

ADMISSION TEST - BIOLOGY

1. In a population at Hardy-Weinberg equilibrium in which the frequency of alleles A is 0.3, the expected frequency of Aa individuals is

1. 0.21
2. 0.18
3. 0.42
4. 0.36
5. 0.63

2. A typical feature of eukaryotic cells is:

1. division of the inner space into compartments
2. cytoskeleton independent movement
3. cell division by binary fission
4. DNA in a form of a single molecule in the cytoplasm
5. the presence of mesosomes

3. Nucleolus:

1. occurs in the nucleus of tumor cells only
2. arises from lamins
3. represents a form of nucleus in mitosis
4. consists of a membrane and a body
5. is part of nucleus in eukaryotes

4. Histones are:

1. acidic proteins regulating the transport of RNA
2. basic, structural DNA-binding proteins
3. basic DNA-shortening proteins
4. basic DNA-binding carbohydrates
5. nuclear lipids

5. Which of the following best supports the statement that mitochondria are descendants of endosymbiotic bacteria like cells?

1. both mitochondria and bacteria have microtubules
2. mitochondria and bacteria possess similar nuclei
3. mitochondria and bacteria possess similar ribosomes and DNA
4. glycolysis occurs in both mitochondria and bacteria
5. neither mitochondria nor bacteria possess chloroplasts

6. Which of the following organelles is not surrounded by one or more membranes?

1. vacuole
2. chloroplast
3. ribosome
4. lysosome
5. mitochondrion

7. Microtubules are made of:

1. keratin
2. myosin
3. actin
4. tubulin
5. Microtubulin

8. Microfilaments:

1. maintain the position of the nucleus in the cell
2. are composed of polysaccharides
3. provide the motive force for cilia and flagella
4. make up the spindle that aids movement of chromosomes
5. are composed of actin

9. All nucleic acids

1. are polymers of amino acids
2. are polymers of nucleotides
3. contain deoxyribose
4. are double-helical
5. are double-stranded

10. Genetic material of prokaryotic cells:

1. is organized into pairs of homologous chromosomes
2. does not include alternative cytoplasmatic carriers of the genetic information
3. consists of a single DNA molecule associated with histone proteins
4. is enclosed by the nuclear membrane
5. consists of a single naked DNA molecule

11. In prokaryotes

1. cell division follows division of the nucleus
2. mitosis proceeds as in eukaryotes
3. the chromosomes are identical to those of eukaryotes
4. the genetic information is not carried in chromosomes
5. there are no meiotic divisions

12. Select the correct definition of semiconservative DNA replication

1. A pairs with T; and G pairs with C
2. the old DNA is completely broken down
3. the old DNA remains completely intact
4. each new DNA molecule has half of the old one
5. only half of the DNA is replicated

13. Anticodon is the term applied to

1. the list of amino acids corresponding to the genetic code
2. the part of the tRNA interacting with the codon
3. the concept that multiple codons sometimes code for a single amino acid
4. the several three-nucleotide stretches that code for "Stop"
5. the control mechanism of prokaryotic genes

14. Making a protein from a template of messenger RNA

1. is catalyzed by RNA polymerase
2. is catalyzed by DNA polymerase
3. is called translation
4. is called transcription
5. utilizes the RNA exactly as it is copied from the eukaryotic DNA template

15. What happens in the nucleus?

1. assembly of amino acids into protein
2. transcription only
3. transcription and replication of genetic material
4. replication of genetic material only
5. translation only

16. What is the corresponding sequence of bases in mRNA, if the original DNA sequence is TAGGCTAA?

1. CGAAUCGG
2. TAGGCTAA
3. AUCCGAUU
4. ATCCGATT
5. AATCGGAT

17. When does crossing over occur?

1. when homologues have aligned and replicated
2. during translation
3. during fertilization
4. during mitosis
5. during mutation

18. The pairing up of homologous chromosomes occurs during

1. mitosis
2. mitosis and meiosis II
3. meiosis I
4. meiosis II
5. protein synthesis

