

HORIZON ACADEMY[®] Since 2003

Medical | IIT-JEE | Foundations

(Divisions of Horizon Study Circle Pvt. Ltd.)

Name.:

Date :

Test No.:

Test Code.:

Time : 3 Hrs.

M.M. : 720

HORIZON TEST SERIES for Medical Entrance Exam. 2016

[Test No. 3]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must not be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 3

Topics of The Test

Physics	Unit, Dimension & Errors, Motion in 1D.
Chemistry	Atomic Structure.
Biology	Zoology : Nutrition & digestion complete. Botany : Molecular basis of inheritance.

Test No. 3

[PHYSICS]

1. Match the following columns.

	Column I		Column II
(A)	Capacitance	(i)	volt(ampere) ⁻¹
(B)	Magnetic induction	(ii)	volt-sec(ampere) ⁻¹
(C)	Inductance	(iii)	newton(ampere) ⁻¹ (metre) ⁻¹
(D)	Resistance	(iv)	coulomb ² (joule) ⁻¹

A B C D

- (A) (ii) (iii) (iv) (i)
 (B) (iv) (iii) (ii) (i)
 (C) (iii) (iv) (i) (ii)
 (D) (iv) (i) (ii) (iii)
2. The unit of universal gas constant is
 (A) watt/K (B) dyne/°C
 (C) erg/K (D) newton/°R
3. Parsec is the unit of
 (A) time (B) distance
 (C) frequency (D) angular acceleration
4. The unit of permittivity of free space, ϵ_0 , is
 (A) coulomb/newton-metre
 (B) newton-metre²/coulomb²
 (C) coulomb²/newton-metre²
 (D) coulomb²/(newton-metre)²
5. Which one of the following is not a derived unit ?
 (A) Planck's constant
 (B) Gravitational constant
 (C) Charge
 (D) Electric current
6. If C be the capacitance and V be the electric potential, then the dimensional formula of CV² is
 (A) [ML²T⁻²A⁰] (B) [MLT⁻²A⁻¹]
 (C) [M⁰LT⁻²A⁰] (D) [ML⁻³TA]
7. The equation of state of some gases can be expressed as

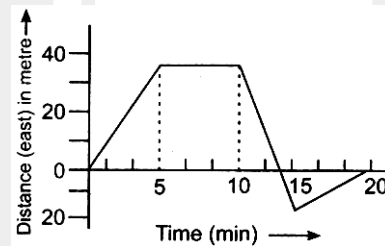
$$\left(p + \frac{a}{V^2}\right)(V - b) = RT$$
 where, p is absolute the pressure, V is the volume, T is absolute temperature and a and b are constants. The dimensional formula of a is
 (A) [ML⁵T⁻²] (B) [M⁻¹L⁵T⁻²]
 (C) [ML⁻¹T⁻²] (D) [ML⁻⁵T⁻²]
8. Dimensions of resistance in an electrical circuit, in terms of dimension of mass M , of length L , of time T and of current A , would be
 (A) [ML²T⁻³A⁻¹] (B) [ML²T⁻²]
 (C) [ML²T⁻¹A⁻¹] (D) [ML²T⁻³A⁻²]
9. Dimensional formula for the universal gravitational constant G is
 (A) [M⁻¹L²T⁻²] (B) [M⁰L⁰T⁰]
 (C) [M⁻¹L³T⁻²] (D) [M⁻¹L³T⁻¹]
10. If E = energy, G = gravitational constant, I = impulse and M = mass, then dimensions of $\frac{GIM^2}{E^2}$ are same as that of
 (A) time (B) mass
 (C) length (D) force

Space for Rough Work

11. The magnetic force on a point charge is

$$\mathbf{F} = q(\mathbf{v} \times \mathbf{B})$$
 Here, q = electric charge
 \mathbf{v} = velocity of point charge
 \mathbf{B} = magnetic field
 The dimension of \mathbf{B} is
 (A) $[\text{MLT}^{-1}\text{A}]$ (B) $[\text{M}^2\text{LT}^{-2}\text{A}^{-1}]$
 (C) $[\text{MT}^{-2}\text{A}^{-1}]$ (D) None of these
12. Out of the following four dimensional quantities, which one qualifies to be called a dimensional constant ?
 (A) Acceleration due to gravity
 (B) Surface tension of water
 (C) Weight of a standard kilogram mass
 (D) The velocity of light in vacuum
13. Dimensions of relative density is
 (A) $[\text{ML}^{-2}]$ (B) $[\text{ML}^{-3}]$
 (C) dimensionless (D) $[\text{M}^2\text{L}^{-6}]$
14. The length, breadth and thickness of a block are given by $l = 12$ cm, $b = 6$ cm and $t = 2.45$ cm. The volume of the block according to the idea of significant figures should be
 (A) $1 \times 10^2 \text{cm}^3$ (B) $2 \times 10^2 \text{cm}^3$
 (C) $1.763 \times 10^2 \text{cm}^3$ (D) None of these
15. The difference in the lengths of a mean solar day and a sidereal day is about
 (A) 1 min (B) 4 min
 (C) 15 min (D) 56 min
16. A boy standing at the top of a tower of 20 m height drops a stone. Assuming $g = 10 \text{ms}^{-2}$, the velocity with which it hits the ground is
 (A) 20ms^{-1} (B) 40ms^{-1}
 (C) 5ms^{-1} (D) 10ms^{-1}
17. A particle has a displacement of 12 m towards east and 5 m towards north and finally 6 m vertically upwards. The sum of these displacement is
 (A) 12 m (B) 10.04 m
 (C) 14.31 m (D) None of these

18. A wheel completes 2000 revolutions to cover the 9.5 km distance, then the diameter of the wheel is
 (A) 1.5 km (B) 1.5 m
 (C) 7.5 cm (D) 7.5 m
19. A ball thrown vertically upwards with an initial velocity of 1.4 m/s returns in 2s. The total displacement of the ball is
 (A) 22.4 cm (B) zero
 (C) 44.8 m (D) 33.6 m
20. The displacement of a particle, starting from rest (at $t=0$) is given by $s = 6t^2 - t^3$
 The time in seconds at which the particle will obtain zero velocity again is
 (A) 2 (B) 4
 (C) 6 (D) 8
21. Which of the following can be zero, when a particle is in motion for some time ?
 (A) Distance (B) Displacement
 (C) Speed (D) None of these
22. A boy begins to walk eastward along a street in front of his house and the graph of his displacement from home is shown in the following figure. His average speed for the whole time interval is equal to



