All India Aakash Test Series for NEET - 2026

TEST - 4 (Code - I)

Click here for Code-J Sol.

Test Date : 23/02/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (4)

Hint: Use, $F = \frac{Gm_1m_2}{r^2}$

Sol.: $F_1 = F_2$

$$\frac{GM_1M_2}{r^2} = \frac{GM_1M_2'}{(2r)^2}$$

$$M_2' = 4M_2$$

% Increase

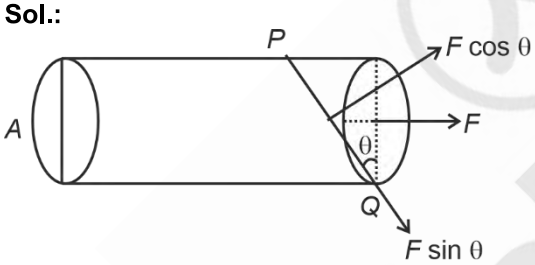
$$= \frac{M_2' - M_2}{M_2} \times 100 = \frac{4M_2 - M_2}{M_2} \times 100 = 300\%$$

2. Answer (2)

Hint: Normal stress = $\frac{F_{\text{Normal}}}{A'}$

Tangential stress = $\frac{F_{\text{Parallel}}}{A'}$

Sol.:



$$\frac{\text{Normal stress}}{\text{tangential stress}} = \frac{\frac{F\cos\theta}{A'}}{\frac{F\sin\theta}{A'}} = \cot\theta$$

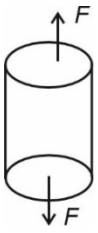
3. Answer (4)

Hint & Sol: Elastomers do not obey Hooke's law. In brittle material, plastic region is very small.

4. Answer (4)

Hint: Stress = $\frac{\text{Restoring force}}{\text{Area}}$

Sol.:



$$\text{Tensile stress} = \frac{\text{Normal force}}{\text{Area}}$$

5. Answer (2)

Hint: $h = \frac{2T}{r\rho g}\cos\theta$

hr = constant

Sol.: $h_1r_1 = h_2r_2$

$$9\left(\frac{0.5}{2}\right) = h_2\left(\frac{3}{2}\right)$$

h_2 = 1.5 cm

6. Answer (3)

Hint: Gravitational field intensity is zero inside a uniform spherical shell.

Sol.: Inside a uniform spherical shell, the gravitational force will be zero, no matter where the point mass m is located.

7. Answer (2)

Hint: & Sol.: A body can be loaded upto yield point and it can still return to its original dimension when the load is removed.

8. Answer (1)

Hint: Terminal velocity, $V_T = \frac{2}{9}\frac{r^2(\rho - \sigma)}{\eta}g$

Sol.:

$$\eta = \frac{2}{9} \times \frac{(10^{-3})^2 \text{m}^2[4.2\times10^3 - 1.2\times10^3]\,\text{kg/ m}^3}{2\times10^{-2}\text{ms}^{-1}} \times 10\ \text{m/s}^2$$

$$\eta = 3.3\times10^{-1}\text{kg m}^{-1}\text{s}^{-1}$$

9. Answer (1)

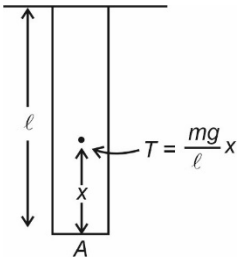
Hint: Characteristics of streamline flow.

Sol.: If at any given point, the velocity of each passing fluid particle remains constant in time, the flow of liquid is streamline flow.

10. Answer (4)

Hint: Energy density = $\frac{1}{2}\frac{(\text{stress})^2}{Y}$.

Sol.:



Energy density at x distance

$= \frac{1}{2Y}(\text{stress})^2 = \frac{1}{2Y}\left(\frac{mgx}{A\ell}\right)^2$

$= \frac{m^2g^2x^2}{2YA^2\ell^2}$

11. Answer (4)

Hint & Sol.: • Total energy of circularly orbiting satellite is negative.

- For elliptical orbiting satellite, both K.E and P.E vary from point to point.
- Satellite motion obeys Kepler's law of periods.
- Astronaut experiences weightlessness in a space satellite.

12. Answer (1)

Hint: Elongation, $\Delta\ell = \frac{FL}{AY}$

Sol.: $\Delta\ell = \frac{FL}{\pi r^2 Y} = \frac{10\times10^3(1)}{3.14\times(10^{-2})^2\times2\times10^{11}}$

$= 1.59 \times 10^{-4}$ m

$= 0.159$ mm

13. Answer (1)

Hint: $P_{absolute} = P_{atm} + h\rho g$

$P_{gauge} = h\rho g$

Sol.: Absolute pressure

$P = P_a + h\rho g$

$= 1.01 \times 10^5$ Pa + $(1.03 \times 10^3 \times 10 \times 1000)$

$= 104.01 \times 10^5$ Pa

Gauge pressure $= 1.03 \times 10^3 \times 10 \times 1000$

$\therefore$ Ratio = $\frac{104}{103} \simeq 1.01$

14. Answer (2)

Hint & Sol: (σ) Poisson's ratio = $\frac{\text{lateral strain}}{\text{longitudinal strain}}$

15. Answer (2)

Hint & Sol.: Variation of gravity with depth:

$g_{depth} = g\left[1-\frac{d}{R}\right]$

Sol.: $g' = g\left[1-\frac{d}{R}\right]$

$g' = g\left[1-\frac{R/2}{R}\right] = g\left[1-\frac{1}{2}\right] = \frac{g}{2}$

Here weight becomes half or weight decreases by 50%.

16. Answer (2)

Hint: Characteristics of elastic materials.

Sol.: Property of a body to regain its original shape and size, on removing the deforming force is elasticity.

17. Answer (1)

Hint & Sol.: Use, $h = \frac{2T\cos\theta}{r\rho g}$

$\theta < 90°$	$\cos\theta$ = +	Concave meniscus
$\theta > 90°$	$\cos\theta$ = (–)	Fall in capillary with convex meniscus
$\theta = 90°$	$\cos90° = 0$	No rise or fall in capillary

18. Answer (3)

Hint: Due to surface tension, free surface tends to occupy minimum surface area.

Sol.: Molecules on the surface of liquid have some extra potential energy as compared to interior molecules. Thus a liquid lends to occupy minimum surface area.

19. Answer (2)

Hint: Buoyant force $F_B = \rho Vg$

Sol.: $\frac{V_{immersed}}{V_{body}} = \frac{\rho_{body}}{\rho_{liquid}}$

For liquid $\Rightarrow \frac{1}{4} = \frac{\rho_{body}}{1.5\,\rho_{water}}$ …(i)

For water $\Rightarrow \frac{V_{immersed}}{V_{body}} = \frac{\rho_{body}}{\rho_{water}}$ …(ii)

$100\times\frac{V_{immersed}}{V_{body}} = \frac{1.5}{4}\times100 = 37.5\%$

20. Answer (1)

Hint: F_{net} = Upthrust – mg

Sol.: $F_{net} = V\rho_w g - V\rho_{body} g$.

$m_{body}a = Vg[1000 - 500]$

$$a = \frac{Vg[500]}{V500} = g$$

21. Answer (4)

Hint: Maximum load is independent of length and depends on nature of material and area of cross-section.

Sol.: Maximum load does not depend on the length of the wire.

22. Answer (4)

Hint: Properties of gravitational force.

Sol.: Gravitational force is conservative and central force in nature. It is also the weakest fundamental force in nature.

23. Answer (1)

Hint and Sol.:

- Mercury barometer is used to measure atmospheric pressure.
- Venturimeter is used to measure volumetric flow rate of incompressible fluid.
- Open tube manometer is used to measure pressure of gas.

24. Answer (3)

Hint: Use, $Y = \frac{F\ell}{A\Delta\ell}$

Sol.: $\Delta\ell = \frac{F\ell}{AY}$; $\Delta\ell \propto \frac{\ell}{d^2}$

$$\frac{\Delta\ell_1}{\Delta\ell_2} = \frac{\ell_1}{d_1^2}\frac{d_2^2}{\ell_2} = \frac{\ell_1}{\ell_2}\frac{d_2^2}{d_1^2}$$

$$= \frac{1}{4}\times\frac{4}{1} = \frac{1}{1}$$

25. Answer (1)

Hint & Sol.: For the circular motion of each particle, $\frac{mv^2}{r} = \frac{Gmm}{(2r)^2}$

$$v^2 = \frac{Gm}{4r}$$

$$v = \frac{1}{2}\sqrt{\frac{Gm}{r}}$$

26. Answer (3)

Hint: Use energy conservation.

Total energy at the height = Total energy outside the field.

Sol.: As per energy conservation

$$-\frac{GMm}{2R} + \frac{1}{2}mv_e^2 = 0$$

$$\frac{GMm}{2R} = \frac{1}{2}mv_e^2$$

$$v_e = \sqrt{\frac{GM}{R}}$$

27. Answer (2)

Hint: Required force = Weight of frame + force due to surface tension.

Sol.:

Force = mg + (Surface tension × length)

= mg + (S × 2 × 2πR)

= mg + 4πRS

28. Answer (1)

Hint: & Sol.: Torr is the unit of pressure.

29. Answer (3)

Hint: Use, $F = kx$

Sol.: $F = \frac{AY}{\ell}x$

$\therefore\ k = \frac{AY}{\ell}$

30. Answer (2)

Hint: Gravitational force is a conservation force.

Sol.: Gravitational force is a conservative force, hence work done is independent of path.

31. Answer (1)

Hint: Variation of acceleration due to gravity with height, $g' = g\frac{R^2}{(R+h)^2}$

Sol.: $g' = g\frac{R^2}{(R+h)^2}$

$$\frac{g}{4} = g\frac{R^2}{(R+h)^2} \Rightarrow 2R = R + h$$

$$\boxed{h = R}$$

32. Answer (1)

Hint: $\rho_{mixture} = \frac{M_1 + M_2}{V_1 + V_2}$

Sol.: $\rho_{mixture} = \frac{M_1 + M_2}{V_1 + V_2} = \frac{V\rho_1 + V\rho_2}{2V}$

$\rho_{mixture} = \frac{\rho_1 + \rho_2}{2}$

$5.5 = \frac{6 + \rho}{2} \Rightarrow \rho = 5$

33. Answer (1)

Hint: Energy stored in a wire = $\frac{1}{2}F\Delta\ell$

Sol.: Energy stored = $\frac{1}{2}F\Delta\ell$

$0.1 = \frac{1}{2}(200)(\Delta\ell)$

$\Delta\ell = 1\,\text{mm}$

34. Answer (1)

Hint: $v_{escape} = \sqrt{\frac{2GM}{R}}$

Sol.: $v = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G}{R} \times \rho \times \frac{4}{3}\pi R^3}$

$\Rightarrow v \propto R$

$\Rightarrow \frac{v_A}{v_B} = \frac{R_A}{R_B}$ and $R_A = 2R_B$

$\Rightarrow \frac{v_A}{v_B} = \frac{2}{1}$

35. Answer (2)

Hint: $\Delta U = U_f - U_i$

Sol.: $U_i = -\frac{GMm}{R+h}$

$U_i = -\frac{GMm}{R+nR}; U_f = \frac{-GMm}{R}$.

