Phase - 1

AJMAL SUPER 40

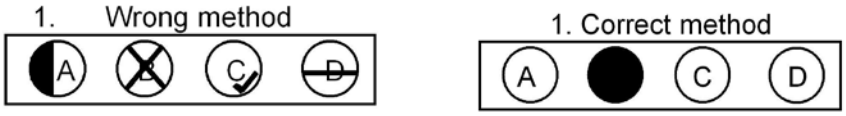
AJMAL SUPER 40 ENTRANCE TEST - 2020

FOR 12th PASSED/APPEARING [REPEATERS]

Conducted by : **AJMAL FOUNDATION, Hojai**

INSTRUCTIONS TO CANDIDATE

1. Candidates are to use the Answer Sheet provided.
2. Ensure that you fill in your **Registration No.** correctly in the space provided in the OMR sheet as shown in the example there.
3. Candidates are required to mark the correct answer choice by **shading** the circle completely with blue or black ball point pen. (Pen of any other colour or pencil is not allowed). For example, if the correct answer to question no 1. is 'B' then the marking should be:



4. Write your details on the OMR sheet which are asked for.
5. Only one circle, i.e. the correct one should be shaded. Shading more than one circle will render the answer invalid.
6. A candidate having completed his/her **ANSWER SHEET** must hand it over, even if blank, to the invigilator.
7. An examinee must not bring any loose paper, book, etc. to the Examination Hall. Any examinee found in possession of even loose papers will be EXPELLED.
8. An examinee must not talk to, disturb or seek help from a fellow examinee during the examination.
9. Any mechanical or digital calculating device (calculator etc.) shall not be used by the examinee during the examination.
10. No candidate will be allowed to leave the Examination Hall during the first hour of the examination.
11. For each correct answer 4 marks will be awarded and for each incorrect answer 1 mark will be deducted
12. Duration of the exam is 03 hours from 11:00 AM to 02:00 PM.
13. For Class XII [Med] Passed/Appearing, Students are asked to use the OMR from 01 to 180.
    For Class XII[Engg] Passed/Appearing, Students are asked to use the OMR from 01 to 120.

Medical			Engineering		
Subject	Questions	Marks	Subject	Questions	Marks
Physics	45	180	Physics	45	180
Chemistry	45	180	Chemistry	45	180
Botany	45	180	Math	30	120
Zoology	45	180			
Total	**180**	**720**	**Total**	**120**	**480**

14. Contravention of any of the instruction mentioned above shall render a candidate liable for disciplinary action as per rule.

Your Registration Number (Write in OMR from here)	Invigilators Signature

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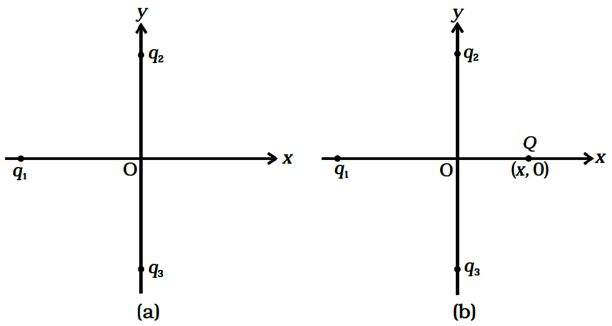
PHYSICS

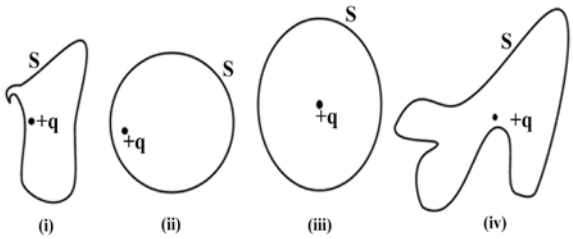
1. In the given **Fig** two positive charges q_2 and q_3 fixed along the y axis, exert a net electric force in the $+x$ direction on a charge q_1 fixed along the x axis. If a positive charge Q is added at (x, 0), the force on q_1

(A) shall increase along the positive x-axis.
(B) shall decrease along the positive x-axis.
(C) shall point along the negative x-axis.
(D) shall increase but the direction changes because of the intersection of Q with q_2 and q_3.



2. The Electric flux through the surface

(A) in Fig. (iv) is the largest.
(B) in Fig. (iii) is the least
(C) in Fig. (ii) is same as Fig. (iii) but is smaller than Fig. (iv)
(D) is the same for all the figures.

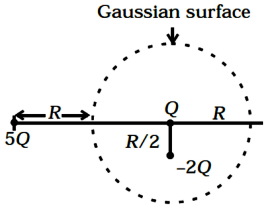


3. A hemisphere is uniformely charged positively. The electric field at a point on a diameter away from the centre is directed
(A) perpendicular to the diameter (B) parallel to the diameter
(C) at an angle tilted towards the diameter (D) at an angle tilted away from the diameter

4. If $\oint \vec{E}.d\vec{s} = 0$ over a surface, then which of the following statements are correct :
(1) the electric field inside the surface and on it is zero.
(2) the electric field inside the surface is necessarily uniform.
(3) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.
(4) all charges must necessarily be outside the surface.
(A) 1 and 2 (B) 2 and 3 (C) 3 and 4 (D) 1 and 4

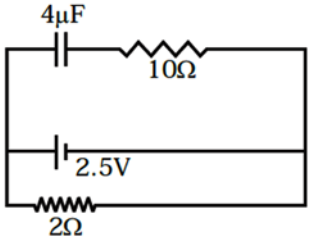
5. Refer to the arrangement of charges in the given **Fig** and a Gaussian surface of radius R with Q at the centre. Then

(A) field on the surface of the sphere is $\frac{-Q}{-4\pi\varepsilon_0 R^2}$
(B) flux through the surface of sphere due to 5Q is zero
(C) field on the surface of sphere due to – 2Q is same everywhere
(D) None of these



6. A capacitor of $4\mu F$ is connected as shown in the circuit. The internal resistance of the battery is 0.5Ω. The amount of charge on the capacitor plates will be

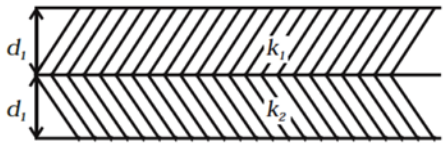
(A) 0
(B) $4\mu C$
(C) $16\mu C$
(D) $8\mu C$



7. A positively charged particle is released from rest in an uniform electric field. The electric potential energy of the charge
(A) remains a constant because the electric field is uniform.
(B) increases because the charge moves along the electric field.
(C) decreases because the charge moves along the electric field.
(D) decreases because the charge moves opposite to the electric field.

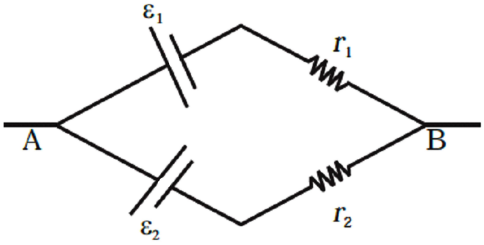
8. Equipotentials at a great distance from a collection of charges whose total sum is not zero are approximately
(A) spheres (B) planes (C) paraboloids (D) ellipsoids

9. A parallel plate capacitor is made of two dielectric blocks in series. One of the blocks has thickness d_1 and dielectric constant k_1 and the other has thickness d_2 and dielectric constant k_2 as shown in figure. This arrangement can be thought as a dielectric slab of thickness d $(= d_1 + d_2)$ and effective dielectric constant *k*. The *k* is



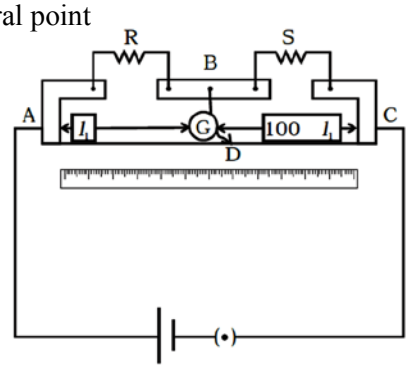
(A) $\frac{k_1 d_1 + k_2 d_2}{d_1 + d_2}$ (B) $\frac{k_1 d_1 + k_2 d_2}{k_1 + k_2}$ (C) $\frac{k_1 k_2 (d_1 + d_2)}{k_1 d_2 + k_2 d_1}$ (D) $\frac{2k_1 k_2}{k_1 + k_2}$

10. Two batteries of emf ε_1 and ε_2 $(\varepsilon_2 > \varepsilon_1)$ and internal resistances r_1 and r_2 respectively are connected in parallel as shown in figure.