- (A) 8 m min^{-1} (B) 6 m min^{-1}
 (C) $\frac{8}{3} \text{ m min}^{-1}$ (D) 2 m min^{-1}
23. An aeroplane flies 400 m due north and then 300 m due south and then flies 1200 m upwards, the net displacement is
 (A) greater than 1200 m
 (B) less than 1200 m
 (C) 1400 m
 (D) 1500 m

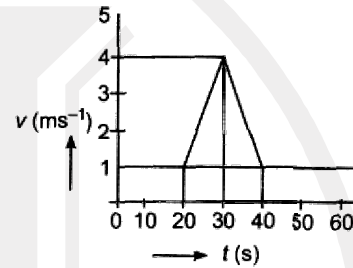
Space for Rough Work

24. The numerical ratio of displacement to the distance covered is always
 (A) less than one
 (B) equal to one
 (C) equal to or less than one
 (D) equal to or greater than one
25. A body goes 20 km north and then 10 km due east. The displacement of body from its starting point is
 (A) 30 km (B) 25.2 km
 (C) 22.36 km (D) 10 km
26. A body falls freely from the top of a tower. It covers 36% of the total height in the last second before striking the ground level. The height of the tower is
 (A) 50 m (B) 75 m
 (C) 100 m (D) 125 m
27. A car starts from rest and accelerates uniformly to a speed of 180 km/h in 10s. The distance covered by the car in this time interval is
 (A) 500 m (B) 250 m
 (C) 100 m (D) 200 m
28. A particle moves in a straight line with a constant acceleration. It changes its velocity from 10 ms^{-1} to 20 ms^{-1} while passing through a distance 135 m in t second. The value of t is
 (A) 10 (B) 1.8
 (C) 12 (D) 9
29. A particle moving in a straight line covers half the distance with speed of 3 ms^{-1} . The other half of the distance is covered in two equal time intervals with speed of 4.5 ms^{-1} and 7.5 ms^{-1} respectively. The average speed of the particle during this motion is
 (A) 4.0 ms^{-1} (B) 5.0 ms^{-1}
 (C) 5.5 ms^{-1} (D) 4.8 ms^{-1}
30. The position x of a particle with respect to time t along X-axis is given by $x = gt^2 - t^3$ where x is in metre and t in second. What will be the position of this particle when it achieves maximum speed along the +X direction?
 (A) 32 m (B) 54 m
 (C) 81 m (D) 24 m
31. A man throws balls with the same speed vertically upwards one after the other at an interval of 2s. What should be the speed of the throw so that more than two balls are in the sky at any time ?
 (Given $g = 9.8 \text{ ms}^{-2}$)
 (A) Any speed less than 19.6 ms^{-1}
 (B) Only with speed 19.6 ms^{-1}
 (C) More than 19.6 ms^{-1}
 (D) At least 9.8 ms^{-1}
32. Two bodies, A (of mass 1 kg) and B (of mass 3 kg) are dropped from heights of 16 m and 25 m, respectively. The ratio of the time taken by them to reach the ground is
 (A) $5/4$ (B) $12/5$
 (C) $5/12$ (D) $4/5$
33. A metro train starts from rest and in 5 s achieves 108 kmh^{-1} . After that it moves with constant velocity and comes to rest after travelling 45 m with uniform retardation. If total distance travelled is 395 m, find total time of travelling
 (A) 12.2 s (B) 15.3 s
 (C) 9 s (D) 17.2 s
34. A ball is thrown upwards, it takes 4 s to reach back to the ground. Find its initial velocity.
 (A) 30 ms^{-1} (B) 10 ms^{-1}
 (C) 40 ms^{-1} (D) 20 ms^{-1}
35. From a balloon rising vertically upwards as 5 ms^{-1} stone is thrown up at 10 ms^{-1} relative to the balloon. Its velocity with respect to ground after 2 s is
 (Assuming $g = 10 \text{ ms}^{-2}$)
 (A) zero (B) 5 ms^{-1}
 (C) 10 ms^{-1} (D) 20 ms^{-1}
36. When a ball is thrown up vertically with velocity v_0 , it reaches a maximum height of h . If one wishes to triple the maximum height then the ball should be thrown with velocity
 (A) $\sqrt{3}v_0$ (B) $3v_0$
 (C) $9v_0$ (D) $3/2v_0$

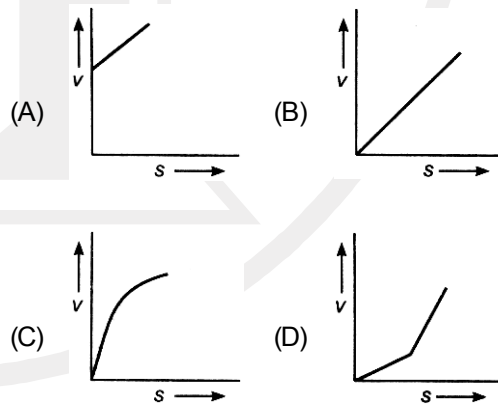
Space for Rough Work

37. If an iron ball and a wooden ball of the same radius are released from a height h in vacuum, then time taken by both of them, to reach the ground will be
 (A) zero (B) unequal
 (C) roughly equal (D) exactly equal
38. From the top of a tower of two stones, whose masses are in the ratio 1 : 2 are thrown on straight up with an initial speed u and the second straight down with the same speed u . Then neglecting air resistance
 (A) the heavier stone hits the ground with a higher speed
 (B) the lighter stone hits the ground with a higher speed
 (C) both the stones will have the same speed when they hit the ground
 (D) the speed can't be determined with the given data
39. A particle moves along Y-axis in such a way that its y-coordinate varies with time t according to the relation $y = 3 + 5t + 7t^2$. The initial velocity and acceleration of the particle are respectively
 (A) 14 ms^{-1} , -5 ms^{-2}
 (B) 19 ms^{-1} , -9 ms^{-2}
 (C) -14 ms^{-1} , -5 ms^{-2}
 (D) 5 ms^{-1} , 14 ms^{-2}
40. An object travels north with a velocity of 10 ms^{-1} and then speeds up to a velocity of 25 ms^{-1} in 5 s. The acceleration of the object in these 5 s is
 (A) 12 ms^{-2} in north direction
 (B) 3 ms^{-2} in north direction
 (C) 15 ms^{-2} in north direction
 (D) 3 ms^{-2} in south direction
41. A man is 45 m behind the bus, when the bus start accelerating from rest with acceleration 2.5 ms^{-2} . With what minimum velocity should the man start running to catch the bus ?

