Test Series (2023)

Mock Test–06

NEET

DURATION : 200 Minutes | **12-04-2023** | **M. MARKS : 720**

Topics Covered

Physics :	Complete Syllabus (Class 11th and 12th)
Chemistry :	Complete Syllabus (Class 11th and 12th)
Biology :	**(Botany) :** Complete Syllabus (Class 11th and 12th)
	(Zoology) : Complete Syllabus (Class 11th and 12th)

General Instructions:

1. Immediately fill in the particulars on this page of the test booklet.
2. The test is of **3 hour 20 minute** duration.
3. The test booklet consists of **200** questions. The maximum marks are **720**.
4. There are four Section in the Question Paper, Section I, II, III & IV consisting of Section-I **(Physics)**, Section-II **(Chemistry)**, Section-III **(Botany)** & Section IV **(Zoology)** and having **50 Questions** in each part.
5. There is only one correct response for each questions.
6. Each correct answer will give 4 marks while 1 Mark will be deducted for a wrong MCQ response.
7. No student is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
8. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.

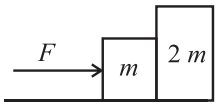
OMR Instructions:

1. Use blue/black dark ballpoint pens.
2. Darken the bubbles completely. Don't put a tick mark or a cross mark where it is specified that you fill the bubbles completely. Half-filled or over-filled bubbles will not be read by the software.
3. Never use pencils to mark your answers.
4. Never use whiteners to rectify filling errors as they may disrupt the scanning and evaluation process.
5. Writing on the OMR Sheet is permitted on the specified area only and even small marks other than the specified area may create problems during the evaluation.
6. Multiple markings will be treated as invalid responses.
7. **Do not fold or make any stray mark on the Answer Sheet (OMR).**

SECTION-I (PHYSICS)

SECTION - A

1. Two blocks of masses m and 2m are placed in contact on a smooth horizontal surface as shown in figure. A horizontal force F = 15 N is applied on block m. The force of interaction between the blocks is



(1) 10 N (2) 12 N
(3) 9 N (4) 6 N

2. A rubber ball is taken to a depth of 2 km inside water so that its volume reduces by 0.04%. The bulk modulus of rubber is nearly (in N m^{-2})
(1) 4×10^8 (2) 1.5×10^{10}
(3) 2×10^8 (4) 4.9×10^{10}

3. 50 g of ice at 0°C is mixed with 40 g of water at 60°C. Then ratio of water and ice at equilibrium is
(1) 5 : 2 (2) 2 : 7
(3) 3 : 2 (4) 7 : 2

4. Two point charges placed at a certain distance r in vacuum experiences a certain force. Then the distance at which they will experience the same force in a medium of dielectric constant k is
(1) $\sqrt{kr}$ (2) $\frac{r}{k}$
(3) kr (4) $\frac{r}{\sqrt{k}}$

5. A convex lens of focal length 12 cm is made of glass of refractive index $\frac{3}{2}$. What will be the focal length, when it is immersed in liquid of refractive index $\frac{5}{4}$?
(1) 30 cm
(2) 24 cm
(3) 16 cm
(4) 10 cm

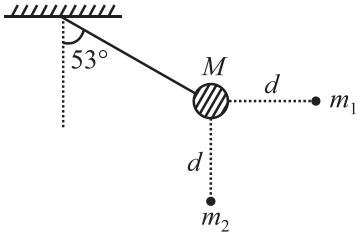
6. In Young's double slit experiment with sodium light, slits are 0.589 m apart. The angular separation of third maxima from the central maxima will be (given) λ = 589 nm)
(1) $\sin^{-1}(0.33 \times 10^{-6})$
(2) $\sin^{-1}(3 \times 10^{-6})$
(3) $\sin^{-1}(0.33 \times 10^{-8})$
(4) $\sin^{-1}(3 \times 10^{-4})$

7. Ratio of maximum to minimum intensity is 25 : 16. Calculate ratio of intensities:
(1) 5 : 4 (2) 4 : 5
(3) 9 : 1 (4) 81 : 1

8. Two waves, travelling in a medium, meet at a point to obtain sustained interference. Choose the best possible option.
(1) Intensity of two waves should be same
(2) Phase difference between two waves should be zero
(3) Amplitude of two waves should be same
(4) Frequency of two waves should be same

9. 20 gm ice at –10°C is mixed with m gm steam at 100°C. The minimum value of m so that finally all ice and steam converts into water is:
(Use, specific heat and latent heat as C_{ice} = 0.5 Cal/gm °C, C_{water} = 1 cal/gm °C, L_{melt} = 80 cal/gm and L_{vapor} = 540 cal/gm]
(1) $\frac{185}{27}$ gm (2) $\frac{185}{17}$ gm
(3) $\frac{85}{32}$ gm (4) $\frac{113}{17}$ gm

10. In the following figure, if mass M attached with the string is in equilibrium in the presence of two fixed masses m_1 and m_2, then the ratio of masses m_1 and m_2 is (consider gravitational force on M because of m_1 and m_2 only). (Weight not consider)



(1) $\frac{3}{5}$ (2) $\frac{4}{5}$
(3) $\frac{3}{4}$ (4) $\frac{4}{3}$

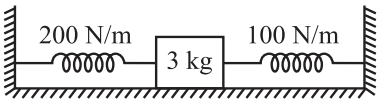
11. Two identical rods are connected in series and 200 J of heat energy is transferred in 10 seconds. What is time taken to transfer same amount of heat if rods are connected in parallel, keeping the temperature of the ends same as before?
(1) 5 s
(2) 2.5 s
(3) 1.25 s
(4) 20 s

12. The equation of a plane progressive wave travelling in a medium is $y = 20 \sin(\pi t - 2\pi x)$. The velocity of the medium particle at $x = \frac{1}{6}$ m and $t = 0$ is [all units are S.I.]

(1) 10 m/s (2) $-\frac{10\pi}{\sqrt{3}}$ m/s

(3) $\frac{20}{\sqrt{3}}$ m/s (4) 10π m/s

13. A 3 kg block connected with two massless springs as shown in figure, is executing SHM. Time period of SHM is



(1) $\frac{\pi}{2}$ s (2) $\frac{\pi}{5}$ s

(3) $\frac{\pi}{4}$ s (4) $\frac{\pi}{6}$ s

14. The magnetic field of an electromagnetic wave in a substance is given by
$B = 2 \times 10^{-6} \cos[\pi(0.04\, x + 10^7 t)]$,
where x is in metre and t in second. What is refractive index of the substance?

(1) 1.2 (2) 1.3

(3) 1.4 (4) 1.5

15. An inductor of inductance 1 H is connected across 220 V, 50 Hz supply. The peak value of the current is approximately

(1) 1.4 A (2) 0.7 A

(3) 1.2 A (4) 1.0 A

16. Two solenoids with equal number of turns have their lengths and radii both in same ratio 1 : 2. The ratio of their self inductance will be

(1) 1 : 1 (2) 1 : 2

(3) 1 : 4 (4) 3 : 1

17. An LC circuit contains a 0.6 H inductor and a 25 μF capacitor. What is rate of change of current (A/s) when charge on capacitor is 6×10^{-5} C?

(1) 1 A/s (2) 2 A/s

(3) 4 A/s (4) 8 A/s

18. We can reduce eddy currents in the core of the transformer

(1) By increasing the number of turns in secondary coil

(2) By using weak AC at high potential

(3) By making step down transformer

(4) By taking laminated core

19. A magnet oscillating in a horizontal plane has a time period of 2 s at a place where the angle of dip is 30° and 3 s at another place where angle of dip is 60°. The ratio of magnetic field at two places is

(1) $\frac{4\sqrt{3}}{7}$ (2) $\frac{9}{4\sqrt{3}}$

(3) $\frac{4}{9\sqrt{3}}$ (4) $\frac{2\sqrt{3}}{4}$

20. A closely wound flat circular coil of 50 turns having diameter 20 cm carries current of 4 A, then magnetic flux density at the centre of the coil will be

(1) $4\pi \times 10^{-4}$ T (2) $2\pi \times 10^{-4}$ T

(3) $8\pi \times 10^{-4}$ T (4) $6\pi \times 10^{-4}$ T

21. A beam of electrons is moving undeflected with constant velocity in the region having electric and magnetic fields of strength 40 V m^{-1} and 0.8 T at right angles to direction of motion of the electrons. What is the velocity of the electrons?

(1) 20 m/s (2) 40 m/s

(3) 50 m/s (4) 60 m/s

22. Two bodies of masses m and $2m$ are moving along positive x and y axes respectively with equal speeds of 4 m/s. They collide at origin and stick together. The final velocity of combined mass is

(1) $\left(\frac{4}{3}\hat{i} + \frac{8}{3}\hat{j}\right)$ m/s (2) $\left(4\hat{i} + \frac{8}{5}\hat{j}\right)$ m/s

(3) $\left(\frac{4}{5}\hat{i} + \frac{8}{3}\hat{j}\right)$ m/s (4) $\left(\frac{5}{3}\hat{i} + \frac{8}{3}\hat{j}\right)$ m/s

23. With the rise in temperature, the electrical conductivity of intrinsic semiconductor

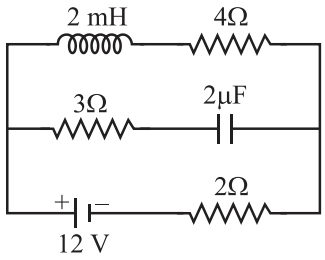
(1) Increases

(2) Decreases

(3) First decreases and then increases

(4) Remains constant

24. In the given figure, charge stored in the capacitor in steady state is



(1) 16 μC

(2) 32 μC

(3) 24 μC

(4) 4 μC

25. A car is moving along a circular path of radius 100 m. At an instant, speed of car is 20 m/s and the speed is increasing at a rate of 3 m/s^2. The magnitude of acceleration of car at this instant is

(1) 5 m/s^2 (2) 4 m/s^2
(3) 3 m/s^2 (4) 7 m/s^2

26. A diatomic gas ($\gamma = 1.4$) does 50 J of work when it is expanded isobarically. The heat given to the gas in this process is

(1) 700 J (2) 350 J
(3) 175 J (4) 125 J

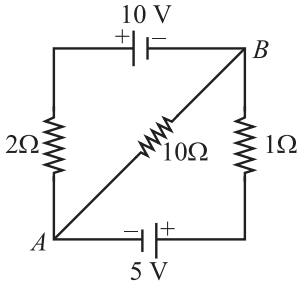
27. At a place, true dip angle is 60°. The apparent dip when plane of the dip circle is at an angle 60° with the magnetic meridian is

(1) $\tan^{-1}(2)$ (2) 45°
(3) $\tan^{-1}(4)$ (4) $\tan^{-1}(2\sqrt{3})$

28. The magnetic dipole moment of a current carrying conducting loop depends on

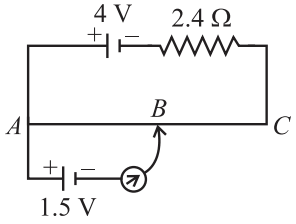
(1) Number of turns
(2) Current in the loop
(3) Area of the loop
(4) All of these

29. The electric current through 10Ω resistor connected across *AB* is



(1) 1.5 A (2) 5.0 A
(3) 0.5 A (4) Zero

30. A simple potentiometer circuit is shown in figure. The internal resistance of 4 *V* battery is negligible. *AC* is the uniform wire of length 100 cm and resistance 2Ω. What would be length *AB* for which galvanometer shows zero deflection?



(1) 82.5 cm
(2) 61.5 cm
(3) 32.5 cm
(4) 72.25 cm

31. A sphere rolls down two different inclined planes of same height but of different inclination. In both cases

(1) The speed and time of descent will be same
(2) The speed will be different but time of descent will be same
(3) The time of descent will be different but speed will be same
(4) The time of descent and speed will be different

32. Two charges 3μC and –2μC are located 15 cm apart. At what point on the line joining two charges is electrostatic potential zero?

(1) 9 cm from 3μC
(2) 6 cm from +3μC
(3) 12 cm from –2μC
(4) 7.5 cm from 3μC

33. A transverse wave travelling on a taut string is represented by $y = 0.01 \sin [2\pi (10t - x)]$, where y and x are in metre and t in second. Then which one is incorrect?

(1) Maximum particle speed is $\frac{\pi}{5}$ m/s
(2) The phase of a certain point on string changes by 120° in $\left(\frac{1}{20}\right)$ seconds
(3) The speed of the wave is 10 m/s
(4) Closest points on the string which differ in phase by 60° are $\left(\frac{1}{6}\right)$ m apart

34. If $Z = \frac{a^{3/2}b^{1/4}}{c}$ and percentage error in a, b and c are 2%, 4% and 1% respectively, then maximum percentage error in Z is

(1) 6%
(2) 5%
(3) 8%
(4) 2%

35. The position of an object moving along x-axis is given by $x = 6 + 2.5t^2$, where x is in meter and t in second. What is average velocity between $t = 2.0$ s and $t = 4.0$ s?

