Aakash
Medical | IIT-JEE | Foundations

FINAL TEST SERIES for NEET-2025

MM : 720

Test - 1

Time : 180 Mins.

Answers

#	Ans	#	Ans	#	Ans	#	Ans	#	Ans
1.	(1)	37.	(2)	73.	(1)	109.	(1)	145.	(4)
2.	(3)	38.	(1)	74.	(4)	110.	(2)	146.	(2)
3.	(4)	39.	(1)	75.	(1)	111.	(4)	147.	(4)
4.	(1)	40.	(2)	76.	(4)	112.	(4)	148.	(4)
5.	(3)	41.	(1)	77.	(4)	113.	(2)	149.	(3)
6.	(4)	42.	(1)	78.	(3)	114.	(4)	150.	(2)
7.	(1)	43.	(3)	79.	(3)	115.	(2)	151.	(1)
8.	(3)	44.	(2)	80.	(4)	116.	(2)	152.	(1)
9.	(3)	45.	(2)	81.	(2)	117.	(4)	153.	(3)
10.	(2)	46.	(4)	82.	(1)	118.	(3)	154.	(4)
11.	(1)	47.	(2)	83.	(3)	119.	(3)	155.	(1)
12.	(4)	48.	(3)	84.	(2)	120.	(3)	156.	(4)
13.	(1)	49.	(3)	85.	(2)	121.	(3)	157.	(2)
14.	(3)	50.	(1)	86.	(3)	122.	(3)	158.	(3)
15.	(2)	51.	(1)	87.	(4)	123.	(2)	159.	(4)
16.	(3)	52.	(4)	88.	(4)	124.	(1)	160.	(2)
17.	(3)	53.	(1)	89.	(3)	125.	(3)	161.	(2)
18.	(1)	54.	(1)	90.	(3)	126.	(4)	162.	(2)
19.	(2)	55.	(2)	91.	(4)	127.	(4)	163.	(2)
20.	(1)	56.	(3)	92.	(2)	128.	(4)	164.	(3)
21.	(4)	57.	(3)	93.	(4)	129.	(4)	165.	(1)
22.	(1)	58.	(4)	94.	(3)	130.	(1)	166.	(2)
23.	(3)	59.	(1)	95.	(4)	131.	(4)	167.	(2)
24.	(4)	60.	(2)	96.	(2)	132.	(3)	168.	(1)
25.	(2)	61.	(2)	97.	(2)	133.	(3)	169.	(3)
26.	(1)	62.	(2)	98.	(2)	134.	(1)	170.	(4)
27.	(3)	63.	(4)	99.	(2)	135.	(2)	171.	(2)
28.	(1)	64.	(3)	100.	(4)	136.	(2)	172.	(3)
29.	(2)	65.	(4)	101.	(2)	137.	(1)	173.	(1)
30.	(3)	66.	(4)	102.	(4)	138.	(4)	174.	(2)
31.	(2)	67.	(1)	103.	(3)	139.	(4)	175.	(3)
32.	(4)	68.	(2)	104.	(2)	140.	(3)	176.	(3)
33.	(4)	69.	(3)	105.	(2)	141.	(4)	177.	(4)
34.	(3)	70.	(2)	106.	(2)	142.	(1)	178.	(1)
35.	(4)	71.	(2)	107.	(1)	143.	(1)	179.	(1)
36.	(3)	72.	(4)	108.	(3)	144.	(2)	180.	(2)

Hints and Solutions

PHYSICS

(1) **Answer :** (1)
Solution:

A	B	Y
1	1	0
0	0	1
1	0	1
0	1	1

This is truth table of NAND gate

(2) **Answer :** (3)
Solution:

Work function $\phi_0 = \frac{hc}{\lambda_{max}}$,

$\lambda_{max} = \frac{hc}{\phi_0} = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{4 \times 1.6 \times 10^{-19}}$,

$\approx 3100 \times 10^{-10}$ m = 3100 Å

(3) **Answer :** (4)
Solution:

$B = \frac{\mu_0\left(\frac{e}{T}\right)}{2R}$

$T \propto n^3 \; R \propto n^2$

$\therefore \; B \propto \frac{1}{n^5}$

(4) **Answer :** (1)
Solution:
Concept of radioactive decay.

(5) **Answer :** (3)
Solution:
Nuclear density is almost constant for all nuclei.

(6) **Answer :** (4)
Solution:
For n-type semiconductors, electrons are majority carriers and dopants are pentavalent.

(7) **Answer :** (1)
Solution:
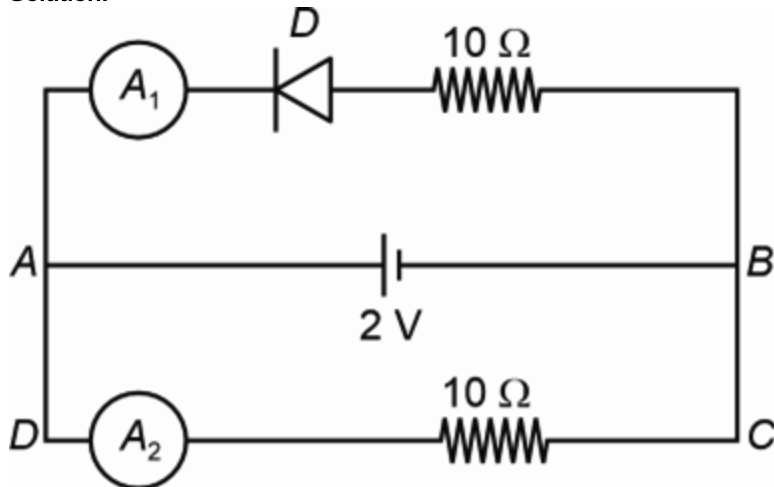
$\because$ Diode D is in reverse biasing, so no current in A_1.

In loop *ABCD*,

$I = \frac{2}{10} = 0.2 \text{ A}$

∴Reading of A$_2$ is 0.2 A.

(8) Answer : (3)
Solution:
Nuclides with the same neutron number *N* but different atomic number *Z* are called isotones.

