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Name.: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Date : 06/09/2015

Test No.: 0 4

Subject Code.: 2 2 2

Time : 3 Hrs.

M.M. : 720

HORIZON TEST SERIES

for

Medical
Entrance Exam.
2016

[Test No. 4]

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. 4

Topics of The Test

Physics	Unit, Dimension, Errors, Motion in 1D

Chemistry	Atomic Structure & Classification of Elements.

| Biology	Zoology : Animal Nutrition + Respiration Botany : Molecular basis of inheritance.

Test No. 4

[PHYSICS]

1. The SI Unit of thermal conductivity is
   (A) $Jsm^{-1}K^{-1}$
   (B) $W^{-1}m^{-1}K^{-1}$
   (C) $Wm^{-1}K^{-1}$
   (D) $Wm^{-2}K^{-1}$

2. The magnitude of any physical quantity
   (A) depends on the method of measurement
   (B) does not depend on the method of measurement
   (C) is more in SI system than in CGS system
   (D) directly proportional to fundamental unit of mass, length and time

3. The volume of a cube in m^3 is equal to the surface area of the cube in m^2. The volume of the cube is
   (A) $64\,m^3$
   (B) $216\,m^3$
   (C) $512\,m^3$
   (D) $195\,m^3$

4. If the magnetic flux is represented in weber, then the unit of magnetic induction will be
   (A) $\dfrac{Wb}{m^2}$
   (B) $Wb \times m$
   (C) $Wb \times m^2$
   (D) $\dfrac{Wb}{m}$

5. What are the units of $k = 1/4\pi\varepsilon_0$?
   (A) $C^2N^{-1}m^{-2}$
   (B) Nm^2C^{-2}
   (C) Nm^2C^2
   (D) Unitless

6. From the dimensional consideration which of the following equations is correct ?
   (A) $T = 2\pi\sqrt{\dfrac{R^3}{GM}}$
   (B) $T = 2\pi\sqrt{\dfrac{GM}{R^3}}$
   (C) $T = 2\pi\sqrt{\dfrac{GM}{R^2}}$
   (D) $T = 2\pi\sqrt{\dfrac{R^2}{GM}}$

7. A uniform wire of length L, diameter D and density ρ is stretched under a tension T. The correct relation between its fundamental frequency f, the length L and the diameter D is
   (A) $f \propto \dfrac{1}{LD}$
   (B) $f \propto \dfrac{1}{L\sqrt{D}}$
   (C) $f \propto \dfrac{1}{D^2}$
   (D) $f \propto \dfrac{1}{LD^2}$

8. The relation $p = \dfrac{\alpha}{\beta} e^{\frac{-\alpha z}{k\theta}}$, where p is pressure, Z is distance, k is Boltzmann constant and θ is temperature. The dimensional formula of β will be
   (A) $[M^0L^2T^0]$
   (B) $[ML^2T]$
   (C) $[ML^0T^{-1}]$
   (D) $[M^0L^2T^{-1}]$

9. The dimensional formula of $\dfrac{1}{\mu_0\varepsilon_0}$ is
   (A) $[M^0LT^{-2}]$
   (B) $[M^0L^{-2}T^{-2}]$
   (C) $[M^0LT^{-1}]$
   (D) $[M^0L^2T^{-2}]$

10. If E, M, L and G denote energy, mass, angular momentum and gravitational constant respectively, then the quantity (E^2L^2 / M^5G^2) has the dimensions of
    (A) angle
    (B) length
    (C) mass
    (D) none of these

11. The speed of light c, gravitational constant G and Planck's constant h are taken as fundamental units in a system. The dimensions of time in this new system should be
    (A) $[G^{1/2}h^{1/2}c^{-5/2}]$
    (B) $[G^{-1/2}h^{1/2}c^{1/2}]$
    (C) $[G^{1/2}h^{1/2}c^{-3/2}]$
   (D) $[G^{1/2}h^{1/2}c^{1/2}]$

Space for Rough Work

12. A gas bubble formed from an explosion under water oscillates with a period T proportional to $p^a d^b E^c$, where p is pressure, d is the density of water and E is the total energy of explosion. The value of a, b, c are

(A) $a = 1, b = 1, c = 2$

(B) $a = 1, b = 2, c = 1$

(C) $a = \dfrac{5}{6}, b = \dfrac{1}{2}, c = \dfrac{1}{3}$

(D) $a = -\dfrac{5}{6}, b = \dfrac{1}{2}, c = \dfrac{1}{3}$

13. If σ =surface charge density, ε = electric permittivity the dimensions of $\dfrac{\sigma}{\varepsilon}$ are same as

(A) electric force　　(B) electric field intensity

(C) pressure　　(D) electric charge

14. If a, b, c and d are mass, length, time and current respectively, then $b^2 a / c^3 d$ has the dimensions of

(A) capacitance　　(B) electric field

(C) permittivity　　(D) electric potential

15. If R, C and L denote resistance, capacitance and inductance. Which of the following will not have the dimensions of frequency ?

(A) $[RL^{-1}]$　　(B) $[R^{-1}C^{-1}]$

(C) $[L^{-1/2}C^{-1/2}]$　　(D) $[RCL]$

16. A capillary tube is attached horizontally to a constant heat arrangement. If the radius of the capillary tube is increased by 10%, then the rate of flow of liquid will change nearly by

(A) +10%　　(B) +46%

(C) −10%　　(D) −40%

17. Percentage error in the measurement of mass and speed are 2% and 3% respectively. The error in the estimation of kinetic energy obtained by measuring mass and speed will be

(A) 12%　　(B) 10%

(C) 2%　　(D) 8%

18. **Assertion** The error in the measurement of radius of the sphere is 0.3%. The permissible error in its surface area is 0.6%.

Reason The permissible error is calculated by the formula $\dfrac{\Delta A}{A} = \dfrac{4\Delta r}{r}$.

