

SHIKSHA CLASSES, BHANDARA

FULL TEST-6

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 :

Phone/Mobile No.

Roll No.

PART A – CHEMISTRY

- Q.1** The increasing order for the values of e/m (charge/mass) is :
- (1) e, p, n, α (2) n, p, e, α
(3) n, p, α , e (4) n, α , p, e
- Q.2** In the hydrolysis process of $H_2S_2O_8$ which is formed ?
- (1) H_2SO_5
(2) H_2O_2
(3) H_2SO_4
(4) All given compound formed
- Q.3** Two mole of an Ideal gas are expanded isothermally and reversibly from 1 litre to 10 litre at 300 K. The enthalpy change (in kJ) for the process is :
- (1) 11.4 kJ (2) -11.4 kJ
(3) 0 kJ (4) 4.8 kJ
- Q.4** Consider the following statements if they are true then use 'T' otherwise 'F' for false.
- (a) $K_2CO_3 > BeCO_3$ (Thermal stability)
(b) $SiO_2 > CO_2$ (Order of hardness)
(c) LiF is ionic but insoluble in water
(d) On heating NH_4NO_3 a gas is evolved which is used in dentistry.
- (1) T T T T (2) T T F T
(3) T T F F (4) T F F T
- Q.5** The conjugate base of HSO_3^- is :
- (1) H_2SO_3 (2) H_2SO_4
(3) SO_3^{2-} (4) None of these
- Q.6** The SRP for $Zn^{2+} | Zn$, $Ni^{2+} | Ni$ and $Fe^{2+} | Fe$ are -0.76 V, -0.23 V and -0.44 V respectively. The reaction $X + Y^{2+} \rightarrow X^{2+} + Y$ will spontaneous when :
- (1) X = Ni, Y = Fe (2) X = Ni, Y = Zn
(3) X = Fe, Y = Zn (4) X = Zn, Y = Ni
- Q.7** 105 mL of pure water at 4°C is saturated with NH_3 producing a solution of 30% by mass of NH_3 . The total weight of solution after saturation becomes :

- (1) 105 g (2) 45 g
(3) 150 g (4) 160 g
- Q.8** Biuret test is not given by :
- (1) Proteins (2) Carbohydrates
(3) Polypeptides (4) Urea
- Q.9** The mechanism of the reaction $2NO_2 + F_2 \rightarrow 2NO_2F$ is :
- (i) $NO_2 \xrightarrow{\text{Slow}} NO + O$
(ii) $F_2 + O + NO \xrightarrow{\text{Fast}} NO_2F + F$
(iii) $F + NO_2 \xrightarrow{\text{Fast}} NO_2F$.
- Select the correct one
- (1) the reaction is of 3rd order.
(2) the molecularity of the reaction is sum of molecularities of all steps.
(3) reaction is zero order w.r.t. F_2 .
(4) Half life of reaction depends upon initial conc. of NO_2 .
- Q.10** Match the column :
- Column I**
- (a) This substance undergoes ionic bonding.
(b) This molecule contains two pi (π) bonds.
(c) This substance undergoes hydrogen bonding.
- Column II**
- (p) CH_4 (q) NH_3
(r) NaCl (s) N_2
- Choose the correct code
- (1) a-p, b-q, c-r (2) a-r, b-s, c-q
(3) a-p, b-r, c-s (4) a-s, b-r, c-p
- Q.11** $a \xrightarrow{H_2NOH} b \xrightarrow{\text{Reduction}} c \xrightarrow{NOCl} CH_3CH_2Cl$
- a and c in the above sequence respectively are
- (1) Methanal, Methylamine
(2) Acetone, ethanamine
(3) Ethanal, dimethylamine
(4) Acetaldehyde, ethylamine

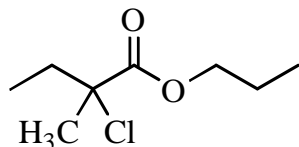
Q.12 With respect to chlorobenzene, which of the following statements is not correct?

- (1) Cl is ortho/para directing
- (2) Cl exhibits + M effect
- (3) Cl is ring deactivating
- (4) Cl is meta directing

Q.13 If a molecule has 5 chiral centers, how many possible stereoisomers can exist?

- (1) 10
- (2) 16
- (3) 32
- (4) 36

Q.14 Determine the correct IUPAC name for the compound shown:



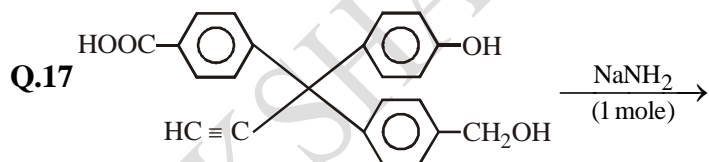
- (1) Propyl 2-chloro-2-methylbutanoate.
- (2) 3-chloro-3-methyl-4-propoxybutanoate.
- (3) 3-chloro-3-methyl-4-propoxybutanone.
- (4) 2-chloro-2-methyl-propyl butanoate.

Q.15 Which of the following molecules is planer :

- (1) AlCl_3 (dimer)
- (2) SnCl_4
- (3) NCl_3
- (4) $\text{CH}_2 = \text{CH}_2$

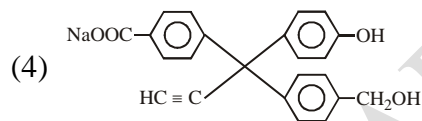
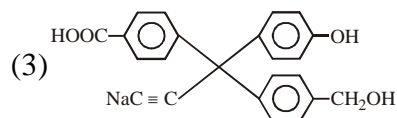
Q.16 In presence of iron, alkali metal react with liquid ammonia and form

- (1) Metal mixture + H_2
- (2) Iron metal mixture + H_2
- (3) Metal mixture
- (4) Metal amide + H_2



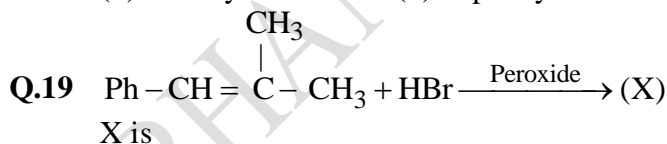
Product is –

- (1)
- (2)



Q.18 Which alcohol produces turbidity with Lucas reagent most slowly –

- (1) 2-Butanol
- (2) t-Butyl alcohol
- (3) Isobutyl alcohol
- (4) Diphenylcarbinol



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

Q.20 The volume of methane evolved by treatment of 16.6g of methyl magnesium iodide with water at S.T.P. is –

- (1) 224 mL
- (2) 2.24 L
- (3) 0.224 L
- (4) 22.4 L

Q.21 The boiling point of an aqueous solution of a non volatile solute is 100.15°C . What is the freezing point of an aqueous solution obtained by diluting the above solution with an equal volume of water? The values of K_b and K_f for water are 0.512 and $1.86 \text{ K molality}^{-1}$:

- (1) -0.544°C
- (2) -0.512°C
- (3) -0.272°C
- (4) -1.86°C

SPACE FOR ROUGH WORK

Q.22 What is the potential of the cell containing two hydrogen electrodes as represented below
 $\text{Pt} ; \text{H}_2(\text{g}) | \text{H}^+ (10^{-8} \text{ M}) || \text{H}^+ (0.001 \text{ M}) | \text{H}_2(\text{g}).\text{Pt}$

- (1) -0.295 V (2) -0.0591 V
 (3) 0.295 V (4) 0.0591 V

Q.23 In which of the following compounds, observed bond angle is found to be greater than expected, but not due to back bonding

- (1) $\text{N}(\text{SiH}_3)_3$ (2) $\text{O}(\text{CH}_3)_2$
 (3) $\text{O}(\text{SiH}_3)_2$ (4) All of these

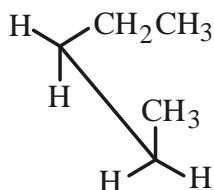
Q.24 Which is less hydrolysed:

- (1) PCl_3 (2) NCl_3
 (3) AsCl_3 (4) SbCl_3

Q.25 The borax bead test is based upon the formation of –

- (1) Boron oxide (2) Boric acid
 (3) Meta borates (4) Elemental boron

Q.26 Which conformation of pentane appears as shown?