Change in gravitational potential energy is

$\Delta U = U_{surface} - U_{height}$

$= -\frac{GMm}{R} - \left[-\frac{GMm}{R(n+1)}\right]$

$= \frac{GMm}{R}\left[\frac{1}{n+1} - 1\right] = -\frac{GMm}{R}\left(\frac{n}{n+1}\right)$

$= \frac{-n}{n+1}(mgR)$.

36. Answer (4)

Hint: & Sol.: • Liquid drops are spherical due to surface tension.

• Pressure difference inside a spherical drop: $P_i - P_0 = \frac{2T}{r}$

• Capillary rise $h = \frac{2T\cos\theta}{r\rho g}$

37. Answer (3)

Hint & Sol.: Terminal velocity, $v_T = \frac{2}{9}\frac{r^2(\rho - \sigma)}{\eta}g$

Terminal velocity is independent of surface tension of liquid.

38. Answer (4)

Hint: Use equation of continuity and Bernoulli's theorem.

Sol.: As per equation of continuity

$A_1v_1 = A_2v_2$

$3Av_1 = Av_2$

$v_2 = 3v_1 \therefore v_2 > v_1$

By energy conservation using Bernoulli's theorem,

As $v_2 > v_1$

$\therefore P_2 < P_1$

39. Answer (4)

Hint: Work done = Increase in surface area × surface tension.

Sol.: $125\frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$

$5r = R$

Work done = $[125 \times 4\pi r^2 - 4\pi R^2]S$

$= (125r^2 - R^2)4\pi S$

$= (125r^2 - 25r^2)4\pi S$

$= (100r^2)4\pi S$

$= 400\pi r^2 S$

40. Answer (4)

Hint: & Sol.: Young's modulus is the property of solid material and is independent of dimensions or deforming force.

41. Answer (3)

Hint: Young's modulus $Y = \frac{W\ell}{A\Delta\ell}$

Sol.: $Y = \frac{\ell}{A} \times \left(\frac{W}{\Delta\ell}\right) = \frac{\ell}{A} \times (\text{slope})$

$= \frac{1}{0.1 \times (10^{-3})^2} \times \left(\frac{60-20}{3-1}\right) \times \frac{1}{10^{-3}}$

$= 10^7 \times 20 \times 10^3 = 2 \times 10^{11}$ N/m^2

42. Answer (3)

Hint: Angular momentum $L = mv_0r$

Sol.: $v_0 = \sqrt{\frac{GM}{r}}$

Angular momentum of satellite

$L = mv_0r$

$= m\sqrt{\frac{GM}{r}}.r$

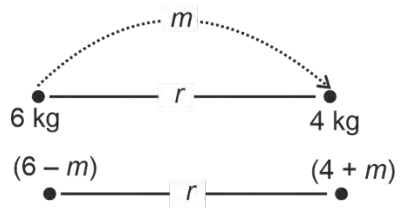
$= \sqrt{GMm^2r}$

43. Answer (2)

Hint: For maximum force

$\frac{dF}{dm} = 0$.

Sol.:



$F = \frac{G(6-m)(4+m)}{r^2}$

For maximum force $\frac{dF}{dm} = \frac{G}{r^2}\frac{d}{dm}(24 + 2m - m^2) = 0$

$0 = 2 - 2m$

$\therefore\ m = 1$ kg

44. Answer (4)

Hint: $V_{efflux} = \sqrt{2gD}$

Sol.: $H - D = \frac{1}{2} \times g \times t^2 \Rightarrow t = \sqrt{\frac{2(H-D)}{g}}$

Range = $X = \sqrt{2gD} \times \sqrt{\frac{2(H-D)}{g}}$

$= 2\sqrt{(H-D)(D)}$

45. Answer (1)

Hint & Sol.: Gravitational field intensity is non-zero outside a hollow spherical shell.

Gravitational field intensity inside a homogeneous solid sphere is towards the centre of the sphere.

[CHEMISTRY]

46. Answer (1)

Hint: $M(OH)_3 \rightleftharpoons M^{3+} + 3OH^-$

$p^{OH} = 14 - 10 = 4$

Sol.: $\left[\bar{OH}\right] = 10^{-4}$

$\left[M^{3+}\right] = \frac{10^{-4}}{3}$

$K_{sp} = [M^{3+}]\left[\bar{OH}\right]^3$

$K_{sp} = \frac{10^{-4}}{3} \times \left(10^{-4}\right)^3 = \frac{10^{-16}}{3} = 3.3 \times 10^{-17}$

47. Answer (3)

Hint: $2A + B \rightleftharpoons 2C$

$K_c = \frac{[C]^2}{[A]^2[B]}$

Sol.: $K_c = \frac{(0.01)^2}{0.02 \times (0.1)^2} = \frac{10^{-4}}{2 \times 10^{-2} \times 10^{-2}} = 0.5$

48. Answer (3)

Hint: For $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

$K_p = \frac{P_{PCl_5}}{P_{Cl_2} \times P_{PCl_3}}$

Sol.:

$PCl_5(g)$	$\rightleftharpoons$	$PCl_3(g)$	+	$Cl_2(g)$	
$1-\alpha$		α		α	(Male)
$\left(\frac{1-\alpha}{1+\alpha}\right)P$		$\frac{\alpha P}{1+\alpha}$		$\frac{\alpha P}{1+\alpha}$	(Partial pressure)

$K_p = \frac{P_{Cl_2} \times P_{PCl_3}}{P_{PCl_5}}$

$$= \frac{\frac{\alpha P}{(1+\alpha)} \times \frac{\alpha P}{(1+\alpha)}}{\frac{(1-\alpha)P}{1+\alpha}}$$

$$K_p = \frac{\alpha^2 P}{1-\alpha^2}$$

49. Answer (2)

Hint: Value of K_c depends upon concentration and stoichiometric constant both.

Sol.: For very small values of K_c, reactant will dominate the equilibrium mixture.

50. Answer (1)

Hint: For any gaseous reaction at equilibrium

$$K_p = K_c(RT)^{\Delta n_g}$$

Sol.: For $2A(g) \rightleftharpoons B(g) + 3C(g)$

$K_p = K_c(RT)^2$

$$\frac{K_p}{K_c} = (RT)^2$$

$$\log\left(\frac{K_p}{K_c}\right) = 2\log(RT)$$

$$\log\left(\frac{K_p}{K_c}\right) - 2\log(RT) = 0$$

51. Answer (2)

Hint: $A(g) + 2B(g) \rightleftharpoons C(g)$; $K_c = K$

$2A(g) + 4B(g) \rightleftharpoons 2C(g)$; $K_c = K^2$

Sol.: $C(g) \rightleftharpoons A(g) + 2B(g)$; $K_c = \frac{1}{K}$

$\frac{1}{2}C(g) \rightleftharpoons \frac{1}{2}A(g) + B(g)$; $K_c = \frac{1}{\sqrt{K}}$

$B(g) + \frac{1}{2}A(g) \rightleftharpoons \frac{1}{2}C(g)$; $K_c = \sqrt{K}$

52. Answer (4)

Hint: $N_2O_4(g) \rightleftharpoons 2NO_2(g)$

$$K_p = \frac{\left(P_{NO_2}\right)^2}{P_{N_2O_4}}$$

		$N_2O_4(g)$	$\rightleftharpoons$	$2NO_2(g)$
Sol.:	$t = 0$	100		0
	$t = t_{eq}$	$100 - p$		$2p$

$P_t = 100 - p + 2p$

$120 = 100 + p$

$p = 20$

$$K_p = \frac{(P_{NO})^2}{P_{N_2O_4}} = \frac{(2P)^2}{100-P} = \frac{40 \times 40}{80} = 20$$

53. Answer (2)

Hint: Equilibrium in a system having more than one phase is called heterogeneous equilibrium.

Sol.: $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$; Homogeneous

$KClO_3(s) \rightleftharpoons KCl(s) + \frac{3}{2}O_2(g)$; Heterogeneous

$N_2O_4(g) \rightleftharpoons 2NO_2(g)$; Homogeneous

$CaSO_4(s) \rightleftharpoons Ca^{2+}(aq) + SO_4^{2-}(aq)$; Heterogeneous

54. Answer (1)

Hint: Dissociation of $SO_3(g)$

$$SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$$

$$K_c = \frac{[SO_2][O_2]^{1/2}}{[SO_3]}$$

Sol.:	$SO_3(g)$	$\rightleftharpoons$	$SO_2(g)+$	$\frac{1}{2}O_2(g)$
$t = 0$	1		0	0
$t = t$	$1-\alpha$		α	$\frac{\alpha}{2}$
	$1 - 0.2$		0.2	0.1

$$K_c = \frac{0.2 \times (0.1)^{1/2}}{0.8} = \frac{1}{4 \times \sqrt{10}} = 0.08$$

55. Answer (1)

Hint: More electronegativity is the element attached with hydrogen, more is the acidic nature of compound.

Sol.: Electronegativity of F is more than O then HF is stronger acid than H_2O.

56. Answer (2)

Hint: At equilibrium $\Delta G = 0$

Sol.: $\Delta G = \Delta G^\circ + 2.303\ RT \log K$

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

57. Answer (4)

Hint: pH = 14 – pOH

Sol.: For 0.01 M KOH

pOH = $-\log 10^{-2} = 2$

pH = 14 – 2 = 12

58. Answer (3)

Hint: For weak monobasic acid

$$\alpha = \sqrt{\frac{K_a}{C}}$$

Sol.: For CH_3COOH

$$\alpha = \sqrt{\frac{1.8\times10^{-5}}{0.1}}$$

$= 1.34 \times 10^{-2}$

59. Answer (1)

Hint: pH of solution increases on decrease in concentration of H^+ ion.

Sol.: KCN will undergo anionic hydrolysis which will result into basic solution.

Addition of water (dilution) will decrease the H^+ ion concentration.

60. Answer (3)

Hint: Due to hydrolysis of aqueous salt solution, pH of solution changes.

Sol.: For aq CH_3COONa anionic hydrolysis will take place and solution will be basic hence pH > 7

- For aq CH_3NH_3Cl cationic hydrolysis will take place and solution will be acidic hence pH < 7
- For aq NaCl solution no hydrolysis will take place and solution will be neutral hence pH = 7
- On increasing temperature beyond 25°C pH of water drops below 7, keeping it neutral.

61. Answer (1)

Hint: For mixing of two HCl solutions

$$[H^+]_{net} = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$$

Sol.: $$[H^+]_{net} = \frac{10^{-2}\times V + 10^{-4}V}{2V}$$

$$= \frac{101\times10^{-4}}{2} = 50.5\times10^{-4}$$

pH = $-\log(5.05 \times 10^{-3})$

= 2.3

62. Answer (2)

Hint: Conjugate base is obtained by removal of one H^+ from the given species.

Sol.: $HCO_3^- + H^+ \longrightarrow \underset{\text{conjuagate acid}}{H_2CO_3}$

$HCO_3^- \longrightarrow \underset{\text{Conjugate base}}{CO_3^{2-}} + H^+$

63. Answer (4)

Hint: Dissociation of weak electrolyte decreases due to common ion effect.

