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**TIME : 3 HRS**

**DATE : 05-5-2019**

# NEET (UG) –2019

## SET- R3 (SOORYA)

### INSTRUCTIONS

1. *The test is of 3 hours duration and Test Booklet contains 180 questions. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.*
2. *Use Blue / Black Ball point Pen only for writing particulars on this page/markings responses.*
3. *Rough work is to be done on the space provided for this purpose in the Test Booklet only.*
4. *On completion of the test, the candidate must handover the Answer Sheet to the Invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.*
5. *The CODE for this Booklet is R3.*
6. *The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.*
7. *Each candidate must show on demand his/her Admission Card to the Invigilator.*
8. *No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.*
9. *Use of Electronic/Manual Calculator is prohibited.*
10. *The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.*
11. *No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.*
12. *The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.*



**Solution: (1)**

$$\frac{Q}{\Delta t} = AK' \left( \frac{\Delta \theta}{\Delta x} \right)$$

$$\frac{(J/s)}{m-K} = K'$$

$$J/s/m/K$$

$$\text{Or } W-m^{-1}-K^{-1}$$

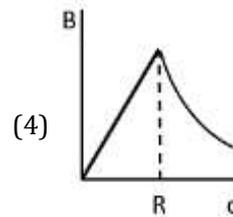
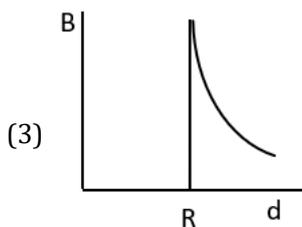
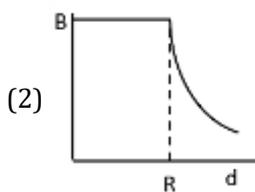
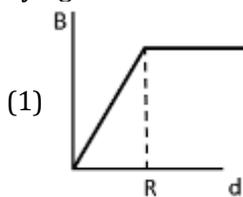
8. For p-type semiconductor, which of the following statements is true?

- (1) Electrons are the majority carries and pentavalent atoms are the dopants
- (2) Electrons are the majority carries and trivalent atoms are the dopants
- (3) Holes are the majority carries and trivalent atoms are the dopants
- (4) Holes are the majority carries and pentavalent atoms are the dopants

**Solution: (3)**

Conceptual.

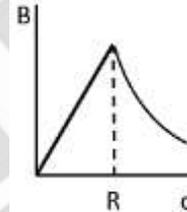
9. A cylindrical conductor of radius R is carrying a constant current. The plot of the magnitude of the magnetic field. B with the distance d from the centre of the conductor, is **correctly** represented by figure.



**Solution: (4)**

$$B_{in} \propto d \quad (d \leq R)$$

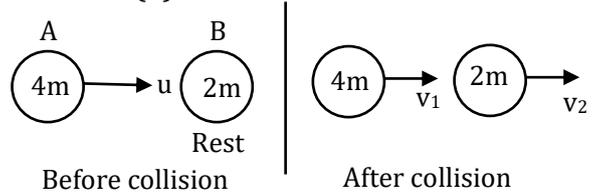
$$\text{And } B_o \propto \frac{1}{d} \quad (d > R)$$



10. Body A of mass 4 m moving with speed u collides with another body B of mass 2m, at rest. The collision is head on and elastic in nature. After the collision the fraction of energy lost by the colliding body A is:

- (1)  $\frac{5}{9}$
- (2)  $\frac{1}{9}$
- (3)  $\frac{8}{9}$
- (4)  $\frac{4}{9}$

**Solution: (3)**



$$v_1 = \left( \frac{m_1 - m_2}{m_1 + m_2} \right) u_1 + \left( \frac{2m_2}{m_1 + m_2} \right) u_2$$

$$v_2 = \left( \frac{2m_1}{m_1 + m_2} \right) u_1 + \left( \frac{m_2 - m_1}{m_1 + m_2} \right) u_2$$

$$\text{Here, } v_2 = 0$$

$$\therefore v_1 = \left( \frac{m_1 - m_2}{m_1 + m_2} \right) v_1; v_2 = \left( \frac{2m_1}{m_1 + m_2} \right) v_1$$

$$v_1 = \left( \frac{4m - 2m}{6m} \right) u$$

$$v_1 = \frac{2m}{6m} u = \frac{1}{3} u$$

SPACE FOR ROUGH WORK

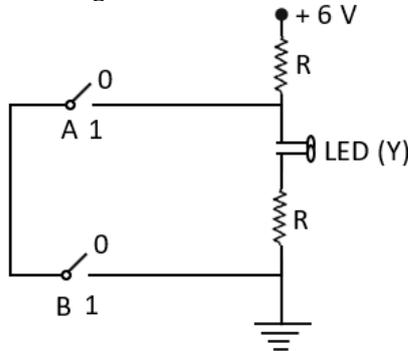
$$\therefore K_i = \frac{1}{2} 4mu^2 \text{ and } K_f = \frac{1}{2} 4m \frac{u^2}{9}$$

$$K_i = 2mu^2 \quad K_f = \frac{2}{9} mu^2$$

$$\text{Loss} = 2mu^2 - \frac{2}{9} mu^2 = 2mu^2 \times \frac{8}{9}$$

$$\therefore \text{fraction} = \frac{2mu^2 \times \frac{8}{9}}{2mu^2} = \frac{8}{9}$$

11. The **correct** Boolean operation represented by the circuit diagram drawn is:



- (1) NOR (2) AND  
 (3) OR (4) NAND

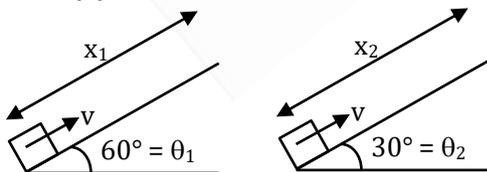
**Solution: (4)**

Conceptual.

12. When an object is shot from the bottom of a long smooth inclined plane kept at an angle  $60^\circ$  with horizontal. It can travel a distance  $x_1$  along the plane. but when the inclination is decreased to  $30^\circ$  and the same object is shot with the same velocity, it can travel  $x_2$  distance. Then  $x_1 : x_2$  will be :

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

**Solution: (4)**



$$v^2 = u^2 + 2a_1x_1$$

$$0 = u^2 + 2a_1x_1$$

$$\therefore x_1 = \frac{-u^2}{2a_1} = \frac{-u^2}{2gsin\theta_1}$$

Similarly,  $x_2 = \frac{-u^2}{2gsin\theta_2}$

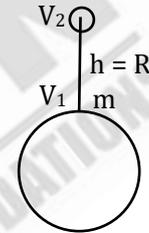
$$\therefore \frac{x_1}{x_2} = \frac{-u^2}{2gsin\theta_1} \times \frac{(2gsin\theta_2)}{-u^2} = \frac{sin\theta_2}{sin\theta_1}$$

$$\frac{x_1}{x_2} = \frac{1/2}{\sqrt{3}/2} = \frac{1}{\sqrt{3}}$$

13. The work done to raise a mass  $m$  from the surface of the earth to a height  $h$ , which is equal to the radius of the earth is:

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

**Solution: (4)**



$$U_1 = -\frac{GMm}{R}$$

$$U_2 = -\frac{GMm}{2R}$$

$$\therefore \Delta W = U_2 - U_1 = -\frac{GMm}{2R} + \frac{GMm}{R}$$

$$\Delta W = \frac{GMm}{2R} = \frac{gR^2m}{2R}$$

$$\Delta W = \frac{mgR}{2}$$

14. The total energy of an electron in an atom in an orbit is  $-3.4$  eV. Its kinetic and potential energies are, respectively :

- (1)  $3.4$  eV,  $3.4$  eV (2)  $-3.4$  eV,  $-3.4$  eV  
 (3)  $-3.4$  eV,  $-6.8$  eV (4)  $3.4$  eV,  $-6.8$  eV

**Solution: (4)**

$$K = -E = +3.4 \text{ eV}$$

$$U = 2E = -6.8 \text{ eV}$$

15. In which of the following process heat is neither absorbed nor released by a system?

- (1) isochoric (2) isothermal  
 (3) adiabatic (4) isobaric

**Solution: (3)**

$$\Delta Q = 0 \text{ for adiabatic process}$$

16. A hollow metal sphere of radius  $R$  is uniformly charged. The electric field due to the sphere at a distance  $r$  from the centre

**SPACE FOR ROUGH WORK**

- (1) decreases as  $r$  increases for  $r < R$  and for  $r > R$
- (2) increases as  $r$  increases for  $r < R$  and for  $r > R$
- (3) zero as  $r$  increases for  $r < R$ , decreases as  $r$  increase for  $r > R$
- (4) zero as  $r$  increases for  $r < R$ , increases as  $r$  increases for  $r > R$

**Solution: (3)**

$E$  for a metal thin spherical shell

$$E_{in} = 0 \quad r < R$$

$$E_0 = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q}{r^2} \quad r > R$$

17. Pick the wrong answer in the context with rainbow,

- (1) Rainbow is combined effect of dispersion, refraction and reflection of sunlight.
- (2) When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.
- (3) The order of colours is reversed in the secondary rainbow.
- (4) An observer can see a rainbow when his front is towards the sun.

