DAT

Free Practice Test — 30 Real Exam-Style Questions

with full answer key & explanations

Unlock the full bank of 1474 questions
+ unlimited timed mock exams + mistake book

Practice on the web: https://certs.theorypractice.app/dat
$2.99 / week · $6.99 / month · cancel anytime

What you unlock: all 1474 questions • unlimited timed mock exams • mistake book • instant explanations

Also on iOS & Android — and watch the full Q&A walkthrough on YouTube @CertsQuizPrep

Practice Questions

Try all 30 first, then check the answer key at the back.

1. Which S_N2 reaction would proceed the fastest?

A. 1-bromo-2-methylpentane and sodium iodide
B. sec-butyl bromide and sodium iodide
C. 1-chloropentane and sodium iodide
D. tert-butyl bromide and sodium iodide

2. What is the hybridization of carbon in C₂H₂?

A. sp³
B. sp³d
C. sp²
D. sp

3. In a jar of candy there are 127 red candies, 92 orange ones, 108 yellow ones, 77 green ones, and 13 blue candies. If a person reaches into the jar without looking and grabs one piece of candy, what is the probability of that piece being red?

A. 20%
B. 35%
C. 30%
D. 25%

4. If <tex>x = i - 1</tex>, then <tex>x2 + 2x + 2 =</tex>

A. i
B. 2i + 4
C. 4 + 2i
D. -2

**5.

Quantity A: Area of the larger circle

Quantity B: ■2×■area of the smaller circle**

A. Quantity B is greater.
B. The two quantities are equal.
C. The relationship cannot be determined from the information given.
D. Quantity A is greater.

6. What is the point of intersection of the line that passes through the points (1,5)and (3,9) and the line perpendicular to that line that passes through the point (0,-2)?

A. (-1,-2)
B. (-2,-1)
C. (2,-2)
D. (-2,2)

7. Given a triangle with a base of 42.20 feet and a height of 63.10 feet, find the area of the triangle.

A. 1,331.41 ft2
B. 634.3 ft2
C. 1,000 ft2
D. 105.30 ft2

8. Convert 75.2228° to degrees, minutes, and seconds.

A. 75°13’22”
B. 75°22’28”
C. 75°37’13”
D. None of these

9. In a plane there are 8 points, no three of which are collinear. How many lines do the points determine?

A. 28
B. 7
C. 36
D. 16

10. The length, width, and height of a rectangular solid are 5 cm, 3 cm, and 7 cm, respectively. What is the length of the longest segment whose endpoints are vertices of the rectangular solid?

A. 7.6 cm
B. 9.1 cm
C. 5.8 cm
D. 8.6 cm

11. Compared to succession, evolution is generally <code>________</code>.

A. Faster
B. More organized
C. Permanent
D. Similar in rate

12. The cellular organelle that synthesizes proteins in prokaryotes is the

A. plasma membrane.
B. nucleus.
C. nucleoid.
D. ribosome.

13. Which of the following best accounts for the ability of legumes to grow well in nitrogen-poor soils?

A. These plants are capable of directly converting nitrogen gas into nitrates
B. These plants make their own proteins
C. These plants have a mutualistic relationship with nitrogen-fixing bacteria
D. These plants do not require nitrogen to make plant proteins

14. With which base is uracil complementary in RNA?

A. G
B. C
C. U
D. T

15. Myriophyllum spicatum, or water milfoil, native to Eurasia, is an aggressive, invasive aquatic plant in North America. All of the following are reasons this species is successful as an invasive species EXCEPT

A. milfoil is a hardy plant capable of succeeding in harsher environments
B. milfoil has few natural predators in a nonnative environment
C. milfoil evolved from North American plant species
D. milfoil is resistant to many native diseases that are adapted to native plant species

16. A panmictic population is one in which <code>________</code>.

A. all individuals are potential partners for breeding.
B. all individuals can survive
C. all individuals are heterozygous
D. all individuals are homozygous

17. Which of the following statements about sex-linked traits in humans is true?

A. X-linked traits can only be inherited from the mother.
B. There are more sex-linked genes on the Y chromosome than on the X chromosome.
C. Y-linked traits are only inherited by females.
D. Y-linked traits can only be inherited from the father.