Solution: Strong electrolyte KCN will impart common ion effect on weak electrolyte HCN, which will result into decrease in dissociation of HCN

Mixture of weak electrolyte and strong electrolyte with at least one ion common can show common ion effect.

64. Answer (3)

Hint: Mixture of a weak acid/base and its salt with strong base/acid gives a buffer solution.

Sol.: Aqueous solution of weak acid weak base (WAWB) type of salt can form a simple buffer.

Hence (aq) CH_3COONH_4 is a buffer.

65. Answer (1)

Hint.: Number of H^+ ions = $M \times V_{(L)} \times N_A$

Sol: For 0.1 M, 100 mL NaOH solution

pH = 14 – 1 = 13

$M = [H^+] = 10^{-13}$

Number of H^+ ions

$= 10^{-13} \times 1 \times 10^{-1} \times 6.02 \times 10^{23}$

$= 6.02 \times 10^9$

66. Answer (1)

Hint: Solubility of sparingly soluble salt decreases due to common ion effect

Sol.: $\underset{C-s}{AgCl(s)} \rightleftharpoons \underset{s}{Ag^+(aq)} + \underset{s+0.25\approx0.25}{Cl^-(aq)}$

$K_{sp} = [Ag^+]\,[Cl^-]$

$= s \times (s + 0.25)$

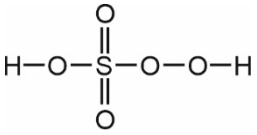
$10^{-10} = 0.25 \times s$

$s = 4 \times 10^{-10}$

67. Answer (4)

Hint: Oxidation state of sulphur cannot be more than +6

Sol.: For H_2SO_5



Oxidation state of S = +6

68. Answer (3)

Hint: Mixed salt may have two different oxidation state of element

Sol.:

Oxidation state of Al is +3 in Al_2O_3

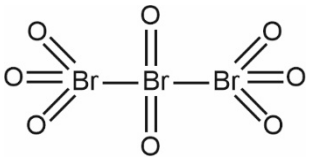
Oxidation state of Mn in Mn_2O_3 is +3

Oxidation state of Fe is +2 and +3 in Fe_3O_4

Oxidation state of Na is +1 in Na_2O

69. Answer (1)

Hint: Structure of Br_3O_8



Sol.: Oxidation state of middle Br = +4

Oxidation state of terminal Br = +6

70. Answer (2)

Hint: Oxidising agent are required for oxidation process.

Sol.:

$2Cl^- \rightarrow Cl_2$ (oxidation)

$SO_2 \rightarrow SO_3$ (oxidation)

$Cr_2O_7^{2-} \rightarrow Cr^{3+}$ (reduction)

$SnCl_4 \rightarrow SnCl_2$ (reduction)

71. Answer (4)

Hint & Sol.: Oxidising agent gets reduced during redox reaction.

72. Answer (4)

Hint: Oxidation states of some elements changes during a redox reaction.

Sol.: $KClO_3 \xrightarrow{\Delta} KCl + O_2$

; Decomposition redox

$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

; Metal displacement redox

$Na + H_2O \rightarrow NaOH + H_2$

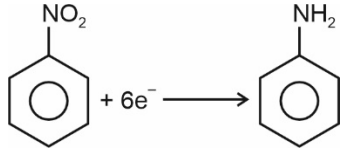
; Non-metal displacement redox

$CaCO_3 \rightarrow CaO + CO_2$; Non-redox

73. Answer (4)

Hint: Number of moles of electrons required for redox change of 1 mol substance is equal to valency factor of that substance.

Sol.:



n-factor of nitrobenzene = 6

hence number of moles of electron required are 6 mol.

74. Answer (2)

Hint: Oxidation and reduction of same element takes place during a disproportionation reaction.

Sol.: $2H_2 + O_2 \rightarrow 2H_2O \Rightarrow$ Combination reaction

$Cl_2 + NaOH \rightarrow NaCl + NaOCl \Rightarrow$ Disproportionation

$PCl_5 \rightarrow PCl_3 + Cl_2 \Rightarrow$ Decomposition

75. Answer (3)

Hint: Oxidation state of CO in metal carbonyls is zero

Sol.: In $Fe(CO)_5$, CO has zero charge hence Fe will have zero oxidation state.

76. Answer (3)

Hint: Metal with positive value of standard reduction potential for cations does not liberate H_2 gas from dilute acid solution.

Sol.: Standard reduction potential for Cu^{2+}/Cu is +0.34 hence it will not liberate H_2 gas from dilute H_2SO_4 solution

77. Answer (4)

Hint: Compound with maximum n-factor will require maximum number of mole of acidic $KMnO_4$ for oxidation

Sol.: n-factor of FeC_2O_4 is 3

n-factor of SO_2 is 2

n-factor of $NaNO_2$ is 2

n-factor of $Al_2(C_2O_4)_3$ is 6

78. Answer (1)

Hint: Arithmetic sum of Oxidation states of all the atom in a neutral compound must be zero.

Sol.: For $A(BC_2)_2$ arithmetic sum of Oxidation states of all the atoms is zero.

79. Answer (2)

Hint & Sol.: Catalyst does not affect the equilibrium composition of the reaction mixture.

80. Answer (3)

Hint: Oxidation state of non-metal in NaH is –1

Sol.: Oxidation state of non-metal in ZnS is –2

Oxidation state of non-metal Cl in Cl_2O_7 is +7

Oxidation state of non-metal in Al_2O_3 is –2

81. Answer (3)

Hint: For gaseous equilibrium

$$K_p = K_c(RT)^{\Delta n_g}$$

Sol.: For $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

$K_p = K_c(RT)^1$

$= 0.2(0.0821 \times 300)^1$

$= 4.92$

82. Answer (4)

Hint: Introduction of inert gas at constant volume and temperature does not affect the equilibrium state of a gaseous reaction.

Sol.: Partial pressure of reacting gases is unchanged on introduction of inert gas at constant volume hence there is no change in equilibrium state

Introduction of inert gas at constant pressure and temperature shifts equilibrium towards more number of gaseous moles.

83. Answer (3)

Hint: For conjugate acid base pair

$K_a \times K_b = K_w$

Sol.: At 25°C

$K_a \times K_b = 10^{-14}$

$4 \times 10^{-10} \times K_b = 10^{-14}$

$K_b = 2.5 \times 10^{-5}$

84. Answer (4)

Hint: $NH_4Cl(aq)$ will undergo cationic hydrolysis and will give acidic solution.

Sol.: $$pH = 7 - \frac{1}{2}pK_a - \frac{1}{2}\log C$$

$$= 7 - \frac{1}{2}(4.76 + \log 0.1)$$

$$= 7 - \frac{1}{2} \times 3.76$$

$= 7 - 1.88$

$= 5.12$

85. Answer (1)

Hint: Neutralisation of weak acid and strong base may give buffer solution.

Sol.: Neutralisation of CH_3COOH with NaOH as limiting reagent will result in acidic buffer.

	CH_3COOH	+	NaOH	⟶	CH_3COONa	+	H_2O
t = 0	(100 × 0.1) mmol		(50 × 0.1)m mol		0		0
t = t	5 mmol		0		5 mmol		

This solution form acidic buffer.

86. Answer (3)

Hint: According to Dalton's law

$P_{gas} = P_T \times \chi_{gas}$

Sol.: For

	A(s)	⇌	B(g)	+	2C(g)
t = 0	a		0		0
t = t	a – x		x		2x

$$\chi_B = \frac{x}{3x} = \frac{1}{3}$$

$$\chi_C = \frac{2x}{3x} = \frac{2}{3}$$

$$P_B = \frac{1}{3} \times 9 = 3$$

$$P_C = \frac{2}{3} \times 9 = 6$$

$K_P = (6)^2 \times 3 = 108$

87. Answer (4)

Hint: Solubility of sparingly soluble salt increases due to complex ion formation which is soluble in water.

Sol.: Since $Ag^+(aq)$ will form $(Ag(NH_3)_2)^+$ with $NH_4OH(aq)$, solubility of AgCl will increase.

88. Answer (1)

Hint: As standard reduction potential increases, reducing power of metal decreases.

Sol.: Since $E^\circ_{B^{2+}/B}$ is minimum, B will be best reducing agent.

89. Answer (2)

Hint: Element with high value of standard reduction potential is good oxidising agent.

Sol.: Since $E^{\circ}_{A^{2+}/A} > E^{\circ}_{B^{2+}/B}$, A will be insoluble in BSO_4.

Since $E^{\circ}_{A^{2+}/A} > E^{\circ}_{C^{2+}/C}$, C will be soluble in $A(NO_3)_2$

C^{2+} has least standard reduction potential hence it will be weakest oxidising agent.

$B(s) + CSO_4 \rightarrow BSO_4 + C(s)$, is nonspontaneous hence will have negative EMF.

90. Answer (2)

Hint: $CaSO_4(s) \rightleftharpoons Ca^{2+}(aq) + SO_4^{2-}(aq)$

$K_{sp} = \left[Ca^{2+}\right]\left[SO_4^{2-}\right]$

Sol.: Molar solubility of the salt = $\frac{0.408}{136}$ mol L^{-1}

$= 3 \times 10^{-3}$ mol L^{-1}

$K_{sp} = 3 \times 10^{-3} \times 3 \times 10^{-3}$

$= 9 \times 10^{-6}$

[BOTANY]

91. Answer (3)

Hint: Pteridophytes are the first terrestrial plants to possess vascular tissue.

Sol.: In pteridophytes, dominant plant body is a sporophyte. Prothallus is the gametophytic stage of the pteridophytes which is multicellular, free-living and mostly photosynthetic. They have motile male gametes.

92. Answer (2)

Hint: Two gametes of dissimilar size are found in *Eudorina.*

Sol.: Similar sized, flagellated gametes are found in *Ulothrix* and non-flagellated gametes occur in *Spirogyra*. *Fucus* shows oogamy

93. Answer (3)

Hint: *Polysiphonia* is a red alga.

Sol.: Red algae reproduce vegetatively by fragmentation. They reproduce asexually by non-motile spores and sexually by non-motile gametes.

94. Answer (4)

Hint: In bryophytes, zygotes do not undergo reduction division immediately.

Sol.: The sporophyte in mosses is more elaborate than in liverworts.

95. Answer (2)

Hint: Prothallus is the gametophytic stage in pteridophytes.

Sol.: The first stage in the life cycle of moss is protonema stage, which is a creeping, green, branched and frequently filamentous stage.

96. Answer (4)

Hint: *Psilotum* belongs to the class Psilopsida.

Sol.:

Lycopsida	–	*Lycopodium, Selaginella*
Sphenopsida	–	*Equisetum*
Pteropsida	–	*Dryopteris, Pteris, Adiantum*

97. Answer (2)

Hint: Biflagellated antherozoids are produced by bryophytes.

Sol.: Bryophytes are the first embryophytes and they lack vascular tissue.

98. Answer (4)

Hint: In pteridophytes, main plant body is differentiated into true stem, leaves and roots.