(A) Both assertion and reason are true and reason is the correct explanation of assertion

(B) Both assertion and reason are true but reason is not the correct explanation of assertion

(C) Assertion is true but reason is false

(D) Both assertion and reason are false

19. The radius of sphere is measured to be (2.1 ± 0.5) cm. Calculate its surface area with error limits

(A) (55.4 ± 26.4) cm^2

(B) (55.4 ± 0.02) cm^2

(C) (55.4 ± 2.64) cm^2

(D) (55.4 ± 0.26) cm^2

20. If the length of rod A is 3.25 ± 0.01 cm and that of B is 4.19 ± 0.01 cm, then the rod B is longer than rod A by

(A) 0.94 ± 0.00 cm　　(B) 0.94 ± 0.01 cm

(C) 0.94 ± 0.02 cm　　(D) 0.94 ± 0.005 cm

21. Position-time graph for motion with zero acceleration is
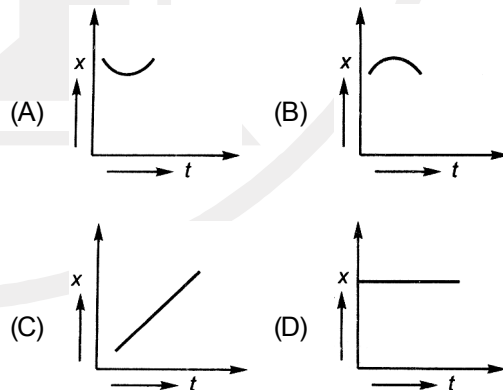
Space for Rough Work

22. The speed-time graph of a particle moving along a solid curve is shown below. The distance traversed by the particle from $t = 0s$ to $t = 3s$ is
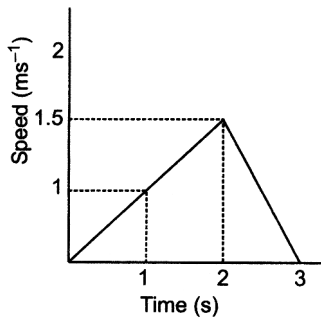
(A) $\dfrac{10}{2}s$ (B) $\dfrac{10}{4}s$

(C) $\dfrac{10}{3}s$ (D) $\dfrac{10}{5}s$

23. A boat is sent across a river with a velocity of 8 km/h. If the resultant velocity of boat is 10 km/h, then velocity of the river is
    (A) 10 km/h   (B) 8 km/h
    (C) 6 km/h   (D) 4 km/h

24. Select the incorrect statements from the following.
    S1   Average velocity is path length divided by the time interval.
    S2   In general, speed is greater than the magnitude of the velocity.
    S3   A particle moving in a given direction with a non-zero velocity can have zero speed.
    S4   The magnitude of average velocity is the average speed.
    (A) S2 and S3   (B) S1 and S4
    (C) S1, S3 and S4   (D) All four statements

25. A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is
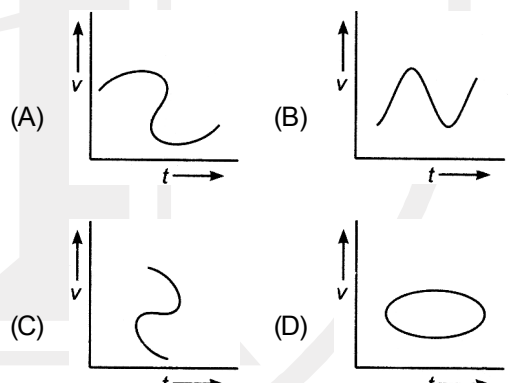
(A) $\dfrac{2v_d v_u}{v_d + v_u}$ (B) $\sqrt{v_u v_d}$

(C) $\dfrac{v_d v_u}{v_d + v_u}$ (D) $\dfrac{v_u + v_d}{2}$

26. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to

(A) $\dfrac{2a}{3b}$ (B) $\dfrac{1}{b}$

(C) $\dfrac{a}{3b}$ (D) c

27. A stone falls freely from rest and the total distance covered by it in the last second of its motion equals the distance covered by it in the first three seconds of its motion. The stone remains in the air for
    (A) 6 s   (B) 5 s
    (C) 7 s   (D) 4 s

28. A conveyor belt is moving horizontally at a speed of 4 ms^{-1}. A box of mass 20 kg is gently laid on it. It takes 0.1 s for the box to come to rest. If the belt continues to move uniformly, then the distance moved by the box on the conveyor belt is
    (A) zero   (B) 0.2 m
    (C) 0.4 m   (D) 0.8 m

29. A ball is projected horizontally with a velocity of 4 ms^{-1} from the top of a tower. The velocity of the ball after 0.7s is (Take g = 10 ms^{-2})
    (A) 1 ms^{-1} (B) 10 ms^{-1}
    (C) 8 ms^{-1} (D) 3 ms^{-1}

30. A particle moving with a uniform acceleration travels 24 m and 64 m in the first two consecutive interval of 4 s each. Its initial velocity will be
    (A) 5 ms^{-1} (B) 3 ms^{-1}
    (C) 1 ms^{-1} (D) 4 ms^{-1}

31. Two spheres of same size, one of mass 2 kg and another of mass 4 kg, are dropped simultaneously from the top of Qutab Minar (height = 72 m). When they are 1 m above the ground, the two spheres have the same
    (A) momentum   (B) kinetic energy
   (C) potential energy   (D) acceleration

Space for Rough Work

32. The velocity of a particle at an instant is 10 ms^{-1}. After 3 s its velocity will become 16 ms^{-1}. The velocity at 2s, before the given instant would have been

    (A) 6 ms^{-1}　　　　　(B) 4 ms^{-1}

    (C) 2 ms^{-1}　　　　　(D) 1 ms^{-1}

33. A body is projected vertically upwards with a velocity u. It crosses a point in its journey at a height h twice, just after 1 and 7 s. The value of u in ms^{-1} is

    (Take g = 10 ms^{-2})

    (A) 50　　　　　　　(B) 40

    (C) 30　　　　　　　(D) 20

34. A ball is thrown from height h and another from 2h. The ratio of time taken by the two balls to reach ground is

    (A) $1:\sqrt{2}$　　　　　(B) $\sqrt{2}:1$

    (C) $2:1$　　　　　　(D) $1:2$

35. If relation between distance and time is $s = a + bt + ct^2$, find initial velocity and acceleration

    (A) $b + 2ct, 2c$　　　(B) $b, 2c$

    (C) $2c, b$　　　　　(D) $b + 2c, 2c$

36. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$, where a, b, α and β are positive constants. The velocity of the particle will

