MEMONEET APP

MemoNeet

NEET(UG) - 2024 Detailed Analysis

MEMONEET
Line by Line NCERT

Test Booklet Code: T3
Date: 05.05.2024

Time : 3 hrs. 20 Min.
Max Mark: 720

Important Instructions

1. The test is of 3 hours 20 minutes duration and the Test Booklet contains 200 multiple choice questions (Four options with a single correct answer) from Physics, Chemistry and Biology (Botany and Zoology). 50 questions in each subject are divided into two sections (A and B) as per details given below:
   (a) Section-A shall consist of 35 (Thirty-five) questions in each subject (Question Nos. 1 to 51 ,35 to 101 ,85 to 135 and 151 to 185). All questions are compulsory.
   (b) Section-B shall consist of 15 (Fifteen) questions in each subject (Question Nos. 36 to 86 ,50 to 136 ,100 to 150 and 186 to 200). In Section B, a candidate needs to attempt any 10 (Ten) questions out of 15 (Fifteen) in each subject.
   Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.
2. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For every wrong response 1 mark shall be deducted from the total scores. The maximum marks are 720.
3. Use Blue / Black Ball point Pen only for writing particulars on these page / marking responses on Answer Sheet
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. The CODE for this Booklet is T3
6. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Use of white fluid for correction is NOT permissible on the Answer Sheet.
7. Use of Electronic/Manual Calculator is prohibited.
8. 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.
9. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.

1. Correct option: 1 [Moving charge and magnetism, magnetic field due to current carrying loop]

Explanation:

Using the formula $B = (\mu_0 n I)/2a$

Where I is current in the loop and a is the radius of the loop.

Given a =10cm = 10×10^{-2} m

I = 7A

Putting the values nd calculating we get $B = 44 \times 10^{-4}$ T = 4.4mT

Difficulty level - 1

2. Correct option: 3 [Magnetism and matter,classification of magnetic material]

Explanation:

Diamagnetic materials have a small negative magnetic susceptibility (χ)

Ferromagnetic materials magnetic susceptibility is very high and positive and depends on the applied.

Paramagnetic materials have constant, small positive susceptibilities, less than 1/1,000 at room temperature.

Non magnetic materials susceptibility close to zero.

Difficulty level - 1

3. Correct option: 3[thermodynamics, work done during cyclic process **]**

Explanation:

As it is clear from the graph that there is no change in volume along the path BC , therefore no work is done .

W = PdV

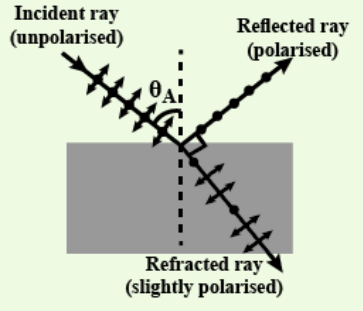
Where P is pressure and dV is change in volume.

dV is 0 here hence W = 0

Difficulty level - 2

4. Correct option: 2[wave optics, polarisation of light**]**

Explanation: An unpolarized light beam is incident on a surface at an angle of incidence equal to Brewster's angle. Then, the reflected beam gets polarized completely and the refracted beam gets polarized partially. Also, both these beams are at right angle to each other.



Difficulty level - 1

5. Correct option: 4[electromagnetic induction, transformer **]**

Explanation:

The transformer ratio is given as $V_P/V_S = N_P/N_S$

Where V_P is voltage across primary coil

V_s is voltage across secondary coil

N_P is number of turns in primary coil

N_S is number of turns in secondary coil

$V_P/V_S = N_P/N_S = ½$

Therefore V_s/V_p = 2/1

Difficulty level - 1

6. Correct option: 1[semiconductors and devices, logic gates**]**

Explanation:

Going by options we find $\overline{B}$ which matches with the output Y

A	B	$\overline{B}$
0	0	1
0	1	0
1	0	1
1	1	0

Difficulty level - 2

7. Correct option: 4[units and measurements , vernier calipers**]**

Explanation:

Given:

(N+1) vernier scale division(VSD) = N Main scale division(MSD)

Therefore 1 VSD = N/(N+1) MSD

Vernier constant or least count = [1-N/(N+1)]MSD

LC = 1/(N+1)MSD

Given 1 MSD = 0.1mm

Therefore

LC = 1/100(N+1)cm

Difficulty level - 2

8. Correct option: (3) [Elasticity, Young's Modulus]

Explanation:

The Young's modulus is given as

$Y = stress/strain = (F/A)/(\Delta L/L)$

or

$\Delta L = (F/A).L/(Y) = (8x10^{8}).1/(2x10^{11}) = 4x10^{-3}m = 4$

Hence the correct option is (3) 4mm

Difficulty level: 1

9. Correct option: (1) [Laws of motion, Free body diagram]

Explanation:

The net force acting is

$F_{net} = (m_1 + m_2)a_{net}$

$a_{net} = F_{net}/(m_1 + m_2) = 10/5 = 2m/s^2$

Hence,

$10 - N = m_1 a$

$10 - N = 2 \times 2$

$N = 6N$

Or,

$N = m_2 a$

$N = 3 \times 2$

$N = 6N$

Hence the correct option is (1) 4 N

Difficult level: 1

10. Correct option: (1) [Wave Optics, Young's double slit experiment]

Explanation:

In Young's double slit experiment, replacing monochromatic light with white light results in a central white fringe and colored fringes on either side. This is because white light is made up of many wavelengths of light, ranging from red to violet, and each wavelength forms its

own interference pattern. The central fringe is white because all the colors' central fringes form at the same point and mix together. The different colors bend at different angles and form fringes of their own color as they move away from the center.

Hence the correct option is (1) there will be a central white bright fringe surrounded by a few colored fringes.

Difficulty level: 1

11. Correct option: (2) [Atomic Physics, de-Broglies wavelength]

Explanation:

We have the relation $\lambda \propto 1/\sqrt{E}$ or $E \propto 1/\lambda^2$

Hence the graph is a straight line.

The correct option is (2)

Difficulty level: 1

12. Correct option: (3) [Electricity, Capacitors]

Explanation: This is a wheatstone bridge condition. Hence the center capacitance does not contribute to the total. The upper and lower capacitances are in parallel.

Hence $1/C_{upper} = 1/2 + 1/2$=1 or $C_{upper} = 1$

And $1/C_{lower} = 1/2 + 1/2$=1 or $C_{lower} = 1$

C upper and C lower are in parallel hence

$C_{equivalent} = C_{upper} + C_{lower} = 1 + 1 = 2\mu\text{F}$

Hence the correct option is (3)$2\mu\text{F}$

Difficulty level: 1

13. Correct option: (3) [Magnetism, Lenz law]

Explanation:

Because of Lenz's law as the bar magnet goes away, the current will try to bring it back as a consequence of Lenz law. Hence the current direction will be clock wise to behave as a south pole. Hence the direction is AB. For second solenoid, it will try to repel and act as south pole which is DC.

Hence the correct option is (1) AB and DC

Difficulty level: 2

14. Correct option: (3) [Semiconductors, pn junction]

Explanation:

The IV characteristic is the graphical representation of current versus voltage. For a solar cell, the connection is forward bias. Hence the graph will be in the Ist quadrant and not IVth quadrant.

A pn junction diode will have a very small current in the range of micro-amps and will lie in the IIIrd quadrant. The current in a reverse biased P-N junction is due to the drifting of minority charge carriers from one region to another through the junction.

Hence the correct option is (3) A is correct and B are incorrect.

Difficulty level: 1

15. Correct Option:(4)$\{\sqrt{5}\}/2$ [Light optics, Refractive index for prism]

Explanation:

Limiting Angle of incidence for No Emergent Ray from a Given Prism,

$30^0=\sin^{-1}[\sin 90^0\sqrt{\mu^2-1}-\cos 90^0]$

$\Rightarrow \sin 30^0=\sqrt{\mu^2-1}$

$\Rightarrow 1/2=\sqrt{\mu^2-1}$

$\Rightarrow 1/4=\mu^2-1$

$\Rightarrow \mu^2=5/4$

$\Rightarrow \mu=\sqrt{5}/2$

Difficulty level: (2/Moderate)

16. Correct Option:(1){$\pm 9\times10^3$V}[Electrostatics, Electric dipole]

Explanation:

Potential due to an electric dipole,

$V=1/4\pi\epsilon_0 .P/r^2$

$v=9\times10^9\times (4\times10^{-6})/2^2$

$V=\pm 9\times10^3$V

Difficulty level:(1/Easy)

17. Correct option: (3) {8.5 Cm },[Rotatinal Motion ,Moment of inertia]

Explanation: The moment of inertia of the thin rod about an axis which is perpendicular to it and passing from the midpoint is $\frac{ml^2}{12}$. So by using this we can calculate any variable if MOI and one variable is given.

We have given the mass=400g and MOI(I)=2400gCm^2, so we can find the length of the thin rod by $\Rightarrow l=\sqrt{\frac{12I}{m}}$. On putting the values we get $l=8.5cm$

Difficulty level:(1/Easy)

18. Correct option: (1) {8 V}[Current Electricty , The terminal voltage along a cell]

Explanation: The terminal voltage is calculated by using the formula $V=E-ir$. By using the above formula and for the given circuit we have $E=10\,V$, $R_{eq}=5\Omega\ so\ by\ using$ Ohm's law we can find the the total current through circuit $i=\frac{V}{R_{eq}}$ On putting the values we get $i=2A$. So now the terminal voltage is 8 V.

Difficulty level:(1/Easy)

19. Correct option: (4) {A-III,B-IV,C-II,D-I}[Atoms ,Energy difference due to cell transition]

Explanation: Energy of electron in nth orbit of Hydrogen atom is given by En=−13.6/n^2. So to find the wavelength we can use the formula, $\lambda=\frac{hc}{\Delta E}$. So for A.($n_2=3\ to\ n_1=2$) $\lambda=656.3$. Similarly for B.($n_2=4\ to\ n_1=2$) $\lambda=486.1$ & C.($n_2=5\ to\ n_1=2$) $\lambda=434.1$ & D.($n_2=6\ to\ n_1=2$) $\lambda=410.2$

Difficulty level:(1/Easy)

20. Correct option: (4) {A, B, C and D}[Dual Nature Of Radiation and Matter 01 : Compton Effect]

Explanation: The energy of a photon is given by $E=h\vartheta$. And the velocity of a photon is 'c'. The momentum of a photon can be given by $p=\frac{E}{c}=\frac{h\vartheta}{c}$. In a photon-electron collision, both total energy and total momentum are conserved. As in the case of the Compton effect, when a photon with some energy collides with a stationary electron, some of the energy and momentum is transferred to the

electron but both energy and momentum are conserved in this elastic collision

Difficulty level:(1/Easy)

21. Correct option: (2) {286,81} [Nuclei, Decay processes]

Explanation: In the 1st process their is alpha decay then a positron is added than beta -ve decay and at last an electron is ejected from it so the final product will have atomic no. 81 and Mass no. 286.

Difficulty level:(1/Easy)

22. Correct option:3

[Work, energy and power, instantaneous power]

Explanation: Given that s = 2t-1 and F = 5N

So instantaneous power will be,

$P = F \times v$

Hence, v = 2 (on differentiating s with respect to t)

So, $P = 5 \times 2 = 10$

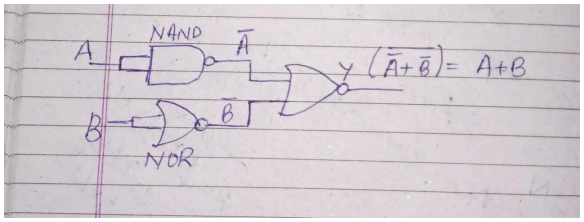
Difficulty level:1

23. Correct option:1 [Semiconductor Electronics, Logic gates]

Explanation: From the figure given in question,

we understand that the NAND gate has input A and NOR gate has input B and then the output of these gates are connected to NOR gate.

So, output is Y = A+B which corresponds to the OR gate.



Difficulty level:2

24. Correct option:2 [Gravitation, acceleration due to gravity]

Explanation:

The acceleration due to gravity, $g = GM_e/R_e^2$

Where, M_e is the mass of Earth and R_e is the radius of earth.

Given that, mass of planet is $M_P = 1/10\ M_e$

And $R_P = D_e/4 = 2R_e/4 = R_e/2$

Therefore, acceleration due to gravity on that planet is, $g_P = G(1/10)\ M_e \times 4 / R^2_e$

$g_P = 4\ GM_e/\ 10\ R_e^2$

$g_P = (4/10) \times 9.8$

$g_P = 3.92\ m/s^2$

Difficulty level:2

25. Correct option:1 [Atoms, Bohr model]

Explanation: Atoms are electrically neutral as they contain an equal number of positive and negative charges.

Atoms of each element are unstable and emit a characteristic spectrum.

Difficulty level: 1

26. Correct option:4 [System of particles and rotational motion,basic concepts of rotational motion]

Explanation: In the figure, Q is the instantaneous centre of rotation, ie., point at

which a body has zero velocity, and all other points in the body rotate around it in a circular field.So, the velocity of Q remains zero during rolling.

Speed of P will be given by v+rω.

Hence, P moves faster than point Q.

Difficulty level:2

27. Correct option:2 [Motion in a plane, Uniform Circular motion]

Explanation: A particle moving with uniform speed in a circular path has varying velocity and varying acceleration because the direction is changing.