Sol.: *Equisetum* is a pteridophyte.

99. Answer (3)

Hint: The given figure represents *Dictyota*.

Sol.: *Dictyota* belongs to the class, phaeophyceae. Asexual reproduction in most brown algae takes place by biflagellate zoospores. Union of gametes may take place in water or within the oogonium in the oogamous species.

100. Answer (1)

Hint: *Volvox* is a colonial alga.

Sol.:

Kelps	–	Profusely branched and possessing carotenoids
Selaginella	–	Female gametophyte retained on parent sporophyte for variable periods
Pinus	–	Male and female cone borne on the same tree

101. Answer (2)

Hint: In *Pinus,* roots have fungal association in the form of mycorrhiza.

Sol.: Coralloid roots of *Cycas* are associated with N_2 - fixing cyanobacteria.

102. Answer (4)

Hint: In conifers, needle-like leaves are present.

Sol.: *Ginkgo* possesses fan-shaped leaves.

103. Answer (2)

Hint: Prothallus is the free-living gametophyte in pteridophytes.

Sol.: In liverworts, spores germinate to form free-living gametophyte.

104. Answer (3)

Hint: Red algae lack motile structures.

Sol.: Both green algae and brown algae possess motile asexual spores.

105. Answer (4)

Hint: Artificial system of classification gave equal weightage to vegetative and sexual characteristics.

Sol.: Natural system of classification was based on natural affinities among the organisms and considered not only the external features, but also internal features.

106. Answer (1)

Hint: Algin is a constituent of the cell wall of brown algae.

Sol.: Green algae usually have a rigid cell wall made up of an inner layer of cellulose and an outer layer of pectose.

107. Answer (2)

Hint: Sporophyte is the main plant body in pteridophytes.

Sol.: Zygote produces a multicellular well-differentiated sporophyte. In pteridophyte, development of zygote take place within the female gametophyte.

108. Answer (2)

Hint: In gymnosperms, ovules are borne on megasporophylls which may be clustered to form female cones.

Sol.: Female cones are absent in *Cycas*.

109. Answer (3)

Hint: As electrons move through the photosystems, protons are transported across the thylakoid membrane.

Sol.: Primary acceptor of electron which is located towards the outer side of the thylakoid membrane transfers its electrons not to an electron carrier but to a H carrier.

110. Answer (4)

Hint: Dictyosomes are separate units of Golgi body found in plant cells.

Sol.: Organelles involved in photorespiration are chloroplast, peroxisome and mitochondria.

111. Answer (1)

Hint: Jan Ingenhousz showed that in the presence of sunlight, it is only the green parts of the plants that could release oxygen.

Sol.:

Joseph Priestley	–	Plants restore the air whatever breathing animals and burning candle remove
T.W. Engelmann	–	Observed that the bacteria accumulated mainly in the region of blue and red light of the split spectrum

112. Answer (4)

Hint: *Sorghum* is a C_4 plant

Sol.: *Sorghum* being a C_4 plant has Kranz anatomy in their leaves.

113. Answer (2)

Hint: Assimilation of CO_2 to carbohydrates occurs in biosynthetic phase of photosynthesis.

Sol.: Light reaction involves formation of high-energy chemical intermediates, ATP and NADPH and include light absorption, water splitting and release of oxygen.

114. Answer (3)

Hint: Ferredoxin accepts electrons from PS I

Sol.: Plastocyanin accepts the electrons from cytochrome b_6f in non-cyclic photophosphorylation.

115. Answer (4)

Hint: Temperature is an external factor that affects the rate of photosynthesis.

Sol.: The plant factors include the number, size, age and orientation of leaves, mesophyll cells and chloroplasts, internal CO_2 concentration and the amount of chlorophyll.

116. Answer (2)

Hint: Photorespiration occurs in C_3 plants.

Sol.: Binding of O_2 and CO_2 to RuBisCO is competitive. The substrate molecule for the activity of RuBisCO is a 5-Carbon compound, named RuBP (Ribulose bisphosphate). The plant or internal factors are dependent on the genetic predisposition and the growth of plants.

117. Answer (4)

Hint: Within the chloroplast, protons in the stroma decrease in number, while in the lumen there is accumulation of protons.

Sol.: The H carrier removes a proton from the stroma while transporting an electron. When this molecule passes on its electrons to the electron carrier on the inner side of membrane, the proton is released into the lumen of membrane.

118. Answer (2)

Hint: C_4 cycle and CAM pathway are restricted to certain plants.

Sol.: Calvin cycle is seen in all the plants.

119. Answer (4)

Sol.: The process of cyclic photophosphorylation cannot occur in absence of PS I.

120. Answer (2)

Hint: Grana are absent in bundle sheath cells.

Sol.: Both bundle sheath cells and mesophyll cells are involved in CO_2 fixation.

121. Answer (4)

Hint: Antenna molecules or accessory pigments are also called the shield pigments.

Sol.: Action spectrum of photosynthesis closely corresponds to the absorption spectrum of the chief photosynthetic pigment, chlorophyll *a*

122. Answer (1)

Hint: C_4 plants respond to higher temperature and show higher rate of photosynthesis as compare to C_3 plants.

Sol.: The dark reactions being enzymatic are temperature controlled.

123. Answer (4)

Hint: C_3 and C_4 plants respond differently to CO_2 concentrations.

Sol.: C_3 plants respond to higher CO_2 concentration by showing increased rates of photosynthesis.

124. Answer (2)

Hint: Water stress causes the stomata to close.

Sol.: Water stress also leads to the wilting of leaves, thus reducing their surface area as well as their metabolic activity.

125. Answer (3)

Hint: In PS I, the reaction centre is P_{700}.

Sol.: PS I is associated with cyclic and non-cyclic flow of electrons but PS I is not associated with splitting of water.

126. Answer (2)

Hint: Sporophyte represents the dominant phase in the life cycle of pteridophytes.

Sol.: Fusion of male gamete with the egg present in archegonium results in the formation of zygote. Zygote thereafter produces a multicellular well differentiate sporophyte.

127. Answer (3)

Hint: Cytotaxonomy/Karyotaxonomy is based on the cytological information like chromosome number, structure and behaviour.

Sol.: Chemotaxonomy is based on chemical constituents of the plants.

128. Answer (4)

Hint: Linnaeus and Aristotle gave the artificial system of classification.

Sol.: George Bentham and Joseph Dalton Hooker gave the natural system of classification.

129. Answer (3)

Hint: The food is stored as floridean starch in the members of Rhodophyceae.

Sol.: Floridean starch is very similar in structure to amylopectin and glycogen.

130. Answer (4)

Hint: In gymnosperms, endosperm represents the female gametophyte

Sol.: Megasporangium contains multicellular female gametophyte that bears two or more archegonia or female sex organ.

131. Answer (1)

Hint: *Pinus* is a gymnosperm.

Sol.: Unlike bryophytes and pteridophytes, in gymnosperms, the male and female gametophytes do not have an independent free-living existence.

132. Answer (2)

Sol.: Bryophytes are also called amphibians of the plant kingdom because these plants can live in soil but are dependent on water for sexual reproduction.

133. Answer (2)

Hint: PGA (3-carbon compound) is the first stable product of CO_2 fixation in C_3 plants

Sol.: In C_4 plants, the first stable product of CO_2 fixation is an organic acid (Oxaloacetic acid) which has 4-carbon atoms in it.

134. Answer (2)

Hint: Products of light reaction are ATP, NADPH and O_2.

Sol.: O_2 diffuses out of the chloroplast, while ATP and NADPH are used to drive the processes leading to the synthesis of food. The effect of water as a factor is more through its effect on the plant, rather than directly on photosynthesis.

135. Answer (3)

Hint: Chlorophyll *b* appears yellow green in colour in the chromatogram.

Sol.: Chlorophyll *a* is the major or chief pigment associated with photosynthesis.

[ZOOLOGY]

136. Answer (4)

Hint: Exclude the enzymes

Sol.: Hormones are released from endocrine glands, they are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts. Enzymes act as biocatalysts.

137. Answer (3)

Hint: Exhibiting bilateral symmetry

Sol.: Bilateral symmetry is seen in annelids, arthropods, *etc*. Sponges are mostly asymmetrical whereas radial symmetry is seen in coelenterates, ctenophores and adult echinoderms.

138. Answer (3)

Hint: Member of the phylum Platyhelminthes

Sol.: *Fasciola* belongs to the phylum Platyhelminthes. Animals belonging to this group are bilaterally symmetrical, triploblastic and acoelomates.

Meandrina, *Adamsia* and *Gorgonia* belong to the phylum Coelenterata. They are radially symmetrical.

139. Answer (1)

Hint: Dorsal to pituitary gland

Sol.: Hypothalamus is the basal part of diencephalon, forebrain and it regulates a wide spectrum of body functions. It contains several groups of neurosecretory cells called nuclei which produce hormones.

140. Answer (2)

Hint: A coelenterate

Sol.: Ctenophores (*Ctenoplana*) are exclusively marine, radially symmetrical and diploblastic organisms.

Cnidarians are mostly marine with some fresh water forms like *Hydra*. *Ophiura* and *Balanoglossus* are found in marine water.

141. Answer (2)

Hint: Active transport

Sol.: Ionic gradient across resting membrane is maintained by sodium potassium pump by active transport of ions which transport Na^+ and K^+. Voltage gated channels are involved during repolarization and depolarization after stimulation.

142. Answer (3)

Hint: Birth hormone

Sol.: Neurohypophysis (pars nervosa) stores and releases two hormones called oxytocin and vasopressin, which are actually synthesised by the hypothalamus and are transported axonally to neurohypophysis. ADH acts mainly at kidney and stimulates reabsorption of water. Somatostatin inhibits the release of growth hormone from pituitary.

143. Answer (3)

Hint: Gland which secretes thymosin

Sol.: Hypothalamus possesses the center for control of body temperature. Thyroid gland plays an important role in regulation of BMR, thus, influences body temperature. Pineal gland also influences body temperature. Thymus gland secretes thymosins which play major role in the differentiation of T-lymphocytes.

144. Answer (1)

Hint: Also called Leydig cells

Sol.: Leydig cells also called interstitial cells are present in intertubular spaces in testis and produce a group of hormones called androgens.

- Testis is composed of seminiferous tubules and stromal tissue.
- Male accessory sex organs are epididymis, vas deferens, seminal vesicles, prostate gland, *etc*.

145. Answer (1)

Hint: Causes ascariasis

Sol.: In *Ascaris* (Roundworm), sexes are separate *i.e*., males and females are distinct, often females are longer than males. *Taenia* (Tapeworm), *Pheretima* (Earthworm) and *Hirudinaria* (blood sucking leech) are monoecious.

146. Answer (4)

Hint: Characteristic features of molluscs

Sol.: Phylum Mollusca is the second largest animal phylum. Body of most of the molluscs is covered by calcareous shell and is unsegmented with a distinct head, muscular foot and visceral hump. Their mouth contains a file-like rasping organ for feeding called radula.

