

(corrected)

1 1 H 1.008																	18 2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (267)	105 Db (268)	106 Sg (269)	107 Bh (270)	108 Hs (270)	109 Mt (278)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (290)	116 Lv (293)	117 Ts (294)	118 Og (294)

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (266)

This exam should have exactly 20 questions. Each question is equally weighted at 5 points each. Bubble in your answer choices on the bubble sheet provided. Your score is based on what you bubble on the bubble sheet and not what is circled on the exam.

1. A person who follows a diet that consists of enough calories but not the correct nutrients is best described as...

- a. malnourished
- b. undernourished
- c. dehydrated
- d. properly nourished

Explanation: One who is malnourished lacks the correct nutrients.

2. A person who follows a diet that contains insufficient calories is best described as...

- a. malnourished
- b. undernourished
- c. dehydrated
- d. properly nourished

Explanation: One who is undernourished lacks the correct number of calories.

3. Select the set of true statements.

- I. Fructose and sucrose are disaccharides.
 - II. Starch is the main form of glucose storage for humans
 - III. Cellulose does not contribute calories to our diet
 - IV. Lactose is formed from two monosaccharides, galactose and glucose
- a. I and II
 - b. I, III, and IV
 - c. I and IV
 - d. II only
 - e. III and IV

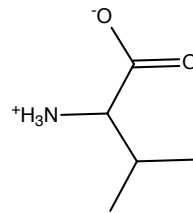
Explanation: III and IV are true statements.

4. How many Calories are in 20 g of carbohydrate?

- a. 80,000 Cal
- b. 335 Cal
- c. 80 Cal
- d. 3.35×10^5 Cal
- e. 5.85×10^5 Cal

Explanation: Each gram of carbohydrate contributes 4 Cal, or 4kcal of energy. This is 80 Cal total.

5. Which amino acid is pictured below?



- a. valine
- b. leucine
- c. glutamate
- d. glutamine
- e. lysine

Explanation: This amino acid is valine.

6. Which of the following amino acids will have a net positive charge in the body?

- a. valine
- b. leucine
- c. glutamate
- d. glutamine
- e. lysine

Explanation: Lysine is our example of a basic amino acid, which means it will have a net positive charge.

7. What is the main reason we need protein in our diets?

- a. It is the most energy dense form of nutrition
- b. We need to ingest all 20 amino acids because we cannot synthesize them ourselves
- c. Proteins are primarily converted into glycogen, which is the fuel our cells metabolize directly.
- d. We need to ingest several essential amino acids that we cannot synthesize ourselves
- e. Proteins allow us to absorb vitamins in food.

Explanation: All the proteins in our body are built of amino acids. There are 9 essential amino acids we cannot synthesize from other nutrients and we must therefore ingest directly.

8. Which amino acid has an acidic side chain?

- a. valine
- b. leucine
- c. glutamate
- d. glutamine
- e. lysine

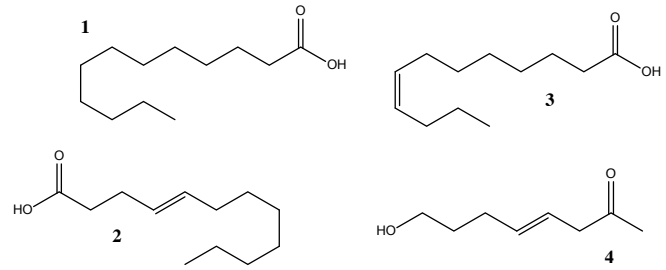
Explanation: Glutamate and aspartate are the two acidic side chain amino acids, each with a carboxylic acid functionality at the end of the chain.

9. Which characteristic is fundamental to all fatty acid monomers?

- a. a carboxylic acid
- b. a *cis*-double bond
- c. a *trans*-double bond
- d. a primary amine

Explanation: Fatty acid monomers have a carboxylic acid and a carbon chain.

10. Identify the trans fatty acid.



- a. 1
- b. 3
- c. 2
- d. 4

Explanation: Molecule 2 is a trans fatty acid. Molecule 1 is a fully saturated fatty acid. Molecule 3 is a cis fatty acid. Molecule 4 has a trans functionality but is not a fatty acid.

11. A flavored liquor is 28% ABV. How many ounces of this liquor are equivalent to one standard drink? You can use the following assumptions: 1 drink = 14 g of alcohol, 1 oz \approx 30mL, density of ethanol \approx 0.8 g/mL.

- a. 1.8 oz
- b. 2.1 oz
- c. 1.5 oz
- d. 3.2 oz
- e. 2.5 oz

Explanation: 14g ethanol(1mL EtOH/0.8g EtOH)(1oz/30 mL)(1 oz liquor/.28 oz EtOH = 2.1 oz liquor. This may also be solved a faster way if you recall 1.5 oz of 40% ABV alcohol is 1 drink. $1.5(40) = x(28)$ $x = 2.1$

12. When humans take in excess calories, they will store some of this excess fuel in adipose tissue, aka, body fat. Adipose tissue is only 85% actual fat by mass, with the remainder being water and other cellular materials that structure the tissue. Theoretically, how many Calories do you need to burn off to eliminate the fat content from 1 pound of adipose tissue? 1 pound = 454 grams (Note: the real process of weight loss is much more complex...this is not diet advice!)

