

SHIKSHA CLASSES, BHANDARA

FULL TEST-5

CHEMISTRY , PHYSICS, BIOLOGY

Time : - 3 Hours

Max. Marks:- 720

Date :

INSTRUCTIONS :

1. The test is of 3 hours duration.
2. The Test Booklet consists of 180 questions. The maximum marks are 720.
3. There are three parts in the question paper A, B, C consisting of Chemistry, Physics having 45 questions each and Biology having 90 questions of equal weightage. Each question is allotted 4 (four) marks for each correct response. $\frac{1}{4}$ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
4. There is only one correct response for each question. Filling up more than one response in each question will be treated as wrong response and marks for wrong response will be deducted accordingly.

Name :

Address :

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Phone/Mobile No.

Roll No.

PART A – CHEMISTRY

- Q.1** Enzyme are :
- (1) Proteins (2) Minerals
(3) Oils (4) Fatty acids
- Q.2** The polymer having strongest intermolecular forces is
- (1) Fibres (2) Elastomer
(3) Thermoplastic (4) Thermosetting polymer
- Q.3** One atom of an element x weigh 6.643×10^{-23} g. Number of moles of atom in 20 kg is :
- (1) 4 (2) 40
(3) 100 (4) 500
- Q.4** The rate constant for the first order reaction is given by : $\ln K = 14.34 - \frac{1.25 \times 10^4}{T}$.
- Calculate the activation energy :
- (1) 2.393×10^5 J (2) 8.69×10^4 J
(3) 1.18×10^5 J (4) 8.69×10^5 J
- Q.5** Which statement is incorrect ?
- (1) In safety matches KClO_3 is used.
(2) Purest form of carbon allotrope is fullerene.
(3) Red phosphorous glows in dark
(4) $\text{H}_2\text{S} + \text{HNO}_3 \rightarrow$ Colloidal sulphur
- Q.6** Which of the following is not oxidised by O_3 ?
- (1) KI (2) KMnO_4
(3) K_2MnO_4 (4) FeSO_4
- Q.7** What is the ratio of time periods (T_1/T_2) in second orbit of hydrogen atom to third orbit of He^+ ion ?
- (1) 8/27 (2) 32/27
(3) 27/32 (4) 8/9
- Q.8** If the ratio of the rates of diffusion of the two gases A & B is 4 : 1, the ratio of their densities is :-
- (1) 1 : 16 (2) 1 : 4
(3) 1 : 8 (4) 1 : 2
- Q.9** Match the column :
- | Column-I | Column-II |
|---------------------------|------------------------|
| (a) I_3^- | (p) Square bipyramidal |
| (b) NH_2^\ominus | (q) Linear |
- (c) XeO_2F_2 (r) Distorted tetrahedral (π -shape)
- (d) H_5IO_6 (s) V-shape / Bent
- (1) (a)-(q) ; (b)-(r) ; (c)-(s) ; (d)-(p)
(2) (a)-(q) ; (b)-(s) ; (c)-(r) ; (d)-(p)
(3) (a)-(p) ; (b)-(q) ; (c)-(r) ; (d)-(s)
(4) (a)-(s) ; (b)-(p) ; (c)-(q) ; (d)-(r)
- Q.10** Given the data at 25°C
- $\text{Ag} + \text{I}^- \rightarrow \text{AgI} + \text{e}^- ; E^\ominus = 0.152 \text{ V}$
 $\text{Ag} \rightarrow \text{Ag}^+ + \text{e}^- ; E^\ominus = -0.800 \text{ V}$
 What is the value of $\log K_{\text{sp}}$ for AgI ?
- (1) -8.12 (2) -37.82
(3) +8.612 (4) -16.13
- Q.11** 25 g ethylene glycol is present in 100 g of water. The solution is cooled to -10°C . K_f for H_2O is $1.86 \text{ K kg mol}^{-1}$. The amount of ice separated on cooling is :
- (1) 25 g (2) 50 g
(3) 75 g (4) 20 g
- Q.12** A ionic solid A^+B^- crystallises as a bcc structure. The distance between cation and anion in the lattice is 338 pm. The edge length of cell is :
- (1) 338 pm (2) 390.3 pm
(3) 292.7 pm (4) 507 pm
- Q.13** Which of the following statements is correct?
- (1) Hybrid orbitals do not form a bonds
(2) Lateral overlap of p-orbitals or p- and d-orbitals produces π -bonds.
(3) The strength of bonds follows the order $\sigma_{\text{p-p}} < \sigma_{\text{s-s}} < \pi_{\text{p-p}}$
(4) s-orbitals do not form σ bonds
- Q.14** Given the equilibrium constants
- $\text{HgCl}^\oplus + \text{Cl}^\ominus \rightleftharpoons \text{HgCl}_2, K_1 = 3 \times 10^6$
 $\text{HgCl}_2 + \text{Cl}^\ominus \rightleftharpoons \text{HgCl}_3^\ominus, K_2 = 8.9$
 The equilibrium constant for the disproportionation equilibrium : $2\text{HgCl}_2 \rightleftharpoons \text{HgCl}^\oplus + \text{HgCl}_3^\ominus$ is –
- (1) -3.3×10^5 (2) 3×10^{-5}
(3) 3.3×10^5 (4) 3×10^{-6}

SPACE FOR ROUGH WORK

Q.15 The lattice energy of NaCl is -780 kJ mol^{-1} . The enthalpies of hydration of $\text{Na}^+(\text{g})$ and $\text{Cl}^-(\text{g})$ ions are -406 kJ mol^{-1} and -364 kJ mol^{-1} . The enthalpy of solution of NaCl(s) is—

- (1) 738 kJ mol^{-1} (2) 10 kJ mol^{-1}
 (3) -10 kJ mol^{-1} (4) -822 kJ mol^{-1}

Q.16 $\text{C}_2\text{H}_5\text{Cl} + \text{AgF} \rightarrow \text{C}_2\text{H}_5\text{F} + \text{AgCl}$

The above reaction is called -

- (1) Hunsdiecker reaction (2) Swart reaction
 (3) Strecker reaction (4) Wurtz reaction

Q.17 Dettol is an example of :

- (1) Antiseptic (2) Antimalarial
 (3) Sedative (4) Antifertility drug

Q.18 A solution, containing 0.01 M Zn^{2+} and 0.01 M Cu^{2+} is saturated by passing H_2S gas. The S^{2-} concentration is $8.1 \times 10^{-21} \text{ M}$, K_{sp} for ZnS and CuS are 3.0×10^{-22} & 8.0×10^{-36} respectively. Which of the following will occur in the solution -

- (1) ZnS will precipitate.
 (2) CuS will precipitate.
 (3) Both ZnS and CuS will precipitate
 (4) Both Zn^{2+} and Cu^{2+} will remain in the solution

Q.19 The order of increasing oxidation states of S in S_8 , $\text{S}_2\text{O}_8^{2-}$, $\text{S}_2\text{O}_3^{2-}$, $\text{S}_4\text{O}_6^{2-}$ is given below -

- (1) $\text{S}_8 < \text{S}_2\text{O}_8^{2-} < \text{S}_2\text{O}_3^{2-} < \text{S}_4\text{O}_6^{2-}$
 (2) $\text{S}_2\text{O}_8^{2-} < \text{S}_2\text{O}_3^{2-} < \text{S}_4\text{O}_6^{2-} < \text{S}_8$
 (3) $\text{S}_2\text{O}_8^{2-} < \text{S}_8 < \text{S}_4\text{O}_6^{2-} < \text{S}_2\text{O}_3^{2-}$
 (4) $\text{S}_8 < \text{S}_2\text{O}_3^{2-} < \text{S}_4\text{O}_6^{2-} < \text{S}_2\text{O}_8^{2-}$

Q.20 General electronic configuration of outermost and penultimate shell is $(n-1)s^2(n-1)p^6(n-1)d^x ns^2$. If $n = 4$ and $x = 5$, then number of protons in the nucleus will be