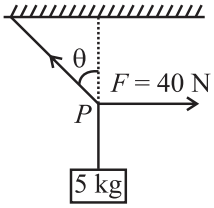
(1) 9 m s^{-1}
(2) 12 m s^{-1}
(3) 15 m s^{-1}
(4) 18 m s^{-1}

SECTION - B

36. Rain is falling vertically downwards with speed of 30 m/s. A woman rides a bicycle with speed of $10\sqrt{3}$ m/s in west to east direction. What is the direction in which she should hold the umbrella to save herself from rain?

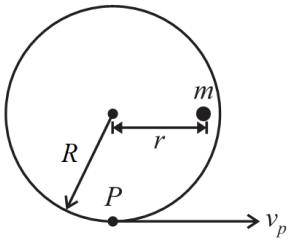
(1) At $\tan^{-1}(3)$ with vertical
(2) 30° with vertical
(3) 60° with vertical
(4) At $\tan^{-1}(1/3)$ with vertical

37. A mass of 5 kg is suspended by a light rope from the ceiling. A force of 40 N is applied in horizontal direction at point *P* of the rope as shown in figure. What is the angle θ, the rope makes with vertical in equilibrium?
(Take $g = 10\ m/s^2$)



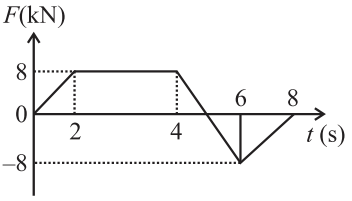
(1) $\theta = \tan^{-1}\left(\frac{5}{4}\right)$
(2) $\theta = \tan^{-1}\left(\frac{4}{5}\right)$
(3) $\theta = \tan^{-1}\left(\frac{4}{3}\right)$
(4) $\theta = \tan^{-1}\left(\frac{3}{4}\right)$

38. A block of mass *m* is kept on a rough horizontal circular turntable at distance *r* from centre. If the coefficient of friction between table and block is μ, then the value of maximum speed v_p of point *P* on turntable so that block does not slip, is



(1) $\sqrt{\mu rg}$]
(2) $\sqrt{\frac{\mu g R^2}{r^2}}$
(3) $\sqrt{\frac{\mu g R^2}{r}}$
(4) $\sqrt{\mu g R}$

39. The force (*F*) acting on a particle of mass *m*, changes with time (*t*) as shown in (*F*-*t*) graph. The change in linear momentum from $t = 0$ and $t = 6$ s is



(1) 12 kN s (2) 16 kN s
(3) 24 kN s (4) 32 kN s

40. If at depth (*h*), acceleration due to gravity decreases by 25% as compared to surface of earth, then at height (*h*) it will decrease by (in comparison with surface of earth)

(1) 50% (2) 40%
(3) 30% (4) 36%

41. If the linear mass density of a rod (kept along *x*-axis) of length 1 m varies as $\lambda = 2 + 6x$, where *x* is in metre. The position of centre of mass, if its one end is at origin, is

(1) $\frac{1}{2}$ m from origin
(2) $\frac{3}{5}$ m from origin
(3) $\frac{3}{7}$ m from origin
(4) $\frac{2}{3}$ m from origin

42. A student's school is 4 km away from home. When he goes to school from home the net displacement is $2\sqrt{2}$ km. If he travelled with constant speed of 20 km/h, then average speed and magnitude of average velocity of the student are respectively.

(1) 20 km/h, 10 km/h
(2) $20\sqrt{2}$ km/h, $10\sqrt{2}$ km/h
(3) 20 km/r, $20\sqrt{2}$ km/h
(4) 20 km/h, $10\sqrt{2}$ km/h

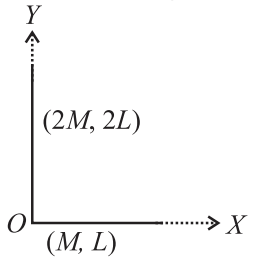
43. If angular displacement (θ) varies with time *t* as, $\theta^2 = t^2 + 1$ then angular acceleration will be equal to

(1) $\frac{1}{\theta^2}$ (2) $\frac{1}{\theta^3}$
(3) $\frac{1}{\theta} + \frac{t^2}{\theta^3}$ (4) $\frac{1}{\theta} - \frac{t^2}{\theta^3}$

44. Two identical balls each of mass 4 kg are moving towards each other with speed 2 m/s and 3 m/s respectively. They undergo head on elastic collision. The magnitude of impulse imparted by one ball on other is

(1) 40 N s (2) 8 N s
(3) 20 N s (4) 4 N s

45. The structure shown in figure is constructed with uniform rods of same material. What is the position of centre of mass w.r.t origin?



(1) $\left(\frac{L}{6}, \frac{2L}{3}\right)$ (2) $\left(\frac{L}{3}, -\frac{2L}{3}\right)$

(3) $\left(\frac{L}{3}, \frac{L}{6}\right)$ (4) $\left(\frac{L}{2}, L\right)$

46. **Assertion:** For an object in rolling motion rotational kinetic energy is always equal to translational kinetic energy.
Reason: For an object in rolling motion magnitude of linear speed and angular speed are equal
(1) If both assertion and reason are correct and reason is a correct explanation of the assertion
(2) If both assertion and reason are correct but reason is not a correct explanation of the assertion
(3) If the assertion is correct but reason is incorrect
(4) If both the assertion and reason are incorrect

47. **Assertion:** All oscillatory motions are necessarily periodic motion but all periodic motion are not oscillatory.
Reason: Simple pendulum is an example of oscillatory motion.
(1) If both assertion and reason are correct and reason is a correct explanation of the assertion
(2) If both assertion and reason are correct but reason is not a correct explanation of the assertion
(3) If the assertion is correct but reason is incorrect
(4) If both the assertion and reason are incorrect

48. **Assertion:** In *R-L-C* circuit, if reactance of L and C are equal than current will not change on changing frequency of supply.
Reason: When $X_L = X_C$ then impedance of circuit is resistive so current in circuit is decided by resistor whose resistance is impendent of frequency.
(1) If both assertion and reason are correct and reason is a correct explanation of the assertion
(2) If both assertion and reason are correct but reason is not a correct explanation of the assertion
(3) If the assertion is correct but reason is incorrect
(4) If both the assertion and reason are incorrect

49. **Assertion:** Second law of thermodynamics explains the direction of flow of heat in an spontaneous process.
Reason: It is a form of law of energy conservation.
(1) If both assertion and reason are correct and reason is a correct explanation of the assertion
(2) If both assertion and reason are correct but reason is not a correct explanation of the assertion
(3) If the assertion is correct but reason is incorrect
(4) If both the assertion and reason are incorrect

50. **Assertion:** In a moving coil galvanometer, the magnetic field is made radial.
Reason: Due to radial magnetic field, the plane of coil always remains perpendicular to the magnetic field.
(1) If both assertion and reason are correct and reason is a correct explanation of the assertion
(2) If both assertion and reason are correct but reason is not a correct explanation of the assertion
(3) If the assertion is correct but reason is incorrect
(4) If both the assertion and reason are incorrect

SECTION-II (CHEMISTRY)

SECTION - A

51. What is the meaning of specific volume?
(1) Volume of a certain substance
(2) Volume of a specific substance
(3) Volume of a certain substance per unit mass.
(4) None of the above

52. **Assertion:** Refractive index is an intensive and isotropic property.
Reason: This property is directional.
(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(3) Assertion is correct, reason is incorrect
(4) Assertion is incorrect, reason is correct

53. Any system containing solid, liquid and vapour phase co-existing at equilibrium at a certain point. It is known as
(1) Single point (2) Double point
(3) Triple point (4) Quadrupole point

54. Match the following:

Column I		Column II	
A.	Thermal equilibrium	i.	Pressure is uniform throughout
B.	Mechanical equilibrium	ii.	Temperature is uniform throughout
C.	Transfer equilibrium	iii.	Chemical reaction is uniform
D.	Reaction equilibrium	iv.	Transfer of one species with the another is in equilibrium

	A	B	C	D
(1)	i	ii	iii	iv
(2)	ii	i	iv	iii
(3)	iii	iv	ii	i
(4)	iv	iii	i	ii

55. Acetyl chloride reacts with cyclohexanol to give compound A. The same compound is obtained on treating acetic anhydride with cyclohexanol. Identify A

(1) Acetic acid (2) Cyclohexyl acetate
(3) Cyclohexanone (4) Cyclohexane

56. **Assertion:** Chloride is a better leaving group than alkoxide.
Reason: The pK_a of conjugate acid of a leaving group chloride is a lower value than that of alkoxide.

(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(3) Assertion is correct, reason is incorrect
(4) Assertion is incorrect, reason is correct

57. The ABABAB…… and ABCABCABC type packing arrangement is known as

(1) Hcp and hcp (2) Ccp and ccp
(3) Ccp and hcp (4) Hcp and ccp

58. Arrange in increasing order of mass:-

(i) One gram atom of Nitrogen
(ii) One atom of silver
(iii) 10^{23} atoms of carbon
(iv) One mole of calcium

(1) (ii) < (iii) < (iv) < (i)
(2) (ii) < (i) < (iv) < (iii)
(3) (i) < (ii) < (iv) < (iii)
(4) (ii) < (iii) < (i) < (iv)

59. White tin is

(1) Alpha form
(2) Beta form
(3) Gamma form
(4) None of these

60. The concentration (M) of pure water is

(1) 54.5
(2) 55.5
(3) 56.5
(4) 57.5

61. Which of these set of quantum numbers is not possible for a 3p electron?

(1) $n = 3, l = 1, m = +1, m_s = +\frac{1}{2}$
(2) $n = 3, l = 2, m = +1, m_s = -\frac{1}{2}$
(3) $n = 3, l = 0, m = -1, m_s = -\frac{1}{2}$
(4) $n = 3, l = 1, m = 0, m_s = +\frac{1}{2}$

62. Which of the following is incorrect?

(1) Nucleic acid contains genetic information.
(2) Nucleic acid does not control the synthesis of protein
(3) Enzymes are functional proteins
(4) Connective tissues are structural proteins

63. Pyruvic acid is a

(1) Aldo carboxylic acid
(2) Keto carboxylic acid
(3) Mineral acid
(4) Both (1) and (2)

64. Read the following statements.

A. Nucleic acid is a polymer of nucleotide.
B. Polyethylene is a polymer of ethene
C. Cellulose is a polymer of glucose
D. Maltose is a polymer of glucose.

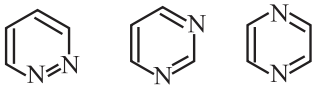
Which is the correct combination?

(1) ABCD (2) ABC
(3) BCD (4) ACD

65. What is the difference between adenine and adenosine?

(1) Both are purine bases
(2) Both are nucleoside
(3) Adenine is purine base and adenosine is a nucleoside
(4) Adenine is nucleoside and adenosine is a purine base

66. Consider the following structure



(A) (B) (C)

What is the correct name of the given heterocycles?

(1) Pyridazine, pyrimidine, pyrazine
(2) Pyrimidine, pyrazine, pyridazine
(3) Pyrazine, pyridazine, pyrimidine
(4) Pyridazine, pyrazine, pyrimidine

67. Which of the following is incorrect?

(1) Simple unconjugated alkenes are nucleophilic and reacts with electrophiles.
(2) Simple unconjugated alkenes are electrophilic and reacts with nucleophiles.
(3) The constructive bonding between an alkene and bromine is due to overlap of filled π-orbital of alkene with the vacant σ* orbital of bromine.
(4) The standard state of bromine is liquid.

68. Identify correct sequence for bond order

(1) $O_2^+ > O_2^- > O_2$
(2) $O_2^+ > O_2 > O_2^-$
(3) $O_2^- > O_2 > O_2^+$
(4) None of these

69. The basicity of oxalic acid, acetic acid and H_4 EDTA is

(1) 1, 2, 3 (2) 2, 1, 3
(3) 2, 1, 4 (4) 4, 2, 1

70. IUPAC name of given compound is

$(CH_3)_2N-CH_2-CH(Cl)-COOH$

(1) 2–chloro–3–(N, N-dimethylamino) propanoic acid
(2) 2–chloro–4–N–methyl pentenoic acid
(3) 2–chloro–4–N–methyl ethyl amine
(4) None of these

71. If pK_a for the conjugate acid of aniline is 4.63, the pK_b of aniline is

(1) 18.63
(2) 9.37
(3) –9.37
(4) 12.43

72. The pK_b for hydrazine is 6.05, its K_b is

(1) 8.91×10^{-7}
(2) 89.1×10^{-7}
(3) 891×10^{-7}
(4) 0.891×10^{-7}

73. In group 14, the metal (II) and Metal (IV) oxides of ____, ____, and ____ are amphoteric.

(1) C, Si, Ge (2) Si, Ge, Sn
(3) Sn, Pb (4) Sn, Pb, C

74. Which hydroxide of alkaline earth metal is amphoteric?

(1) Be (2) Mg
(3) Ca (4) Sr

75. Read the following statements.

A. In coordination complex, metal is Lewis acid and ligand is Lewis base.
B. There are two valency of a metal in a coordination complex.
C. A complex of a cation having higher charge density is more stable than that of having low charge density.