$^{198}_{80}$Hg has *Z* = 80 but *N* = 198 – 80 = 118
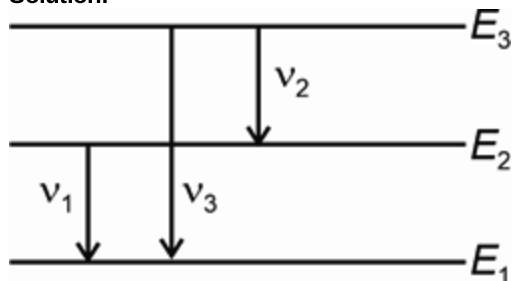
$^{197}_{79}$Au has *Z* = 79 but *N* = 197 – 79 = 118

(9) Answer : (3)
Solution:
At 0°C, semiconductor acts as an insulator and in an intrinsic semiconductor fermi level just lies in the middle between the valence band and conduction band.

(10) Answer : (2)
Solution:

$\nu_1 = \frac{E_2 - E_1}{h}$

$\nu_2 = \frac{E_3 - E_2}{h} \;\Rightarrow\; \nu_3 = \frac{E_3 - E_1}{h} = \nu_1 + \nu_2$

(11) Answer : (1)
Solution:

$\overline{A + B} = \overline{A} \cdot \overline{B}$

$\overline{A \cdot B} = \overline{A} + \overline{B}$

$\overline{\overline{A} + \overline{B}} = \overline{\overline{A}} \cdot \overline{\overline{B}}$

$= A \cdot B$

$\overline{\overline{A} \cdot \overline{B}} = \overline{\overline{A}} + \overline{\overline{B}}$

$= A + B$

(12) Answer : (4)
Solution:
Q = [final kinetic energy-initial kinetic energy]
Due to conservation of mass-energy, this is also,

Q = [sum of initial masses – sum of final masses]c^2

(13) Answer : (1)
Solution:

$\lambda = \frac{h}{\sqrt{2m\left(\text{KE}\right)}}$

So,

$\lambda_1 = \frac{h}{\sqrt{2mKE}}, \quad \lambda_2 = \frac{h}{\sqrt{2\left(\frac{m}{4}\right)KE}}$

$\Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{1}{2}.$

(14) Answer : (3)
Solution:
A free neutron is unstable.
It decays into a proton, an electron and a antineutrino.

(15) Answer : (2)
Hint:

$$\frac{1}{\lambda} = R \left\{ \frac{1}{n_1^2} - \frac{1}{n_2^2} \right\}$$

Solution:

$$\frac{1}{\lambda} = R \left\{ 1 - \frac{1}{n^2} \right\}$$

$$\Rightarrow \frac{R}{n^2} = R - \frac{1}{\lambda} = \frac{\lambda R - 1}{\lambda}$$

$$n = \sqrt{\frac{\lambda R}{\lambda R - 1}}$$

(16) **Answer :** (3)
Solution:

For electron moving in 4th circular orbit of radius *r*,
$2\pi r = 4\lambda$

$\therefore$ 4 standing waves can fit in the 4th orbit.

(17) **Answer :** (3)
Solution:

$$\frac{n(n-1)}{2} = 6$$

$n^2 - n - 12 = 0$
$(n - 4)(n + 3) = 0$
$\therefore n = 4$

$$\frac{1}{\lambda} = R \left(1 - \frac{1}{16} \right)$$

$\lambda = 975 \text{ Å}$

(18) **Answer :** (1)
Solution:

$Q = (\Delta m)c^2$
$(\Delta m) = 0.0046 \text{ u}$
$Q = .0046 \times 931.5 \text{ MeV}$
$= 4.28 \text{ MeV}$

(19) **Answer :** (2)
Solution:
L.C. = 1 MSD − 1 VSD
20 VSD = 16 MSD

$1 \text{ VSD} = \frac{16}{20} \text{ MSD}$

$\therefore \text{L.C.} = \left(1 - \frac{16}{20} \right) \text{ MSD}$

$= \frac{4}{20} \text{ MSD}$
$= 0.2 \times 0.2 \text{ mm}$
$= 0.04 \text{ mm}$

(20) **Answer :** (1)
Solution:
In N-type semiconductor, rate of recombination of holes increases because number of electrons is more compare to intrinsic semiconductor.
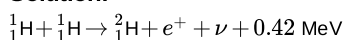
(21) **Answer :** (4)
Solution:
Stopping potential of *B* is greater than *A*, hence incident frequency on *B* is greater than *A* by equation
$h\nu = \phi_0 + eV_0$

(22) **Answer :** (1)
Solution:

$_1^1\text{H} + _1^1\text{H} \rightarrow _1^2\text{H} + e^+ + \nu + 0.42 \text{ MeV}$
This is one of the reaction happening in stars like our sun.

(23) **Answer :** (3)
Solution:
Nuclear force is charge independent. The attractive force between two neutrons is nearly equal to that between two protons.

(24) **Answer :** (4)

Solution:
Saturation current is found to be proportional to the intensity of incident radiation whereas the stopping potential is independent of its intensity for a given photosensitive material and incident radiation. The time lag between the incidence of radiation and emission of photo-electrons is negligible.

(25) Answer : (2)
Solution:

$\lambda = \frac{1.227}{\sqrt{V}}$ nm $= \frac{1.227}{\sqrt{400}} = \frac{1.227}{20} = 0.061$ nm $\simeq 0.6$ Å

(26) Answer : (1)
Solution:

$\frac{1}{4\pi\varepsilon_0} \frac{e^2}{r^2} = \frac{mv^2}{r} \Rightarrow v^2 = \frac{e^2}{4\pi\varepsilon_0 mr}$

Angular momentum $= m \left(\frac{e}{2\sqrt{\pi\varepsilon_0 mr}} \right) r = \frac{h}{2\pi}$

$\Rightarrow \frac{m^2 e^2}{\pi\varepsilon_0 mr} r^2 = \frac{h^2}{\pi^2}$

$\therefore r = a_0 = \frac{h^2 \varepsilon_0}{\pi m e^2}$

(27) Answer : (3)
Solution:
When an electron undergoes a transition such that it jumps from any higher energy level to $n = 4$ (third excited state), then it releases energy in the form of infrared radiation.