**Solution: (4)** Conceptual

18. A small hole of area of cross-section  $2\text{mm}^2$  is present near the bottom of a fully filled open tank of height 2 m. Taking  $g = 10\text{m/s}^2$ , the rate of flow of water through the open hole would be nearly:

- (1)  $6.4 \times 10^{-6} \text{m}^3/\text{s}$
- (2)  $12.6 \times 10^{-6} \text{m}^3/\text{s}$
- (3)  $8.9 \times 10^{-6} \text{m}^3/\text{s}$
- (4)  $2.23 \times 10^{-6} \text{m}^3/\text{s}$

**Solution: (2)**

$$\begin{aligned} Q &= av = a\sqrt{2gh} \\ &= (2 \times 10^{-6})\sqrt{2 \times 10 \times 2} \\ &= 2 \times 2 \times \sqrt{10} \times 10^{-6} \\ &= 4 \times 3.16 \times 10^{-6} \\ &= 12.6 \times 10^{-6} \text{m}^3/\text{s} \end{aligned}$$

19. Which of the following acts as a circuit protection device?

- (1) fuse
- (2) conductor

- (3) inductor
- (4) switch

**Solution: (1)** Conceptual

20. Two point charge A and B, having charges  $+Q$  and  $-Q$  respectively is placed at certain distance apart and force acting between them is  $F$ . If 25% charge of A is transferred to B then force between the charges becomes:

- (1)  $\frac{4F}{3}$
- (2)  $F$
- (3)  $\frac{9F}{16}$
- (4)  $\frac{16F}{9}$

**Solution: (3)**

$$\begin{array}{ccc} Q & & -Q \\ \hline A & r & B \end{array}$$

$$F = \frac{kQQ}{r^2} = \frac{kQ^2}{r^2}$$

$$\begin{array}{ccc} A & & B \\ \hline q_1 = \frac{3Q}{4} & r & q_2 = \frac{3Q}{4} \end{array}$$

$$q_1 = Q - \frac{Q}{4} = \frac{3Q}{4}$$

$$q_2 = -Q + \frac{Q}{4} = -\frac{3Q}{4}$$

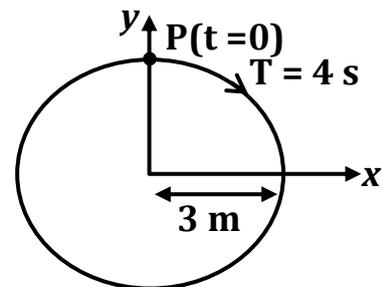
$$\begin{aligned} \therefore F^1 &= k \frac{3Q}{4} \times \frac{3Q}{4r^2} = \frac{9}{16} \left( \frac{kQ^2}{r^2} \right) \\ &= \frac{9F}{16} \end{aligned}$$

21. Which colour of the light has the longest wavelength?

- (1) violet
- (2) red
- (3) blue
- (4) green

**Solution: (2)** Conceptual.

22. The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the figure.



SPACE FOR ROUGH WORK

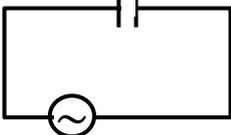


$$= \frac{Mgl}{2}$$

29. A parallel plate capacitor of capacitance  $20 \mu\text{F}$  is being charged by a voltage source whose potential is changing at the rate of  $3 \text{ V/s}$ . The conduction current through the connecting wires, and the displacement current through the plates of the capacitor, would be, respectively:

- (1) zero, zero                      (2) zero,  $60 \mu\text{A}$   
 (3)  $60 \mu\text{A}$ ,  $60 \mu\text{A}$             (4)  $60 \mu\text{A}$ , zero

**Solution: (3)**



$$i_c = \frac{d(cv)}{dt} = c \frac{dv}{dt} = 20 \times 3 = 60 \mu\text{A}$$

$$\therefore i_c = i_d$$

$$i_c = i_d = 60 \mu\text{A}$$

30. A mass  $m$  is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when:

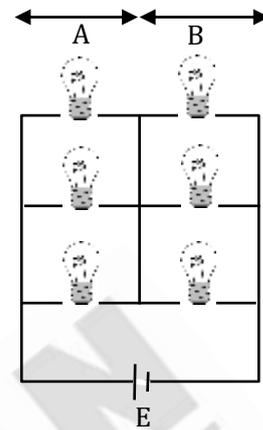
- (1) inclined at an angle of  $60^\circ$  from vertical  
 (2) the mass is at the highest point  
 (3) the wire is horizontal  
 (4) the mass is at the lowest point

**Solution: (4)**

Tension is maximum at bottom  $\Rightarrow$  Mass is at the lowest point

31. Six similar bulbs are connected as shown in the figure with a DC source of emf  $E$  and zero internal resistance.

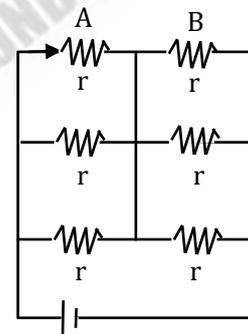
The rate of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing will be :



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

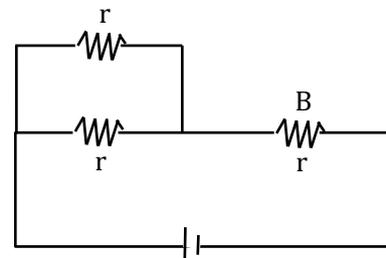
**Solution: (3)**

$$(i) R_{eq} = \frac{r}{3} + \frac{r}{3} = \frac{2r}{3}$$



$$(ii) R'_{eq} = \frac{r}{2} + r = \frac{3r}{2}$$

$$\frac{P_i}{P_{ii}} = \frac{V^2/R_{eq}}{V^2/R'_{eq}} = \frac{3r/2}{2r/3} = \frac{9}{4}$$



32. In total internal reflection when the angle of incidence is equal to the critical angle for the pair

SPACE FOR ROUGH WORK

of media in contact. What will be angle of refraction?

- (1)  $90^\circ$
- (2)  $180^\circ$
- (3)  $0^\circ$
- (4) Equal to angle of incidence

**Solution: (1)**

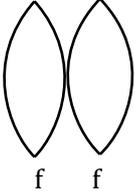
$$(\sin c) \times \eta = \sin r \times 1$$

$$r = 90^\circ$$

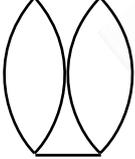
33. Two similar thin equi-convex lens of focal length each are kept coaxially in contact with each other such that the focal length of the combination is  $F_1$ . When the space between the two lens is filled with glycerin (which has the same refractive index ( $\mu = 1.5$ ) index as that of glass) then the equivalent focal length is  $F_2$ . The ratio  $F_1 : F_2$  will be

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

**Solution: (3)**



$$\frac{1}{F_1} = \frac{1}{f} + \frac{1}{f} = \frac{2}{f} \quad F_1 = f/2$$



$$\frac{1}{F_2} = \frac{1}{f} - \frac{1}{f} + \frac{1}{f} = \frac{1}{f} \quad F_2 = f$$

$$F_1 : F_2 = 1 : 2$$

34. Ionized hydrogen atoms and  $\alpha$ -particles with same momenta enters perpendicular to a constant magnetic field B. the ratio of their radii of their paths  $r_H : r_\alpha$  will be

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

**Solution: (2)**

$$R = \frac{mv}{qB}$$

$$\frac{R_H}{R_\alpha} = \frac{mv}{eB} \times \frac{2eB}{mv} = 2 : 1$$

35. In an experiment the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where  $X = \frac{A^2 B^{1/2}}{C^{1/3} D^3}$  will be:

- (1) 10%
- (2)  $\left(\frac{3}{13}\right)\%$
- (3) 16%
- (4) -10%

**Solution: (3)**

$$\frac{dx}{x} = \frac{2dA}{A} + \frac{1}{2} \frac{dB}{B} + \frac{1}{3} \frac{dC}{C} + \frac{3dD}{D}$$

$$= 2(1\%) + \frac{1}{2}(2\%) + \frac{1}{3}(3\%) + 3(4\%)$$

$$= 2 + 1 + 1 + 12 = 16\%$$

36. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary whose the cylinder is vertical and rotating about its axis, will be ( $g = 10 \text{ m/s}^2$ )

- (1) 10 = rad/s
- (2)  $\sqrt{10}$  = rad/s
- (3)  $\frac{10}{2v}$  rad/s
- (4) 10 rad/s

**Solution: (4)**

$$Mg = \mu N = \mu m \omega^2 r$$

$$\omega = \sqrt{\frac{g}{\mu r}} = \sqrt{\frac{10}{0.1 \times 1}} = 10 \text{ rad/s}$$

37. A 800 turns rod of effective area  $0.05 \text{ m}^2$  is kept perpendicular to a magnetic field  $5 \times 10^{-5} \text{ T}$ . When the plane of the coil is rotated at  $90^\circ$  around any of its coplanar axis is 0.1 s. The emf induced in the coil will be:

- (1) 0.02 V
- (2) 2 V
- (3) 0.2 V
- (4)  $2 \times 10^{-3} \text{ V}$

**Solution: (1)**

SPACE FOR ROUGH WORK

$$\varepsilon = \frac{N \cdot \Delta\phi}{\Delta t} = \frac{800 \times 0.05 \times 5 \times 10^{-5}}{0.1} = 0.02V$$

38. Two particles A and B are moving in uniform circular motion in concentric circles of radii  $r_A$  and  $r_B$  with equal speed  $v_A$  and  $v_B$  respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be :

- (1) 1 : 1                                      (2)  $r_A : r_B$   
(3)  $v_A : v_B$                                 (4)  $r_B : r_A$

**Solution: (1)**

$$\omega = \frac{2\pi}{T}$$

$$\Rightarrow T_1 = T_2 \text{ or } \omega_1 = \omega_2$$

39. A soap bubble having radius of 1 mm, is blown from a detergent solution having a surface tension of  $2.5 \times 10^{-2}$  N/m. The pressure inside the bubble equals at a point  $Z_0$  below the free surface of water in a container. Taking  $g = 10$  m/s<sup>2</sup> density of water =  $10^3$  kg/m<sup>3</sup>, the value of  $Z_0$  is :