- (1) > 25 (2) < 24
 (3) 25 (4) 30

Q.21 Among the following species identify the isostructural pairs:

NF_3 , NO_3^- , BF_3 , H_3O^+ , HN_3

- (1) $[\text{NF}_3, \text{NO}_3^-]$ and $[\text{BF}_3, \text{H}_3\text{O}^+]$

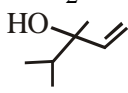
(2) $[\text{NF}_3, \text{HN}_3]$ and $[\text{NO}_3^-, \text{BF}_3]$

(3) $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{NO}_3^-, \text{BF}_3]$

(4) $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{HN}_3, \text{BF}_3]$

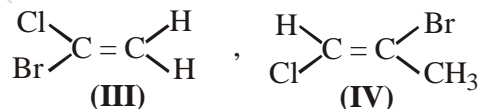
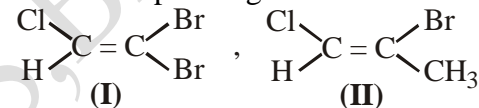
Q.22 When magnesium ribbon is heated to redness in an atmosphere of nitrogen and subsequently cooled with water, the gas evolved is -

- (1) N_2 (2) NH_3
 (3) O_2 (4) CO_2

Q.23  has the IUPAC name

- (1) 3,4-Dimethyl-1-penten-3-ol
 (2) Isopropyl-3-methyl vinyl carbinol
 (3) 2,3-Dimethyl-4-penten-3-ol
 (4) None of the above

Q.24 Which is a pair of geometrical isomers :



- (1) I and II (2) I and III
 (3) II and IV (4) III and IV

Q.25 Among the following the most highly ionised in water is -

- (1) $\text{CH}_3\text{CH}_2\text{CHClCOOH}$
 (2) $\text{CH}_3\text{CH}_2\text{CCl}_2\text{COOH}$
 (3) $\text{CH}_3\text{CHClCH}_2\text{COOH}$
 (4) $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{COOH}$

Q.26 The product in the following reaction is $\text{Ph}-\text{Cl} + \text{Fe} / \text{Br}_2 \rightarrow \text{Product}$

- (1) o-bromo-chloro benzene
 (2) p-bromo-chloro benzene
 (3) (1) and (2) Both
 (4) 2,4,6-tribromo chloro benzene

Q.27 The number of chiral carbons in 'A' are -



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

SPACE FOR ROUGH WORK

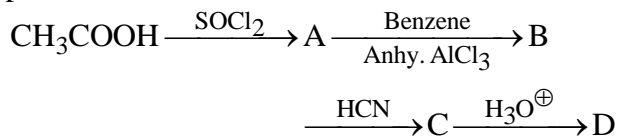
- Q.28** Oxidation of isobutylene with acid potassium permanganate gives –
 (1) Acetone + CO₂
 (2) Acetic acid
 (3) Acetic acid + CO₂
 (4) Acetic acid + Acetone
- Q.29** Identify the **incorrect** statement from the following:
 (1) Oxides of nitrogen in the atmosphere can cause the depletion of ozone layer.
 (2) Ozone absorbs the intense ultraviolet radiation of the sun.
 (3) Depletion of ozone layer is because of its chemical reactions with chlorofluoro alkanes.
 (4) Ozone absorbs infrared radiation.
- Q.30** For HCl solution at 25°C. equivalent conductance at infinite dilution, is 425 ohm⁻¹cm² equiv⁻¹. The specific conductance of a solution of HCl is 3.825 ohm⁻¹cm⁻¹. If the apparent degree of dissociation is 90% the normality of the solution is
 (1) 0.90 N (2) 1.0 N
 (3) 10 N (4) 1.2 N
- Q.31** Graph between log (x/m) and log p is a straight line at an angle 45° with intercept on y-axis 0.3010. Calculate the amount of gas adsorbed in gram per gram of the adsorbent when pressure is 0.2 atm.
 (1) 0.4 (2) 0.6
 (3) 0.8 (4) 0.2
- Q.32** The product formed in the reaction,
 $\text{BCl}_3 + \text{H}_2\text{O} \rightarrow \text{Product}$ is –
 (1) H₃BO₃ + HCl (2) B₂O₃ + HOCl
 (3) B₂H₆ + HCl (4) No reaction
- Q.33** Compounds A and B are treated with dilute HCl separately. The gases liberated are Y and Z respectively Y turns acidified dichromate paper green while Z turns lead acetate paper black. So A and B compounds are respectively
 (1) Na₂SO₃, Na₂S (2) NaCl, Na₂CO₃
 (3) Na₂S, Na₂SO₃ (4) Na₂SO₃, K₂SO₄
- Q.34** (NH₄)₂Cr₂O₇ (Ammonium dichromate) is used in fire works. The green coloured powder blown in air is –
 (1) Cr₂O₃ (2) CrO₂
 (3) Cr₂O₄ (4) CrO₃
- Q.35** The aqueous solution containing which one of the following ions will be colourless [Atomic no. : Sc = 21, Fe = 26, Ti = 22, Mn = 25]
 (1) Fe²⁺ (2) Mn²⁺
 (3) Ti³⁺ (4) Sc³⁺
- Q.36** The oxidation and coordination number of Pt in [Pt(C₂H₄)Cl₃]⁻ is respectively –
 (1) + 1, 3 (2) + 2, 4
 (3) + 3, 6 (4) + 2, 5
- Q.37** Which of the following complexes is an inner orbital complex?
 (1) [CoF₆]³⁻ (2) [FeF₆]³⁻
 (3) [Cr(NH₃)₆]³⁺ (4) [Fe(H₂O)₆]²⁺
- Q.38** A Planar Complex (Mabcd) gives –
 (1) Two Optical isomer
 (2) Two geometrical isomer
 (3) Three optical isomer
 (4) Three geometrical isomers
- Q.39** The oxide cannot be reduced by coke
 (1) Cu₂O, ZnO (2) Fe₂O, ZnO
 (3) CaO, K₂O (4) PbO, Fe₃O₄
- Q.40** Chloroform when treated with benzene in presence of anhydrous AlCl₃, the product formed is
 (1) Chlorobenzene
 (2) Toluene
 (3) Mixture of ortho and para chlorotoluene
 (4) Triphenyl methane
- Q.41** What will happen when diethyl ether treated with hot and conc. HI :
 (1) Ethyl alcohol (2) Ethyl iodide
 (3) Methyl iodide (4) Methanol

SPACE FOR ROUGH WORK

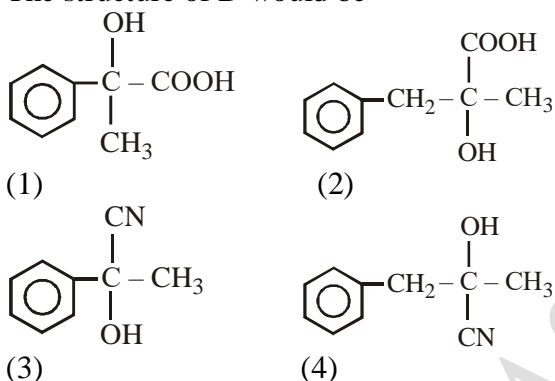
Q.42 When calcium formate and calcium acetate is heated then major product will be

- (1) CH_3COCH_3 (2) $\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{OCH}_3$
 (3) HCHO (4) $\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{H}$

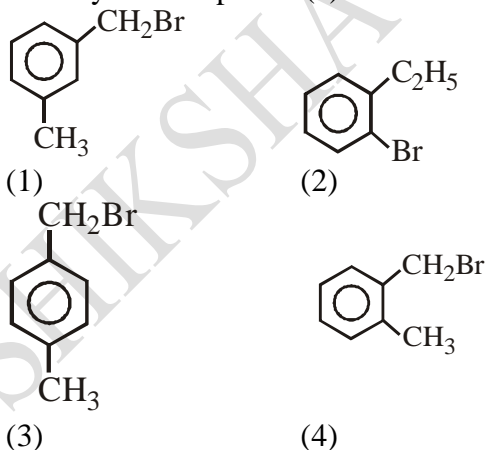
Q.43 In a set of reactions acetic acid yielded a product D.