(28) Answer : (1)
Solution:
Hint : $\phi = \phi_0 + $ K.E$_{max}$

Sol. : $\frac{hc}{\lambda} = \phi_0 + 3.6$ eV

$\frac{hc}{2\lambda} = \phi_0 + 1.2$ eV

$\frac{hc}{\lambda} = \phi_0 + 3 \left(\frac{hc}{2\lambda} - \phi_0 \right)$

$\frac{hc}{\lambda} = -2\phi_0 + \frac{3hc}{2\lambda}$

$-2\phi_0 = -\frac{hc}{2\lambda}$

$\frac{2hc}{\lambda_1} = \frac{hc}{2\lambda}$

$\lambda_1 = 4\lambda$

(29) Answer : (2)
Solution:

Number of α particles emitted $= \frac{226-206}{4} = \frac{20}{4} = 5$

Let x β$^-$ particles be emitted, then
$88 = 82 + (2 \times 5) - x \Rightarrow x = 4$

(30) Answer : (3)
Solution:
The nuclear mass M is found to be always less than the total mass of its individual protons and neutrons.
This difference = ΔM = mass defect

Binding energy E_b = ΔMc^2

(31) Answer : (2)
Solution:

Dynamic resistance $R = \frac{\Delta V}{\Delta I}$

$= \frac{0.7-0.6}{4 \times 10^{-3}} = \frac{0.1}{4 \times 10^{-3}} = 25$ Ω

(32) Answer : (4)
Solution:
Time period of orbital motion of electron

$T = \frac{4\varepsilon_0^2 n^3 h^3}{mZ^2 e^4}$

$\Rightarrow T \propto n^3 \Rightarrow \frac{1}{\text{Frequency} \left(f \right)} \propto n^3$

$\Rightarrow f \propto n^{-3}$

(33) Answer : (4)
Solution:
To get a steady DC output from the pulsating voltage, normally a capacitor is connected across the output terminals (parallel to the load). This additional circuit filters out the ac ripple.

(34) Answer : (3)
Solution:
Certain metals like zinc responded only to ultraviolet light, having short wavelength, to cause electron emission from surface.
Some alkali metals like sodium were sensitive even to visible light.

(35) Answer : (4)
Solution:
In a photon-electron collision, the number of photons may not be conserved in the collision. The photon may be absorbed or a new photon may be created.

(36) Answer : (3)
Solution:
By conservation of energy, $E_i = E_f$

$\Rightarrow \frac{1}{2}mv^2 = \frac{k(2e)(Ze)}{d}$

$\Rightarrow d = \frac{4kZe^2}{mv^2} = \frac{Ze^2}{\pi\varepsilon_0 mv^2}$

(37) Answer : (2)
Solution:
$Y = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}} \cdot \overline{\overline{B}} = A \cdot B$

(38) Answer : (1)
Solution:
When contact angle θ < 90°, the liquid wets the surface causing the liquid to form a concave upward meniscus.

(39) Answer : (1)
Solution:
$ms\,\Delta T = n(hf)$

$n = \frac{ms\Delta T}{hf} = \frac{2 \times 4200 \times 1}{7 \times 10^{-34} \times 2 \times 10^{10}} = 6 \times 10^{26}$

(40) Answer : (2)
Solution:
Binding energy per nucleon (E_{bn}) for,

$^{12}_{6}A$ is $\frac{92}{12} = 7.67$ MeV

$^{56}_{26}D$ is $\frac{490}{56} = 8.75$ MeV is the highest

$^{127}_{53}E$ is $\frac{1066}{127} = 8.4$ MeV

More the E_{bn}, more is the stability of nucleus.

(41) Answer : (1)
Solution:
Einstein's mass-energy equivalence relation, $E = mc^2 = 10^{-6} \times (3 \times 10^8)^2 = 9 \times 10^{10}$ J

(42) Answer : (1)
Solution:
Current through $\frac{3}{2}$ kΩ resistor, $I = \frac{15}{1500} = \frac{1}{100} = 10$ mA

(43) Answer : (3)
Solution:
$P = NE = N(hν) = 2.5 \times 10^{15} \times (6.63 \times 10^{-34} \times 3 \times 10^{14})$

$= 2.5 \times 10^{15} \times (2 \times 10^{-19})$

$= 5 \times 10^{-4}$ W

(44) Answer : (2)
Solution:
Photodiode in reverse bias is used to detect the intensity of light.

(45) Answer : (2)
Solution:
Dynamic resistance
$$r_d = \frac{\Delta V}{\Delta I} = \frac{(0.8-0.6) \text{ V}}{(20-10) \text{ mA}} = \frac{0.2}{10 \times 10^{-3}}$$
= 20 Ω

CHEMISTRY

(46) Answer : (4)
Solution:
(1) 1 gm-molecules of N_2 = N_A molecules
2.5 gm-molecules of N_2 = 2.5 N_A molecules
(2) 1 gm-atoms of nitrogen = N_A atoms
4 gm-atoms of nitrogen = 4 N_A atoms
Number of nitrogen molecule = 2 N_A molecule
(3) Number of nitrogen molecules = $\frac{3.01 \times 10^{24}}{6.02 \times 10^{23} \times 2}$
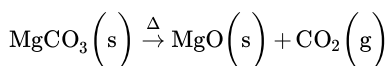$= \frac{10}{2 \times 2} N_A$
= 2.5 N_A
(4) Number of N_2 molecule = $\frac{84}{28} N_A = 3 \, N_A$

(47) Answer : (2)
Solution:
For minimum molecular mass atleast one Fe atom must be present in the biomolecule
∴ Minimum molecular mass $= \frac{56 \times 100}{0.2}$
= 28000 u

(48) Answer : (3)
Solution:

$$\text{MgCO}_3\left(s\right) \xrightarrow{\Delta} \text{MgO}\left(s\right) + \text{CO}_2\left(g\right)$$

$\frac{10}{40} = \frac{1}{4}$
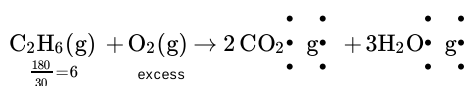1 mole of MgO(s) formed from 1 mole of $MgCO_3$
$\frac{1}{4}$ mole of MgO(s) will formed from $\frac{1}{4}$ mole of $MgCO_3$
Mass of $MgCO_3$ = $\frac{1}{4} \times 84 = 21$ gm
Let the mass of sample is x.
$x \times \frac{50}{100} = 21$
X = 2 × 21 = 42 gm