- (1) 0.5 cm                                      (2) 100 cm  
(3) 10 cm                                        (4) 1 cm

**Solution: (4)**

$$\frac{4T}{R} = pgh \text{ (} h = Z_0 \text{)}$$

$$Z_0 = \frac{4 \times 2.5 \times 10^{-2}}{10^{-3}} \times 10^3 \times 10 = 10 \text{ mm} = 1 \text{ cm}$$

40. A body weighs 200 N on the surface of the earth. How much will it weigh half way down to the center of the earth?

- (1) 100 N                                        (2) 150 N  
(3) 200 N                                        (4) 250 N

**Solution: (1)**

$$mg = \frac{GMm}{R^2} = 200 \text{ N}$$

$$mg' = \frac{GMm}{R^3} \left(\frac{R}{2}\right) = 100 \text{ N}$$

41. An electron is accelerated through a potential difference of 10,000 V. Its de Broglie wavelength is, (nearly) : ( $m_e = 9 \times 10^{-31}$  Kg)

- (1) 12.2 nm                                      (2)  $12.2 \times 10^{-13}$  m  
(3)  $12.2 \times 10^{-12}$  m                        (4)  $12.2 \times 10^{-4}$  nm

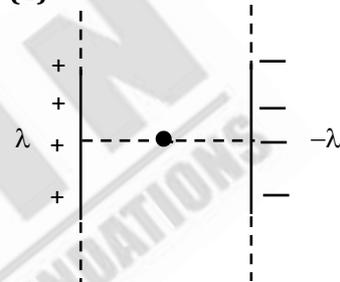
**Solution: (3)**

$$\lambda = \frac{h}{\sqrt{2mK}} = \frac{6.63 \times 10^{-34}}{\sqrt{2 \times 9.1 \times 10^{-31} \times 10^4 \times 1.6 \times 10^{-19}}} = 12.2 \times 10^{-12} \text{ m}$$

42. Two parallel infinite line charge with linear charge densities  $+\lambda$  C/m and  $-\lambda$  C/m are placed at a distance of  $2R$  in free space. What is the electric field midway between the two line charge?

- (1)  $\frac{\lambda}{2\pi\epsilon_0 R}$  N/C                              (2) Zero  
(3)  $\frac{2\lambda}{\pi\epsilon_0 R}$  N/C                              (4)  $\frac{\lambda}{\pi\epsilon_0 R}$  N/C

**Solution: (4)**



$$E_P = \frac{\lambda}{2\pi\epsilon_0 R} + \frac{\lambda}{2\pi\epsilon_0 R} = \frac{\lambda}{\pi\epsilon_0 R}$$

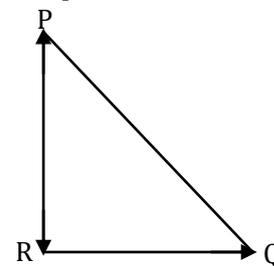
43. Increase in temperature of a gas filled in a container would lead to :

- (1) Decrease in intermolecular distance  
(2) Increase in its mass  
(3) Increase in its kinetic energy  
(4) Decrease in its pressure

**Solution: (3)**

Increase in temperature leads to increase in kinetic energy

44. A particle moving with velocity  $\vec{v}$  is acted by three force shown by the vector triangle PQR. The velocity of the particle will :



- (1) Change according to the smallest force  $\vec{QR}$   
(2) Increase

SPACE FOR ROUGH WORK



52. A gas at 350 K and 15 bar has molar volume 20 percent smaller than that for an ideal gas under the same conditions. The correct option about the gas and its compressibility factor (Z) is:

- (1)  $Z < 1$  and repulsive forces are dominant  
 (2)  $Z > 1$  and attractive forces are dominant  
 (3)  $Z > 1$  and repulsive forces are dominant  
 (4)  $Z < 1$  and attractive forces are dominant

**Solution: (4)**

$Z < 1$  so more attractive forces.

53. For a cell involving one electron  $E_{\text{cell}}^{\ominus} = 0.59 \text{ V}$  at 298 K, the equilibrium constant for the cell reaction is:

[Given that  $\frac{2.303 RT}{F} = 0.059 \text{ V}$  at  $T = 298 \text{ K}$ ]

- (1)  $1.0 \times 10^{30}$                       (2)  $1.0 \times 10^2$   
 (3)  $1.0 \times 10^5$                       (4)  $1.0 \times 10^{10}$

**Solution: (4)**

$\Delta G^{\circ} = -2.303 RT \log K$

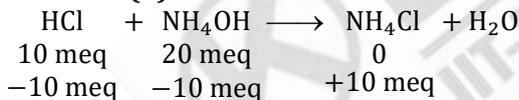
$E = \frac{2.303 RT}{nF} \log K$

$\log K = \frac{1000}{100} \times \frac{0.59}{0.059} = 10, K = 10^{10}$

54. Which will make basic buffer?

- (1) 100 mL of 0.1 M HCl + 100 mL of 0.1 M NaOH  
 (2) 50 mL of 0.1 M NaOH + 25 mL of 0.1 M  
 (3) 100 mL of 0.1 M  $\text{CH}_3\text{COOH}$  + 100 mL of 0.1 M  
 (4) 100 mL of 0.1 M HCl + 200 mL of 0.1 M  $\text{NH}_4\text{OH}$

**Solution: (4)**



So solution of weak base ( $\text{NH}_4\text{OH}$ ) and salt of weak base and strong acid ( $\text{NH}_4\text{Cl}$ ). So buffer solution.

55. Which is the correct thermal stability order for  $\text{H}_2\text{E}$  (E = O, S, Se, Te and Po)

- (1)  $\text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po} < \text{H}_2\text{O} < \text{H}_2\text{S}$   
 (2)  $\text{H}_2\text{S} < \text{H}_2\text{O} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$   
 (3)  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$   
 (4)  $\text{H}_2\text{Po} < \text{H}_2\text{Te} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{O}$

**Solution: (4)**

Fact

56. For an ideal solution, the correct option is

- (1)  $\Delta_{\text{mix}}G = 0$  at constant T and P

(2)  $\Delta_{\text{mix}}S = 0$  at constant T and P

(3)  $\Delta_{\text{mix}}V \neq 0$  at constant T and P

(4)  $\Delta_{\text{mix}}H = 0$  at constant T and P

**Solution: (4)**

Fact

57. The biodegradable polymer is:

- (1) Buna-S                                      (2) nylon-6, 6  
 (3) nylon 2-nylon 6                      (4) nylon-6

**Solution: (3)**

Factual

58. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor M is:

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

**Solution: (3)**

Factual

59. If the rate constant for a first order reaction is  $k$ , the time (t) required for the completion of 99% of the reaction is given by:

- (1)  $t = 2.303/k$                               (2)  $t = 0.693/k$   
 (3)  $t = 6.909/k$                               (4)  $t = 4.606/k$

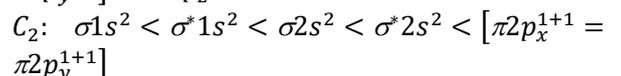
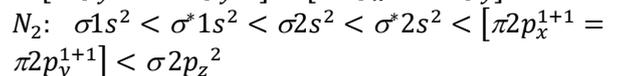
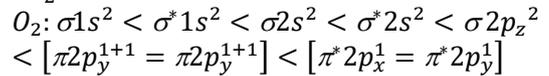
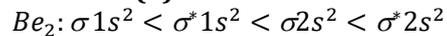
**Solution: (4)**

$t_{99\%} = \frac{1}{k} \ln \left( \frac{a_0}{a_0 - x} \times 100 \right) = \frac{2}{k} \ln 10$   
 $\frac{2 \times 2.303}{k} = \frac{4.606}{k}$

60. Which of the following diatomic molecular species has only  $\pi$  bonds according to Molecular Orbital Theory?

- (1)  $\text{Be}_2$     (2)  $\text{O}_2$   
 (3)  $\text{N}_2$     (4)  $\text{C}_2$

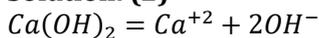
**Solution: (4)**



61. pH of a saturated solution of  $\text{Ca}(\text{OH})_2$  is 9. The solubility product ( $K_{sp}$ ) of  $\text{Ca}(\text{OH})_2$  is:

- (1)  $0.5 \times 10^{-10}$                               (2)  $0.5 \times 10^{-15}$

SPACE FOR ROUGH WORK

(3)  $0.25 \times 10^{-10}$  (4)  $0.125 \times 10^{-15}$ **Solution: (2)** $pH = 9$ , so  $pOH = 5$ , so  $[OH^-] = 10^{-5} M$ at equilibrium,  $[OH^-] = 10^{-5} M$  $[Ca^{+2}] = 0.5 \times 10^{-5} M$ 

$$K_{sp} = [Ca^{+2}][OH^-]^2 = \left(\frac{1}{2} \times 10^{-5}\right) \times (10^{-5})^2 = 0.5 \times 10^{-15}$$

62. The mixture that forms maximum boiling azeotrope is:

- (1) Heptane + octane  
 (2) Water + Nitric acid  
 (3) Ethanol + Water  
 (4) Acetone + Carbon disulphide

**Solution: (2)**

Mixture of water and strong acid shows negative deviation.