Difficulty level:1

28. Correct option:3 [Mechanical properties of fluid, surface tension]

Explanation: Given, r = 4.5 cm, T = 0.07 N/m

So, force required will be,

$F = 2\pi rT$

$F = 2\times3.14\times4.5\times10^{-2} \times 0.07$

$F = 1.98\times10^{-}N = 19.8mN$

Difficulty level:2

29. Correct option-2 (chapter - moving charges and magnetism, topic - Torque on a current loop, magnetic dipole)

Explanation- magnetic field, B = 0.049T

t = 5sec

Moment of inertia, I = 9.8×10^{-6}

Magnetic moment of the needle = $X \times 10^{-5}$

$T = 2\pi\sqrt{I/mB}$

I = moment of inertia

M = magnetic moment

20 oscillations in 5 sec

So 1 oscillations = 5 / 20 = 1/4 sec

$T = 1/4 = 2\pi (9.8 \times 10^{-6} / X \times 10^{-5} \times 0.049)^{1/2}$

After solving,

$1/4 = 2\pi\sqrt{2 \times 10 / x}$

On squaring,

$1/16 = 4\pi^2 \times 20/x$

$x = 1280\ \pi^2$

Difficulty level - 3

30. Correct option - 4 (chapter - work energy power , topic-inelastic collision in one dimension)

Explanation-After collision two bodies move together with a common velocity , v_2 (given)

Initial velocity of body A, $u_1 = v_1$ (given)

Body B is at rest , $u_2 = 0$

Let $m_1 = m_2 = m$

Formula used , $V = m_1u_1 /(m_1 + m_2)$

$v_2 = m\ v_1 / 2m$

$v_2 = v_1 / 2$

$v_1 / v_2 = 2 / 1$

Difficulty level - 1

31. Correct option - 4 (Chapter- Simple harmonic motion, topic - equation of simple harmonic motion)

Explanation: $x = 5 (\pi t + \pi/3)....(1)$

Simple harmonic equation can be written as , $x = A \sin(\omega t + \phi)....(2)$

Where A = amplitude

Compare equation (1) and(2)

A = 5m

$\omega = \pi$

$\omega = 2\pi/T = \pi$

T = 2 sec

Difficulty level - 1

32. correct option- 3 (Chapter -Units and dimensions, topic-dimensional Formula)

Explanation- solid angle , $d\Omega = dA / r^2$

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Its dimensional formula is = $M^0 L^0 T^0$

Only strain and angle have the same dimensions

Strain = Change in dimension/ original dimension = $M^0 L^0 T^0$

Angle = length / radius = $l/r = M^0 L^0 T^0$

Difficulty level - 1

33. Correct option- 2 (Chapter- Electric potential, topic- Electric potential of charged spherical shell)

Explanation - Potential , $V = q/4\pi\epsilon_0 R$

Charge inside a thin spherical shell is zero

As the potential inside the spherical shell and outside the spherical shell is equal.Therefore potential difference betweeb P and C will be zero.

Difficulty level - 1

34. Correct option - 4 (chapter - Rotational motion, tension in the string)

Explanation- tension in a string is give by the formula ,

$T = mr\omega^2$

So $T_1 = mr\omega^2_1$

$T_1 = mr\omega^2$

$T= mr\omega^2$…..(1)

$T_2 = mr\omega^2_2$

$T_2= mr(2\omega)^2 = mr4\omega^2$…….(2)

Divide (2) by (1)

$T_2 / T = 4/1$

$T_2 = 4T$

Difficulty level - 2

35. Correct option- 4 (chapter - current electricity. Topic - combinations of resistors in series and parallel)

Explanation- resistance of wire= 100 Ω

After divided into 10 parts then resistance of each wire becomes, 100/10 = 10Ω

First 5 parts are connected in series ,

$R_1 = 10 + 10+ 10+ 10+ 10$

$R_1 = 50\ \Omega$

Next 5 parts are connected in parallel,

$1/R_2 = 1/10 + 1/10 + 1/10 + 1/10 + 1/10$

$R_2 = 2\Omega$

Now R_1 and R_2 are connected in series

So total resistance becomes = 50 +2 = 52Ω

Difficulty level - 2

36. Correct option- 2 (Kinetic theory of gases, ideal gas equation)

Explanation:

As we know,

According to ideal gas equation

$PV = nRT$

By Charle's law

T = constant, so

P will be inversely proportional to V

So the curve having more volume will have lesser Pressure.

Therefore,

$P_1 > P_2 > P_3$

Difficulty level - 2

37. Correct option- 4 (Electromagnetic Induction, Displacement current)

Explanation:

As we know displacement current $I_d = \varepsilon . d\phi/dt$

Displacement current of magnitude equal to I flows in the same direction as I_d

Difficulty level - 1

38. Correct Option- 2 (Electromagnetic wave, introduction)

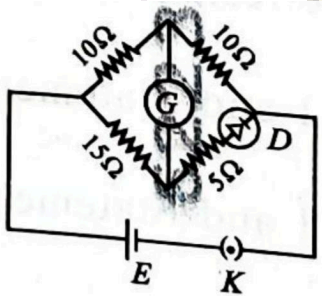
Explanation: As we know, that electromagnetic wave generate from charges which are moving with acceleration i.e. $a \neq 0$. So our correct option is option 2

Difficulty level - 1

39. Correct Option- 3(Semiconductor + Current electricity, wheatstone bridge)

Explanation:

As we know a diode in reverse bias act as infinite resistor and don't permit flow of current through it.



That's why in option 2 no current will flow from 5Ω and 15Ω so it will act as a balanced wheatstone bridge.

Difficulty level - 2

40. **Correct Option- 4** (Electrostatic potential and capacitance, Parallel plate capacitor)

Explanation:

Capacitance of parallel plate capacitor $C = \varepsilon_0 A/d$

For statement A $Q = CV$, as we move plates closer then Capacitance increases and Potential remain constant as battery is connected

For statement C $C = \varepsilon 0A/d$, as we move plates closer then Capacitance increases

For statement E product of charge and voltage $= QV = CV^2$ do as C increases product will also increase

Difficulty level - 3

41. Correct Option- 4 (Units and Dimensions, Dimensional analysis)

Explanation:

$F = \alpha t^2 + \beta t$

As βt and αt^2 are adding in equation

Then $[\alpha t^2] = [\beta t]$

$t = \beta/\alpha$

For option 4

$= \alpha t/\beta$

$= \alpha/\beta \times \beta/\alpha$

So this will be dimensionless

Difficulty level - 2

42. Correct Option- 4 (Mechanical properties of solids + thermal properties of matter, Young's modulus of elasticity)

Explanation:

Given $l = 1m$, $A = 10^{-3}m^2$, $\alpha = 10^{-5}\,°C^{-1}$, $\Delta T = 100°C$, $Y = 0.5 \times 10^{11}\ N/m^2$

$Y = Fl/A\Delta l$

For $\Delta l = l_0 \alpha \Delta T$

$\Delta l = 1\times10^{-5}\times100$

$\Delta l = 10^{-3}$

$Y = Fl/A\Delta l$

$0.5\times10^{11} = F\times1/10^{-3}\times10^{-3}$

$F = 50 \times 10^{3}N$

Difficulty level - 3

43. Correct Option: 4[Ray Optics, Telescope]

Explanation:

Magnifying power $=f_0/f_e$

$=140/5$

$=28$

Difficulty level: 1

44. Correct Option: 4 [Magnetism,Magnetic moment]

Explanation:

Magnetic moment is a vector quantity.

$M=\sqrt{M_1^2+M_2^2+2M_1M_2\cos\theta}$

$=\sqrt{(M/2)^2+(M/2)^2+2M^2/4\cos60^0}$(angle between the vectors would be 120^0)

$= M/2$

Difficulty level: 2

45. Correct Option: 4[AC,LCR circuit]

Explanation:

I=

Peak current, $I_0=I/\sqrt{2}$

Since no resistor or inductor is present in the circuit,

Therefore,

$Z=\sqrt{(0-X_C)^2}$

$Z=X_C$

From equation,

$V/I= 1/2\pi\nu C$

$10\ \mu F=10^{-5}F$

$=>1/2\pi(50)(10^{-5})=210/I$

$=>I=\pi210(100)(10^{-5})$

$=>I=2.1\pi(10^{-1})$

$=>I=0.21\pi A$

$I_0=\sqrt{2}(0.21\pi)$

$I_o=0.93A$

Difficulty level: 3

46. Correct Option: 4[Current Electricity, Electrical Power]

Explanation:

When they were connected in series,

$P_s=P_1P_2/(P_1+P_2)=1.2/(1+2)=2/3kW$

When they were connected in parallel,

$P_p=P_1+P_2=1+2=3kW$

Ratio

$P_s/P_p=(2/3)/3$

$=2/9$

$P_S:P_p=2:9$

Difficulty level: 2

47. Correct Option: 1[Kinematics,s-t graph]

Explanation:

In the given graph , the object is at first accelerating then it is then it is in uniform velocity and then in retardation.

Therefore graph 1 is the correct graph for this.

Difficulty level: 1

48. Correct Option: 1[Oscillation,Time period]

Explanation:

Time period of a pendulum doesn't depend on it's mass

For a pendulum,

$T \propto \sqrt{l}$

$T_1/T_2=\sqrt{l_1}/\sqrt{l_2}$

$T_1/(T_1.x/2)=\sqrt{l_1}/\sqrt{l_1}\ /2$

$2/x=\sqrt{2}$

$x=\sqrt{2}$

Difficulty level: 2

49. Correct Option: 3

[Gravitation,Energy on a satellite]

Explanation:

Energy of the satellite on the surface of earth is only the potential energy given by

$E_i=-GMm/R$

The energy of satellite at a distance (2R+R)=3R from the center of earth is both potential as well as kinetic .Hence the total energy is given by,

$E_f=-GmM/2(3R)=-GmM/6R$

$E=E_f-E_i=-GmM/6R+GMm/R$

$=5GMm/6R$

Difficulty level: 2

50. Correct Option: 4[Magnetism,Magnetic Flux,Lenz's Law,EMI]

Explanation:

In the question it is said that a metal sheet is placed in front of a strong magnetic pole. Now due to the properties of the metal if it is magnetic it will be magnetised, and an opposite pole will be induced. Due to this the metal will be pulled by the magnet towards itself. So a force will be required to keep the magnet in place. If the metal is non-magnetic, there will be no effect on the metal due to the magnet and hence no force will be required to hold the metal in place.

Difficulty level: 3

51. Correct option- 3

(Electrochemistry, Faraday's Law)

Explanation:

G.S ⟶ energy of electron in (n=1) He^+ ⟶ -xJ

(n=2) for Be^{+3} ⟶ ?

$$En = \frac{-Z^2 R_H}{n^2}$$

En =Energy of the electron in the n_{th} energy level

Z = Atomic number

R_H = Rydberg constant

For He^+ ion, Z=2 , (n=1)= -x

$$En = \frac{-2^2 R_H}{1^2} = -4R_H$$

$$-x = -4R_H$$

$$R_H = \frac{x}{4}$$

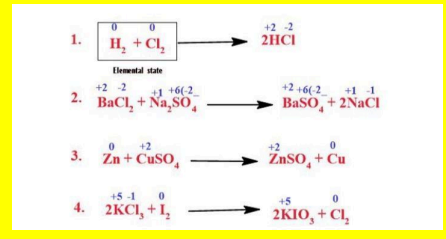
For Be^{+3} ion, Z=4 , n = 2

$$En = \frac{-4^2\left(\frac{x}{4}\right)}{2^2} = -x$$

Difficulty level- 2

52. Correct option- 2 (Redox reaction, Oxidation numbers)

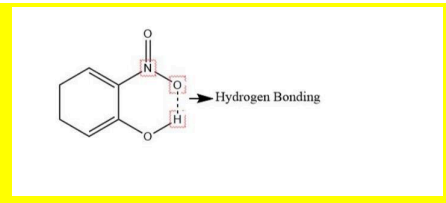
Explanation: A redox reaction is any chemical reaction in which the oxidation number of a molecule, atom, or ion changes by gaining or losing an electron.



Difficulty level- 2

53. Correct option- 3 (Basic principles of organic chemistry, Hydrogen bonding)

Explanation:



Difficulty level- 1

54. Correct option- 3 (Practical chemistry, Fehlings reagent)

Solution A: Aqueous $CuSO_4$ solution.

Explanation:

Solution B: Rochelle salt (sodium potassium tartrate) + sodium hydroxide

Difficulty level- 1

55. Correct option- 4(Basic concepts of chemistry, Mole concept)

Explanation- Volume of HCl solution= 25 mL = 0.025 L

Molarity of HCl = 0.75 mol/L

Number of moles of HCl = Molarity × Volume = 0.75 ×0.025 = 0.01875 mol

Since the reaction between sodium hydroxide (NaOH) and hydrochloric acid (HCl) is a 1:1 reaction (1 mole of NaOH reacts with 1 mole of HCl), the number of moles of NaOH consumed is also 0.01875 moles.

The molar mass of NaOH is approximately 40 g/mol.

Initial mass of NaOH = 1 g

Mass of NaOH remaining = Initial mass - Mass reacted

Mass reacted = Number of moles of NaOH × Molar mass of NaOH

Mass reacted = 0.01875 mol × 40 g/mol= 0.75 g

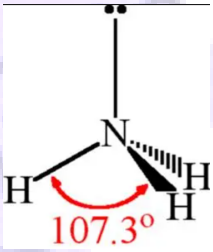
Mass of NaOH remaining =1 g − 0.75 g = 0.25 g

So, the mass of sodium hydroxide left unreacted is 0.25 grams.