Examples of molluscs: *Pila* (Apple snail), *Pinctada* (Pearl oyster)

147. Answer (3)

Hint: Feature of echinoderms

Sol.: Echinoderms (spiny bodied) are animals that have an endoskeleton of calcareous ossicles. The most distinctive feature is presence of water vascular system. An excretory system is absent. Reproduction is sexual. The adult echinoderms are radially symmetrical but their larvae are bilaterally symmetrical.

- Water canal system is distinctive feature of sponges.

148. Answer (2)

Hint: Location of unmyelinated nerve fibres

Sol.: Unmyelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath around the axon and is commonly found in autonomous and the somatic neural systems which are parts of peripheral nervous system.

149. Answer (3)

Hint: Prolonged hyperglycaemia

Sol.: Prolonged hyperglycaemia leads to a complex disorder called diabetes mellitus which is associated with loss of glucose through urine and formation of harmful compounds known as ketone bodies.

Insulin enhances rapid movement of glucose from blood to hepatocytes and adipocytes resulting in decreased glucose levels and stimulates conversion of glucose to glycogen (glycogenesis).

150. Answer (2)

Hint: Source of emergency hormones

Sol.: The adrenal medulla secretes two hormones called adrenaline and noradrenaline which are commonly called catecholamines. The adrenal cortex can be divided into three layers, called zona reticularis (inner layer), zona fasciculata (middle layer) and zona glomerulosa (outer layer).

151. Answer (3)

Hint: Seminiferous tubules are present in testis

Sol.: The thyroid gland is composed of thyroid follicles and stromal tissues.

Both the lobes of the gland are interconnected with a thin flap of connective tissue called isthmus.

152. Answer (4)

Hint: Role of thyroid gland

Sol.: Patient is suffering from exopthalmic goitre, a form of hyperthyroidism. Thyroid hormones influence the maintenance of water and electrolyte balance.

Thyroid gland also secretes a peptide hormone called thyrocalcitonin which regulates the blood calcium level.

Androgens stimulate the growth of facial and axillary hair in males.

153. Answer (4)

Hint: Feature of chemical synapse

Solution: Chemicals called neurotransmitters filled in the vesicles in axon terminals are involved in the transmission of impulse in chemical synapse.

Electrical synapse is rare in our system.

Transmission of impulse in electrical synapse is very similar to impulse conduction along a single axon.

154. Answer (3)

Hint: Hormone which acts on exocrine pancreas

Sol.:

Gastrin	–	Stimulates secretion of gastric gland
CCK (cholecystokinin)	–	Stimulates the secretion of pancreatic enzymes and bile juice
Secretin	–	Stimulates secretion of water and bicarbonate ions from exocrine pancreas
GIP (Gastric inhibitory peptide)	–	Inhibits gastric secretion and motility

155. Answer (2)

Hint.: Members of phylum Echinodermata

Sol: The most distinctive features of echinoderms is presence of water vascular system.

- *Asterias*, *Ophiura*, *Antedon*, *Echinus*, *Cucumaria* – Echinoderm
- *Ancyclostoma* – Aschelminth
- *Gorgonia*, *Adamsia* – Coelenterates
- *Aplysia*, *Sepia* – Molluscs

156. Answer (4)

Hint: Circulatory system in arthropods

Sol.: In hemichordates, a structure similar to notochord called stomochord is present. They have gills for respiration, fertilisation is external with indirect development. Circulatory system is of open type.

157. Answer (2)

Hint: Action of peptide hormone

Sol.: ANF is a peptide hormone secreted from atrial wall of human heart which decreases blood pressure by causing dilation of the blood vessels.

Erythropoietin stimulates erythropoiesis. Thyroxine binds to the intracellular receptors and ANF binds to the membrane-bound receptors in target cells.

158. Answer (1)

Hint: Example is cortisol

Sol.: Glucocorticoids stimulate gluconeogenesis, lipolysis and proteolysis. They inhibit cellular uptake and utilisation of amino acids. They stimulate RBCs production and produce anti inflammatory reactions by suppressing immune responses.

159. Answer (3)

Hint: Exclude the vector of filariasis

Sol.:

Living fossil – *Limulus*

Mosquitoes – *Culex, Anopheles* and *Aedes*

Gregarious pest – *Locusta*

Economically important insects – *Apis*, *Bombyx*, *Laccifer*

160. Answer (1)

Hint: Multipolar neurons have one axon and two or more dendrites

Sol.: Based on number of axon and dendrites, the neurons are divided into three types, *i.e.*, multipolar (found in cerebral cortex), bipolar (found in the retina of the eye) and unipolar (found usually in the embryonic stage).

Pseudounipolar neurons are found in the dorsal root ganglia of spinal nerves.

161. Answer (4)

Hint: Second largest animal phylum

Sol.:

(1)	Coelenterata	Cnidoblasts	Sea-pen, Sea-fan
(2)	Platyhelminthes	Dorso-ventrally flattened body	Liver fluke, Tapeworm
(3)	Echinodermata	Water vascular system	Sea lily, Sea urchin
(4)	Mollusca	Feather-like gills	Sea hare, cuttle fish

Choanocytes are characteristic cells of sponges.

Aschelminthes are circular in cross section. example- roundworm.

162. Answer (2)

Hint: Neither clearly sensory nor motor.

Sol.: The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function called association areas responsible for complex functions like intersensory associations, memory and communication. Thalamus is major coordinating centre for sensory and motor signaling. The cerebral cortex is also referred to as grey matter.

163. Answer (4)

Hint: Location of thymus gland

Sol.: Thymus gland is responsible for development of cell mediated immunity and it is located between lungs behind sternum on the ventral side of aorta. Thyroid gland is located on either side of trachea.

164. Answer (3)

Hint: Not a function of parathormone

Sol.: Parathyroid glands secrete a peptide hormone called parathyroid hormone. The secretion of PTH is regulated by the circulating levels of calcium ions. PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food.

165. Answer (1)

Hint: Function of midbrain

Sol.: Midbrain is located between the hypothalamus/thalamus of forebrain and pons of the hindbrain, they receive and integrate visual, tactile and auditory inputs.

166. Answer (1)

Hint: Functions of limbic lobe

Sol.: The inner parts of cerebral hemispheres and a group of associated deep structures like amygdala, hippocampus, *etc.*, form the complex structure called the limbic lobe or limbic system. Along with the hypothalamus, it is involved in the regulation of sexual behaviour, expression of emotional reactions (*e.g.* excitement, pleasure, rage and fear) and motivation.

167. Answer (2)

Hint: Exclude the disorder caused by deficiency of growth hormone

Sol.: Disorder caused due to deficiency of vasopressin is called diabetes insipidus, while disorders caused by deficiency of insulin, growth hormone and hormones of adrenal cortex are called diabetes mellitus, dwarfism and Addison's disease respectively.

168. Answer (3)

Hint: Aquatic annelid

Sol.: Aquatic annelid like *Nereis* possesses lateral appendages called parapodia which help in swimming.

Pheretima and *Hirudinaria* have longitudinal and circular muscles which help in locomotion.

Taenia has hooks and suckers for attachment.

169. Answer (3)

Hint: Symptoms of acromegaly

Sol.: Excess secretion of growth hormone in adults especially in middle age can result in severe disfigurement (especially of face) called acromegaly, which may lead to serious complications and premature death, if unchecked.

- Over-secretion of GH in children stimulates abnormal growth of the body leading to gigantism and low secretion of GH results in stunted growth resulting in pituitary dwarfism.
- Mental retardation is associated with cretinism.

170. Answer (4)

Hint: Water goes out of the body through a large pore

Sol.: In sponges like *Sycon* and *Euspongia*, water enters through minute pores (ostia) in the body wall into a central cavity, spongocoel, from where it goes out through the osculum and their body is supported by skeleton made up of spicules.

171. Answer (3)

Hint: Peptide hormone

Sol.: Glucagon is a peptide hormone, secreted from α-cells of Islet of Langerhans of pancreas. It interacts with membrane-bound receptors.

Estradiol, aldosterone and cortisol are steroid hormones.

172. Answer (3)

Hint: Annelid

Sol.: Closed circulatory system is seen in chordates and annelids.

Pheretima has closed circulatory system. *Apis* (Honeybee), *Musca* (Housefly) have open circulatory system.

173. Answer (2)

Hint: Secretion of corpus luteum

Sol.: In human females, corpus luteum is formed from ruptured follicle after ovulation which mainly secretes progesterone and in minor quantity estrogen. Estrogen is mainly secreted from growing ovarian follicles. Relaxin is secreted from ovary in later stages of pregnancy. Prolactin is secreted from pituitary gland.

174. Answer (1)

Hint: Deficiency of thyroid hormone

Sol.: Iodine is essential for the normal rate of hormone synthesis in the thyroid. Deficiency of iodine in our diet may result in hypothyroidism and enlargement of the thyroid gland called goitre.

175. Answer (2)

Hint: Its another name is *Dugesia*.

Sol.: In some platyhelminths like *Planaria*, high regeneration capacity is seen.

Wuchereria – Filarial worm

Octopus – Devil fish

Bombyx – Silk worm

176. Answer (2)

Hint: Exclusively present in mammals

Sol.: Cerebral hemispheres are connected by tract of nerve fibres called corpus callosum. Cerebral aqueduct is a canal which passes through midbrain. Corpora quadrigemina are four round swellings on dorsal portion of midbrain. Cranial meninges cover the brain inside the skull.

177. Answer (4)

Hint: Function of gills

Sol.: In molluscs, feather-like gills present in mantle cavity have respiratory and excretory functions.

178. Answer (3)

Hint: Body form of jelly fish

Sol.: In cnidarians, two basic body forms are seen called polyp and medusa. Former is a sessile and cylindrical form like *Hydra*, whereas the latter is umbrella-shaped and free swimming. Alternation of generation between these two body forms is called metagenesis.

179. Answer (2)

Hint: Function of cerebellum

Sol.: Cerebellum, part of hindbrain has a very convoluted surface. It integrates the information received from semicircular canals of ear and auditory system. Medulla oblongata contains centres which control respiration, cardiovascular reflexes and gastric secretions. Hypothalamus controls urge for eating and drinking.

180. Answer (2)

Hint: Function of gonadotrophins

Sol.: LH and FSH stimulate gonadal activity and are called gonadotrophins. They help in regulation of spermatogenesis in males.

ACTH stimulates the synthesis and secretion of glucocorticoids.

GH stimulates closure of epiphyseal plates after adolescence.

❑ ❑ ❑

All India Aakash Test Series for NEET - 2026

TEST - 4 (Code - J)

Click here for Code-I Sol.

Test Date : 23/02/2025

ANSWERS

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

HINTS & SOLUTIONS

[PHYSICS]

1. Answer (1)

Hint & Sol.: Gravitational field intensity is non-zero outside a hollow spherical shell.

Gravitational field intensity inside a homogeneous solid sphere is towards the centre of the sphere.

2. Answer (4)

Hint: $V_{efflux} = \sqrt{2gD}$

Sol.: $H - D = \frac{1}{2} \times g \times t^2 \Rightarrow t = \sqrt{\frac{2(H-D)}{g}}$

Range = $X = \sqrt{2gD} \times \sqrt{\frac{2(H-D)}{g}}$

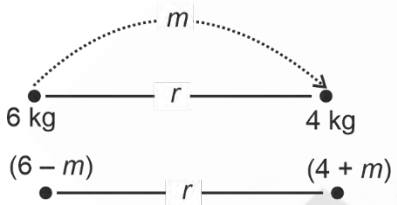
$= 2\sqrt{(H-D)(D)}$

3. Answer (2)

Hint: For maximum force

$\frac{dF}{dm} = 0$.