63. 4d, 5p, 5f and 6p orbitals are arranged in the order of decreasing energy. The correct option is:

- (1)  $5f > 6p > 4d > 5p$  (2)  $5f > 6p > 5p > 4d$   
 (3)  $6p > 5f > 5p > 4d$  (4)  $6p > 5f > 4d > 5p$

**Solution: (2)**

Orbital	n	l	n+l
4d	4	2	6
5p	5	1	6
5f	5	3	8
6p	6	1	7

64. Which of the following is an amphoteric hydroxide?

- (1)  $Be(OH)_2$  (2)  $Sr(OH)_2$   
 (3)  $Ca(OH)_2$  (4)  $Mg(OH)_2$

**Solution: (1)**

Be forms amphoteric hydroxide.

65. Which of the following is incorrect statement?

- (1)  $SnF_4$  is ionic in nature  
 (2)  $PbF_4$  is covalent in nature  
 (3)  $SiCl_4$  is easily hydrolysed  
 (4)  $GeX_4$  (X = F, Cl, Br, I) is more stable than  $GeX_2$

**Solution: (2)** $SnF_4$  and  $PbF_4$  both are ionic.

66. Under isothermal condition, a gas at 300 K expands from 0.1 L to 0.25 L against a constant

external pressure of 2 bar. The work done by the gas is:

[Given that 1 L bar = 100 J]

- (1) 30 J (2) -30 J  
 (3) 5 kJ (4) 25 J

**Solution: (2)**

Isothermal, Constant external pressure of 2 bar

$$W = -p_{ext} \Delta V = -2 \times (0.25 - 0.1) \text{ bar-litre} = -30 \text{ joule}$$

67. The number of sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds in pent-2-en-4-yne is:

- (1) 13  $\sigma$  bonds and no  $\pi$  bond  
 (2) 10  $\sigma$  bonds and 3  $\pi$  bond  
 (3) 8  $\sigma$  bonds and 5  $\pi$  bond  
 (4) 11  $\sigma$  bonds and 2  $\pi$  bond

**Solution: (2)**

68. Match the Xenon compounds in Column-I with its structure in Column-II and assign the correct code:

Column - I	Column-II
(a) $XeF_4$	(i) pyramidal
(b) $XeF_6$	(ii) square planar
(c) $XeOF_4$	(iii) distorted octahedral
(d) $XeO_3$	(iv) square pyramidal

**Code:**

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

**Solution: (3)** $XeF_4$ :  $sp^3d^2$ : Square planar $XeF_6$ :  $sp^3d^3$ : distorted octahedral $XeOF_4$ :  $sp^3d^2$ : square pyramidal $XeO_3$ :  $sp^3$ : pyramidal

69. In which case change in entropy is negative?

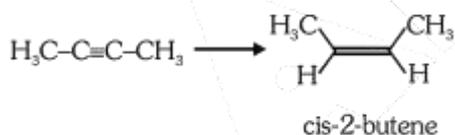
- (1)  $2H(g) \rightarrow H_2(g)$   
 (2) Evaporation of water  
 (3) Expansion of gas at constant temperature  
 (4) Sublimation of solid to gas

**Solution: (1)** $2H(g) \rightarrow H_2(g)$ ;  $\Delta n_g < 0 \Rightarrow \Delta S < 0$  $H_2O(l) \rightarrow H_2O(g)$ ;  $\Delta n_g > 0 \Rightarrow \Delta S > 0$ 

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Gas( $V_1, T$ )  $\rightarrow$  Gas( $V_2, T$ ); volume increases so  $\Delta S > 0$   
 $X(s) \rightarrow X(g)$ ; ;  $\Delta n_g > 0 \Rightarrow \Delta S > 0$

70. The most suitable reagent for the following conversion is:

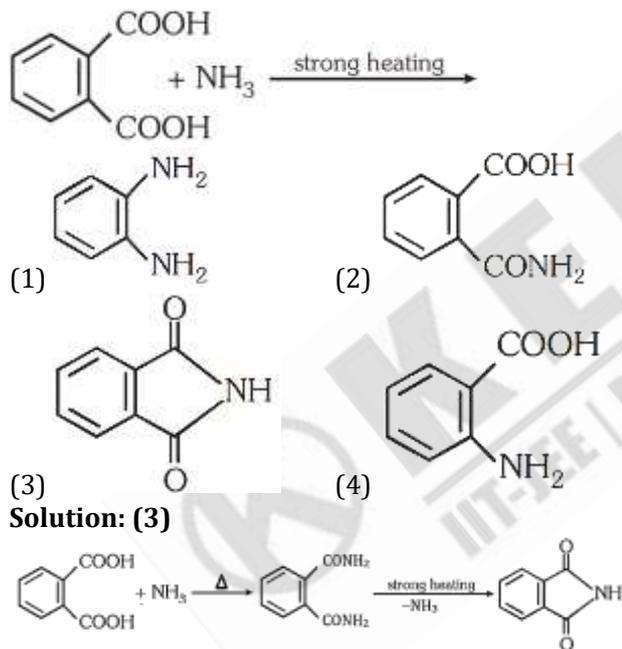


- (1)  $\text{Hg}^{2+}/\text{H}^+, \text{H}_2\text{O}$                       (2) Na/liquid  $\text{NH}_3$   
 (3)  $\text{H}_2, \text{Pd/C}, \text{quinoline}$                 (4) Zn/HCl

**Solution: (3)**

Lindlar's catalyst converts alkyne into Cis-alkene.

71. The major product of the following reaction is:



72. Match the following

Column - I	Column-II
(a) Pure nitrogen	(i) Chlorine
(b) Haber process	(ii) Sulphuric acid
(c) Contact process	(iii) Ammonia
(d) Deacon's process	(iv) Sodium azide or Barium azide

Which of the following is the correct option?

- (a)                      (b)                      (c)                      (d)

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

**Solution: (1)**

Fact

73. Which of the following series of transitions in the spectrum of hydrogen atom falls in visible region?

- (1) Brackett series                      (2) Lyman series  
 (3) Balmer series                      (4) Paschen series

**Solution: (3)**

Balmer series

74. Among the following, the narrow spectrum antibiotic is:

- (1) chloramphenicol                      (2) penicillin G  
 (3) ampicillin                      (4) amoxicillin

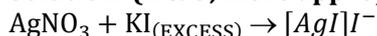
**Solution: (2)**

Fact

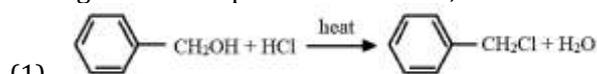
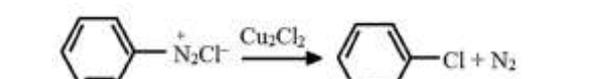
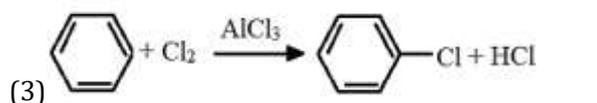
75. Which mixture of the solutions will lead to the formation of negatively charged colloidal  $[\text{AgI}]I^-$  sol?

- (1) 50 mL of 0.1 M  $\text{AgNO}_3$  + 50 mL of 0.1 M KI  
 (2) 50 mL of 1 M  $\text{AgNO}_3$  + 50 mL of 1.5 M KI  
 (3) 50 mL of 1 M  $\text{AgNO}_3$  + 50 mL of 2 M KI  
 (4) 50 mL of 2 M  $\text{AgNO}_3$  + 50 mL of 1.5 M KI

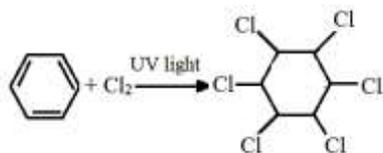
**Solution: (2 & 3, more appropriate 3)**



76. Among the following, the reaction that proceeds through an electrophilic substitution, is

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

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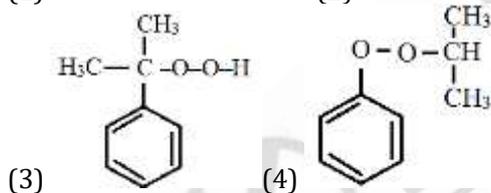
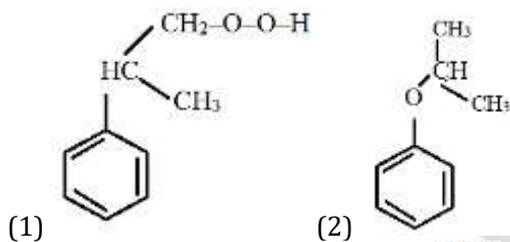
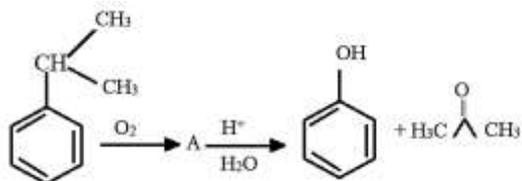


(4)

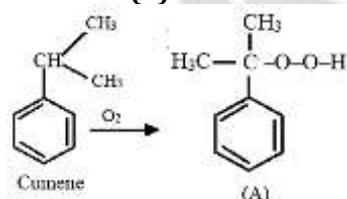
**Solution: (3)**



77. The structure of intermediate A in the following reaction is:



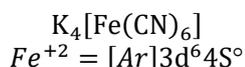
**Solution: (3)**



78. What is the correct electronic configuration of the central atom in  $\text{K}_4[\text{Fe}(\text{CN})_6]$  based on crystal field theory

- (1)  $e^4 t_2^2$                       (2)  $t_{2g}^4 e_g^2$   
 (3)  $t_{2g}^6 e_g^0$                     (4)  $e^3 t_2^3$

**Solution: (3)**



CN $\rightarrow$  Strong ligand, so pairing of electron takes place so  $t_{2g}^6 e_g^0$ .