(A) The equivalent emf ε_{eq} of the two cells is between ε_1 and ε_2, i.e. $\varepsilon_1 < \varepsilon_{eq} < \varepsilon_2$
(B) The equivalent emf ε_{eq} is smaller than ε_1
(C) The ε_{eq} is given by $\varepsilon_{eq} = \varepsilon_1 + \varepsilon_2$ always
(D) ε_{eq} is independent of internal resistances r_1 and r_2

11. In a meter bridge the point D is a neutral point



(A) When the jockey contacts a point on meter wire left of D, current flows to B from the wire.
(B) When the jockey contacts a point on the meter wire to the right of D, current flows from B to the wire through galvanometer.
(C) When R is increased, the neutral point shifts to left.
(D) The meter bridge can have many neutral point for this set of resistances.

12. Kirchhoff 's junction rule is a reflection of
(A) Conservation of current density vector
(B) The fact that the momentum with which a charged particle approaches a junction is unchanged (as a vector) as the charged particle leaves the junction
(C) The fact that there is no accumulation of charges at a junction
(D) All of the above

13. Two cells of emf's approximately 5V and 10V are to be accurately compared using a potentiometer of length 400 cm.
(A) The battery that runs the potentiometer should have voltage of 8V
(B) The battery of potentiometer can have a voltage of 15V and R adjusted so that the potential drop across the wire slightly exceeds 10V.
(C) The first portion of 50 cm of wire itself should have a potential drop of 10V.
(D) Potentiometer is usually used for comparing resistances and not voltages.

14. Two charged particles traverse identical helical paths in a completely opposite sense in a uniform magnetic field B = $B_0 \hat{k}$
(A) They have equal z-components of momenta
(B) They must have equal charges
(C) They necessarily represent a particle-antiparticle pair
(D) The charge to mass ratio satisfy : $\left(e/m\right)_1 + \left(e/m\right)_2 = 0$

15. Biot-Savart law indicates that the moving electrons (velocity v) produce a magnetic field B such that
(A) $B \perp v$ (B) $B \parallel v$ (C) It obeys inverse cube law
(D) It is along the line joining the electron and point of observation

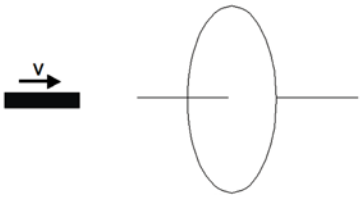
16. In a cyclotron, a charged particle
(A) undergoes acceleration all the time. (B) speeds up between the dees because of the magnetic field.
(C) speeds up in a dee. (D) slows down within a dee and speeds up between dees.

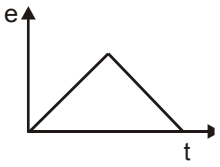
17. A circular current loop of magnetic moment M is in an arbitrary orientation in an external magnetic field B. The work done to rotate the loop by 30° about an axis perpendicular to its plane is
(A) MB (B) $\frac{\sqrt{3}}{2}MB$ (C) $\frac{MB}{2}$ (D) zero

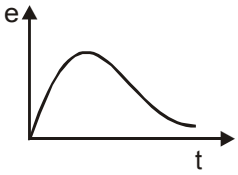
18. A toroid of n turns, mean radius R and cross-sectional radius a carries current I. It is placed on a horizontal table taken as x-y plane. Its magnetic moment m
(A) is non-zero and points in the z-direction by symmetry
(B) points along the axis of the toroid ($m = m\hat{\varphi}$)
(C) is zero, otherwise there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid.
(D) is pointing radially outwards.

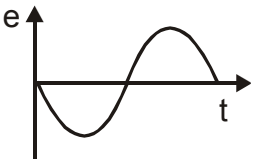
19. A paramagnetic sample shows a net magnetisation of 8 Am^{-1} when placed in an external magnetic field of 0.6 T at a temperature of 4K. When the same sample is placed in an external magnetic field of 0.2 T at a temperature of 16K, the magnetisation will be
(A) 32 Am^{-1} (B) 2 Am^{-1} (C) 6 Am^{-1} (D) 2.4 Am^{-1}

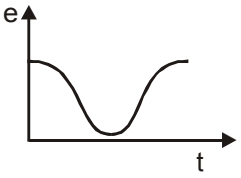
20. A bar magnet is moved with constant velocity as shown which of the following best depicts emf induced as time –



(A) 

(B) 

(C) 

(D) 

21. Let the magnetic field on earth be modelled by that of a point magnetic dipole at the centre of earth. The angle of dip at a point on the geographical equator
(A) can be zero at specific points. (B) can be positive or negative.
(C) is bounded. (D) All of the above

22. A square of side L meters lies in the x-y plane in a region, where the magnetic field is given by, $B = B_0\ (\hat{i} + \hat{j} + \hat{k})$ where B_0 is constant. The magnitude of flux passing through the square is
(A) $2B_0\ L^2$ Wb (B) $3B_0\ L^2$ Wb (C) $4B_0\ L^2$ Wb (D) $\sqrt{29}\ B_0\ L^2$ Wb

23. Unpolarized light intensity 32 Wm^{-2} passes through three polarizers such that the transmission axis of the last polarizer is crossed with that of the first. The intensity of final emerging light is 3 Wm^{-2}. Find : (i) intensity of light transmitted by first polarizer. (ii) the angle between the transmission axes of the first two polarizers.(iii) angle for which the transmitted intensity will be maximum -
(A) $32Wm^{-2}, 10^\circ, 15^\circ$ (B) $16Wm^{-2}, 30^\circ, 45^\circ$ (C) $8Wm^{-2}, 45^\circ, 30^\circ$ (D) $4Wm^{-2}, 60^\circ, 60^\circ$

24. The mutual inductance M_{12} of coil 1 with respect to coil 2
(A) increases when they are brought nearer (B) depends on the current passing through the coils.
(C) increases when one of them is rotated about an axis.
(D) decreases when they are brought nearer.

25. The self inductance L of a solenoid of length l and area of cross section A, with a fixed number of turns N increases as
(A) l and A increase (B) l decreases and A increases
(C) l increases and A decreases (D) both l and A decrease

26. An e.m.f is produced in a coil, which is not connected to an external voltage source. This can be due to
(A) the coil being in a time varying magnetic field. (B) the coil moving in a time varying magnetic field.
(C) the coil moving in a constant magnetic field. (D) All of the above.

27. If the rms current in a 50 Hz ac circuit is 5 A, the value of the current 1/300 seconds after its value becomes zero is

(A) $5\sqrt{2}$ A (B) $5\sqrt{(3/2)}$A (C) 5/6 A (D) $5/\sqrt{2}$ A

28. When a thin film of thickness *t* is placed in the path of light wave emerging out of S_1 then increase in the length of optical path will be-

(A) $(\mu-1)t$ (B) $(\mu+1)t$ (C) μt (D) $\frac{\mu}{t}$

29. As the frequency of an ac circuit increases, the current first increases and then decreases. What combination of circuit elements is most likely to comprise the circuit?

(A) Inductor and capacitor(B) Resistor and inductor
(C) Resistor and capacitor (D) Inductor only

30. The line that draws power supply to your house from street has

(A) Zero average current
(B) 220 V average voltage
(C) voltage and current out of phase by 90°.
(D) voltage and current possibly differing in phase φ such that $|\Phi| > \pi/2$.