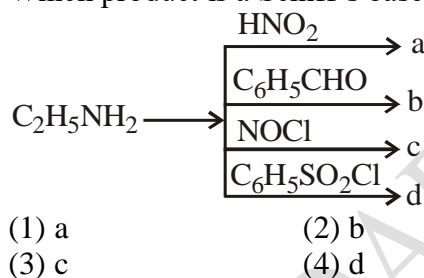
The structure of D would be –



Q.44 Compound (a), $\text{C}_8\text{H}_9\text{Br}$, gives a yellow precipitate when warmed with alcoholic AgNO_3 . Oxidation of (a) gives an acid (b), $\text{C}_8\text{H}_6\text{O}_4$. (b) easily forms anhydride on heating. Identify the compound (a):

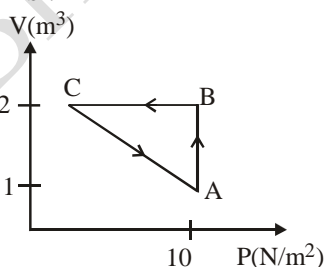


Q.45 Which product is a Schiff's base –



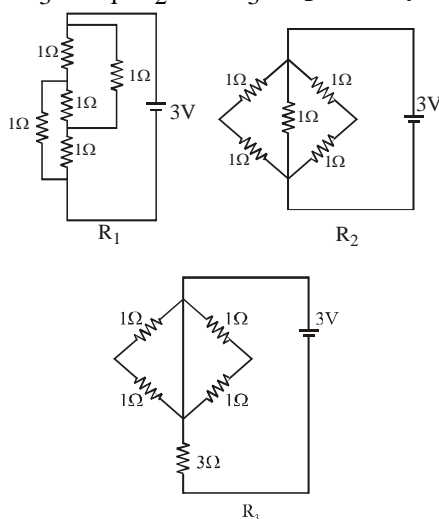
PART B – PHYSICS

Q.46 An ideal gas is taken through the cycle $\text{A} \rightarrow \text{B} \rightarrow \text{C} \rightarrow \text{A}$, as shown in the figure. If the net heat supplied to the gas in the cycle is 5J, the work done by the gas in the process $\text{C} \rightarrow \text{A}$ is :



- (1) -5 J (2) -10 J
 (3) -15 J (4) -20 J

Q.47 Figure shows three resistor configurations R_1 , R_2 and R_3 connected to 3V battery. If the power dissipated by the configuration R_1 , R_2 and R_3 is P_1 , P_2 and P_3 respectively, then



SPACE FOR ROUGH WORK

- (1) $P_1 > P_2 > P_3$ (2) $P_1 > P_3 > P_2$
 (3) $P_2 > P_1 > P_3$ (4) $P_3 > P_2 > P_1$

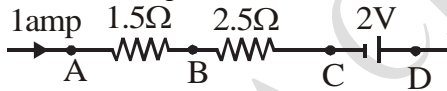
Q.48 A heavy brass sphere is hung from a spring and it executes vertical vibrations with period T . The sphere is now immersed in a non-viscous liquid with a density $(1/10)^{\text{th}}$ that of brass. When set into vertical vibrations with the sphere remaining inside liquid all the time, the time period will be:

- (1) $\sqrt{9/10} T$ (2) $\sqrt{10/9} T$
 (3) $(9/10) T$ (4) T

Q.49 A locomotive of mass m starts moving so that its velocity varies according to the law $v = k\sqrt{s}$ where k is constant and s is the distance covered. Find the total work performed by all the forces which are acting on the locomotive during the first t seconds after the beginning of motion

- (1) $W = \frac{1}{8} mk^4 t^2$ (2) $W = \frac{1}{4} m^2 k^4 t^2$
 (3) $W = \frac{1}{4} mk^4 t^4$ (4) $W = \frac{1}{8} mk^4 t^4$

Q.50 In the circuit element given here, if the potential at point B, $V_B = 0$, then the potentials of A and D are given as



- (1) $V_A = -1.5 V, V_D = +2V$
 (2) $V_A = +1.5 V, V_D = +2V$
 (3) $V_A = +1.5 V, V_D = +0.5 V$
 (4) $V_A = +1.5 V, V_D = -0.5 V$

Q.51 The material of wire has specific gravity 8. If it is not wetted by water, what is the maximum diameter (approximately) of the wire that will float on the surface of water ? ($T = 70$ dyne/cm)

- (1) 0.65 mm (2) 0.65 cm
 (3) 1.48 mm (4) 1.48 cm

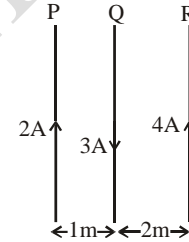
Q.52 Length of a string tied to two rigid supports is 40cm. Maximum length (wavelength in cm) of a stationary wave produced on it, is-

- (1) 20 (2) 80
 (3) 40 (4) 120

Q.53 A current carrying circular arc subtends an angle 270° at its centre. The value of field at its centre is 'x' tesla. For same current and radius, the angle of arc becomes 45° , then value of magnetic field becomes :

- (1) $4x / 9$ (2) $9x / 4$
 (3) $x / 6$ (4) $9x / 3$

Q.54 Three infinite length wire P, Q and R placed parallel to each other, net force on 10 cm. length of wire R (approximately) is :



- (1) $6 \times 10^{-8} N$ (2) $6 \times 10^{-7} N$
 (3) $6 \times 10^{-6} N$ (4) Zero

Q.55 A particle of mass m is being circulated on a vertical circle of radius r . If the speed of particle at the highest point be v , then :

- (1) $mg = \frac{mv^2}{r}$ (2) $mg > \frac{mv^2}{r}$
 (3) $mg < \frac{mv^2}{r}$ (4) $mg \geq \frac{mv^2}{r}$

Q.56 Two radioactive nuclei P and Q, in a given sample decay into a stable nucleus R. At time $t = 0$, number of P species are $4N_0$ and that of Q are N_0 . Half-life of P (for conversion to R) is 1 minute where as that of Q is 2 minutes. Initially there are no nuclei of R present in the sample. When number of nuclei of P and Q are equal, the number of nuclei of R present in the sample would be :

- (1) $5N_0 / 2$ (2) $2N_0$
 (3) $3N_0$ (4) $9N_0 / 2$

SPACE FOR ROUGH WORK

Q.57 A uniform disc of mass M and radius R is mounted on an axle supported in frictionless bearings. A light cord is wrapped around the rim of the disc and a steady downward pull T is exerted on the cord. The angular acceleration of the disc is :

- (1) T / MR (2) MR / T
 (3) $2T / MR$ (4) $MR / 2T$

Q.58 The frequency of vibration of string is given by

$$f = \frac{p}{2\ell} \left[\frac{F}{m} \right]^{1/2}$$

Here p is number of segments

in the string, ℓ is the length and F is tension. The dimensional formula for m will be :

- (1) $[M^0LT^{-1}]$ (2) $[ML^0T^{-1}]$
 (3) $[ML^{-1}T^0]$ (4) $[M^0L^0T^0]$

Q.59 A cockroach is moving with velocity v in anticlockwise direction on the rim of a disc of radius R of mass m . The moment of inertia of the disc about the axis is I and it is rotating in clockwise direction with an angular velocity ω . If the cockroach stops, the angular velocity of the disc will be :

- (1) $\frac{I\omega}{I + mR^2}$ (2) $\frac{I\omega + mvR}{I + mR^2}$
 (3) $\frac{I\omega - mvR}{I + mR^2}$ (4) $\frac{I\omega - mvR}{I}$