79. Among the following the one that is not a green house gas is

- (1) sulphur dioxide  
 (2) nitrous oxide  
 (3) methane  
 (4) ozone

**Solution: (1) Fact**

80. Identify the incorrect statement related to  $\text{PCl}_5$  from the following:

- (1)  $\text{PCl}_5$  molecule is non reactive  
 (2) Three equatorial P - Cl bond make an angle of  $120^\circ$  with each other  
 (3) Two axial P-Cl bonds make an angle of  $180^\circ$  with each other  
 (4) Axial P-Cl bond are longer than equatorial P-Cl bonds

**Solution: (1) Fact**

81. Which one is malachite from the following?

- (1)  $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$                       (2)  $\text{CuFeS}_2$   
 (3)  $\text{Cu}(\text{OH})_2$                                       (4)  $\text{Fe}_3\text{O}_4$

**Solution: (1) factual**

82. Which of the following species is not stable?

- (1)  $[\text{SiCl}_6]^{2-}$                                       (2)  $[\text{SiF}_6]^{2-}$   
 (3)  $[\text{GeCl}_6]^{2-}$                                       (4)  $[\text{Sn}(\text{OH})_6]^{2-}$

**Solution: (1)**

$[\text{SiCl}_6]^{2-}$  is not stable due to steric hinderance of Cl atom

83. A compound is formed by cation C and anion A. The anions form hexagonal close packed (hcp) lattice and the cations occupy 75% of octahedral voids. The formula of the compound is:

- (1)  $\text{C}_4\text{A}_3$     (2)  $\text{C}_2\text{A}_3$   
 (3)  $\text{C}_3\text{A}_2$     (4)  $\text{C}_3\text{A}_4$

**Solution: (4)**

No. of atoms in hexagonal lattice (A) = 6

No. of octahedral (c) =  $6 \times \frac{75}{100} = \frac{9}{2}$

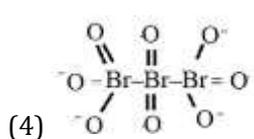
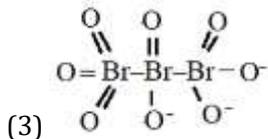
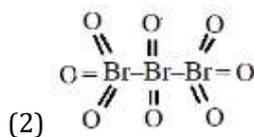
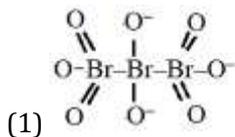
$\therefore$  Formula is  $\text{C}_9 \text{A}_6$

$\text{C}_9\text{A}_{12}$

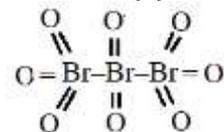
$\text{C}_3\text{A}_4$

84. The correct structure of tribromooctaoxide is:

**SPACE FOR ROUGH WORK**



**Solution: (2)**



85. The method used to remove temporary hardness of water is:

- (1) Synthetic resins method
- (2) Calgon's method
- (3) Clark's method
- (4) Ion-exchange method

**Solution: (3)**

86. The non-essential amino acid among the following is:

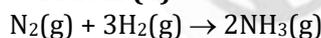
- (1) lysine
- (2) valine
- (3) leucine
- (4) alanine

**Solution: (4)**

87. The number of moles of hydrogen molecules required to produce 20 moles of ammonia through Haber's process is:

- (1) 40
- (2) 10
- (3) 20
- (4) 30

**Solution: (4)**



To produce 20 moles of ammonia, we need 30 mole of  $\text{H}_2$ .

88. Which of the following reactions are disproportionation reaction?

- (a)  $2\text{Cu}^+ \rightarrow \text{Cu}^{2+} + \text{Cu}^0$
- (b)  $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$
- (c)  $2\text{KMnO}_4 \xrightarrow{\Delta} \text{K}_2\text{MnO}_4 + \text{MnO}_2 + \text{O}_2$
- (d)  $2\text{MnO}_4^- + 3\text{Mn}^{2+} + 2\text{H}_2\text{O} \rightarrow 5\text{MnO}_2 + 4\text{H}^+$

Select the correct option from the following:

- (1) (a) and (d) only

(2) (a) and (b) only

(3) (a), (b) and (c)

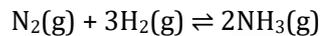
(4) (a), (c) and (d)

**Solution: (2)**

(a)  $\text{Cu}^+$  goes into  $\text{Cu}^{+2}$  and  $\text{Cu}$ .

(b)  $\text{Mn}^{+6}$  goes into  $\text{Mn}^{+7}$  and  $\text{Mn}^{+4}$

89. For the chemical reaction



The correct option is

(1)  $3 \frac{d[\text{H}_2]}{dt} = + \frac{d[\text{NH}_3]}{dt}$

(2)  $-\frac{1}{3} \frac{d[\text{H}_2]}{dt} = -\frac{1}{2} \frac{d[\text{NH}_3]}{dt}$

(3)  $-\frac{d[\text{N}_2]}{dt} = 2 \frac{d[\text{NH}_3]}{dt}$

(4)  $-\frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt}$

**Solution: (4)**

$$-\frac{d[\text{N}_2]}{dt} = \frac{1}{2} \frac{d[\text{NH}_3]}{dt}$$

90. Conjugate base for Bronsted acids  $\text{H}_2\text{O}$  and  $\text{HF}$  are

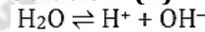
(1)  $\text{H}_3\text{O}^+$  and  $\text{H}_2\text{F}^+$ , respectively

(2)  $\text{OH}^-$  and  $\text{H}_2\text{F}^+$ , respectively

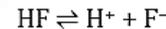
(3)  $\text{H}_3\text{O}^+$  and  $\text{F}^-$ , respectively

(4)  $\text{OH}^-$  and  $\text{F}^-$ , respectively

**Solution: (4)**



Conjugate base



Conjugate base

91. Grass leaves curl inwards during very dry weather. Select the most appropriate reason from the following:

(1) Tyloses in vessels

(2) Closure of stomata

(3) Flaccidity of Bulliform cells

(4) Shrinkage of air spaces in spongy mesophyll

**Solution: (3)**

Ref. XI NCERT Chapter- 6, Page No. 94

92. What triggers activation of protoxin to active Bt Toxin of *Bacillus Thuringowa*'s in boll worm?

(1) Acidic pH of stomach

(2) Body temperature

(3) Moist surface of midgut

(4) Alkaline pH of gut

**Solution: (4)**

SPACE FOR ROUGH WORK

- Factual- NCERT
93. Select the correctly written scientific name of mango which was first described by Carolus Linnaeus:  
 (1) *Mangifera Indica*  
 (2) *Mangifera indica* Car. Linn  
 (3) *Mangifera indica* Linn.  
 (4) *Mangifera indica*  
**Solution: (3)**  
*Ref. XI NCERT Chapter- 1, Page No. 07*
94. Cells in  $G_0$  Phase:  
 (1) Terminate the cell cycle  
 (2) Exit the cells cycle  
 (3) enter the cell cycle  
 (4) Suspend the cell cycle  
**Solution: (4)**  
 In  $G_0$  phase cell is inactive for division but may again become active based on body requirements.
95. Phloem in gymnosperms lacks:  
 (1) Both sieve tubes and companion cells  
 (2) Albuminous cells and sieve cells  
 (3) Sieve tubes only  
 (4) Companion cells only  
**Solution: (1)**  
*Ref. XI NCERT Chapter- 6, Page No. 88*
96. Which of the following contraceptive methods to involve a role of hormone?  
 (1) Pills, Emergency contraceptives, Barrier methods  
 (2) Lactational amenorrhea, Pills, Emergency contraceptives  
 (3) Barrier method, Lactational amenorrhea, Pills  
 (4) CuT, Pills, Emergency contraceptives  
**Solution: (2)**  
 Factual- NCERT
97. Which of the following statements is incorrect?  
 (1) Yeasts have filamentous bodies with long thread – like hyphae.  
 (2) Morels and truffles are edible delicacies.  
 (3) *Claviceps* is a source of many alkaloids and LSD.  
 (4) Conidia are produced exogenously and ascospores endogenously.  
**Solution: (1)**
- Ref. XI NCERT Chapter- 2, Page No. 22*
98. It takes very long time for pineapple plants to produces flowers. Which combination of hormones can be applied to artificially induces flowering in pineapple plate throughout the year to increase yield  
 (1) Cytokinin and Abscisic acid  
 (2) Auxin and Ethylene  
 (3) Gibberellin and Cytokinin  
 (4) Gibberellin and Abscisic acid  
**Solution: (2)**  
*Ref. XI NCERT Chapter- 15, Page No. 248 & 250*
99. Conversion of glucoses to glucose – 6 - phosphate, the first irreversible reaction of glycolysis is catalyzed by:  
 (1) Phosphofructokinase  
 (2) Aldolase  
 (3) Hexokinase  
 (4) Enolase  
**Solution: (3)**  
*Ref. XI NCERT Chapter- 14, Page No. 229*
100. Consider following features:  
 (a) Organ system level of organisation  
 (b) Bilateral symmetry  
 (c) True coelomates with segmentation of body  
 Select the correct option of animal groups which posses all the above characteristics.  
 (1) Annelida, Mollusca and Chordata  
 (2) Annelida Arthropoda and Chordata  
 (3) Annelida, Arthropoda and Mollusca  
 (4) Arthropoda, Mollusca and Chordata  
**Solution: (2)**  
 Factual- NCERT
101. Which of the following muscular disorders is inherited?  
 (1) Botulism  
 (2) Tetany  
 (3) Muscular dystrophy  
 (4) Myasthenia gravis  
**Solution: (3)**  
*Out of NCERT, Muscular dystrophy is an X linked recessive disorder.*
102. The Earth Summit held in Rio de Janeiro in 1992 was called:

**SPACE FOR ROUGH WORK**

- (1) For immediate steps to discontinue use of CFSs that were damaging the ozone layer,
- (2) To reduce CO<sub>2</sub> emissions and global warming.
- (3) For conservation of biodiversity and sustainable utilization of its benefits,
- (4) To assess threat posed to native species by invasive weed species.