- (A) 12 ms^{-1} (B) 14 ms^{-1}
 (C) 15 ms^{-1} (D) 16 ms^{-1}
42. A bullet loses $1/20$ of its velocity after penetrating a plank. How many planks are required to stop the bullet?
 (A) 6 (B) 9
 (C) 11 (D) 13
43. Velocity-time ($v-t$) graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is non-zero acceleration and retardation is

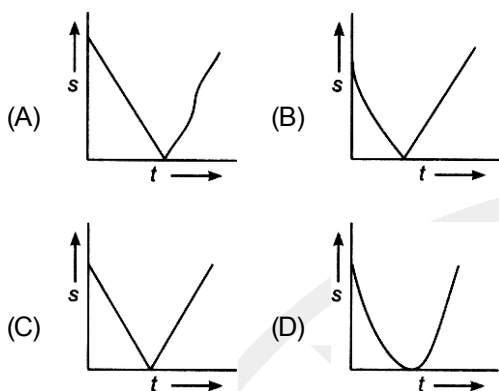


- (A) 60 m (B) 50 m
 (C) 30 m (D) 40 m
44. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is represented by the graph



Space for Rough Work

45. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its flight if the air resistance is not ignored ?



[CHEMISTRY]

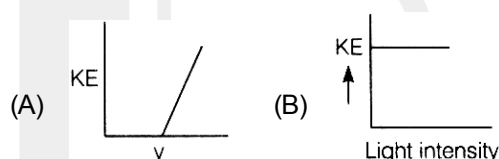
46. Bohr's theory is applicable to
 (A) He (B) Li^{2+}
 (C) He^{2+} (D) None of these
47. The energy of the electron in the second and the third Bohr orbits of the hydrogen atom are -5.42×10^{-12} erg and -2.41×10^{-12} erg respectively. The wavelength of emitted light when the electrons drops from the third to the second orbit is
 (A) 0.660 nm (B) 330 nm
 (C) 660 nm (D) 590 nm
48. If E_e, E_α and E_p represents the kinetic energies of an electron, alpha particle and a proton respectively, each moving with same de-Broglie wavelength then
 (A) $E_e = E_\alpha = E_p$ (B) $E_e > E_\alpha > E_p$
 (C) $E_\alpha > E_p > E_e$ (D) $E_e > E_p > E_\alpha$
49. Choose the correct statement among the following.
 (A) ψ^2 represents the atomic orbital
 (B) The number of peaks in radial distribution is $(n - l)$
 (C) A node is a point in space around nucleus where the wave function ψ has zero value
 (D) All of the above

50. Four different sets of quantum numbers for 4 electrons are given below

$$e_1 = 4, 0, 0, -\frac{1}{2}; e_2 = 3, 1, 1, -\frac{1}{2}; e_3 = 3, 2, 2, +\frac{1}{2}; e_4 = 3, 0, 0, +\frac{1}{2}$$

The order of energy of e_1, e_2, e_3 and e_4 is

- (A) $e_1 > e_2 > e_3 > e_4$ (B) $e_4 > e_3 > e_2 > e_1$
 (C) $e_3 > e_1 > e_2 > e_4$ (D) $e_2 > e_3 > e_4 > e_1$
51. A particle A moving with a certain velocity has the de-Broglie wavelength of 1 Å. For particle B with mass 25% of A and velocity 75% of A. Calculate the de-Broglie wavelength
 (A) 3 Å (B) 5.33 Å
 (C) 6.88 Å (D) 0.48 Å
52. Which of the following options represents the correct graph for photo electrons ?



- (C) Both (A) and (B) (D) None of these
53. The set of quantum number for 19th electrons of chromium ($Z = 24$) is
 (A) $4, 0, 0, +\frac{1}{2}$ (B) $4, 1, -1, +\frac{1}{2}$
 (C) $3, 2, 2, +\frac{1}{2}$ (D) $3, 2, -2, +\frac{1}{2}$
54. Atomic emission spectra of an element cannot be used to
 (A) identify the atom
 (B) determine the mass number of the nucleus of atom
 (C) measure the difference in energy between pairs of stationary state of atom
 (D) All of the above.