Q.60 A carnot engine whose low temperature reservoir is at 7°C has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees approximately should the temperature of the high temperature reservoir be increased :

- (1) 840 K (2) 280 K
 (3) 560 K (4) 373 K

Q.61 The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is :

- (1) Infinite (2) Five
 (3) Three (4) Zero

Q.62 A cart is moving horizontally along a straight line with constant speed 30 m/s. A projectile is

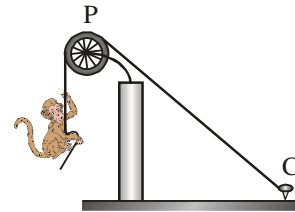
to be fired from the moving cart in such a way that it will return to the cart after the cart has moved 80m. At what speed (relative to the cart) must the projectile be fired (Take $g = 10\text{m/s}^2$) :

- (1) 10 m/s (2) $10\sqrt{8}$ m/s
 (3) $(40/3)$ m/s (4) None of these

Q.63 The escape velocity of a body from earth's surface is v_e . The escape velocity of the same body from a height equal to $7R$ from earth's surface will be :

- (1) $\frac{v_e}{\sqrt{2}}$ (2) $\frac{v_e}{2}$
 (3) $\frac{v_e}{2\sqrt{2}}$ (4) $\frac{v_e}{4}$

Q.64 One end of massless rope, which passes over a massless and frictionless pulley P is tied to a hook C while the other end is free. Maximum tension that the rope can bear is 360 N. with what value of minimum safe acceleration (in ms^{-2}) can a monkey of 60 kg move down on the rope :



- (1) 16 (2) 6
 (3) 4 (4) 8

Q.65 A body of density d_1 is counterpoised by another body of weights Mg and density d_2 in air of density d . Then the true mass of the body is :

- (1) M (2) $m \left(1 - \frac{d}{d_2} \right)$
 (3) $m \left(1 - \frac{d}{d_1} \right)$ (4) $\frac{M(1 - d/d_2)}{(1 - d/d_1)}$

Q.66 A speeding motorcyclist sees traffic jam ahead of him. He slows down to 36 km/hour. He finds that traffic has eased and a car moving ahead of

SPACE FOR ROUGH WORK

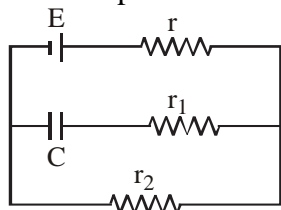
him at 18 km/hour is honking at a frequency of 1392 Hz. If the speed of sound is 343 m/s, the frequency of the honk as heard by him will be :

- (1) 1412 Hz (2) 1454 Hz
(3) 1332 Hz (4) 1372 Hz

Q.67 Assume that a neutron breaks into a proton and an electron. The energy released during this process is (mass of neutron = 1.6725×10^{-27} kg, Mass of proton = 1.6725×10^{-27} kg, mass of electron = 9×10^{-31} kg) :

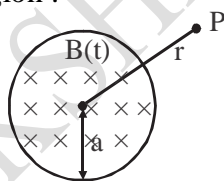
- (1) 0.51 MeV (2) 7.10 MeV
(3) 6.30 MeV (4) 5.4 MeV

Q.68 In the given circuit diagram when the current reaches steady state in the circuit, the charge on the capacitor of capacitance C will be :



- (1) $CE \frac{r_1}{(r_1 + r)}$ (2) CE
(3) $CE \frac{r_1}{(r_2 + r)}$ (4) $CE \frac{r_2}{(r + r_2)}$

Q.69 A uniform but time-varying magnetic field $B(t)$ exists in a circular region of radius a and is directed into the plane of the paper, as shown. The magnitude of the induced electric field at point P at a distance r from the centre of the circular region :



- (1) Is zero (2) Decreases as $1/r$
(3) Increases as r (4) Decreases as $1/r^2$

Q.70 If the kinetic energy of a free electron doubles, its de-Broglie wavelength changes by the factor

- (1) $1/\sqrt{2}$ (2) $\sqrt{2}$
(3) $1/2$ (4) 2

Q.71 Two walls of thicknesses d_1 and d_2 and thermal conductivities K_1 & K_2 are in contact. In the steady state, if the temperature at the outer surfaces are T_1 and T_2 , the temperature at the common wall is :

- (1) $\frac{K_1 T_1 d_2 + K_2 T_2 d_1}{K_1 d_2 + K_2 d_1}$ (2) $\frac{K_1 T_1 + K_2 T_2}{d_1 + d_2}$
(3) $\left(\frac{K_1 d_1 + K_2 d_2}{T_1 + T_2} \right) T_1 T_2$ (4) $\frac{K_1 d_1 T_1 + K_2 d_2 T_2}{K_1 d_1 + K_2 d_2}$

Q.72 The work function for metals A, B and C are respectively 1.92 eV, 2.0 eV and 5 eV. According to Einstein's equation, the metals which will emit photo electrons for a radiation of wavelength 4100 \AA is/are :

- (1) None of these (2) A only
(3) A and B only (4) All the three metals

Q.73 A body of mass 4 kg moving with velocity 12 m/s collides with another body of mass 6 kg at rest. If two bodies stick together after collision, then the loss of kinetic energy of system is :

- (1) zero (2) 288 J
(3) 172.8 J (4) 144 J

Q.74 Consider the following statements about electric dipole and select the correct ones :

- S1 : Electric dipole moment vector \vec{p} is directed from the negative charge to the positive charge.
S2 : The electric field of a dipole at a point with position vector \vec{r} depends on $|\vec{r}|$ as well as the angle between \vec{r} and \vec{p}
S3 : The electric dipole potential falls off as $1/r^2$ and not as $1/r$.
S4 : In a uniform electric field, the electric dipole experiences no net forces but a torque $\vec{\tau} = \vec{p} \times \vec{E}$.

- (1) S2, S3 and S4 (2) S3 and S4
(3) S2 and S3 (4) All of these

Q.75 A man can see upto 100 cm of the distant object. The power of the lens required to see far objects will be :

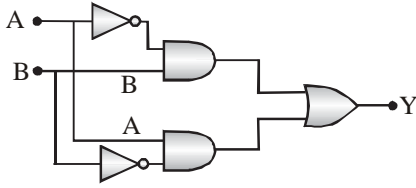
- (1) +0.5 D (2) +1.0 D

SPACE FOR ROUGH WORK

(3) +2.0 D

(4) -1.0 D

Q.76 The truth table for the following logic circuit is:



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Q.77 In a metre bridge experiment null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If

$X < Y$, then where will be the new position of the null point from the same end, if one decides to balance a resistance of $4X$ against Y :

- (1) 50 cm (2) 80 cm
 (3) 40 cm (4) 70 cm

Q.78 Two cylinders A and B fitted with pistons contain equal amounts of an ideal diatomic gas at 300 K. The piston of A is free to move while that of B is held fixed. The same amount of heat is given to the gas in each cylinder. If the rise in temperature of the gas in A is 30 K, then the rise in temperature of the gas in B is :

- (1) 30 K (2) 18 K
 (3) 50 K (4) 42 K

Q.79 A telescope has an objective lens of focal length 1m and an eye piece of focal length 20 cm. The final image of the sun 10cm in diameter is formed at a distance of 24cm from

the eye piece. What angle does the sun subtend at the objective lens :-

- (1) 0.0455 rad (2) 0.03 rad
 (3) 0.0141 rad (4) 0.060 rad

Q.80 An organ pipe P closed at one end vibrates in its first harmonic. Another organ pipe Q open at both ends vibrates in its third harmonic. When both are in resonance with a tuning fork, the ratio of the length of P to that of Q is :

- (1) 1/2 (2) 1/4
 (3) 1/6 (4) 1/8

Q.81 A bar magnet of magnetic moment $1.5 \text{ A} \times \text{m}^2$ lies aligned with the direction of a uniform magnetic field of 2 Tesla. What is the amount of work required to turn the magnet so as to align its magnetic moment normal to the field direction -