- (1) anti (2) gauche
 (3) eclipsed (4) totally eclipsed

Q.27 When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to formation of

- (1) CrO_3 (2) Cr_2O_3
 (3) CrO_5 (4) CrO_4^{2-}

Q.28 The solubility of AgBr in hypo solution is due to the formation of

- (1) Ag_2SO_3 (2) $\text{Ag}_2\text{S}_2\text{O}_3$
 (3) $[\text{Ag}(\text{S}_2\text{O}_3)]^-$ (4) $[\text{Ag}(\text{S}_2\text{O}_3)_2]^{3-}$

Q.29 An aqueous solution of CoCl_2 on addition of excess of concentrated HCl turns blue due to formations of:

- (1) $[\text{Co}(\text{H}_2\text{O})_4\text{Cl}_2]$ (2) $[\text{Co}(\text{H}_2\text{O})_2\text{Cl}_4]^{2-}$
 (3) $[\text{CoCl}_4]^{2-}$ (4) $[\text{Co}(\text{H}_2\text{O})_2\text{Cl}_2]$

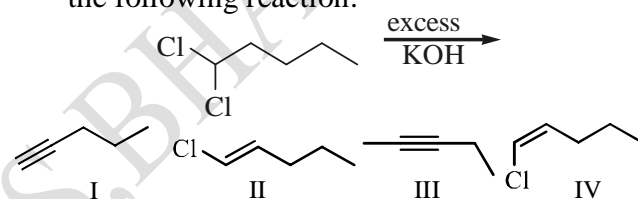
Q.30 Purification of Ge like semiconductor is done by

- (1) Cyanide process (2) Van arkel process
 (3) Alumino thermite (4) Zone refining

Q.31 One mole of alkene X on ozonolysis gave one mole of acetaldehyde and one mole of acetone. The IUPAC name of X is –

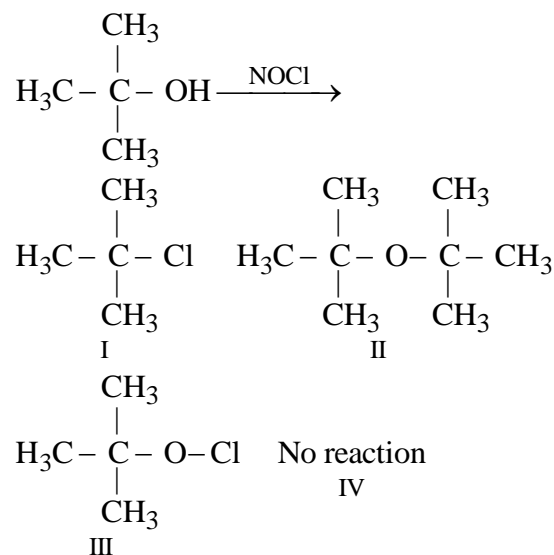
- (1) 2-methyl-2-butene (2) 2-methyl-1-butene
 (3) 2-butene (4) 1-butene

Q.32 Predict the product formed in highest yield in the following reaction:



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

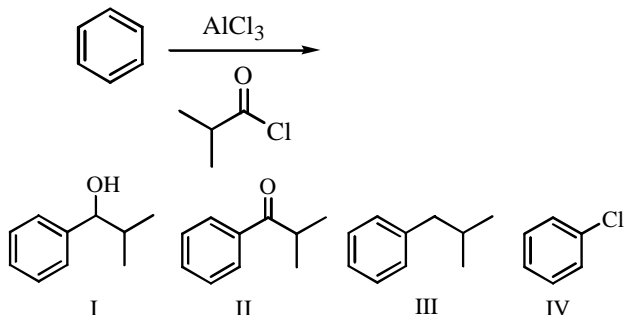
Q.33 Predict the correct product of the reaction shown:



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

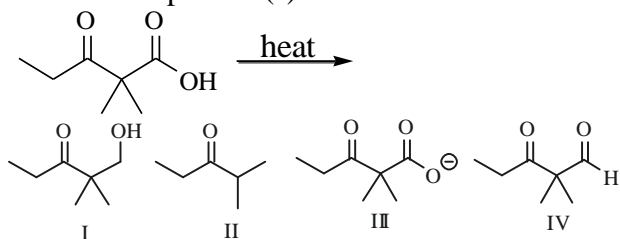
SPACE FOR ROUGH WORK

Q.34 Which is the correct product for the reaction shown:



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

Q.35 What is the product(s) of the reaction shown?

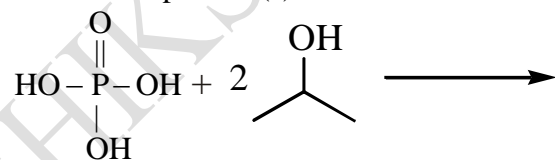


- (1) I (2) II
(3) III (4) IV

Q.36 Which of the following statements about decarboxylation is not true?

- Both β -ketoesters and β -ketoacids undergo thermal decarboxylation.
- Decarboxylation usually requires heat.
- The initial product of a β -ketoacid decarboxylating is an enol.
- In the first step of the reaction, a pericyclic hydrogen transfer allows for the release of carbon dioxide.

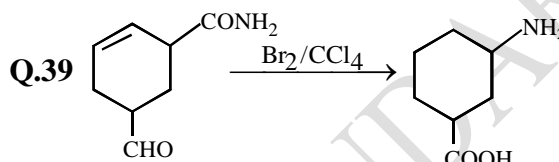
Q.37 What is the product(s) of the reaction shown?



- Phosphoric acid and water
- Phosphoric acid isopropyl ester and water
- Phosphoric acid diisopropyl ester and water
- Phosphate anion

Q.38 What is the main product of the reaction between an amide and lithium aluminum hydride?