Space for Rough Work

55. What is the ratio of mass of an electron to the mass of a proton ?
 (A) 1 : 1 (B) 1 : 2
 (C) 1 : 3 (D) 1 : 1837
56. The wavelength corresponding to maximum energy for hydrogen is 91.2 nm. The corresponding wavelength for He^+ ion is
 (A) 2.28 nm (B) 22.8 nm
 (C) 182.4 nm (D) 364.8 nm
57. Choose isosteres from the following.
 (A) NO_2^- and PO_4^{3-} (B) NO_2^- and O_3
 (C) CO_2 , N_2O , NO_3^- (D) ClO_4^- and OCN^-
58. In hydrogen spectrum, the different line of Lyman series are present in
 (A) UV field (B) IR field
 (C) visible field (D) far IR field
59. In wavelength of the radiation emitted when in a hydrogen atom electron falls from infinity to first stationary state would be ($R_H = 1.097 \times 10^7 \text{ m}^{-1}$)
 (A) 91 nm (B) 191 nm
 (C) 209 nm (D) 314 nm
60. Which of the following options does not represent ground state electronic configuration of an atom ?
 (A) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$
 (B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$
 (C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$
 (D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
61. The two electrons in s-subshell will differ in
 (A) principal quantum number
 (B) azimuthal quantum number
 (C) magnetic quantum number
 (D) spin quantum number
62. If an electron has spin quantum number of $+\frac{1}{2}$ and a magnetic quantum number of -1 , it cannot be represented in an
 (A) s-orbital (B) p-orbital
 (C) d-orbital (D) f-orbital
63. Which of the following statements about the electron is incorrect ?
 (A) It is negatively charged particle
 (B) The mass of electron is equal to the mass of neutron
 (C) It is a basic constituent of all atoms
 (D) It is a constituent of cathode rays
64. The number of nodal planes in p_x is
 (A) 1 (B) 2
 (C) 3 (D) 0
65. The value of Planks's constant is $6.63 \times 10^{-34} \text{ Js}$. The velocity of light is $3 \times 10^8 \text{ ms}^{-1}$. Which value is closest to the wavelength in nanometers of a quantum of light with frequency of $8 \times 10^{15} \text{ s}^{-1}$?
 (A) 2×10^{-25} (B) 3×10^7
 (C) 4×10^1 (D) 5×10^{-18}
66. According to Bohr's theory, the angular momentum of electron in 5th orbit is
 (A) $25 \frac{h}{\pi}$ (B) $1.0 \frac{h}{\pi}$
 (C) $10 \frac{h}{\pi}$ (D) $2.5 \frac{h}{\pi}$
67. Uncertainty in the position of an electron (mass = $9.1 \times 10^{-31} \text{ kg}$) moving with a velocity 300 ms^{-1} , accurate upon 0.001% will be ($h = 6.63 \times 10^{-34} \text{ Js}$)
 (A) $19.3 \times 10^{-2} \text{ m}$ (B) $5.76 \times 10^{-2} \text{ m}$
 (C) $1.93 \times 10^{-2} \text{ m}$ (D) $3.84 \times 10^{-2} \text{ m}$

Space for Rough Work

68. Consider the following sets of quantum numbers

	n	l	m	s
(i)	3	0	0	$+\frac{1}{2}$
(ii)	2	2	1	$+\frac{1}{2}$
(iii)	4	3	-2	$-\frac{1}{2}$
(iv)	1	0	-1	$-\frac{1}{2}$
(v)	3	2	3	$+\frac{1}{2}$

Which of the following sets of quantum numbers is not possible ?

- (A) (ii), (iii) and (iv) (B) (i), (ii), (iii) and (iv)
 (C) (ii), (iv) and (v) (D) (i) and (iii)
69. The de-Broglie wavelength associated with a ball of mass 1 kg having kinetic energy 0.5 J is
 (A) $6.626 \times 10^{-34} \text{m}$ (B) $13.20 \times 10^{-34} \text{m}$
 (C) $10.38 \times 10^{-21} \text{m}$ (D) $6.626 \times 10^{-34} \text{\AA}$
70. The energy of second Bohr orbit of the hydrogen atom is -328 kJ mol^{-1} , hence the energy of fourth Bohr orbit would be
 (A) -41 kJ mol^{-1} (B) $-1312 \text{ kJ mol}^{-1}$
 (C) -164 kJ mol^{-1} (D) -82 kJ mol^{-1}
71. The kinetic energy of an electron emitted from a surface of a metal by light of wavelength $5.5 \times 10^{-8} \text{cm}$. Threshold frequency for the metal is $3.62 \times 10^{12} \text{s}^{-1}$, is
 (A) $6.6 \times 10^{-27} \text{Erg}(5.5 \times 10^{17} \text{s}^{-1} - 3.62 \times 10^{12} \text{s}^{-1})$
 (B) $6.6 \times 10^{-27} \text{Erg}(-5.5 \times 10^{17} \text{s}^{-1} - 3.62 \times 10^{12} \text{s}^{-1})$
 (C) $6.6 \times 10^{-27} \text{Erg}(-5.5 \times 10^{17} \text{s}^{-1} + 3.62 \times 10^{12} \text{s}^{-1})$
 (D) $6.6 \times 10^{-27} \text{Erg}(5.5 \times 10^{17} \text{s}^{-1} + 3.62 \times 10^{12} \text{s}^{-1})$
72. Which of the following is a pair of isoelectronic species?
 (A) $\text{Cl}_2\text{O}_3, \text{ICl}_2^-$ (B) $\text{ICl}_2^-, \text{ClO}_2$
 (C) $\text{IF}_2^+, \text{I}_3^-$ (D) $\text{ClO}_2^-, \text{ClF}_2^+$

73. The frequency of radiation emitted when electron falls from $n = 4$ to $n = 1$ in a hydrogen atom will be (Given ionisation energy of $\text{H} = 2.18 \times 10^{-18} \text{J atom}^{-1}$ and $h = 6.625 \times 10^{-34} \text{Js}$)

- (A) $1.54 \times 10^{15} \text{s}^{-1}$ (B) $1.03 \times 10^{15} \text{s}^{-1}$
 (C) $3.08 \times 10^{15} \text{s}^{-1}$ (D) $2.00 \times 10^{15} \text{s}^{-1}$
74. The ratio of area covered by second orbital to the first orbital is
 (A) 1 : 2 (B) 1 : 16
 (C) 8 : 1 (D) 16 : 1
75. If principal quantum number $n = 4$, the total number of orbitals having $l = 3$ is
 (A) 3 (B) 7
 (C) 5 (D) 9

Direction : In the following question, more than one of the answers given may be correct. Select the correct answers and mark it according to the codes:

Codes

- (A) 1, 2 and 3 are correct
 (B) 1 and 2 are correct
 (C) 2 and 4 are correct
 (D) 1 and 3 are correct
76. Which of the following statement (s) is (are) correct?
 1. The electronic configuration of Cr is $[\text{Ar}] 3d^5 4s^1$. (Atomic number of Cr = 24).
 2. The magnetic quantum number may have a negative value.
 3. In silver atom, 23 electrons have a spin of one type and 24 of the opposite type. (Atomic number of Ag = 47)
 4. For valency electron of potassium, value of n is 2
77. What is the maximum numbers of electrons that can be associated with the following set of quantum numbers ? $n = 3, l = 1, m = -1$
 (A) 6 (B) 4
 (C) 2 (D) 10
78. Maximum number of electrons in a subshell with $l = 3$ and $n = 4$ is
 (A) 14 (B) 16
 (C) 10 (D) 12