**Solution: (3)**

*Ref. XII NCERT Chapter- 15, Page No. 267*

103. Which of the following can be used as a biocontrol agent in the treatment of plant disease?

- (1) *Lactobacillus*                      (2) *Trichoderma*
- (3) *Chlorella*                         (4) *Anabaena*

**Solution: (2)**

*Ref. XII NCERT Chapter- 10, Page No. 187*

104. Extrusion of second polar body from egg nucleus occurs:

- (1) simultaneously with first cleavage
- (2) after entry of sperm but before fertilization
- (3) after fertilization
- (4) before entry of sperm into ovum

**Solution: (2)**

Contact of sperm with egg causes completion of meiosis II

105. Xylem translocates:

- (1) Water, mineral salts, some organic nitrogen and hormones
- (2) Water only
- (3) Water and mineral salts only
- (4) Water, mineral salts and some organic nitrogen only

**Solution: (1)**

*Ref. XI NCERT Chapter- 11, Page No. 184*

106. The concept of "Omnis cellula - e cellula" regarding cell division was first proposed by:

- (1) Aristotle
- (2) Rudolf Virchow
- (3) Theodore Schwann
- (4) Schleiden

**Solution: (2)**

Factual- NCERT

107. Which of the following glucose transporters is insulin - dependent?

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

**Solution: (1)**

Factual- NCERT

108. Which of the following statements is correct?

- (1) Cornea consists of dense matrix of collagen and is the most sensitive portion of the eye.
- (2) Cornea is an external, transparent and protective proteinaceous covering of the eye - ball.
- (3) Cornea consists of dense connective tissue of elastin and can repair itself.
- (4) Cornea is convex, transparent layer which is highly vascularized.

**Solution: (1)**

Cornea is white fibrous connective tissue and very sensitive due to good nerve supply

109. Match the following genes of the Lac operon with their respective products:

- (a) i gene                                (i) β - galactosidase
- (b) z gene                                (ii) Permease
- (c) a gene                                (iii) Repressor
- (d) y gene                                (iv) Transacetylase

Select the correct option.

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

**Solution: (4)**

*Ref. XII NCERT Chapter- 06, Page No. 116*

110. Respiratory Quotient (RQ) value of tripalmitin is:

- (1) 0.09                                  (2) 0.9
- (3) 0.7                                    (4) 0.07

**Solution: (3)**

*Ref. XI NCERT Chapter- 14, Page No. 237*

111. Which of the following statements regarding mitochondria is incorrect?

- (1) Mitochondrial material contains single circular DNA molecule and ribosomes.
- (2) Outer membrane is permeable to monomers of carbohydrates, fats and proteins.

**SPACE FOR ROUGH WORK**

- (3) Enzymes of electron transport and embedded in outer membrane.  
 (4) Inner membrane is convoluted with infoldings.

**Solution: (3)**

*Ref. XI NCERT Chapter- 14, Page No. 233*

112. The shorter and longer arms of a submetacentric chromosome are referred to as:  
 (1) m – arm and n – arm respectively  
 (2) s – arm and l – arm respectively  
 (3) p – arm q – arm respectively  
 (4) q – arm and p – arm respectively

**Solution: (3)**

Short arm is 'p' is and long arm is 'q'

113. Purines found both in DNA and RNA are:

- (1) Cytosine and thymine  
 (2) Adenine and thymine  
 (3) Adenine and guanine  
 (4) Guanine and cytosine

**Solution: (3)**

*Ref. XII NCERT Chapter- 06, Page No. 96*

114. Which of these following methods is the most suitable for disposal of nuclear waste?

- (1) Bur the waste within rocks deep below the Earth's surface  
 (2) Shoot the waste into space  
 (3) Bury the waste under Antarctic ice – cover  
 (4) Dump the waste within rocks under deep ocean

**Solution: (1)**

*Ref. XII NCERT Chapter- 16, Page No. 280*

115. The ciliated epithelial cells are required to move particles or mucus in a specific direction. In humans, these cells are mainly present in:

- (1) Bronchioles and Fallopian tubes  
 (2) Bile duct and Bronchioles  
 (3) Fallopian tubes and Pancreatic duct  
 (4) Eustachian tube and Salivary duct

**Solution: (1)**

Factual NCERT

116. Variations caused by mutation, as proposed by Hugo de Vries, are

- (1) Small and directionless  
 (2) Random and directional

- (3) Random and directionless

- (4) Small and directional

**Solution: (3)**

Mutations are random and directionless.

117. How does steroid hormone influence the cellular activities?

- (1) using aquaporin channels are second messenger.  
 (2) Changing the permeability of the cell membrane.  
 (3) Binding to DNA and forming a gene-hormone complex.  
 (4) Activating cyclic AMP located on the cell membrane.

**Solution: (3)**

Factual- NCERT

118. In *Antirrhinum* (Snapdragon), a red flower was crossed with a white flower and in F<sub>1</sub> generation, pink flowers were obtained. When pink flowers were selfed, the F<sub>2</sub> generation showed white, red and pink flowers. Choose the incorrect statement from the following:

- (1) Law of Segregation does not apply in this experiment.  
 (2) This experiment does not follow the Principle of Dominance.  
 (3) Pink colour in F<sub>1</sub> is due to incomplete dominance  
 (4) Ratio of F<sub>2</sub> is  $\frac{1}{4}$  (Red):  $\frac{2}{4}$  (Pink):  $\frac{1}{4}$  (White)

**Solution: (1)**

*Ref. XII NCERT Chapter- 05, Page No. 76*

*Law of Segregation is universally followed.*

119. Placentation in which ovules develop on the inner well of the ovary of in peripheral part is:

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

**Solution: (4)**

*Ref. XI NCERT Chapter- 05, Page No. 75*

120. Select the correct group of biocontrol agents

- (1) *Nostoc*, *Azospirillum*, *Nucleopolyhedrovirus*  
 (2) *Bacillus thuringiensis*, tobacco mosaic virus, Aphids

SPACE FOR ROUGH WORK

(3) *Trichoderma*, *Baculovirus*, *Bacillus thuringiensis*

(4) *Oscillatoria*, *Rhizobium*, *Trichoderma*

**Solution: (3)**

Ref. XII NCERT Chapter- 10, Page No. 187

121. The correct sequence of phases of cell cycle is:

(1)  $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$

(2)  $M \rightarrow G_1 \rightarrow G_2 \rightarrow S$

(3)  $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$

(4)  $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$

**Solution: (1)**

Factual- NCERT

122. Which part of the brain is responsible for thermoregulation?

(1) Medulla oblongata (2) Cerebrum

(3) Hypothalamus (4) Corpus callosum

**Solution: (3)**

Factual- NCERT

123. Which one of the following is not a method of in situ conservation of biodiversity?

(1) Sacred Grove (2) Biosphere Reserve

(3) Wildlife Sanctuary (4) Botanical Garden

**Solution: (4)**

Ref. XII NCERT Chapter- 15, Page No. 267

124. Which of the following pairs of gases is mainly responsible for green house effect?

(1) Carbon dioxide and Methane

(2) Ozone and Ammonia

(3) Oxygen and Nitrogen

(4) Nitrogen and Sulphur dioxide

**Solution: (1)**

Ref. XII NCERT Chapter- 16, Page No. 281

125. Persistent nucellus in the seed is known as :

(1) Tegmen (2) Chalaza

(3) Perisperm (4) Hilum

**Solution: (3)**

Ref. XII NCERT Chapter- 02, Page No. 36

126. Watch the column-I with column-II

**Column-I**

(a) P-wave

(b) QRS complex

**Column-II**

(i) Depolarisation of ventricles

(ii) Repolarisation of ventricles

(c) T-wave

(d) Reduction in the size of T-wave

(iii) Coronary ischemia

(iv) Depolarisation of atria

(v) Repolarisation of atria

Select the correct option.

(a) (b) (c) (d)

(1) (ii) (iii) (v) (iv)

(2) (iv) (i) (ii) (iii)

(3) (iv) (i) (ii) (v)

(4) (ii) (i) (v) (iii)

**Solution: (2)**

Factual- NCERT (T – wave is reduced in size under hypoxia)

127. Following statements describe the characteristics of the enzyme Restriction Endonuclease. Identify the incorrect statement.

(1) The enzyme recognizes a specific palindromic nucleotide sequence in the DNA

(2) The enzyme cuts DNA molecule at identified position within the DNA

(3) The enzyme binds DNA at specific sites and cuts only of the two strands.

(4) The enzyme cuts the sugar-phosphate backbone at specific sites on each strand.

**Solution: (3)**

It cuts both the strands

128. Which of the following is true for Golden rice?

(1) It has yellow grains, because of a gene introduced from a primitive variety of rice

(2) It is vitamin A enriched, with a gene from daffodil.

(3) It is pest resistant, with a gene from *Bacillus thuringiensis*.

(4) It is drought tolerant, developed using *Agrobacterium* vector

**Solution: (4)**

Factual- NCERT

129. Match column-I with Column-II

Column-I Column-II

(a) Saprophyte

(b) Parasite

(i) Symbiotic association of fungi with plant roots

(ii) Decomposition of dead organic materials

SPACE FOR ROUGH WORK

- (c) Lichens (iii) Living on living  
 planta or animals  
 (d) Mycorrhiza (iv) Symbiotic association  
 of algae and fungi

Choose the correct answer from the options given below:

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

**Solution: (1)**

*Ref. XI NCERT Chapter- 02, Page No. 22*

130. What would be the heart rate of a person if the cardiac output is 5L blood volume in the ventricles at the end of diastole is 100 mL and at the end of ventricular systole is 50 mL?