19. The sex in human offspring is determined by

1. autosomes carried by the egg cell
2. sex chromosome carried by the sperm cell
3. autosomes carried by the sperm cell
4. sex chromosome carried by the egg cell
5. the environment of the mother's uterus

20. All of the following are genetic disorders, except

1. phenylketonuria
2. malaria
3. cystic fibrosis
4. sickle-cell anemia
5. Huntington's disease

21. The failure of chromosomes to segregate properly during meiosis is called

1. independent assortment
2. translocation
3. replication
4. inversion
5. nondisjunction

22. The phosphate group in the DNA molecule

1. links the 5-C sugar of one nucleotide to the 3-C sugar of the next nucleotide
2. links two nucleotide bases together
3. links histone molecules to DNA
4. links two strands of the DNA molecule together
5. none of the above

23. The strands of the DNA molecule are antiparallel, which means that

1. one strand is oriented in a 5' to 3' direction and the other in a 3' to 5' direction
2. both strands are oriented in a 5' to 3' direction
3. both strands are oriented in a 3' to 5' direction
4. the molecule is oriented differently from the rest of the cell
5. only one strand of the molecule replicates

24. A promoter is a sequence of bases on the DNA molecule that

1. promotes DNA replication
2. activates DNA polymerase
3. activates RNA polymerase
4. represents the starting point of transcription
5. activates amino acids during protein synthesis

25. The presence or absence of one or more chromosomes from the normal chromosome set is known as

1. ploidy
2. triploidy
3. tetraploidy
4. polyploidy
5. aneuploidy

ADMISSION TEST - CHEMISTRY

1. The amount of 4.5 grams of NaCl was dissolved in distilled water to final volume 500 mL. Calculate molarity of the solution.
a.w.: Na=23, Cl=35.5

- | | |
|----------|----------|
| 1) 0.154 | 2) 0.650 |
| 3) 0.074 | 4) 1.300 |
| 5) 0.039 | |

2. Glycosidic linkage is typical of

- A) nucleic acids
- B) rubber
- C) lactose
- D) starch

- | | |
|---|--------------------|
| 1) A, D are valid | 2) only B is valid |
| 3) C, D are valid | |
| 4) all of the above mentioned (A-D) are valid | |
| 5) A, C, D are valid | |

3. NaNO_2 is

- | | |
|-----------------------|-------------------|
| 1) sodium nitrite | 2) sodium nitrate |
| 3) sodium hyponitrite | 4) sodium nitride |
| 5) sodium hyponitrate | |

4. Which element is the most electronegative one?

- | | |
|-------------|------------|
| 1) sulphur | 2) bromine |
| 3) oxygen | 4) iodine |
| 5) nitrogen | |

5. Which reaction/s represent/s the neutralization of HCl?

- A) HCl + silver nitrate
- B) HCl + sodium bromide
- C) HCl + potassium hydroxide
- D) HCl + sodium bicarbonate

- | | |
|---|--------------------|
| 1) D is only valid | |
| 2) all of the above mentioned (A-D) are valid | |
| 3) A, B, C are valid | 4) A is only valid |
| 5) C, D are valid | |

6. Which of the following acids is the weakest one?

- | | |
|--------------------|--------|
| 1) HNO_3 | 2) HCl |
| 3) HBr | 4) HCN |
| 5) HClO_4 | |
-

7. Choose hydroxy acid(s):

- A) succinic acid
- B) lactic acid
- C) fumaric acid
- D) malic acid

- 1) B is only valid
- 2) all of the above mentioned (A-D) are valid
- 3) A, C are valid
- 4) A is only valid
- 5) B, D are valid

8. Haemoglobin contains in its molecule heterocycle

- 1) pyrane
- 2) imidazole
- 3) pyrimidine
- 4) pyridine
- 5) pyrrol

9. What mass of NaOH (g) would be required to produce 8 g of the $Mg(OH)_2$ by reaction of $MgCl_2$ with NaOH. a.w.: Na=23, Cl=35.5, O=16, H=1, Mg=24