    (A) go on decreasing with time

    (B) be independent of α and β

    (C) drop to zero when $\alpha = \beta$

    (D) go on increasing with time

37. A car starts from rest, moves with an acceleration a and then decelerates at a constant rate b for sometime to come to rest. If the total time taken is t. The maximum velocity of car is given by

    (A) $\dfrac{abt}{(a+b)}$　　　　(B) $\dfrac{a^2 t}{a+b}$

    (C) $\dfrac{at}{(a+b)}$　　　　(D) $\dfrac{b^2 t}{a+b}$

38. An automobile travelling at 50 kmh^{-1}, can be stopped at a distance of 40 m by applying brakes. If the same automobile is travelling at 90 kmh^{-1}, all other conditions remaining same and assuming no skidding, the minimum stopping distance in metre is

    (A) 72　　　　　　　(B) 92.5
    (C) 102.6　　　　　(D) 129.6

39. A packet is dropped from a balloon which is going upwards with the velocity 12 ms^{-1}, the velocity of the packet after 2 s will be
    (A) -12 ms^{-1}　　　(B) 12 ms^{-1}
    (C) -7.6 ms^{-1}　　(D) 7.6 ms^{-1}

40. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

    (A) $ut - \dfrac{1}{2}gt^2$　　　(B) $(u + gt)t$

    (C) ut　　　　　　(D) $\dfrac{1}{2}gt^2$

41. Which of the following velocity-time graphs shows a realistic situation for a body in motion ?

42. Velocity-time curve for a body, projected vertically upwards, is
    (A) parabola　　　　(B) ellipse
    (C) hyperbola　　　(D) straight line

Space for Rough Work

43. Acceleration-time graph of a body is shown. The corresponding velocity-time graph of the same body is

(A)

(B)

(C)

(D)
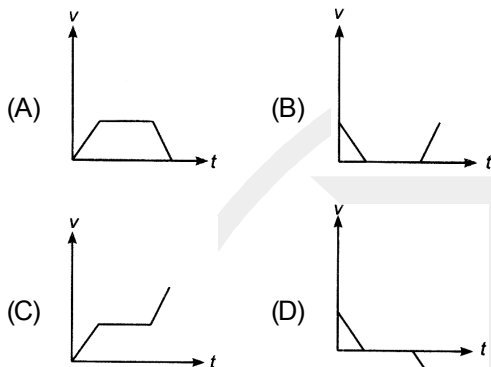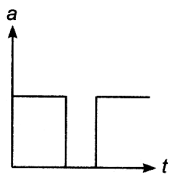
44. If the figure below represents a parabola, identify the physical quantities representing Y and X for constant acceleration
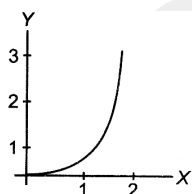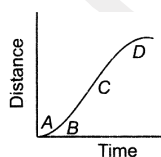

(A)   X = time, Y = velocity
(B)   X = velocity, Y = time
(C)   X = time, Y = displacement
(D)   X = time, Y = acceleration

45. A particle shows distance-time curve as given in this figure. The maximum instantaneous velocity of the particle is around the point

(A)   B   (B)   C
(C)   D   (D)   A

[CHEMISTRY]

46. An element 'X' belongs to fourth period and fifteenth group of the periodic table. Which one of the following is true regarding the outer electronic configuration of 'X' ?
   (A) It has partially filled *d*-orbitals and completely filled *s*-orbitals.
   (B) It has completely filled *s*-orbitals and completely filled *p*-orbitals.
   (C) It has completely filled *s*-orbitals and half-filled *p*-orbitals.
   (D) It has half-filled *d*-orbitals and completely filled *s*-orbitals.

47. Anything that influences the valence electrons will affect the chemistry of the element. Which one of the following factors does not affect the valence shell ?
   (A) Valence principal quantum number (n)
   (B) Nuclear charge (Z)
   (C) Nuclear mass
   (D) Number of core electrons

48. Match the atomic numbers given in column I with the block in which the element is placed in column II and mark the appropriate choice.

	Column I (Atomic number)		Column II (Block)
(A)	62	(i)	d-block
(B)	47	(ii)	p-block
(C)	56	(iii)	f-block
(D)	53	(iv)	s-block

(A)   (A) → (iii), (B) → (i), (C) → (iv), (D) → (ii)
(B)   (A) → (i), (B) → (ii), (C) → (iii), (D) → (iv)
(C)   (A) → (ii), (B) → (iv), (C) → (i), (D) → (iii)
(D)   (A) → (iv), (B) → (i), (C) → (ii), (D) → (iii)

49. Which of the following have the same number of electrons in outermost shell ?
   (A) Elements with atomic numbers 30, 48, 80
   (B) Elements with atomic numbers 14, 15, 16
   (C) Elements with atomic numbers 20, 30, 50
   (D) Elements with atomic numbers 10, 18, 26

Space for Rough Work

50. Match the column I with column II and mark the appropriate choice.

	Column I (Atomic number)		Column II (Period, Group)
(A)	14	(i)	3, 14
(B)	53	(ii)	5, 2
(C)	38	(iii)	6, 10
(D)	78	(iv)	5, 17

(A) (A) $\to$ (ii), (B) $\to$ (iv), (C) $\to$ (iii), (D) $\to$ (i)

(B) (A) $\to$ (i), (B) $\to$ (iv), (C) $\to$ (ii), (D) $\to$ (iii)

(C) (A) $\to$ (iii), (B) $\to$ (ii), (C) $\to$ (i), (D) $\to$ (iv)

(D) (A) $\to$ (ii), (B) $\to$ (i), (C) $\to$ (iii), (D) $\to$ (iv)

51. There are two rows of inner transition elements in the periodic table each containing 14 elements. The reason for this may be

(A) *f*-orbital has seven values for magnetic quantum number, hence total electrons are 14

(B) in the periodic table there is space to accommodate 14 electrons only

(C) only 28 inner transition elements have been discovered till date

(D) 28 is the maximum number of elements that any block can accommodate.

52. Which of the following is not correct statement for periodic classification of elements ?

(A) The properties of elements are the periodic functions of their atomic number.

(B) Non-metallic elements are less in number than metallic elements.