- An alcohol
- An amine
- An aldehyde
- A nitrile



What is sequence of reagent use to convert following

- H_2/Pd , $[\text{Ag}(\text{NH}_3)_2]^+$, Br_2/NaOH
- $\text{Ag}[(\text{NH}_3)_2]^+$, H_2/Pd , Br_2/NaOH
- Br_2/NaOH , $[\text{Ag}(\text{NH}_3)_2]^+$, H_2/Pd
- H_2/Pd , Br_2/NaOH , $[\text{Ag}(\text{NH}_3)_2]^+$

Q.40 Match the following

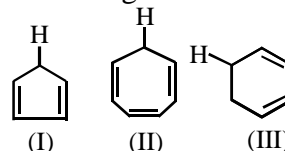
Column I

- Biodegradable polymer
- Bakelite
- Neoprene
- Glyptal

Column II

- 3-Hydroxybutanoic acid
 - phenol
 - 2-chlorobuta-1,3-diene
 - phthalic acid
- i - p; ii - q; iii - r; iv - s
 - i - q; ii - p; iii - r; iv - s
 - i - p; ii - q; iii - s; iv - r
 - i - s; ii - r; iii - p; iv - q

Q.41 Order of increasing acidic strength



- I > II > III
- II > III > I
- I > III > II
- III > II > I

Q.42 Wavelength of particular transition for H atom is 400 nm. What can be wavelength of He^+ for same transition :

- 400 nm
- 100 nm
- 1600 nm
- 200 nm

Q.43 When NH_3 (0.1 M) 50 ml mix with HCl (0.1 M) 10 ml then what is pH of resultant solution ($\text{P}k_b = 4.75$)

- (1) 9.25 (2) 10
(3) 9.85 (4) 4.15

Q.44 Which of following statement is **incorrect**.

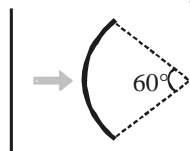
- (1) On prolonged dialysis colloid becomes stable
(2) AgNO_3 in excess KI forms negative colloid.
(3) AgNO_3 in excess KI forms positive colloid.
(4) Medicines work best in colloidal form because of greater surface area.

Q.45 Which of the following have maximum pH?

- (1) Black coffee (2) blood
(3) Gastric juice (4) Saliva

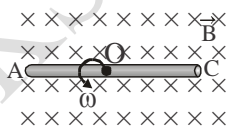
PART B – PHYSICS

Q.46 A magnetised wire of moment M is bent into an arc of a circle subtending an angle of 60° at the centre; then the new magnetic moment is :



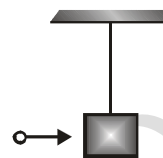
- (1) $2M / \pi$ (2) M / π
(3) $\frac{3\sqrt{3}M}{\pi}$ (4) $3M / \pi$

Q.47 A conducting rod AC of length 4ℓ is rotated about a point O in uniform magnetic field \vec{B} directed into the paper. $\text{AO} = \ell$ and $\text{OC} = 3\ell$. Then :



- (1) $V_A - V_0 = \frac{B\omega\ell^2}{2}$ (2) $V_0 - V_C = \frac{7}{2}B\omega\ell^2$
(3) $V_A - V_C = 4B\omega\ell^2$ (4) $V_C - V_0 = \frac{9}{2}B\omega\ell^2$

Q.48 A mass of 10 gm, moving horizontally with a velocity of 100 cm/sec, strikes the bob of a pendulum and sticks to it. The mass of the bob is also 10 gm. The maximum height to which the system can be raised is ($g = 10 \text{ m/sec}^2$)



- (1) Zero (2) 5 cm
(3) 2.5 cm (4) 1.25 cm

Q.49 The plates of a capacitor are charged to a potential difference of 320 volts and are then connected across a resistor. The potential difference across the capacitor decays exponentially with time. After 1 second the potential difference between the plates of the capacitor is 240 volts, then after 2 and 3 seconds the potential difference between the plates will be-

- (1) 200 and 180 V (2) 180 and 135 V
(3) 160 and 80 V (4) 140 and 20 V

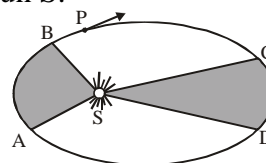
Q.50 A particle is moving on circular path of radius r with constant speed v . Magnitude of its average acceleration when it describes half circle is :

- (1) $\frac{v}{\pi r}$ (2) $\frac{v^2}{\pi r}$
(3) $\frac{2v^2}{\pi r}$ (4) $2v^2$

Q.51 An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. what is the percentage increase in the apparent frequency ?

- (1) zero (2) 0.5%
(3) 5% (4) 20%

Q.52 Figure shows elliptical orbit of a planet P about the sun S.



SPACE FOR ROUGH WORK

The shaded area SCD is twice the shaded area SAB. If t_1 is the time for the planet to move from C to D and t_2 is the time to move from A to B, then

- (1) $t_1 = t_2$ (2) $t_1 = 2t_2$
 (3) $t_1 = 4t_2$ (4) $t_1 > t_2$

Q.53 The potential energy of a particle of mass m is

given by
$$U(x) = \begin{cases} E_0; & 0 \leq x \leq 1 \\ 0; & x > 1 \end{cases}$$

λ_1 and λ_2 are the de-Broglie wavelengths of the particle, when $0 \leq x \leq 1$ and $x > 1$ respectively. If the total energy of particle is $2E_0$, the ratio

$\frac{\lambda_1}{\lambda_2}$ will be

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

Q.54 A uniform cylinder has a radius R and length L . If the moment of inertia of this cylinder about an axis passing through its centre and normal to its circular face is equal to the moment of inertia of the same cylinder about an axis passing through its centre and normal to its length; then :

- (1) $L = R$ (2) $L = \sqrt{3}R$
 (3) $L = R/\sqrt{3}$ (4) $L = 0$

Q.55 A simple pendulum is suspended in a car. The car starts moving on a horizontal road according to equation $x = \frac{g}{2}\sqrt{3}t^2$. Find the time period of oscillation of the pendulum.

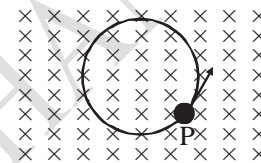
- (1) $2\pi\sqrt{\frac{\ell}{g}}$ (2) $\pi\sqrt{\frac{2\ell}{g}}$
 (3) $2\pi\sqrt{\frac{\ell}{8g}}$ (4) $2\pi\sqrt{\frac{\ell}{g\sqrt{3}}}$

Q.56 A load resistance of $3\text{ k}\Omega$ is connected in the collector circuit of an amplifier using common emitter configuration with $\beta = 50$ and input

resistance 500Ω . If the input current is changed by $40\text{ }\mu\text{A}$ then by what amount does the output voltage change :

- (1) 3 V (2) 4.5 V
 (3) 6 V (4) 9 V

Q.57 A particle having a charge of $10.0\mu\text{C}$ and mass $1\mu\text{g}$ moves in a circle of radius 10 cm under the influence of a magnetic field of induction 0.1 T . When the particle is at a point P, a uniform electric field is switched on so that the particle starts moving along the tangent with a uniform velocity. The electric field is :



- (1) 0.1 V/m (2) 1.0 V/m
 (3) 10.0 V/m (4) 100 V/m

Q.58 Two polaroids are placed in the path of unpolarized beam of intensity I_0 such that no light is emitted from the second polaroid. If a third polaroid whose polarization axis makes an angle θ with the polarization axis of first polaroid, is placed between these polaroids then the intensity of light emerging from the last polaroid will be :

- (1) $\left(\frac{I_0}{8}\right)\sin^2 2\theta$ (2) $\left(\frac{I_0}{4}\right)\sin^2 2\theta$
 (3) $\left(\frac{I_0}{2}\right)\cos^4 \theta$ (4) $I_0 \cos^4 \theta$

Q.59 The relation between time and distance is $t = \alpha x^2 + \beta x$, where α and β are constants. The retardation is :

- (1) $2\alpha v^3$ (2) $2\beta v^3$
 (3) $2\alpha\beta v^3$ (4) $2\beta^2 v^3$

Q.60 The frequency of tuning forks A and B are respectively 3% more and 2% less than the frequency of tuning fork C. When A and B are simultaneously excited, 5 beats per second are produced. Then the frequency of the tuning fork 'A' (in Hz) is :