Which is the correct combination?

(1) AC (2) AB
(3) BC (4) ABC

76. How many chelate rings are present in $[Cu(trien)]^{2+}$?

(1) 1 (2) 2
(3) 3 (4) 4

77. The oxidation state of respective metals in the given complex: $[MnO_4]^-$ and $MnCl_2$

(1) +2 and +2 (2) +7 and +2
(3) +3 and +1 (4) +4 and +2

78. For a thermodynamic favourable cell reaction

(1) $E^o_{cell} > 0$ (2) $\Delta G° < 0$
(3) K = 1 (4) All of the above

79. Which of the following is a homopolymer?

(1) Dacron (2) Nylon-6,6
(3) Teflon (4) PHBV

80. Which compound(s) will show ionization, linkage and geometrical isomerism?

(I) $[Co(NH_3)_5(NO_2)]Br$
(II) $Pt(NH_3)_4][Pt(SCN)_4]$
(III) $[Co(en)(NH_3)_2Cl_2]Br$
(IV) $[Cr(NH_3)_4(NO_2)_2](NO_3)$

(1) III only (2) I and II only
(3) IV only (4) All of these

81. Which of the following is correct?

(1) $E^o_{cell} = E^o_{\text{reduction process}} - E^o_{\text{oxidation process}}$
(2) $K_a \times K_b = pK_w$
(3) Both are correct
(4) None are correct

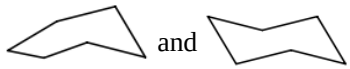
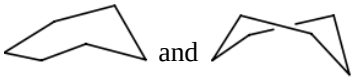
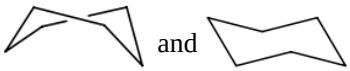
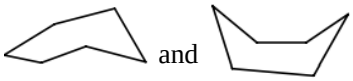
82. Molecular shape of SO_2Cl_2 is
(1) Square planar
(2) Tetrahedral
(3) See-saw
(4) Trigonal pyramidal

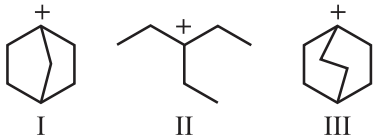
83. Which of the following contain 3c-2e bonds?
(1) Diborane
(2) Hydrazine
(3) Beryllium hydride
(4) Sodium hydride

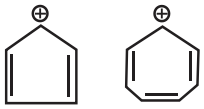
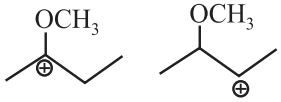
84. The compound formed by dissolving elemental gold in aqua regia is
(1) AuCl
(2) $AuNO_3$
(3) $H[AuCl_4]$
(4) $H[Au(NO_3)_4]$

85. The complementary DNA sequence of the given DNA 5'-G-A-A-T-T-C-3' is
(1) 5'-C-T-T-A-A-G-3'
(2) 5'-C-U-U-A-A-G-3'
(3) 3'-C-T-T-A-A-G-5'
(4) 3'-G-A-A-T-T-C-5'

SECTION - B

86. The pair of conformation that has maximum energy difference is
(1)  and
(2)  and
(3)  and
(4)  and

87. The correct order of stability of the following carbonium ions is

I II III
(1) II > I > III
(2) III > II > I
(3) I > III > II
(4) II > III > I

88. In which of these, Ist is more stable than IInd?
(A) 
(B) 
(C) $CH_3-O-\overset{\oplus}{C}H-CH_3$ $CH_3-\overset{\oplus}{C}(CH_3)-CH_3$
(1) (A), (B), (C)
(2) (B) only
(3) Both (B) and (C)
(4) (C) only

89. For Na^+, Mg^{2+}, Al^{3+} and F^-, the correct order of ionic radii is
(1) $Al^{3+} > Mg^{2+} > Na^+ > F^-$
(2) $Al^{3+} > Na^+ > Mg^{2+} > F^-$
(3) $F^- > Na^+ > Mg^{2+} > Al^{3+}$
(4) $Na^+ > F^- > Mg^{2+} > Al^{3+}$

90. Two liquids X & Y form an ideal solution. The mixture has a vapour pressure of 400 mm at 300 K when mixed in molar ratio of 1 : 1 and vapour pressure of 350 mm when mixed in molar ratio of 1 : 2 at same temp. The vapour pressure of two pure liquids X & Y, respectively are:
(1) 250 mm, 550 mm
(2) 350 mm, 450 mm
(3) 350 mm, 400 mm
(4) 550 mm, 250 mm

91. Hybridization of the central atoms in I_3^-, ClF_3 and SF_4, respectively, are
(1) sp^3d, sp^2 and dsp^2
(2) sp, sp^3d and dsp^2
(3) sp^3d, sp^3d and sp^3d
(4) sp, sp^2 and sp^3d

92. How many water molecules are present in hydrated copper sulphate?
(1) 2
(2) 3
(3) 4
(4) 5

93. Which of the following is true about dihydrogen?
(1) Colourless
(2) Odourless
(3) Sparingly soluble in all solvents
(4) All of the above

94. There are two types of hydrogen molecule on the basis of nuclear spin combination of both hydrogen atom. One is para and other is ortho when the spins are
(1) Same, same
(2) Same, opposite
(3) Opposite, same
(4) Opposite, opposite

95. At 0 K which form of hydrogen exists?
(1) Para
(2) Ortho
(3) Meta
(4) All three

96. **Assertion:** Electrolysis of water produces hydrogen gas at anode
Reason: Hydrogen cation takes up an electron and reduces as hydrogen gas in the process of electrolysis of water
(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(3) Assertion is correct, reason is incorrect
(4) Assertion is incorrect, reason is correct

97. The equilibrium constant for the reaction,
$Cu(s) + 2Ag^{+}(aq) \longrightarrow Cu^{2+}(aq) + 2Ag(s)$
$E^{o} = 0.46\,V$ at 298 K is
(1) 2.4×10^{10} (2) 2.0×10^{10}
(3) 4.0×10^{10} (4) 4.0×10^{15}

98. Which of the following type of hydrides acts as hydrogen storage vessel?
(1) Ionic (2) Covalent
(3) Molecular (4) Metallic

99. Hinsberg reagent is used to distinguish between
(1) Alcohol (2) Amines
(3) Acids (4) Acyl chlorides

100. The reaction for decomposition of Ozone is
$O_3 \rightleftharpoons O_2 + O \ (\text{fast})$
$O + O_3 \rightarrow 2O_2 \quad (\text{slow})$
rate expression should be
(1) Rate = k $[O_3]^2$
(2) Rate = k $[O_3]^2$ $[O_2]^{-1}$
(3) Rate = k $[O_3]$ $[O_2]$
(4) Rate = k $[O_3]$ $[O_2]^{-1}$

SECTION-III (BOTANY)

SECTION - A

101. The rate of conversion of light energy into chemical energy of organic molecules in an ecosystem is
(1) Gross secondary productivity
(2) Secondary productivity
(3) Gross primary productivity
(4) Net primary productivity

102. The correct sequence of stages of succession on a bare rock is
(1) Mosses → Lichens → Grasses → Shrubs → Trees
(2) Mosses → Shrubs → Trees → Lichens→ Grasses
(3) Trees → Shrubs → Lichens → Mosses → Grasses Trees
(4) Lichens → Mosses → Grasses → Shrubs → Trees

103. The term biodiversity is popularised by
(1) Tilman
(2) Paul Ehrlich
(3) Odum
(4) Edward Wilson

104. Keystone species deserve protection because these
(1) Play an important role in supporting other species.
(2) Have become rare due to over-exploitation.
(3) Indicate presence of certain minerals in the soil.
(4) Are capable of surviving in harsh environmental conditions.

105. A : There is sharp decline in dissolved O_2 levels downstream from the point of sewage discharge
B : Microorganisms involved in biodegradation of organic matter in the receiving water body consume lot of dissolved oxygen.
(1) Both statement A and B are correct.
(2) Statement A is correct but statement B is incorrect.
(3) Statement A is incorrect but statement B is correct.
(4) Both statement A and B are incorrect.

106. Which among the following disease is not a water borne.
(1) Hepatitis-B
(2) Jaundice
(3) Cholera
(4) Typhoid

107. Match column I with column II and select the correct option

	Column-I		**Column-II**
(A)	Biopesticide	(i)	*Monascus purpureus*
(B)	Root nodules	(ii)	Gal ghotu
(C)	Diphtheria	(iii)	Mycorrhiza
(D)	Blood cholesterol lowering agent	(iv)	***Bt***

(1) A → (iii), B → (iv), C → (ii), D → (i)
(2) A → (iv), B → (iii), C → (ii), D → (i)
(3) A → (iv), B → (ii), C → (iii), D → (i)
(4) A → (i), B → (ii), C → (iv), D → (iii)

108. A student while performing experiment came to know that BOD of given water sample is 'zero', what does that indicates.
(1) Water is highly polluted.
(2) Water is safe to drink.
(3) Water is polluted, but very negligible
(4) Water is moderately polluted.

109. Which of the following is hybrid variety of 'rapeseed mustard'?
(1) *Pusa Gaurav*
(2) *Pusa Sawani*
(3) *Pusa Sadabhar*
(4) *Pusa* A-4

110. Radioactive thymidine experiments were performed by Taylor and colleagues on
(1) *E.coli* (2) Bacteriophage
(3) *Streptococcus* (4) *Vicia faba*

111. The process of copying genetic information from one strand of DNA into RNA is termed as
(1) Translation (2) Transcription
(3) Transformation (4) Transduction

112. Match CI with CII and select the correct option.

	Column I		**Column II**
(A)	Structural gene	(i)	Codes for repressor molecule
(B)	Regulator gene	(ii)	Codes for protein
(C)	Promotor site	(iii)	Binding site for repressor
(D)	Operator site	(iv)	Binding site for RNA polymerase

(1) A-(iv), B-(ii), C-(i), D-(iii)
(2) A-(ii), B-(iv), C-(i), D-(iii)
(3) A-(ii), B-(i), C-(iv), D-(iii)
(4) A-(iv), B-(iii), C-(i), D-(ii)

113. **A:** Turner's syndrome is caused due to absence of any one of the X and Y Sex chromosome
B: Turner's syndrome is an example of Aneuploidy.
(1) Both statement A and B are correct.
(2) Statement A is correct but statement B is incorrect.
(3) Statement A is incorrect but statement B is correct.
(4) Both statement A and B are incorrect.

114. Which among the following is not an autosomal recessive condition.
(1) Cystic fibrosis
(2) Sickle cell anaemia
(3) Haemophilia
(4) Phenylketonuria

115. In polygenic inheritance
(1) Only one gene influences many characters.
(2) Heterozygous organisms express both alleles.
(3) Heterozygous organisms express only one allele itself.
(4) Many genes control single character.

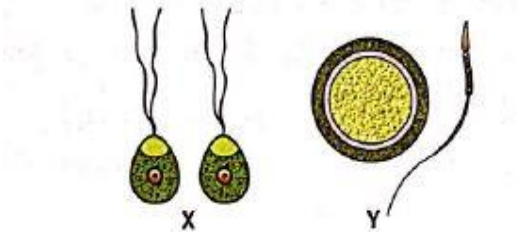
116. Genes located very close to one another on same chromosome tend to be transmitted together and are called
(1) Recessive genes (2) Dominant genes
(3) Linked genes (4) Identical genes

117. Match CI with CII and select correct option

	Column I		**Column II**
	Organism		**Mode of Reproduction**
(A)	*Penicillium notatum*	(i)	Stem tuber
(B)	Rose plant	(ii)	Conidiospores
(C)	*Spirogyra*	(iii)	Stem cuttings
(D)	*Solanum tuberosum*	(iv)	Zoospores

(1) A → (ii), B → (iv), C → (iii), D → (i)
(2) A → (ii), B → (iii), C → (iv), D → (i)
(3) A → (iv), B → (iii), C → (iv), D → (i)
(4) A → (iii), B → (ii), C → (i), D → (iv)

118. Which of the following options is correct for given figures?



	X	Y
(1)	Homogamy	Isogamy
(2)	Anisogamy	Isogamy
(3)	Heterogamy	Anisogamy
(4)	Isogamy	Oogamy

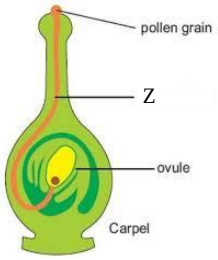
119. Cells that found in a pollen grain when it is shed at 3-celled stages are.