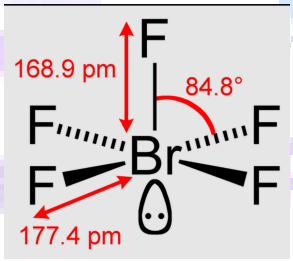
Difficulty level- 3

56. Correct option-3 (Chemical Bonding, Hybridisation)

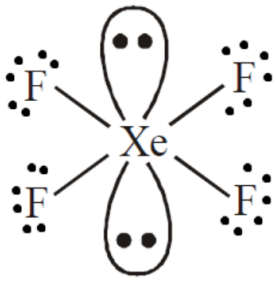
Explanation:



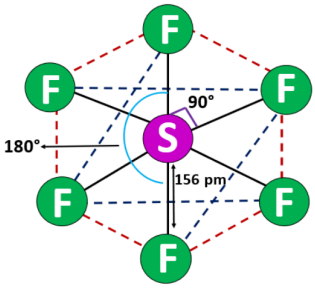
trigonal pyramidal



square pyramidal



square planar



octahedral

Difficulty level- I

57. Correct option- 1 (d and f block, properties of d block elements)

Explanation:

Higher the E° value for Mn^{+3}/ Mn^{+2} because Mn^{+3} has the outer electronic configuration of $3d^4$ and Mn^{+2} has the same outer electronic configuration of $3d^5$. Thus the conversion takes place from $3d^4$ to $3d^5$.

Hence, the value of Mn^{+3}/ Mn^{+2} is positive.

Difficulty level- 2

58. Correct option- 2 (Thermodynamics, Types of process)

Explanation:

- Temperature remains constant in an isothermal process
- Volume of gas remains constant in an isochoric process.
- Pressure remains constant in an isobaric process
- There is no exchange of heat between the system and surrounding in an adiabatic process.

Difficulty level- I

59. Correct Option: 2 [Chemical Kinetics, Arrhenius Equation]

Explanation: Activation energy is defined as the minimum amount of extra energy required by a reacting molecule to get converted into a product. It can also be described as the minimum amount of energy needed to activate or energise molecules or atoms so that they can undergo a chemical reaction or transformation.

The formula used to find the value of Activation Energy, Ea is;

$K = Ae^{-Ea/RT}$

Where

K = Rate Constant

A = Arrhenius Constant

Ea = Activation Energy

R = Gas constant

$K = Ae^{-Ea/RT}$

Taking log on both sides

$\ln K = \ln A - (Ea/RT) \ln e$

$2.303 \log K = 2.303 \log A - Ea/RT$

$\log K = \log A - Ea/2.303RT$

Activation energy of a chemical reaction can be determined by evaluating rate constants at two different temperature.It can be determined with the help of Arrhenius equation:

$$\log k_2 - \log k_1 = \frac{E_a}{2.303\,R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$$\boxed{\log \frac{k_2}{k_1} = \frac{E_a}{2.303\,R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]}$$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303\,R}\,\frac{T_2 \times T_1}{T_1 \times T_2}$$

Difficulty Level : I

60. Correct Option: 1 [Hydrocarbons, IUPAC Nomenclature]

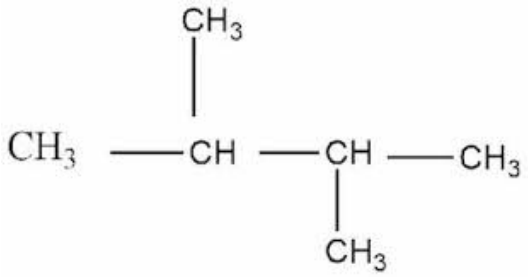
Explanation: A primary carbon atom is attached to only one other carbon atom

A secondary carbon would be attached to 2 carbon atoms.

A tertiary carbon would be attached to 3 carbon atoms.

C_6H_{14} is saturated alkane of the form C_nH_{2n+1} and it has 2 tertiary carbon atoms.

It can only be 2,3-dimethylbutane



Difficulty level: 1

61. Correct Option: 3[The d and f block elements, Magnetic properties]

Explanation: Spin Magnetic moment is $\sqrt{n(n+2)}$

For given ions the electronic configurations are:

Ti^{3+} - $3d^1$ (1 unpaired electron)

Cr^{2+} - $3d^4$ (4 unpaired electrons)

Mn^{2+} - $3d^5$ (5 unpaired electrons)

Fe^{2+} - $3d^6$(4 unpaired electrons)

Sc^{3+} $3d^0$ (0 unpaired electrons)

Thus Cr^{2+} (B) and Fe^{2+} (D)have 4 unpaired electrons each so they will have the same magnetic moment.

Difficulty level: 2

62. Correct Option : 3[Classification of elements and periodicity in properties, Electronegativity]

Explanation: Electronegativity is a measure of an atom's ability to attract shared electrons to itself. On the periodic table, electronegativity generally increases as we move from left to right across a period due to increase in effective nuclear charge.

Thus C < N < O < F

In a group, electronegativity decreases as the size increases, which leads to the ability to attract electrons decreases.

Thus Si < C

Hence correct order is Si < C < N < O < F

Difficulty level: 2

63. Correct Option : 2 [Alcohols, Phenols and Ethers;Identification of Alcohols]

Explanation: Lucas test is used to differentiate and categorize primary, secondary and tertiary alcohols using a solution of anhydrous zinc chloride in concentrated hydrochloric acid. This solution is commonly referred to as the Lucas reagent.

Primary alcohol	Secondary alcohol	Tertiary alcohol
RCH_2OH	R_2—CH—OH	R_3—C—OH
$-H_2O$ | HCl, Anhy. $ZnCl_2$	$-H_2O$ | HCl, Anhy. $ZnCl_2$	$-H_2O$ | HCl, Anhy. $ZnCl_2$
R—CH_2—Cl	R_2—CH—Cl	R_3—CCl
Cloudiness appears on heating	Cloudiness appears after 5 minutes	Cloudiness appears immediately
1° Alcohol	2° Alcohol	3° Alcohol

Option 2 is a tertiary alcohol so it will react immediately with Lucas Reagent.

Difficulty level: 1

64. Correct Option: 3[Coordination Compounds, Valence Bond Theory]

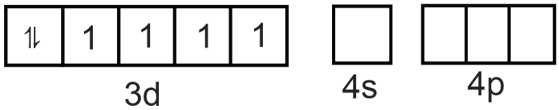
Explanation: Both are octahedral complexes.

$[CoF_6]^{3-}$

F^- is anionic ligand having –1 charge. ∴ Co is in +3 oxidation state.

Co has electronic configuration: $3d^74s^2$

Co^{3+} has electronic configuration: $3d^64s^\circ$



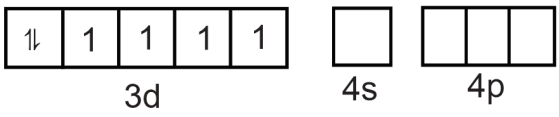
As F^- is a weak field ligand, pairing of electrons donor occur.

∴ $[CoF_6]^{3-}$ is paramagnetic.

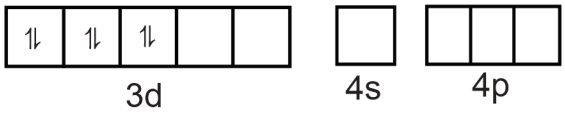
$[Co(CN)6]^{3-}$

CN^- is anionic ligand having -1 charge. ∴ Co is in +3 oxidation state.

Co^{3+} has electronic configuration: $3d^64s^\circ$



As CN^- is a strong field ligand, pairing of electrons occur.



∴ $[Co(CN)_6]^{3-}$ is diamagnetic.

Difficulty level: 2

65. Correct Option : 3

Explanation: Gradual increase in boiling points down the group happens as the relative molecular mass of the molecules increases. Also, boiling point of water is anomalously high because of extensive Hydrogen Bonding. Intermolecular hydrogen bonding is responsible for the high boiling point of water (100 °C) compared to the other group 16 hydrides that have no hydrogen bonds.

H_2O (H-bond) H_2S H_2Se H_2Te (VWA ∝ mol.wt.)

$$B.P. \rightarrow H_2S < H_2Se < H_2Te < H_2O$$

Difficulty level : 2

66. Correct option : 4 (Atomic Structure : Quantum numbers)

Explanation :

m_l -orientation of orbital

m_s - orientation of spin of electron

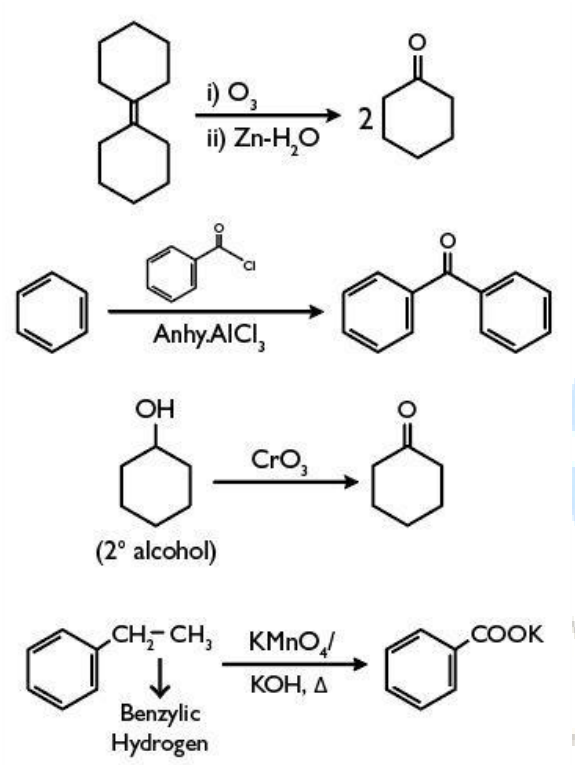
l - Shape of orbital

n - Size of orbital

Difficulty Level - 1

67. Correct Option : 1 (Organic Compounds containing Oxygen : Properties of Aldehyde & Ketone)

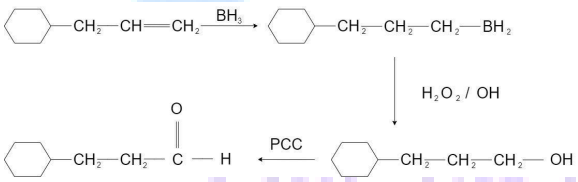
Explanation : A - IV, B- I, C- II, D - III



Difficulty level - 2

68. Correct Option : 4 (Organic compounds containing Oxygen: Hydroboration - Oxidation)

Explanation : (I) BH_3 (II) H_2O_2/ OH^- (III) PCC



Difficulty Level - 2

69. Correct option - 1 (Biomolecules: Carbohydrates)

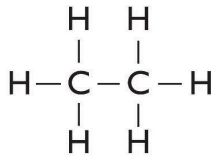
Explanation : Glucose does not react with Schiff's reagent, $NaHSO_3$, 2-4- DNP. This is because the aldehyde group in glucose is involved in hemiacetal formation and thus is not free.

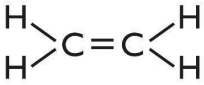
Difficulty Level - 1

70. Correct option - 1 (Some basic principles of organic Chemistry)

Explanation :

A-III B-IV D-I C-II

Ethane - 

Ethene - 

Carbon molecule, C_2 → :C≡C:

Ethyne → H-C≡C-H

Difficulty level - 1

71. Correct Option - 2 (P - Block elements : Group - 16)

Explanation : In the group 16, most metallic element (i.e. most electropositive element) does not show −2 oxidation state as its electronegativity is very low.

Hence, Po (polonium) (Z=84) does not show −2 oxidation state because on going down the group, electropositive nature increases.

Difficulty level : 1

72 . Correct option : 1 (Equilibrium : Predicting the direction of the reaction)

Explanation :

For the reaction the reaction quotient Q_c is given by,

$Q_c = [B][C]/[A]^2$

as $[A]= [B] = [C]= 2\times 10^{-3}$ M

$Q_c = (2\times 10^{-3}) (2\times 10^{-3})/(2\times 10^{-3})^2 = 1$

As $Q_c > K_c$ so the reaction will proceed in backward direction.

Difficulty Level - 1

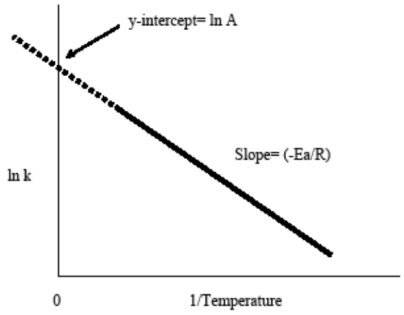
73. Correct option: 2 [Chemical kinetics - Arhenius equation]

Explanation: According to Arrhenius equation:

$$k = Ae^{-\frac{E_a}{RT}}$$

$$ln(k) = ln\left(Ae^{-\frac{E_a}{RT}}\right)$$

$$ln\ k = ln\ A - \frac{E_a}{RT}$$



Difficulty level: 1

74. Correct option: 3 [Equilibrium - K_P and K_c relation]

Explanation:

We know the equation $K_P = K_c(RT)^{\Delta n}$

If $\Delta n=0$, then $K_P = K_c$

Δn = no. of moles of product -no. of moles of reactants

In option 1,2,4 the value of Δn is 0. Hence they follow $K_P = K_c$.

$PCl_{5(g)} = PCl_{3(g)} + Cl_{2(g)}$

Here no. of moles of product -no. of moles of reactants = 2 - 1 ≠ 0

Option 3 is correct.