SPACE FOR ROUGH WORK

- (1) 98 (2) 100
 (3) 103 (4) 105

Q.61 Two identical short bar magnets, each having magnetic moment M , are placed a distance of $2d$ apart with axes perpendicular to each other in a horizontal plane. The magnetic induction at a point midway between them is :

- (1) $\frac{\mu_0}{4\pi}(\sqrt{2})\frac{M}{d^3}$ (2) $\frac{\mu_0}{4\pi}(\sqrt{3})\frac{M}{d^3}$
 (3) $\left(\frac{2\mu_0}{\pi}\right)\frac{M}{d^3}$ (4) $\frac{\mu_0}{4\pi}(\sqrt{5})\frac{M}{d^3}$

Q.62 Starting with a sample of pure ^{66}Cu , $(7/8)$ of it decays into Zn in 15 min. The corresponding half-life is :

- (1) 5 min (2) 7.5 min
 (3) 10 min (4) 15 min

Q.63 A current of $25/\pi$ Hz frequency is passing through an A.C. circuit having series combination of $R = 100\Omega$ and $L = 2\text{H}$, the phase difference between voltage and current is

- (1) 90° (2) 60°
 (3) 30° (4) 45°

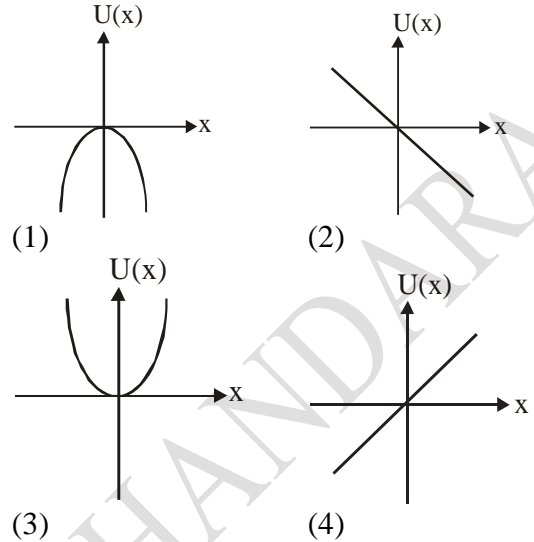
Q.64 A boy of mass 40 kg is climbing a vertical pole at a constant speed. If the coefficient of friction between his palms and the pole is 0.8 and $g = 10 \text{ m/s}^2$, the minimum horizontal force that he is applying on the pole is :

- (1) 300 N (2) 400 N
 (3) 500 N (4) 600 N

Q.65 Water is in streamline flow along a horizontal pipe with non-uniform cross-section. At a point in the pipe where the area of cross-section is 10cm^2 , the velocity of water is 1 ms^{-1} and the pressure is 2000Pa . The pressure at another point where the cross-sectional area is 5 cm^2 is

- (1) 4000 Pa (2) 2000 Pa
 (3) 1000 Pa (4) 500 Pa

Q.66 A particle is placed at the origin and a force $F = kx$ is acting on it (where k is positive constant). If $U(0) = 0$ at $x = 0$, the graph of $U(x)$ versus x will be (where U is the potential energy function) :



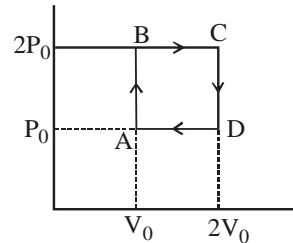
Q.67 A thin spherical conducting shell of radius R has a charge q . Another charge Q is placed at the centre of the shell. The electrostatic potential at a point p a distance $R/2$ from the centre of the shell is :

- (1) $\frac{(q+Q)2}{4\pi\epsilon_0 R}$ (2) $\frac{2Q}{4\pi\epsilon_0 R}$
 (3) $\frac{2Q}{4\pi\epsilon_0 R} - \frac{2q}{4\pi\epsilon_0 R}$ (4) $\frac{2Q}{4\pi\epsilon_0 R} + \frac{q}{4\pi\epsilon_0 R}$

Q.68 The maximum wavelength of radiation emitted at 2000 K is $4\mu\text{m}$. What will be the maximum wavelength of radiation emitted at 2400 K :

- (1) $3.33 \mu\text{m}$ (2) $0.66 \mu\text{m}$
 (3) $1 \mu\text{m}$ (4) 1 m

Q.69 Helium gas goes through a cycle ABCDA (consisting of two isochoric and isobaric lines) as shown in figure. Efficiency of this cycle is nearly : (Assume the gas to be close to ideal gas)



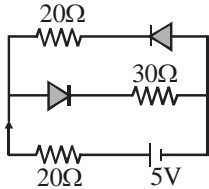
- (1) 15.4% (2) 9.1%
 (3) 10.5% (4) 12.5%

SPACE FOR ROUGH WORK

Q.70 Radius of curvature of concave mirror is 40 cm and the size of image is twice as that of object, then the object distance is :

- (1) 60 cm (2) 20 cm
(3) 40 cm (4) 30 cm

Q.71 Current in the circuit will be :

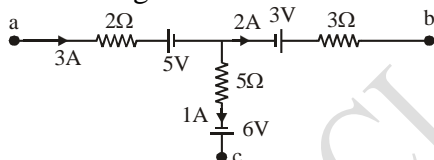


- (1) $(5/40)$ A (2) $(5/50)$ A
(3) $(5/10)$ A (4) $(5/20)$ A

Q.72 When a current of 5mA is passed through a galvanometer having a coil of resistance 15Ω , it shows full scale deflection. The value of the resistance to be put in series with the galvanometer to convert it into a voltmeter of range 0-10 V is :

- (1) $4.005 \times 10^3 \Omega$ (2) $1.985 \times 10^3 \Omega$
(3) $2.045 \times 10^3 \Omega$ (4) $2.535 \times 10^3 \Omega$

Q.73 Find the potential difference ($V_a - V_b$) between a and b in the given circuit



- (1) 14 V (2) 17 V
(3) 12 V (4) -14V

Q.74 The magnifying glass is made of combination of lenses of power +20D and -4D. If the distance of distinct vision is 25cm, calculate the size of an object 2cm height seen through the magnifying glass :

- (1) 4 (2) 16
(3) $25/4$ (4) 5

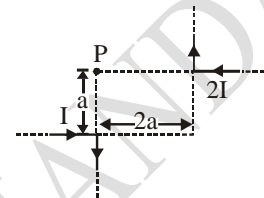
Q.75 A string vibrates with a frequency of 200 Hz. When its length is doubled and tension is altered, it begins to vibrate with a frequency of 300 Hz. The ratio of the new tension to the original tension is :

- (1) 9 : 1 (2) 1 : 9
(3) 3 : 1 (4) 1 : 3

Q.76 A beaker of radius 15 cm is filled with a liquid of surface tension 0.075 N/m. Force across an imaginary diameter on the surface of the liquid as :

- (1) 0.075 N (2) 1.5×10^{-2} N
(3) 0.225 N (4) 2.25×10^{-2} N

Q.77 Magnetic field at point 'P' of given current distribution is :



- (1) $\frac{\mu_0 I}{2\pi a} \otimes$ (2) $\frac{\mu_0 I}{8\pi a} \square$
(3) $\frac{\mu_0 I}{2\pi a} \square$ (4) zero