(1) 1 vegetative cell, 1 generative cell, 1 male gamete
(2) 1 vegetative cell, 2 male gametes
(3) 1 generative cell, 2 male gametes
(4) None of above

120. Identify correct function of tapetum.

(1) Synthesis of callase enzyme for separation of microspore tetrads.
(2) Transportation of nutrients to inner side of anther
(3) Pollen wall formation
(4) All the above

121. Which of the following phenomenon is seen in growth of part (Z)



(1) Thigmotaxis
(2) Chemotropic
(3) Geotropic
(4) None

122. During the process of fertilisation the pollen tube usually enters the embryo sac through

(1) Micropyle (2) Nucellus
(3) Integument (4) Chalaza

123. In some bacteria small **bristle** like fibres sprouting out of cell which aid in attachment to host tissues

(1) Pilli (2) Fimbriae
(3) Hook (4) Basal body

124. What is the size of Ribosome

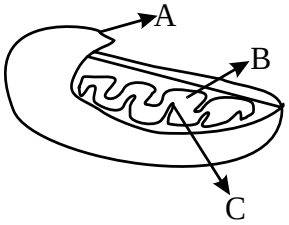
(1) 15 nm – 20 nm
(2) 15 μm – 20 μm
(3) 150 nm – 200 nm
(4) 150 μm – 200 μm

125. Among the following statements regarding mitochondria select the correct ones.

(i) Mitochondria are semi-autonomous.
(ii) Mitochondria divide by fission division.
(iii) Matrix of mitochondria contains single circular ds DNA molecule and a few RNA molecules and 70S Ribosomes.
(iv) These are the sites of aerobic respiration

(1) (i), (ii), (iii) and (iv)
(2) (iii) and (iv)
(3) (i) and (iii)
(4) (i), (ii) and (iii)

126. Identify (A) (B) (C) in given diagram



	A	B	C
(1)	Outer membrane	Stroma	Crista
(2)	Outer membrane	Matrix	Crista
(3)	Outer membrane	Crista	Matrix
(4)	Inner membrane	Stroma	Crista

127. A: Axonemal microtubules in cilia and flagella show 9 + 2 arrangement.

B: It is a combination of nine pairs of doublets of radially arranged peripheral microtubules and a pair of centrally located microtubules.

(1) Both statement A and B are correct.
(2) Statement A is correct but statement B is incorrect.
(3) Statement A is incorrect but statement B is correct.
(4) Both statement A and B are incorrect.

128. Identify the incorrect statement about amino acids

(1) Lysine & Arginine are acidic amino acids.
(2) Leucine, Isoleucine, lysine, valine are essential amino acids.
(3) Cysteine and methionine are sulphur containing amino acids.
(4) Essential amino acids are not synthesised in the body, therefore they are ingested by diet.

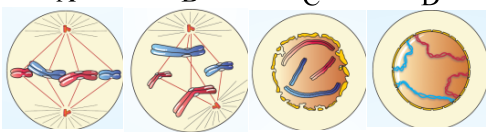
129. Which among the following phases of cell cycle is not included in interphase?

(1) S (2) M

(3) G_1 (4) G_2

130. Identify the given stages of mitosis and select correct options.

A B C D



(1) (A) – Early prophase, (B) – late prophase, (C) – Metaphase, (D) – Transition to metaphase

(2) (A) – Metaphase, (B) – Transition to metaphase, (C) – Early prophase, (D) – Late prophase

(3) (A) – Metaphase, (B) – Transition to metaphase, (C) – Late prophase, (D) – Early prophase

(4) (A) – Transition to metaphase, (B) – Metaphase, (C) – Late prophase, (D) – Early prophase

131. How many pollen mother cells are required to produce 1988 seeds in a garden?

(1) 497 (2) 994

(3) 400 (4) 662

132. Mitosis is characterised by

(1) Pairing of homologous chromosomes

(2) Both reduction and equal division

(3) Equal division

(4) Reductional division

133. During anaphase I of Meiosis

(1) Non-sister chromatid chromosomes separate.

(2) Sister chromatid chromosomes separate.

(3) Non-homologous chromosomes separate.

(4) Homologous chromosome separate.

134. Identify correct statement regarding G_1 phase.

(1) It is interval between mitosis and DNA replication.

(2) Cell remains metabolically active.

(3) Cell continuously grow in size.

(4) All the above.

135. Wood formed during winter season is called

(1) Early wood

(2) Autumn wood

(3) Late wood

(4) Both (2) & (3)

SECTION - B

136. Phelloderm is also called as

(1) Cork

(2) Cork cambium

(3) Secondary cortex

(4) None

137. Among the following diagram of types of placenta identify (A), (B) and (C)

A B C

(1) A – Basal, B – Free central, C - Marginal

(2) A – Axile, B – Parietal, C - Marginal

(3) A – Parietal, B – Axile, C - Marginal

(4) A – Parietal, B – free central, C - Marginal

138. Which among the following is an ornamental plant

(1) *Indigofera* (2) *Sesbania*

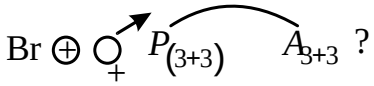
(3) Sweet pea (4) *Trifolium*

139. Which among the following is an medicinal plant

(1) *Belladonna* (2) Tobacco

(3) *Petunia* (4) *Gloriosa*

140. Identify missing floral organs in floral formula of Liliaceae family



(1) $G_{(3)}$ (2) G_3

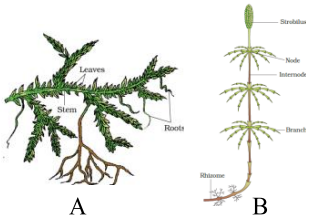
(3) $G_{(3+3)}$ (4) $G_{(2)}$

141. Leaf tip tendril are present in

(1) *Smilax* (2) *Lathyrus*

(3) *Gloriosa* (4) *Pisum sativum*

142. Identify *Salvinia* from following figures



A B

C D

(1) C (2) A

(3) B (4) D

143. Gemmae are asexual bodies of
(1) Red algae
(2) Mosses
(3) Liver worts
(4) Brown algae

144. Select the incorrect pair
(1) Chlorophyceae → Chlorophyll a, b
(2) Phaeophyceae→ Chlorophyll a, c
(3) Rhodophyceae→ Chlorophyll b, c
(4) Phaeophyceae→ Cell wall made of **cellulose** and **algin**

145. A : The cell walls of fungi are composed of chitin and polysaccharide.
B : Most fungi are heterotrophic and absorb soluble organic matter from dead and decaying organic matter.
(1) Both statement A and B are correct.
(2) Statement A is correct but statement B is incorrect.
(3) Statement A is incorrect but statement B is correct.
(4) Both statement A and B are incorrect.

146. Which among the following is not a insectivores plant
(1) *Nepenthes*
(2) Venus flytrap
(3) Bladder wart
(4) *Alternaria*

147. Which among the following is not basidiomycetes.
(1) Smut (2) Rust fungus
(3) Mushroom (4) Yeast

148. Match CI with CII and select correct option

	Column I		**Column I**
(A)	Viroids	(i)	W.M Stanley
(B)	Prions	(ii)	T.O Diener
(C)	Crystallography Technique on Viruses	(iii)	Pasteur D.J. Ivanowsky
(D)	Poisonous fluid	(iv)	Cr-Jacob disease

(1) A → (ii), B → (iv), C → (i), D → (iii)
(2) A → (ii), B → (i), C → (iv), D → (iii)
(3) A → (iv), B → (i), C → (ii), D → (iii)
(4) A → (iv), B → (ii), C → (i), D → (iii)

149. Identify flagellated protozoan among the following
(1) *Paramecium* (2) *Plasmodium*
(3) *Trypanosoma* (4) *Entamoeba histolytica*

150. Identify the family which does not belong to order polymoniales
(1) Solanaceae (2) Convolvulaceae
(3) Fabaceae (4) Both 1 & 2

SECTION-IV (ZOOLOGY)

SECTION - A

151. Excretion in Arthropods takes place by
(1) Malpighian tubules
(2) Green glands
(3) Coxal glands
(4) All of the above

152. Water vascular system is found in
(1) *Sycon*
(2) *Sepia*
(3) *Myxine*
(4) *Asterias*

153. The amphibians are characterised by
(1) Only aquatic habitat
(2) Monocondylic skull
(3) Scale less, smooth, moist and glandular skin
(4) Claws present at the tips of digits

154. Match the organism with their characterstic features.

	Column I		**Column II**
A.	*Bacillus thuringiensis*	1.	Cloning vector
B.	*Thermus aquaticus*	2.	Construction of first rDNA
C.	*Agrobacterium tumefaciens*	3.	DNA Polymerase
D.	*Salmonella typhimurium*	4.	Cry proteins

	A	B	C	D
(1)	3	2	1	4
(2)	3	4	1	2
(3)	2	4	3	1
(4)	4	3	1	2

155. *Macropus* is
(1) Monkey
(2) Dog
(3) Kangaroo
(4) Tiger

156. Ciliated Epithelium is found in
(1) Oviduct (2) Trachea
(3) Brain ventricles (4) All of these

157. Large amoeboid cells, that are a part of our innate immune system, found in the areolar tissue are called as:
(1) Macrophages (2) Mast cells
(3) Fibroblasts (4) Adipocytes

158. Major excretory product of cockroach is
(1) Urea (2) Ammonia
(3) Uric acid (4) Amino acids

159. Substances having identifiable function and play Known role in normal physiological functions of a cells are called as :-
(1) Primary metabolites
(2) Secondary metabolites
(3) Metabolites
(4) Biomolecules

160. Agar is a
(1) Mucopolysaccharide
(2) Disaccharide
(3) Trisaccharide
(4) Monosaccharide

161. **Statement I:** Pentoses and hexoses are monosaccharides
Statement II: Monosaccharides can be hydrolysed
Choose the correct option.
(1) Statement I is correct but statement II is incorrect
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and statement II are correct
(4) Both statement I and statement II are incorrect

162. **Assertion (A):** Living organisms have more nitrogen and oxygen per unit mass than inanimate objects.
Reason (R): Living organisms have more calcium, magnesium and sodium than inanimate objects.
Choose the correct option.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(3) (A) is true (R) is false
(4) Both (A) and (R) are false

163. Fats have _____ melting points and oils have _____ melting points.
(1) Low, High (2) Low, Low
(3) High, Low (4) High, High

164. The spread of bird flu can be prevented by
(1) Culling
(2) Breeding
(3) Separation of infected birds from the flocks of undiseased ones
(4) Both (1) and (3)

165. Which statement about nutrient absorption by the enterocyte is true?
(1) Carbohydrates are absorbed as disaccharides
(2) Fats are absorbed passively as fatty acids and monoglycerides
(3) Amino acids move across the plasma membrane only by diffusion
(4) Bile transports fats across plasma membrane

166. Symbiotic microorganisms normally occur in human body in
(1) Duodenum
(2) Caecum
(3) Intestinal lining and tongue surface
(4) Vermiform appendix and rectum

167. Fructose is absorbed into the blood through mucosa cells of intestine by the process called _____
(1) Active transport
(2) Facilitated transport
(3) Simple diffusion
(4) Co-transport mechanism

168. Fetal haemoglobin differs from adult haemoglobin in its
(1) Structure
(2) Affinity for O_2
(3) Both (1) and (2)
(4) Shape

169. What is the partial pressure of oxygen (pO_2) and carbon dioxide (pCO_2) in atmosphere in mmHg.
(1) 159, 0.3 (2) 104, 40
(3) 40, 45 (4) 95, 40

170. **Assertion (A):** Most fishes when taken out of water, die due to of suffocation.
Reason (R): Atmospheric air contains far less oxygen content than the dissolved oxygen in water
Choose the correct option.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(3) (A) is true (R) is false
(4) Both (A) and (R) are false

171. Heart is protected by double walled membranous bag called as _____
Fill in the blanks with the most appropriate options
(1) Epicardium
(2) Endocardium
(3) Pericardium
(4) Myocardium

172. Blood protein that mainly help in maintaining osmotic balance is :
(1) Fibrinogen
(2) Albumin
(3) Globulin
(4) Prothrombin

173. Majority of nephrons are
(1) Medullary nephrons
(2) Cortical nephrons
(3) Meta nephridia
(4) Juxta-medullary nephrons

174. Which of the following processess is/are involved in urine formation?
(1) Glomerular filtration
(2) Reabsorption
(3) Tubular secretion
(4) All of these

175. **Statement I:** The epithelial cells of Bowman's capsule are called podocytes.
Statement II: Podocytes are arranged in an intricate manner so as to leave some minute spaces called as filtration slits.
Choose the appropriate option
(1) Statement I is correct but statement II is incorrect
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and statement II are correct
(4) Both statement I and statement II are incorrect

176. Choose the incorrect statement about actin
(1) It is a globular protein
(2) Magnesium ions are not required in the polymerisation of G-actin to F-actin
(3) It occurs in two form: monomeric G-actin and polymeric F-actin
(4) F-actin is composed of G-actin

177. Elbow joint is an example of
(1) Hinge joint
(2) Gliding joint
(3) Ball and socket joint
(4) Pivot joint

178. Source of Ca^{2+} for muscle contraction in both sarcoplasmic (endoplasmic) reticulum as well as extracellular fluid in case of
(a) Skeletal muscles
(b) Smooth muscles
(c) Cardiac muscles
(1) a only (2) b and c only
(3) a and c only (4) b only

179. Which of the following is not a lobe of cerebral hemisphere?
(1) Parietal lobe (2) Occipital lobe
(3) Temporal lobe (4) Olfactory lobe

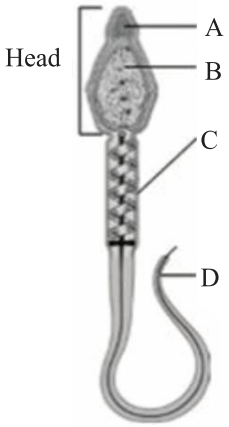
180. Choose the correct statement regarding spinal cord.
(1) It is a elongated, cubical structure
(2) It measures about 95 cm in length
(3) It controls all voluntary actions
(4) It controls most of the reflex activities

181. Pituitary gland is located in the bony cavity of
(1) Sphenoid bone (2) Temporal bone
(3) Occipital bone (4) Lacrimal bone

182. Hormone responsible for causing grave's disease is
(1) Parathormone (2) Thyroxine
(3) Testosterone (4) Somatocrinin

183. The part of the fallopian tube closest to the ovary is
(1) Ampulla (2) Isthmus
(3) Infundibulum (4) Cervix

184. Which of the following labelled parts in sperm produces energy for the movement of the tail that facilitate sperm motility essential for fertilisation?