31. A linearly polarized electromagnetic wave given as E = $E_0\hat{i}$ cos(kz-wt) is incident normally on a perfectly reflecting infinite wall at $z = a$. Assuming that the material of the wall is optically inactive, the reflected wave will be given as

(A) Er = $-E_0\hat{i}$ cos (kz – wt) (B) Er = $E_0\hat{i}$ cos (kz + wt)

(C) Er = $-E_0\hat{i}$ cos (kz + wt) (D) Er = $E_0\hat{i}$ sin (kz – wt)

32. The electric field intensity produced by the radiations coming from 100 W bulb at a 3 m distance is E. The electric field intensity produced by the radiations coming from 50 W bulb at the same distance is

(A) E / 2 (B) 2 E (C) $E/\sqrt{2}$ (D) $\sqrt{2}E$

33. A ray of light incident at an angle θ on a refracting face of a prism emerges from the other face normally. If the angle of the prism is 5° and the prism is made of a material of refractive index 1.5, the angle of incidence is

(A) 7.5° (B) 5° (C) 15° (D) 2.5°

34. An object approaches a convergent lens from the left of the lens with a uniform speed 5 m/s and stops at the focus. The image

(A) moves away from the lens with an uniform speed 5 m/s
(B) moves away from the lens with an uniform acceleration
(C) moves away from the lens with a non-uniform acceleration
(D) moves towards the lens with a non-uniform acceleration

35. A magnifying glass is used, as the object to be viewed can be brought closer to the eye than the normal near point. This results in

(A) the formation of a virtual erect image (B) increase in the field of view
(C) infinite magnification at the near point (D) None of these

36. An astronomical refractive telescope has an objective of focal length 20m and an eyepiece of focal length 2cm.

(A) The length of the telescope tube is 20.02m. (B) The magnification is 1000
(C) The image formed is inverted. (D) All of the above

37. Consider the diffraction pattern for a small pinhole. As the size of the hole is increased

(A) the size decreases (B) the size increases
(C) the intensity decreases (D) size and intensity will not change

38. For light diverging from a point source than which of the following is/are correct

(1) the wave front is spherical. (2) the intensity decreases in proportion to the distance squared.
(3) the wave front is parabolic. (4) the intensity at the wave front does not depend on the distance.
(A) Both 1 and 3 (B) Both 1 and 2 (C) only 1 (D) Both 1 and 4

39. Taking the Bohr radius as $a_0 = 53$ pm, the radius of Li^{2+} ion in its ground state, on the basis of Bohr's model, will be about

(A) 53 pm (B) 27 pm (C) 18 pm (D) 13 pm

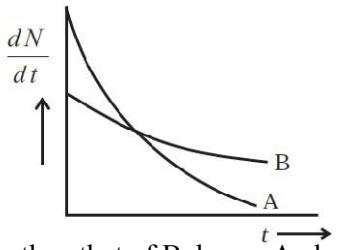
40. The simple Bohr model cannot be directly applied to calculate the energy levels of an atom with many electrons. This is because

(A) of the electrons not being subject to a central force.
(B) of the electrons colliding with each other
(C) of screening effects
(D) the force between the nucleus and an electron will no longer be given by Coulomb's law.

41. Two H atoms in the ground state collide inelastically. The maximum amount by which their combined kinetic energy is reduced is

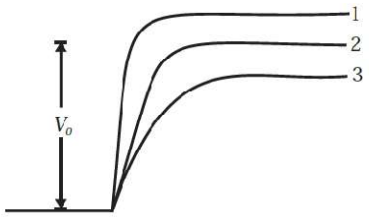
(A) 10.20 eV (B) 20.40 eV (C) 13.6 eV (D) 27.2 eV

42. The variation of decay rate of two radioactive samples A and B with time is shown in **Fig.** Which of the following statement is true?



(A) Decay constant of A is greater than that of B, hence A always decays faster than B.
(B) Decay constant of B is greater than that of A but its decay rate is always smaller than that of A.
(C) Decay constant of B is smaller than that of A but still its decay rate becomes equal to that of A at a later instant.
(D) Decay constant of A is smaller than that of B but it does not always decay faster than B.

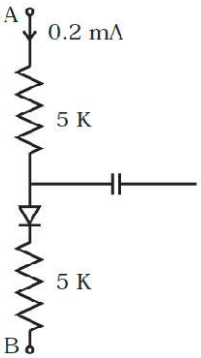
43. In V_o is the potential barrier across a p-n junction, when no battery is connected across the junction



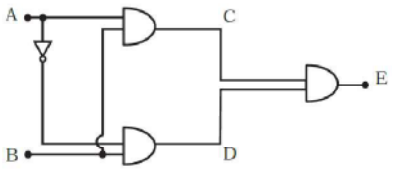
(A) 1 and 3 both correspond to forward bias of junction
(B) 3 corresponds to forward bias of junction and 1 corresponds to reverse bias of junction
(C) 1 corresponds to forward bias and 3 corresponds to reverse bias of junction.
(D) 3 and 1 both correspond to reverse bias of junction.

44. In the circuit shown in fig. if the diode forward voltage drop is 0.3 V, the voltage difference between A and B is

(A) 1.3 V
(B) 2.3 V
(C) 0
(D) 0.5 V



45. Truth table for the given circuit is



(A)

A	B	E
0	0	1
0	1	0
1	0	1
1	1	0

(B)

A	B	E
0	0	1
0	1	0
1	0	0
1	1	1

(C)

A	B	E
0	0	0
0	1	1
1	0	1
1	1	0

(D) None of these

CHEMISTRY

46. Schottky defect is observed in crystals when_____.
    (A) some cations move from their lattice site to interstitial sites.
    (B) equal number of cations and anions are missing from the lattice.
    (C) some lattice sites are occupied by electrons.
    (D) some impurity is present in the lattice.

47. If two liquids A and B form minimum boiling azeotrope at some specific composition then_____.
    (A) A–B interactions are stronger than those between A–A or B–B.
    (B) vapour pressure of solution increases because more number of molecules of liquids A and B can escape from the solution.
    (C) vapour pressure of solution decreases because less number of molecules of only one of the liquids escape from the solution.
    (D) A–B interactions are weaker than those between A–A or B–B.

48. We have three aqueous solutions of NaCl labeled as 'A', 'B' and 'C' with concentrations 0.1M, 0.01M and 0.001M, respectively. The value of van't Hoff factor for these solutions will be in the order_____.
    (A) $i_A < i_B < i_C$ (B) $i_A > i_B > i_C$ (C) $i_A = i_B = i_C$ (D) $i_A < i_B > i_C$

49. An electrochemical cell can behave like an electrolytic cell when _____.
    (A) $E_{cell} = 0$ (B) $E_{cell} > E_{ext}$ (C) $E_{ext} > E_{cell}$ (D) $E_{cell} = E_{ext}$

50. Compounds 'A' and 'B' react according to the following chemical equation. A (g) + 2 B (g) →2C (g) Concentration of either 'A' or 'B' were changed keeping the concentrations of one of the reactants constant and rates were measured as a function of initial concentration. Following results were obtained. Choose the correct option for the rate equations for this reaction.

Experiment	Initial concentration of [A]/mol L^{-1}	Initial concentration of [B]/mol L^{-1}	Initial rate of formation of [C]/mol L^{-1} s^{-1}
1.	0.30	0.30	0.10
2.	0.30	0.60	0.40
3.	0.60	0.30	0.20

    (A) Rate = k $[A]^2$ $[B]$ (B) Rate = k $[A]$ $[B]^2$ (C) Rate = k $[A]$ $[B]$ (D) Rate = k $[A]^2$ $[B]^0$

51. Which of the following statements is **incorrect** about the collison theory of chemical reaction?
    (A) It considers reacting molecules or atoms to be hard spheres and ignores their structural features.
    (B) Number of effective collisions determines the rate of reaction.
    (C) Collision of atoms or molecules possessing sufficient threshold energy results into the product formation.
    (D) Molecules should collide with sufficient threshold energy and proper orientation for the collision to be effective.