- 1) 5.8
- 2) 22.0
- 3) 11.0
- 4) 5.5
- 5) 16.5

10. Glycerol

- A) contains two hydroxy groups only
- B) could be oxidized
- C) is a derivative of pentane
- D) is an aromatic compound

- 1) none of the above mentioned (A-D) is valid
- 2) A, B are valid
- 3) B is only valid
- 4) C is only valid
- 5) D is only valid

11. The reduction of acetoacetic acid gives

- 1) an anhydride
- 2) two molecules of acetic acid
- 3) a hydroxy acid
- 4) a ketone
- 5) an ester

12. Acetone is

- 1) pentanone
- 2) diethyl ketone
- 3) propanone
- 4) a derivative of urea
- 5) an aromatic ketone

13. Balance redox equation given: potassium dichromate + potassium iodide + sulphuric acid \rightarrow molecular iodine + chromium(III) sulphate + potassium sulphate + water

- 1) 6,2,7 \rightarrow 2,6,4,14
- 2) 1,6,7 \rightarrow 3,1,4,7
- 3) 1,3,7 \rightarrow 6,1,2,7
- 4) 2,6,7 \rightarrow 6,2,4,14
- 5) 1,4,5 \rightarrow 2,1,2,5

14. Ammonia

- A) may be a donor of an electron pair
- B) forms complex ions with some metals
- C) is an oxidizing agent
- D) is toxic

- 1) A, D are valid
- 2) A, B, D are valid
- 3) all of the above mentioned (A-D) are valid
- 4) B is only valid
- 5) D is only valid

15. $\text{CH}_3\text{-CONH}_2$ is

- 1) a ketone
- 2) an amide
- 3) a primary amine
- 4) a lactone
- 5) urea

16. What is the oxidation number of manganese in potassium permanganate?

- 1) 4
- 2) 6
- 3) 7
- 4) 2
- 5) 3

17. What volume (cm^3) of the more concentrated H_2SO_4 would you have to measure, to prepare 2 dm^3 of 32 % (w/w) H_2SO_4 , density 1.235 g.cm^{-3} , from 98 % (w/w) H_2SO_4 , density 1.836 g.cm^{-3} ?

- 1) 0.440
- 2) 910
- 3) 134
- 4) 2.937
- 5) 439

18. Choose (a) true statement/s:

- A) Ca(OH)_2 is a stronger hydroxide than Ba(OH)_2
- B) H_2O_2 could be decomposed to H_2O
- C) iron is a transition element
- D) mercury forms alloys with some metals

- 1) A, C, D are valid
- 2) all of the above mentioned (A-D) are valid
- 3) D is only valid
- 4) B, C, D are valid
- 5) C, D are valid

19. Two mL of H_2SO_4 ($c=0.0005 \text{ mol/L}$) were diluted by distilled water to final volume 100 mL. Calculate pH value of diluted solution.

- 1) 1.8
 - 2) 4.7
 - 3) 5.0
 - 4) 1.6
 - 5) 5.3
-

20. Which of the following is a chemical change?

- A) Coal is burned.
- B) An ice cube melts.
- C) An iron nail rusts.
- D) Starch is digested.

- 1) C, D are valid
- 2) A, C, D are valid
- 3) A is only valid
- 4) all of the above mentioned (A-D) are valid
- 5) B, C are valid

21. The "pair" citric acid - isocitric acid is an example of

- A) position (place) isomerism
- B) tautomerism
- C) cis-trans isomerism
- D) stereoisomerism

- 1) D is only valid
- 2) B is only valid
- 3) C is only valid
- 4) none of the above mentioned (A-D) is valid
- 5) A is only valid

22. An aldol is the product of

- 1) the mixed condensation of 1 mole of ketone and 1 mol of ester
- 2) the reaction of 2 moles of alcohol with 1 mole of ketone
- 3) the self-condensation of 2 moles of aldehyde
- 4) the self-condensation of 2 moles of alcohol
- 5) the self-condensation of 2 moles of ester