Q.78 A photon collides with a stationary hydrogen atom in ground state inelastically. Energy of the colliding photon is 10.2 eV. After a time interval of the order of micro second another photon collides with same hydrogen atom inelastically with an energy of 15eV. What will be observed by the detector :

- (1) 2 photon of energy 10.2 eV
(2) 2 photon of energy of 1.4 eV
(3) One photon of energy 10.2 eV and an electron of energy 1.4 eV
(4) One photon of energy 10.2 eV and another photon of 1.4 eV

Q.79 For a gas undergoing an adiabatic process, the relation between temperature and volume is found to be $TV^{0.4} = \text{const}$. This gas must be :

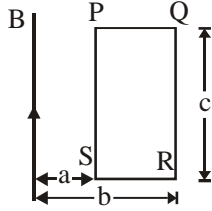
- (1) Hydrogen (2) Argon
(3) Carbon dioxide (4) Helium

Q.80 Moment of inertia of a uniform circular disc about a diameter is I. Its moment of inertia about an axis perpendicular to its plane and passing through a point on its rim will be :

- (1) 5I (2) 3I
(3) 6I (4) 4I

SPACE FOR ROUGH WORK

Q.81 AB is an infinitely long wire placed in the plane of rectangular coil of dimensions as shown in the figure. Calculate the mutual inductance of wire AB and coil PQRS :



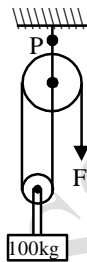
- (1) $\frac{\mu_0 b}{2\pi} \ln \frac{a}{b}$ (2) $\frac{\mu_0 c}{2\pi} \ln \frac{b}{a}$
 (3) V (4) None of these

Q.82 Which of the following physical quantities has a unit but no dimensions ?

- (1) Relative velocity (2) Relative density
 (3) Strain (4) Angle

Q.83 In the diagram 100 kg block is moving up with constant velocity, then find out the tension at point P :

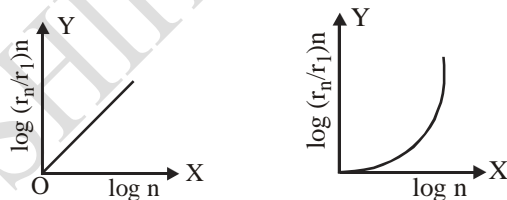
- (1) 490 N (2) 980 N
 (3) 1470 N (4) 2180 N



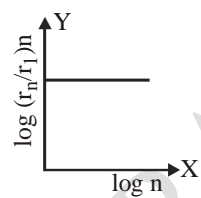
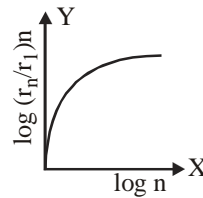
Q.84 A particle of mass m is placed at the centre of a uniform spherical shell of mass $3m$ and radius R . Gravitational potential on the surface of the shell is

- (1) $-\frac{Gm}{R}$ (2) $-\frac{3Gm}{R}$
 (3) $-\frac{4Gm}{R}$ (4) $-\frac{2Gm}{R}$

Q.85 In a hydrogen atom, the radius of n^{th} Bohr orbit is r_n . The graph between $\log (r_n/r_1)$ and $\log n$ will be



- (1) (2)



- (3) (4)

Q.86 A bimetallic strip is formed out of two identical strips, one of copper and the other of brass. The coefficients of linear expansion of the two metals are α_C and α_B . On heating, the temperature of the strip increases by ΔT and the strip bends to form an arc of radius R . Then R is proportional to –

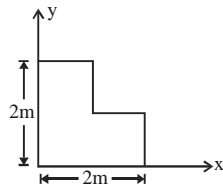
- (1) ΔT (2) $1/\Delta T$
 (3) $\sqrt{\Delta T}$ (4) $1/\sqrt{\Delta T}$

Q.87 The kinetic energy K of a particle of mass m moving along a circle of radius R depends on distance covered s as $K = as^2$. Then the acceleration of particle is given by

- (1) $\frac{2as}{m} \left(1 + \frac{s^2}{R^2}\right)^{1/2}$ (2) $\frac{2as}{m} \left(1 - \frac{s^2}{R^2}\right)^{1/2}$
 (3) $\frac{2as^2}{mR}$ (4) $\frac{2as}{m}$

Q.88 The x, y coordinates of the centre of mass of a uniform L-shaped lamina of mass 3 kg is :

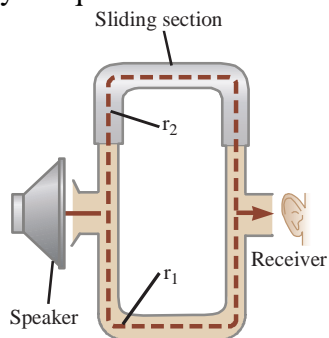
- (1) $\left(\frac{5}{6}m, \frac{5}{6}m\right)$ (2) $(1m, 1m)$
 (3) $\left(\frac{6}{5}m, \frac{6}{5}m\right)$ (4) $(2m, 2m)$



Q.89 In Figure, a sound wave of wavelength 0.8 m divides into two equal parts that recombine to interfere constructively, with the original difference between their path lengths being $|r_2 - r_1| = 0.8$ m. Rank the following situations according to the intensity of sound at the receiver from the highest to the lowest. Assume the tube walls absorb no sound energy.

SPACE FOR ROUGH WORK

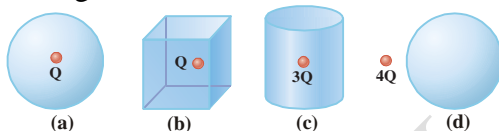
Give equal ranks to situations in which the intensity is equal.



- (a) From its original position, the sliding section is moved out by 0.1 m.
 (b) Next it slides out an additional 0.1 m.
 (c) It slides out still another 0.1 m.
 (d) It slides out 0.1 m more.

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

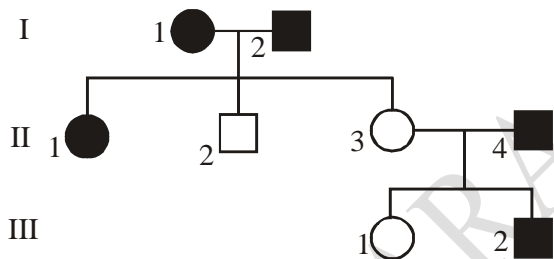
Q.90 Rank the electric fluxes through each gaussian surface shown in Figure from largest to smallest. Display any cases of equality in your ranking.



- (1) $b > c = a > d$ (2) $a > b = c > d$
 (3) $c > a = b > d$ (4) $b > d = a > c$

PART C – BIOLOGY

- Q.91** Annelida is characterised by :-
 (1) Triploblastic, bilateral symmetry and metameric segmentation.
 (2) Bilateral symmetry and pair of wings
 (3) Acoelomates and radial symmetry
 (4) Exoskeleton, metameric segmentation and jointed appendages.
- Q.92** The given pedigree is for autosomal dominant disorder. What will be genotype of III-2 individual?



- (1) AA (2) Aa
 (3) aa (4) AA or Aa

Q.93 Which of the following plant group is not embryophyte ?

- (1) Pteridophyta (2) Algae
 (3) Gymnosperm (4) Bryophyta

Q.94 Select correct option w.r.t. cell membrane :

- (1) Human RBC has 58% lipid, 40% protein
 (2) Major lipid is phospholipid
 (3) Membrane is composed of only lipid & protein
 (4) Carbohydrate are present on both outer and inner side of membrane

Q.95 Critinism is caused due to :

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

Q.96 How much blood is filtered by both kidneys per minute ?