Difficulty level: 1

75. Correct option: 3 [General organic chemistry - Physical properties]

Explanation:

- The branched-chain isomer of an alkane has a lower surface area than that of its straight-chain isomer, so the branched-chain isomer of an alkane has a lower boiling point than its straight-chain isomer.
- Branching of an alkane chain makes the molecules more compact and brings various atoms closer which results in decreasing molecular size. Since a sphere has minimum surface area, therefore, Vander Waal forces of attraction are minimum and hence the boiling point of the alkane decreases with branching.

Difficulty level: 1

76. **Correct option: 2 [Haloalkanes and haloarenes- SN^1 reaction]**

Explanation:

Secondary benzyl carbocation: Benzyl carbocation is most stable because of

delocalization of charge due to resonance of π electrons in the ring.

Difficulty level: 2

77. Correct option: 3 [Structure of atom - Energy of electron]

Explanation:

$E_n = (-z^2R_H)/ n^2$

Z = Atomic number

R_H = Rydberg constant

For He^+ ion, Z=2

(n=1) = -x

$E_n = (-2^2R_H)/ 1^2 = -4R_H$

$-x = -4R_H$

$R_H = x/4$

For Be^{+3}, z=4, n=2

$E_n = (-4^2(x/4))/2^2 = (16(x/4))/4 = -x$

Difficulty level: 2

78. Correct option: 1[Thermodynamics - entropy]

Explanation: As temperature decreases, particles in the solid vibrate less and become more ordered, resulting in a decrease in entropy. Absolute zero temperature (0 K) represents the state of perfect order, where particles have minimal motion.

Difficulty level: 1

79. Correct option: 4 [General organic chemistry - Purification of organic compounds]

Explanation:

Sublimation is the conversion of a substance from the solid to the gaseous state without its becoming liquid.

Difficulty level: 1

80. Correct option : (3)[Coordination Compounds, Isomerism]

Explanation :

- [Co(NH3)5(NO2)]Cl2 - This compound demonstrates linkage isomerism. Linkage isomerism occurs when ligands can bind to the central metal atom through different atoms. In this case, the NO2 ligand can bind either through nitrogen (N) or through oxygen (O), resulting in different isomeric compounds.
- [Co(NH3)5SO4]Br - This compound represents ionization isomerism. Ionization isomerism arises when the counter ion in the coordination compound can be exchanged with one of the ligands to form an isomeric compound. Here, the SO4 group can be exchanged with the Br- ion, resulting in different isomeric compounds.
- [Co(NH3)6][Cr(CN)6] - This compound exhibits coordination isomerism. Coordination isomerism occurs when both the cation and the anion in a compound are complex ions, and ligands can be exchanged between them. In this case, the NH3 ligands from the cobalt complex can be exchanged with the CN- ligands from the chromium complex, leading to different isomeric compounds.
- [Co(H2O)6]Cl3 - This compound demonstrates solvate isomerism. Solvate isomerism occurs when the coordination compound forms different

isomeric compounds based on the solvent molecules attached to the central metal ion. Here, the chlorine ions can be associated with different numbers of water molecules, resulting in different isomeric compounds.

Difficulty level: 3

81. Correct option : (3) [Amines and their compound , Preparation of amines]

Explanation :

Statement I: Aniline does not undergo Friedel-Crafts alkylation reaction.

- This statement is correct. Aniline is not suitable for Friedel-Crafts alkylation reaction because it is a poor nucleophile due to the presence of the amino group (-NH_2), which can deactivate the benzene ring towards electrophilic substitution reactions.

Statement II: Aniline cannot be prepared through Gabriel synthesis.

- This statement is true. Aniline cannot be prepared by the Gabriel synthesis because Gabriel synthesis is specifically used for the synthesis of primary alkylamines, not aromatic amines like aniline.

Difficulty level:3

82. Correct option : 4 [Periodic properties, ionization enthalpy]

Explanation :

Both Be and N have comparatively more stable subshells than B and O.

The correct order is Li < B < Be < C < N, which corresponds to option (4)

Difficulty level: 1

83. Correct option :3 [Basic concept of chemistry, Mole concept]

Explanation :

(1)4 grams of helium contains approximately $6.022 \times 10^{23} helium\ atoms$

(2) 2.272098 litres of helium at STP contains approximately 1.363×10^{24}helium

(3) 4 moles of helium contains 24.092×10^{24} helium atoms

(4) 4 atomic mass units of helium contains $6.022 \times 10^{23}\ helium\ atoms$

Comparing these options, the highest number of helium atoms is in 4 moles of helium.

Difficulty level: 1

84. Correct option :2 [Organic chemistry, Carbocation]

Explanation : In the given carbocation, the stability can be assessed based on hyperconjugation. The greater the number of $\alpha - Hydrogen$ attached to the carbon bearing the positive charge, the more stable the carbocation.Hence . in option 2 the structure is having 7 $\alpha - Hydrogen.$

Difficulty level:3

85. Correct option :4 [Solutions, Henry law]

Explanation :

Henry's law constant (K_h indicates the solubility of gases in a solvent at a particular temperature.

$$K_h\ \alpha \frac{1}{Solublity}$$

Higher K_h values suggest lower solubility.

Given:

Since 1Kbar = 986.92327 atm

K_h for A = 145 kbar=143103.874atm

K_h for B = 2×10^{-5} kbar=0.0197384 atm

K_h for C = 35 kbar= 34542.314atm

Comparing the values:

1. A has the highest K_h value (143103.874atm), indicating it is the least soluble gas.
2. C has a K_h value of 34542.314atm, which is higher than B's 0.0197384atm.

So, the order of solubility is:

1. B
2. C
3. A

Therefore, the correct order is B>C>A, which corresponds to option (4).

Difficulty level: 2

86. Correct option : 4 [Some basics concept of chemistry, Empirical formula]

Explanation :

Given:

- 32% of A
- 20% of B
- Remaining percentage is C

Let's assume we have 100g of compound X.

Then:

- A = 32g
- B = 20g
- C = 100g - (32g + 20g) = 48g

Next, we'll find the moles of each element:

- Moles of A = 32g / 64g/mol = 0.5 mol
- Moles of B = 20g / 40g/mol = 0.5 mol
- Moles of C = 48g / 32g/mol = 1.5 mol

Now, we'll find the simplest whole number ratio of moles:

- Divide each mole value by the smallest mole value (0.5 mol):
  - Moles of A: 0.5 mol / 0.5 mol = 1
  - Moles of B: 0.5 mol / 0.5 mol = 1
  - Moles of C: 1.5 mol / 0.5 mol = 3

So, the empirical formula is ABC3, which corresponds to option (4).

Difficulty level: 3

87. Correct option:2 [p-block - properties of phosphorus pentachloride]

Explanation:

$ROH+PCl_3 \rightarrow RCl+H_3PO_3$

$ROH + PCl_5 \rightarrow RCl + POCl_3$

H_3PO_3 and $POCl_3$

Difficulty level {2}

88.Correct option :3 [Solution, sub topic - osmotic pressure]

Explanation:

$\Pi = CRT$

Y= xm

m=RT

27.73 Lbarmol^{-1}= RT

$T = \frac{27.73}{0.083}$

T= 310K

T= 310-273

T= 37^0C

Difficulty level {1}

89 Correct option: 4 [Hydrocarbon, subtopic-oxidation, topic -Alkenes]

Explanation:

Acidic potassium permanganate or acidic potassium dichromate oxidises alkene to ketones and/or acids depending upon the nature of the alkene and the experimental condition

$$(CH_3)_2C=CH_2 \xrightarrow{KMnO_4/H^+} (CH_3)_2C=O + CO_2 + H_2O$$

2-Methylpropene Propan-2-one

Difficulty level {2}

90. Correct option: 3[Coordination compound - Types of complexes]

Explanation:

Homoleptic complexes are compounds which contain identical ligands whereas the heteroleptic complexes contain more than one type of the ligand.

Difficulty level {2}

91. Correct option: 2 [Practical chemistry - Qualitative analysis]

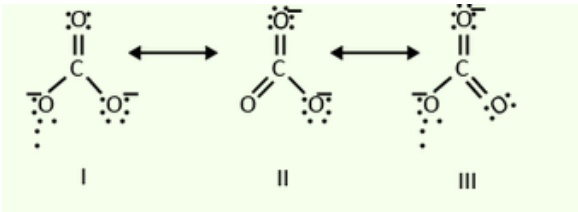
Explanation:

Fe^{2+} and Al^{3+} ions undergo hydrolysis, therefore, while preparing aqueous solutions of ferrous sulphate and aluminium sulphate in water, 2-3 mL dilute sulphuric acid is added to prevent the hydrolysis of these salts.

Difficulty level {2}

92. Correct option: 3[Chemical Bonding, subtopic- Resonance structure]

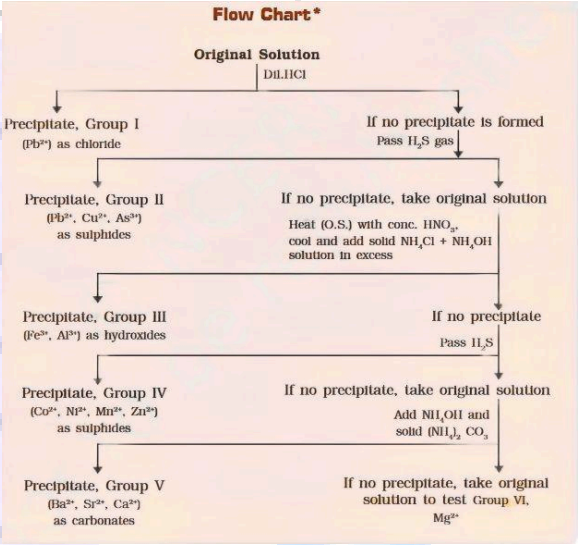
Explanation:CO_3^{2-}a single Lewis structure based on the presence of two single bonds and one double bond between carbon and oxygen atom is inadequate to represent the molecule accurately as it represents unequal bonds.



Difficulty level {1}

93. correct option: 3 [Practical chemistry,Qualitative analysis]

Explanation:



Difficulty level {2}

94. Correct option: (3)

Explanation:

A= CH3-CH2-CH2-CN

B= CH3-CH2-CH2-CONH2

C= Hoffman Bromamide Reaction = CH3-CH2-CH2-NH2

Difficulty level: 1

95. Correct option: (3) [Thermodynamics, Activation energy]

Explanation:

The Arrhenius equation at two different temperatures is as follows:

$\log(k'/k)=Ea2.303R[1/T-1/T']$

$k'/k=4$

$\log(4)=Ea/2.303\times8.314*[1/300-1/330]$

The energy of activation, Ea=38044 J/mol = 38.044 kJ/mol

Difficulty level: 2

96. Correct option: (1) []

Explanation:

a = (1.6*10-3*30/0.1)^0.5

= 0.8889

Difficulty level: 3

97. Correct option: (1) [Thermodynmaics, Work]

Explanation:

work done $=-2.303nRT\log(P1/P2)$

$=-2.303\times2\times298x\log(10/20)$

$=-2.303\times2\times \log(0.5)$

=413.14 calories

Difficulty level: 2

98. Correct option: (4) [Electrochemistry, Nerst Equation]

Explanation:

Number of coulombs = (current in amps x time in seconds)

Number of coulombs = (9.6487 A x 100 s)
= 964.87 Coulomb

N= Q/zF
= 964.87/2*96487
=1/200 moles

Mass in grams = 63*1/200 = 0.315 g

Difficulty level: 2

99. Correct option: (3) []

Explanation:OH- gets replaced by Br- and after treatment with alc. KOH/heat, there is elimination reaction.

Difficulty level: 3

100. Correct option: (3) [d and f block , LAnthanoid electronic configuration]

Explanation: Ce4+ and Yb2+ acquire f° and f14 configuration

Difficulty level: 1

101. Correct option : 2 (Sexual reproduction in flowering plants, water pollination)

Explanation :

Some examples of water pollinated plants are Vallisneria and Hydrilla which grow in fresh water and several marine sea-grasses such as Zostera.

Not all aquatic plants use water for pollination. In a majority of aquatic plants such as water hyacinth and water lily, the flowers emerge above the level of water and are pollinated by insects or wind as in most of the land plants. In Vallisneria, the female flower reach the surface of water by the long stalk and the male flowers or pollen grains are released on to the surface of water. They are carried passively by water currents. Some of them eventually reach the female flowers and the stigma.

In another group of water pollinated plants such as seagrasses, female flowers remain submerged in water and the pollen grains are released inside the water.

Pollen grains in many such species are long, ribbon like and they are carried passively inside the water; some of them reach the stigma and achieve pollination.

In most of the water-pollinated species, pollen grains are protected from wetting by a mucilaginous covering.

Both wind and water pollinated flowers are not very colorful and do

not produce nectar.

Difficulty level : {1}

102. Correct answer : 4 (Organization and population, biodiversity conservation)

Explanation : Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care. Zoological parks, botanical gardens and wildlife safari parks serve this purpose. There are many animals that have become extinct in the wild but continue to be maintained in zoological parks.