- (1) Zero (2) 3J
 (3) 6J (4) 4.5J

Q.82 An ideal coil of 10H is connected in series with a resistance of 5Ω and a battery of 5V. 2s after the connection is made, the current flowing (in ampere) in circuit is :

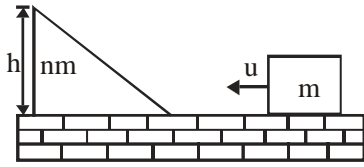
- (1) $(1 - e)$ (2) e
 (3) e^{-1} (4) $(1 - e^{-1})$

Q.83 In series L-C-R circuit voltage drop across resistance is 8 V, across inductor is 6 V and across capacitor is 12 V. Then :

- (1) Voltage of the source will be leading in the circuit.
 (2) Voltage drop across each element will be less than the applied voltage
 (3) Power factor of the circuit will be 3/4
 (4) None of the above

Q.84 A block of mass m is pushed towards movable wedge of mass nm and height h , with a velocity u . All surfaces are smooth. The minimum value of u for which the block reach the top of the wedge is :

SPACE FOR ROUGH WORK



- (1) $\sqrt{2gh}$ (2) $2ngh$
 (3) $\sqrt{2gh\left(1+\frac{1}{n}\right)}$ (4) $\sqrt{2gh\left(1-\frac{1}{n}\right)}$

Q.85 A glass slab is subjected to a pressure of 10 atm. The fractional change in its volume is (Bulk modulus of glass = $37 \times 10^9 \text{ N m}^{-2}$, $1 \text{ atm} = 1 \times 10^5 \text{ N m}^{-2}$)

- (1) 2.7×10^{-2} (2) 2.7×10^{-3}
 (3) 2.7×10^{-4} (4) 2.7×10^{-5}

Q.86 Two charges of magnitude 5 nC and -2 nC , one placed at points (2 cm, 0, 0) and (x cm, 0, 0) in a region of space, where there is no other external field. If the electrostatic potential energy of the system is $-0.5 \mu\text{J}$. The value of x is :

- (1) 20 cm (2) 80 cm
 (3) 4 cm (4) 16 cm

Q.87 A step down transformer converts transmission line voltage from 11000 V to 220 V. The primary of the transformer has 6000 turns and efficiency of the transformer is 60%. If the output power is 9kW, then the input power will be :

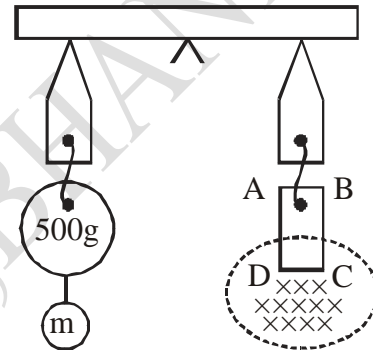
- (1) 11 kW (2) 12 kW
 (3) 14 kW (4) 15 kW

Q.88 Which of the following statement is **false** for the properties of electromagnetic waves ?

- (1) Both electric and magnetic field vectors attain the maxima and minima at the same place and same time.
 (2) The energy in electromagnetic wave is divided equally between electric and magnetic field vectors.
 (3) Both electric and magnetic field vectors are parallel to each other and perpendicular to the direction of propagation of wave.

(4) These wave do not require any material medium for propagation.

Q.89 A rectangular coil ABCD is hung from one side of a balance as shown in figure. A 500 g mass is added to the other arm to balance the weight of the coil. A current of 9.8 A is passed through the coil and a constant magnetic field of 0.4 T acting inward (in xz plane) is switched on such that only arm CD of length 1.5 cm lies in the field. The additional mass m must be added to regain the balance is :



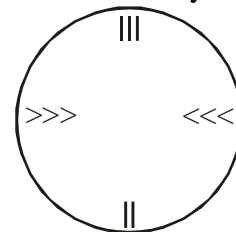
- (1) 4 g (2) 5 g
 (3) 6 g (4) 7 g

Q.90 A 90 cm long solenoid has six layers of windings of 450 turns each. If the diameter of solenoid 2.2 cm and current carried is 6 A, then magnitude of magnetic field inside the solenoid, near its centre is

- (1) $50 \pi\text{G}$ (2) $60 \pi\text{G}$
 (3) $72 \pi\text{G}$ (4) $80 \pi\text{G}$

PART C – BIOLOGY

Q.91 Given below is the karyotype of a *Drosophila*. On the basis of genic balance theory of C.B. Bridges, the sex of this fly would be



- (1) Super female (2) Super male
 (3) Intersex (4) Fertile female

SPACE FOR ROUGH WORK

Q.92 Which of the following is endangered species ?

- (1) *Wolfia*
- (2) *Rauwolfia serpentina*
- (3) *Hydrilla*
- (4) *Cupressus cashmeriana*

Q.93 Type of fertilization in cockroach and earthworm is _____

- (1) External and internal
- (2) Internal and external
- (3) Internal only
- (4) External only

Q.94 Which of the following element is not essential for plants ?

- (1) Zinc
- (2) Potassium
- (3) Sodium
- (4) Iron

Q.95 Which of the following food chain is the major conduit of energy flow in aquatic ecosystem ?

- (1) GFC
- (2) PFC
- (3) DFC
- (4) (1) and (3)

Q.96 LUBB sound of heart is :

- (1) Sharp sound for short period due to closure of cuspid valves.
- (2) Dull sound for short period due to closure of cuspid valves.
- (3) Sharp sound for long period due to opening of cuspid valves.
- (4) Dull sound for long period due to closure of cuspid valves.

Q.97 Match the column and choose the correct option:

Column I

- A. *Homo habilis*
- B. *Homo erectus*
- C. Neanderthal man
- D. Cromagnon man

Column II

- i. 1400cc
- ii. 650-800cc
- iii. 1650cc
- iv. 900cc

Column III

- a. First man to use fire
- b. Cave painting
- c. First tool maker man
- d. Buried their dead

- (1) A-iv-a, B-ii-c, C-i-b, D-iii-d
- (2) A-ii-c, B-i-a, C-iii-d, D-iv-b
- (3) A-ii-c, B-iv-a, C-i-d, D-iii-b

(4) A-iv-b, B-ii-c, C-iii-b, D-iv-d

Q.98 α -1 antitrypsin, synthesised by genetic engineering is used to treat :

- (1) Phenylketonuria
- (2) Cystic fibrosis
- (3) Emphysema
- (4) Adenosine deaminase deficiency

Q.99 Stroma lamellae membrane lack :

- (1) Only PS-I
- (2) Only PS-II
- (3) Only NADP-reductase
- (4) PS-II as well as NADP reductase

Q.100 During menstruation cycle the hormone responsible for maintenance of corpus luteum is :

- (1) Estrogen
- (2) Progesterone
- (3) LH
- (4) Testosterone

Q.101 Most contraceptive pills contain

- (1) Estrogen and progesterone
- (2) Estrogen and FSH
- (3) FSH and LH
- (4) Progesterone and LH

Q.102 Find the incorrect statement :

- (1) Bacteria are the sole members of the kingdom monera.
- (2) Bacteria occur almost every where.
- (3) Bacteria are most abundant micro organisms
- (4) Bacteria are not able to survive in extreme habitats

Q.103 Arthropoda is characterised by :

- (1) Triploblastic, bilateral symmetry and abdominal appendages
- (2) Bilateral symmetry and pair of wings
- (3) Acoelomates and radial symmetry
- (4) Exoskeleton, metameric segmentation and jointed appendages.