Sol.:



$F = \frac{G(6-m)(4+m)}{r^2}$

For maximum force $\frac{dF}{dm} = \frac{G}{r^2}\frac{d}{dm}(24 + 2m - m^2) = 0$

$0 = 2 - 2m$

$\therefore\ m = 1$ kg

4. Answer (3)

Hint: Angular momentum $L = mv_0r$

Sol.: $v_0 = \sqrt{\frac{GM}{r}}$

Angular momentum of satellite

$L = mv_0r$

$= m\sqrt{\frac{GM}{r}}.r$

$= \sqrt{GMm^2r}$

5. Answer (3)

Hint: Young's modulus $Y = \frac{W\ell}{A\Delta\ell}$

Sol.: $Y = \frac{\ell}{A} \times \left(\frac{W}{\Delta\ell}\right) = \frac{\ell}{A} \times (\text{slope})$

$= \frac{1}{0.1 \times (10^{-3})^2} \times \left(\frac{60-20}{3-1}\right) \times \frac{1}{10^{-3}}$

$= 10^7 \times 20 \times 10^3 = 2 \times 10^{11}$ N/m^2

6. Answer (4)

Hint: & Sol.: Young's modulus is the property of solid material and is independent of dimensions or deforming force.

7. Answer (4)

Hint: Work done = Increase in surface area × surface tension.

Sol.: $125\frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$

$5r = R$

Work done = $[125 \times 4\pi r^2 - 4\pi R^2]S$

$= (125r^2 - R^2)4\pi S$

$= (125r^2 - 25r^2)4\pi S$

$= (100r^2)4\pi S$

$= 400\pi r^2 S$

8. Answer (4)

Hint: Use equation of continuity and Bernoulli's theorem.

Sol.: As per equation of continuity

$A_1v_1 = A_2v_2$

$3Av_1 = Av_2$

$v_2 = 3v_1 \therefore v_2 > v_1$

By energy conservation using Bernoulli's theorem,

As $v_2 > v_1$

$\therefore\ P_2 < P_1$

9. Answer (3)

Hint & Sol.: Terminal velocity, $v_T = \frac{2}{9}\frac{r^2(\rho - \sigma)}{\eta}g$

Terminal velocity is independent of surface tension of liquid.

10. Answer (4)

Hint: & Sol.: • Liquid drops are spherical due to surface tension.

• Pressure difference inside a spherical drop: $P_i - P_0 = \frac{2T}{r}$

• Capillary rise $h = \frac{2T\cos\theta}{r\rho g}$

11. Answer (2)

Hint: $\Delta U = U_f - U_i$

Sol.: $U_i = -\frac{GMm}{R+h}$

$U_i = -\frac{GMm}{R+nR}; U_f = \frac{-GMm}{R}$.

Change in gravitational potential energy is

$\Delta U = U_{surface} - U_{height}$

$= -\frac{GMm}{R} - \left[-\frac{GMm}{R(n+1)}\right]$

$= \frac{GMm}{R}\left[\frac{1}{n+1} - 1\right] = -\frac{GMm}{R}\left(\frac{n}{n+1}\right)$

$= \frac{-n}{n+1}(mgR)$.

12. Answer (1)

Hint: $v_{escape} = \sqrt{\frac{2GM}{R}}$

Sol.: $v = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G}{R} \times \rho \times \frac{4}{3}\pi R^3}$

$\Rightarrow v \propto R$

$\Rightarrow \frac{v_A}{v_B} = \frac{R_A}{R_B}$ and $R_A = 2R_B$

$\Rightarrow \frac{v_A}{v_B} = \frac{2}{1}$

13. Answer (1)

Hint: Energy stored in a wire = $\frac{1}{2}F\Delta\ell$

Sol.: Energy stored = $\frac{1}{2}F\Delta\ell$

$0.1 = \frac{1}{2}(200)(\Delta\ell)$

$\Delta\ell = 1\,mm$

14. Answer (1)

Hint: $\rho_{mixture} = \frac{M_1 + M_2}{V_1 + V_2}$

Sol.: $\rho_{mixture} = \frac{M_1 + M_2}{V_1 + V_2} = \frac{V\rho_1 + V\rho_2}{2V}$

$\rho_{mixture} = \frac{\rho_1 + \rho_2}{2}$

$5.5 = \frac{6 + \rho}{2} \Rightarrow \rho = 5$

15. Answer (1)

Hint: Variation of acceleration due to gravity with height, $g' = g\frac{R^2}{(R+h)^2}$

Sol.: $g' = g\frac{R^2}{(R+h)^2}$

$\frac{g}{4} = g\frac{R^2}{(R+h)^2} \Rightarrow 2R = R + h$

$\boxed{h = R}$

16. Answer (2)

Hint: Gravitational force is a conservation force.

Sol.: Gravitational force is a conservative force, hence work done is independent of path.

17. Answer (3)

Hint: Use, $F = kx$

Sol.: $F = \frac{AY}{\ell}x$

$\therefore k = \frac{AY}{\ell}$

18. Answer (1)

Hint: & Sol.: Torr is the unit of pressure.

19. Answer (2)

Hint: Required force = Weight of frame + force due to surface tension.

Sol.:

Force = mg + (Surface tension × length)

= $mg + (S \times 2 \times 2\pi R)$

= $mg + 4\pi RS$

20. Answer (3)

Hint: Use energy conservation.

Total energy at the height = Total energy outside the field.

Sol.: As per energy conservation

$$-\frac{GMm}{2R}+\frac{1}{2}mv_e^2=0$$

$$\frac{GMm}{2R}=\frac{1}{2}mv_e^2$$

$$v_e=\sqrt{\frac{GM}{R}}$$

21. Answer (1)

Hint & Sol.: For the circular motion of each particle, $\frac{mv^2}{r}=\frac{Gmm}{(2r)^2}$

$$v^2=\frac{Gm}{4r}$$

$$v=\frac{1}{2}\sqrt{\frac{Gm}{r}}$$

22. Answer (3)

Hint: Use, $Y=\frac{F\ell}{A\Delta\ell}$

Sol.: $\Delta\ell=\frac{F\ell}{AY};\ \Delta\ell\propto\frac{\ell}{d^2}$

$$\frac{\Delta\ell_1}{\Delta\ell_2}=\frac{\ell_1}{d_1^2}\frac{d_2^2}{\ell_2}=\frac{\ell_1}{\ell_2}\frac{d_2^2}{d_1^2}$$

$$=\frac{1}{4}\times\frac{4}{1}=\frac{1}{1}$$

23. Answer (1)

Hint and Sol.:

- Mercury barometer is used to measure atmospheric pressure.
- Venturimeter is used to measure volumetric flow rate of incompressible fluid.
- Open tube manometer is used to measure pressure of gas.

24. Answer (4)

Hint: Properties of gravitational force.

Sol.: Gravitational force is conservative and central force in nature. It is also the weakest fundamental force in nature.

25. Answer (4)

Hint: Maximum load is independent of length and depends on nature of material and area of cross-section.

Sol.: Maximum load does not depend on the length of the wire.

26. Answer (1)

Hint: F_{net} = Upthrust – mg

Sol.: $F_{net}=V\rho_w g-V\rho_{body}\,g$.

$$m_{body}a=Vg[1000-500]$$

$$a=\frac{Vg[500]}{V500}=g$$

27. Answer (2)

Hint: Buoyant force $F_B=\rho Vg$

Sol.: $\frac{V_{immersed}}{V_{body}}=\frac{\rho_{body}}{\rho_{liquid}}$

For liquid $\Rightarrow \frac{1}{4}=\frac{\rho_{body}}{1.5\,\rho_{water}}$ …(i)

For water $\Rightarrow \frac{V_{immersed}}{V_{body}}=\frac{\rho_{body}}{\rho_{water}}$ …(ii)

$$100\times\frac{V_{immersed}}{V_{body}}=\frac{1.5}{4}\times100=37.5\%$$

28. Answer (3)

Hint: Due to surface tension, free surface tends to occupy minimum surface area.

Sol.: Molecules on the surface of liquid have some extra potential energy as compared to interior molecules. Thus a liquid lends to occupy minimum surface area.

29. Answer (1)

Hint & Sol.: Use, $h=\frac{2T\cos\theta}{r\rho g}$

$\theta < 90°$	$\cos\theta$ = +	Concave meniscus
$\theta > 90°$	$\cos\theta$ = (–)	Fall in capillary with convex meniscus
$\theta = 90°$	$\cos90°$ = 0	No rise or fall in capillary

30. Answer (2)

Hint: Characteristics of elastic materials.

Sol.: Property of a body to regain its original shape and size, on removing the deforming force is elasticity.

31. Answer (2)

Hint: Variation of gravity with depth:

$$g_{depth}=g\left[1-\frac{d}{R}\right]$$

Sol.: $g' = g\left[1-\frac{d}{R}\right]$

$g' = g\left[1-\frac{R/2}{R}\right] = g\left[1-\frac{1}{2}\right] = \frac{g}{2}$

Here weight becomes half or weight decreases by 50%.

32. Answer (2)

Hint & Sol: $(\sigma)\,\text{Poisson's ratio} = \frac{\text{lateral strain}}{\text{longitudinal strain}}$

33. Answer (1)

Hint: $P_{absolute} = P_{atm} + h\rho g$

$P_{gauge} = h\rho g$

Sol.: Absolute pressure

$P = P_a + h\rho g$

$= 1.01 \times 10^5\ \text{Pa} + (1.03 \times 10^3 \times 10 \times 1000)$

$= 104.01 \times 10^5\ \text{Pa}$

Gauge pressure $= 1.03 \times 10^3 \times 10 \times 1000$

$\therefore$ Ratio $= \frac{104}{103} \simeq 1.01$

34. Answer (1)

Hint: Elongation, $\Delta\ell = \frac{FL}{AY}$

Sol.: $\Delta\ell = \frac{FL}{\pi r^2 Y} = \frac{10\times10^3(1)}{3.14\times(10^{-2})^2\times2\times10^{11}}$

$= 1.59 \times 10^{-4}$ m

$= 0.159$ mm

35. Answer (4)

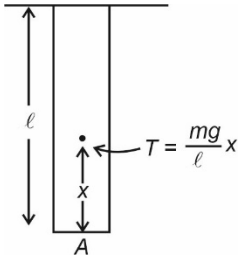
Hint & Sol.: • Total energy of circularly orbiting satellite is negative.

- For elliptical orbiting satellite, both K.E and P.E vary from point to point.
- Satellite motion obeys Kepler's law of periods.
- Astronaut experiences weightlessness in a space satellite.

36. Answer (4)

Hint: Energy density $= \frac{1}{2}\frac{(\text{stress})^2}{Y}$.