- a. 4,085 Calories
- b. 1,544 Calories
- c. 3,473 Calories
- d. 2,701 Calories

Explanation: 1 pound body fat = 454 g body fat. $454 \text{ g body fat} \times 85\% = 386 \text{ g pure fat}$ $386 \text{ g fat} \times 9 \text{ Cal/g} = 3,473 \text{ Calories}$

13. What was the science fail associated with using a polyalcohol instead of glycerol to make the synthetic fat substitute, Olestra?

- a. Olestra was a tasty substitute for fat.
- b. Olestra had zero calories.
- c. The body still digested Olestra as if it were an ordinary fat
- d. Olestra consumption resulted in unforeseen physiological effects, like anal leakage.

Explanation: Olestra worked as advertised as far as being a tasty, zero calorie substitute for fats. However, olestra consumption resulted in unforeseen physiological effects, like anal leakage.

14. (corrected) Given the macronutrient information on the nutrition label below, how many calories would you expect 2 servings to contain?

One Serving	38 g
Fat	8 g
Carbohydrate	28 g
Protein	2 g

- a. 192
- b. 384
- c. 366
- d. 304
- e. 211

Explanation: Each serving contains 8g of fat, 28 g of carbohydrate, and 2 g of protein. $(8 \times 9) + (28 \times 4) + (2 \times 4) = 192 \text{ Calories/serving}$. Two servings = 384 Calories.

15. (corrected) An athlete wants to consume 1800 calories in a day. For their specific diet, they expect to consume 60 grams of fat each day. Which of the following combinations of proteins and carbohydrates will get them closest to their total daily calorie goal?

- a. 200 g carbohydrate, 155 g protein
- b. 110 g carbohydrate, 215 g protein
- c. 195 g carbohydrate, 180 g protein
- d. 220 g carbohydrate, 95 g protein
- e. 90 g carbohydrate, 180 g protein

Explanation: $1800 - (9 \times 60) = 1260 \text{ calories remaining}$. $1260/4 = 315 \text{ g total combined protein and carbs}$, as both contribute 4 cal/g. 220 g carbs and 95 g protein matches this. **Note that this problem was thrown out due to the typos - all answer choices on the exam received full credit.**

16. Why might single, high-dose oral B-vitamin supplements be less effective than smaller, frequent doses?

- a. The body stores water soluble B vitamins very efficiently, making high doses potentially very dangerous.
- b. The body cannot effectively store water soluble vitamins, so excess is simply digested for energy.
- c. The body cannot effectively store water soluble vitamins, so excess is quickly excreted in urine.
- d. Excess fat soluble vitamins like Vitamin B will quickly be excreted in urine.

Explanation: B vitamins are a family of water soluble vitamins, which are not easily stored in body tissues.

17. A simple distillation is performed to separate Liquid P and Liquid Q. Liquid P has a boiling point of 59 °C. Liquid Q has a boiling point of 78 °C. Which statement best describes the collected distillate?

- a. It will be enriched in P relative to the initial mixture.
- b. It will be enriched in Q relative to the initial mixture.
- c. It will be pure Q.
- d. It will be equal quantities of P and Q.

Explanation: A single simple distillation cannot fully separate two volatile liquids. However, collected distillate will be enriched with the compound with the lower boiling point (P).

18. After properly distilling his mixture of liquid A and liquid B for 10 minutes, Carl was shocked to find out that his distillate was no different in composition as his original mixture. What is evidently happening to Carl's distillation?

- a. The liquids A and B were mixed and formed an azeotrope.
- b. He didn't distill the mixture correctly.
- c. Steve messed it up - even though Steve was in Lubbock.
- d. The liquid A is exothermic while liquid B is endothermic.
- e. Liquid B must be a carboxylic acid.

Explanation: Azeotropes distill with no change in composition - the vapor phase is identical to the liquid phase. All the other answers are silly and nonsensical.

19. What functional group is shared between glycerol and sucrose, which made sucrose a prime candidate to make the monster-fat, Olestra?

- a. amine
- b. carboxylic acid
- c. hydroxyl (alcohol)
- d. phenyl
- e. ether

Explanation: The alcohol groups of sucrose were used to make an ester link similar to those on the triglyceride made from glycerol.

20. Why is a *cis*-unsaturated fatty acid is healthier than a saturated fatty acid?

- a. A *cis*-unsaturated fatty acid has permanent kinks in its structure, resulting in lower overall dispersion forces
- b. A *cis*-unsaturated fatty acid has permanent kinks in its structure, resulting in higher overall dispersion forces
- c. A *cis*-unsaturated fatty acid has a more linear structure, resulting in lower overall dispersion forces
- d. A *cis*-unsaturated fatty acid has a more linear structure, resulting in higher overall dispersion forces

Explanation: A *cis*-unsaturated fatty acid has permanent kinks in its structure, resulting in lower overall dispersion forces. The more linear the structure, the higher the overall dispersion forces are. This resulting in a thicker (more viscous) substance that is more likely to be unhealthy.

Remember to bubble in ALL your answers BEFORE time is called. Double check your name, utetid, and version number before you turn in your bubblesheet. You must keep your exam for future reference. Please do not lose it. We will not replace it.