Q.104 Each chromosome essentially has :-

- (1) Secondary constriction
- (2) Primary constriction
- (3) Centromere
- (4) Both (2) & (3)

SPACE FOR ROUGH WORK

Q.105 Two friends x and y have same blood group, when x donate blood to y, this transfusion will lead to RBC agglutination in :

- (1) First transfusion if x is Rh⁻ and y is Rh⁺
- (2) First transfusion if x is Rh⁺ and y is Rh⁻
- (3) Second transfusion if x is Rh⁻ and y is Rh⁺
- (4) Second transfusion if x is Rh⁺ and y is Rh⁻

Q.106 Roman numbers in the names of restriction endonuclease indicates :

- (1) Order in which enzymes were discovered from that strain of bacteria.
- (2) Order in which enzymes function inside the body of bacteria.
- (3) Order in which the enzymes were isolated from that strain of bacteria.
- (4) Order in which enzymes were synthesised inside the body of bacteria.

Q.107 Which statement is not correct ?

- (1) Only dehydration of mature seed are crucial for storage of seeds
- (2) The central cell after triple fusion becomes the primary endosperm cell
- (3) Pollen grains are rich in nutrient
- (4) Flowers are morphological and embryological marvels and the site of sexual reproduction.

Q.108 'Exophthalmic goitre'(Grave's disease) is related to:

- (1) Hypofunction of the thyroid
- (2) Hyperfunction of the thyroid
- (3) Hypofunction of the parathyroid
- (4) Hyperfunction of the parathyroid

Q.109 Drought resistant plant and limited rain during the winter is found in :

- (1) Chaparral biome (2) Desert biome
- (3) Savanna biome (4) Tundra biome

Q.110 Glucose, amino acid, Na⁺, H₂O and K⁺

From the above mentioned items how many things will be actively reabsorbed from PCT .

- (1) Five (2) Four
- (3) Three (4) Two

Q.111 Parathormone is secreted during

- (1) Increased blood calcium level
- (2) Decreased blood calcium level
- (3) Increased blood sugar level
- (4) Decreased blood sugar level

Q.112 (a) Leaf tendrils (i) *Euphorbia*
(b) Leaf Spine (ii) Pea
(c) Stem tendrils (iii) *Bougainvillea*
(d) Stem thorn (iv) Gourds
(v) Grapes

Choose the correct match.

- (1) a-v, b-iii, c-ii, d-i (2) a-ii, b-iii, c-v, d-i
- (3) a-iv, b-i, c-v, d-iii (4) a-ii, b-i, c-iv, d-iii

Q.113 Which step is important for continuity of glycolysis in anerobic respiration ?

- (1) oxidation of PGAL
- (2) substrate level phosphorylation
- (3) oxidation of NADH
- (4) formation pyruvic acid

Q.114 Which of the following is the correct sequence of the development of a mature sperm cell?

- (1) 1° spermatocyte → spermatid
→ 2° spermatocyte → spermatozoan.
- (2) 1° spermatocyte → 2° spermatocyte
→ spermatid → spermatozoan
- (3) Spermatogonium → 1° spermatocyte
→ 2° spermatocyte → spermatozoan
- (4) 1° spermatocyte → 2° spermatocyte
→ spermatogonium → spermatid

Q.115 Which of the following choices INCORRECTLY pairs a digestive enzyme with its site of secretion?

- (1) Pancreatic amylase—pancreas
- (2) Aminopeptidase—stomach
- (3) Enterokinase—intestinal glands
- (4) Maltase—intestinal glands

Q.116 Which one of the following does not affects Hardy-Weinberg's equilibrium ?

- (1) Random mating (2) Genetic drift
- (3) Natural selection (4) Genetic recombination

SPACE FOR ROUGH WORK

Q.117 Read the following statements and select the correct option :

- (a) Gymnosperm do not show xerophytic character.
- (b) In *Cycas* coralloid roots are associated with fungi
- (c) All gymnosperms are heterosporous
- (d) In conifers needle like leaves reduce the surface area.

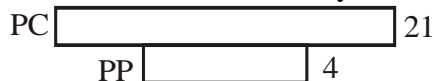
How many above statements are correct ?

- (1) a, b and c
- (2) b, c and d
- (3) c and d
- (4) a and d

Q.118 Which of the following protein is present in the threads that are obtained from bombyx ?

- (1) Collagen
- (2) Fibroin
- (3) Fibrin
- (4) Melanin

Q.119 The given pyramid represents _____ parameter in _____ ecosystem:-



- (1) Number, pond
- (2) Standing crop, tree
- (3) Number, tree
- (4) Standing crop, pond

Q.120 Which one of the following plants is monoecious?

- (1) *Cycas*
- (2) *Marchantia*
- (3) *Pinus*
- (4) Papaya

Q.121 The ciliated columnar epithelium cells in human are known to occur in :

- (1) Oesophagus
- (2) Ducts of glands
- (3) Bowman's capsule and fallopian tube
- (4) Bronchioles and fallopian tube

Q.122 In mammalian ear, a membranous structure which separate the scala vestibuli and scala media is

- (1) Basilar membrane
- (2) Reissner's membrane
- (3) Autolith membrane
- (4) Tectorial membrane

Q.123 How many of the following statements are correct regarding properties of enzymes ?

- (a) It lowers down the activation energy

(b) An active site of an enzyme is a pocket into which the substrate fits.

(c) The catalytic structure of most of the enzyme is primary and globular.

(d) Carbonic anhydrase enzyme is considered as fastest enzyme.

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

Q.124 Which of the following statement is incorrect ?

(1) Diffusion capacity of CO_2 is 20-25 times higher than that of O_2 .

(2) The solubility of CO_2 is 20-25 times higher than that of O_2 .

(3) The diffusion capacity of O_2 is 20-25 times higher than that of CO_2 .

(4) More than one statements are correct.

Q.125 In a Ecosystem :

(a) Cycling of energy and nutrients is a coupled process.

(b) Cycling of energy is an independent process

(c) Movement of energy is unidirectional

(d) Both macro and micro consumers are necessary component.

Choose correct statement(s) :

- (1) Only a
- (2) Only c
- (3) a and c both
- (4) Only d

Q.126 Which one of the following statement is incorrect regarding diffusion pressure deficit (DPD) :

(1) DPD is directly proportional to the solute concentration of the system

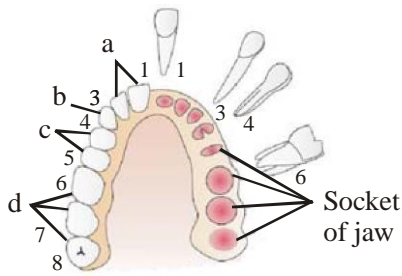
(2) DPD of fully turgid cell becomes zero

(3) DPD for a plasmolysed cell is highest

(4) DPD of flaccid cell is always more than osmotic pressure.

Q.127 Diagram shows arrangement of different types of teeth in the jaws on one side and the sockets on the other side. Identify a, b, c and d :

SPACE FOR ROUGH WORK



- (1) a-Incisor, b-Canine, c-Premolars, d-Molars
 (2) a-Molars, b-Premolars, c-Canine, d-Incisor
 (3) a-Incisor, b-Canine, c-Molars, d-Premolars
 (4) a-Canine, b-Incisor, c-Premolars, d-Molars

Q.128 If in a pond there are 40 lotus plants last year and through reproduction 10 new plants are added, taking the current population to 50. The birth rate is as :

- (1) 0.25 offspring per lotus per year
 (2) 0.25 offspring per lotus per day
 (3) 0.25 offspring per total population per year
 (4) 0.5 offspring per total population per year

Q.129 Angiotensinogen \xrightarrow{a} b \rightarrow Angiotensin II \rightarrow c. Identify a, b & c ?

- (1) Rennin, Aldosterone, ADH
 (2) Renin, Angiotensin-I, Aldosterone
 (3) ADH, ANF, Renin
 (4) ANF, ACE, ADH

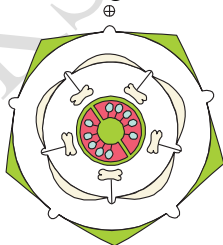
Q.130 Reduced filtration of urea will lead to ?