- (1) 125 beats per minute  
 (2) 50 beats per minute  
 (3) 75 beats per minute  
 (4) 100 beats per minute

**Solution: (4)**

Cardiac output = stroke volume  $\times$  number of heart beats

Stroke volume = EDP – ESP (100 – 50)

131. Which of the following statements is incorrect?  
 (1) prions consist of abnormally folded proteins  
 (2) Viroids lack a protein coat  
 (3) Viruses are obligate parasites  
 (4) Infective constituent in viruses is the protein coat

**Solution: (4)**

*Ref. XI NCERT Chapter- 02, Page No. 26-27*

132. Match the following structures with their respective location in organs

- |                           |                       |
|---------------------------|-----------------------|
| (a) Crypts of Lieberkithn | (i) Pancreas          |
| (b) Glisson's capsule     | (ii) Duodenum         |
| (c) latest of Langerhans  | (iii) Small intestine |
| (d) Brunner's Glands      | (iv) Laver            |

Select the correct option from the following:

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

- (4) (iii) (iv) (i) (ii)

**Solution: (4)**

Brunner's glands are in duodenum

133. which of the following immune responses is responsible for rejection of Kidney graft?

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

**Solution: (1)**

Factual- NCERT

134. identify the cells whose secretion protects the lining of gastro-intestinal tract from various enzymes.

- (1) Duodenal Cells (2) Chief Cells  
 (3) Goblet Cells (4) Oxyntic Cells

**Solution: (3)**

Factual- NCERT

135. Coder which of the following conditions will there be no change in the reading frame of following mRNA?

5' AACAGCGGUGCUAAU 3'

- (1) Deletion of GGU from 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> positions  
 (2) Insertion of G at 5<sup>th</sup> position  
 (3) Deletion of G from 5<sup>th</sup> position  
 (4) Insertion of A and G at 4<sup>th</sup> and 5<sup>th</sup> positions respectively

**Solution: (1)**

*Ref. XII NCERT Chapter- 06, Page No. 114*

*If GGU is removed from the given mRNA, one amino acid coded by this codon is not incorporated in the polypeptide, rest all codon will not change.*

136. Which of the following is a commercial blood cholesterol lowering agent?

- (1) Lipases (2) Cyclosporin A  
 (3) Statin (4) Streptokinase

**Solution: (3)**

*Ref. XII NCERT Chapter- 10, Page No. 183*

137. Select the incorrect statement.

- (1) Human males have one of their sex-chromosome much shorter than the other.  
 (2) Male fruit fly is heterogametic.  
 (3) In male grasshoppers, 50% of sperms have no sex-chromosome.

**SPACE FOR ROUGH WORK**

(4) In domesticated fowls, sex of progeny depends on the type of sperm rather than egg.

**Solution: (4)**

Ref. XII NCERT Chapter- 05, Page No. 85-86

138. Tidal volume and Expiratory Reserve Volume of in athlete is 500 mL and 1000 mL respectively. What will be his Expiratory Capacity if the Wedual Volume is 1200 mL?

- (1) 2700 mL (2) 1500 mL  
(3) 1700 mL (4) 2200 mL

**Solution: (2)**

E.C = TV + ERV

139. Select the correct sequence for transport of sperm cells in male reproductive system.

- (1) Testis → Epididymis → Vasa efferentia → Vas deferens → Ejaculatory duct → Inguinal canal → Urethra → Urethral meatus  
(2) Testis → Epididymis → Vasa efferentia → Rate testis → Inguinal canal → Urethra  
(3) Seminiferous tubules → Rate testis → Vasa efferentia → Epididymis → Vas deferens → Ejaculatory duct → Urethra → Urethral meatus  
(4) Seminiferous tubules → Vasa efferentia → Epididymis → Inguinal canal → Urethra

**Solution: (3)**

Factual- NCERT

140. Colostrum, the yellowish fluid, secreted by mother during the initial days of location is very essential to impart immunity to the newborn infants because it contains:

- (1) Immunoglobulin A (2) Natural killer cells  
(3) Monocytes (4) Macrophages

**Solution: (1)**

Factual- NCERT

141. In some plants, the female gamete develops into is known as:

- (1) Parthenogenesis (2) Autogamy  
(3) Parthenocarpy (4) Syngamy

**Solution: (1)**

Ref. XII NCERT Chapter- 01, Page No. 14

142. Identify the correct pair representing the causative agent of typhoid fever and the confirmatory test for typhoid.

- (1) Salmonella typhi / Widal test  
(2) Plasmodium vivax / UTI test  
(3) Streptococcus / pneumoniae / Widal test  
(4) Salmonella typhi / Anthrone test

**Solution: (1)**

Factual- NCERT

143. Expressed Sequence Tags (ESTs) refers to:

- (1) Novel DNA sequences  
(2) Plasmodium vivax / UTt test  
(3) Streptococcus pneumonic / Widal test  
(4) Salmonella typhi / Anthrome test

**Solution: (2)**

Ref. XII NCERT Chapter- 06, Page No. 119

144. Match the following hormones with the respective diseases:

(a)	Insulin	(i)	Addison's disease
(b)	Thyroxin	(ii)	Diabetes insipidus
(c)	Corticoids	(iii)	Acromegaly
(d)	Growth Hormone	(iv)	Goiter
		(v)	Diabetes mellitus

Select the correct option.

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

**Solution: (4)**

Factual- NCERT

145. Which of the following factors is responsible for the formation of concentrated urine

- (1) Hydrostatic pressure during glomerular filtration.  
(2) Low levels of antidiuretic hormone.  
(3) Maintaining hyperosmolarity towards inner medullary interstitium in the kidneys.

SPACE FOR ROUGH WORK

(4) Secretion of erythropoietin by Juxtaglomerular complex.

**Solution: (3)**

Gradient of osmolarity towards inner medulla concentrates urine

146. Select the hormone-releasing Intra-Uterine Devices.

(1) Lippes Loop, Multiload 375

(2) Vaults, LNG-20

(3) Multiload 375, Progestasert

(4) Progestasert, LNG-20

**Solution: (4)**

Factual NCERT

147. Match the following organisms with their respective characteristics:

(a)	Pila	(i)	Flame cells
(b)	Bombyx	(ii)	Comb plates
(c)	Pleurobrachia	(iii)	Radula
(d)	Taenia	(iv)	Malpighian tubules

Select the correct option from the following:

**(a) (b) (c) (d)**

(1) (iii) (ii) (iv) (i)

(2) (iii) (ii) (i) (iv)

(3) (iii) (iv) (ii) (i)

(4) (ii) (iv) (iii) (i)

**Solution: (3)**

Factual NCERT

148. which of the following sexually transmit diseases is not completely curable?

(1) Chlamydia

(2) Gonorrhoea

(3) Genital warts

(4) Genital herpes

**Solution: (4)**

Factual NCERT

149. Drug called 'Heroin' is synthesized by:

(1) Nitration of morphine

(2) Methylation of morphine

(3) Acetylation of morphine

(4) glycosylation of morphine

**Solution: (3)**

Factual NCERT

150. What is the site of perception of photoperiod necessary for induction of flowering in plants?

(1) Leaves

(2) Lateral buds

(3) Pulvinus

(4) Shoot apex

**Solution: (1)**

Ref. XI NCERT Chapter- 15, Page No. 252

151. A gene locus has two alleles A. a if the frequency of dominant allele A is 0.4. then what will be the frequency homozygous dominant, heterozygous and homozygous recessive individuals in the population?

(1) 0.16(AA); 0.36 (Aa); 0.48 (aa)

(2) 0.36(AA); 0.48 (Aa); 0.16 (aa)

(3) 0.16(AA); 0.24 (Aa); 0.36 (aa)

(4) 0.16(AA); 0.48 (Aa); 0.36 (aa)

**Solution: (4)**

Given  $(p) = 0.4$

$(p + q = 1)$

Hence  $(q) = 0.6$

To find

Homozygous dominant =  $p^2$

$$= (0.4)^2 = 0.16$$

Heterozygous =  $2pq$

$$= 2 \times 0.4 \times 0.6$$

$$= 0.48$$

Homozygous recessive =  $q^2$

$$= (0.6)^2$$

$$= 0.36$$

152. What map unit (Centimorgan) is adopted in the construction of genetic maps?

(1) A unit of distance between genes on chromosomes representing 50% cross over.

(2) A unit of distance between two expressed genes, representing 10% cross over.

(3) A unit of distance between two expressed Genes, representing 100% cross over

(4) A unit of distance between genes on chromosomes, representing 1% cross over.

**Solution: (4)**

Ref. XII NCERT Chapter- 05, Page No. 83 (some part is out of NCERT)

1% crossover = 1 Centimorgan = 1 map unit

153. Concanavalin A is:

(1) a pigment

(2) an alkaloid

(3) an essential oil

(4) a lectin

**Solution: (4)**

Factual NCERT

SPACE FOR ROUGH WORK

154. *Pinus* seed cannot germinate and establish without fungal association. This is because:  
 (1) Its seeds contain inhibitors that prevent germination.  
 (2) Its embryo is immature.  
 (3) It has obligate association with mycorrhizae  
 (4) It has very hard seed coat.