(1) A (2) B
(3) C (4) D

185. During copulation semen is released by penis into
(1) Cervix (2) Vagina
(3) Uterus (4) Vestibule

SECTION - B

186. Emergency contraceptives are effective if used.
(1) Within 72 hours of ovulation
(2) Within 72 hours of coitus
(3) After 72 hours of menstruation
(4) After 72 hours of implantation

187. Origin of earth dates back to
(1) 10,000 – 15,000 million years ago
(2) 4000 – 4500 million years ago
(3) 500 – 1000 million years ago
(4) 2000 – 3000 million years ago

188. Who finally refuted the theory of spontaneous generation and experimentally disproved it ?
(1) Thomas Malthus
(2) Alfred Wallace
(3) Louis Pasteur
(4) Charles Darwin

189. What did S.L. Miller observed in his experimental set up?
(1) Formation of sugar and nitrogenous bases
(2) Formation of amino acids
(3) Formation of pigments
(4) Formation of fats

190. Cytokine barriers include
(1) Interferons (2) WBC
(3) PMNL (4) Saliva

191. The antibody present in colostrum is
(1) IgA (2) IgD
(3) IgG (4) IgE

192. Pneumatic bones are found in
(1) Scolidon
(2) *Rana*
(3) *Balaenoptera*
(4) *Corvus*

193. Among the non-infectious diseases, which of the following is the most common fatal disease of human beings?
(1) AIDS
(2) Cancer
(3) Cystic fibrosis
(4) Cholera

194. The amount of adenine is always equal to _____ in DNA
(1) Thymine (2) Guanine
(3) Cytosine (4) Uracil

195. **Assertion (A):** The chemical stored in the synaptic vesicles are termed as neurotransmitters.
Reason (R): Synaptic vesicles release these chemicals in the synaptic cleft.
Choose the correct option.
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
(3) (A) is true (R) is false
(4) Both (A) and (R) are false

196. Which of the following are not steroid hormones but still do not act through second messenger system, are small, nonpolar and can be taken orally?
(1) Prostaglandin
(2) Estrogen and progesterone
(3) Insulin and glucagon
(4) Thyroid hormones(T3 and T4)

197. Identify the plasmid among the following.
(1) Hind III (2) pBR-322
(3) λ-phage (4) Both (2) and (3)

198. Gel electrophoresis separates DNA molecule according to their
(1) Size (2) Shape
(3) Magnetic field (4) All of these

199. The bacteria *Bacillus thuringiensis* is widely used in contemporary biology as
(1) Bioweapon
(2) Bioinsecticide
(3) Bioweedicide
(4) Indicator of water pollution

200. The inter-atrial septum in the human heart can be best described as:
(1) A thick fibrous tissue
(2) A thin fibrous tissue
(3) A thick muscular wall
(4) A thin muscular wall

Test Series (2023)

Mock Test - 06

NEET

DURATION : 200 Minutes | 12-04-2023 | M. MARKS : 720

ANSWER KEY

PHYSICS		CHEMISTRY		BOTANY		ZOOLOGY	
1.	(1)	51.	(3)	101.	(3)	151.	(4)
2.	(4)	52.	(1)	102.	(4)	152.	(4)
3.	(4)	53.	(3)	103.	(4)	153.	(3)
4.	(4)	54.	(2)	104.	(1)	154.	(4)
5.	(1)	55.	(2)	105.	(1)	155.	(3)
6.	(2)	56.	(1)	106.	(1)	156.	(4)
7.	(4)	57.	(4)	107.	(2)	157.	(1)
8.	(4)	58.	(4)	108.	(2)	158.	(3)
9.	(3)	59.	(2)	109.	(1)	159.	(1)
10.	(4)	60.	(2)	110.	(4)	160.	(1)
11.	(2)	61.	(3)	111.	(2)	161.	(1)
12.	(4)	62.	(2)	112.	(3)	162.	(3)
13.	(2)	63.	(2)	113.	(1)	163.	(3)
14.	(1)	64.	(2)	114.	(3)	164.	(4)
15.	(4)	65.	(3)	115.	(4)	165.	(2)
16.	(2)	66.	(1)	116.	(3)	166.	(2)
17.	(3)	67.	(2)	117.	(2)	167.	(2)
18.	(4)	68.	(2)	118.	(4)	168.	(3)
19.	(2)	69.	(3)	119.	(2)	169.	(1)
20.	(1)	70.	(1)	120.	(4)	170.	(3)
21.	(3)	71.	(2)	121.	(2)	171.	(3)
22.	(1)	72.	(1)	122.	(1)	172.	(2)
23.	(1)	73.	(3)	123.	(2)	173.	(2)
24.	(1)	74.	(1)	124.	(1)	174.	(4)
25.	(1)	75.	(4)	125.	(1)	175.	(3)
26.	(3)	76.	(3)	126.	(2)	176.	(2)
27.	(4)	77.	(2)	127.	(1)	177.	(1)
28.	(4)	78.	(4)	128.	(1)	178.	(2)
29.	(4)	79.	(3)	129.	(2)	179.	(4)
30.	(1)	80.	(3)	130.	(3)	180.	(4)
31.	(3)	81.	(1)	131.	(1)	181.	(1)
32.	(1)	82.	(2)	132.	(3)	182.	(2)
33.	(2)	83.	(1)	133.	(4)	183.	(3)
34.	(2)	84.	(3)	134.	(4)	184.	(3)
35.	(3)	85.	(3)	135.	(4)	185.	(2)
36.	(2)	86.	(1)	136.	(3)	186.	(2)
37.	(2)	87.	(4)	137.	(3)	187.	(2)
38.	(3)	88.	(3)	138.	(3)	188.	(3)
39.	(3)	89.	(3)	139.	(1)	189.	(2)
40.	(4)	90.	(4)	140.	(1)	190.	(1)
41.	(2)	91.	(3)	141.	(3)	191.	(1)
42.	(4)	92.	(4)	142.	(1)	192.	(4)
43.	(4)	93.	(4)	143.	(3)	193.	(2)
44.	(3)	94.	(3)	144.	(3)	194.	(1)
45.	(1)	95.	(1)	145.	(2)	195.	(2)
46.	(4)	96.	(4)	146.	(4)	196.	(4)
47.	(2)	97.	(4)	147.	(4)	197.	(2)
48.	(1)	98.	(4)	148.	(1)	198.	(1)
49.	(3)	99.	(2)	149.	(3)	199.	(2)
50.	(3)	100.	(2)	150.	(3)	200.	(4)

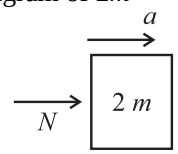
SECTION – I (PHYSICS)

1. **(1)**

Common acceleration $a = \dfrac{F}{m_1 + m_2}$

$a = \dfrac{F}{m + 2m} = \dfrac{F}{3m} \Rightarrow \dfrac{15}{3m}$

Free body diagram of $2m$



$N = 2m \times a = 2m \times \dfrac{15}{3m} = 10\text{N}$

2. **(4)**

$P = \beta \cdot \dfrac{\Delta V}{V}$

$\beta = \dfrac{P \times V}{\Delta V}$;

$P = \rho g h$

$= 2000 \times 1000 \times 9.8$

$= 19.6 \times 10^6\ \text{N m}^{-2}$

$\beta = \dfrac{19.6 \times 10^6 \times 100}{0.04} = 4.90 \times 10^{10}\ \text{N/m}^2$

3. **(4)**

Heat given by water till it comes to 0°C will be used to melt ice.

Heat given by water till it comes to 0°C.

$\Delta Q_1 = ms\Delta T = 40 \times 1 \times (60 - 0) = 2400$ cal.

Heat requires to melt ice completely

$\Delta Q_2 = mL = 50 \times 80 = 4000$ cal.

So only some part of ice will melt

Mass of ice method = $\dfrac{2400}{80} = 30\ g$

Final contents.

Water = 40 + 30 = 70 g

Ice remaining = (50 – 30) = 20 g

$\therefore\ \dfrac{\text{Mass of water}}{\text{Mass of ice}} = \dfrac{70}{20} = \dfrac{7}{2}$

4. **(4)**

$F_v = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1 q_2}{r^2} \cdot F_m = \dfrac{1}{4\pi\varepsilon_0 K}\dfrac{q_1 q_2}{d^2}$

Force in vaccum

$F_v = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1 q_2}{r^2}$

Force in medium

$F_m = \dfrac{1}{4\pi\varepsilon_0 K}\dfrac{q_1 q_2}{d^2}$

Force $F_m = F_v$

$\dfrac{1}{4\pi\varepsilon_0 K}\dfrac{q_1 q_2}{d^2} = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q_1 q_2}{r^2}$

$Kd^2 = r^2$

$\therefore$ Distance $d = \dfrac{r}{\sqrt{K}}$

5. **(1)**

$\dfrac{1}{f} = \left(\dfrac{\mu_2}{\mu_1} - 1\right) \times \left[\dfrac{1}{R_1} - \dfrac{1}{R_2}\right]$

$\dfrac{1}{f_a} = \left({}_a\mu_g - 1\right)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

$\dfrac{1}{f_l} = \left({}_l\mu_g - 1\right)\left(\dfrac{1}{R_1} - \dfrac{1}{R_2}\right)$

$\dfrac{f_l}{f_a} = \dfrac{\left({}_a\mu_g - 1\right)}{\left({}_l\mu_g - 1\right)} = \dfrac{\left(\dfrac{3}{2} - 1\right)}{\left(\dfrac{\dfrac{3}{2}}{\dfrac{5}{4}} - 1\right)} = \dfrac{5}{2}$

$f_l = \dfrac{5}{2} \times 12 = 30$ cm

6. **(2)**

For maxima $d \sin\theta_n = n\lambda$

$\sin\theta_n = \dfrac{n\lambda}{d}$

$\sin\theta_3 = \dfrac{3\lambda}{d} = \dfrac{3 \times 589 \times 10^{-9}}{0.589} = 3 \times 10^{-6}$

$\theta_3 = \sin^{-1}(3 \times 10^{-6})$

7. **(4)**

Given,

$\boxed{\dfrac{I_{\max}}{I_{\min}} = \dfrac{25}{16}}$

We know that

$I_{\max} = (a_1 + a_2)^2$

$I_{\min} = (a_1 - a_2)^2$

$\boxed{\dfrac{I_1}{I_2} = ?}$

We know that

Also

$\dfrac{I_1}{I_2} = \left(\dfrac{a_1}{a_2}\right)^2 = ?$

$\Rightarrow\ \dfrac{I_{\max}}{I_{\min}} = \dfrac{25}{16}$

$\Rightarrow\ \dfrac{(a_1 + a_2)^2}{(a_1 - a_2)^2} = \dfrac{25}{16}$

$\Rightarrow \quad \frac{a_1 \quad a_2}{a_1 - a_2} \quad \frac{5}{4}$

$4a_1 + 4a_2 = 5a_1 - 5a_2$

$-a_1 = -9a_2$

$\boxed{\frac{a_1}{a_2} = \frac{9}{1}}$

Now, $\frac{I_1}{I_2} = \left(\frac{a_1}{a_2}\right)^2 = \left(\frac{9}{1}\right)^2$

$\boxed{I_1 : I_2 = 81:1}$

8. (4)

For sustained interference pattern, sources should be coherent.