(C) The first ionisation energies of elements along a period do not vary in regular manner with increase in atomic number.

(D) For transition elements, the last electron enters into (n –2) d-subshell.

53. Which of the following transitions will involve maximum amount of energy ?

(A) $M \to M^+ + e^-$　　(B) $M^- \to M^+ + 2e^-$

(C) $M^{2+} \to M^{3+} + e^-$　(D) $M^+ \to M^{2+} + e^-$

54. Indicate the wrong statement on the basis of the periodic table.

(A) The most electronegative element in the periodic table is fluorine.

(B) Scandium is the first transition element and belongs to fourth period.

(C) There are three transition series in the periodic table each containing 10 elements.

(D) Along a period halogens have maximum negative electron gain enthalpy.

55. The first ionisation enthalpy of the elements are in the order of

(A) C<N<Si<P　　　　(B) N<Si<C<P

(C) Si<P<C<N　　　　(D) P<Si<N<C

56. Which is correct increasing order of their tendency of the given elements to form M^{3-} ion ?

(A) Bi>Sb>As>P>N　(B) Bi<Sb<As<P<N

(C) N<P<Sb<Bi<As　(D) Bi>Sb $\sim$ N $\sim$ P>As

57. Which of the following elements will have highest second ionisation enthalpy ?

(A) $1s^2 2s^2 2p^6 3s^2$

(B) $1s^2 2s^2 2p^6 3s^1$

(C) $1s^2 2s^2 2p^6 3s^2 3p^2$

(D) $1s^2 2s^2 2p^6 3s^2 3p^3$

58. Which of the following arrangements represents the correct order of electron gain enthalpy ?

(A) O<S<F<Cl　　　　(B) Cl<F<S<O

(C) S<O<Cl<F　　　　(D) F<Cl<O<S

59. As we move from left to right, the electronegativity increases. An atom which is highly electronegative has

(A) large size

(B) low electron affinity

(C) high ionisation enthalpy

(D) low chemical reactivity

Space for Rough Work

60. What is the decreasing order of basicity of hydroxides of the alkaline earth metals ?

    (A) $Be(OH)_2 > Mg(OH)_2 > Sr(OH)_2 > Ba(OH)_2$

    (B) $Mg(OH)_2 > Be(OH)_2 > Ba(OH)_2 > Sr(OH)_2$

    (C) $Ba(OH)_2 > Sr(OH)_2 > Mg(OH)_2 > Be(OH)_2$

    (D) $Sr(OH)_2 > Be(OH)_2 > Mg(OH)_2 > Ba(OH)_2$

61. Which of the following statements is not correct about the electron gain enthalpy ?

    (A) In general, the electron gain enthalpy becomes less negative in going from top to bottom in a group.

    (B) The electron gain enthalpy becomes less negative in a period from left to right.

    (C) The elements having stable configuration like noble gases have large positive electron gain enthalpies.

    (D) Electron gain enthalpy of O or F is less than that of succeeding element.

62. A sudden large jump between the values of second and third ionization energies of an element would be associated with which of the following electronic configuration ?

    (A) $1s^2, 2s^2 2p^6, 3s^1 3p^2$

    (B) $1s^2, 2s^2 2p^6, 3s^2 3p^1$

    (C) $1s^2, 2s^2 2p^6, 3s^1$

    (D) $1s^2, 2s^2 2p^6, 3s^2$

63. Few elements are matched with their successive ionisation energies. Identify the elements.

Element	IE_1 (kJ/mol)	IE_2 (kJ/mol)
X	2372	5251
Y	520	7297
Z	900	1758

	X	Y	Z
(A)	A noble gas	Alkali metal	Alkaline earth metal
(B)	Alkali metal	A noble gas	Alkaline earth metal
(C)	Alkaline earth metal	Alkali metal	A noble gas
(D)	Alkali metal	Alkaline earth metal	A noble gas

64. Which of the following statements regarding the variation of atomic radii in the periodic table is not true?

    (A) In a group, there is continuous increase in size with increase in atomic number.

    (B) In $4f$-series, there is a continuous decrease in size with increase in atomic number.

    (C) The size of inert gases is larger than halogens.

    (D) In 3rd period, the size of atoms increases with increase in atomic number.

65. The correct order of acidic character of oxides in third period of periodic table is

    (A) $SiO_2 < P_4O_{10} < SO_3 < Cl_2O_7$

    (B) $Cl_2O_7 < SO_3 < P_4O_{10} < SiO_2$

    (C) $SO_3 < Cl_2O_7 < P_4O_{10} < SiO_2$

    (D) $SiO_2 < Cl_2O_7 < P_4O_{10} < SO_3$

66. Which of the following elements will have highest ionisation energy ?

    (A) $1s^2 2s^2 2p^6 3s^1$ (B) $1s^2 2s^2 2p^6 3s^2 3p^3$

    (C) $1s^2 2s^2 2p^6 3s^2 3p^4$ (D) $1s^2 2s^2 2p^6 3s^2 3p^1$

67. In which of the following, the order is not in accordance with the property mentioned.

    (A) $Li < Na < K < Rb$ - Atomic radius

    (B) $F > N > O > C$ - Ionisation enthalpy

    (C) $Si < P < S < Cl$ - Electronegativity

    (D) $F < Cl < Br < I$ - Electronegativity

Space for Rough Work

68. Which of the following is arranged in order of increasing metallic character ?

   (A) P<Si<Na<Be<Mg
   (B) Be<Mg<P<Na<Si
   (C) Si<Be>Mg<Na<P
   (D) P<Si<Be<Mg<Na

69. The main reason for showing anomalous properties of the first member of a group in *s* or *p*-block is

   (A) maximum chemical reactivity
   (B) maximum electronegativity and different configurations
   (C) small size, large charge/radius ratio
   (D) tendency to form multiple bonds.