Difficulty level : {2}

103. Correct answer : 1 (Biomolecules, Enzymes)

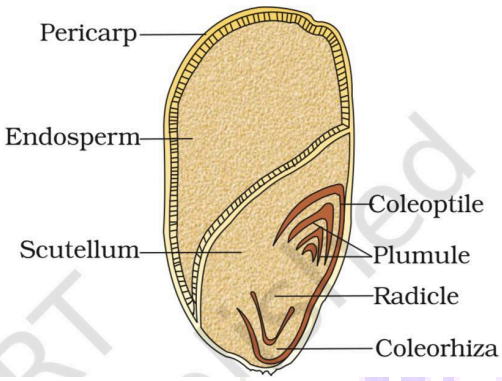
Explanation : When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor. Due to its close structural similarity with the substrate, the inhibitor competes with the substrate for the substrate binding site of the enzyme. Consequently, the substrate cannot bind and as a result, the enzyme action declines, e.g., inhibition of succinic dehydrogenase by

malonate which closely resembles the substrate succinate in structure.

Difficulty level : {1}

104. Correct answer : 1 1(Sexual reproduction in flowering plantsPlant reproduction, Embryo and Seed)

Explanation : A typical dicotyledonous embryo, consists of an embryonal axis and two cotyledons. The portion of embryonal axis above the level of cotyledons is the epicotyl, which terminates with the plumule or stem tip. The cylindrical portion below the level of cotyledons is hypocotyl that terminates at its lower end in the radicle or root tip. The root tip is covered with a root cap.



Difficulty level : {2}

105. Correct answer : 3 (Anatomy of flowering plants, leaf anatomy)

Explanation : The bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimise water loss.

Difficulty level : {1}

106. Correct answer : 1 (Photosynthesis in higher plants, Calvin cycle)

Explanation : The dark reactions, also known as the Calvin cycle, utilize CO2, ATP, and NADPH to convert carbon dioxide into glucose. CO2 provides the carbon atoms needed for glucose synthesis, while ATP and NADPH provide the energy and reducing power, respectively, required to drive the chemical reactions that transform CO2 into glucose.

Difficulty level : {2}

107. Correct answer : 1 (Plant growth and regulators, Dedifferentiation)

Explanation : The living differentiated cells, that by now have lost the capacity to divide can regain the capacity of division under certain conditions. This phenomenon is termed as dedifferentiation. For example, formation of meristems – interfascicular cambium and cork cambium from fully differentiated parenchyma cells.

Difficulty level - {1}

108. Correct answer : 4 (Biotechnology principles and processes, Restriction enzymes)

Explanation : The first restriction endonuclease–Hind II, whose functioning depended on a specific DNA nucleotide sequence was isolated and characterised five years later. It was found that Hind II always cut DNA molecules at a particular point by recognising a specific sequence of six base pairs. This specific base sequence is known as the recognition sequence for Hind II. Besides Hind

II, today we know more than 900 restriction enzymes that have been isolated from over 230 strains of bacteria each of which recognise different recognition sequences.
Difficulty level : {1}

109. Correct option: [3] {Biodiversity & Conservation, Patterns of Biodiversity}
Explanation-

- (1) Speciation is generally a function of time. Unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years. Therefore, they have had a long evolutionary time for species diversification.
- (2) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant, and predictable. Such constant environments promote niche specialization, where species adapt to specific ecological niches, leading to a greater species diversity.
- (3) There is more solar energy available in the tropics, which contributes to higher productivity. This increased productivity supports a larger number of individuals and higher population densities, creating more opportunities for speciation and thus contributing indirectly to greater diversity.
- Hence we can say here Option 3 that is A , C, D , E are correct

Difficulty Level- {1}

110. Correct option: [4] {Biological classification, Fungi}

The morphology of the mycelium, mode of spore formation and fruiting bodies form the basis for the classification of kingdom fungi into various classes.

Difficulty Level- {2}

111. Correct option: 2 [Photosynthesis in Higher Plants, The Calvin Cycle]
Explanation: For every CO_2 molecule entering the Calvin cycle, 3 molecules of ATP and 2 of NADPH are required. It is probably to meet this difference in number of ATP and NADPH used in the dark reaction that the cyclic phosphorylation takes place.
Difficulty level: I

112. Correct option: 2 [Biodiversity and Conservation, Loss of Biodiversity]
Explanation: There are four major causes (' The Evil Quartet' is the sobriquet used to describe them).
(i) Habitat loss and fragmentation
(ii) Over-exploitation
(iii) Alien species invasions
(iv) Co-extinctions
Difficulty level: I

113. Correct option: 3 [Biotechnology and it's application, Biotechnological Applications in Agriculture]
Explanation: By scientists, during 1950s, that whole plants could be regenerated from explants, i.e., any part of a plant taken out and grown in a test tube, under sterile conditions in special nutrient media. This capacity to generate

a whole plant from any cell/explant is called totipotency.

Difficulty level: I

114. Correct option: I [Organisms and Population, Population Growth]

Explanation: The Verhulst-Pearl Logistic Growth and is described by the following equation:

$$dN/dt = rN(K-N)/K$$

Where N = Population density at time t

r = Intrinsic rate of natural increase

K = Carrying capacity

Difficulty level: I

115. Correct option: 4 [Cell cycle and Division, Metaphase]

Explanation: The key features of metaphase are:

I. Spindle fibres attach to kinetochores of chromosomes.

I. Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres to both poles.

Difficulty level: I

116. Correct option: 2 [Morphology of flowering plants, The Flower]

Explanation: If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous.

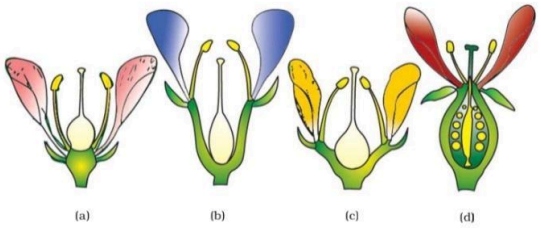


Figure 5.13 Position of floral parts on thalamus : (a) Hypogynous (b) and (c) Perigynous (d) Epigynous

Difficulty level: 2

117. Correct option:3 [Biological Classification, Kingdom Fungi]

Explanation:

A. Rhizopus - III. Bread mould

B. Ustilage - II. Smut fungus

C. Puccinia - IV. Rust fungus

D. Agaricus - I. Mushroom

Difficulty level: I

118. Correct option: 4 [Principles of Inheritance and variations, Inheritance of one gene]

Explanation: In a typical test cross an organism (pea plants here) showing a dominant phenotype (and whose genotype is to be determined) is crossed with the recessive parent instead of self-crossing. The progenies of such a cross can easily be analysed to predict the genotype of the test organism.

Difficulty level: I

119. Correct option: 4 [Principles of Inheritance and Variations, Incomplete Dominance]

Explanation:

Rr(Pink) × RR(Red)

RR	**Rr**
RR	**Rr**

Red flower as well as pink flower produced.

Difficulty level: I

120. Correct option: 1 [Principles of Inheritance, Summary]

Explanation: A - III, B - IV, C - I , D - II

A. Two or more alternative forms of a gene - Allele

B. Cross of F_1 progeny with homozygous recessive parent - Test cross

C. Cross of F_1 progeny with any of the parents - Back cross

D. Number of chromosome sets in plant - Ploidy

Difficulty level: I

121. Answer- 4 {Biomolecule, Enzyme]

Explanation - These are phospholipids. They are found in cell membranes.

Difficulty level: 1

122. Answer- 1

Explanation -

- Clostridium butylicum- Butyric acid
- Saccharomyces cerevisiae- Ethanol
- Trichoderma polysporum - Cyclosporin A
- Streptococcus sp.- Streptokinase

Difficulty level: 2

123. Answer- 3 {Anatomy of flowering plants, Stomata}

Explanation -The stomatal pore is enclosed between two bean-shaped guard cells. The inner walls of guard cells are thick, while the outer walls are thin.

Difficult level: 2

124. Answer-3 {Morphology of flowering plants, The flower}

Explanation -

Actinomorphy : A flower, capable of being divided, by more than one line passing through the middle of the flower, into two equal parts that are mirror images of one another.

Example - Datura

Difficulty level: 1

125. Answer- 2 {Molecular basis of inheritance, Transcription)

Explanation: A transcription unit is a segment of DNA that takes part in transcription. It has three components - (i) a promoter (ii) a structural gene and (iii) a terminator.

Difficulty level: 1

126- Answer- 1 {Biotechnology: principles and prpcesses}

Explanation:

Fate of DNA in an alien organism

- A piece of DNA cannot multiply in the cells of an alien organism if it doesn't get integrated into the host genome.
- A special feature called origin of replication is present in the chromosome of the host organism. This sequence of DNA directs the initiation of replication.

- So, once the piece of DNA integrates into the chromosome of the host cell, under the influence of origin of replication,it replicates and multiplies in the host cell and several identical copies of the DNA are produced.

Difficulty level: 3

127. Answer- 1 {Plant growth and development, Auxin}

Explanation - Auxins also induce parthenocarpy, e.g., in tomatoes. They are widely used as herbicides.

2, 4-D, widely used to kill dicotyledonous weeds, does not affect mature monocotyledonous plants. It is used to prepare weed-free lawns by gardeners.

Difficulty level : 2

128. Answer- 3 {Biomolecule, enzyme }

Explanation -The cofactor of the enzyme carboxypeptidase is zinc.

Difficulty level: 2

129. Answer- 1 {Molecular basis of inheritance, Lac operon}

Explanation - The lacY gene encodes a membrane protein called lactose permease, which is a transmembrane "pump" that allows the cell to import lactose.

Difficulty level: 2

130. Answer- 4 {Mendel's law of inheritance}

Explanation -

- Out of one pair of factors one is dominant and the other is recessive.
- Factors occur in pair in normal Diploid plant.
- The discrete unit controlling a particular character is called factor.
- The expression of only one of the parental characters is found in a monohybrid cross.

Difficulty level: 3

131. Correct Option - (1) (Biotechnology and its Applications / Bt Cotton)

Explanation: The toxin is coded by a gene cryIAc named cry. There are a number of them, for example, the proteins encoded by the genes cryIAc and cryIIAb control the cotton bollworms, that of cryIAb controls corn borer.

the Bt toxin protein exist as inactive protoxins but once an insect ingest the inactive toxin, it is converted into an active form of toxin due to the alkaline pH of the gut which solubilise the crystals. The activated toxin binds to the surface of midgut epithelial cells and create pores that cause cell swelling and lysis and eventually cause death of the insect.

Difficulty level : {1}

132. Correct option-(2) (Anatomy of Flowering Plants)

Explanation: Parenchyma tissue is living as well is Collenchyma which is living both of these are examples of simple tissue , sclerenchyma is the type of simple tissue which are Dead (not living, important for the structural support)

Gymnosperms typically do not possess vessel elements in their xylem, in contrast to flowering

plants which feature both vessels and tracheids. Vessel elements are predominantly present in Angiosperms (flowering plants), while they are notably absent in Gymnosperms

Difficulty level : {2}

133. Correct Option-(3) (Cell Cycle and Division)

Explanation: During leptotene stage the chromosomes become gradually visible under the light microscope.

During the leptotene stage of prophase I of meiosis, chromosomes begin to condense. This condensation process involves the chromosomes coiling and becoming more compact. As a result, they become gradually visible under a light microscope. Prior to leptotene, the chromosomes are in an extended form known as chromatin, which is not easily distinguishable under a light microscope.

The beginning of diplotene is recognised by the dissolution of the synaptonemal complex and the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at the sites of crossovers. These X-shaped structures, are called chiasmata. In oocytes of some vertebrates, diplotene can last for months or years.

Difficulty level : {1}

134. Correct Option- (3) (Cell the Unit of Life)

Explanation:

Nucleolus -The content of nucleolus is continuous with the rest of the nucleoplasm as it is not a membrane bound structure. It is a site for active ribosomal RNA synthesis.

Centriole - Centrioles in a centrosome lie perpendicular to each other in which each has an organisation like the cartwheel.

Leucoplasts - The leucoplasts are the colourless plastids of varied shapes and sizes with stored nutrients: Amyloplasts store carbohydrates (starch), e.g., potato; elaioplasts store oils and fats whereas the aleuroplasts store proteins

Golgi Apparatus - A number of proteins synthesised by ribosomes on the endoplasmic reticulum are modified in the cisternae of the golgi apparatus before they are released from its trans face. Golgi apparatus is the important site of formation of glycoproteins and glycolipids.

Difficulty level : {1}

135. Correct Option- (2) (biodiversity and Conservation)

Explanation: The International Union for Conservation of Nature (IUCN) is a global organization dedicated to conserving nature and biodiversity. It's the world's largest and most diverse environmental network, comprising government agencies, non-governmental organizations, scientists, and experts from around the world.

Difficulty level : {1}

136. Correct Option- (4) (Cell the Unit of Life)

Explanation: It also contains small, double stranded circular DNA molecules and ribosomes.

The presence of circular DNA in chloroplasts can be traced back to their evolutionary origins. Chloroplasts are believed to have originated from ancient cyanobacteria that were engulfed

by a eukaryotic cell through a process called endosymbiosis. These cyanobacteria eventually evolved into the organelles we now know as chloroplasts.

Difficulty level : {1}

137. Correct Option-(1) (Biotechnology and Application)

Explanation: Scientists have even isolated single cells from plants and after digesting their cell walls have been able to isolate naked protoplasts (surrounded by plasma membranes). **Isolated protoplasts** from two different varieties of plants – each having a desirable character – can be fused to get hybrid **protoplasts**, which can be further grown to form a new plant. These hybrids are called **somatic hybrids** while the process is called **Somatic Hybridization.**

Imagine a situation when a protoplast of tomato is fused with that of potato, and then they are grown – to form new hybrid plants combining tomato and potato characteristics. Well, this has been achieved – resulting in formation of pomato; unfortunately this plant did not have all the desired combination of characteristics for its commercial utilization**.**

Difficulty level : {1}

138. Correct Option (3) (Sexual Reproduction in Plants, Pollination)

Explanation: A wind-pollinated plant with compact inflorescence and well-exposed stamens is optimized for efficient pollen dispersal by wind, as it reduces surface area, maximizes pollen exposure, and does not rely on attracting pollinators.