52. Brine is electrolysed by using inert electrodes. The reaction at anode is _____.
    (A) $Cl^-(aq.) \longrightarrow \frac{1}{2}Cl_2(g) + e^- : \quad E^\ominus_{Cell} = 1.36V$ (B $2H_2O(l) \longrightarrow O_2(g) + 4H^+ + 4e^- : E^\ominus_{Cell} = 1.23V$
    (C) $Na^+(aq.) + e^- \longrightarrow Na(s) : \quad E^\ominus_{Cell} = 2.71V$ (D) $H^+(aq.) + e^- \longrightarrow \frac{1}{2}H_2(g) : \quad E^\ominus_{Cell} = 0.00V$

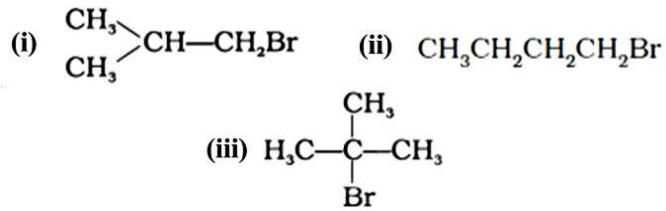
53. Strong reducing behaviour of H_3PO_2 is due to
    (A) Low oxidation state of phosphorus (B) Presence of two –OH groups and one P–H bond
    (C) Presence of one –OH group and two PH bonds (D) High electron gain enthalpy of phosphorus

54. On heating lead nitrate forms oxides of nitrogen and lead. The oxides formed are _____.
    (A) N_2O, PbO (B) NO_2, PbO (C) NO, PbO (D) NO, PbO_2

55. Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type $[Pd(C_6H_5)_2(SCN)_2]$ and $[Pd(C_6H_5)_2(NCS)_2]$ are
    (A) linkage isomers (B) coordination isomers
    (C) ionisation isomers (D) geometrical isomers

56. Which reagent will you use for the following reaction? $CH_3CH_2CH_2CH_3 \rightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$
    (A) Cl_2/UV light (B) NaCl + H_2SO_4
    (C) Cl_2 gas in dark (D) Cl_2 gas in the presence of iron in dark

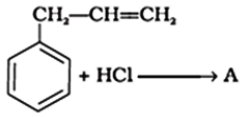
57. Arrange the following compounds in increasing order of their boiling points.

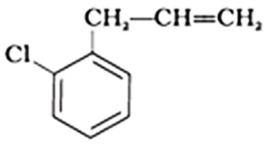


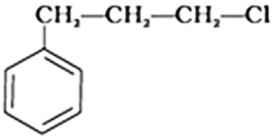
    (A) $(ii) < (i) < (iii)$ (B) $(i) < (ii) < (iii)$ (C) $(iii) < (i) < (ii)$ (D) $(iii) < (ii) < (i)$

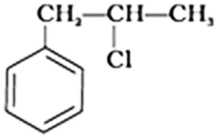
58. Chlorobenzene is formed by reaction of chlorine with benzene in the presence of $AlCl_3$. Which of the following species attacks the benzene ring in this reaction?
(A) Cl^- (B) Cl^+ (C) $AlCl_3$ (D) $[AlCl_4]^-$

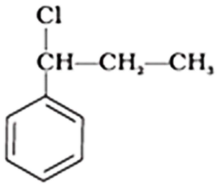
59. What is 'A' in the following reaction?



(A) 

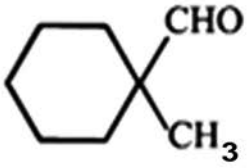
(B) 

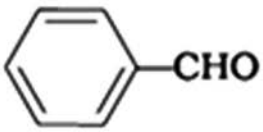
(C) 

(D) 

60. The correct order of increasing acidic strength is_____.
(A) Phenol < Ethanol < Chloroacetic acid < Acetic Acid
(B) Ethanol < Phenol < Chloroacetic acid < Acetic Acid
(C) Ethanol < Phenol < Acetic acid < Chloroacetic acid
(D) Chloroacetic acid < Acetic acid < Phenol < Ethanol

61. Cannizaro's reaction is not given by.

(A) 

(B) 

(C) H CHO (D) CH_3CHO

62. Which is the most suitable reagent for the following conversion?

(A) Tollen's reagent (B) Benzoyl peroxide (C) I_2 and $NaOH$ solution (D) Sn and $NaOH$ solution

63. Best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is
(A) Hoffmann Bromamide reaction (B) Gabriel phthalimide synthesis
(C) Sandmeyer reaction (D) Reaction with NH_3

64. Reduction of aromatic nitro compounds using Fe and HCl gives _____.
(A) aromatic oxime (B) aromatic hydrocarbon
(C) aromatic primary amine (D) aromatic amide

65. Which of the following polymers of glucose is stored by animals?
(A) Cellulose (B) Amylose (C) Amylopectin (D) Glycogen

66. Which statement about aspirin is not true
(A) Aspirin belongs to narcotic analgesics. (B) It is effective in relieving pain.
(C) It has anti blood clotting action. (D) It is a neurologically active drug.

67. Which of the following B group vitamins can be stored in our body?
(A) Vitamin B_1 (B) Vitamin B_2 (C) Vitamin B_6 (D) Vitamin B_{12}

68. DNA and RNA contain four bases each. Which of the following bases is not present in RNA?
(A) Adenine (B) Uracil (C) Thymine (D) Cytosine

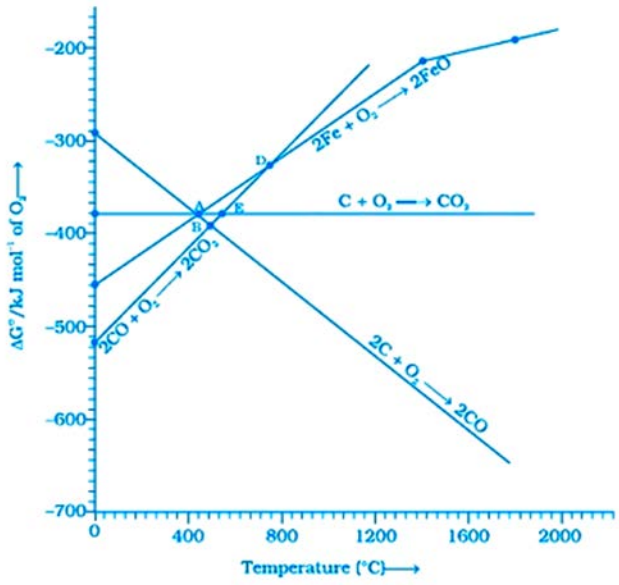
69. A primary alkyl halide would prefer to undergo_____.
(A) S_N1 reaction (B) S_N2 reaction (C) α–Elimination (D) Racemisation

70. The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light in the visible region, for the complexes, $[Co(NH_3)_6]^{3+}$, $[Co(CN)_6]^{3-}$,$[Co(H_2O)_6]^{3+}$
(A) $[Co\ (CN)_6]^{3-} > [Co\ (NH_3)_6]^{3+} > [Co(H_2O)_6]^{3+}$ (B) $[Co\ (NH_3)_6]^{3+} > [Co\ (H2O)_6]^{3+} > [Co(CN)_6]^{3-}$
(C) $[Co\ (H_2O)_6]^{3+} > [Co\ (NH_3)_6]^{3+} > [Co(CN)_6]^{3-}$ (D) $[Co\ (CN)_6]^{3-} > [Co\ (NH_3)_6]^{3+} > [Co(H_2O)_6]^{3+}$

71. When acidified $K_2Cr_2O_7$ solution is added to salts then Sn_{2+} changes to
(A) Sn (B) Sn^{3+} (C) Sn^{4+} (D) Sn^+

72. Extent of physisorption of a gas increases with_____.
(A) increase in temperature. (B) decrease in temperature.
(C) decrease in surface area of adsorbent. (D) decrease in strength of van der Waals forces.

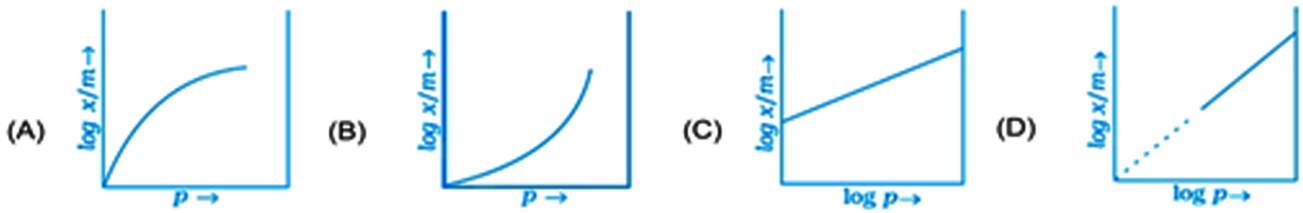
73. Which one of the following is not applicable to the phenomenon of adsorption?
(A) $\Delta H > 0$ (B) $\Delta G < 0$ (C) $\Delta S < 0$ (D) $\Delta H < 0$

74. 

Based on the figure, choose the correct option of temperature at which carbon reduces FeO to iron and produces CO.