Amplitude can be different, phase deference should remain constant but wavelength or frequency should be exactly equal.

9. (3)

For minimum value of m, the final temperature of the mixture must be 0°C.

We know that

Heat lost by steam = Heat gained by ice

$\Rightarrow \quad mL_{vapor} + mC_{water}\,\Delta T = m_i C_{ice}\,\Delta T + m_{ice}\,L_{melt}$

$\Rightarrow \quad m \times 540 + m \times 1 \times 100 = 20 \times 0.5 \times 10 + 20 \times 80$

$\Rightarrow \quad 540\,m + 100\,m = 100 + 1600$

$= 640\,m = 1700$

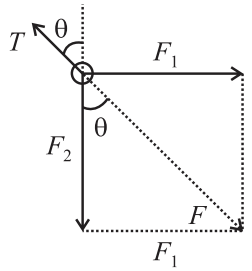
$m = \frac{1700}{640}$

$m = \frac{170}{64} = \boxed{\frac{85}{32}\ \text{gm}}$

10. (4)

In equilibrium, $F_{net} = 0$

From geometry



$\tan\theta = \frac{F_1}{F_2}$

$\tan 53° = \frac{F_1}{F_2}$

$\frac{4}{3} = \frac{F_1}{F_2}$ …(i)

$F_1 = \frac{GMm_1}{d^2}, F_2 = \frac{GMm_2}{d^2}$

$\frac{F_1}{F_2} = \frac{m_1}{m_2}$ …(ii)

$\therefore \frac{4}{3} = \frac{m_1}{m_2}$

11. (2)

Heat transfer rate $\frac{\Delta H}{\Delta t} = \frac{\Delta T}{R}$

In series $R_S = R + R = 2R$

In parallel $R_p = \frac{R}{2}$

$\left(\frac{\Delta H}{\Delta t}\right)_s = \frac{\Delta T}{2R}$ …(i)

$\left(\frac{\Delta H}{\Delta t}\right)_s = \frac{1}{4} \cdot \left(\frac{\Delta H}{\Delta t}\right)_p$

$(\Delta H)_p = (\Delta H)_s = 200$ J

$\therefore (\Delta t)_s = 4 \times (\Delta t)_p$

$(\Delta t)_p = \frac{1}{4} \times (\Delta t)_s = \frac{1}{4} \times 10 = 2.5$ second

12. (4)

$v_p = \frac{dy}{dt}$

$y = 20 \sin(\pi t - 2\pi x)$

$\therefore v_p = \frac{dy}{dt} = 20 \times \pi \times \cos(\pi t - 2\pi x)$

At $t = 0,\ x = \frac{1}{6}$

$v_p = 20\pi \times \left[\cos\left(-\frac{2\pi}{6}\right)\right]$

$= 20\pi \times \left[\frac{1}{2}\right] = 10\pi$ m/s

13. (2)

Time period $T = 2\pi\sqrt{\frac{m}{K_p}}$

$K_p = 200 + 100 = 300$ N/m

$m = 3$ kg

$T = 2\pi\sqrt{\frac{m}{K_p}} = 2 \times \pi \times \sqrt{\frac{3}{300}} = \frac{\pi}{5}$s

14. (1)

$v = \frac{\omega}{k}$ and $B = B_0 \cos(\omega t \pm kx)$

Comparing with $B = B_0 \cos(kx + \omega t)$

$\omega = \pi \times 10^7$ rad/s

$K = \pi \times 0.04\ \text{m}^{-1}$

$v = \frac{\omega}{k} = 2.5 \times 10^8$ m/s

$\therefore$ Refractive index of substance

$\mu = \frac{c}{v} = \frac{3 \times 10^8}{2.5 \times 10^8} = 1.2$

15. (4)

$X_L = \omega L = 2\pi fL, I_0 = \dfrac{E_0}{X_L}$

L = 1 H

$\omega = 2\pi \times 50 = 100\pi$ rad s^{-1}

$X_L = \omega L = 100\pi \times 1 = 100\pi\Omega$

$I_0 = \dfrac{E_0}{X_L} = \dfrac{220\sqrt{2}}{100\pi} = 1\text{A}$

16. (2)

$L = \dfrac{\mu_0 N^2 \pi r^2}{l}$

$\dfrac{l_1}{l_2} = \dfrac{1}{2}$ and $\dfrac{r_1}{r_2} = \dfrac{1}{2}$

$\dfrac{L_1}{L_2} = \left(\dfrac{r_1}{r_2}\right)^2 \times \left(\dfrac{l_2}{l_1}\right) = \left(\dfrac{1}{2}\right)^2 \times \left(\dfrac{2}{1}\right)$

$= \dfrac{1}{2}$

17. (3)

$\dfrac{di}{dt} = \omega^2 q$

$q = 6 \times 10^{-5}\ C;\ C = 25 \times 10^{-6}\ F,\ L = 0.6$ H

$\dfrac{di}{dt} = \omega^2 q = \dfrac{q}{LC} = \dfrac{6\times10^{-5}}{0.6\times25\times10^{-6}} = 4$ A/s

18. (4)

Laminating the core will reduce strength of eddy currents.

Laminating the core, limits the path of eddy currents which reduces strength of eddy currents.

19. (2)

$T = 2\pi\sqrt{\dfrac{l}{MB_H}}$ where $B_H = B\cos\theta$

$T \propto \dfrac{1}{\sqrt{B_H}}$

$\dfrac{T_1}{T_2} = \sqrt{\dfrac{B_2\cos\theta_2}{B_1\cos\theta_1}}$

$\dfrac{B_1}{B_2} = \left(\dfrac{T_2}{T_1}\right)^2 \times \dfrac{\cos\theta_2}{\cos\theta_1} = \left(\dfrac{3}{2}\right)^2 \times \dfrac{\cos 60°}{\cos 30°}$

$= \dfrac{9}{4} \times \dfrac{\left(\dfrac{1}{2}\right)}{\dfrac{\sqrt{3}}{2}} = \dfrac{9}{4\sqrt{3}}$

20. (1)

$B = \dfrac{\mu_0 Nl}{2R}$

Magnetic field at centre, $B = \dfrac{\mu_0 Nl}{2R}$

$B = \dfrac{4\pi\times10^{-7}\times50\times4}{2\times0.1} = 4\pi\times10^{-4}\text{T}$

21. (3)

$qvB = qE \qquad \therefore v = \dfrac{E}{B}$

$v = \dfrac{E}{B} = \dfrac{40}{0.8}$ = 50 m/s

22. (1)

Momentum for colliding bodies.

$\vec{P}_i = m\times(4\hat{i}) + 2m\times(4\hat{j})$

$\vec{P}_i = (m+2m)\vec{v} = 3m\vec{v}$

$\therefore\ \vec{P}_f = \vec{P}_i$

$3m\vec{v} = 4m\hat{i} + 8m\hat{j}$

$\vec{v} = \dfrac{4m\hat{i} + 8m\hat{j}}{3m} = \left(\dfrac{4}{3}\hat{i} + \dfrac{8}{3}\hat{j}\right)$ m/s

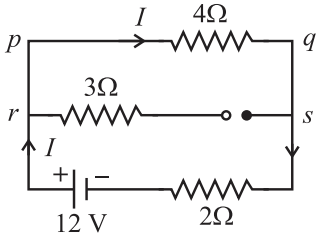
23. (1)

Electrical conductivity of semi-conductor increases on increasing temperature.

Semiconductors have negative temperature coefficient of resistivity. When temperature rises, electric resistivity falls and conductivity increases.

24. (1)

In steady state inductor behaves like short circuited circuit and capacitor as open circuit.



Current in circuit through battery

$I = \dfrac{12}{(2+4)} = 2\text{A}$

$V_{pq} = 4 \times 2 = 8$ V

Also $V_{pq} = V_{rs} = 8$ V

Charge stored $Q = 2 \times 10^{-6} \times 8 = 16 \times 10^{-6}\ C$

25. (1)

In circular motion, tangential and radial accelerations are perpendicular to each other.

$a = \sqrt{a_c^2 + a_t^2}$

v = 20 m/s, r = 100 m

$a_c = \frac{v^2}{r} = \frac{(20)^2}{100}$ = 4 ms^{-2}

a_t = 3 ms^{-2}

$\therefore a = \sqrt{a_c^2 + a_t^2} = \sqrt{(3)^2 + (4)^2}$ = 5 ms^{-2}

26. (3)

Heat supplied in isobaric is used in changing internal energy and performing mechanical work.

$\frac{W}{\Delta Q} = \frac{P\Delta V}{nC_P\Delta T} = \frac{nR\Delta T}{nC_P\Delta T} = \frac{R}{C_P}$

$C_P = \frac{7}{2}R$

$\frac{50}{\Delta Q} = \frac{R}{\frac{7}{2}R} = \frac{2}{7}$

$\Delta Q = \frac{50 \times 7}{2}$ = 175 J

27. (4)

If ϕ' is apparent dip and ϕ is true dip.

$\tan\phi' = \frac{\tan\phi}{\cos\alpha}$, α is angle in horizontal plane through which dip circle is rotated.

$\tan\phi' = \frac{\tan\phi}{\cos\alpha}$; $\phi = 60°$, $\alpha = 60°$

$\tan\phi' = \frac{\tan 60°}{\cos 60°} = \frac{\sqrt{3}}{1/2} = 2\sqrt{3}$

$\phi' = \tan^{-1}(2\sqrt{3})$

28. (4)

Magnetic dipole moment of current loop

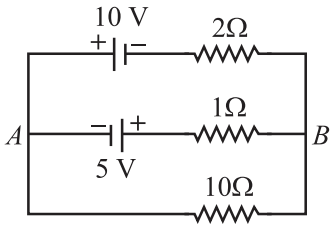
$M = NIA$

Magnetic dipole moment depends on current in loop, loop area and also on number of turns.

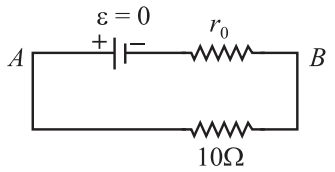
29. (4)

Find equivalent emf of cells and equivalent interval resistance and then redraw the circuit.

$\varepsilon = \frac{\left(\frac{\varepsilon_1}{r_1} - \frac{\varepsilon_2}{r_2}\right)}{\left(\frac{1}{r_1} + \frac{1}{r_2}\right)}$



$\varepsilon = \frac{\left(\frac{10}{2} - \frac{5}{1}\right)}{\left(\frac{1}{2} + \frac{1}{1}\right)} = 0$



$\frac{1}{r_0} = \frac{1}{2} + \frac{1}{1}$

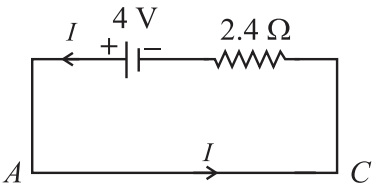
$\frac{1}{r_0} = \frac{1+2}{2}$

$\therefore\ r_0 = \frac{2}{3}\Omega$

No current flows through 10Ω resistor.

30. (1)

Galvanometer will show zero deflection, when emf of 1.5 V battery will be equal to potential drop of AB wire.



$I = \frac{4}{2 + 2.4} = \frac{4}{4.4} = \frac{10}{11}$A

Potential drop across wire *AC*

$V_{AC} = I \times R_{AC} = \frac{10}{11} \times 2 = \frac{20}{11}$ volt.

Potential gradient = $\frac{V_{AC}}{L_{AC}} = \frac{20}{11 \times 100}$ V/cm

Potential fall across wire *AB*

$V_{AB} = \frac{20}{1100} \times I$

$V_{AB} = \varepsilon$ = 1.5 V

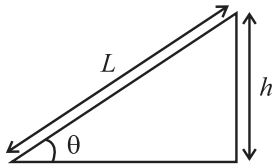
$\therefore \frac{20I}{1100} = 1.5$

$\Rightarrow I = \frac{1.5 \times 1100}{20}$ = 82.5 cm

31. (3)

$$a = \frac{g\sin\theta}{1+\frac{K^2}{R^2}},\ v = \sqrt{\frac{2gh}{\left(1+\frac{K^2}{R^2}\right)}}$$

$$L = \frac{1}{2}at^2 \ \therefore t = \sqrt{\frac{2L}{a}} = \sqrt{\frac{2L\left(1+\frac{K^2}{R^2}\right)}{g\sin\theta}}$$



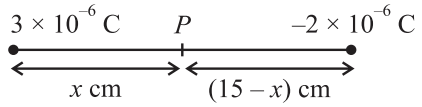
$$\Rightarrow t = \frac{1}{\sin\theta}\sqrt{\frac{2h\left(1+\frac{K^2}{R^2}\right)}{g}}$$

$$v = \sqrt{\frac{2gh}{1+\frac{K^2}{R^2}}}$$

Time of descent (t) depends on θ but speed v is independent of θ.