23. $\text{CH}_3\text{-CO-O-CH}_3$ is

- 1) an ester
- 2) an ether
- 3) an acetal
- 4) a ketone
- 5) an anhydride

24. In aqueous solution, bicarbonate ion may react with water molecules. In this reaction, the bicarbonate ion may

- A) accept protons only
- B) act as a Bronstedt acid only
- C) act as neither Bronstedt acid or Bronstedt base
- D) act as either Bronstedt acid or Bronstedt base

- 1) C is only valid
- 2) D is only valid
- 3) A is only valid
- 4) B is only valid
- 5) A, B are valid

25. Which of the compounds mentioned does not form hydrogen bonds?

- 1) albumins
 - 2) HI
 - 3) H_2O
 - 4) HF
 - 5) DNA
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ADMISSION TEST - MATHEMATICS

1. Find the distance from the point (4,0) to the line $3y - 4x - 9 = 0$.

- 1) 3
- 2) 6
- 3) 7
- 4) 5
- 5) 4

2. Evaluate $\log_a \left(\frac{a^{\frac{3}{2}}}{\sqrt{a}} \right) + \log_b (\sqrt{b^3} \cdot b^2)$

- 1) 4.5
- 2) $a+b$
- 3) 4
- 4) 3
- 5) 5

3. A and B are two events such that $p(A) = \frac{1}{2}$, and $p(A \cap B) = \frac{1}{10}$. If A and B are independent find $p(A \cup B)$.

- 1) 0.3
- 2) 0.7
- 3) 0.5
- 4) 0.6
- 5) 0.4

4. Find the x and y coordinates of the origin of the circle which is given by the equation: $x^2 + y^2 - 2x - 2y - 2 = 0$

- 1) $x = 1, y = 1$
- 2) $x = 1, y = 2$
- 3) $x = 2, y = 2$
- 4) $x = 2, y = 1$
- 5) $x = 0, y = 1$

5. Find the slope of the tangent to the circle $x^2 + y^2 = 1$ at the point $\left(\frac{\sqrt{3}}{2}, \frac{1}{2} \right)$.

- 1) $\sqrt{2}$
- 2) $\sqrt{3}$
- 3) $-\sqrt{3}$
- 4) $-\sqrt{2}$
- 5) 1

6. For a given two-digit positive integer, the tens digit is smaller than the units digit by 3. The sum of the digits is 9. Find the square root of the integer.

- 1) 5
- 2) 4
- 3) 7
- 4) 6
- 5) 8

7. Solve for x in the following equation: $e^{2x} - 3e^x + 2 = 0$

- 1) $x = \ln 3$ and $x = 0$
- 2) $x = 1$
- 3) $x = 0$ and $x = \ln 2$
- 4) $x = 3$
- 5) no answer (1-4) is correct

8. The coin is tossed five times. How many arrangements of heads and tails are possible?

- 1) 16
- 2) 25
- 3) 10
- 4) 2
- 5) 32

9. Solve for (x, y) in the following equations:

$$x^2 + y^2 = 26$$

$$x - y = 6$$

- 1) $(-1, -5)$ and $(-5, -1)$
- 2) $(1, -5)$ and $(5, -1)$
- 3) $(1, 5)$ and $(5, 1)$
- 4) $(-1, -5)$ and $(-5, 1)$
- 5) $(-1, 5)$ and $(-5, 1)$

10. The activity A_t of a radionuclide decreases in time t according to the

formula $A_t = A_0 \cdot e^{-10t}$, where A_0 is the original activity ($t = 0$). Find the time t for which the activity $A_t = 0.25 \cdot A_0$.