**Solution: (3)**

*Out of NCERT Pinus seed can not germinate until unless mycorrhizal association is not developed.*

155. The frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes was explained by:  
 (1) Sutton Boveri  
 (2) T.H. Morgan  
 (3) Gregor J. Mendel  
 (4) Alfred Sturtevant

**Solution: (4)**

*Ref. XII NCERT Chapter- 05, Page No. 83*

156. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights form 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place?

- (1) Cyclical Selection  
 (2) Directional Selection  
 (3) Stabilizing Selection  
 (4) Disruptive Selection

**Solution: (3)**

Average phenotypes are selected in stabilizing selection

157. Match the hominids with their correct brain size:

(a)	Homo habilis	(i)	900 cc
(b)	Homo neanderthalensis	(ii)	1350 cc
(c)	Homo erectus	(iii)	650-800 cc
(d)	Homo sapiens	(iv)	1400 cc

Select the correct option

- |     |            |            |            |            |
|-----|------------|------------|------------|------------|
|     | <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| (1) | (iv)       | (iii)      | (i)        | (ii)       |
| (2) | (iii)      | (i)        | (iv)       | (ii)       |

- |     |       |      |     |      |
|-----|-------|------|-----|------|
| (3) | (iii) | (ii) | (i) | (iv) |
| (4) | (iii) | (iv) | (i) | (ii) |

**Solution: (4)**

Factual NCERT

158. Select the correct option

- (1) There are seven pairs of vertebrocostal, three pairs of vertebrochondral and two pairs of vertebral ribs.  
 (2) 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> pairs of ribs articulate directly with the sternum.  
 (3) 11<sup>th</sup> and 12<sup>th</sup> pairs of ribs are connected to the sternum with the help of hyaline cartilage.  
 (4) Each rib is a flat thin bone and all the ribs are connected dorsally to the thoracic vertebrae and ventrally to the sternum.

**Solution: (1)**

Factual NCERT

159. What is the direction of movement of sugars in phloem?

- (1) Bi-directional  
 (2) Non-multidirectional  
 (3) Upward  
 (4) Downward

**Solution: (1)**

*Ref. XI NCERT Chapter- 11, Page No. 190*

160. Polyblend, a fine powder of recycled modified plastic, has proved to be a good material for:

- (1) making tubes and pipes  
 (2) making plastic sacks  
 (3) use as a fertilizer  
 (4) construction of roads

**Solution: (4)**

*Ref. XII NCERT Chapter- 16, Page No. 279*

161. Which of the following ecological pyramids is generally inverted?

- (1) Pyramid of biomass in a sea  
 (2) Pyramid of numbers in grassland  
 (3) Pyramid of energy  
 (4) Pyramid of biomass in a forest

**Solution: (1)**

*Ref. XII NCERT Chapter- 14, Page No. 249*

SPACE FOR ROUGH WORK

162. use of an artificial kidney during hemotiyais may result in:

- (1) Nitrogenous waste build-up in the bod
- (2) Non-elimination of excess potassium from gastro-intestinal tract
- (3) Reduced absorption of calcium from gastro-intestinal tract
- (4) Reduced RBC production

Which of the following options is the correct appropriate?

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

**Solution: (3)**

Nitrogenous waste removed by dialysis.

163 Which of the following pairs of organelles **does not** contain DNA?

- (1) Nuclear envelope and Mitochondria
- (2) Mitochondria and Lysosomes
- (3) Chloroplast and Vacuoles
- (4) Lysosomes and Vacuoles

**Solution: (4)**

Factual NCERT

164. Which of the following is the most important cause for animals and plants being driven to extinction?

- (1) Alien species invasion
- (2) Habitat loss and fragmentation
- (3) Drought and floods
- (4) Economic

**Solution: (2)**

*Ref. XII NCERT Chapter- 15, Page No. 264*

165. What is the fate of the male gemetes discharged in the synergid?

- (1) One fuses with egg and other fuses with central cell nuclei.
- (2) One fuses with egg, other(s) degenerate(s) in the synergid.
- (3) All fuse with the egg.
- (4) one fuses with egg. other(s) fuse(s) with synergid nucleus.

**Solution: (1)**

*Ref. XII NCERT Chapter- 02, Page No. 34*

166. Which of the following protocols did aim for reducing emission of chlorofluorocarbouns into the atmosphere ?

- (1) Geneva Protocol
- (2) Montreal protocol
- (3) Kyoto Protocol
- (4) Gothenburg Protocol

**Solution: (2)**

*Ref. XII NCERT Chapter- 16, Page No. 283*

167. Due to increasing air borne allergens and pollutants many people in urban areas are suffering from respiratory disorder causing wheezing due to:

- (1) reduction in the secretion of surfactants by pneumocytes.
- (2) benign growth on mucous lining of nasal cavity .
- (3) inflammation of bronchi and bronchioles.
- (4) profile form of fibrous tissues and damage walls.

**Solution: (3)**

Allergy is type of inflammation specific to respiratory tract

168. From evolutionary point of view retention of the female gametophyte with developing young embryo on the parent sporophyte for some time is first observed in

- (1) Gymnosperms
- (2) Liverworts
- (3) mosses
- (4) Pteridophytes

**Solution: (4)**

*Ref. XI NCERT Chapter- 03, Page No. 38*

169. What is the genetic disorder in which an individual has an overall masculine development. Gynaecomastia and is sterile?

- (1) Down s syndrome
- (2) Turne's syndrome
- (3) Klinefelter 's syndrome
- (4) Edward syndrome

**Solution: (3)**

*Ref. XII NCERT Chapter- 05, Page No. 91*

**SPACE FOR ROUGH WORK**

170. Which of the following features of genetic code does allow bacteria to produce human insulin by recombinant DN Technology ?

- (1) Genetic code is specific
- (2) Genetic code is not ambiguous
- (3) Genetic code is redundant
- (4) Genetic code is nearly universal

**Solution: (4)**

*Ref. XII NCERT Chapter- 06, Page No. 112*

171. match the following organisms with the products they produces :

- |                              |                   |
|------------------------------|-------------------|
| (a) <i>Lactobacillus</i>     | (i) Cheese        |
| (b) <i>Saccharomyces</i>     | (ii) Curd         |
| (c) <i>Aspergillus niger</i> | (iii) Citric Acid |
| (d) <i>Acetobacter</i>       | (iv) Bread        |
|                              | (v) Acetic Acid   |

Select the correct option.

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

**Solution: (3)**

*Ref. XII NCERT Chapter- 10, Page No. 183*

172. DNA precipitation out of a mixture of biomolecules can be achieved by treatment with :

- (1) Chilled Chloroform
- (2) Isopropanol
- (3) Chilled ethanol
- (4) Methanol at room temperature

**Solution: (3)**

Factual NCERT

173. *Thiobacillus* is a group of bacteria helpful in carrying out :

- (1) Denitrification
- (2) Nitrogen fixation
- (3) Chemoautotrophic fixation
- (4) Nitrification

**Solution: (1)**

*Ref. XI NCERT Chapter- 12, Page No. 201*

174. Which of the following statements is not correct?

- (1) Lysosomes are formed by the process of packaging in the endoplasmic reticulum.

(2) Lysosomes have numerous hydrolytic enzymes.

(3) The hydrolytic enzymes of lysosomes are active under acidic PH

(4) Lysosomes are membrane bound structures.

**Solution: (1)**

Factual NCERT

175. Select the incorrect statement

(1) Inbreeding helps in accumulation of superior genes and elimination of undesirable genes.

(2) Inbreeding increases homozygosity.

(3) Inbreeding is essential to evolve pure lines in any animal.

(4) Inbreeding selects harmful recessive genes that reduce fertility and productivity.

**Solution: (1)**

Factual NCERT

176. Select the correct sequence of organs in the alimentary canal of cockroach starting from mouth?

(1) Pharynx → Oesophagus → Ileum → Crop → Gizzard → Colon → Rectum

(2) Pharynx → Oesophagus → Crop → Gizzard → Ileum → Colon → Rectum

(3) Pharynx → Oesophagus → Gizzard → Crop → Ileum → Colon → Rectum

(4) Pharynx → Oesophagus → Gizzard → Ileum → Crop → Colon → Rectum

**Solution: (2)**

Factual NCERT

177. Consider the following statement:

(A) Coenzyme or metal ion that is tightly bound to enzyme protein is called prosthetic group.

(B) A complete catalytic active enzyme with its bound prosthetic group is called apoenzyme.

Select the correct option.

(1) (A) is false but (B) is true.

(2) Both (A) and (B) are true.

(3) (A) is true but (B) are true.

(4) Both (A) and (B) are false.

**Solution: (3)**

Any non-organic group which binds tightly to protein group of Enzyme can be considered prosthetic group.

SPACE FOR ROUGH WORK

178. Which of the statements given below is not true about formation of Annual Rings in trees ?
- (1) Annual rings are not prominent in tree of temperate region.
  - (2) Annual rings is a combination of spring wood and autumn wood produced in a year.
  - (3) Differential activity of cambium causes light and dark bands of tissue early and late wood respectively.
  - (4) Activity of cambium depends upon variation in climate.

**Solution: (1)**

*Ref. XI NCERT Chapter- 06, Page No. 96*

179. Which one of the following statements regarding post fertilization development in flowering plants is incorrect?

- (1) Ovules develop into embryo sac
- (2) Ovary develops into fruit
- (3) Zygote develops into embryo
- (4) Central cell develops into endosperm

**Solution: (1)**

*Ref. XII NCERT Chapter- 01, Page No. 15*

180. Which one of the following equipment is essentially required for growing increase on a large scale for industrial production of enamels?

- (1) Bioreactor
- (2) BOD incubator
- (3) Sludge digester
- (4) Industrial oven

**Solution: (1)**

Factual NCERT



SPACE FOR ROUGH WORK