32. (1)

$V = \frac{Kq}{x}$ and potential is a scalar quantity.



$V_P = V_1 + V_2$

$$= \frac{k\times 3\times 10^{-6}}{x} + \frac{k(-2\times 10^{-6})}{(15-x)} = 0$$

$$\frac{3}{x} + \left(\frac{-2}{15-x}\right) = 0 \qquad \therefore \frac{3}{x} = \frac{2}{(15-x)}$$

$45 - 3x = 2x$

$45 = 5x$ or $x = 9$ cm

33. (2)

$$\Delta\phi = \frac{2\pi}{\lambda}\times(\Delta x), v_p = \frac{dy}{dt}, v_{wave} = \frac{\omega}{k}$$

$y = 0.01\sin(20\pi t - 2\pi x)$

- Wave speed = $\frac{\omega}{k} = \frac{20\pi}{2\pi}$ = 10 m/s
- $k = \frac{2\pi}{\lambda} = 2\pi \ \therefore \lambda = 1$ m

  For 60° phase difference

  Path difference $\Delta x = \frac{\lambda}{2\pi}\times\frac{\pi}{3} = \frac{1}{6}$ m
- Particle velocity = $v_p = \frac{dy}{dt}$

  $(v_p)_{max} = \omega A = 20\pi\times 0.01$

  $= 20\pi\times\frac{1}{100} = \frac{\pi}{5}$ m/s
- For 120° phase change $\Delta t = \frac{T}{2\pi}\times\frac{2\pi}{3}$

  $= \frac{T}{3} = \frac{1}{30}$ s

34. (2)

$$\frac{\Delta Z}{Z} = \frac{3}{2}\frac{\Delta a}{a} + \frac{1}{4}\frac{\Delta b}{b} + \frac{\Delta c}{c}$$

$$\frac{\Delta Z}{Z} = \frac{3}{2}\left(\frac{\Delta a}{a}\right) + \frac{1}{4}\left(\frac{\Delta b}{b}\right) + \frac{\Delta c}{c}$$

$$\therefore \frac{\Delta Z}{Z}\times 100 = \frac{3}{2}(2\%) + \frac{1}{4}(4\%) + (1\%)$$

= 3% + 1% + 1% = 5%

35. (3)

Hint: $V_{av} = \frac{\Delta x}{\Delta t} = \frac{(x_2 - x_1)}{(t_2 - t_1)}$

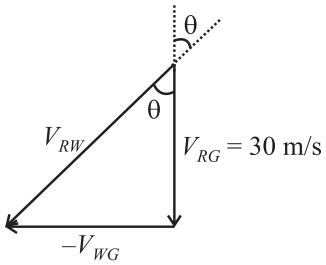
At t = 2 s, $x_1 = 6 + 2.5\times(2)^2 = 16$ m

At t = 4 s, $x_2 = 6 + 2.5\times(4)^2 = 46$ m

$$v_{av} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{(46-16)}{(4-2)} = \frac{30}{2} = 15 \text{ m/s}$$

36. (2)

$V_{RW} = V_{RG} - V_{WG}$



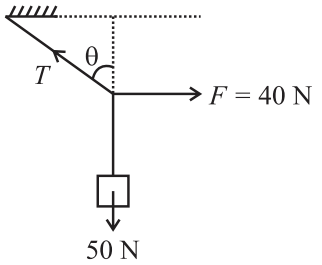
Using triangle law of vectors

$$\tan\theta = \frac{|V_{WG}|}{|V_{RG}|} = \frac{10\sqrt{3}}{30} = \frac{1}{\sqrt{3}}$$

θ = 30°

37. (2)

For equilibrium $\Sigma F_x = 0$ and $\Sigma F_y = 0$



$T\cos\theta = 50$

$T\sin\theta = 40$

$$\Rightarrow \frac{T\sin\theta}{T\cos\theta} = \frac{40}{50} = \frac{4}{5} \Rightarrow \tan\theta = \frac{4}{5}$$

$$\theta = \tan^{-1}\left(\frac{4}{5}\right)$$

38. (3)

Frictional force provides centripetal force.

Maximum frictional force on block = μmg

Centripetal force required = $\frac{mv^2}{r}$

$\frac{mv^2}{r} = \mu mg \qquad \therefore v = \sqrt{\mu rg}$

Speed of point P, $v_p = \omega R = \frac{v}{r} \times R = \frac{\sqrt{\mu rg}}{r} \times R$

$v_p = \sqrt{\frac{\mu g R^2}{r}}$

39. (3)

Area of $F - t$ graph gives changes in momentum.

$\Delta P = 8 \times \left[\frac{5+2}{2}\right] - \frac{1}{2} \times 1 \times (8)$

ΔP = 28 – 4 = 24 kN s.

40. (4)

$g_d = g\left(1 - \frac{d}{R}\right), g_h = g \times \left(\frac{R}{R+h}\right)^2$

$\frac{g_d}{g} - 1 = \frac{-d}{R}$

$\frac{\Delta g}{g} = -\frac{h}{R} \qquad (d = h)$

$\frac{25}{100} = \frac{-h}{R} \qquad \therefore h = \frac{R}{4}$

At height (h) above the surface of earth

$\frac{g_h}{g} = \left(\frac{R}{R + \frac{R}{4}}\right)^2 = \left(\frac{4}{5}\right)^2$

$\Rightarrow \frac{g_h}{g} - 1 = \left(\frac{16}{25} - 1\right) = \frac{-9}{25}$

$\Rightarrow \left(\frac{\Delta g}{g}\right) \times 100 = \frac{-9}{25} \times 100 = -36\%$

41. (2)

$X_{cm} = \frac{\int_0^I \lambda x dx}{\int_0^I \lambda dx}$

$X_{cm} = \frac{\int_0^I \lambda x dx}{\int_0^I \lambda \cdot dx}$ here $\lambda = 2 + 6x$

$X_{cm} = \frac{\int_0^1 (2+6x) x \cdot dx}{\int_0^1 (2+6x) dx} = \frac{\int_0^1 (2xdx + 6x^2 dx)}{\int_0^1 2dx + 6\int_0^1 xdx}$

$X_{cm} = \frac{2\left[\frac{x^2}{2}\right]_0^1 + \frac{6}{3}\left[x^3\right]_0^1}{2\left[x\right]_0^1 + \frac{6}{2}\left[x^2\right]_0^1} = \frac{[1]+[2]}{[2]+[3]} = \frac{3}{5}\text{ m}$

42. (4)

$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

$|\text{Average velocity}| = \frac{|\text{Displacement}|}{\text{Time}}$

Since moving at constant speed, average speed = 20 km/h

Time taken = $\frac{d}{v} = \frac{4}{20}$ hours

$|\text{Average velocity}| = \frac{|\text{Displacement}|}{\text{Time}} = \frac{2\sqrt{2}}{\left(\frac{4}{20}\right)}$

$= \frac{20\sqrt{2} \times 2}{4} = 10\sqrt{2}$ km/h.

43. (4)

$\omega = \frac{d\theta}{dt}$ and $\alpha = \frac{d\omega}{dt}$

$\theta = \sqrt{t^2 + 1}$

$\omega = \frac{d\theta}{dt} = \frac{d}{dt}(t^2+1)^{1/2} = \frac{1}{2}(t^2+1)^{-1/2} \times 2t$

$\omega = t \times \frac{1}{\sqrt{t^2+1}} = \frac{t}{\sqrt{t^2+1}}$

$\alpha = \frac{d\omega}{dt} = \frac{\sqrt{t^2+1} \times \frac{d}{dt}(t) - t \times \frac{d}{dt}\sqrt{t^2+1}}{(t^2+1)}$

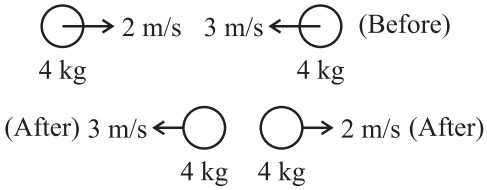
$\alpha = \frac{\sqrt{t^2+1} - t \times \frac{1}{2} \times \frac{1}{\sqrt{t^2+1}} \times 2t}{(t^2+1)}$

$\alpha = \frac{1}{\sqrt{t^2+1}} - \frac{t^2}{(t^2+1)^{3/2}}$ (But $\theta = \sqrt{t^2+1}$)

$\alpha = \frac{1}{\theta} - \frac{t^2}{\theta^3}$

44. (3)

In elastic collision when masses are equal particles interchange velocities after collision.

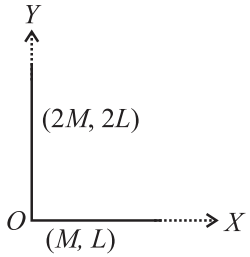


Impulse = $|\Delta P| = 4 \times [3 + 2] = 20$ N s

45. (1)

$$X_{cm} = \frac{m_1x_1 + m_2x_2}{m_1 + m_2}$$

$$Y_{cm} = \frac{m_1y_1 + m_2y_2}{m_1 + m_2}$$



$$X_{cm} = \frac{M\left(\frac{L}{2}\right) + 2M(0)}{M + 2M} = \frac{L}{6}$$

$$Y_{cm} = \frac{M(0) + 2M(L)}{M + 2M} = \frac{2L}{3}$$

$$(X_{cm}, Y_{cm}) \rightarrow \left(\frac{L}{6}, \frac{2L}{3}\right)$$

46. (4)

Fact based.

47. (2)

Fact based.

48. (1)

Fact based.

49. (3)

Fact based.

50. (3)

Fact based.

SECTION – II (CHEMISTRY)

51. (3)

Specific volume of a substance is the volume occupied by a mass.

52. (1)

Fact-based question.

53. (3)

Triple point.

54. (2)

Fact-based question.

55. (2)

Oxygen of cyclohexanol acts as a nucleophile and attacks the electrophilic carbonyl carbon of acetyl chloride to give tetrahedral intermediate which collapses to give cyclohexyl acetate due to good leaving group chloro and acetate.

56. (1)

Lower pK_a of a conjugate acid of a leaving group means that leaving group is a weaker base hence can exist as leaving group.

57. (4)

HCP and CCP

58. (4)

(i) Mass of 1 g atom of N = 14 g

(ii) Mass of 1 atom of Ag = $\frac{1}{108}$ g

(iii) 10^{23} atom of carbon $\Rightarrow \frac{12 \times 10^{23}}{6.022 \times 10^{23}} \approx 2$g

(iv) 1 mole of Ca = 40 g

59. (2)

Beta polymorph of tin is known as white tin.

60. (2)

Density of water = 1 g cm^{-3}

Thus, 1000 cm^3 (or 1 dm^3) has a mass of 1000 g

For H_2O, M = 18 g/mol

Number of moles in 1000 g

$= \frac{1000}{18} = 55.5$ = Number of moles per dm^3

61. (3)

m = $-l$ to $+l$

For $l = 0$, m = 0 only

62. (2)

Nucleic acid control the synthesis of protein.

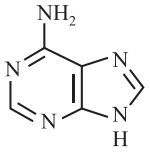
63. (2)

Pyruvic acid is 2-oxo-propanoic acid.

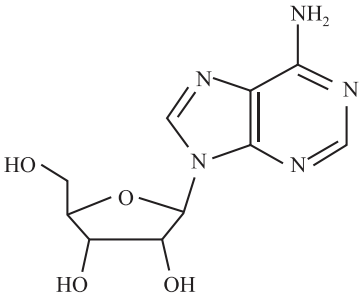
64. **(2)**

Maltose is a disaccharide of glucose.

65. **(3)**



Adenine



Adenosine

66. **(1)**

Fact-based question.

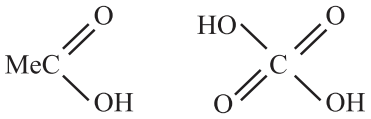
67. **(2)**

Due to loosely held and weak pi-bond of alkene makes it nucleophilic.

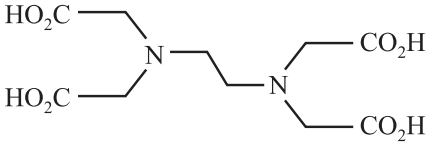
68. **(2)**

$O_2^+ = 2.5;\ O_2 = 2;\ O_2^- = 1.5\ \left(e^{\ominus} \text{is added to ABMO}\right)$

69. **(3)**



Structure of acetic acid and oxalic acid



H_4EDTA

70. **(1)**

2–chloro–3–(N, N-dimethylamino) propanoic acid correct

71. **(2)**

$pK_a + pK_b = 14$

72. **(1)**

$pK_b = -\log(K_b)$

73. **(3)**

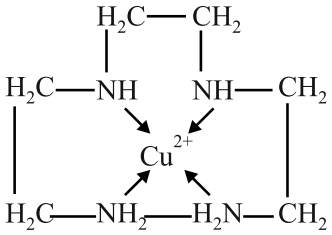
Fact based question.