Sol.:



Energy density at x distance

$= \frac{1}{2Y}(\text{stress})^2 = \frac{1}{2Y}\left(\frac{mgx}{A\ell}\right)^2$

$= \frac{m^2g^2x^2}{2YA^2\ell^2}$

37. Answer (1)

Hint: Characteristics of streamline flow.

Sol.: If at any given point, the velocity of each passing fluid particle remains constant in time, the flow of liquid is streamline flow.

38. Answer (1)

Hint: Terminal velocity, $V_T = \frac{2}{9}\frac{r^2(\rho-\sigma)}{\eta}g$

Sol.:

$\eta = \frac{2}{9}\times\frac{(10^{-3})^2\text{m}^2[4.2\times10^3 - 1.2\times10^3]\,\text{kg/m}^3}{2\times10^{-2}\text{ms}^{-1}}\times10\ \text{m/s}^2$

$\eta = 3.3\times10^{-1}\text{kg m}^{-1}\text{s}^{-1}$

39. Answer (2)

Hint: & Sol.: A body can be loaded upto yield point and it can still return to its original dimension when the load is removed.

40. Answer (3)

Hint: Gravitational field intensity is zero inside a uniform spherical shell.

Sol.: Inside a uniform spherical shell, the gravitational force will be zero, no matter where the point mass m is located.

41. Answer (2)

Hint: $h = \frac{2T}{r\rho g}\cos\theta$

hr = constant

Sol.: $h_1r_1 = h_2r_2$

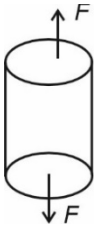
$9\left(\frac{0.5}{2}\right) = h_2\left(\frac{3}{2}\right)$

$h_2 = 1.5$ cm

42. Answer (4)

Hint: Stress $= \frac{\text{Restoring force}}{\text{Area}}$

Sol.:



Tensile stress $= \frac{\text{Normal force}}{\text{Area}}$

43. Answer (4)

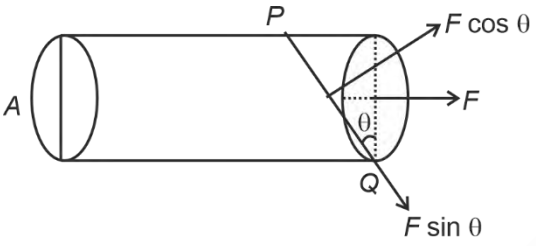
Hint & Sol: Elastomers do not obey Hooke's law. In brittle material, plastic region is very small.

44. Answer (2)

Hint: Normal stress = $\frac{F_{\text{Normal}}}{A'}$

Tangential stress = $\frac{F_{\text{Parallel}}}{A'}$

Sol.:



$$\frac{\text{Normal stress}}{\text{tangential stress}} = \frac{\frac{F\cos\theta}{A'}}{\frac{F\sin\theta}{A'}} = \cot\theta$$

45. Answer (4)

Hint: Use, $F = \frac{Gm_1m_2}{r^2}$

Sol.: $F_1 = F_2$

$$\frac{GM_1M_2}{r^2} = \frac{GM_1M_2'}{(2r)^2}$$

$M_2' = 4M_2$

% Increase

$$= \frac{M_2' - M_2}{M_2} \times 100 = \frac{4M_2 - M_2}{M_2} \times 100 = 300\%$$

[CHEMISTRY]

46. Answer (1)

Hint: $M(OH)_3 \rightleftharpoons M^{3+} + 3OH^-$

$p^{OH} = 14 - 10 = 4$

Sol.: $\left[\bar{O}H\right] = 10^{-4}$

$$\left[M^{3+}\right] = \frac{10^{-4}}{3}$$

$$K_{sp} = [M^{3+}]\left[\bar{O}H\right]^3$$

$$K_{sp} = \frac{10^{-4}}{3} \times \left(10^{-4}\right)^3 = \frac{10^{-16}}{3} = 3.3 \times 10^{-17}$$

47. Answer (3)

Hint: $2A + B \rightleftharpoons 2C$

$$K_c = \frac{[C]^2}{[A]^2[B]}$$

Sol.: $K_c = \frac{(0.01)^2}{0.02 \times (0.1)^2} = \frac{10^{-4}}{2 \times 10^{-2} \times 10^{-2}} = 0.5$

48. Answer (3)

Hint: For $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

$$K_p = \frac{P_{PCl_5}}{P_{Cl_2} \times P_{PCl_3}}$$

Sol.:

$PCl_5(g)$	$\rightleftharpoons$	$PCl_3(g)$	+	$Cl_2(g)$	
$1-\alpha$		α		α	(Mole)
$\left(\frac{1-\alpha}{1+\alpha}\right)P$		$\frac{\alpha P}{1+\alpha}$		$\frac{\alpha P}{1+\alpha}$	(Partial pressure)

$$K_p = \frac{P_{Cl_2} \times P_{PCl_3}}{P_{PCl_5}}$$

$$= \frac{\frac{\alpha P}{(1+\alpha)} \times \frac{\alpha P}{(1+\alpha)}}{\frac{(1-\alpha)P}{1+\alpha}}$$

$$K_p = \frac{\alpha^2 P}{1-\alpha^2}$$

49. Answer (2)

Hint: Value of K_c depends upon concentration and stoichiometric constant both.

Sol.: For very small values of K_c, reactant will dominate the equilibrium mixture.

50. Answer (1)

Hint: For any gaseous reaction at equilibrium

$$K_p = K_c(RT)^{\Delta n_g}$$

Sol.: For $2A(g) \rightleftharpoons B(g) + 3C(g)$

$K_p = K_c(RT)^2$

$$\frac{K_p}{K_c} = (RT)^2$$

$$\log\left(\frac{K_p}{K_c}\right) = 2\log(RT)$$

$$\log\left(\frac{K_p}{K_c}\right) - 2\log(RT) = 0$$

51. Answer (2)

Hint: $A(g) + 2B(g) \rightleftharpoons C(g)$; $K_c = K$

$2A(g) + 4B(g) \rightleftharpoons 2C(g)$; $K_c = K^2$

Sol.: $C(g) \rightleftharpoons A(g) + 2B(g)$; $K_c = \frac{1}{K}$

$\frac{1}{2}C(g) \rightleftharpoons \frac{1}{2}A(g) + B(g)$; $K_c = \frac{1}{\sqrt{K}}$

$B(g) + \frac{1}{2}A(g) \rightleftharpoons \frac{1}{2}C(g)$; $K_c = \sqrt{K}$

52. Answer (4)

Hint: $N_2O_4(g) \rightleftharpoons 2NO_2(g)$

$$K_p = \frac{\left(P_{NO_2}\right)^2}{P_{N_2O_4}}$$

		$N_2O_4(g)$	$\rightleftharpoons$	$2NO_2(g)$
Sol.:	$t = 0$	100		0
	$t = t_{eq}$	100 – p		2p

$P_t = 100 - p + 2p$

$120 = 100 + p$

$p = 20$

$$K_p = \frac{(P_{NO})^2}{P_{N_2O_4}} = \frac{(2P)^2}{100 - P} = \frac{40 \times 40}{80} = 20$$

53. Answer (2)

Hint: Equilibrium in a system having more than one phase is called heterogeneous equilibrium.

Sol.: $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$; Homogeneous

$KClO_3(s) \rightleftharpoons KCl(s) + \frac{3}{2}O_2(g)$; Heterogeneous

$N_2O_4(g) \rightleftharpoons 2NO_2(g)$; Homogeneous

$CaSO_4(s) \rightleftharpoons Ca^{2+}(aq) + SO_4^{2-}(aq)$; Heterogeneous

54. Answer (1)

Hint: Dissociation of $SO_3(g)$

$$SO_3(g) \rightleftharpoons SO_2(g) + \frac{1}{2}O_2(g)$$

$$K_c = \frac{[SO_2][O_2]^{1/2}}{[SO_3]}$$

		$SO_3(g)$	$\rightleftharpoons$	$SO_2(g)+$	$\frac{1}{2}O_2(g)$
Sol.:	$t = 0$	1		0	0
	$t = t$	$1-\alpha$		α	$\frac{\alpha}{2}$
		1 – 0.2		0.2	0.1

$$K_c = \frac{0.2 \times (0.1)^{1/2}}{0.8} = \frac{1}{4 \times \sqrt{10}} = 0.08$$

55. Answer (1)

Hint: More electronegativity is the element attached with hydrogen, more is the acidic nature of compound.

Sol.: Electronegativity of F is more than O then HF is stronger acid than H_2O.

56. Answer (2)

Hint: At equilibrium $\Delta G = 0$

Sol.: $\Delta G = \Delta G^\circ + 2.303\ RT \log K$

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

57. Answer (4)

Hint: pH = 14 – pOH

Sol.: For 0.01 M KOH

$pOH = -\log 10^{-2} = 2$

pH = 14 – 2 = 12

58. Answer (3)

Hint: For weak monobasic acid

$$\alpha = \sqrt{\frac{K_a}{C}}$$

Sol.: For CH_3COOH

$$\alpha = \sqrt{\frac{1.8 \times 10^{-5}}{0.1}}$$

$= 1.34 \times 10^{-2}$

59. Answer (1)

Hint: pH of solution increases on decrease in concentration of H^+ ion.

Sol.: KCN will undergo anionic hydrolysis which will result into basic solution.

Addition of water (dilution) will decrease the H^+ ion concentration.

60. Answer (3)

Hint: Due to hydrolysis of aqueous salt solution, pH of solution changes.

Sol.: For aq CH_3COONa anionic hydrolysis will take place and solution will be basic hence pH > 7

- For aq CH_3NH_3Cl cationic hydrolysis will take place and solution will be acidic hence pH < 7
- For aq NaCl solution no hydrolysis will take place and solution will be neutral hence pH = 7
- On increasing temperature beyond 25°C pH of water drops below 7, keeping it neutral.

61. Answer (1)

Hint: For mixing of two HCl solutions

$$[H^+]_{net} = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$$

Sol.: $[H^+]_{net} = \frac{10^{-2} \times V + 10^{-4}V}{2V}$

$= \frac{101 \times 10^{-4}}{2} = 50.5 \times 10^{-4}$

pH = $-\log(5.05 \times 10^{-3})$

= 2.3

62. Answer (2)

Hint: Conjugate base is obtained by removal of one H^+ from the given species.

Sol.: $HCO_3^- + H^+ \longrightarrow \underset{\text{conjuagate acid}}{H_2CO_3}$

$HCO_3^- \longrightarrow \underset{\text{Conjugate base}}{CO_3^{2-}} + H^+$

63. Answer (4)

Hint: Dissociation of weak electrolyte decreases due to common ion effect.

Solution: Strong electrolyte KCN will impart common ion effect on weak electrolyte HCN, which will result into decrease in dissociation of HCN

Mixture of weak electrolyte and strong electrolyte with at least one ion common can show common ion effect.

64. Answer (3)

Hint: Mixture of a weak acid/base and its salt with strong base/acid gives a buffer solution.

Sol.: Aqueous solution of weak acid weak base (WAWB) type of salt can form a simple buffer.

Hence (aq) CH_3COONH_4 is a buffer.