- (1) Diuresis (2) Kidney stone
 (3) Uremia (4) Nephritis

Q.131 During succession from pioneer to climax community biomass :

- (1) Increases (2) Decreases
 (3) Remain stable (4) Can not predict

Q.132 Following floral diagram is of which plant.



- (1) *Sesbania* (2) *Lupin*
 (3) *Makoi* (4) *Asparagus*

Q.133 How many of the following are haploid ? primary spermatocyte, spermatogonium, secondary spermatocyte, spermatid, spermatozoa.

- (1) Two (2) Three
 (3) Four (4) Five

Q.134 Who made cave paintings first time ?

- (1) Neanderthal man (2) Heidelberg
 (3) Cromagnon man (4) Peking man

Q.135 The female external genitalia include :

- (1) Mons pubis, labia majora, vagina, hymen
 (2) Mons pubis, labia minora, hymen, clitoris
 (3) Mons pubis, labia majora, labia minora, vagina
 (4) Mons pubis, labia majora, labia minora, hymen, clitoris

Q.136 Which loop recognize the aminoacyl synthetase enzyme ?

- (1) 5' end (2) Anticodon site
 (3) 3' end (4) DHU loop

Q.137 BOD values of different samples of water are given

- (a) (b) (c) (d)
 BOD = 5, BOD = 12, BOD = 2, BOD = 7

Which of the above given sample will have more number of Daphnia ?

- (1) a (2) b
 (3) c (4) d

Q.138 The transfer of genetic material from one bacterium to another through virus is called :

- (1) Transformation (2) Conjugation
 (3) Recombination (4) Transduction

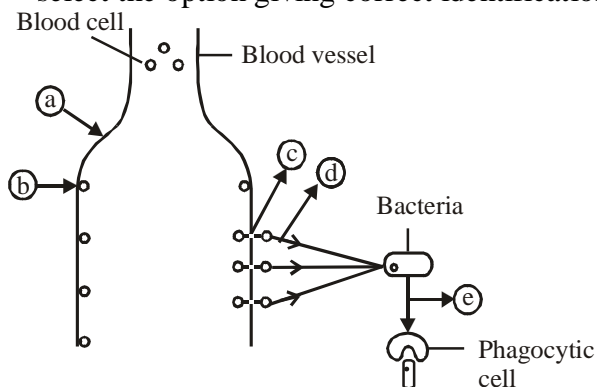
Q.139 Select the incorrect statements :

- (1) Stomata only helps in transpiration.
 (2) Cellulose microfibrils are oriented radially in gaurd cells.
 (3) Transpiration is effected by light and wind speed.
 (4) Plant factor affecting transpiration is atmospheric humidity.

Q.140 If the chyme of a person who had orally consumed only starch as food is analysed before it enters the duodenum it will show the presence of :

- (1) Starch, dextrins and glucose
- (2) Maltose and glucose
- (3) Dextrine and maltase
- (4) Starch, dextrine and maltose

Q.141 The figure below shows steps of phagocytosis select the option giving correct identification.



- (1) c - Shows diapedesis movement of RBC from dilated vessel.
- (2) a - Shows vasoconstriction due to effect of histamine.
- (3) d - Shows chemotactic movement of bacteria to WBC.
- (4) b - Shows adhesion of monocyte due to decreased rate of blood flow.

Q.142 In pteridophyte, meiosis occurs when :

- (1) Gametes are formed
- (2) Spores are formed
- (3) Prothallus is formed
- (4) Sex organs are formed

Q.143 Match the column-I with column-II :

Column-I	Column-II
a. Urochordate	i. Notochord extend from head to tail
b. Cephalo chordate	ii. Notochord absent
c. Vertebrate	iii. Notochord in larval tail
d. Invertebrate	iv. Notochord during embryonic period

- (1) a-(iii), b-(i), c-(iv), d-(ii)
- (2) a-(iv), b-(iii), c-(i), d-(ii)

(3) a-(i), b-(iv), c-(iii), d-(ii)

(4) a-(ii), b-(iii), c-(iv), d-(i)

Q.144 Identify the hormone with its correct matching of source and function :

- (1) ANF – ventricular wall, increases the blood pressure.
- (2) Oxytocin – Posterior pituitary, growth and maintenance of mammary glands.
- (3) Melatonin – Pineal Gland, regulates the normal rhythm of sleep wake cycle.
- (4) Progesterone – Corpus Luteum, stimulation of growth & activation of female secondary sexual organs.

Q.145 Which of the following seed characters were studied by Mendel in his experiments ?

- | | |
|----------------------|----------------------------|
| (a) Seed shape | (b) Seed weight |
| (c) Seed coat colour | (d) Seed starch grain size |
| (e) Seed number | |
- (1) a & b
 - (2) a & e
 - (3) a & c
 - (4) only a

Q.146 The microbe that produces root nodules on the roots of non leguminous plants like alnus is :

- (1) Nitrobacter
- (2) Rhizobium
- (3) Nitrosomonas
- (4) Frankia

Q.147 Which one of the following is indispensable in genetic engineering

- (1) DNA ligase
- (2) Restriction endonuclease
- (3) RNA polymerase
- (4) Reverse transcription

Q.148 Gibberellins promotes bolting in :-

- (1) Raddish
- (2) Carrot
- (3) Beet
- (4) Mustard

Q.149 Match the column-I to column-II :

Column-I	Column-II
(a) Ankle Joint	(i) Cartilagenous
(b) Wrist Joint	(ii) Ball and socket
(c) Shoulder Joint	(iii) Hinge
(d) Pubic-symphysis	(iv) Ellipsoid

- (1) a-(i), b-(ii), c-(iii), d-(iv)
- (2) a-(iii), b-(iv), c-(ii), d-(i)
- (3) a-(iii), b-(ii), c-(iv), d-(i)
- (4) a-(iv), b-(iii), c-(i), d-(ii)

SPACE FOR ROUGH WORK

Q.150 During the conduction of nerve impulse, the action potential is the result of movement of :

- (1) Na^+ from intracellular fluid to extracellular fluid
- (2) Na^+ from extracellular fluid to intracellular fluid
- (3) Na^+ towards both directions
- (4) None of the above

Q.151 How many statements are **incorrect** :-

- (a) Pusa gaurav variety of Brassica is disease resistant for bacteria.
- (b) Jaya and Ratna are varieties of wheat.
- (c) Method of producing thousands of plants through tissue culture is called micropropagation.
- (d) Pusa sawani is a variety of Brassica.
- (e) capacity to generate a whole plant from any cell explants is called totipotency.

- (1) One
- (2) Two
- (3) Three
- (4) four

Q.152 In which of the following, electron produced through photolysis of water will enter the non-cyclic photophosphorylation ?

- (1) PS I
- (2) PS II
- (3) PC
- (4) PQ

Q.153 Which of the following statements about mitochondria is NOT correct?

- (1) They serve as sites for cellular respiration.
- (2) They are enclosed by a double membrane.
- (3) They are the sites where most of the cell's ATP is produced.
- (4) They are found in animal cells only; plant cells have chloroplasts instead.

Q.154 Which of the following statements is correct?

- (1) The product of transcription is DNA.
- (2) The product of transcription is mRNA.
- (3) The product of transcription is a polypeptide.
- (4) The product of translation is mRNA.

Q.155 A host plant produces a toxin that is lethal to aphids feeding on its leaves. Over time, some of the aphids become immune to the toxin. In response, the host plant begins to produce a

different toxin that is lethal to aphids. This is an example of

- (1) parasitism.
- (2) commensalism.
- (3) predation.
- (4) coevolution.

Questions 156–157

Refer to the following breeding experiment. The researcher's goal was to develop white mice with short tails.

P : Brown mice with short tails.

x : White mice with long tails .

F₁ : All offspring are brown and have long tails.

F₂ : 292 mice are brown with long tails.

97 mice are brown with short tails.

103 mice are white with long tails.

36 mice are white with short tails.

Q.156 The results of the above cross indicate that among the original parents (P-generation).