18. Which of the following substances are produced by the light reactions of photosynthesis?

A. NADPH and glucose
B. ATP and NADPH
C. ATP and NADH
D. NADH and glucose

19. The location on an enzyme where a substrate binds is called the

A. active site
B. allosteric site
C. reaction center
D. binding site

20. In glycolysis, one <code>________</code> molecule is converted into two <code>________</code> molecules.

A. glucose; acetyl CoA
B. pyruvic acid; glucose
C. pyruvic acid; acetyl CoA
D. acetyl CoA; glucose

21. Which of these mutations in a gene will MOST LIKELY result in a shortened protein with a long sequence of substituted amino acids?

A. Silent substitution of four nucleotides
B. Missense substitution of one nucleotide
C. Insertion of two nucleotides
D. Deletion of three nucleotides

22. Exist as diatomic molecules at room temperature

A. Alkali metals
B. Noble gases
C. Halogens
D. Alkaline earth metals

23. A certain radioactive material has a half-life of 36 minutes. Starting with 10.00 grams of this material, how many grams will be left after 2 hours?

A. 1.5 × 10^-4 grams
B. 10.00 grams
C. 1.00 grams
D. 0.25 gram

24. The chemical formula of glucose is C₆H₁₂O₆. What is its empirical formula?

A. C₁₂H₂₄O₁₂
B. C₆H₁₂O₆
C. CH₂O
D. C₂H₄O₂

**25.

Two different acids with identical pH are placed in separate beakers. Identical portions of NaOH are added to each beaker, and the resulting pH is indicated in the table above. What can be determined about the strength of each acid?**

A. Acid 1 is a weak acid and acid 2 is a strong acid because the concentration of the weak acid must be significantly greater to have the same pH as the strong acid
B. Acid 1 is a weak acid and acid 2 is a strong acid because the concentration of the hydrogen ions will be greater in acid 2 after the NaOH addition
C. Acid 1 is a strong acid and acid 2 is a weak acid because the NaOH is more effective at neutralizing acid 2
D. Acid 1 is a strong acid and acid 2 is a weak acid because acid 1 resists change in pH more effectively

**26. The figures have been created by cementing cubes of the same size together. After being cemented, the cubes were painted on all exposed sides, excluding the bottom on which the figure rests. The only invisible cubes are those required to support other cubes.

<img src="asset:assets/questions/c7683f5ad6c43737.png">

In Figure A, how many cubes have one of their exposed sides painted?**

A. 5 cubes
B. 3 cubes
C. 1 cube
D. 2 cubes

**27. You are given the top, front, and end views of various solid objects. The projection looking down on each object is shown in the upper left-hand corner (TOP VIEW). The projection looking at each object from the front is shown in the lower left-hand corner (FRONT VIEW). The projection looking at each object from the end is shown in the lower right-hand corner (END VIEW). These views are always located in the same place and labeled accordingly.

Two views of each object will be shown, and four alternatives are given to complete the set. Choose the correct view as indicated. Choose the correct END VIEW.

 <img src="asset:assets/questions/fc2cc91b75856cef.png">**

A. C
B. A
C. B
D. D

28. Which of the following statements is true?

A. Antibody-mediated rejection is the most common type of donor organ rejection following heart transplantation.
B. Mixed rejection is the most common type of donor organ rejection following heart transplantation.
C. Antibody-mediated rejection is less common than hyperacute rejection but more common than acute cellular rejection.
D. Hyperacute rejection is less common than acute cellular rejection but more common than antibody-mediated rejection.