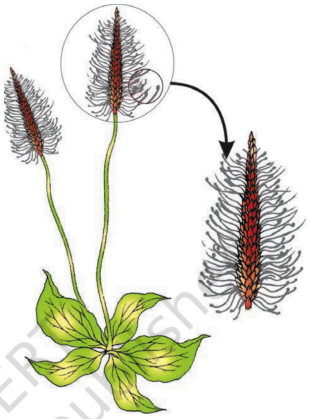


Figure 1.10 A wind-pollinated plant showing compact inflorecence and well-exposed stamens

Difficulty level : {1}

139. Answer (4) (plant growth and Development)

Explanation: Sugarcane stores carbohydrate as sugar in their stems. Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield by as much as 20 tonnes per acre.

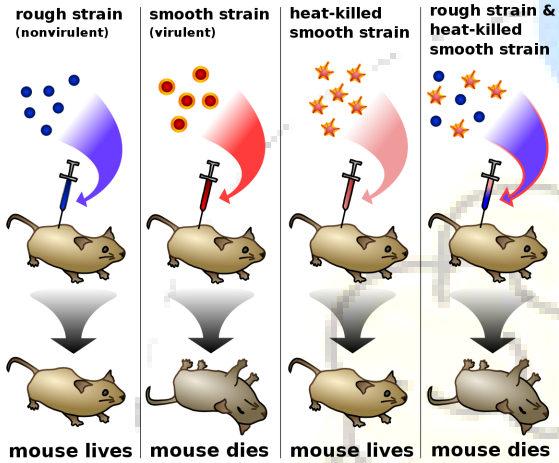
Gibberellins are essential growth-regulating hormones found in plants. They influence various aspects of plant growth and development, including stem elongation. When applied to sugarcane crops, gibberellins can stimulate cell elongation in the stems, causing them to grow longer. As a result, the overall height of the sugarcane plants increases, which can lead to a higher yield.

Difficulty level : {1}

140. Answer (4) (Molecular Basis of inheritance)

Explanation: Fredrick griffith - Transformation

Frederick Griffith's experiment on bacterial transformation, conducted in 1928, laid the groundwork for modern molecular biology and genetics. Griffith was studying Streptococcus pneumoniae, a bacterium responsible for pneumonia in humans. He observed that there were two strains of this bacterium: a virulent, or disease-causing, strain (S strain) and a non-virulent, or harmless, strain (R strain).



Francois Jacob and a biochemist, Jacque Monod - Lac operon

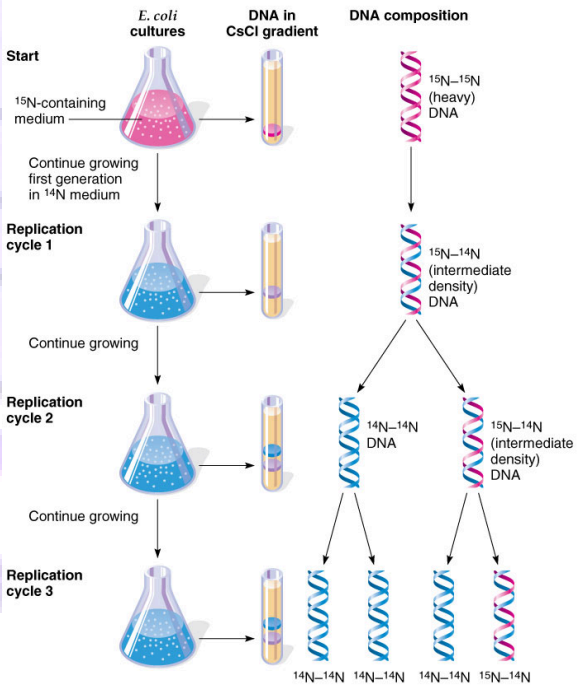
The lac operon, a classic example in molecular biology, was extensively studied by François Jacob and Jacques Monod in the 1960s. Their work, which earned them the Nobel Prize in the year 1965 showed the mechanisms of gene regulation in bacteria, particularly in Escherichia coli. They demonstrated how the lac operon controls the expression of genes involved in the metabolism of lactose.

Har Gobind Khorana - Genetic code

Har Gobind Khorana was a biochemist who played a crucial role in deciphering the genetic code. In the 1960s, he, along with his colleagues, synthesized RNA molecules with specific sequences, which led to the understanding of how nucleotide triplets (codons) encode for amino acids

Messelson and Stahl - Semiconservative mode of DNA replication

Meselson and Stahl's experiment in 1958 used heavy and light isotopes of nitrogen to demonstrate that DNA replication is semiconservative, meaning each new DNA molecule contains one original and one newly synthesized strand.



Difficulty level : {1}

141. (3)A-IV , B-I, C-II, D-III

Explanation: GLUT-4 is glucose transporter which helps in transport of glucose across the adipose tissues and muscles. **Insulin** is a hormone secreted by pancreas which help in glucose metabolism. **Trypsin** is an enzyme which helps in breakdown of proteins in small intestine. Collagen is the intercellular ground substance.

Difficulty level :-2

142 (1) statement I is true but statement II is false (Photosynthesis in higher plants)

Explanation: In C-3 plants some oxygen binds to Rubisco and hence carbon dioxide fixation is decreased. In C-4 plants, mesophyll cells and bundle sheath cells do not have RuBisCO no photorespiration occurs . So productivity and yield is better in these plants.

Difficulty level :- 2

143. (1) Succinyl CoA to succinic acid (respiration in plants, TCA cycle)

In this step succinyl CoA is converted succinic acid by the enzyme sucvinyl synthetase. This enzyme requires GDP. IN Presence of inorganic phosphate the high energy bond of succinyl coA us transferred to GDP converting it to GTP. This is an example of substrate level phosphorylation.

Difficulty level :- 3

144. (4) A-II, B-I, C-IV, D-III (Respiration in plants)

Explanation: Citric acid cycle occurs in mitochondrial matrix, **glycolysis** occurs in cytoplasm, **Electron transport chain** occurs on inner mitochondrial membrane, and **proton gradient** is develpoed in intermembrane space of mitochondria.

Difficulty level :- 2

145 (2) The DNA dependant RNA polymerase catalyzes polymerization in 5' to 3' Explanation: direction. (Molecular basis of Inheritance, DNA Replication)

DNA dependant DNA polymerase is an enzyme which can catalyze polymerisation only in one direction. It is a replication enzyme.

Difficulty level :2

146 (2) (Ecosystem)

Explanation: NPP= 100x (Kcal m-2)yr-1

Energy transfer= 10% =0.1%

GPP third trophic level = NPP 1st trophic level

_____

Energy transfer efficiency

GPP third trophic level = 100x

_____ Kcal m-2 yr -1

3x

Difficulty level : 3

147 (3) A-II, B-IV , C-I, D-III (Morphology of flowering plants)

Explanation: In **Rose** gynoecium is situated in the center and the other part of the flower are located in the rim of thalamus almost at the same level it is called perigynous. In **pea** marginal placentation is found placenta forms a ridge along the ventral suture of ovary and

ovules are borne on this ridge forming two rows, when sepal or petal one overlap on the next it is called twisted aestivation as found in **cotton, In Mango** fruit is called a drupe it develops from monocarpellary superior ovary.
Difficulty level : **2**

148 (4) A-III, B-I, C-IV, D- II (Ecosystem)
Robert May estimated global species diversity to about 7 million, **Alexander Von Humboldt** demonstrated species area relationship. **Paul Ehrlich** proposed Rivet popper hypothesis which suggests importance of species richness in maintenance of ecosystem. **David Tilman** conducted long term ecosystem experiment using outdoor plots.
Difficulty level :**1**

149 (3) A-IV, B-II, C-I . D-III (Morphology of flowering plants, new families)
Explanation:Monoadelphoous stamen are those in which filaments are fused to form a single tube and anthers are free, it's found in **China rose. Diadelphous** stamen are those when stamen are united partially and are present in two bunches, they are found in **pea**. **Polyadelphous stamen re**fers to plants in which the stamen or anthers are present in three or more bundles, This is common in **Citrus fruits.** The stamen that are connected to the perianth of the flower are called **epiphyllous stamen** commonly found in **Lily.**
Difficulty level : **2**

150 (1) A, C ,D and E only (plant Kingdom, algae)

Explanation:In Phaeophyceae asexual reproduction occurs by biflagellated zoospores, but sexual reproduction may be isogamous , anisogamous or oogamous so statement B is incorrect, Stored food is in the form of carbohydrate which is either mannitol or laminarin. The major pigments are chlorophyll a c and carotene and xanthophyll, and cellulosic wall covered by gelatinous algin is found
Difficulty level :**3**

151. Correct Option: [4] {Human Health And Diseases , Common Diseases in Human}
Explanation:

A. Typhoid - caused by Bacteria.

Typhoid fever is a bacterial infection caused by Salmonella typhi.

- It is transmitted through contaminated food and water.
- Symptoms include fever, headache, abdominal pain, and diarrhea.

B. Leishmaniasis - caused by Protozoa

- Leishmaniasis is a parasitic disease caused by protozoa of the Leishmania genus.
- It is transmitted through the bites of infected sandflies.
- There are different forms of leishmaniasis, including cutaneous, mucocutaneous, and visceral (the most severe form).

C. Ringworm - caused by Fungus

- Ringworm is a fungal infection of the skin or scalp.
- Despite its name, it's not caused by a worm but rather by various types of fungi.
- It's characterized by red, itchy, and sometimes ring-shaped rashes on the skin.

D. Filariasis - caused by Nematode

- Filariasis is a parasitic disease caused by nematode worms of the Filarioidea superfamily.
- It is transmitted through the bites of infected mosquitoes.
- The worms primarily affect the lymphatic system, leading to symptoms such as swelling of the limbs (lymphedema) and fever.

So, matching them up:
A - III (Bacteria)
B - II (Protozoa)
C - I (Fungus)
D - IV (Nematode)
Difficulty level - {1}

152. Correct option: [2] {Reproductive Health , Population Stabilisation & Birth Control}

Explanation- A. Non-medicated IUD - Lippes loop: The Lippes loop is a type of non-medicated intrauterine device (IUD) that is inserted into the uterus for contraception. It does not release any hormones.

B. Copper-releasing IUD - Multiload 375: The Multiload 375 is an IUD that releases copper into the uterus, which acts as a spermicide, preventing fertilization.

C. Hormone-releasing IUD - LNG-20: LNG-20 is a type of hormone-releasing IUD that continuously releases a low dose of levonorgestrel (a progestin hormone) into the uterus, which thickens cervical mucus and inhibits sperm mobility.

D. Implants - Progestogens: Implants are contraceptive devices that are inserted under the skin and release progestogens (synthetic forms of progesterone) slowly over time, preventing ovulation and thickening cervical mucus to prevent sperm from reaching the egg.

Difficulty Level- {1}

153. Correct option- [1] {Human Reproduction , Female Reproductive System}

Explanation-

➔ Statement I: The presence or absence of hymen is not a reliable indicator of virginity.

This statement is true. The hymen, a thin membrane located at the opening of the vagina, can be stretched or torn due to various activities other than sexual intercourse, such as physical activity, tampon use, or medical examinations. Therefore, its presence or absence does not definitively indicate whether someone is a virgin.

➔ Statement II: The hymen is torn during the first coitus only.

This statement is false. While the hymen may tear or stretch during the first instance of vaginal penetration, it is

not always the case. Some individuals may not experience any tearing or stretching of the hymen during their first sexual encounter, while others may have already stretched or torn their hymen through non-sexual activities before engaging in sexual intercourse.

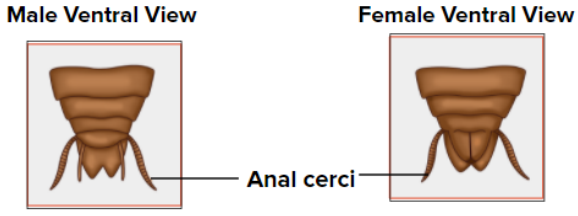
Difficulty Level- I

154. Correct option- [4]{Structural Organisation in animals , Cockroach Morphology}

Explanation-

In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on:

- The correct answer is (4) 10th segment
- Cockroaches have 10 abdominal segments, and the anal cerci are located on the10th segment
- These cerci serve as sensory organs, helping the cockroach detect vibrations and air movements, aiding in navigation and predator detection.
- The anal cerci are particularly important for detecting threats from behind, as cockroaches are capable of rapid movement in response to perceived danger.



Difficulty Level- I

155. Correct option- [4] {Neural Control & Coordination , Brain}

Explanation-

A. Pons - III. Connects different regions of the brain.

- The pons is a structure located in the brainstem that serves as a relay center, connecting different regions of the brain. It facilitates communication between the cerebrum, cerebellum, and other parts of the brain.

B. Hypothalamus - IV. Neurosecretory cells.

- The hypothalamus is a small but crucial region located below the thalamus. It contains neurosecretory cells that produce and release hormones that regulate various bodily functions, including metabolism, growth, reproduction, and stress responses. These hormones are either released into the bloodstream or transported to the pituitary gland for further distribution.