- (1) 1100–1200 ml (1/5th of cardiac output)
 (2) 500–600 ml (1/5th of stroke volume)
 (3) 1100–1200 ml (1/5th of stroke volume)
 (4) 0.5–1.2 litre (1/5th of single circulation)

Q.97 Find out the correct match from following table?

Act	Year
(i) The National Environment Protection Act	1981
(ii) Wild life (protection) Act	1972
(iii) Forest Act	1927
(iv) The air (Prevention & Control of Pollution) Act	1986

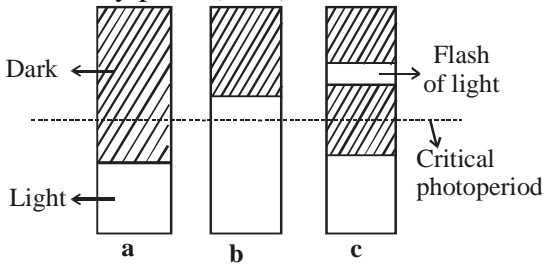
- (1) (i), (ii) and (iii) (2) (ii) and (iv) only
 (3) (ii) and (iii) only (4) (i), (iii) and (iv)

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Q.98 Which biocontrol agent is very common in root ecosystem and is effective against several plant pathogens ?

- (1) Nucleopolyhedro virus
- (2) Baculo virus
- (3) *Trichoderma*
- (4) *Bacillus Thuringiensis*

Q.99 Which option will be correct for flowering in short day plant (SDP) ?



- (1) a and c
- (2) b and c
- (3) only a
- (4) only b

Q.100 At the point of fusion of ilium, ischium and pubis, a cavity is formed, which is known as :

- (1) Glenoid cavity
- (2) Acetabulum
- (3) Olecranon fossa
- (4) Odontoid

Q.101 In the given four statements (a-d), select the options which includes all the correct ones :

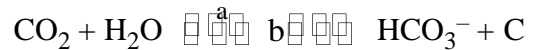
- (a) LNG-20 makes uterus unsuitable for implantation.
- (b) Rete testis, testis, epididymis are male accessory ducts.
- (c) Placenta is formed only by maternal tissues.
- (d) By the end of second month of pregnancy foetus develops limbs and digits.

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

Q.102 Select the correct matching—

	Phylum	Character	Example
(1)	Hemichordata	Notochord	<i>Balanoglossus</i>
(2)	Mollusca	Radula	<i>Dentalium</i>
(3)	Platyhelminthes	Coelomate	<i>Dugesia</i>
(4)	Coelenterata	All marine	<i>Hydra</i>

Q.103 Read this reaction carefully and find a, b and c



- (1) a = Carbonic anhydrase, b = Adenylate cyclase, c = CO_2
- (2) a = Carbonic anhydrase, b = H_2CO_3 , c = H^+
- (3) a = Carbonic anhydrase, b = H_2CO_3 , c = HCO_3^-
- (4) a = Acetic anhydrase, b = HCO_3^- , c = H^+

Q.104 Jawless fishes probably evolved around :

- (1) 500 mya
- (2) 400 mya
- (3) 350 mya
- (4) 300 mya

Q.105 Which of the following statement is correct ?

- (1) Methods of producing thousands of plants through tissue culture is called somaclones.
- (2) Atlas-66, having a high protein content, wheat variety.
- (3) Pusa gaurav is a aphids resistant variety of okra (Bhindi)
- (4) Better yielding semi dwarf wheat varieties Jaya and Ratna were developed in India.

Q.106 In nitrogen cycle ammonia is converted into nitrite by :

- (1) *Azotobacter*
- (2) *Nitrosomonas*
- (3) *Nitrobacter*
- (4) *Rhizobium*

Q.107 Which of the following is incorrect for human digestive system ?

- (1) Tongue is attached to the floor of the oral cavity by the frenulum.
- (2) Larynx is the common passage for food and air.
- (3) Duodenum is C shaped.
- (4) Mucosal epithelium has goblet cells which secrete mucus that help in lubrication.

Q.108 Correctly match the column-I with column-II :

- | Column-I | Column-II |
|------------------|---------------------------------------|
| A. Statins | (i) <i>Streptococcus</i> |
| B. Streptokinase | (ii) <i>Penicillium notatum</i> |
| C. Penicillin | (iii) <i>Saccharomyces cerevisiae</i> |
| D. Ethanol | (iv) <i>Monascus purpureus</i> |
- (1) A-iv, B-i, C-ii, D-iii
 - (2) A-i, B-iv, C-ii, D-iii
 - (3) A-iv, B-ii, C-i, D-iii
 - (4) A-iv, B-i, C-iii, D-ii

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Q.109 Grafted kidney may be rejected in a patient due to

- (1) Cell-mediated immune response
- (2) Passive immune response
- (3) Innate immune response
- (4) Humoral immune response

Q.110 Which of the following food chain is the major conduct of energy flow in aquatic and terrestrial ecosystem respectively :

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

Q.111 Which of the following plant group is embryophyte but not vascular :

- (1) Pteridophyta
- (2) Angiosperm
- (3) Gymnosperm
- (4) Bryophyta

Q.112 Which of the following effect is produced by colchicine

- (1) Duplication of centrioles
- (2) Duplication of chromosomes
- (3) Promotes formation of spindle fibres
- (4) Inhibition of the synthesis of middle wall

Q.113 Red drop effect is due to :

- (1) Inactivation of PS-I
- (2) Inactivation of PS-II
- (3) Inactivation of both PS-I and PS-II
- (4) Inactivation of neither PS-I nor PS-II

Q.114 In flowering plants fertilization occurs in :

- (1) Ovary
- (2) Embryosac
- (3) Nucellus
- (4) Ovule

Q.115 Sauropsids were derived from early reptiles and these sauropsids gave rise to :

- (1) Dinosaurs, Therapsids & Lizard
- (2) Dinosaurs, Modern Reptile & Bird
- (3) Mammals, Turtle & tortoise
- (4) Pelycosaurus, Therapsid & mammals

Q.116 If the sequence of the coding strand in a transcription unit is written as follows :

5'-ATGCATGCATGCATGCATGCATGC-3'

Write down the sequence of m-RNA :

- (1) 3'-AUGCAUGCAUGCAUGCAUGCAUGCAUG C-5'

- (2) 5'-ATGCATGCATGCATGCATGCATGCATGCA TGC-3'

- (3) 5'-AUGCAUGCAUGCAUGCAUGCAUGCAUGCAUGC-5'

- (4) 5'-AUGCAUGCAUGCAUGCAUGCAUGCAUGCAUGC-3'

Q.117 The coxal bone of the pelvic girdle is formed by the fusion of:-

- (1) Ilium, ischium and pubis
- (2) Scapula and clavicle
- (3) Ilium and scapula
- (4) Ilium, scapula and ischium

Q.118 Which of the following does not give clue to common ancestry ?

- (1) Homology
- (2) Evidence from biochemistry
- (3) Vestigial organs
- (4) Analogy

Q.119 Oxidation of one molecule of glucose yield 36 ATP in proportion :

- (1) All 36 ATP in mitochondria.
- (2) 6 ATP out side of mitochondria and 30 ATP inside mitochondria.
- (3) Two ATP in glycolysis and 34 ATP in Krebs cycle.
- (4) Two ATP out side of mitochondria and 34 ATP inside mitochondria.