70. The first ionization enthalpies of Na, Mg, Al and Si are in the order

   (A) Na<Mg>Al<Si   (B) Na>Mg>Al>Si
   (C) Na<Mg<Al<Si   (D) Na>Mg>Al<Si

71. The electronic configuration of gadolinium (atomic number 64) is

   (A) $[Xe]4f^3 5d^5 6s^2$ (B) $[Xe]4f^7 5d^2 6s^1$

   (C) $[Xe]4f^7 5d^1 6s^2$ (D) $[Xe]4f^8 5d^6 6s^2$

72. The formation of the oxide ion, $O^{2-}_{(g)}$, from oxygen atom requires first an exothermic and then an endothermic step as shown below:

$$O_{(g)} + e^- \rightarrow O^-_{(g)}; \Delta H° = -141 \text{ kJ mol}^{-1}$$

$$O^-_{(g)} + e^- \rightarrow O^{2-}_{(g)}; \Delta H° = +780 \text{ kJ mol}^{-1}$$

   Thus, process of formation of O^{2-} in gas phase is unfavourable even though O^{2-} is isoelectronic with neon. It is due to the fact that,

   (A) oxygen is more electronegative
   (B) addition of electron in oxygen results in larger size of the ion
   (C) electron repulsion outweighs the stability gained by achieving noble gas configuration
   (D) O^- ion has comparatively smaller size than oxygen atom.

73. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Find the symbol of the atom.

   (A) $^{81}_{34}Se$ (B) $^{81}_{35}Br$

   (C) $^{81}_{36}Kr$ (D) $^{81}_{37}Rb$

74. Mark the incorrect statement regarding the photoelectric effect.

   (A) There is no time lag between the striking of light beam and the ejection of electrons from the metal surface.
   (B) The number of electrons ejected is inversely proportional to the intensity of light.
   (C) Photoelectric effect is not observed below threshold frequency.
   (D) The kinetic energy of the electrons increases with increase in frequency of light used.

75. The spectrum of white light ranging from red to violet is called a continuous spectrum because

   (A) different colours are seen as different bands in the spectrum
   (B) the colours continuously absorb energy to form a spectrum
   (C) the violet colour merges into blue, blue into green, green into yellow and so on
   (D) it is a continuous band of coloured and white light separating them.

76. A certain metal when irradiated by light ($\upsilon = 3.2 \times 10^{16}$Hz) emits photoelectrons with twice K.E. as did photoelectrons when the same metal is irradiated by light ($\upsilon = 2.0 \times 10^{16}$Hz). The υ_0 of the metal is

   (A) 1.2×10^{14}Hz   (B) 8×10^{15}Hz
   (C) 1.2×10^{16}Hz   (D) 4×10^{12}Hz

77. The energy difference between the ground state of an atom and its excited state is 3×10^{-19}J. What is the wavelength of the photon required for this transition ?

   (A) 6.6×10^{-34}m   (B) 3×10^{-8}m
   (C) 1.8×10^{-7}m   (D) 2×10^4m

Space for Rough Work

78. The angular momentum of an electron in a given stationary state can be expressed as $m_e v r = n \dfrac{h}{2\pi}$. Based on this expression an electron can move only in those orbits for which its angular momentum is

    (A) equal to n
    (B) integral multiple of $\dfrac{h}{2\pi}$

    (C) multiple of n
    (D) equal to $\dfrac{h}{2\pi}$ only

79. What is the colour corresponding to the wavelength of light emitted when the electron in a hydrogen atom undergoes transition from $n = 4$ to $n = 2$?
    (A) Blue
    (B) Red
    (C) Yellow
    (D) Green

80. If the radius of first Bohr orbit is x pm, then the radius of the third orbit would be

    (A) $(3 \times x)$ pm
    (B) $(6 \times x)$ pm

    (C) $\left(\dfrac{1}{2} \times x\right)$ pm
    (D) $(9 \times x)$ pm

81. The radius of hydrogen atom in ground state is 0.53 Å. What will be the radius of $_3LI^{2+}$ in the ground state ?
    (A) 1.06 Å
    (B) 0.265 Å
    (C) 0.17 Å
    (D) 0.53 Å

82. What does the negative electronic energy (negative sign for all values of energy) for hydrogen atom means?

    (A) The energy of an electron in the atom is lower than the energy of a free electron at rest which is taken as zero.

    (B) When the electron is free from the influence of nucleus it has a negative value which becomes more negative.

    (C) When the electron is attracted by the nucleus the energy is absorbed which means a negative value.

    (D) Energy is released by hydrogen atom in ground state.

83. The energy of the electron in a hydrogen atom has a negative sign for all possible orbits because

    (A) when the electron is attracted by the nucleus and is present in orbit n, the energy is emitted and its energy is lowered.

    (B) when the electron is attracted by the nucleus and is present in orbit n, the energy is absorbed and its energy is increased.

    (C) when the electron is repelled by the nucleus, the energy is released and its energy is lowered.

    (D) None of these.

84. An electron in excited hydrogen atom falls from fifth energy level to second energy level. In which of the following regions, the spectrum line will be observed and is part of which series of the atomic spectrum ?
    (A) Visible, Balmer
    (B) Ultraviolet, Lyman
    (C) Infrared, Paschen
    (D) Infrared, Brackett

85. What will be the uncertainty in velocity of a bullet with a mass of 10 g whose position is known with ± 0.01 mm?
    (A) 5.275×10^{-33} m s^{-1}
    (B) 5.275×10^{-25} m s^{-1}
    (C) 5.275×10^{-5} m s^{-1}
    (D) 5.275×10^{-28} m s^{-1}

86. Few statements are given regarding nodes in the orbitals. Mark the statement which is not correct.

    (A) In case of p_z-orbital, xy plane is a nodal plane.

    (B) ns-orbital has $(n+1)$ nodes.

    (C) The number of angular nodes is given by l.

    (D) The total number of nodes is given by $(n-1)$ *i.e.* sum of l angular nodes and $(n-l-1)$ radial nodes.

87. Effective nuclear charge ($Z_{eff}e$) for a nucleus of an atom is defined as

    (A) shielding of the outermost shell electrons from the nucleus by the innermost shell electrons

    (B) the net positive charge experienced by electron from the nucleus

    (C) the attractive force experienced by the nucleus from electron

   (D) screening of positive charge on nucleus by innermost shell electrons.

Space for Rough Work

88. Which of the following is not a correct statement regarding the energies of orbitals ?

    (A) The lower the value of $(n + l)$ for an orbital, lower is its energy.
    (B) Energies of the orbitals in the same subshell decreases with increase in atomic number.
    (C) Energy of s-orbital is lower than the p-orbital and that of p-orbital is lower than the d-orbital.
    (D) If two orbitals have same value for $(n + l)$, the orbital with higher value of n will have lower energy.