29. Which of the following is NOT an example of a functioning technology fused with the brain already in use?

A. Brain-computer interfaces
B. The exobrain
C. Sensory implants
D. EEG biofeedback

30. Which of the following best captures the author's stated primary goal for reverse engineering the human brain in the final paragraph?

A. To create technology that functions similarly to the human brain
B. To create more high-speed computers
C. To better understand memory, emotion, cognition and other higher order functions of the brain
D. To create a nonhuman test subject that will not pose ethical concerns

Answer Key & Explanations

1. A — 1-bromo-2-methylpentane and sodium iodide
S_N2 reactions involve a backside nucleophilic attack on an electrophilic carbon. As a result, less steric congestion for this backside attack results in a faster reaction, meaning that S_N2 reactions proceed fastest for primary carbons. In addition, beta-branching next to a primary carbon results in a slower reaction, as does a poorer leaving group (i.e. chloride instead of bromide).

1-bromopentane has a good leaving group (bromine) attached to a primary carbon with no beta-branching, meaning it will proceed the fastest.

2. D — sp
The carbon is bonded to two other atoms (C and H), which means that it needs two hybrid orbitals.

3. C — 30%
A person reaching into the candy jar would have a 30% chance of pulling out a piece of red candy. There are 417 pieces of candy in the jar altogether, which means the person has 127 chances in 417 to pull out a piece of red candy (or 127/417 if the candy is red). To convert that to a percentage, divide the number of chances to get a red candy (127) by the total number of pieces (417), then multiply the quotient by 100.

4. A — i
You're dealing with imaginary numbers here, so your calculator won't be much use. To solve this problem, just plug (i - 1) into the expression in place of x and do the math.

5. B — The two quantities are equal.
Consider the length of the square side is a. To find the length of the diagonal of the square, multiply the length of one side by the square root of 2:

As can be seen, the half of the diagonal of the square is the radius of the larger circle and the length of the square side is equal to the radius of the smaller circle. Therefore,

The area of the larger circle:

The area of the smaller circle: ■

6. B — (-2,-1)
Determine the equation of the line through the points (1,5) and (3,9). The slope is which is 2. Find the y-intercept, b: 5 = 2(1) + b, so b = 3. The equation of the line is y = 2x + 3. The line perpendicular to this line has a slope that is the negative reciprocal, namely and the y-intercept is -2, because the given point is (0,-2). Now, find the intersection of these lines.

7. A — 1,331.41 ft2
The area of the triangle is 1,331.41 ft².

Solution

Use the formula <i>A </i>= 1/2<i>bh</i>

Where A = area
<i>b</i> = base
<i>h</i> = height

A = ½ (42.20 ft)(63.10 ft) = 1,331.41 ft^{2
}

8. A — 75°13’22”
One minute is defined as 1/60 of a degree (1° = 60 minutes).

One second is defined as 1/60 of a minute (one minute = 60 seconds).

Therefore, 1° = (60 minutes per degree) (60 seconds per minute) = 3600 seconds.

Convert the decimal part of the angle reading (0.2228°) to minutes:(0.2228°)(60 minutes per degree) = 13.368 minutes.

Convert the decimal part of 13.368 minutes to seconds:(0.368 minutes) (60 seconds per minute) = 22 seconds.

Add together to obtain DMS 75°13’22”.

9. A — 28
Since no three points are collinear, every pair of points determines a distinct line. There are such lines.

10. B — 9.1 cm
The length of the longest segment is.

11. A — Faster
While succession is a relatively fast process, evolution is a much slower one.

Key Takeaway: In general, succession is a much faster process than evolution. While succession proceeds in a relatively ordered fashion, evolution is depended on random changes. Succession does proceed until a fixed point, whereas evolution is constantly taking place.

12. D — ribosome.
Ribosomes produce proteins in both prokaryotes and eukaryotes.

Choice A is incorrect because prokaryotes do not have Golgi bodies—they lack membrane-bound organelles.