74. **(1)**

Fact based question.

75. **(4)**

76. **(3)**



77. **(2)**

$\left[MnO_4\right]^- = +7$, $MnCl_2 = +2$

78. **(4)**

Fact based question.

79. **(3)**

Teflon is a polymer of tetrafluoroethene.

80. **(3)**

IV only can show

81. **(1)**

Fact based question.

82. **(2)**

The hybridisation of S is sp^3.

83. **(1)**

Electron deficient borane dimerises to give diborane in 3c-2e bonds are present.

84. **(3)**

Fact based question.

85. **(3)**

A pairs with T and G pairs with C and 5' pairs with 3'.

86. **(1)**

The order of energy of conformations of cyclohexane is:

Half chair > boat > twist boat > chair.

87. **(4)**

A carbocation has to be planar, so the carbocation at a bridge head is very unstable.

88. (3)

(3) is correct due to +M stabilization by 'O'

89. (3)

Negative charge means expansion of electron cloud and positive charge means compression of electron cloud.

90. (4)

Case-I:– No. of moles of X = Y

$$x_x = X_y = 0.5$$

$$P_S = P_x^o x_x + P_y^o x_y$$

$$400 = 0.5p_x^o + 0.5p_y^o \Rightarrow p_x^o + p_y^o = 800 \quad \ldots\ldots(i)$$

Case-II:– $X_x = \frac{1}{3}, x_y = \frac{2}{3}$

$$p_x^o + 2p_y^o = 1050 \quad \ldots\ldots\ldots..(ii)$$

From (i) and (ii)

$p_x^o = 550$ mm, $p_y^o = 250$ mm

91. (3)

Calculate the total electron pair around central atom.

92. (4)

The formula is $CuSO_4.5H_2O$

93. (4)

Fact based question.

94. (3)

Fact based question.

95. (1)

Fact based question.

96. (4)

97. (4)

At equation,

$$E_{cell}^o = \frac{0.0591}{n}\log K \quad (n = 2)$$

$$\log k = \frac{0.46 \times 2}{0.0591} = 15.56$$

$$\boxed{k = 4.0 \times 10^{15}}$$

98. (4)

Fact based question.

99. (2)

Primary amine gives soluble in alkali medium, secondary amine gives insoluble in alkali medium, tertiary amine do not react with Hinsberg reagent.

100. (2)

Rate depends on slow step

$$r = k[O][O_3] \quad \ldots\ldots\ldots..(i)$$

Using equation reaction, $k_A = \frac{[O_2][O]}{[O_3]}$

$$O = \frac{k_A[O_3]}{[O_2]} \quad \ldots\ldots\ldots..(ii)$$

Putting in equation (i)

$$r = [O_3]^2[O_2]^{-1}$$

SECTION – III (BOTANY)

101. (3)

The amount of carbon fixed during photosynthesis by all produces in the ecosystem is gross primary productivity.

102. (4)

$$\frac{\text{stages of succession}}{\text{lichens} \rightarrow \text{mosses} \rightarrow \text{grasses} \rightarrow}$$

$\rightarrow$Shrubs$\rightarrow$Trees

103. (4)

The term biodiversity is popularised by Edward Wilson .

104. (1)

Keystone species deserves protection because they play an important role in supporting other species

105. (1)

106. (1)

Hepatitis -B is not a waterborne disease.

107. (2)

Biopesticide$\rightarrow$Bt

Root nodules $\rightarrow$ mycorrhiza

Diptheria$\rightarrow$ gal ghotu

Blood cholesterol lowering agent ------*Monascus purpurens*.

108. (2)

BOD = 0 (Pure water)

BOD high $\rightarrow$Highly polluted water

109. (1)

Pusa Gaurav is hybrid variety of rapeseed mustard

110. (4)

Taylor and colleagues perfumed Radioactive thymidine experiments on *Vicia faba*

111. (2)

The process of copying genetic information from one strand of DNA into RNA is termed as Transcription

112. (3)

(A) Structure gene → codes for protein

(B) Regulator Gene → Codes for repressor Molecule

(C) Promotor site → Binding site For RNA Polymerase.

(D) Operator site → Binding site for Repressor

113. (1)

Monosomy is another type of aneuploidy in which there is a missing chromosome

114. (3)

The abnormal gene responsible for haemophilia is carried on the X chromosome. Haemophilia is an X-linked recessive hereditary disorder

115. (4)

In Polygenic inheritance, many genes control Single character.

116. (3)

Genes located very close to one another on same Chromosome tend to transmitted together and are called linked-genes.

117. (2)

A) *Penicillium*→Conidiospores

B) Rose plant → Stem cutting

C) *Spirogyra*→ Zoospores

D) *Solanum tuberosum*→ Stem tubers

118. (4)

ISOGAMY → ⊙ ⊙

(Similar gametes)

ANISOGAMY → ⊙ ⊙~

(Dissimilar gametes)

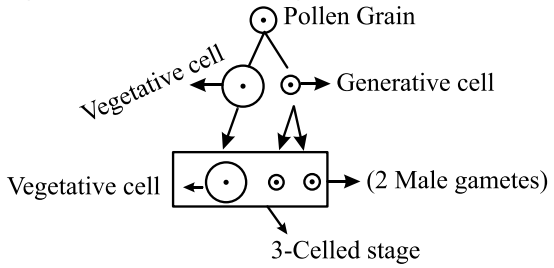
similar gametes → Isogamy

dissimilar gametes

→Oogamy (anisogamy)

119. (2)

3-Celled Stage of Pollen grain consist of I vegetative cell and 2 male gametes



120. (4)

Tapetum is associated with synthesis of callase enzyme, Transportation of nutrients, pollen wall formation.

121. (2)

The following phenomenon is chemotropism (pollen tube formation)

122. (1)

During fertilisation pollen tube usually enters the embryo sac through micropyle

123. (2)

In some bacteria small bristle like fibres sporting out cell which aid in attachment are **fimbriae**.

124. (1)

Size of Ribosomes varies from 15 nm – 20nm.

125. (1)

126. (2)

A → Outer membrane

B → Matrix

C → Crista

127. (1)

128. (1)

Lysine and arginine are basic amino acids they contain amino group than acidic group

129. (2)

Interphase Include G_1 Phase (cell Growth)

S Phase (DNA Synthesis)

G_2 Phase (Cell Growth)

130. (3)

A → Metaphase

B → Transition to Metaphase

C → Late Prophase

D → Early Prophase

131. (1)

To Produce 1998 Seeds, we required 1988 pollen grains

1 Pollen Mother cell $\rightarrow$ 4 Pollen grain

$\times \leftarrow$ 1988 Pollen grain

$x = 1988 \times \frac{1}{4}$ = 497 P.M.C

132. (3)

Mitosis is characterized by Equal division also called Equational division.

133. (4)

During Anaphase I of meiosis homologous Chromosomes Separate.

134. (4)

135. (4)

Wood formed during winter Season is called autumn wood (or) late wood

136. (3)

Phelloderm is also called as secondary cortex

137. (3)

A $\rightarrow$ Parental Placentation

B $\rightarrow$Axile Placentation

C $\rightarrow$ Marginal Placentation

138. (3)

Sweet Pea (*Lathyrus*) belongs to Fabaceae and is an ornamental plant

139. (1)

Belladonna belongs to family Solanaceae and is medicinal plant.

140. (1)

141. (3)

Leaf tip tendrils are present in *Gloriosa superba*.

142. (1)

143. (3)

Gemmae are unsexual bodies of Liver Worts.

144. (4)

In **Rhodophyceae** major pigments Presents are **chlorophyll a**, **d**

145. (2)

146. (4)

Nepenthes, venus fly trap and, bladder wart are insectivorous plants.

147. (4)

Yeast belongs to class Ascomycetes

148. (1)

(A) Viroids$\rightarrow$ T.O. Diener

(B) Prions $\rightarrow$ Cr-Jacob disease

(C) Crystallography technique of viruses$\rightarrow$W. M Stanley

(D) Poisonous fluid $\rightarrow$ Pasteur D.J Ivanowsky.

149. (3)

Trypanosoma is a flagellated Protozoan

150. (3)

Fabaceae belongs to order fabales.

SECTION – IV (ZOOLOGY)

151. (4)

Excretion in Arthropods take place by malpighian tubule, green gland and coxal gland.

152. (4)

Water vascular system is found in echinoderms (star fish) but sycon has water canal system.

153. (3)

The amphibians are characterised by scale less, smooth, moist and glandular skin.

154. (4)

Bacillus thuringiensis - Cry proteins

Thermus aquaticus - DNA polymerase

Agrobacterium tumefaciens - Cloning vectors

Salmonella typhimurium - Construction of first rDNA

155. (3)

Macropus = Kangaroo, Monkey = *Macaca*, Dog = *Canis*, Tiger = *Panthera*.

156. (4)

Ciliated epithelium is found in oviduct, trachea and brain ventricle.

157. (1)

Large amoeboid cells, that are a part of our innate immune system, found in the areolar tissue are called as macrophages.

158. (3)

Cockroach are uricotelic excrete uric acid.

159. (1)

Substances having identifiable function and play known role in normal physiological functions of a cells are called as primary metabolites.

160. (1)

Agar is a muconopolysaccharide.

161. (1)

Pentoses and hexoses are monosaccharide and monosaccharide cannot be hydrolysed further.

162. (3)

Living organisms have more nitrogen and oxygen per unit mass than inanimate objects.

Living organisms have less Ca, Mg and Na than inanimate objects.

163. (3)

Fats have high melting point and oils have low melting point.

164. (4)

The spread of bird flu can be prevented by culling and separation of infected birds from the separation of flocks of undiseased ones.

165. (2)

Fats are absorbed passively as fatty acids and monoglycerides.

166. (2)

Symbiotic microorganisms normally occur in human body in caecum.

167. (2)

Fructose is absorbed into the blood through mucosa cells of the small intestine by the process called facilitated transport.

168. (3)

Fetal haemoglobin differ from adult haemoglobin in structure and its affinity for O_2.

169. (1)

pO_2 and pCO_2 in atmosphere is 159 mmHg and 0.3 mmHg.

170. (3)

Most fishes when taken out of water die due to suffocation. Atmospheric air contains more oxygen content than dissolved oxygen in water.

171. (3)

Heart is protected by double walled membranous bag called pericardium.

172. (2)

Blood protein that mainly help in maintaining osmotic balance is albumin.

173. (2)

Cortical nephrons are majority of nephrons.

174. (4)

Glomerular filteration, reabsorption and tubular secretion are involved in urine formation.

175. (3)

The epithelial cells of Bowman's capsule are called Podocytes. Podocytes are arranged in intricate manner so as to leave some minute spaces called as filteration slits

176. (2)

Magnesium ions are required in the polymerisation of G-actin into F-actin.

177. (1)

Elbow joint is an example of Hinge joint.

178. (2)

Source of Ca^{2+} for muscle contraction is both sarcoplasmic reticulum as well as extracellular fluid in case of smooth and cardiac muscles.

179. (4)

Olfactory is not a lobe of cerebral hemisphere.

180. (4)

Spinal cord controls most of the reflex activities.

181. (1)

Pitutary gland is located in the bony cavity of sphenoid bone.

182. (2)

Hormone responsible for causing grave's disease is Thyroxine.

183. (3)
Infundibulum is the part closest to the ovary.

184. (3)
Part C in the labelled diagram produce energy for the movement of tail that facilitate sperm motility essential for fertilisation.

185. (2)
During copulation semen is released by penis into vagina.

186. (2)
Emergency contraceptives are effective if used within 72 hours of coitus.

187. (2)
Origin of earth date back to 4000-4500 million years back.

188. (3)
Louis pasteur finally refuted the theory of spontaneous generation and experimentally disproved it.

189. (2)
Formation of amino acid were observed by S.L. Miller in his experiment.

190. (1)
Cytokine barrier include interferons.

191. (1)
IgA is the antibody that is found in colostrum.

192. (4)
Pneumatic bones are found in *Corvus*.

193. (2)
Cancer is non-infectious and most common fatal disease of human beings.

194. (1)
The amount of adenine is always equal to thymine

195. (2)
The chemical stored in the synaptic vesicles are termed as neurotransmitters. Synaptic vesicles release these chemicals in the synaptic cleft.

196. (4)
Thyroid hormones (T3 and T4) are not steroid hormones but still do not act through second messenger system, are small, nonpolar and can be taken orally.

197. (2)
pBR-322 is a plasmid

198. (1)
Gel electrophoresis separates DNA molecules according to their size.

199. (2)
The Bacterium *Bacillus thringinesis* is widely used in contemporary biology as Bio-insecticides.

200. (4)
The inter-atrial septum in the human heart can be best described as a thin muscular wall.