Q.120 Decomposition is one of the important functional aspect of ecosystem. About which of the following statements is not correct?

- (1) Warm and moist environment favours decomposition.
- (2) Nitrogen and sugar component favours decomposition
- (3) Low temperature and anaerobiosis favours decomposition
- (4) Decomposition is largely an oxygen requiring process.

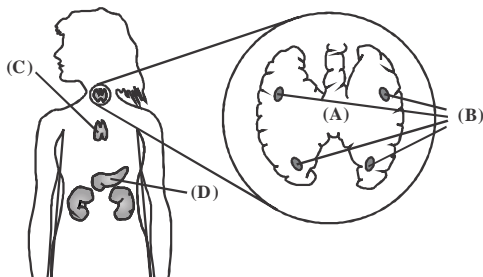
Q.121 The central body cavity of coelenterates is called as

- (1) Gastro vascular cavity
- (2) Spongocoel
- (3) Coelom
- (4) Hypostome

Q.122 Sympathetic nervous system does not stimulate:-

- (1) Tachycardia (2) Bronchodilation
(3) Micturition (4) Ejaculation

Q.123 Which organ decreases the amount of glycogen stored in the liver?



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

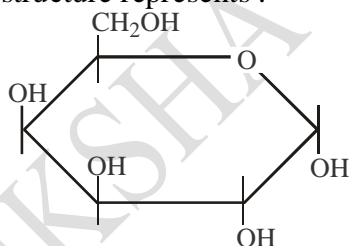
Q.124 Which of the following statement is incorrect ?

- (1) IgA is present in colostrum.
(2) NK cells, neutrophil and monocytes are phagocytic cells.
(3) Lysozyme in saliva, fever and HCl in stomach form second line of defence.
(4) T-lymphocyte takes part in cell mediated immunity.

Q.125 Which of the following mollusca does not has any external or internal shell ?

- (1) *sepia* (2) cuttle fish
(3) *teredo* (4) *octopus*

Q.126 Given structure represents :



- (1) Fructose (2) Galactose
(3) Glucose (4) Mannose

Q.127 Which of following hormone play an important role in seed maturation ?

- (1) ABA (2) Ethylene
(3) Cytokinin (4) Auxin

Q.128 Match the column-I to column-II

- | Column-I | Column-II |
|-------------------|------------------------|
| a. Oblique bridge | i. Contractile Protein |
| b. Actin | ii. Cardiac muscle |
| c. Tropomyosin | iii. Skeletal muscle |
| d. Multinucleated | iv. Regulatory protein |
- (1) a-i, B-ii, C-iii, d-iv (2) a-iv, B-iii, C-ii, d-i
(3) a-ii, B-i, C-iv, d-iii (4) a-iii, B-i, C-iv, d-iii

Q.129 Organisms capable to tolerate narrow range of salinities called as :

- (1) Stenohaline (2) Euryhaline
(3) Thermoregulators (4) Both B and C

Q.130 Once a week pill contains :

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

Q.131 In a population of 1000 individuals, 500 individuals have Aa genotype and 500 have AA genotype. What will be the proportion of a and A alleles in their gametes ?

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

Q.132 Analogous structures are result of :

- (1) Convergent evolution
(2) Adaptive radiation
(3) Divergent evolution
(4) Both 2 and 3

Q.133 Which algae is most advanced :

- (1) Blue-green algae (2) Green algae
(3) Red algae (4) Brown algae

Q.134 How many of the following statements are correct?

- (a) The smooth endoplasmic reticulum is the major site for synthesis of protein and steroidal hormones synthesis.
(b) Tonoplast always facilitates the transport of a number of ions and other materials along with concentration gradients into the vacuole.
(c) Nucleolus is a site for active ribosomal RNA synthesis.

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(d) Microbodies contains various enzymes, are present in both plant and animal cells.

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

Q.135 Nucleic acid segment which is used to find the position of a gene and it forms a hybrid with this gene would be

- (1) Retrovirus (2) Probe
(3) Vector (4) Clone

Q.136 Few events regarding meiosis is given below Arrange these events in ascending order and select the correct option given below :-

- (a) Segregation of homologous chromosome
(b) Terminalization of chiasmata
(c) Arrangement of bivalent on equator
(d) Formation of synaptonemal complex
(e) Exchange of genetic material

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

Q.137 How many plants are pollinated by insect from the following : Lobia, Lemon, Coriander, Papaya, Cucumber, Mustard, Apple

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

Q.138 Which among the following is most crucial step of Calvin cycle :

- (1) Cyclic photphosphorylation
(2) Carboxylation
(3) Reduction
(4) Regeneration

Q.139 Under low glomerular blood flow, JG cells release

- (1) Angiotensin-I (2) Angiotensin-II
(3) Aldosterone (4) Renin

Q.140 If filiform apparatus have 28 chromosome than what will be their number in nucellus and funicle cell respectively ?

- (1) 56, 28 (2) 28, 56
(3) 56, 56 (4) 84, 56

Q.141 These floral characters are of which plant. Flower-bisexual, zygomorphic

Corolla-vexillary aestivation

Androecium-diadelphous

Gynoecium-ovary superior

Seed-Non-endospermic

- (1) *Petunia* (2) *Colchicum*
(3) *Indigofera* (4) *Belladonna*

Q.142 Which of the following technique is used for amplification of DNA :-

- (1) Repetitive DNA
(2) ELISA
(3) Polymerase Chain Reaction (PCR)
(4) VNTR

Q.143 Minute cells which separate from the developing ova during their maturation are called

- (1) Primary spermatogonia
(2) Secondary oogonia
(3) Primary oogonia
(4) Polar bodies

Q.144 Which of following are correct matching pairs :

- | Taxonomic group | Percent threat of extinction |
|-----------------|------------------------------|
| (a) Birds | (i) 31% |
| (b) Mammals | (ii) 12% |
| (c) Amphibia | (iii) 23% |
| (d) Gymnosperms | (iv) 32% |
- (1) a-ii, b-i, c-iii, d-iv (2) a-ii, b-i, c-iv, d-iii
(3) a-ii, b-iii, c-iv, d-i (4) a-iii, b-ii, c-i, d-iv

Q.145 Peripheral stroma of ovary is made up of

- (1) Yellow fibrous connective tissue
(2) White fibrous connective tissue
(3) Reticular connective tissue
(4) Adipose tissue

Q.146 Principle of vaccination is based on –

- (1) Discrimination between self-non self
(2) Diversity
(3) Memory
(4) Specificity

Q.147 The function of insulin hormone is :

- (1) To increase glycogenolysis
(2) To increase blood sugar level
(3) To release glucose from liver cells and glycogenolysis promotion

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(4) To convert glucose into glycogen and stored into the liver

Q.148 Pathogen of Dysentery :

- (1) Bacteria (2) Fungi
(3) Protozoa (4) A & C both

Q.149 In aquatic ecosystems, major producers are :-

- (1) Chemoautotrophs (2) Phytoplankton
(3) Saprotrophs (4) Heterotrophs

Q.150 Mitochondrial DNA

- (1) is circular.
(2) is self-replicating.
(3) is important in the synthesis of mitochondrial ribosomes.
(4) both (1) and (2).

Q.151 Which type of plants die after flowering and fruiting?