(49) Answer : (3)
Solution:

$$\text{C}_2\text{H}_6(g) + \text{O}_2(g) \rightarrow 2\,\text{CO}_2 + 3\text{H}_2\text{O}$$
$\frac{180}{30}=6$ excess

1 mole of C_2H_6 on combustion gives 2 moles of CO_2
6 moles of C_2H_6 will gives = 12 moles of CO_2
Volume of 1 mole of CO_2 gas at STP = 22.4 L
Volume of 12 mole of CO_2 gas at STP
= 22.4 × 12 L
= 268.8 L

(50) Answer : (1)
Solution:
P + n = 56 …(1)
Number of electron = P – 3

Number of neutron = (P – 3) + (P – 3) 0.304

P + P – 3 + (P – 3) 0.304 = 56

2.304 P = 59.912

$P = \frac{59.912}{2.304} = 26.0034$

(51) Answer : (1)

Solution:

$\Delta E = 13.6 \times 2^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$

If n_1 is lowest and n_2 is highest then on electronic transition in the hydrogen atom emits maximum energy.

Therefore $n_1 = 1$, $n_2 = 2$ will emits maximum energy.

(52) Answer : (4)

Solution:

$r_n = r_0 \times \frac{n^2}{Z}$

Radius of second orbit of $He^+ = r_0 \times \frac{2 \times 2}{2} = 2\, r_0$

r_0 is the radius of 1st orbit of hydrogen atom.

(53) Answer : (1)

Solution:

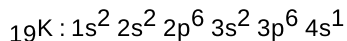| Subshell	4s	4p	4d	4f
Total electrons	2	6	10	14
Total electrons with $S = +\frac{1}{2}$	1	3	5	7

(54) Answer : (1)

Solution:

For single electron species the energy depends upon principal quantum number 'n' only. So, statement II is incorrect.

(55) Answer : (2)

Solution:

$_{19}K : 1s^2\, 2s^2\, 2p^6\, 3s^2\, 3p^6\, 4s^1$

Outermost orbital of potassium is 4s orbital.

$n = 4, l = 0, m = 0, s = \pm\frac{1}{2}$

(56) Answer : (3)

Hint:

Higher the bond order higher is the stability. For same bond order if the last electron is in anti bonding molecular orbital then the species will be less stable.

Solution:

Molecule/ion	Bond order
N_2	3
N_2^+	2.5
N_2^-	2.5

∴ Order of stability : $N_2 > N_2^+ > N_2^-$

(57) Answer : (3)

Solution:

Element	$\Delta_{eg}H$ (kJ/mol)
He	+48
Ne	+116
Kr	+96
Xe	+77

(58) Answer : (4)

Solution:

Atomic number	Block
37(Rb)	s-block

78(Pt)	d-block
52(Te)	p-block
65(Tb)	f-block

(59) Answer : (1)
Solution:
Electronegativity of an element depends on the atom with which it is attached.
$CO \rightarrow$ neutral oxide
$Cr_2O_3 \rightarrow$ amphoteric

(60) Answer : (2)
Solution:
Element E is selenium (Se) the element which is just above 'E' in periodic table is sulphur, its electronic configuration is [Ne] $3s^2, 3p^4$.

(61) Answer : (2)
Solution:
Radius of anionic species are always greater than their parent atomic radius.
In Cl_2 molecule the covalent radius is less than the atomic radius.

(62) Answer : (2)
Solution:
Orbitals with fully filled and half filled electronic configuration are stable and required more energy for ionization.
Hence the correct order is C > D > A > B.

(63) Answer : (4)
Solution:
$SF_4 \rightarrow sp^3d$, see-saw
$NH_4^+ \rightarrow sp^3$, Tetrahedral
$BrF_3 \rightarrow sp^3d$, bent T-shaped
$XeF_4 \rightarrow sp^3d^2$, Square planar

(64) Answer : (3)
Solution:
NO is paramagnetic with BO = 2.5
NO^+ is diamagnetic with BO = 3

(65) Answer : (4)
Solution:
H_2O and NH_3 have non-zero net dipole moment.
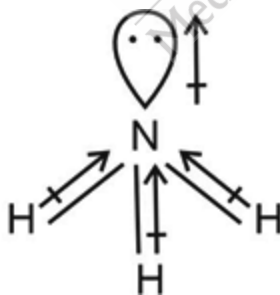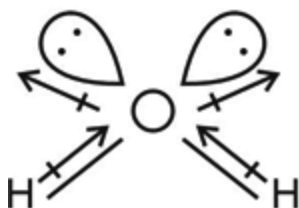
(66) Answer : (4)
Hint:
Number of atoms = Moles × N_A × atomicity
Solution:
7 g of nitrogen gas = $\frac{7}{28} \times N_A \times 2$
$\Rightarrow 0.5\ N_A$
34 g of ammonia gas = $\frac{34}{17} \times N_A \times 4$
= $8\ N_A$
1.6 g of oxygen gas = $\frac{1.6}{32} \times N_A \times 2$
$\Rightarrow 0.1\ N_A$

2 g of hydrogen gas = $\frac{2}{2} \times N_A \times 2$

= 2 N_A

(67) **Answer :** (1)

Hint:

The reactant that gets consumed first during course of reaction is known as limiting reagent.

Solution:

If the amount of limiting reagent is altered then the amount of product formed will also be changed as the amount of product formed depends on the amount of limiting reagent.

After the reaction, limiting reagent will not be left in the reaction mixture.

(68) **Answer :** (2)

Hint:

T.E. = $-13.6\frac{Z^2}{n^2}$ eV

Solution:

T.E. = $-13.6\frac{Z^2}{n^2}$ eV

⇒ T.E. = –13.6 eV

(69) **Answer :** (3)

Hint:

For the value of ℓ, m = – ℓ to +ℓ

Solution:

For 2*p* orbital, ℓ = 1

So m = – 1, 0, +1

Magnetic quantum number defines the spatial arrangement of orbitals with respect to standard set of coordinate axes not the energies.