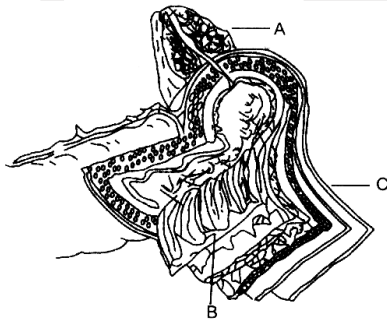
Space for Rough Work

79. The correct set of four quantum numbers for the valence electron of rubidium atom ($Z = 37$) is
- (A) $5, 1, 1, +\frac{1}{2}$ (B) $6, 0, 0, +\frac{1}{2}$
 (C) $5, 0, 0, +\frac{1}{2}$ (D) $5, 1, 0, +\frac{1}{2}$
80. Which of the following is non-permissible ?
- (A) $n = 4, l = 3, m = 0$ (B) $n = 4, l = 2, m = 1$
 (C) $n = 4, l = 4, m = 1$ (D) $n = 4, l = 0, m = 0$
81. The ratio of the difference in energy between the first and second Bohr orbit to that between the second and the third Bohr orbit is
- (A) $\frac{1}{2}$ (B) $\frac{1}{3}$
 (C) $\frac{4}{9}$ (D) $\frac{27}{5}$
82. Calculate the wavelength of light required to break the bond between two chlorine atoms in a chlorine molecule. The Cl—Cl bond energy is 243 kJ mol^{-1} ($h = 6.6 \times 10^{-34} \text{ Js}$; $c = 3 \times 10^8 \text{ ms}^{-1}$, Avogadro's number = $6.02 \times 10^{23} \text{ mol}^{-1}$).
- (A) $4.91 \times 10^{-7} \text{ m}$ (B) $4.11 \times 10^{-6} \text{ m}$
 (C) $8.81 \times 10^{-31} \text{ m}$ (D) $6.26 \times 10^{-21} \text{ m}$
83. The energies E_1 and E_2 of two radiations are 25 eV and 50 eV respectively. The relation between their wavelengths *i.e.*, λ_1 and λ_2 will be
- (A) $\lambda_1 = 2\lambda_2$ (B) $\lambda_1 = 4\lambda_2$
 (C) $\lambda_1 = \frac{1}{2}\lambda_2$ (D) $\lambda_1 = \lambda_2$
84. The total number of atomic orbitals in fourth energy level of an atom is
- (A) 16 (B) 32
 (C) 4 (D) 8
85. In $n = 6$, the correct sequence for filling of electrons will be
- (A) $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$
 (B) $ns \rightarrow (n-2)f \rightarrow np \rightarrow (n-1)d$
 (C) $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n-2)f$
 (D) $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$
86. Which of the following statement in relation to the hydrogen atom is correct ?
- (A) 3s, 3p and 3d-orbitals all have the same energy
 (B) 3s and 3p-orbitals are of lower energy than 3d-orbital
 (C) 3p-orbital is lower in energy than 3d-orbital
 (D) 3s-orbital is lower in energy than 3p-orbital
87. The wavelength of a spectral line emitted by hydrogen atom in the Lyman series is $\frac{16}{15R}$ cm. What is the value of n_2 ? (where, R = Rydberg constant)
- (A) 2 (B) 3
 (C) 4 (D) 1
88. Which one of the following ions has electronic configuration $[\text{Ar}]3d^6$? (At. No : Mn = 25, Fe = 26, CO = 27, Ni = 28)
- (A) Ni^{3+} (B) Mn^{3+}
 (C) Fe^{3+} (D) Co^{3+}
89. Deuterium nucleus contains
- (A) $1p + 1n$ (B) $2p + 0n$
 (C) $1p + 1e^-$ (D) $2p + 2n$
90. If the photon of the wavelength 150 pm strikes an atom and one of its inner bound electrons is ejected out with a velocity of $1.5 \times 10^7 \text{ ms}^{-1}$, what is the energy with which it is bound to the nucleus ?
- (A) $1.2 \times 10^2 \text{ eV}$ (B) $2.15 \times 10^3 \text{ eV}$
 (C) $7.6 \times 10^3 \text{ eV}$ (D) $8.12 \times 10^3 \text{ eV}$

Space for Rough Work

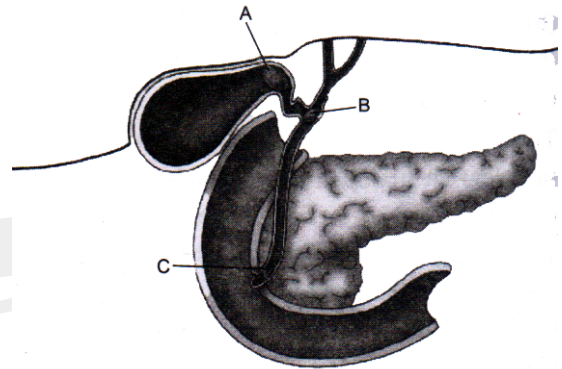
[ZOOLOGY]

91. Which of the following enzymes carries out the initial step in the digestion of milk in humans ?
 (A) Rennin (B) Lipase
 (C) Trypsin (D) Pepsin
92. The mucosal layer in the stomach form irregular folds known as
 (A) villi (B) lumen
 (C) rugae (D) crypts of Lieberkuhn
93. With reference to a normal human being, which one of the following statements is not correct ?
 (A) Human saliva is slightly alkaline
 (B) An adult human may secrete 1 to 1.5 litres of saliva per day
 (C) Saliva is secreted by six pairs of salivary glands in human beings
 (D) The salivary enzyme (ptyalin) breaks down cooked starch into maltose
94. Ptyalin is inactivated by a component of gastric juice known as
 (A) pepsin (B) mucus
 (C) renin (D) HCl
95. The lactase hydrolyses lactose into
 (A) glucose (B) glucose and galactose
 (C) fructose (D) glucose and fructose
96. Which one is the correct option for labels A, B and C in the given diagram ?