- (1) All annual plant (2) All biennial plant
(3) All polycarpic plant (4) Both (1) and (2)

Q.152 Hugo de vries discovered mutation while he was working on :

- (1) *Lathyrus odhoratus*
(2) *Evening primrose*
(3) *Oenothera lamarckiana*
(4) Both (2) & (3)

Q.153 In meiosis, at which stage does crossing over occur?

- (1) Prophase I (2) Prophase II
(3) Metaphase I (4) Metaphase II

Q.154 The sporophyte of the *Riccia* is composed of :

- (1) Only capsule (2) Foot and capsule
(3) Foot, seta and capsule (4) Only foot

Q.155 Which of the following factors determine an enzyme's specificity?

- (1) The three-dimensional shape of the active site
(2) The Michaelis constant
(3) The type of cofactor required for the enzyme to be active
(4) The prosthetic group on the enzyme.

Q.156 Cell A has $\psi_w = -10$ bars and cell B has

$\psi_w = -7$ bars. The movement of water will be from :

- (1) A \rightarrow B

(2) B \rightarrow A

(3) Water can't move in negative value of ψ_w

(4) Data insufficient

Q.157 Henle loop & vasa recta are mainly concerned with

- (1) Concentration of urine
(2) Absorption of glucose
(3) Removal of urea from blood
(4) Reabsorption of useful substances from glomerular filtrate

Q.158 Which leaf structure is derived from ground tissue?

- (1) Cuticle (2) Epidermis
(3) Mesophyll (4) Phloem

Q.159 Which groups of organisms are capable of meiotic recombination?

- I. Monera II. Protista
III. Fungi IV. Plantae
V. Animalia

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

Q.160 Which of these processes utilizes tRNA?

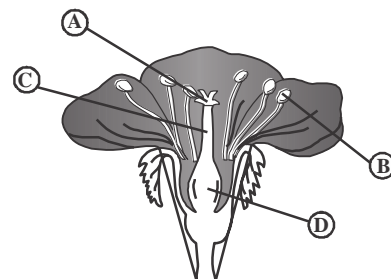
- I. Transcription II. Translation
III. DNA replication

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

Q.161 This organ secretes the hormone responsible for the "fight-or-flight" response.

- (1) Thyroid (2) Pancreas
(3) Anterior pituitary (4) Adrenal medulla

Q.162 The site of fertilization



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

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Q.163 The following change is an example of which type of mutation?

Original DNA sequence: ATGGA–AGC

New DNA sequence: ATTGACAGC

I. Point mutation II. Deletion

III. Frameshift

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

Q.164 The steps of protein synthesis and modification take place in several different locations throughout the cell. What is the proper order of these locations, from start to finish?

I. Ribosome II. Nucleus
 III. Golgi apparatus IV. Endoplasmic reticulum

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

Q.165 Which of the following shows the proper order of blood flow through the heart, entering from the vena cava?

- (1) Left atrium → left ventricle → right ventricle → right atrium
 (2) Left ventricle → left atrium → right atrium → right ventricle
 (3) Right atrium → right ventricle → left atrium → left ventricle
 (4) Right ventricle → right atrium → left atrium → left ventricle

Q.166 Which of the following are in order of least complex to most complex, in terms of the amount of genetic information they carry?

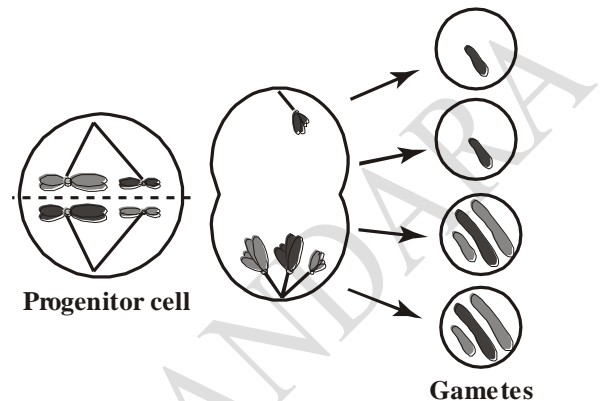
I. Chromosome II. Base pair
 III. Codon IV. Gene

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

Q.167 An organism that demonstrates radial symmetry and an exoskeleton would be classified into which phylum?

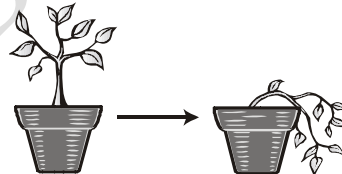
- (1) Arthropoda (2) Cnidaria
 (3) Echinodermata (4) Mollusca

Q.168 The phenomenon depicted in the diagram is known as



- (1) linkage (2) independent assortment
 (3) crossing over (4) nondisjunction

Q.169 Which cellular process is responsible for the change shown below?



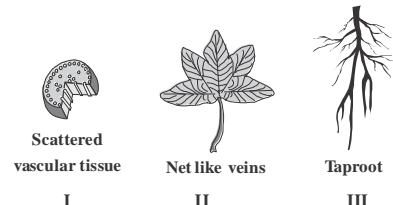
- (1) Closing of stomata
 (2) Slowing of photosynthesis
 (3) Reduction in protein synthesis
 (4) Decreased pressure in the vacuole

Q.170 In which plants is the haploid gametophyte generation dominant?

I. Angiosperms
 II. Gymnosperms
 III. Horsetails, ferns, club mosses (lycophytes and pterophytes)
 IV. True mosses, liverworts, and hornworts (bryophytes)

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

Q.171 Which of the following characteristics are present in monocots?



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

Q.172 Which structure allows photosynthesis to begin in a germinating dicot plant?

- (1) Cotyledon (2) Endosperm
 (3) Embryonic root (4) Apical meristem

Q.173 In cellular respiration, the role of $FADH_2$ and NADH is to

- (1) catalyze the breakdown of glucose to three-carbon sugars.
 (2) carry electrons to the cytochrome membrane proteins.
 (3) catalyze the addition of a phosphate group to ADP.
 (4) act as final electron acceptors in the electron transport chain.

Q.174 Type of placentation in mustard and china rose respectively?

- (1) Axile and Parietal (2) Parietal and axile
 (3) Free central and axile (4) Basal and Parietal

Q.175 How many of the following contain simple squamous epithelium? Air sacs of lungs, blood vessels, PCT of nephrons, fallopian tubes, bronchioles

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

Q.176 What is the liquid part of green Coconut

- (1) Endosperm (2) Female gametophyte
 (3) Nucellus (4) Embryo

Q.177 Endosperm of angiosperm is

- (1) $2n$ (2) $3n$
 (3) n (4) $4n$

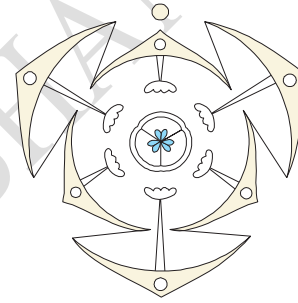
Q.178 Which of the following is correctly matched?

- (1) *Monstera*- Fibrous root
 (2) *Dahlia*- Fasciculated root
 (3) *Azadirachta* - Adventitious root
 (4) *Basil*- Prop roots

Q.179 Plants with inferior ovary usually bear

- (1) pseudocarps (2) berries
 (3) aggregate fruits (4) seedless fruits

Q.180 Plants having the given floral diagram are



- (1) leguminous
 (2) dicots
 (3) medicinal and perennial
 (4) having pinnately compound leaves.

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