(70) **Answer :** (2)

Hint:

$\lambda = \frac{h}{mv}$

Solution:

$\lambda = \frac{6.6 \times 10^{-34}}{1 \times 10^{-6} \times 200}$ = 3.3×10^{-30} m

(71) **Answer :** (2)

Hint:

Element, below aluminium in periodic table is called Eka-aluminium

Solution:

• Potassium is more electropositive than sodium.

• Electron gain enthalpy of inert gases is positive.

(72) **Answer :** (4)

Hint:

Al_2O_3 reacts both with acid and base.

Solution:

Compounds	Chemical nature
NO	Neutral
Al_2O_3	Amphoteric
Na_2O	Basic
SO_2	Acidic

(73) **Answer :** (1)

Hint:

Smaller is the size of atoms, smaller is the bond length

Solution:

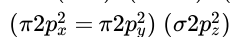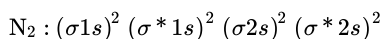Atomic size order: C > O > H

Correct order of bond length:

C–C > C–O > C–H > O–H

Bond type	Bond length (pm)
C–C	154
C–O	143
C–H	107

O–H   96

(74) Answer : (4)
Hint:
$\text{N}_2 : (\sigma 1s)^2 \, (\sigma * 1s)^2 \, (\sigma 2s)^2 \, (\sigma * 2s)^2$
$(\pi 2p_x^2 = \pi 2p_y^2) \, (\sigma 2p_z^2)$
Solution:
In N_2^- the added electron will go to π*$2p_X$ or π*$2p_y$ molecular orbital.

(75) Answer : (1)
Solution:
Both CO_3^{2-} and NO_3^- are trigonal planar and isoelectronic species.
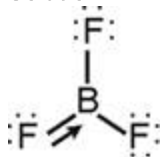
(76) Answer : (4)
Hint:
• BF$_3$ is an electron deficient species with only 6 electrons on central atom 'B'.

• In BF$_3$, 'B' atom is sp^2 hybridised.
Solution:

• The observed B-F bond length is smaller than expected B-F bond length due to pπ-pπ back bonding (partial double bond character).
∴ (a), (c) and (d) are correct.

(77) Answer : (4)
Hint:
Valence electrons of central atom which form σ-bond or appear as lone pair, participate in hybridisation.
Solution:

Molecule	Structure	Hybridisation
SF$_4$		sp^3d
SO$_2$		sp^2
SF$_6$		sp^3d^2

(78) Answer : (3)
Solution:
BH$_3$ ⇒ electron deficient
ICl$_3$ ⇒ Expanded octet
SF$_4$ ⇒ Expanded octet

(79) Answer : (3)
Hint:
σ-bond is formed using σ molecular orbital

Solution:

Molecules	Nature of bond
B_2	1π bond
C_2	2π bond
H_2	1σ bond
N_2	1σ and 2π bonds

N_2 (electronic configuration): $(\sigma 1s)^2 \, (\sigma^*1s)^2 \, (\sigma 2s)^2 \, (\sigma^*2s)^2 \, (\pi 2p_x^2 = \pi 2p_y^2) \, (\sigma 2p_z^2)$

(80) Answer : (4)
Hint:
When more than one molecules are involved in H-bonding, it is known as intermolecular H-bonding.
Solution:
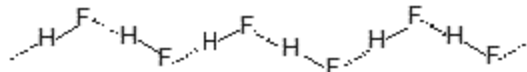
Intermolecular H-bonding in HF

(81) Answer : (2)
Hint:
17 group elements are called halogens
Solution:
Vanadium → Transition metal
Iodine → Halogen
Cerium → Lanthanoid
Thorium → Actinoid

(82) Answer : (1)
Hint:
Neptunium comes after uranium in periodic table
Solution:
Samarium is a lanthanoid element

(83) Answer : (3)
Hint:
Generally, down the group, metallic character increases.
Solution:
When the electron is added to F, due to its small size, the interelectronic repulsion increases, and hence the electron affinity decreases. On the other hand, in Cl, the electron-electron repulsion is much less due to its larger size, so the electron affinity of Cl is more than F.

(84) Answer : (2)
Solution:
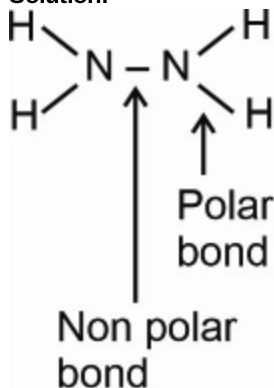
(85) Answer : (2)
Hint:
The value of m varies from $-\ell$ to $+\ell$
Solution:
For $\ell = 2$, m = –2, –1, 0, +1, +2
So for $\ell = 2$, m = +3 is not possible

(86) Answer : (3)
Hint:

Phenomena which are associated with the characteristics of waves can be explained by wave nature of electromagnetic radiation

Solution:
• Diffraction and interference can be explained by the wave nature of electromagnetic radiation.
• Black-body radiation and photoelectric effect can be explained by the particle nature of electromagnetic radiation.

(87) Answer : (4)
Hint:
Power = rate of consumption of energy
Solution:
10 W = 10 Js^{-1}

Energy of photons = $\frac{hc}{\lambda} = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{400 \times 10^{-9}}$
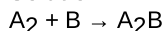
= 4.9 × 10^{-19}
Rate of emission of photon
= $\frac{10}{4.9 \times 10^{-19}} = 2.04 \times 10^{19}$

(88) Answer : (4)
Hint:
From stoichiometry, $(n_{A_2})_{reacted} = (n_B)_{reacted} = (n_{A_2B})_{formed}$
Solution:
$A_2 + B \rightarrow A_2B$
From above equation
1 molecule of A_2 combines with 1 atom of B so 200 molecules of A_2 will combine with 200 atoms of B. So 100 atoms of B will remain unreacted and 200 molecules of A_2B will be formed.