89. How many electrons in an atom have the following quantum numbers ?

    $$n = 4, m_s = -1/2$$

    (A) 32   (B) 18
    (C) 8   (D) 16

90. In how many elements the last electron will have the following set of quantum numbers, $n = 3$ and $l = 1$?

    (A) 2   (B) 8
    (C) 6   (D) 10

[ZOOLOGY]

91. The back flow of faecal matter in the large intestine is prevented by the presence of

    (A) epiglottis
    (B) sphincter of Oddi
    (C) ileo-caecal valve
    (D) gastric-oesophageal sphincter

92. Vitamin necessary for normal functioning of liver, clotting of blood and preventing haemorrhage is

    (A) tocopherol   (B) phylloquinone
    (C) cyanocobalamin (D) riboflavin

93. Proportion of which of the following should be increased in diet to improve strength and growth of bones ?

    (A) Vitamin-D, Ca^{2+} and vitamin-K
    (B) Vitamin-D, Ca^{2+} and iodine
    (C) Vitamin-D, Ca^{2+} and vitamin-A
    (D) Vitamin-A, Ca^{2+} and Zn^{2+}

94. Maltose gives rise to two molecules of

    (A) fructose   (B) lactose
    (C) glucose   (D) sucrose

95. Which one of the following statements is true regarding digestion and absorption of food in humans ?

    (A) Oxyntic cells in our stomach secrete the proenzyme pepsinogen
    (B) Fructose and amino acids are absorbed through intestinal mucosa with the help of carrier ions like Na^{2+}
    (C) Chylomicrons are small lipoprotein particles that are transported from intestine into blood capillaries
    (D) About 60% of starch is hydrolysed by salivary amylase in our mouth

96. Crypts of Leiberkuhn are involved in

    (A) secretion of succus entericus
    (B) secretion of rennin
    (C) secretion of ptyalin
    (D) digestion of food

97. The malnutrition disease in man is

    (A) Cri-du-chat syndrome
    (B) Klinefelter's syndrome
    (C) Potbelly syndrome
    (D) Edward's syndrome

98. Which one of the following pairs of the kinds of cells and their secretion are correctly matched ?

    (A) Oxyntic cells   -   A secretion with pH between 2.0 and 3.0
    (B) Alpha cells of islets of Langerhans   -   Secretion that decreases blood sugar level
    (C) Kupffer's cells   -   A digestive enzyme that hydrolyses nucleic acids
    (D) Sebaceous glands   -   A secretion that evaporates for cooling

Space for Rough Work

99. Which of the following is not a function of liver ?
   (A) Production of bile
   (B) Production of insulin
   (C) Glycogen storage
   (D) Detoxification

100. The function of ductus choledochus is to carry.
   (A) Gastric juice
   (B) Bile and pancreatic juice
   (C) Urine
   (D) Bile juice only

101. Sacculus rotundus is a dilated part at posterior end of
   (A) ileum   (B) oesophagus
   (C) ilium   (D) colon

102. Succus entericus is secreted by
   (A) Crypts of Leiberkuhn
   (B) Brunner's glands
   (C) Both (A) and (B)
   (D) None of these

103. Find out the correctly matched pair.
   (A) Pepsinogen - Zymogenic cells
   (B) HCl - Goblet cells
   (C) Mucus - Oxyntic cells
   (D) Pancreatic juice - Salivary glands

104. The factor which governs the absorption of digested food by intestinal villi is :
   (A) Peristalsis
   (B) Osmosis
   (C) Emulsification
   (D) Differential absorption

105. Vitamin-D is synthesized in skin by the action of sunlight on
   (A) cholesterol
   (B) 7-hydroxy cholesterol
   (C) cephalin cholesterol
   (D) All of the above

106. The following is a scheme showing the fate of carbohydrates during digestion in the human alimentary canal. Identify the enzymes acting at stages indicated as A, B, C and D. Choose the correct option from those given.
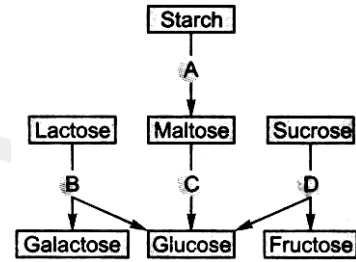
   (A) A - Amylase, B - Maltase, C - Lactase, D = Invertase
   (B) A - Amylase, B - Maltase, C - Invertase, D - Lactase
   (C) A - Amylase, B - Invertase, C - Maltase, D - Lactase
   (D) A - Amylase, B - Lactase, C - Maltase, D - Invertase

107. The juice containing sodium glycocholate is released under the influence of
   (A) secretin   (B) cholecystokinin
   (C) enterogasterone   (D) enterocrinin

108. Carnassial teeth are modified for
   (A) crushing   (B) tearing
   (C) grinding   (D) cutting

109. Submucosa is thickest in
   (A) Oesophagus
   (B) Rectum
   (C) Duodenum
   (D) Stomach

110. Secretin hormone in secreted form
   (A) stomach and stimulates gastric gland
   (B) duodenum and stimulates liver
   (C) thyroid and stimulates thyroid gland
   (D) duodenum and stimulates pancreas

Space for Rough Work

111. Which of the following vitamins is water soluble as well as an antioxidant ?
    (A) Vitamin-B$_1$ 　　(B) Vitamin-A
    (C) Vitamin-D 　　　 (D) Vitamin-C

112. Bile acids are
    (A) Carbohydrates 　(B) Steroids
    (C) Proteins 　　　　(D) Fats

113. Compound saccular glands are
    (A) intestinal glands 　(B) salivary glands
    (C) gastric glands 　　(D) endocrine glands

114. The opening of the Ampula of veter is guarded by sphincter ?
    (A) Pyloric 　　　　　(B) Ileo-caecal
    (C) Oddi 　　　　　　(D) Muscularis mucosa

115. Poison glands of snake are modified
    (A) sebaceous glands
    (B) ceruminous glands
    (C) salivary glands
    (D) endocrine glands

116. Least peristalsis occurs in
    (A) rectum 　　　　　(B) stomach
    (C) oesophagus 　　(D) duodenum

117. A person is suffering from long standing constipation. It is likely that ?
    (A) His intestinal bacteria will get killed by poisonous gases produced by accumulated faeces.
    (B) He will suffer from piles.
    (C) He will feel severe pain in the stomach due to accumulated faeces.
    (D) He will suffer from vitamin-B deficiency as its absorption is inhibited.