- (1) both were heterozygous for coat color and tail length.
- (2) one was homozygous dominant for coat color and tail length, whereas the other was homozygous recessive for both traits.
- (3) one was homozygous dominant for coat color and homozygous recessive for tail length, whereas the other was homozygous recessive for coat color and homozygous dominant for tail length.
- (4) one was homozygous dominant for both traits, whereas the other was heterozygous for both traits.

Q.157 Based on the results, how many genes control the four traits observed among the F₂ progeny (brown coat color, white coat color, short tail, long tail)?

- (1) one
- (2) two
- (3) four
- (4) eight

Q.158 One produces spores, whereas the other produces seeds.

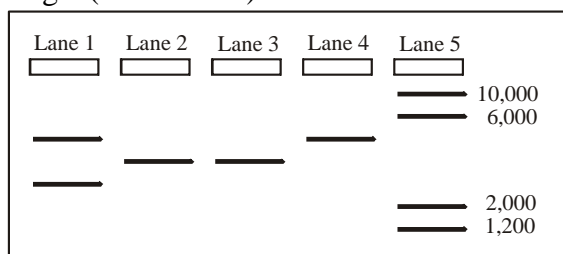
- (1) monocot and dicot
- (2) algae and fungi
- (3) mosses and ferns
- (4) ferns and gymnosperms

SPACE FOR ROUGH WORK

- Q.159** Responsible for primary growth (growth in length) of the plant body.
 (1) vascular cambium (2) ground tissue
 (3) apical meristem (4) phloem
- Q.160** Which of the following best describes a pattern of idealized population growth that is restricted by limiting factors?
 (1) logistic growth model
 (2) carrying capacity model
 (3) dispersion model
 (4) exponential growth model
- Q.161** If a molecule of DNA is composed of approximately 16.2% adenine (A) and 33.4% guanine (G), the percentages of thymine (T) and cytosine (C) must be approximately
 (1) 16.3% T and 16.3% C
 (2) 34.1% T and 34.1% C
 (3) 34.1% T and 16.3% C
 (4) 16.3% T and 34.1% C.
- Q.162** Which of the following pairs represents homologous structures?
 (1) human arm and octopus tentacle.
 (2) human arm and sea star arm.
 (3) human arm and bird wing.
 (4) bird wing and fly wing.
- Q.163** Which of the following has a vitamin as a building block?
 (1) apoenzyme (2) alloenzyme
 (3) metallic ion (4) coenzyme
- Q.164** The role of oxygen in aerobic respiration is
 (1) to couple with C to form CO_2 in chemiosmosis.
 (2) to form ATP.
 (3) to contribute H^+ to the Krebs's cycle.
 (4) to accept electrons from the Electron Support Chain (ETC).
- Q.165** Which of the bonding examples below is NOT possible?
 (1) a DNA adenine to a DNA thymine
 (2) a DNA adenine to an RNA thymine
 (3) a DNA guanine to an RNA cytosine
 (4) a DNA adenine to an RNA uracil
- Q.166** A patient's chart reveals that he has a cardiac output of 7,500 mL/min and a stroke volume of 50 mL. What is his pulse (in beats per minute)?
 (1) 50 beats/min (2) 100 beats/min
 (3) 150 beats/min (4) 400 beats/min
- Q.167** Which of the following is radially symmetrical and possesses nematocysts?
 (1) Porifera (2) Coelenterates
 (3) Mollusca (4) Amphibians
- Q.168** Select the correct sequence for human circulation.
 (1) heart—vein—capillary—artery—heart
 (2) heart—artery—lung—vein—body systems—heart
 (3) heart—artery—lungs—vein—heart—body systems
 (4) body system—lungs—heart—vein—capillary—artery
- Q.169** Which of the following statements most accurately describes the process of double fertilization in angiosperms?
 (1) Two pollen grains land on each stigma; thus, two ovules are fertilized.
 (2) Two sperm cells produced by a single pollen grain fertilize two separate ovules, resulting in the formation of two seeds.
 (3) One sperm cell from a single pollen grain fertilizes an egg cell to form a diploid zygote, while a second sperm cell from the same pollen grain combines with two fused nuclei in the embryo sac, resulting in the formation of a triploid endosperm nucleus.
 (4) One sperm cell from a single pollen grain fertilizes an egg cell to form a haploid zygote, while a second sperm cell from the same pollen grain combines with a single nucleus in the embryo sac, resulting in the formation of a diploid endosperm nucleus.
- Q.170** Which of the above structures develops into the fruit once fertilization has occurred?
 (1) integument (2) cotyledon
 (3) ovule (4) ovary

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Q.171 A group of students tried to insert a small gene into a plasmid that was 4,500 bp in size. They then attempted to insert the plasmids into bacteria by transformation. Several days later, they chose four small colonies and grew them up in a broth culture. They extracted the DNA from the bacteria in each tube and loaded them onto a gel (lanes 1 to 4).



The plasmids shown in lanes 2 and 3 are the same size as the original plasmid. Which of the following statements is (are) true?

- (1) The plasmids in lane 1 could be the result of cutting the original plasmid with restriction enzymes.
- (2) The plasmids in lane 1 can be the same size but different configurations.
- (3) The plasmids in lane 4 are smaller than the original plasmids.
- (4) The students were probably successful in their genetic engineering attempt.

Q.172 The plasmids were separated according to

- (1) their size.
- (2) their charge.
- (3) their A-T : G-C composition.
- (4) both (1) and (2).

Q.173 Monocotyledons and dicotyledons are the two subdivisions of flowering plants.

Monocotyledons are distinguished from dicotyledons because monocots possess

- (1) floral structures in multiples of fours and fives.
- (2) long taproots and parallel venation in their leaves.
- (3) netted leaf venation and floral structures in multiples of three.
- (4) parallel leaf venation and fibrous roots.

Q.174 Which of the following statements is true concerning plants that utilize C_4 photosynthesis?

- (1) They only open their stomates at night.
- (2) They use bundle sheath cells to separate the Calvin cycle from the atmosphere.
- (3) They use rubisco (ribulose biphosphate carboxylase oxygenase) to capture carbon dioxide from the atmosphere.
- (4) They use lenticels exclusively for gaseous exchange in order to conserve water.

Q.175 Which of the following statements about the menstrual cycle is false?

- (1) Luteinizing hormone is produced by the pituitary in response to GNRH from the hypothalamus.
- (2) Luteinizing hormone acts on the follicle, causing ovulation.
- (3) Birth control pills that contain estrogen and progesterone would inhibit the secretion of FSH by the pituitary.
- (4) The endometrium builds up to its maximum thickness soon after the release of FSH.

Q.176 Which is the correct sequence of events during embryonic development?

- (1) cleavage — differentiation — fertilization — gastrulation
- (2) differentiation— fertilization— gastrulation — cleavage
- (3) fertilization — cleavage — gastrulation — differentiation
- (4) fertilization — differentiation — cleavage — gastrulation

Q.177 People who have an extra X chromosome could have gotten it through

- (1) nondisjunction
- (2) transposition
- (3) transduction
- (4) crossing over

Q.178 The function of ATP in voluntary muscle movement is to supply the energy for

- (1) myosin to bind to actin.
- (2) myosin to become separated from actin.
- (3) tropomyosin to bind to troponin.

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(4) tropomyosin to become separated from troponin.

Q.179 Which of the following correctly describes the amount of ATP produced from the high energy carrier coenzymes?

- (1) $1 \text{ FADH}_2 \rightarrow 1 \text{ ATP}$
- (2) $1 \text{ FADH}_2 \rightarrow 3 \text{ ATP}$
- (3) $1 \text{ NADH} \rightarrow 1 \text{ ATP}$
- (4) $1 \text{ NADH} \rightarrow 3 \text{ ATP}$

Q.180 The target tissue for parathyroid hormone is (are) the

- (1) kidneys
- (2) bones
- (3) small intestine
- (4) all of the above

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