(89) Answer : (3)
Hint:
$M_1V_1 = M_2V_2$
Solution:
Suppose V L of water is required, then
(1.6 + V) × 0.1 = 1.6 × 0.2
V = 1.6 L

(90) Answer : (3)
Hint:
• One g-molecule means one mole.
• Volume of 1 mol of a gas at STP is 22.4 L
Solution:
• 72 g of O_3 = 1.5 mol of O_3
= 1.5 × 24 N_A electrons
= 36 N_A electrons
• 34 g of NH_3 = 2 mol of NH_3
= 2 × 10 N_A electrons
= 20 N_A electrons
• 1.5 g molecules of SO_2 = 1.5 mol of SO_2
= 1.5 × 32 N_A electrons
= 48 N_A electrons
• 44.8 L of CO_2 at STP = 2 mol of CO_2
= 2 × 22 N_A electrons
= 44 N_A electrons

BOTANY

(91) Answer : (4)
Solution:
Planaria (flat worm) shows true regeneration, i.e., a fragmented organism regenerates the lost part of its body and becomes a new organism.

(92) Answer : (2)

Solution:
ICBN stands for International Code for Botanical Nomenclature and is provided by plant taxonomists.

(93) Answer : (4)
Solution:
Internal and external structure, development process as well as ecological information form the basis of the modern taxonomic studies.

(94) Answer : (3)
Solution:
Diptera is an order of housefly.

(95) Answer : (4)
Solution:
Self consciousness is seen in humans only.
Both self consciousness and growth are characteristic features of living organisms. Growth is seen in every organism.

(96) Answer : (2)
Solution:
Scientific name of brinjal – *Solanum melongena*
Scientific name of makoi – *Solanum nigrum*

(97) Answer : (2)
Solution:
Monkey, gorilla and gibbon belong to the order primata.
In plants, classes with a few similar characters are assigned to a higher category called division.

(98) Answer : (2)
Solution:
According to five kingdom classification system given by R.H. Whittaker, both *Chlorella* and *Amoeba* are unicellular eukaryotes and they have been placed under the kingdom protista.

(99) Answer : (2)
Solution:
Puccinia is a fungus and shows heterotrophic mode of nutrition and hence is devoid of chlorophyll.

(100) Answer : (4)
Solution:
Cellulose is present in the cell wall of the members of the kingdom plantae.

(101) Answer : (2)
Solution:
Viruses comprise of either DNA or RNA as the genetic material.

(102) Answer : (4)
Solution:
Presence of gullet – *Paramoecium*
Occurrence of spore-like stage in the life cycle – *Plasmodium*
Marine forms having silica shell on their surface – *Amoeboid* protozoan
Presence of pigments identical to higher plants – *Euglena*

(103) Answer : (3)
Solution:
The members of kingdom fungi cannot function as photoautotrophs.

(104) Answer : (2)
Solution:
The given characteristics are true for the members of the class basidiomycetes.
e.g. Agaricus

(105) Answer : (2)
Solution:
The criteria for classification under the two kingdom classification given by Linnaeus includes cell wall, locomotion, mode of nutrition, response to external stimuli and contractile system.

(106) Answer : (2)
Solution:
Yeast (*Saccharomyces*) belongs to the class, Ascomycetes.

(107) Answer : (1)
Solution:

Artificial system of classification was given by Aristotle and Linnaeus.

(108) Answer : (3)
Solution:
Oogamy may occur either between motile male gamete and egg or non-motile male gamete and egg.

(109) Answer : (1)
Solution:
Members of Chlorophyceae are rich in chlorophyll *a* and *b*.

(110) Answer : (2)
Solution:
Gymnosperms are archegoniate plants. They form pollen grains. *Cycas* is dioecious plant.
Main plant body in gymnosperms is independent free-living sporophyte.

(111) Answer : (4)
Solution:
Bryophytes and pteridophytes act as soil binders and prevent soil erosion.

(112) Answer : (4)
Solution:
Main plant body of bryophytes is haploid.

(113) Answer : (2)
Solution:
Bryophytes have little economical importance such as used as food by birds & mammals.

(114) Answer : (4)
Solution:
Certain marine brown and red algae produce large amounts of hydrocolloids. *e.g.*: algin (brown algae) and carrageen (red algae).

(115) Answer : (2)
Solution:
Viroids are smaller than viruses and lack protein coat.

(116) Answer : (2)
Solution:
Pellicle is present in Euglenoids. Diatoms are found in fresh water as well as in marine environments.

(117) Answer : (4)
Solution:
Members of Kingdom Protista are eukaryotes. They have membrane bound cell organelles.

(118) Answer : (3)
Solution:
According to R.H. Whittaker, kingdom portista includes all the unicellular eukaryotic organisms.

(119) Answer : (3)
Solution:
In some cyanobacteria such as *Nostoc*, N_2 fixation under anaerobic conditions occurs in specialized cells called heterocysts.

(120) Answer : (3)
Hint:
Protozoans are heterotrophic. Some protists, like euglenoids, do not have cell wall.
Solution:
Spores formed in the sporangium are dispersed by air currents. Dinoflagellates are mostly marine.

(121) Answer : (3)
Solution:
a. Diatoms - Their cell wall is embedded with silica.
b. *Euglena* shows mixotrophic mode of nutrition.
c. *Paramoecium* have two types of nuclei.
d. Dinoflagellates - *Gonyaulax* cause red tides.

(122) Answer : (3)
Solution:
The three-domain system divides kingdom Monera into two domains, leaving the remaining eukaryotic kingdoms in the third domain.

(123) **Answer :** (2)

Solution:

In members of ascomycetes asexual reproduction occurs by means of exogenous spores and sexual reproduction occurs by means of endogenous spores. It shows dikaryophase, in its sexual life cycle.

(124) **Answer :** (1)

Solution:

Mycoplasma are pathogenic in both plants and animals.

(125) **Answer :** (3)

Solution:

Lax is spirally arranged sporophylls in gymnosperms like *Cycas*.

(126) **Answer :** (4)

Solution:

Heterosporus pteridophytes (e.g. *Selaginella*) exhibit an event that is a precursor to seed habit.

(127) **Answer :** (4)

Solution:

In *Pinus*, the male or female cones or strobili may be borne on the same tree. The leaves are needle-like and stems are branched.

(128) **Answer :** (4)

Solution:

The given figure belongs to the brown alga, *Fucus* which contains mannitol and laminarin as the stored food. Agar is obtained from red algae. In red algae, stored food is floridean starch which is very similar to amylopectin and glycogen in structure.