118. The largest variety of digestive enzymes is found in
    (A) carnivores 　　　(B) herbivores
    (C) omnivores 　　　(D) parasites

119. The layer of cells that secretes enamel of tooth is
    (A) dentoblast 　　　(B) ameloblast
    (C) osteoblast 　　　(D) odontoblast

120. Digestion and distribution of nutrients both functions are performed by
    (A) blastocoel 　　　(B) coelom
    (C) spongocoel 　　 (D) coelenteron

121. The term "External respiration" means :
    I.   pulmonary ventilation
    II. gas exchange between the air and blood
    III. Transport of gas by the blood
    IV. Cellular respiration
    (A) I, II, III, IV 　　　(B) I, II, III,
    (C) I, II, IV 　　　　 (D) I, III, IV

122. Phonation, or the production of sound, is the function of :
    (A) Pharynx 　　　　(B) Larynx
    (C) Trachea 　　　　(D) Lips and tongue

123. Which of the following is not a function of the nasal cavity in humans ?
    (A) Filtration of the air
    (B) Humidification of the air
    (C) Warming of the air
    (D) Removal of carbon dioxide from the air

124. Identify the structure that does not form a part of the human respiratory system.
    (A) the pharynx 　　(B) the bronchus
    (C) the larynx 　　　(D) the hyoid

125. The ability of the lungs to stretch or expand is called their ____.
    (A) resilience 　　　(B) compliance
    (C) capacitance 　　(D) elasticity

126. The type of cartilage, present in the tracheal rings, is the :
    (A) Hyaline 　　　　(B) Elastic
    (C) Fibrous 　　　　(D) Calcified

127. A respiratory unit does not include :
    (A) Terminal bronchiole
    (B) Respiratory bronchiole
    (C) Alveolar ducts
    (D) Alveoli

Space for Rough Work

128. The double layered membrane covering the lung surface is called as :
   (A) Pericardium   (B) Pleura
   (C) Mesentery   (D) Peritoneum

129. A negative intrapleural pressure :
   (A) is caused by accumulation of fluid in pleural cavity.
   (B) does not allow the lungs to expand.
   (C) helps in expiration.
   (D) keeps the lungs inflated.

130. Which of the following is the last structure through which the exhaled air passes ?
   (A) bronchiole   (B) larynx
   (C) pharynx   (D) trachea

131. Under normal resting conditions, almost the entire respiratory effort is due to the :
   (A) contraction and relaxation of diaphragm
   (B) movements of the rib cage
   (C) abdominal muscles
   (D) sternocleidomastoid muscle

132. The division of the respiratory tree from which the alveoli branching off are the :
   (A) tertiary bronchi
   (B) bronchioles
   (C) terminal bronchioles
   (D) respiratory bronchioles

133. Which of the following leads to expiration ?
   (A) Contraction of diaphragm
   (B) Elevation of the rib cage
   (C) Contraction of internal intercostal muscles
   (D) Contraction of external intercostal muscles

134. Consider the following:
   I. Contraction of the diaphragm
   II. Relaxation of the diaphragm
   III. Contraction of internal intercostals
   IV. Contraction of external intercostals

Inhalation would be brought about by :
   (A) I and III   (B) II and III
   (C) I and IV   (D) II and IV

135. In the bird respiratory system, which of the following structures is the actual gas exchange surface ?
   (A) Bronchus   (B) Alveolus
   (C) Bronchiole   (D) Parabronchi

[BOTANY]

136. The process of transfer of genetic information from DNA to RNA / formation of RNA from DNA is
   (A) Transversion   (B) Transcription
   (C) Translation   (D) Translocation

137. One gene one enzyme hypothesis was proposed by
   (A) Jacob and Manod
   (B) Beadle and Tatum
   (C) Watson and Crick
   (D) Garrod and Jenson

138. DNA polymerase helps in
   (A) Splitting of two DNA strands
   (B) Proof reading of DNA
   (C) Renaturation of DNA
   (D) Joining monomers of DNA

139. Polypeptide chain is initiated by
   (A) Glycine   (B) Leucine
   (C) Methionine   (D) Lysine

140. Genetic code determines
   (A) Sequence of amino acids in protein chain
   (B) Variations
   (C) Constancy of morphological traits
   (D) Structural pattern

Space for Rough Work

141. Khorana et al synthesised RNA with copolymer of UGUGUGUGUG.......It produced a peptide with alternate cysteine and valine. The codons for the two are
    (A) UGU and GUG
    (B) UUG and GGU
    (C) GUG and UGU
    (D) UGG and GUU

142. In the genetic dictionary, there are 64 codons as
    (A) 64 amino acids are to be coded
    (B) 64 types of tRNAs are present
    (C) There are 44 nonsense codons and 20 sense codons
    (D) Genetic code is triplet

143. Nucleotide arrangement in DNA can be seen by
    (A) X-ray crystallography
    (B) Electron microscope
    (C) Ultracentrifuge
    (D) Light microscope

144. Okazaki segment are formed during
    (A) Transduction　　　(B) Transcription
    (C) Replication　　　(D) Translation

145. Amino acid binding site of tRNA is
    (A) 5'end　　　　　(B) Anticodon loop
    (C) DHU loop　　　(D) -CCA 3' end.

146. In which of the following will DNA melt at the lowest temperature
    (A) 5'- AATAAAGC-3'
    　　3'- TTATTTCG -5'
    (B) 3'-AATGCTGC-5'
    　　3'-TTACCACG-5'
    (C) 5'-ATGCTGAT-3'
    　　3'-TACGACTA-5'
    (D) 5'-GCATAGCT-3'
    　　3'-CGTATCGA-5'

147. Which is true according to Chargaff,s rule?
    (A) A + G = T + C　(B) A = C
    (C) G = T　　　　　(D) A + T / C + G = 1

148. Successive nucleotides are covalently linked through
    (A) Glycosidic bonds
    (B) Phosphodiester bonds
    (C) Hydrogen bonds
    (D) Nitrogen bonds