- (A) A-Liver, B-Mucosa, C-Peritoneum
 (B) A-Liver, B-Circular muscle layer, C-Serosa
 (C) A-Pancreas, B-mucosa, C-Peritoneum
 (D) A-Pancreas B-Submucosa, C-Serosa

97. Sphincter of Oddi guards
 (A) hepato-pancreatic duct
 (B) common bile duct
 (C) pancreatic duct
 (D) cystic duct
98. Human dental formula is
 (A) $I \frac{2}{2} C \frac{1}{1} P m \frac{2}{2} M \frac{3}{3}$ (B) $I \frac{2}{1} C \frac{1}{2} P m \frac{2}{2} M \frac{3}{3}$
 (C) $I \frac{1}{2} C \frac{2}{1} P m \frac{2}{2} M \frac{3}{3}$ (D) $I \frac{1}{1} C \frac{2}{2} P m \frac{2}{2} M \frac{3}{3}$
99. Given below is the diagram of hepatobiliary tree showing stones at various locations. Which stone is in cystic duct ?



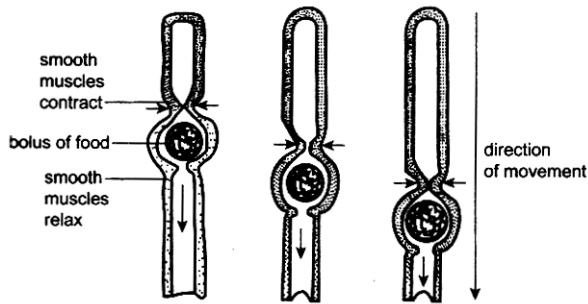
- (A) A (B) B
 (C) C (D) None of these
100. Which of the following represents all proteolytic enzymes ?
 (A) Erepsin, trypsin, pepsin
 (B) Cholecystokinin, pepsin, gastrin
 (C) Lipase, duocrinin, trypsin
 (D) Enterocrinin, gastrin, erepsin
101. Diastema refers to
 (A) gap between the teeth
 (B) gap between tongue and teeth
 (C) ciliary cells on alimentary wall
 (D) cell lining along pharynx

Space for Rough Work

102. Which of the following cells produce HCl ?
(A) β -cells (B) α -cells
(C) Oxyntic cells (D) Chief cells
103. Which one of the following pairs of food components in humans reaches the stomach totally undigested ?
(A) Protein and starch
(B) Starch and fat
(C) Fat and cellulose
(D) Starch and cellulose
104. Glisson's capsules are found, in which organ of mammals ?
(A) Stomach (B) Kidney
(C) Testis (D) Liver
105. Enterokinase converts
(A) trypsinogen to trypsin
(B) pepsinogen to pepsin
(C) chymotrypsin to pepsinogen
(D) pepsin to chymotrypsin
106. Digestive enzymes are
(A) hydrolases (B) oxidoreductases
(C) transferases (D) lyases
107. Pepsinogen is secreted by
(A) chief cells (B) oxyntic cells
(C) mast cells (D) parietal cells
108. Which of the following processes will be affected by the absence of enterokinase ?
(A) Lipid \rightarrow Fatty acid \rightarrow Glycerol
(B) Dipeptides \rightarrow Amino acid
(C) Proteases \rightarrow Dipeptide
(D) Amylase \rightarrow Maltose
109. Medium, in which pepsin is active ?
(A) Neutral (B) Alkaline
(C) Acidic (D) Isotonic
110. Curdling of milk in small intestine takes place due to
(A) trypsin (B) rennin
(C) ptyalin (D) chymotrypsin
111. Which of the following is the largest gland in an adult man ?
(A) Thymus (B) Liver
(C) Thyroid (D) Pancreas
112. Which is not used up in human body ?
(A) Calcium (B) Phosphorus
(C) Zinc (D) Barium
113. The digestive enzyme that is not found in human pancreatic juice is
(A) nucleotidase (B) nuclease
(C) trypsin (D) lipase
114. The epithelial cells lining the stomach of vertebrates is protected from damage by HCl because
(A) hydrochloric acid is too dilute
(B) the epithelial cells are resistant to the action of HCl
(C) HCl is neutralised by alkaline gastric juice
(D) the epithelial cells are covered with a mucous secretion
115. Starch is converted to maltose by the action of
(A) invertase (B) amylase
(C) sucrose (D) maltase
116. Hardest part in animal body is
(A) bone (B) hair
(C) dentine (D) enamel
117. In horses, rabbits, hares, the cellulose gets digested in the
(A) caecum (B) stomach
(C) appendix (D) rumen

Space for Rough Work

118. Which of the following can be absorbed by hepatic caeca ?
 (A) Glucose and amino acid
 (B) Glucose and lipid
 (C) Lipid
 (D) Glucose
119. Which of the following is correct chronological order for enzyme activity of some enzymes taking part in protein digestion ?
 (A) Pepsin → Trypsin → Peptidase
 (B) Pepsin → Peptidase → Trypsin
 (C) Trypsin → Pepsin → Peptidase
 (D) Peptidase → Trypsin → Pepsin
120. Cud chewing animals are known as
 (A) frugivorous (B) sanguivorous
 (C) ruminants (D) cannibals
121. Chloragen cells help in
 (A) respiration (B) reproduction
 (C) circulation (D) nutrition
122. What process is being shown in the given diagram ?



- (A) Deglutition (B) Mastication
 (C) Emulsification (D) Peristalsis
123. Acetylcholinesterase enzyme splits acetylcholine into
 (A) acetone and choline
 (B) acetic acid and choline
 (C) aspartic acid and acetylcholine
 (D) amino acid and choline

124. In the wall of alimentary canal, what is the actual sequence from outer to inner ?
 (A) Serosa, longitudinal muscle, mucosa, submucosa
 (B) Mucosa, serosa, longitudinal muscle
 (C) Serosa, longitudinal muscle, circular muscle, submucosa, mucosa
 (D) Serosa, longitudinal muscle, submucosa, mucosa
125. Both the crown and root of a tooth is covered by a layer of bony hard substance called
 (A) enamel (B) dentine
 (C) bony socket (D) cement
126. Animals consuming only plant materials are referred as
 (A) herbivorous (B) carnivorous
 (C) omnivorous (D) insectivorous
127. The amount of bile released is proportional to the amount of
 (A) fat in meal
 (B) protein in meal
 (C) carbohydrate in meal
 (D) All of these
128. The lacteals are found in
 (A) Salivary glands (B) villi
 (C) spleen (D) mammary glands
129. Brunner's glands are located in
 (A) oesophagus (B) intestine
 (C) stomach (D) duodenum
130. Which one of the following elements is essential for the life of animal and not for plants ?
 (A) Calcium (B) Iodine
 (C) Phosphorus (D) Potassium
131. Cattle fed on spoilt sweet clover may suffer from deficiency of vitamin.
 (A) A (B) K
 (C) D (D) E