(A) Below temperature at point A.
(B) Approximately at the temperature corresponding to point A.
(C) Above temperature at point A but below temperature at point D.
(D) Above temperature at point A.

75. Which of the following curves is in accordance with Freund lich adsorption isotherm?



76. A first order reaction is 50% completed in $1.26\times10^{14}\,s$. How much time would it take for 100% completion?
(A) 1.26×10^{15} s (B) 2.52×10^{14} s (C) 2.52×10^{28} s (D) infinite

77. The cell constant of a conductivity cell _____.
(A) changes with change of electrolyte (B) changes with change of concentration of electrolyte
(C) changes with temperature of electrolyte (D) remains constant for a cell

78. Which of the following is not a characteristic of a crystalline solid?
(A) Definite and characteristic heat of fusion. (B) Isotropic nature
(C) A regular periodically repeated pattern of arrangement of constituent particles in the entire crystal
(D) A true solid

79. Which of the following aqueous solutions should have the highest boiling point?
(A) 1.0 M NaOH (B) 1.0 M Na_2SO_4 (C) 1.0 M NH_4NO_3 (D) 1.0 M KNO_3

80. A brown ring is formed in the ring test for NO^{3-} ion. It is due to the formation of
(A) $[Fe(H_2O)_5\,(NO)]^{2+}$ (B) $FeSO_4.NO_2$ (C) $[Fe(H_2O)_4(NO)_2]^{2+}$ (D) $FeSO_4.HNO_3$

81. Zone refining is based on the principle that _____.
(A) impurities of low boiling metals can be separated by distillation.
(B) impurities are more soluble in molten metal than in solid metal.
(C) Different components of a mixture are differently adsorbed on an adosrbent.
(D) vapours of volatile compound can be decomposed in pure metal.

82. Which of the following oxidation state is common for all lanthanoids?
(A) +2 (B) +3 (C) +4 (D) +5

83. Which of the following chemicals can be added for sweetening of food items at cooking temperature and does not provide calories?
(A) Sucrose (B) Glucose (C) Aspartame (D) Sucralose

84. Which of the following should be most volatile?

(I) $CH_3CH_2CH_2NH_2$ (II) $(CH_3)_3N$ (III) $CH_3CH_2NHCH_3$ (IV) $CH_3CH_2CH_3$

(A) II (B) IV (C) I (D) III

85. Which of the following statements is **not** true about low density polythene?
(A) Tough (B) Hard
(C) Poor conductor of electricity (D) highly branched structure

86. What is the correct order of reactivity of alcohols in the following reaction?

$$R-OH+HCl \xrightarrow{ZnCl_2} R-Cl+H_2O$$

(A) $1^\circ > 2^\circ > 3^\circ$ (B) $1^\circ < 2^\circ > 3^\circ$ (C) $3^\circ > 2^\circ > 1^\circ$ (D) $3^\circ > 1^\circ > 2^\circ$

87. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is _____.
(A) 1F (B) 6F (C) 3F (D) 2F

88. In the cubic close packing, the unit cell has _____.
(A) 4 tetrahedral voids each of which is shared by four adjacent unit cells.
(B) 4 tetrahedral voids within the unit cell.
(C) 8 tetrahedral voids each of the which is shared by four adjacent unit cells.
(D) 8 tetrahedral voids within the unit cells.

89. The correct IUPAC name of [Pt $(NH_3)_2Cl_2$] is
(A) Diamminedichloridoplatinum (II) (B) Diamminedichloridoplatinum (IV)
(C) Diamminedichloridoplatinum (0) (D) Dichloridodiammineplatinum (IV)

90. On addition of small amount of $KMnO_4$ to concentrated H_2SO_4, a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following.
(A) Mn_2O_7 (B) MnO_2 (C) $MnSO_4$ (D) Mn_2O_3

BIOLOGY

91. Grafting is not possible in monocots as they
(A) Lack cambium (B) Are herbaceous
(C) Have scattered vascular bundles (D) Have parallel venation

92. Arrange the following in the ascending order based on their chromosome number *(i)* Primary endosperm cell of Maize (*ii*) Meristematic cell of Apple *(iii)* Xylem parenchyma cell of Potato *(iv)* Aleurone layer cell of Rice
(A) *iv, i, ii, iii* (B) *iii, iv, i, ii* (C) *i, ii, iv, iii* (D) *ii, iii, i, iv.*

93. Female gametophyte of angiosperms is represented by
(A) Ovule (B) Megaspore mother cell
(C) Embryo sac (D) Nucellus

94. Ovule is inverted with body fused to funicle, micropyle lying close to hilum and facing the placenta. It is
(A) Hemitropous (B) Orthotropous (C) Anatropous (D) Campylotropous

95. Mendel formulated the laws of heredity considering seven pairs of constrasting characters in the pea plant. If he had studied an eighth pair, the law which would have been altered is
(A) Law of segregation (B) Law of dominance
(C) Law of independent assortment (D) Law of unit characters

96. YyRR is crossed with yyRR. The progeny will be
(A) 1 Yy RR : 1 yy RR (B) 3 Yy RR : 1 yy RR (C) 1 Yy RR : 3 yy RR (D) Yy RR only

97. A gene that shows its effect on more than one character is
(A) Polygene (B) Pleiotropic gene (C) Multifactor gene (D) Multiple gene

98. Trihybrid ratio is
(A) 27 : 9 : 9 : 9 : 3 : 3 : 3 : 1 (B) 27 : 9 : 9 : 6 : 6 : 3 : 3 : 1
(C) 1 : 6 : 15 : 20 : 15 : 6 : 1 (D) 36 : 6 : 6 : 6 : 3 : 3 : 3 : 1

99. F_2 generation of a cross between two white flowered strains of Sweet Pea yields 9 purple flowered plants: 7 white flowered plants. This is an example of
(A) Epistasis (B) Complementary genes
(C) Supplementary genes (D) Gene inhibition

100. Inheritance of skin colour in human beings is an example of
(A) Mendelian inheritance (B) Monogenic inheritance
(C) Complementary genes (D) Polygenic Quantitative inheritance

101. Which amino acid is substituted in sickle cell anaemia?
(A) Glutamic acid by valine in α- chain (B) Glutamic acid by valine in β- chain
(C) Valine by glutamic acid in β- chain (D) Valine by glutamic acid in α- chain.

102. In *Cucurbita,* W is epistatic over Y and *y* gene normally responsible for yellow and green colour fruits. It produces white flowers. What is the ratio of fruits in the progeny of cross WwYyx wwYy?
(A) 9 white : 7 yellow : 0 green (B) 3 white : 4 yellow : 1 green
(C) 4 white : 3 yellow : 1 green (D) 2 white : 1 yellow : 1 green

103. Complete linkage is found in
(A) Birds (B) Snakes (C) Female *Drosophila* (D) Male *Drosophila*

104. A colour blind man marries a normal woman whose father was colour blind. What percentage of children is expected to be colour blind?
(A) 25% (B) 50% (C) 75% (D) 100%

105. Haemophilia is more common in males because it is a
(A) Recessive character carried by Y- chromosome
(B) Dominant character carried by Y- chromosome
(C) Dominant trait carried by X-chromosome
(D) Recessive trait carried by X-chromosome

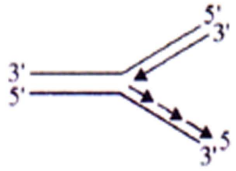
106. *t*RNA attaches amino acid at its
(A) 3' end (B) 5' end (C) Anticodon (D) Loop

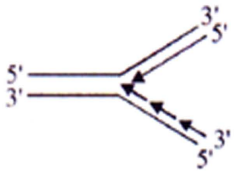
107. The first codon discovered by Nirenberg and Matthaei was
(A) GGG (B) CCC (C) UUU (D) AAA

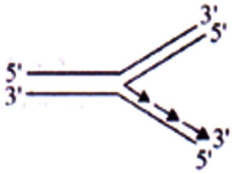
108. Functional unit of gene that specifies synthesis of one polypeptide is
(A) Codon (B) Cistron (C) Recon (D) Muton

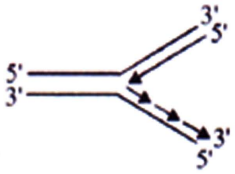
109. Base sequence on one strand of DNA is GCATG. Replicated complementary strand has
(A) GCATG (B) GCATC (C) CGTAC (D) ATGCG