149. *Pneumococcus* experiment proves that
    (A) DNA is a genetic material
    (B) Bacteria undergo binary fission
    (C) bacteria do not reproduce sexually
    (D) At times RNA controls production of DNA

150. During elongation of polypeptide chain, sigma factor is
    (A) Functionless
    (B) Retained for specific function
    (C) Released for re-use
    (D) Required during closing of chain

151. Three dimensional shape of tRNA is
    (A) L-shaped　　　(B) Clover leaf-like
    (C) X-shaped　　　(D) Y-shaped

152. Best method to determine paternity is
    (A) Protein analysis
    (B) Chromosome counting
    (C) Gene counting
    (D) DNA finger printing

153. First deciphering of genetic code through trinucleotide synthesis was performed by
    (A) Beadle and tatum
    (B) Watson and Crick
    (C) Nirenberg
    (D) Ochoa

Space for Rough Work

154. Regulator gene controls chemical synthesis (Operon concept) by
     (A) Inhibiting transcription of mRNA
     (B) Inhibiting enzymes
     (C) Inhibiting passage of mRNA
     (D) Inhibiting substrate enzyme reaction.

155. In operon concept, the operator gene combines with
     (A) Regulatory protein to switch off structural gene transcription
     (B) Regulatory protein to switch on structural gene transcription
     (C) Inducer to switches off structural gene transcription
     (D) Regulator gene to switch off structural gene transcription

156. In viruses, the nucleic acid is :
     (A) DNA　　　　　　(B) RNA
     (C) Both A or B　　(D) Either A or B

157. The one used in recombinant DNA technology.
     (A) Plasmid　　　　(B) Plastid
     (C) Ribosome　　　(D) Mutation

158. In Rous Sarcoma Virus information flow is:
     (A) $DNA \longrightarrow Protein \longrightarrow RNA$
     (B) $Protein \longrightarrow DNA \longrightarrow RNA$
     (C) $RNA \longrightarrow DNA \longrightarrow Protein$
     (D) $DNA \longrightarrow RNA \longrightarrow Protein$

159. The term gene was coined by
     (A) Mc Clinto　　　(B) Morgan
     (C) Johanesen　　　(D) De Duve

160. Operon model of gene regulation and organisation of prokaryotic was proposed by
     (A) Messelson and Stahl
     (B) Wilkins and Franklin
     (C) Beadle and Tatum
     (D) Jacob and Monod

161. Viroids differ from viruses in
     (A) Satellite RNA packaged with viral genome
     (B) Naked DNA molecules
     (C) Naked RNA molecules only
     (D) Naked DNA packaged with viral genome

162. In split genes, the coding sequences are called
     (A) Exons　　　　　(B) Introns
     (C) Cistrons　　　　(D) Operons

163. Operator gene of *lac*-operon is turned on when lactose molecules bind to
     (A) Promoter site　(B) mRNA
     (C) Operator gene　(D) Regulator protein

164. Genes regulate growth and differentiation through
     (A) Transformation
     (B) Translocation
     (C) translation and Transduction
     (D) Transcription and translation.

165. Two bacteria most useful in genetic engineering are :
     (A) Rhizobium and Azotobactor
     (B) Escherichia and Agrobacterium
     (C) Rhizobium and Diplococcus
     (D) Nitrosomonas and Klebsiella

166. Intron is part of DNA which
     (A) Codes for protein synthesis
     (B) Helps in joining pieces of DNA
     (C) Does not code for protein synthesis
     (D) Initiates transcription

167. In operon model, regulator gene function as :
     (A) Repressor　　　(B) Regulator
     (C) Inhibitor　　　　(D) All the above

168. Restriction endonuclease is used in
     (A) Tissue culture
     (B) genetic engineering
     (C) Cell fractionation
     (D) Regeneration

169. The names, Temin and Baltimore are associated with
     (A) Photorespiration
     (B) RNA synthesis
     (C) Reverse transcription
     (D) Translation

Space for Rough Work

170. In *Escherichia coli,* the product of i gene combines with
    (A) Operator gene to switch off structural genes
    (B) Inducer gene to switch off structural genes
    (C) Operator gene to switch on structural genes
    (D) Regulator gene to switch off structural genes

171. Operon contains
    (A) Operator and regulator genes
    (B) Operator and structural genes
    (C) Operator and regulator genes, and repressor
    (D) Operator gene, regulator gene, repressor, structural genes and promoter gene

172. Lactose operon of Escherichia coli is
    (A) Monocistronic   (B) Inducible
    (C) Repressible   (D) Both B and C

173. Tryptophan operon of Escherichia coli is
    (A) Monocistronic   (B) Inducible
    (C) Unregulated   (D) Repressible

174. House keeping genes
    (A) Produces Antibodies
    (B) Constantly operates for cellular activity
    (C) Form hormones
    (D) Function only at the time of reproduction

175. Genes are formed of
    (A) RNA
    (B) DNA
    (C) DNA and RNA
    (D) DNA and proteins

Directions (Q. Nos. 176 to 180) :

These questions consist two statement each printed as **Assertion and Reason.** While answering these question, you are required to choose any one of the following four options.

(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(B) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(C) Assertion is true but Reason is false.

(D) Both Assertion and Reason are false.

176. **Assertion :** A single strand of m-RNA is capable of forming a number of different polypeptide chains.

    Reason : Termination codons occur in m-RNA.

177. **Assertion :** Amber codon is a termination codon.

    Reason : If in m-RNA, a termination codon is present, the protein synthesis stops abruptly whether the protein synthesis is completed or not.

178. **Assertion :** Watson and Crick provided experimental proof of semiconservative nature of DNA relication.

    Reason : DNA polymerase binds nucleotides in replication.

179. **Assertion :** DNA code is not copied in the synthesis of transfer RNA.

    Reason : Transfer RNA move out of the nucleus and after attaching on the ribosomes, form the template.

180. **Assertion :** Polytene chromosomes have a high amount of DNA.

    Reason : Polytene chromosomes are formed by repeated replication of chromosomal DNA without separation of chromatids.

❏   ❏   ❏

Space for Rough Work