- 1) $t = 0.2 \cdot \ln 2$
- 2) $t = 0.1 \cdot \ln 2$
- 3) $t = \ln 2$
- 4) $t = 1/\ln 2$
- 5) $t = 0.1$

ADMISSION TEST - PHYSICS

Where necessary, assume: gravitation acceleration = 9.81 m/s^2 ,
velocity of sound in air = 340 m/s , in water = 1500 m/s ,
velocity of light in vacuum (or air) = $3 \cdot 10^8 \text{ m/s}$,

- Tom is waiting at a traffic light in his car. When the light turns green, Tom accelerates from rest at a rate of a 6.00 m/s^2 for an interval of 4 seconds. Determine the displacement of Tom's car during this time period.
 - 24 m
 - 48 m
 - 96 m
 - 72 m
 - 144 m
- Determine the amount of work done by a 100 N force which is applied at an angle of 60° to the horizontal to move a 10 kg object at a constant speed for a horizontal distance 10 m.
 - 981 J
 - 1000 J
 - 5 kJ
 - 10 kJ
 - 500 J
- An oil drop having a charge of $9.81 \cdot 10^{-19} \text{ C}$ is suspended between two charged parallel plates. The plates are separated by a distance of 12.0 mm, and there is a potential difference of 1200 V between the plates. What is the weight of the suspended oil drop?
 - between 1 pg and 1 ng
 - less than 1 pg
 - between 1 ng and 1 μg
 - between 1 μg and 1 mg
 - more than 1 mg
- A 200 watt light bulb is connected to a 120 volt outlet. What is the resistance of the filament in the light bulb?
 - 144 ohms
 - 18 ohms
 - 72 ohms
 - 36 ohms
 - no answer (1-4) is correct
- A 3 volt battery, a resistor, and an ammeter are connected in series in a circuit. If the 3 volt battery is replaced by a 6 volt battery, then
 - the resistance of the resistor will decrease by a factor of two.
 - the ammeter reading will decrease by a factor of two.
 - the resistance of the resistor will increase by a factor of two.
 - the ammeter reading will increase by a factor of two.
 - none of the above; both the current and the resistance will remain constant.

6. An open-end resonance tube sounds out a fifth harmonic at 5000 Hz. The wavelength of the third harmonic in the water is
- 1) 0.5 m
 - 2) 0.4 m
 - 3) 0.3 m
 - 4) 0.2 m
 - 5) 0.1 m
7. The "buzz" of a mosquito produces a sound intensity level having a 40 dB rating. How many times more intense is the sound of normal conversation if it has a sound intensity level rating of 60 dB?
- 1) 150
 - 2) 10
 - 3) 1.5
 - 4) 15
 - 5) 100
8. Calculate the critical angle (in radians) for light traveling from diamond ($n = 2.42$) into water ($n = 1.34$).
- 1) 0.758
 - 2) 0.875
 - 3) 0.587
 - 4) 0.857
 - 5) 0.578
9. A ball was thrown straight up at 19.62 m/s then caught at the same place it was released. How many seconds was it in the air?
- 1) 2 s
 - 2) 4 s
 - 3) 3 s
 - 4) 5 s
 - 5) 1 s
10. The counting rate recorded by a detector fixed in front of a natural radionuclide is 512 per second. What is the half-life of the radionuclide, for the same arrangement, if the counting rate twenty days later is 32 per second?
- 1) 144 hours
 - 2) 96 hours
 - 3) 72 hours
 - 4) 120 hours
 - 5) no answer (1-4) is correct

The Correct Answers

Question No.	BIOLOGY	CHEMISTRY	MATHEMATICS	PHYSICS
1	1	1	4	2
2	1	5	1	5
3	5	1	4	1
4	2	3	1	3
5	3	5	3	4
6	3	4	4	1
7	4	5	3	5
8	5	5	5	3
9	2	3	2	2
10	5	3	1	4
11	5	3		
12	4	3		
13	2	2		
14	3	2		
15	3	2		
16	3	3		
17	1	5		
18	3	4		
19	2	2		
20	2	2		
21	5	5		
22	1	3		
23	1	1		
24	4	2		
25	5	2		