C. Medulla - II. Controls respiration and gastric secretions.

- The medulla, or medulla oblongata, is the lowermost part of the brainstem. It plays a vital role in controlling involuntary functions such as breathing (respiration), heart rate, blood pressure, and reflexes like coughing and swallowing. Additionally, it regulates gastric secretions, aiding in digestion.

D. Cerebellum - I. Provides additional space for neurons, regulates posture and balance.

- The cerebellum, located at the back of the brain, is responsible for coordinating voluntary movements, maintaining posture, and ensuring balance. While it doesn't provide additional space for neurons, it contains a vast number of neurons and is essential for motor control and coordination.

Difficulty Level- [3]

156. Correct option- [2] {Chemical Control & Coordination , Mechanism of Hormone action}

Explanation-

Glucagon is not a steroid hormone.

1. Progesterone:
    - Progesterone is a steroid hormone.
    - It plays a crucial role in the menstrual cycle and pregnancy, preparing the uterus for implantation and maintaining pregnancy.
    - It is primarily produced by the corpus luteum in the ovaries and, during pregnancy, by the placenta.
2. Glucagon:
    - Glucagon is not a steroid hormone; it is a peptide hormone.
    - It is produced by alpha cells in the pancreas and plays a key role in regulating blood sugar levels.
    - Glucagon acts to increase blood glucose levels by stimulating the liver to convert stored glycogen into glucose, which is then released into the bloodstream.
3. Cortisol:
    - Cortisol is a steroid hormone.
    - It is often referred to as the "stress hormone" because its levels increase in response to stress.
    - Cortisol plays a role in regulating metabolism, immune function, and inflammation.
    - It is produced by the adrenal glands in response to signals from the hypothalamus and pituitary gland.
4. Testosterone:
    - Testosterone is a steroid hormone.
    - It is primarily known as the male sex hormone, but it is also present in females in smaller amounts.
    - Testosterone plays a key role in the development of male reproductive tissues such as the testes and prostate, as well as promoting secondary sexual characteristics such as increased muscle mass and facial hair growth.

Difficulty Level- [1]

157. Correct option- [1] {Molecular Basis Of Inheritance , Transcription}

Explanation-

To find the correct product of DNA-dependent RNA polymerase, we need to transcribe the template sequence provided:

Template strand: 3'
TACATGGCAAATATCCATTCAS 5'

Transcription involves replacing thymine (T) with uracil (U) in the RNA sequence. Also, the RNA transcript is complementary to the template strand.

So, the correct RNA sequence transcribed from the given template would be:

5' AUGUACCGUUUAUAGGGAAGU 3'

Difficulty Level- [2]

158. Correct option- [4] {Locomotion & Movement , Types Of Muscle}

Explanation-

(a) Skeletal - Biceps

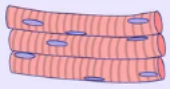
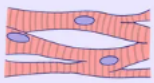
- Skeletal muscles are attached to bones and are responsible for voluntary movements of the body.
- The biceps are a well-known skeletal muscle located in the upper arm that flexes the forearm at the elbow joint.

(b) Involuntary - Intestine

- Involuntary muscles are not under conscious control.
- The intestine contains smooth muscles that contract involuntarily to propel food through the digestive system.

(c) Smooth - Heart

- Smooth muscles are found in the walls of hollow organs and blood vessels, and they contract involuntarily.
- However, the heart primarily consists of cardiac muscle, which is a specialized type of striated muscle that contracts involuntarily to pump blood throughout the body.

	Main features	Histology
Skeletal muscle	• Fibers: striated, tubular and multi nucleated • Voluntary • Usually attached to skeleton	
Smooth muscle	• Fibers: non-striated, spindle-shaped, and uninucleated • Involuntary • Usually covering wall of internal organs	
Cardiac muscle	• Fibers: striated, branched and uninucleated • Involuntary • Only covering walls of the heart	

Difficulty Level- [2]

159. Correct option- [2] {Cell Cycle & Cell Division , Phases of Cell Cycle}

Explanation-

➔ E. Gap 1 phase:
- ◆ Cell grows and performs its normal functions.
- ◆ Prepares for DNA replication.

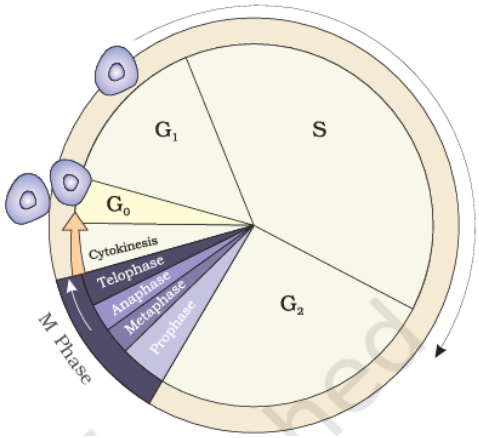
➔ C. Synthesis phase:
- ◆ DNA replication occurs.
- ◆ The cell duplicates its genetic material to prepare for cell division.

➔ A. Gap 2 phase:
- ◆ Cell continues to grow and prepares for division.
- ◆ Checks for any errors in DNA replication and repairs them if necessary.

➔ D. Karyokinesis:
- ◆ Nuclear division takes place. By Mitosis process or meiosis
- ◆ Duplicated chromosomes are separated into two daughter nuclei.

➔ B. Cytokinesis:
- ◆ Cytoplasm divides, resulting in two daughter cells.
- ◆ Each daughter cell contains a nucleus and a set of chromosomes.

➔ This sequence represents the stages of the cell cycle leading to cell division.



Difficulty Level- [2]

160. Correct option- [4] {Locomotion & Movement , Disorder}

Explanation-

Autoimmune disorders are conditions in which the body's immune system mistakenly attacks its own tissues, leading to inflammation and damage. Among the options provided:

A. **Myasthenia gravis: This is an autoimmune disorder** that affects the neuromuscular junction, leading to muscle weakness and fatigue. The immune system targets acetylcholine receptors, impairing nerve impulses to muscles.

B. **Rheumatoid arthritis: This is a chronic autoimmune disorder** that primarily affects the joints, causing inflammation, pain, and swelling. The immune system attacks the synovium, the lining of the membranes surrounding the joints.

C. Gout: Gout is not an autoimmune disorder. It is a type of arthritis caused by the accumulation of uric acid crystals in the joints, leading to inflammation and pain. It is primarily influenced by dietary factors and genetic predisposition, rather than an autoimmune response.

D. Muscular dystrophy: Muscular dystrophy is not an autoimmune disorder. It is a genetic disorder characterized by progressive muscle weakness and degeneration. It is caused by mutations in genes responsible for the structure and function of muscle fibers.

E. Systemic Lupus Erythematosus (SLE): This is a classic autoimmune disorder where the immune system attacks various tissues and organs in the body, leading to inflammation and damage. It can affect multiple systems, including the skin, joints, kidneys, heart, lungs, and brain.

So, among the options provided, Myasthenia gravis (A), Rheumatoid arthritis (B), and Systemic Lupus Erythematosus (SLE) (E) are autoimmune disorders, while Gout (C) and Muscular dystrophy (D) are not.

Difficulty Level- [3]

161. Correct Option: [1] {biomolecules, classification of enzymes}

Explanation: All the options mentioned in list I are enzymes, that are used to cleave ie- cut the bonds in various compounds.

Lipase- is an enzyme used to break down triglycerides into fatty acids and glycerol by increasing rate of hydrolysis of ester bonds
Nucleases- are used to cleave phosphodiester bonds of nucleic acids
Proteases- are used to breakdown proteins by breaking/ cleaving the peptide bonds
Amylase- used to breakdown glycosidic bonds
Difficulty Level: {1 }

162. Correct Option: [1] {Evolution, Convergent evolution}
Explanation: Convergent evolution is the process in which unrelated organisms evolve similar body forms and adaptations but are not from common ancestors. Dolphins and penguins are from different ancestors but both have a common body form ie- flippers
Difficulty Level: {1 }

163. Correct Option: [3] {Breathing and Exchange of Gases, Breathing capacity}
Explanation:
Expiratory Capacity (EC): This is the total volume of air a person can expire after a normal inspiration. This is the sum total of tidal volume and expiratory reserve volume (TV+ERV).

Functional Respiratory Capacity (FRC) represents the volume of air present in the lungs at the end of passive normal expiration. It is the sum total of ERV and RV.

Vital Capacity (VC) This is the maximum volume of air that a person can breathe in after

a forceful expiration. This is the sum total of ERV, TV and IRV.

Inspiratory Capacity (IC): The total volume of air a person can inspire after a normal expiration. This is the sum total of tidal volume and inspiratory reserve volume (TV+IRV).
Difficulty Level:{1 }

164. Correct Option: [2] {Evolution, Hardy Weinberg equilibrium}
Explanation: The options mentioned will affect the Hardy Weinberg equilibrium except the Constant gene pool- this is because as per Hardy weinberg equilibrium the allelic frequency remains constant from generation to generation ie- until the gene pool remains constant, the equilibrium is maintained.
Difficulty Level:{1 }

165. Correct Option: [2] {Evolution, Human evolution}
Explanation: There are four stages of human evolution. Over time Australopithecus evolved into Homo habilis. Homo habilis evolved into Homo erectus which evolved into Homo Neanderthalensis. Finally, Homo Neanderthalensis evolved into Homo sapiens.
Difficulty Level: {2 }

166. Correct Option: [3] {Body fluids and circulation, Cardiac cycle}
Explanation: Action potentials from the SA node propagate to the atria. From there the impulse travels to the atrioventricular (AV)node and through specialized conduction fibers (Purkinje fibers) into ventricular muscles.
Difficulty Level:{2}

167. Correct Option: [4] {Breathing and Exchange of Gases, Exchange of Gases}
Explanation: Here oxygen combines with haemoglobin to form oxyhaemoglobin. There various factors favour the formation of oxyhaemoglobi in lungs. They includes high pO2, low pCO2, lesser H+ concentration and lower temperature.
Difficulty Level: {1 }

168. Correct Option: [1]{Biotechnology and its Applications , Bt cotton, Gene therapy }
Explanation: alpha-1 antitrypsin is a protein that protects tissues from enzymes of inflammatory cells. It is used to treat emphysema,
The proteins encoded by the genes Cry IAc control the cotton bollworms, cryIAb controls corn borer.
Enzyme replacement therapy is used to replace a missing or deficient enzyme in a person with inherited enzyme deficiency syndrome
Difficulty Level: {1 }

169. Correct Option: [3] {Human reproduction, Gametogenesis}
Explanation: FSH stimulates follicles on the ovary to grow and prepare the eggs for ovulation , Leydig cells synthesis and secretion of androgens , androgens stimulates the process of spermatogenesis and maintain secondary sexual characteristics.
Difficulty Level: {1 }

170. Correct Option: [4] { Biotechnology : Principles and Processes, Cloning vectors}

Explanation: the gene x(ORI) is the origin of replication , where replication starts,and gene y (rop) it codes for the proteins involved in the replication of the plasmid.

Difficulty Level:{1 }

171. Correct option: (2) [Human Health and Diseases, Drugs and Alcohol Abuse]

Explanation: In this question, we have to match the drugs with their correct description.

A. Cocaine is obtained from Erythroxylum coca.

B. Heroin is also called Diacetylmorphine and belongs to the class Opioids, which are obtained from the latex of Papaver somniferum.

C. Morphine is a very effective sedative and painkiller. Therefore, it is used as an effective sedative in surgery.

D. Marijuana belongs to the group Cannabinoids along with hashish, charas, and ganja. Cannabinoids are obtained from the inflorescences of the plant Cannabis sativa.

Difficulty level: I

172. Correct option: (4) [Animal Kingdom, Coelom]

Explanation: In this question, we have to identify the correct statement from the given statements.

A. Annelids are true coelomates.

This statement is correct, as annelids contain a true body cavity which is called coelom.

B. Poriferans are pseudocoelomates.

This statement is incorrect, as poriferans belong to acoelomata, which means they do not have a coelom.

C. Aschelminthes are acoelomates.

This statement is incorrect, as the mesoderm of Aschelminthes is present as scattered pouches in between ectoderm and endoderm. Therefore, they are called pseudocoelomates.

D. Platyhelminthes are pseudocoelomates.

This statement is incorrect, as platyhelminthes belong to acoelomata, which means they do not have a coelom.

Difficulty level: I

173. Correct option: (4)[Excretory Products and Their Elimination, Function of the Tubules]

Explanation: In this question, we have to identify which of the given 2 statements are true.

Statement 1: In the nephron, the descending limb of the loop of Henle is impermeable to water and permeable to electrolytes.

This statement is incorrect as the descending limb of the loop of Henle is permeable to water but almost impermeable to electrolytes. This concentrates the filtrate as it moves down.

Statement 2: The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

This statement is incorrect as the PCT is lined by simple cuboidal brush border epithelium which increases the surface area for reabsorption.

Therefore, both the statement 1 and statement 2 are false.

Difficulty level: I

174. Correct option: (2)[Locomotion and Movement, Joints]

Explanation: In this question, we have to match the different types of joints with their locations.

A. Fibrous joints are found in the skull and they do not allow any movement.
B. Cartilaginous joints are found in between the adjacent vertebrae and they allow limited movement.
C. Hinge joints are found in the knee and they help in locomotion.
D. The ball and socket joint is found in between the humerus and the pectoral girdle and it allows rotational movement.

Difficulty level: I

175. Correct option: (2) [Reproductive Health, Population Stabilisation and Birth Control]

Explanation: In this question, we have to identify which of the given options is not a natural contraceptive method.