110. Which one represents the correct manner of DNA replication?

(A) 

(B) 

(C) 

(D) 

111. Sequence of AATGCT TAG GCA on template coding segment of DNA will be represented over the transcribed *m*RNA as
(A) UUT CGT TUC CGU (B) AAT GCT AAG GCA
(C) UUA CGAAUC CGU (D) TTA CGAATC CGT

112. Compare the list and find the correct option

(1) Operon	(*i*) Binding of repressor proteins
(2) Operator	(*ii*) Binding of RNA polymerase
(3) Promoter	(*iii*) Inactivated by inducer
(4) Represser	(*iv*) Binding of polynucleotide phosphorylase
	(*v*) Polycistronic structural gene regulation

(A) 1 – *iv*, 2 – *iii*, 3 – *i*, 4 – *ii* (B) 1 – *iii*, 2 – *v*, 3 – *iv*, 4 – *i*
(C) 1 – *ii*, 2 – *iv*, 3 – *iii*, 4 – *v* (D) 1 – *v*, 2 – *i*, 3 – *ii*, 4 – *iii*

113. Which of the following is not required for any of the techniques of DNA finger printing available at present
(A) DNA-DNA hybridization (B) Polymerase chain reaction
(C) Zinc finger analysis (D) Restriction enzymes

114. Find the correctly matched enzyme with rRNAs they transcribe
(*i*) RNA polymerase I — 28 S, 18 S and 5' 8S rRNAs
(*ii*) RNA polymerase III — 28 S, 18 S and 5' 8S rRNAs
(*iii*) RNA polymerase II— tRNA, 5S rRNA and sn RNA
(*iv*) RNA polymerase II— hn RNA
(A) *i* and *iv* only (B) *ii* and *iii* only (C) *ii* only (D) *iii* and *iv* only

115. The total number of genes present on human Y- chromosomes is
(A) 321 (B) 231 (C) 292 (D) 682

116. Genetically improved crop varieties can be developed by
(A) Somatic hybridisation (B) Transgenic technology
(C) Somaclonal variations (D) Both A and B

117. Which statement about breeding is wrong
(A) Continued inbreeding reduces fertility and productivity
(B) By inbreeding pure lines cannot be evolved
(C) Cross breeding allows desirable qualities of two different breeds to be combined
(D) Inbreeding exposes harmful recessive genes that are eliminated by selection

118. Resistance to yellow mosaic virus in *Abelmoschus esculent us* was transferred from a wild species and resulted in a new variety called
(A) Sehore (B) *Raphanus satiuus* (C) Prabhani Kranti (D) *Musa pudica*

119. Organic farming is raising crops through use of
(A) Biofertilisers (B) Manures (C) Resistant varieties (D) All of above

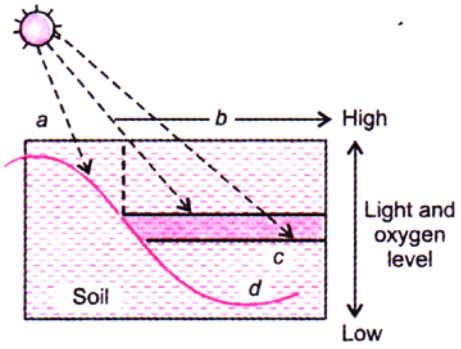
120. Primary sludge is used for
(A) Preparation of compost (B) Preparation of manure
(C) Biogas production (D) All the above

121. The first bioherbicide developed in 1981 was based on
(A) *Phytophthora palmivora* (B) *Phytophthora infestans*
(C) *Bacillus thuringenesis* (D) *Azadirachta indica*

122. Submerged hydrophytes have a well developed
(A) Vascular system (B) Aerenchyma (C) Root system (D) Stomatal system

123. Viviparity and pneumatophores are features of
(A) Hydrophytes (B) Halophytes (C) Mesophytes (D) Xerophytes

124. Choose correct combination of labeling in aquatic Zones



(A) *a* – limnetic zone, *b* – profundal zone, *c* – littoral zone, *d* – benthic zone
(B) *a* – limnetic zone, *b* – benthic zone, *c* – profundal zone, *d* – littoral zone
(C) *a* – littoral zone, *b* – limnetic zone, *c* – profundal zone, *d* – benthic zone
(D) *a* – limnetic zone, *b* – littoral zone, *e* – benthic zone, *d* – profundal zone

125. Match the columns and choose the correct

	Column I		**Column II**
(*i*)	Mutualism	(*p*)	Beneficial to a, no effect for b
(*ii*)	Competition	(*q*)	Beneficial to both a and b
(*iii*)	Parasitism	(*r*)	Beneficial to a And inhibitory for b
(*iv*)	Predation	(*s*)	Beneficial to a and harmful for b
(*v*)	Commensalism	(*t*)	Harmful to both a and b

(A) *i – t, ii – s, iii – p, iv – q, v – r* (B) *i – p, ii – r, iii – q, iv – t, v – s*
(C) *i – q, ii – t, iii – s, iv – r, v – p* (D) *i – r, ii – p, iii – q, iv – s, v – t*

126. Birth rate is 100, death rate is 10. Number of individuals in population group is 1000. What is the percentage of natural growth rate ?
(A) 0.09% (B) 9.0% (C) 0.9% (D) 90%

127. Path of energy flow in an ecosystem is
(A) Herbivores → Producers → Carnivores → Decomposers
(B) Herbivores → Carnivores → Producers → Decomposers
(C) Producers → Carnivores → Herbivores → Decomposers
(D) Producers → Herbivores → Carnivores → Decomposers

128. The process of breakdown of detritus by detrivores is
(A) Mineralisation (B) Fragmentation (C) Leaching (D) Humification

129. Crop residue allowed to decay and decompose in farm land is called
(A) Mulching (B) Strip cropping (C) Contour farming (D) Terracing

130. Arrange according to ascending order of BOD
(1) Highly polluted pond water (2) Unpolluted pond water
(3) Distilled water
(A) 2-3-1 (B) 3-2-1 (C) 3-1-2 (D) 1-3-2

131. Testes produce ..... hormone.
(A) Estrogen (B) Testosterone (C) Progesterone (D) Both estrogen and progesterone

132. What is the energy currency for most cellular processes ?
(A) ATP (B) ADP (C) GTP (D) AMP

133. Malaria is caused by a.....
(A) Protozoan (B) Fungi (C) Virus (D) Bacteria

134. What is the correct sequence of trophic level?
(A) Secondary consumer →primary consumer →producer
(B) Primary consumer →secondary consumer →tertiary consumer →producer

(C) Producer → primary consumer → secondary consumer → tertiary consumer
(D) None of these

135. Movement of food through oesophagus is mainly due to
(A) Lubrication by saliva (B) Peristalsis
(C) Gravitational pull (D) All of the above

136. Cryptorchidism is the condition in man when
(A) There are two testis in each scrotum (B) Testis do not descent into the scrotum
(C) Testis enlarge in the scrotum (D) Testis degenerate in the scrotum

137. In human, the unpaired male reproductive structure is
(A) Seminal vesicle (B) Prostate
(C) Bulbourethral gland (D) Testes

138. In the absence of acrosome, the spenn
(A) Cannot penetrate the egg (B) Cannot get energy
(C) Cannot get food (D) Cannot swim

139. How many spermatids are formed from a secondary spermatocyte
(A) 1 (B) 2 (C) 4 (D) 8

140. Which of the following cells are present in mammalian testes and help to nourish sperms
(A) Leyding cells (B) Oxyntic cells (C) Interstitial cells (D) Sertoli cells

141. Which hormone level reaches peak during luteal phase of menstrual cycle
(A) Luteinizing hormone (B) Progesterone
(C) Follicle stimulating hormone (D) Estrogen

142. In human female which of the following is incorrect
(A) Menstrual cycle takes 28 days (B) Menopause occur at 45-55 years
(C) The ovulated egg released during pregnancy die (D) Menstruation takes 4 days

143. During the development of an embryo, migration and rearrangement of cells lead to a pattern formation known as
(A) Epiboly (B) Emboly (C) Involution (D) Gastrulation

144. 'Sex ratio' means
(A) Number of males/l000 females (B) Number of females/1000 males
(C) Both (D) None