Space for Rough Work

132. The main source of Thiamine in Indian diet is.

- (A) Milk (B) Meat
(C) Vegetables (D) Cereals

133. Chronic alcoholism is characterized by the deficiency of Vitamin.

- (A) A (B) B1
(C) C (D) E

134. Regarding Vitamin C.

- I. It plays an important role in tissue oxidation
II. It is needed for the formation of collagen
III. It inhibits nitrosamine formation by intestinal mucosa

- (A) I, II, III are correct (B) I, II are correct
(C) II, III are correct (D) I, III are correct

135. Which of the following is not a good source of calcium?

- (A) Milk (B) Green leafy vegetables
(C) Ragi (D) Rice

[BOTANY]

136. A small segment of DNA contains the base sequence CGT. If an mRNA transcript is made that includes this DNA sequence, what will be the anticodon on the tRNA that will bind to the corresponding mRNA codon for this DNA triplet?

- (A) CGT (B) GCA
(C) CGU (D) GCT

137. A functional piece of mRNA has 66 codons. What is the maximum number of amino acids that could be present in the protein coded for by this mRNA?

- (A) 22 (B) 64
(C) 65 (D) 66

138. A triplet base sequence in DNA reads ATT. What will be the corresponding mRNA codon, tRNA anticodon, and amino acid called by this DNA?

- (A) TAA; UTT ; methionine?
(B) TAA; AUU ; no amino acid (= stop codon)
(C) UAA ; AUU ; no amino acid (= stop codon)
(D) CGG; GCC; alanine

139. The primary function of DNA polymerase is to

- (A) add nucleotides to the growing daughter strand.
(B) seal nicks along the sugar-phosphate backbone of the daughter strand.
(C) unwind the parent DNA double helix.
(D) prevent reassociation of the denatured parent DNA strands.

140. The lagging daughter strand of DNA is synthesized in what appears to be the "wrong" direction. This synthesis is accomplished by

- (A) ligating (connecting short Okazaki fragments that are synthesized in short spurts in the "right" direction.
(B) primase.
(C) using multiple primers and DNA polymerase I.
(D) Both (A) and (B)

141. RNA primers are necessary in DNA synthesis because

- (A) DNA polymerase can only add to an existing strand of nucleotides.
(B) DNA polymerase can only add to an existing DNA strand.
(C) DNA primase is the first enzyme in the replication complex.
(D) All of the above

142. Proof reading and repair occur

- (A) at anytime during or after synthesis of DNA.
(B) only before DNA methylation occurs.
(C) only in the presence of DNA polymerase.
(D) only in the presence of an excision repair mechanism.

Space for Rough Work

143. DNA replication is an _____ process and _____ energy.
- (A) exergonic; does not require
 - (B) endothermic; does require
 - (C) endergonic; does require
 - (D) entothermic; does not require
144. Which of the following statements about DNA replication is false?
- (A) Okazaki fragments are the initiators of continuous DNA synthesis along the leading strand.
 - (B) Replication forks represent areas of active DNA synthesis on the chromosomes.
 - (C) Error rates for DNA replication are often less than one in every billion base pairings.
 - (D) Ligases and polymerases function in the vicinity of replication forks.
145. The key finding of the Hershey and Chase experiments on the mechanism of viral replication was that
- (A) protein, not DNA, is the hereditary material.
 - (B) DNA, not protein, is the hereditary material.
 - (C) protein and DNA play an equal role in determining inheritance.
 - (D) neither protein nor DNA play a role in determining inheritance.
146. When a molecule of DNA replicates without error, each of the resulting molecules contains
- (A) the same amount of A as T.
 - (B) the same amount of G as C.
 - (C) one new strand and one old strand.
 - (D) All of the above
147. Which of the following statements about the process of DNA replication is false?
- (A) Many different enzymes are needed for the process to function properly.
 - (B) Mistakes can be corrected at multiple steps in the process.
 - (C) Uncorrected mistakes introduce mutations into the DNA base sequence.
 - (D) Mistakes in the copying process are very common occurrences.
148. Assume that you chemically label both strands within a molecule of DNA. You then allow this DNA to replicate using unlabelled nucleotides. Which of the following statements about the two resulting DNA molecules is false?
- (A) Both will have the chemical label.
 - (B) One will have the chemical label, the other will not.
 - (C) One strand within each molecule will have the chemical label.
 - (D) Assuming no replication errors, both molecules will be genetically identical.
149. In order for the information contained in a gene to be used to produce a functioning protein, the
- (A) DNA must be replicated
 - (B) information must be transcribed into mRNA and then translated into amino acids.
 - (C) tRNA must be transcribed into rRNA and then translated into amino acids.
 - (D) ribosome must be converted from rRNA into mRNA.
150. The process of gene transcription begins with the
- (A) binding of RNA polymerase to a region of DNA called the promoter.
 - (B) removal of introns from the newly formed mRNA.
 - (C) joining of rRNA with various ribosomal proteins.
 - (D) attachment of an mRNA molecule to the ribosome.

