one separate amino acid

21) Eva wants to breed a rabbit that will set a world record for highest jump. Eva hypothesizes that how high a rabbit jumps is a heritable trait. For each generation, she selects rabbits that jump higher than their siblings. Eva's friend Jose hypothesizes that how high a rabbit jumps is not heritable, but is instead dependent on what type of food the rabbit eats. If Eva's hypothesis is correct, what would you expect a plot of jump height as a function of generation to look like?



22) You obtain the following rRNA sequences from three plant species. Based only on this information, which two species are most closely related?

Cambylictus tree: CAGAUCAUG ><sup>y</sup>  
Barnacle tree: CAGUCUACG ><sup>y</sup>  
Abyssinian shrivelfig: CAGACUAAG ><sup>y</sup>

- A) Barnacle tree and Cambylictus tree are both equally related to Mendelsaurus
- B) Barnacle tree and Cambylictus tree
- C) Abyssinian shrivelfig and Barnacle tree**
- D) Cambylictus tree and Abyssinian shrivelfig
- E) Phylogenetic relationships cannot be determined from the information given.

23) Humans can digest starch but not cellulose because \_\_\_\_\_.

- A) the monomer of starch is fructose, while the monomer of cellulose is glucose
- B) starch monomers are joined by covalent bonds and cellulose monomers are joined by ionic bonds
- C) the monomer of starch is glucose, while the monomer of cellulose is galactose**
- D) humans have enzymes that can hydrolyze the  $\alpha$ -glycosidic linkages of starch but not the  $\beta$ -glycosidic linkages of cellulose**
- E) humans have enzymes that can hydrolyze the glycosidic linkages of starch but not the ester linkages of cellulose

24) A molecule called M1 RNA catalyzes hydrolysis of part of tRNA strands. What type of molecule is the M1 RNA?

- A) ribozyme**
- B) tRNA
- C) rRNA
- D) enzyme
- E) riboenzyme

25) Why are hydrocarbons insoluble in water?

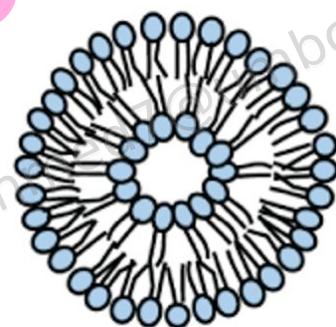
- A) The majority of their bonds are nonpolar covalent carbon-to-hydrogen linkages.**
- B) They are hydrophilic.
- C) They are less dense than water.
- D) The majority of their bonds are polar covalent carbon-to-hydrogen linkages.
- E) They exhibit considerable molecular complexity and diversity.

26) Phospholipids and fats both \_\_\_\_\_.

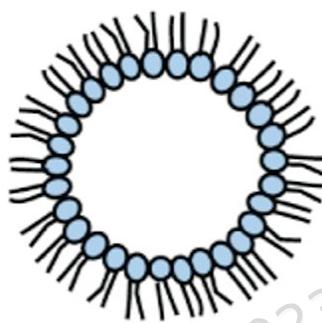
- A) contain one or more phosphate
- B) have three fatty acids**
- C) contain serine or other polar group
- D) form bilayers
- E) have a glycerol backbone**

27) Your study partners have drawn four models of membrane-bound vesicles to try to show what a vesicle would look like with water both inside and outside of the membrane. Select the most accurate model.

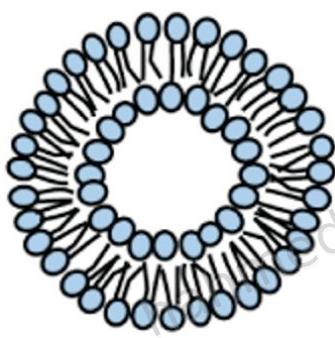
A)



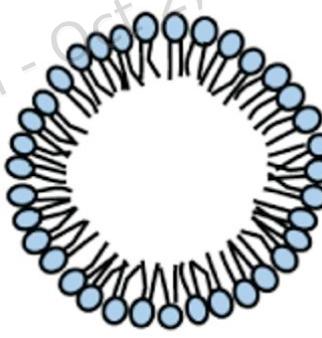
B)



C)



D)



The following question(s) refer to this table of codons.

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

Met - Ser - Ser - Leu - Ser - Leu

- 28) What amino acid sequence will be generated, based on the following mRNA codon sequence?

5' AUG-UCU-UCG-UUA-UCC-UUG 3'

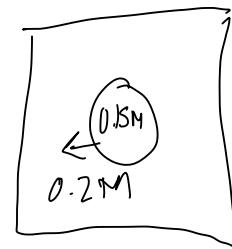
- A) Met Arg Glu Arg Glu Arg
- B) Met Ser Leu Ser Leu Ser
- C) Met Leu Phe Arg Glu Glu
- D) Met Glu Arg Arg Glu Leu
- E) Met-Ser-Ser-Leu-Ser-Leu

- 29) What is the pH of a solution with a hydronium ion ( $\text{H}_3\text{O}^+$ ) concentration of  $10^{-12} \text{ M}$ ?