145. What is the full form of RCH
(A) Reproduction and Child Health Care (B) Reproduction, Contraception and Health
(C) Reproductive and Child Health (D) None

146. Which of the following is an STD
(A) Measles (B) Syphilis (C) Diphtheria (D) Cancer

147. STD's lead to
(A) Itching, fluid discharge, slight pain, swellings etc
(B) Pelvic inflammatory Diseases (PID), ectopic pregnancies, stillbirths, infertility, abortions etc
(C) Both (A) and (B) (D) None

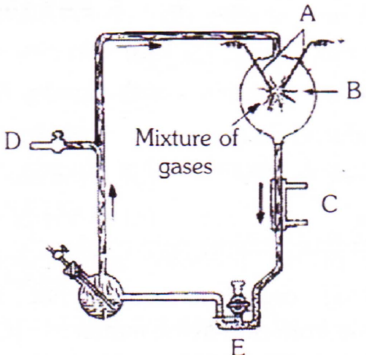
148. What is the function of copper-T
(A) Checks mutation (B) Stops fertilization
(C) Stops zygote formation (D) Stops obliteration of blastocoels

149. Test tube baby means a baby born when
(A) It develops from a non-fertilized egg (B) It developed in a test tube
(C) It is developed through tissue culture method
(D) The ovum is fertilized externally and thereafter implanted in the uterus

150. Progesterone pill helps in preventing pregnancy by not allowing
(A) Ova formation (B) Fertilization (C) Implantation (D) None of these

151. Abiogenesis means
(A) Origin of life from non-living organisms (B) Origin of life from living organisms
(C) Origin of viruses and microbes (D) None of these

152. The diagram represents Miller's experiment. Choose the correct combination of labeling



(A) A– electrodes, $B-NH_3+H_2+H_2O+CH_4$, C– cold water, D– vacuum, E– U trap

(B) A– electrodes, $B-NH_4+H_2+CO_2+CH_3$, C–hot water, D– vacuum, E– U trap

(C) A– electrodes, $B-NH_3+H_2O$, C– hot water, D– tap, E– U trap

(D) A– electrodes, $B-NH_3+H_2+H_2O+CH_4$, C– steam, D– vacuum, E– U trap

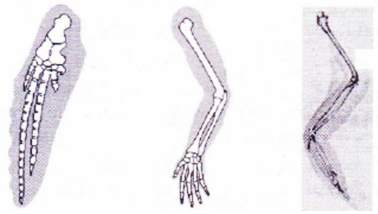
153. As per modern synthetic theory organic evolution depends upon
(A) Mutation, reproductive isolation and natural selection
(B) Gene recombination and natural selection
(C) Mutation and natural selection (D) All of these

154. Ancestral amphibians were tetrapods that evolved during
(A) Jurassic period (B) Cretaceous period
(C) Devonian period (D) Carboniferous period

155. Which type of selection, explains industrial melanism observed in moth, Biston bitularia
(A) Stabilising (B) Directional (C) Disruptive (D) Artificial

156. Which is incorrect
(A) Wings of insects and birds are analogous (B) Wings of insects and bats are analogous
(C) Wings of insects and birds are homologous (D) Wings of bats and birds are homologous

157. The following structures shows that



(A) They have nothing to do with each other (B) They are analogous
(C) They are vestigial structures (D) They are homologous

158. Analogous organs arise due to
(A) Divergent evolution (B) Artificialselection
(C) Genetic drift (D) Convergent evolution

159. Which one of the following provide non specific Pathogen defense for the body
(A) T-cells (B) B-cells (C) Phagocytes (D) Stem cells

160. Expand ELISA
(A) Enzyme linked immune sorbent assay (B) Enzyme linked ion sorbent assay
(C) Enzyme linked inductive assay (D) None of the above

161. After vaccination the body builds up
(A) Toxins (B) Lymph (C) Antibodies (D) Plasma

162. Humoral immunity is due to
(A) B-lymphocytes (B) T-lymphocytes (C) L-Lymphocytes (D) P- Lymphocytes

163. A molecule that elicits an immune response is called
(A) Antibody (B) Antigen (C) Mutagen (D) Carcinogen

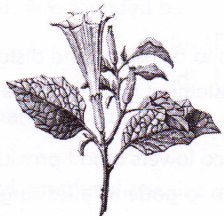
164. Short-lived immunity acquired from mother to foetus across placenta or through mother's milk is categorized as
(A) Active immunity (B) Passive immunity (C) Cellular immunity (D) Innate non-specific immunity

165. Which of the following is not a lymphoid tissue
(A) Spleen (B) Tonsils (C) Pancreas (D) Thymus

166. Which one of the following options gives the correct matching of a disease with its causative organism and mode of infection

	Disease	**Causative Organisms**	**Mode of Infection**
(A)	Elephantiasis	*Wuchereria bancrofti*	With infected water and food
(B)	Malaria	*Plasmodium vivax*	Bite of male *Anopheles* mosquito
(C)	Typhoid	*Salmonella typhi*	With inspired air
(D)	Pneumonia	*Streptococcus pneumoniae*	Droplet infection

167. Which is the particular type of drug that is obtained from the plant whose one flowering branch is shown below



(A) Stimulant
(B) Pain-killer
(C) Hallucinogenic
(D) Depressant

168. The transgenic animals are those which have
(A) Foreign DNA in some of its cells (B) Foreign DNA in all its cells
(C) Foreign DNA and RNA in some of its cells (D) Foreign DNA and RNA in all its cells

169. More than 70 percent of livestock population is found in
(A) Denmark (B) India (C) China (D) India and China

170. Domestication of the honey bee is called
(A) Sericulture (B) Apiculture (C) Tissue culture (D) Pisciculture

171. Worker bees are
(A) Sterile females (B) Fertile females
(C) When the queen is absent then acts as a fertile females (D) Sterile drones

172. Which of the following animal can be formed without fertilization
(A) Human (B) Hen (C) Honeybee (D) Ascaris

173. The honey bees exhibit a type of dance to communicate the location of food. This is known as
(A) Waggle dance (B) Tap dance (C) Round dance and waggle dance
(D) Breakdance

174. Restriction endonucleases are most widely used in recombinant DNA technology. They are obtained from
(A) Bacteriophages (B) Bacterial cells (C) Plasmids (D) All prokaryotic cells

175. During the process of isolation of DNA, chilled ethanol is added to
(A) Precipitate DNA (B) Break open the cell to release DNA
(C) Facilitate action of restriction enzymes (D) Remove proteins such as histones

176. Significance of 'heat shock' method in bacterial transformation is to facilitate
(A) Binding of DNA to the cell wall (B) Uptake of DNA through membrane transport proteins
(C) Uptake of DNA through transient pores in the bacterial cell wall
(D) Expression of antibiotic resistance gene

177. Which of the following steps are catalysed by Taq DNA polymerase in a PCR reaction
(A) Denaturation of temple DNA (B) Annealing of primers to template DNA
(C) Extension of primer end of the template DNA (D) All of the above

178. Which of the following techniques serve the purpose of early diagnosis
I. r-DNA technology
II. PCR
III. ELISA
IV. Conventional method of diagnosis (serum, urine analysis, etc)
(A) I, II, III (B) IV only (C) III only (D) All

179. Which of the following is not correctly matched for the organism and its cell wall degrading enzyme
(A) Bacteria – Lysozyme (B) Plant cells - Cellulose
(C) Algae - Methylase (D) Fungi – Chitinase

180. Which of the following represents the action of insulin
(A) Increases blood glucose levels by stimulating glucagon production
(B) Decreases blood glucose levels by forming glycogen
(C) Increases blood glucose level by promoting cellular uptake of glucose
(D) Increases blood glucose levels by hydrolysis of glycogen

MATHEMATICS

91. The value of $\begin{vmatrix}\log_3 512 & \log_4 3\\ \log_3 8 & \log_4 9\end{vmatrix}\times\begin{vmatrix}\log_2 3 & \log_8 3\\ \log_3 4 & \log_3 4\end{vmatrix}$ is

(A) 7 (B) 10 (C) 13 (D) 17

92. If 1, ω, ω^2 are the cube roots of unity, then $\Delta=\begin{vmatrix}1 & \omega^n & \omega^{2n}\\ \omega^n & \omega^{2n} & 1\\ \omega^{2n} & 1 & \omega^n\end{vmatrix}$ is equal to -