Choice B is incorrect because the nucleoid is not the site of protein synthesis in prokaryotes.

Choice C is incorrect because prokaryotes do not have nuclei.

Choice D is incorrect because the plasma membrane is not the site of protein synthesis in prokaryotes; the ribosome is.

13. C — These plants have a mutualistic relationship with nitrogen-fixing bacteria
Legume plants are able to live in nitrogen-poor soil because they obtain nitrogen from nitrogen-fixing bacteria. These plants cannot make their own proteins without nitrogen from nitrogen-fixing bacteria.

14. A — G
Adenine (A) and uracil pair up in RNA.

Choices B and C are incorrect because C (cytosine) and G (guanine) pair up in DNA and RNA.

Choice D (T; thymine) is incorrect because T is found only in DNA and does not pair up with U.

Choice E is incorrect because U (uracil) is not complementary with itself.

15. C — milfoil evolved from North American plant species
Because its evolutionary history is elsewhere, milfoil has adapted to an environment that lacks the natural predators and pathogens of North America, making it less susceptible to them and therefore more competitive than native plants in North America.

16. A — all individuals are potential partners for breeding.
A panmictic population is one where all individuals are potential partners. This assumes that there are no mating restrictions, neither genetic nor behavioral, upon the population, and that therefore all recombination is possible. The Wahlund effect assumes that the overall population is panmictic.

A panmictic population is one where all individuals are potential partners. This assumes that there are no mating restrictions, neither genetic nor behavioral, upon the population, and that therefore all recombination is

possible. The Wahlund effect assumes that the overall population is panmictic.
In genetics, random mating involves the mating of individuals regardless of any physical, genetic, or social preference. In other words, the mating between two organisms is not influenced by any environmental, hereditary, or social interaction. Hence, potential mates have an equal chance of being selected. Random mating is a factor assumed in the Hardy-Weinberg principle and is distinct from lack of natural selection: in viability selection, for instance, selection occurs before mating.

In a panmictic species, all of the individuals of a single species are potential partners, and the species gives no mating restrictions throughout the population. Panmixia can also be referred to as random mating, referring to a population that randomly chooses their mate, rather than sorting between the adults of the population.

Panmixia allows for species to reach genetic diversity through gene flow more efficiently than monandry species. However, outside population factors, like drought and limited food sources, can affect the way any species will mate. When scientists examine species mating to understand their mating style, they look at factors like genetic markers, genetic differentiation, and gene pool.

17. D — Y-linked traits can only be inherited from the father.
The statement that is true about sex-linked traits is that Y-linked traits can only be inherited from the father. Since the father is the only parent with a copy of the Y-chromosome, only he can pass that trait on to offspring.

Key Takeaway: Sex linkage is the phenotypic expression of an allele (i.e. trait) that is related to the chromosomal sex of an individual. Sex-linked traits are not equally inherited by the sexes, which is the opposite of autosomal traits. In humans, X-linked traits are more common, as the X-chromosome is bigger and has more genes. X-linked traits can be inherited from either parent and inherited by offspring of either sex, but Y-linked traits are only inherited from the father and can only be inherited by males.

18. B — ATP and NADPH
The light reactions of photosynthesis convert solar energy to usable energy in the form of ATP (choices C and E are eliminated) and NADPH (a reduced electron carrier). The ATP and NADPH (i.e., energy) produced during these reactions are used later during the Calvin cycle to fix carbon dioxide into carbohydrates, like glucose. Because glucose is a product of the light-independent reactions, choice B could be eliminated. Remember that NADPH belongs with photosynthesis to eliminate choice D.

19. A — active site
The other choices do not describe substrate binding sites on an enzyme.

20. A — glucose; acetyl CoA
Glycolysis is the first step of respiration, converting a glucose molecule into two pyruvic acid molecules.

Choices A and B are incorrect because acetyl CoA is the molecule that enters the Krebs cycle during aerobic respiration.