- A) pH 12
- B) pH 14
- C) pH 4
- D) pH 2
- E) pH 10

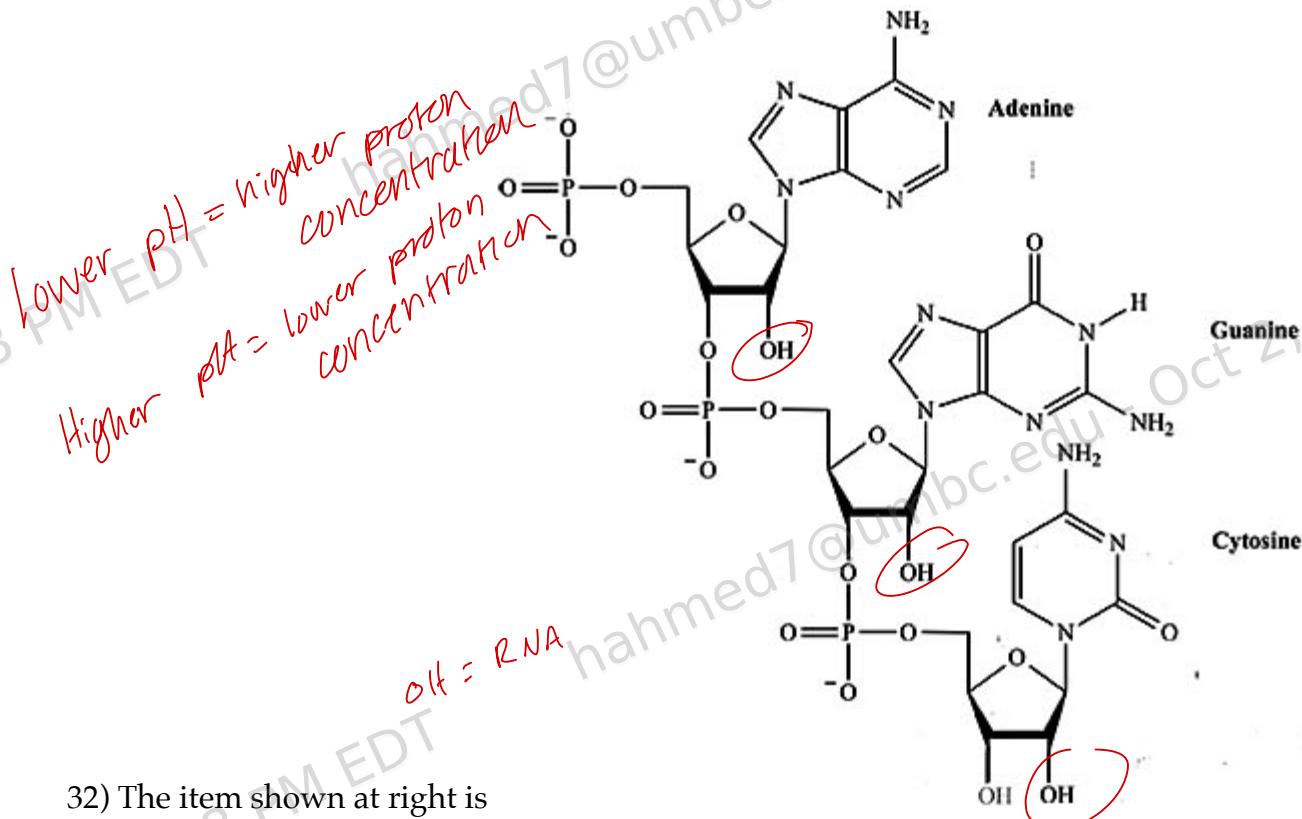
- 30) A cell with a solute concentration of 0.15 M is placed in a solution with a solute concentration of 0.2 M. If no solute can cross the cell membrane, what will happen to the cell?

- A) The cell membrane will rupture.  
B) The cell will decrease in volume.  
C) The cell will increase in volume.  
D) The volume of the cell will not change.  
E) Definitely C, and possibly A



- 31) Sample A has a pH of 5. Sample B has a pH of 3. Which statement describes the relative proton concentrations of the two solutions?

- A) Sample A has 1000 times fewer protons than Sample B.  
B) Sample A has 2 times more protons than Sample B.  
C) Sample A has 100 times fewer protons than Sample B.  
D) Sample A has 1000 times more protons than Sample B.  
E) Sample A has 100 times more protons than Sample B.



- 32) The item shown at right is

- A) RNA with the sequence 5'-AGC-3'  
B) DNA with the sequence 5'-AGC-3'  
C) RNA with the sequence 3'-AGC-5'  
D) adenosine triphosphate  
E) DNA with the sequence 3'-AGC-5'

33) In comparison to eukaryotes, prokaryotes \_\_\_\_\_.

- A) lack a nucleus, as do archaea, while eukaryotes have a nucleus
- B) do not require ATP for energy while eukaryotes do require ATP
- C) have chromosomes composed of single-stranded DNA, while eukaryotes have chromosomes composed of double-stranded DNA
- D) are always single-celled while eukaryotes are always multicellular
- E) are more closely related to archaea than eukaryotes

34) Did you bubble in your campus ID and version on the Akindi sheet?

- A) Yes

Answer Key

Testname: EXAM1 2022FA

- 1) A
- 2) C
- 3) A
- 4) C
- 5) D
- 6) A
- 7) D
- 8) E
- 9) D
- 10) C
- 11) B
- 12) C
- 13) E
- 14) C
- 15) D
- 16) D
- 17) D
- 18) D
- 19) C
- 20) B
- 21) D
- 22) C
- 23) D
- 24) A
- 25) A
- 26) E
- 27) A
- 28) E
- 29) A
- 30) B
- 31) C
- 32) A
- 33) A