(129) **Answer :** (4)

Solution:

The female gametophytes in these plants are retained on the parent sporophytes for variable periods.

(130) **Answer :** (1)

Solution:

Mosses differ from liverworts as the former have an elaborate mechanism of spore dispersal.

(131) **Answer :** (4)

Solution:

Reproduction in *Volvox* and *Fucus* is Oogamous. Pyrenoids store proteins besides starch. *Sphagnum* provides peat which is used as fuel.

(132) **Answer :** (3)

Solution:

Higher the category, fewer is the number of common characteristics in it.

(133) **Answer :** (3)

Solution:

Dog – Canidae
Cat, Tiger, Lion – Felidae
Man – Hominidae
Housefly - Muscidae

(134) **Answer :** (1)

Solution:

Rhizopus belongs to the group Phycomycetes. It has aseptate and coenocytic mycelium.

(135) **Answer :** (2)

Solution:

Marchantia is a liverwort.

ZOOLOGY

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(136) **Answer :** (2)

Solution:

Meiocytes are diploid cells, hence each meiocyte of human contains 46 chromosomes. The genetic make up of each female gamete is 22 + X.

(137) **Answer :** (1)
Solution:
The primary follicles get surrounded by more layers of granulosa cells and a new theca and are called secondary follicles.
The secondary follicle transforms into a tertiary follicle which is characterised by a fluid filled cavity called antrum.

(138) **Answer :** (4)
Solution:
Foreskin – Covering of enlarged end of male external genitalia
Clitoris – Part of female external genitalia
Corpus luteum – Endocrine in nature
Urethral meatus – External opening of urethra

(139) **Answer :** (4)
Solution:
The reproductive events that take place in human females include oogenesis, insemination, capacitation, fertilisation, implantation, gestation and parturition.

(140) **Answer :** (3)
Solution:
Ovum formation ceases in women around the age of 50 years.

(141) **Answer :** (4)
Solution:
Secretions of seminal vesicle, prostate gland and bulbourethral glands constitute the seminal plasma which is rich in fructose, calcium and certain enzymes.

(142) **Answer :** (1)
Solution:
In human males, spermatogenesis starts at the age of puberty due to significant increase in GnRH secretion from hypothalamus. Increased levels of GnRH stimulate the secretions of FSH and LH from anterior pituitary gland. LH acts on Leydig cells and stimulates androgen secretion. Androgen, in turn, stimulates the process of spermatogenesis.

(143) **Answer :** (1)
Solution:
Widespread use of contraceptives have a significant role in checking uncontrolled growth of population. However, their possible ill-effects like nausea, abdominal pain, breakthrough bleeding, irregular menstrual bleeding or even breast cancer, though not very significant, should not be totally ignored.

(144) **Answer :** (2)
Solution:
Fish with stout and strong fins could move on land and go back in water. This was about 350 mya. By the time 500 mya, invertebrates were formed and active.

(145) **Answer :** (4)
Solution:
Kangaroo, marsupial rat, flying phalanger and koala are Australian marsupials that exhibit adaptive radiation.
Lemur, bobcat and wolf are placental mammals.

(146) **Answer :** (2)
Hint:
About 20 feet in height
Solution:
The biggest dinosaur was *Tyrannosaurus rex*, about 20 feet in height and had huge fearsome dagger like teeth. The most successful story of evolution is the evolution of man with language skills and self consciousness.

(147) **Answer :** (4)
Solution:
About 15 mya *Dryopithecus* and *Ramapithecus* were existing. They were hairy and walked like gorillas and chimpanzees. *Ramapithecus* was more man-like while *Dryopithecus* was more ape-like.

(148) **Answer :** (4)
Solution:
An ideal contraceptive should be user-friendly, easily available, effective and reversible with no or least side-effects. It should in no way interfere with the sexual drive, desire and/or the sexual act of the user.

(149) **Answer :** (3)
Solution:
Condoms are disposable. Condoms protect the users from contracting STIs. Condoms are used to cover the penis in the male or vagina and cervix in female, just before coitus. Barriers like vaults, prevent conception by blocking the entry of sperms through the cervix.

(150) **Answer :** (2)

Solution:

Amniocentesis is used to test for the presence of certain genetic disorders such as, down syndrome, haemophilia, sickle-cell anemia, *etc*.

(151) **Answer :** (1)

Solution:

The world population in 1900 was 2 billion which became three times in 2000, *i.e.*, in the year 2000, the world population became 6 billion. In 2011, the Indian population was 1.2 billion and world population was 7.2 billion.

(152) **Answer :** (1)

Solution:

In human beings, after one month of pregnancy, the embryo's heart is formed.

(153) **Answer :** (3)

Solution:

The process of child birth is induced by a complex neuroendocrine mechanism involving cortisol, estrogens and oxytocin.

(154) **Answer :** (4)

Solution:

Diaphragms, cervical caps and vaults are barriers made up of rubber and inserted into female reproductive tract to cover the cervix during coitus.

(155) **Answer :** (1)

Solution:

The duration of luteal phase is of 14 days irrespective of the duration of menstrual cycle.

(156) **Answer :** (4)

Solution:

The common ancestor of Zosterophyllum and Rhynia-type plants was Tracheophyte ancestors. Tracheophyte-ancestors evolved from Chlorophyte ancestors.

(157) **Answer :** (2)

Solution:

Sauropsids were the common ancestors of snakes and crocodiles. They existed between Carboniferous and Permian periods.

(158) **Answer :** (3)

Solution:

Given that, 'A' = 0.6, hence according to Hardy-Weinberg equilibrium, p + q = 1,
a = 1 – p
= 1 – 0.6 = 0.4
Heterozygotes can be represented as 2 Aa *i.e.*,
2 × 0.6 × 0.4 = 0.48
Total number of heterozygous individuals
= 0.48 × 200 = 96

(159) **Answer :** (4)

Solution:

Gene flow, genetic drift, mutation, genetic recombination, natural selection and selective mating are factors known to affect Hardy-Weinberg equilibrium. Random mating maintains Hardy-Weinberg equilibrium.