(A) 0 (B) 1 (C) ω (D) ω^2

93. Let P is a nonsingular matrix such that $I+P+P^2+...+P^n=O$ (O denotes the null matrix), then P^{-1} is –

(A) P^n (B) $-P^n$ (C) $-\left(1+P+..+P^n\right)$ (D) None of these

94. If $A=\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$ and $f\left(x\right)=\frac{1+x}{1-x}$ then $f\left(A\right)$ is -

(A) $\begin{bmatrix}-1 & -1\\ -1 & -1\end{bmatrix}$ (B) $\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$ (C) $\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$ (D) None of these

95. If two coins are tossed 5 times then the probability of getting 5 heads and 5 tails is -

(A) $\frac{63}{256}$ (B) $\frac{1}{1024}$ (C) $\frac{2}{205}$ (D) $\frac{9}{64}$

96. If $P\left(B\right)=\frac{3}{4}, P\left(A\cap B\cap\overline{C}\right)=\frac{1}{3}$ & $P\left(\overline{A}\cap B\cap\overline{C}\right)=\frac{1}{3}$, then $P\left(B\cap C\right)$ *is* –

(A) $\frac{1}{12}$ (B) $\frac{1}{6}$ (C) $\frac{1}{15}$ (D) $\frac{1}{9}$

97. $\sin^{-1}\left(x-\frac{x^2}{2}+\frac{x^3}{4}....\right)+\cos^{-1}\left(x^2-\frac{x^4}{2}+\frac{x^6}{4}....\right)=\frac{\pi}{2}$. Where $0<\left|x\right|<\sqrt{2}$, then. the value of x is

(A) 0 (B) 1 (C) 2 (D) None of these

98. The value of $\cot^{-1}\left[\frac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}\right]$ is –

(A) $\pi-x$ (B) $\pi-\frac{x}{2}$ (C) $\pi-\frac{x}{3}$ (D) None of these

99. The period of function $f\left(x\right)=\sin^4 x+\cos^4 x$ is –

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) 0

100. If $f\left(x\right)=\ln\left(3x-1\right)$, then $f^{-1}\left(x\right)$ is given by

(A) e^{3x-1} (B) $\frac{1}{e^{3x+1}}$ (C) $\frac{1}{e^{3x-1}}$ (D) $\frac{e^x+1}{3}$

101. If $f\left(x\right)=\begin{cases}\frac{x-1}{2x^2-7x+5}; \text{ for } x\neq 1\\ -\frac{1}{3} \quad \text{for } x=1\end{cases}$; then $f'\left(1\right)$ is equal to -

(A) $\frac{1}{9}$ (B) $-\frac{2}{9}$ (C) -13 (D) $\frac{1}{3}$

102. If $f\left(x\right)=\begin{cases}x, \ if\ x \text{ is rational}\\ -x, \ if\ x \text{ is irrational}\end{cases}$, then

(A) $f\left(x\right)$ is an odd function (B) $f\left(x\right)$ is continuous at $x=\frac{1}{2}$

(C) $f\left(x\right)$ is continuous at $x=0$ (D) $f\left(x\right)$ is a periodic function

103. If $g(x)=\min(x,x^2)$, where x is real number, then

(A) $g(x)$ is an increasing function (B) $g(x)$ is an decreasing function

(C) $f(x)$ is a constant function (D) $g(x)$ is a continuous function except at $x=0$

104. If normal to the curve $y=f(x)$ is Parallel to x-axis, then -

(A) $\frac{dy}{dx}=0$ (B) $\frac{dy}{dx}=1$ (C) $\frac{dy}{dy}=0$ (D) None of these

105. $\int |x|\,dx$ is equal to -

(A) $\frac{x^2}{2}+c$ (B) $\frac{-x^2}{2}+c$ (C) $x|x|+c$ (D) $\frac{x|x|}{2}+c$

106. $\int \frac{dx}{x(x^n+1)}$ is equal to –

(A) $\frac{1}{n}\log\left(\frac{x^n}{x^n+1}\right)+c$ (B) $\frac{1}{n}\log\left(\frac{x^n+1}{x^n}\right)+c$ (C) $\log\left(\frac{x^n}{x^n+1}\right)+c$ (D) None of these

107. If $\int_0^a f(2a-x)\,dx=\mu$ and $\int_0^a f(x)\,dx=\lambda$, the $\int_0^{2a} f(x)\,dx$ equal -

(A) $2\lambda-\mu$ (B) $\lambda+\mu$ (C) $\mu-\lambda$ (D) $\lambda-2\mu$

108. The value of $\int_0^{\pi} |\sin^3\theta|\,d\theta$ is -

(A) 0 (B) $\frac{3}{8}$ (C) $\frac{4}{3}$ (D) π

109. What is the area bounded by the curves $y=x\sin x$ and $x-axis$ between $x=0$ and $x=2\pi$?

(A) 4π sq unit (B) 3π sq unit (C) π sq unit (D) None of these

110. The order and degree of the differential equation $\rho=\frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ are respectively,

(A) 2, 2 (B) 2, 3 (C) 2, 1 (D) None of these

111. If $xdy=y(dx+ydy)$, $y(1)=1$ & $y(x)>0$, then $y(-3)$ is equal to -

(A) 3 (B) 2 (C) 1 (D) 0

112. The differential equation $\frac{d^2y}{dx^2}=2$ represents,

(A) a parabola whose axis is parallel to x-axis (B) a parabola whose axis is parallel to y-axis

(C) a circle (D) none of these

113. Let $\vec{a}=2\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=\hat{i}+2\hat{j}-\hat{k}$ and a unit vector $\vec{c}$ be coplanar. If $\vec{c}$ is perpendicular to $\vec{a}$, then $\vec{c}$ is equal to -

(A) $\left(-\hat{j}+\hat{k}\right)$ (B) $\pm\frac{1}{\sqrt{2}}\left(-\hat{j}+\hat{k}\right)$ (C) $\pm\frac{1}{\sqrt{2}}\left(\hat{j}+\hat{k}\right)$ (D) None of these

114. If $\vec{a},\vec{b},\vec{c}$ are non-coplanar vectors and $\vec{d}=\lambda\vec{a}+\mu\vec{b}+\gamma\vec{c}$, then λ is equal to -

(A) $\frac{[\vec{a}\ \vec{b}\ \vec{c}]}{[\vec{b}\ \vec{a}\ \vec{c}]}$ (B) $\frac{[\vec{b}\ \vec{c}\ \vec{d}]}{[\vec{b}\ \vec{c}\ \vec{a}]}$ (C) $\frac{[\vec{b}\ \vec{d}\ \vec{c}]}{[\vec{a}\ \vec{b}\ \vec{c}]}$ (D) None of these

115. If the liner $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ & $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then value of k -

(A) $\frac{3}{2}$ (B) $\frac{9}{2}$ (C) $\frac{-2}{9}$ (D) $\frac{-3}{2}$

116. If the straight lines $x=1+s,\ y=-3-\lambda s,\ z=1+\lambda s$ *and* $x=\frac{t}{2}, y=1+t, z=2-t$, with parameters s and t respectively are coplanar, then λ equals -

(A) -2 (B) -1 (C) $\frac{-1}{2}$ (D) 0

117. A bag contains 2 white & 4 black balls. A ball is drawn 5 times with replacement. The probability that at least 4 of the balls drawn are white is -

(A) $\frac{8}{141}$ (B) $\frac{10}{243}$ (C) $\frac{11}{243}$ (D) $\frac{8}{41}$

118. Five coins whose faces are marked 2,3 are tossed the chance of obtaining a total of 12 is -

(A) $\frac{1}{32}$ (B) $\frac{1}{16}$ (C) $\frac{3}{16}$ (D) $\frac{5}{16}$

119. Let, $f(x)=\big||x|-1\big|$, then points where $f(x)$ is not differentiable is/are :

(A) $0,\pm 1$ (B) ± 1 (C) 0 (D) 1

120. The area bounded between the parabolas $x^2=y/4$ $\&\, x^2=9y$ and the straight line $y=2$ is –

(A) $20\sqrt{2}$ (B) $\frac{10\sqrt{2}}{3}$ (C) $\frac{20\sqrt{2}}{3}$ (D) $10\sqrt{2}$

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