The Natural Methods of contraception include the following:

1. Periodic abstinence
2. Withdrawal or coitus interruptus
3. Lactational amenorrhea

Therefore, vaults are not a natural method as it is a Barrier Method of contraception.

Difficulty level: I

176. Correct option: (4) [Animal Kingdom, Classification of Animals]

Explanation:

A. Pleurobrachia is an example of a member of the phylum Ctenophora.
B. Radula is a file-like rasping organ which is used for feeding by the members of the phylum Mollusca.
C. A stomochord is a rudimentary structure that is similar to a notochord in the collar region of the Hemichordates.
D. Air bladder is found in the bony fishes or Osteichthyes and its function is to regulate buoyancy.

Difficulty level: I

177. Correct option: (2) [Cell: The Unit of Life, Eukaryotic Cells]

Explanation:

A. The axoneme is also called the core of cilia and flagella which contains microtubules in the pattern of 9+2 array.
B. A cartwheel pattern is found in the centrosome, in which two centrioles lie perpendicular to each other.
C. Crista are the infoldings formed by the inner membrane of mitochondria and their function is to increase the surface area.

D. Satellite is the non-staining secondary constriction found at a constant location in a chromosome.

Difficulty level: I

178. Correct option: I [Biotechnology: Principles and Processes, Obtaining the Foreign Gene Product]

Explanation: In this question, we have to identify the incorrect statement.

(I) Bio-reactors are used to produce small-scale bacterial cultures.

This statement is incorrect as in bioreactors, large volumes (100-1000 liters) of culture can be processed.

The other three statements are correct.

Difficulty level: I

179. Correct option: (1) [Cell Cycle and Cell Division, Meiosis I]

Explanation: This question is about different phases of the Prophase I of Meiosis I.

A. Diakinesis is the final stage of prophase I of meiosis I which is marked by terminalisation of chiasmata.

B. Pachytene is characterized by the appearance of recombination nodules.

C. The zygotene stage is characterized by the formation of a synaptonemal complex.

D. Leptotene is the first stage of prophase I of meiosis I in which the chromosomes look like thin threads.

Difficulty level: I

180. Correct option: (1) [Human Health and Disease, Common Diseases in Humans]

Explanation:

A. The common cold is caused by Rhinoviruses.

B. Haemozoin is a toxic substance that is released by the rupture of RBCs and is responsible for the chills and high fever associated with malaria.

C. The widal test is a confirmatory test for typhoid.

D. Allergy is produced by common allergens such as Dust mites, pollens, animal dander, etc.

Difficulty level: I

181. Correct option: (3)

Explanation: Colostrum is the first form of breastmilk that is released by the mammary glands after giving birth. It's nutrient-dense and high in antibodies and antioxidants to build a newborn baby's immune system. It changes to breast milk within two to four days after your baby is born.

[Reproductive health - Immunity]

Difficulty Level: {2}

182. Correct option: (4) [Animal Kingdom]

Explanation: A. Pterophyllum - III. Angel fish

Pterophyllum, known as the angelfish, belongs to the family Cichlidae and is recognized for its graceful appearance resembling angels.

B. Myxine - I. Hagfish

Myxine, referred to as the hagfish, is a jawless fish found in the family Myxinidae, known for its slimy texture and scavenging behavior.
C. Pristis - II. Sawfish

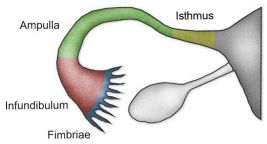
Pristis, the sawfish, is a large cartilaginous fish with a distinctive saw-like rostrum, belonging to the family Pristidae.
D. Exocoetus - IV. Flying fish

Exocoetus, known as the flying fish, possesses enlarged pectoral fins that enable it to glide above the water's surface, belonging to the family Exocoetidae.

Difficulty level: {3}

183. Correct option: (1) [Biotechnology and its applications]
Explanation: Ti plasmid is used as a vector for transformation. It stands for tumor inducing plasmid. It is used for producing transgenic plants. The presence of Ti plasmid is essential for the bacteria to cause crown gall disease in plants.
Difficulty level: {1}

184. Correct option: (3) [Human reproduction, female reproductive system]
Explanation: Parts of fallopian tube: The fallopian tube is composed of three parts, infundibulum, ampulla and isthmus.



Difficulty level: {1}

185. Correct option: (1) [Principle of inheritance and variation, Mendelian Disorders]
Explanation: Down syndrome is a condition in which a human is born with an extra chromosome number 21. A total of 47 chromosomes instead of 46.
Alpha thalassemia is caused by reduced or absent synthesis of alpha globin chains, and beta thalassemia is caused by reduced or absent synthesis of beta globin chains.

Klinefelter's syndrome - A genetic condition in which a male is born with an extra copy of the X chromosome. (47,XXY)
Difficulty Level: {3}

186. Correct option: (1)**[** Animal Kingdom, non chordata]
Explanation: Non-chordates are creatures that do not have a notochord, which is a rod-like elastic structure that provides support for the whole body. Heart is dorsal if present.
Difficulty level:2}

187. Correct option: (3) [Evolution, A BRIEF ACCOUNT OF EVOLUTION]
Explanation: The Mesozoic Era, also known as the Age of Dinosaurs, lasted from about 252 to 66 million years ago. During this era, birds and reptiles, including dinosaurs, flourished and diversified.

The Proterozoic Era, which spanned from about 2.5 billion to 541 million years ago, is

characterized by the diversification and evolution of various early life forms.

The Cenozoic Era began about 66 million years ago and continues to the present day. It is often referred to as the Age of Mammals because it witnessed the rapid diversification and dominance of mammals.

The Paleozoic Era, which lasted from about 541 to 252 million years ago, is known as the Age of Fishes and the Age of Amphibians.

Difficulty level:{3}

188. Correct option: (1) [Neural control and coordination - brain]

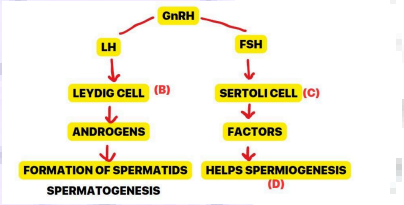
Explanation: statement one is correct. The cerebral hemispheres, which make up the largest part of the brain, are connected by a dense bundle of nerve fibers called the corpus callosum. This structure facilitates communication between the two hemispheres, allowing them to work together in various cognitive and motor functions.

statement two is incorrect. The brain stem does consist of the medulla oblongata and the pons, but the cerebrum is not part of the brain stem. The cerebrum is the largest and most prominent part of the brain, located above the brain stem, and it is responsible for higher functions such as conscious thought, memory, and voluntary movement.

Difficulty level:{ 3}

189. Correct option: (3) **[** Human reproduction, spermatogenesis]

Explanation: FSH (Follicle-Stimulating Hormone) stimulates Sertoli cells in the seminiferous tubules of the testes.
Sertoli cells, in turn, support and nourish developing sperm cells and play a crucial role in spermatogenesis.
Leydig cells, also known as interstitial cells, are stimulated by LH (Luteinizing Hormone) to produce androgens, including testosterone.
Testosterone, produced by Leydig cells, plays a vital role in supporting spermatogenesis, the process of sperm cell development.
So, the correct sequence is FSH stimulating Sertoli cells, which support spermatogenesis, and LH stimulating Leydig cells to produce androgens, which also support spermatogenesis.



Difficulty level:{2}

190. Correct option: (2) [Molecular basis of inheritance, transcription]

Explanation: RNA polymerase III transcribes genes that encode small RNA molecules, including transfer RNA (tRNA) and small nuclear RNAs (snRNAs) involved in splicing.

The termination of transcription involves the Rho factor in prokaryotes, which facilitates the release of RNA polymerase from the DNA template at the end of transcription.

The splicing of exons involves small nuclear ribonucleoproteins (snRNPs), which recognize splice sites and catalyze the removal of introns during RNA processing.

The TATA box is a specific DNA sequence located upstream of the transcription start site that serves as a promoter element, binding transcription factors and helping to initiate transcription.

Difficulty level:{2}

191. Correct Option: 2

Chapter Name- Chemical Control & Co-ordination

Topic- Adrenal, Pituitary

Explanation:

A. Exophthalmic goitre- III. Hypersecretion of thyroid hormone & protruding eyeballs
B. Acromegaly- IV. Excessive secretion of growth hormone
C. Cushings's syndrome- I. Excess secretion of cortisol, moon face & hyperglycemia
D. Cretinism- II. Hypo secretion of thyroid hormone and stunted growth

A-III B-IV C-I D-II

Difficulty level: 1

192. Correct Option: 1

Chapter Name- Structural Organisation in Animals

Topic- Tissues

Explanation-

List I

A. Unicellular glandular- III. Goblet cells of alimentary canal
epithelium
B. Compound epithelium- IV. Moist surface of buccal cavity
C. Multicellular- I. Salivary gland
glandular epithelium
D. Endocrine glandular- II. Pancreas
epithelium

A.III B.IV C-I D-II

Difficulty level:1

193. Correct Option: 3 {Human Health & Disease, Immune System}

Explanation-

Statement I: Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced- Correct

Statement II: Both bone marrow and thymus provide micro environments for the development and maturation of T-lymphocytes- Correct

(3) Both Statement I and Statement II are correct.

Difficulty level:: 2

194. Correct Option: 3 {Structural Organisation in Animals, Cockroach}

Explanation-

A. The structures used for storing of food- IV. Crop
B. Ring of 6-8 blind tubules at junction of foregut and midgut- II. Gastric caecae

C. Ring of 100-150/yellow coloured thin filaments at junction of midgut and hindgut- III. Malphigian tubules

D. The structures used for grinding the food- I. Gizzard

Difficulty level: 2

195. Correct Option: 1{Excretory Products & Elimination, Nephron}

Explanation-

The correct statement given below regarding juxta medullary nephron is- (1) Loop of Henle of juxta medullary nephron runs deep into medulla.

Difficulty level: 1

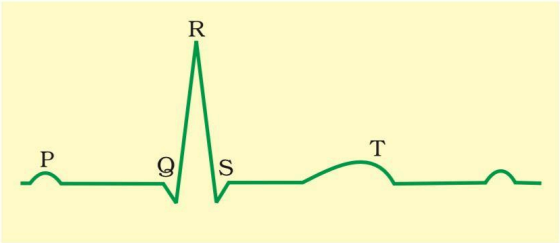
196. Correct Option: 4 {Body Fluids & Circulation, ECG}

Explanation-

A. P wave- III. Depolarisation of atria
B. QRS Complex- II. Depolarisation of ventricles
C. T wave- IV. Repolarisation of ventricles
D. T-P gap- I. Heart muscles are electrically silent

The P-wave represents the electrical excitation (or depolarisation) of the atria, which leads to the contraction of both the atria. The QRS complex represents the depolarisation of the ventricles, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole. The T-wave represents the return of the ventricles from excited to normal state (repolarisation). The end of the T-wave marks the end of systole.

A- III, B- II, C- IV, D- I



Difficulty level: 1

197. Correct Option: 3 {Principle of Inheritance, ABO blood grouping}

Explanation-

Father blood group- B+
Mother blood group - A+
Child blood group- O+

So, if the child is O+, both parents should have a recessive allele
Father blood group- B+ (Ib/i)
Mother blood group - A+ (Ia/i)

Child blood group- O+(i/i)

3- A only

Difficulty level:2

198. Correct Option: 2{Organisms and Population, Competition}

Explanation-

Statement I: Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely- False

Statement II: According to Gaue's principle during competition, the inferior will be eliminated. This may be true if resources are limited- true

Statement I is false but Statement II is true

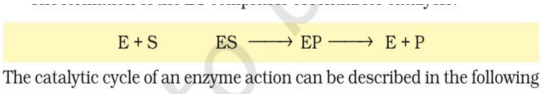
Difficulty level: 2

199. Correct Option: 3{Biomolecules, Enzyme}

Explanation-

E. Substrate binding to active site.
A. Substrate enzyme complex formation.
D. Chemical bonds of the substrate broken.
C. Release of products.
B. Free enzyme ready to bind with another substrate.

The catalytic cycle of an enzyme action can be described in the following steps: 1. First, the substrate binds to the active site of the enzyme, fitting into the active site. 2. The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate. 3. The active site of the enzyme, now in close proximity of the substrate breaks the chemical bonds of the substrate and the new enzyme-product complex is formed. 4. The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.



The catalytic cycle of an enzyme action can be described in the following

Difficulty level: 1

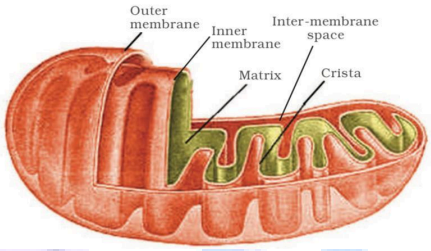
200. Correct Option: 3 {Cell, Mitochondria and Chloroplast}

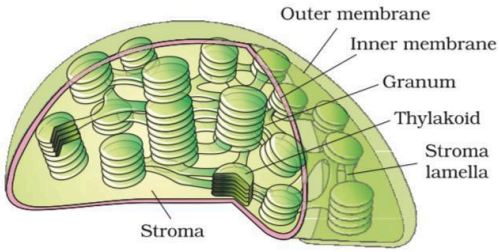
Explanation-

Statement I: Mitochondria and chloroplasts an both double membrane-bound organelle- Correct

Statement II: Inner membrane of mitochondria is relatively less permeable, as compared to chloroplast- Correct

Both Statement I and Statement II are correct





Difficulty level: 2

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