Choice D is incorrect because pyruvic acid is the product, not the input, for glycolysis, and glucose is the input, not the product.

Choice E is incorrect because pyruvic acid is converted to acetyl CoA during the linking reaction between glycolysis and the Krebs cycle, though not in a 2:1 ratio.

21. C — Insertion of two nucleotides
The insertion of two nucleotides will shift the reading frame of all the codons "downstream" of the mutation, resulting in a series of mis-sense codons and eventually a nonsense (stop) codon.

22. C — Halogens
Did you remember this statement: Have No Fear Of Ice Cold Bears? If so, you'd realize that some of the most

common diatomic molecules are halogens-F2, Cl2, Br2, and I2.

23. C — 1.00 grams
With a half-life of 36 minutes, there will be 120/36 = 3.33 half-lives. Therefore there are more than 3 and less than 4 half-lives. Three half-lives leaves 1/8 of the material, and 4 half-lives leaves 1/16 of the material. 1/8 of the initial 10 grams is a little more than 1 gram, while 1/16 of 10 grams is a little more than 1/2 gram. The only answer that falls in that range is 1.00 gram.

Use the integrated rate equation: ln(<i>g</i>₀/<i>g</i>_{<i>t</i>}) = <i>kt</i>, also ln(2) = <i>kt</i>_{1/2}.

Therefore <i>k</i> = (0.693)/36 min = 0.0193 min⁻¹.

Then

■■

24. C — CH₂O
Reducing the subscripts as much as possible gives this 1:2:1 ratio of C:H:O. It does maintain the correct stoichiometric ratio, however.

Choice A is incorrect because these elements are not in the correct stoichiometric ratio.

Choice C is incorrect because this formula is reduced, but it is not fully reduced.

Choice D is incorrect because this is the chemical formula, not the empirical formula, of glucose.

Choice E is incorrect because this formula maintains the correct stoichiometric ratio, but it increases the subscripts.

25. A — Acid 1 is a weak acid and acid 2 is a strong acid because the concentration of the weak acid must be significantly greater to have the same pH as the strong acid
Weak acids resist changes in pH more effectively than strong acids because so many molecules of weak acid are undissociated in solution. The base must cause those molecules to dissociate before affecting the pH significantly.

26. B — 3 cubes
The number of painted sides on this figure's constituent cubes are as follows:
1 side: 3
2 sides: 2
3 sides: 6
4 sides: 2
5 sides: 1.

27. A — C
Choice A is incorrect because the horizontal solid line at the foot of the rightmost column suggests that the column is recessed from the rest of this viewing face. This is not the case as described by both top and front views.

Choice B is incorrect because a broad rectangular column on the right as featured here fails to explain the horizontal dotted line between the two small dotted squares seen in the top view. It also fails to explain the solid horizontal line bisecting the right column in the front view.

Choice D is incorrect because the upper half of the rightmost column seen in the front view would not be present if this were a correct solution.

28. A — Antibody-mediated rejection is the most common type of donor organ rejection following heart transplantation.
Paragraph 2 states that acute cellular rejection occurs in 20–40% of patients, while antibody-mediated rejection is less common (10–20%), and hyperacute rejection is uncommon.

Choices A, C, D, and E do not follow the data provided in paragraph 2.

29. B — The exobrain
The passage lists "working examples of fusing such 'intelligent' systems with the brain" and goes on to discuss the possibility of an "exobrain"—meaning it is not presently a working example.

Choices A,

B, C, and D are mentioned in the passage as one of these working examples.

30. A — To create technology that functions similarly to the human brain
The author states the primary goal is to "recreate the same functional mechanisms that underlie human consciousness" in technology.

Choices B, C, D, and E are either not supported by the passage or are discussed elsewhere.

Ready to pass?

Unlock the full DAT bank, every explanation, and unlimited timed mock exams.

Scan to start practising
https://certs.theorypractice.app/dat

Watch the full video walkthrough on YouTube @CertsQuizPrep