(160) **Answer :** (2)

Solution:

Hint: Camouflage

Sol.: Lichens helped the light coloured moths to survive due to similarity in colour and the predating birds could not identify them. Mutations pre-existed in dark coloured moths and were not introduced by pollution.

(161) **Answer :** (2)

Hint:

Facilitate spermiation

Solution:

Male sex accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens. After spermiogenesis, sperm heads become embedded in the Sertoli cells, and are finally released from the seminiferous tubules by the process called spermiation. Sperm formation continues in old men also.

(162) **Answer :** (2)

Hint:
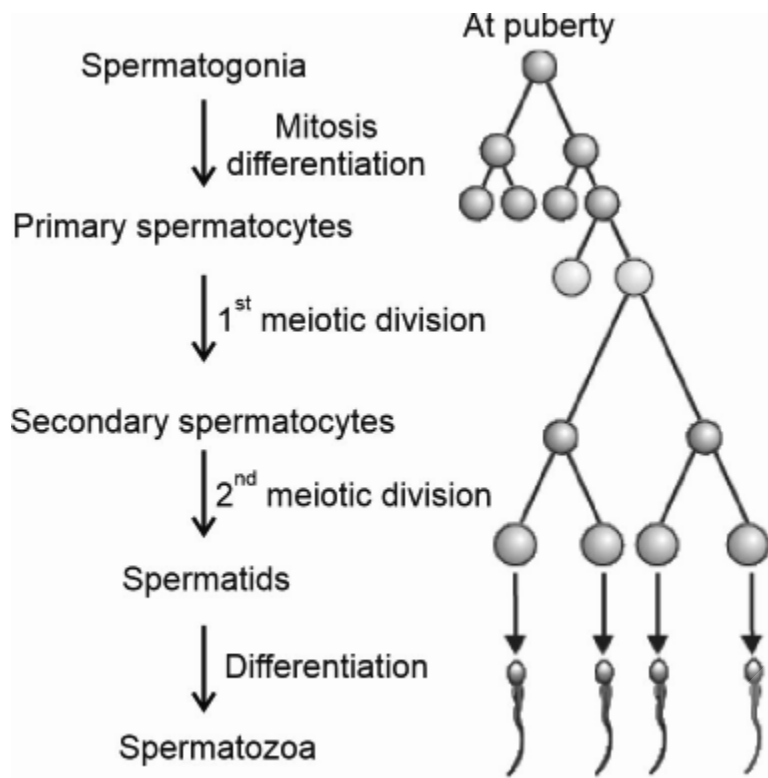
(163) Answer : (2)
Solution:
Entry of sperm into secondary oocyte induces second meiotic division and release of second polar body.

(164) Answer : (3)
Hint:
Structure which is present in testicular lobules
Solution:
Seminiferous tubules are present in testis which are lined by spermatogonium and Sertoli cells. Sertoli cells secrete some factors which help in spermiogenesis.

(165) Answer : (1)
Solution:
The ejaculatory duct opens into the urethra which is a common passage for urine and semen.

(166) Answer : (2)
Hint:
Reducing atmosphere
Solution:
In 1953, S.L. Miller, an American scientist, created similar conditions as that of primitive Earth in a laboratory scale. He created electric discharge in a closed flask containing CH_4, H_2, NH_3 and water vapours at 800°C. He observed the formation of different amino acids.

(167) Answer : (2)
Solution:
Genetic drift affects the Hardy-Weinberg equilibrium.

(168) Answer : (1)
Solution:
Forelimbs of mammals are example of homologous organs. Homologous organs are result of divergent evolution.

(169) Answer : (3)
Solution:
Herbicide and pesticide resistance developed in the weeds and pests, respectively after prolonged use of herbicides and pesticides. This is the result of evolution by anthropogenic action.

(170) Answer : (4)
Hint:
Geographical isolation prevents inter breeding.

Solution:
Geographical isolation prevents breeding in between isolated populations. As a result there is reduced gene flow that results in speciation.

(171) Answer : (2)
Solution:
The correct sequence of periods in geological time scale:
Carboniferous → Permian → Triassic → Jurassic → Cretaceous → Tertiary

(172) Answer : (3)
Hint:
Spontaneous generation was dismissed once and for all.
Solution:
Louis Pasteur by careful experimentation demonstrated that life comes only from pre-existing life. He showed that in pre-sterilised flask, life did not come from killed yeast while in another flask open to air, new living organisms arose from 'killed yeast'. Spontaneous generation theory was dismissed once and for all.

(173) Answer : (1)
Hint:
Low levels of pregnancy hormone
Solution:
Menstruation does not occur if ovum gets fertilized and implanted. It occurs when progesterone levels drop at the end of luteal phase. LH surge causes ovulation.

(174) Answer : (2)
Solution:
4 spermatids are formed by one meiotic division. Thus, 43 meiotic divisions will form 172 spermatids.

(175) Answer : (3)
Hint:
Gametes are the result of meiosis in humans.
Solution:
Human sperms are motile (flagella is present)
Sperms and ovum are haploid cells.
Distal centriole and spiral mitochondria are characteristics of sperms only.

(176) Answer : (3)
Solution:
In human females, at puberty only 60,000 to 80,000 primary follicles are left in each ovary.

(177) Answer : (4)
Hint:
Occurs in male primary reproductive organ
Solution:
Oral contraceptive pills for females inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent/retard entry of sperms. Spermiation involves release of sperms from Sertoli cells into the lumen of seminiferous tubules.

(178) Answer : (1)
Hint:
Located in Lucknow
Solution:
'Saheli' is a non-steroidal oral contraceptive pill developed by scientists at CDRI, Lucknow.
WHO (World Health Organization) is a specialized agency of the United Nations, responsible for international public health.
EFB gave the definition of biotechnology that encompasses both modern molecular biotechnology and traditional views.

(179) Answer : (1)
Hint:
Decline in MMR and IMR increases population growth
Solution:
A rapid decline in death rate, maternal mortality rate (MMR) and infant mortality rate (IMR) as well as an increase in number of people in reproducible age are the probable reasons for population explosion.

(180) Answer : (2)
Solution:
Oxytocin is synthesised and secreted in hypothalamus and is stored in neurohypophysis. Placenta secretes hCG, hPL, estrogen and progesterone.