Space for Rough Work

151. Genes can be inactivated by
(A) inaccurate removal of introns.
(B) transposable genetic elements.
(C) movement of genes to heterochromatic regions of the chromosome
(D) All of the above.
152. The genes that malfunction in cancer normally
(A) control RNA transcription.
(B) are responsible for organizing DNA packing.
(C) code for enzymes that repair damaged DNA.
(D) regulate cell division.
153. Which of the following mechanisms of gene regulation operates after mRNA transcription but before translation of mRNA into protein?
(A) mRNA splicing
(B) DNA packing
(C) Repressors and activators
(D) Protein degradation
154. Homeobox polypeptide segments
(A) serve as histones, facilitating DNA packing.
(B) bind to DNA and activate or repress gene transcription.
(C) are vastly different in different organisms.
(D) act as enzymes, carrying out important chemical reactions.
155. In humans, the hormone testosterone enters cells and binds to specific proteins, which in turn bind to specific sites on the cells' DNA. These proteins probably act to
(A) help RNA polymerase transcribe certain genes.
(B) alter and pattern of DNA splicing.
(C) stimulate protein synthesis.
(D) unwind the DNA so that its genes can be transcribed.
156. During transcription, the DNA site at which RNA polymerase binds is called
(A) enhancer (B) promoter
(C) regulator (D) receptor
157. During translation initiation in prokaryotes, a GTP molecule is needed in
(A) association of 50 S subunit of ribosome with initiation complex
(B) formation of formyl-met-tRNA
(C) binding of 30 S subunit of ribosome with mRNA
(D) association of 30 S-mRNA with formyl-met-tRNA
158. Which one of the following triplet codes, is correctly matched with its specificity for an amino acid in protein synthesis or as 'start' or 'stop' codon?
(A) UAC – Tyrosin (B) UCG – Start
(C) UUU – Stop (D) UGU – Leucine
159. What would happen if in a gene encoding a polypeptide of 50 amino acids, 25th codon (UAU) is mutated to UAA?
(A) A polypeptide of 25 amino acids will be formed
(B) A polypeptide of 24 amino acids will be formed
(C) Two polypeptides of 24 and 25 amino acids will be formed
(D) A polypeptide of 49 amino acids will be formed
160. In the genetic code dictionary, how many codons are used to code for all the 20 essential amino acids?
(A) 60 (B) 20
(C) 64 (D) 61
161. Protein synthesis occurs
(A) on ribosomes present in cytosol as well as in mitochondria
(B) only on ribosomes attached to the nuclear envelope and endoplasmic reticulum
(C) only on the ribosomes present in cytosol
(D) on ribosomes present in the nucleolus as well as cytoplasm.

Space for Rough Work

162. Which step of translation does not consume a high energy phosphate bond?
- (A) Translocation
(B) Amino acid activation
(C) Peptidyl-transferase reaction
(D) Aminoacyl tRNA binding to active ribosomal site
163. During replication of a bacterial chromosome DNA synthesis starts from a replication origin site.
- (A) RNA primers are involved
(B) is facilitated by telomerase
(C) moves in one direction of the site
(D) moves in bi-directional way
164. In transgenics, expression of transgene in target tissue is determined by
- (A) enhancer (B) transgene
(C) promoter (D) reporter
165. E.coli cells with a mutated z gene of the lac operon cannot grow in medium containing only lactose as the source of energy because :
- (A) the lac operon is constitutively active in these cells
(B) they cannot synthesize functional beta-galactosidase
(C) in the presence of glucose, E.coli cells do not utilize lactose
(D) they cannot transport lactose from the medium into the cell
166. During transcription holoenzyme RNA polymerase binds to a DNA sequence and the DNA assumes a saddle like structure at that point. What is that sequence called?
- (A) AAAT box (B) TATA box
(C) GGTT box (D) CAAT box
167. Which one of the following makes use of RNA as a template to synthesize DNA?
- (A) DNA polymerase
(B) RNA polymerase
(C) Reverse transcriptase
(D) DNA dependant RNA polymerase
168. Telomerase is an enzyme which is a
- (A) simple protein (B) RNA
(C) ribonucleoprotein (D) repetitive DNA
169. One gene-one enzyme hypothesis was postulated by
- (A) Hershey and Chase
(B) A. Garrod
(C) Beadle and Tatum
(D) R. Franklin
170. The okazaki fragments in DNA chain growth
- (A) polymerize in the 3' - to -5' direction and forms replication fork
(B) prove semi-conservative nature of DNA replication
(C) polymerize in the 5' - to -3' direction and explain 3' -to -5' DNA replication
(D) result in transcription.
171. The length of DNA molecule greatly exceeds the dimensions of the nucleus in eukaryotic cells. How is this DNA accommodated?
- (A) super-coiling in nucleosomes
(B) DNase digestion
(C) through elimination of repetitive DNA
(D) deletion of non-essential genes

Space for Rough Work

172. A sequential expression of a set of human genes
(A) messenger RNA
(B) DNA sequence
(C) ribosome
(D) transfer RNA
173. One gene-one enzyme relationship was established for the first time in
(A) *Salmonella typhimurium*
(B) *Escherichia coli*
(C) *Diplococcus pneumoniae*
(D) *Neurospora crassa*
174. Molecular basis of organ differentiation depends on the modulation in transcription by
(A) ribosome (B) transcription factor
(C) anticodon (D) RNA polymerase
175. In the DNA molecule
(A) the total amount of purine nucleotides and pyrimidine nucleotides is not always equal
(B) there are two strands which run parallel in the 5' @ 3' direction
(C) the proportion of adenine in relation to thymine varies with the organism
(D) there are two strands which run anti-parallel in 5' @ 3' direction
176. Which one of the following pairs of codons is correctly matched with their function or the signal for the particular amino acid?
(A) GUU, GCU – Alanine
(B) UAG, UGA – Stop
(C) AUG, ACG – start/Methionine
(D) UUA, UCA – Leucine
177. Which one of the following pairs of nitrogenous bases of nucleic acids, is wrongly matched with the category mentioned against it?
(A) Thymine, Uracil – Pyrimidines
(B) Uracil, Cytosine – Pyrimidines
(C) Guanine, Adenine – Purines
(D) Adenine, Thymine – Purines
178. Haploids are more suitable for mutation studies than the diploids. This is because
(A) haploids are reproductively more stable than diploids
(B) mutagens penetrate in haploids more effectively than diploids
(C) haploids are more abundant in nature than diploids
(D) all mutations, whether dominant or recessive are expressed in haploids.
179. T.O. Diener discovered a :
(A) free infectious DNA
(B) infectious protein
(C) bacteriophage
(D) free infectious RNA
180. What is not true for genetic code?
(A) It is nearly universal
(B) It is degenerate
(C) It is unambiguous
(D) A codon in mRNA is read in a non contiguous fashion.

□ □ □

Space for Rough Work