65. Answer (1)

Hint.: Number of H^+ ions = $M \times V_{(L)} \times N_A$

Sol: For 0.1 M, 100 mL NaOH solution

pH = 14 – 1 = 13

M = $[H^+] = 10^{-13}$

Number of H^+ ions

$= 10^{-13} \times 1 \times 10^{-1} \times 6.02 \times 10^{23}$

$= 6.02 \times 10^9$

66. Answer (2)

Hint: $CaSO_4(s) \rightleftharpoons Ca^{2+}(aq) + SO_4^{2-}(aq)$

$K_{sp} = \left[Ca^{2+}\right]\left[SO_4^{2-}\right]$

Sol.: Molar solubility of the salt = $\frac{0.408}{136}$ mol L^{-1}

$= 3 \times 10^{-3}$ mol L^{-1}

$K_{sp} = 3 \times 10^{-3} \times 3 \times 10^{-3}$

$= 9 \times 10^{-6}$

67. Answer (2)

Hint: Element with high value of standard reduction potential is good oxidising agent.

Sol.: Since $E^\circ_{A^{2+}/A} > E^\circ_{B^{2+}/B}$, A will be insoluble in BSO_4.

Since $E^\circ_{A^{2+}/A} > E^\circ_{C^{2+}/C}$, C will be soluble in $A(NO_3)_2$

C^{2+} has least standard reduction potential hence it will be weakest oxidising agent.

$B(s) + CSO_4 \rightarrow BSO_4 + C(s)$, is nonspontaneous hence will have negative EMF.

68. Answer (1)

Hint: As standard reduction potential increases, reducing power of metal decreases.

Sol.: Since $E^\circ_{B^{2+}/B}$ is minimum, B will be best reducing agent.

69. Answer (4)

Hint: Solubility of sparingly soluble salt increases due to complex ion formation which is soluble in water.

Sol.: Since $Ag^+(aq)$ will form $(Ag(NH_3)_2)^+$ with $NH_4OH(aq)$, solubility of AgCl will increase.

70. Answer (3)

Hint: According to Dalton's law

$P_{gas} = P_T \times \chi_{gas}$

Sol.: For

$$A(s) \rightleftharpoons B(g) + 2C(g)$$

$t = 0$	a	0	0
$t = t$	a – x	x	2x

$$\chi_B = \frac{x}{3x} = \frac{1}{3}$$

$$\chi_C = \frac{2x}{3x} = \frac{2}{3}$$

$$P_B = \frac{1}{3} \times 9 = 3$$

$$P_C = \frac{2}{3} \times 9 = 6$$

$K_P = (6)^2 \times 3 = 108$

71. Answer (1)

Hint: Neutralisation of weak acid and strong base may give buffer solution.

Sol.: Neutralisation of CH_3COOH with NaOH as limiting reagent will result in acidic buffer.

	CH_3COOH	+ NaOH	$\longrightarrow$ CH_3COONa	+ H_2O
$t = 0$	(100×0.1) mmol	(50×0.1)m mol	0	0
$t = t$	5 mmol	0	5 mmol	

This solution form acidic buffer.

72. Answer (4)

Hint: $NH_4Cl(aq)$ will undergo cationic hydrolysis and will give acidic solution.

Sol.: $$pH = 7 - \frac{1}{2}pK_a - \frac{1}{2}\log C$$

$$= 7 - \frac{1}{2}(4.76 + \log 0.1)$$

$$= 7 - \frac{1}{2} \times 3.76$$

$$= 7 - 1.88$$

$$= 5.12$$

73. Answer (3)

Hint: For conjugate acid base pair

$K_a \times K_b = K_w$

Sol.: At 25°C

$K_a \times K_b = 10^{-14}$

$4 \times 10^{-10} \times K_b = 10^{-14}$

$K_b = 2.5 \times 10^{-5}$

74. Answer (4)

Hint: Introduction of inert gas at constant volume and temperature does not affect the equilibrium state of a gaseous reaction.

Sol.: Partial pressure of reacting gases is unchanged on introduction of inert gas at constant volume hence there is no change in equilibrium state

Introduction of inert gas at constant pressure and temperature shifts equilibrium towards more number of gaseous moles.

75. Answer (3)

Hint: For gaseous equilibrium

$$K_p = K_c(RT)^{\Delta n_g}$$

Sol.: For $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

$K_p = K_c(RT)^1$

$= 0.2(0.0821 \times 300)^1$

$= 4.92$

76. Answer (3)

Hint: Oxidation state of non-metal in NaH is –1

Sol.: Oxidation state of non-metal in ZnS is –2

Oxidation state of non-metal Cl in Cl_2O_7 is +7

Oxidation state of non-metal in Al_2O_3 is –2

77. Answer (2)

Hint & Sol.: Catalyst does not affect the equilibrium composition of the reaction mixture.

78. Answer (1)

Hint: Arithmetic sum of Oxidation states of all the atom in a neutral compound must be zero.

Sol.: For $A(BC_2)_2$ arithmetic sum of Oxidation states of all the atoms is zero.

79. Answer (4)

Hint: Compound with maximum n-factor will require maximum number of mole of acidic $KMnO_4$ for oxidation

Sol.: n-factor of FeC_2O_4 is 3

n-factor of SO_2 is 2

n-factor of $NaNO_2$ is 2

n-factor of $Al_2(C_2O_4)_3$ is 6

80. Answer (3)

Hint: Metal with positive value of standard reduction potential for cations does not liberate H_2 gas from dilute acid solution.

Sol.: Standard reduction potential for Cu^{2+}/Cu is +0.34 hence it will not liberate H_2 gas from dilute H_2SO_4 solution

81. Answer (3)

Hint: Oxidation state of CO in metal carbonyls is zero

Sol.: In $Fe(CO)_5$, CO has zero charge hence Fe will have zero oxidation state.

82. Answer (2)

Hint: Oxidation and reduction of same element takes place during a disproportionation reaction.

Sol.: $2H_2 + O_2 \rightarrow 2H_2O \Rightarrow$ Combination reaction

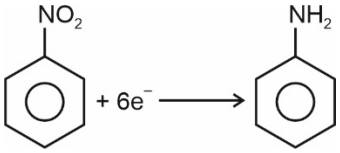
$Cl_2 + NaOH \rightarrow NaCl + NaOCl \Rightarrow$ Disproportionation

$PCl_5 \rightarrow PCl_3 + Cl_2 \Rightarrow$ Decomposition

83. Answer (4)

Hint: Number of moles of electrons required for redox change of 1 mol substance is equal to valency factor of that substance.

Sol.:



n-factor of nitrobenzene = 6

hence number of moles of electron required are 6 mol.

84. Answer (4)

Hint: Oxidation states of some elements changes during a redox reaction.

Sol.: $KClO_3 \xrightarrow{\Delta} KCl + O_2$

; Decomposition redox

$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

; Metal displacement redox

$Na + H_2O \rightarrow NaOH + H_2$

; Non-metal displacement redox

$CaCO_3 \rightarrow CaO + CO_2$; Non-redox

85. Answer (4)

Hint & Sol.: Oxidising agent gets reduced during redox reaction.

86. Answer (2)

Hint: Oxidising agent are required for oxidation process.

Sol.:

$2Cl^- \rightarrow Cl_2$ (oxidation)

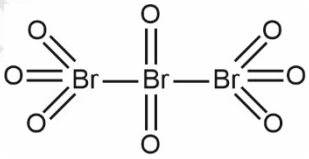
$SO_2 \rightarrow SO_3$ (oxidation)

$Cr_2O_7^{2-} \rightarrow Cr^{3+}$ (reduction)

$SnCl_4 \rightarrow SnCl_2$ (reduction)

87. Answer (1)

Hint: Structure of Br_3O_8



Sol.: Oxidation state of middle Br = +4

Oxidation state of terminal Br = +6

88. Answer (3)

Hint: Mixed salt may have two different oxidation state of element

Sol.:

Oxidation state of Al is +3 in Al_2O_3

Oxidation state of Mn in Mn_2O_3 is +3

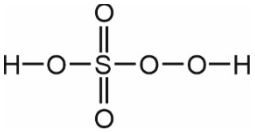
Oxidation state of Fe is +2 and +3 in Fe_3O_4

Oxidation state of Na is +1 in Na_2O

89. Answer (4)

Hint: Oxidation state of sulphur cannot be more than +6

Sol.: For H_2SO_5



Oxidation state of S = +6

90. Answer (1)

Hint: Solubility of sparingly soluble salt decreases due to common ion effect

Sol.: $\underset{C-s}{AgCl(s)} \rightleftharpoons \underset{s}{Ag^+(aq)} + \underset{s+0.25\approx 0.25}{Cl^-(aq)}$

$K_{sp} = [Ag^+]\,[Cl^-]$

$= s \times (s + 0.25)$

$10^{-10} = 0.25 \times s$

$s = 4 \times 10^{-10}$

[BOTANY]

91. Answer (3)

Hint: Chlorophyll *b* appears yellow green in colour in the chromatogram.

Sol.: Chlorophyll *a* is the major or chief pigment associated with photosynthesis.

92. Answer (2)

Hint: Products of light reaction are ATP, NADPH and O_2.

Sol.: O_2 diffuses out of the chloroplast, while ATP and NADPH are used to drive the processes leading to the synthesis of food. The effect of water as a factor is more through its effect on the plant, rather than directly on photosynthesis.

93. Answer (2)

Hint: PGA (3-carbon compound) is the first stable product of CO_2 fixation in C_3 plants

Sol.: In C_4 plants, the first stable product of CO_2 fixation is an organic acid (Oxaloacetic acid) which has 4-carbon atoms in it.

94. Answer (2)

Sol.: Bryophytes are also called amphibians of the plant kingdom because these plants can live in soil but are dependent on water for sexual reproduction.

95. Answer (1)

Hint: *Pinus* is a gymnosperm.

Sol.: Unlike bryophytes and pteridophytes, in gymnosperms, the male and female gametophytes do not have an independent free-living existence.

96. Answer (4)

Hint: In gymnosperms, endosperm represents the female gametophyte

Sol.: Megasporangium contains multicellular female gametophyte that bears two or more archegonia or female sex organ.

97. Answer (3)

Hint: The food is stored as floridean starch in the members of Rhodophyceae.

Sol.: Floridean starch is very similar in structure to amylopectin and glycogen.

98. Answer (4)

Hint: Linnaeus and Aristotle gave the artificial system of classification.

Sol.: George Bentham and Joseph Dalton Hooker gave the natural system of classification.

99. Answer (3)

Hint: Cytotaxonomy/Karyotaxonomy is based on the cytological information like chromosome number, structure and behaviour.

Sol.: Chemotaxonomy is based on chemical constituents of the plants.

100. Answer (2)

Hint: Sporophyte represents the dominant phase in the life cycle of pteridophytes.

Sol.: Fusion of male gamete with the egg present in archegonium results in the formation of zygote. Zygote thereafter produces a multicellular well differentiate sporophyte.

101. Answer (3)

Hint: In PS I, the reaction centre is P_{700}.

Sol.: PS I is associated with cyclic and non-cyclic flow of electrons but PS I is not associated with splitting of water.

102. Answer (2)

Hint: Water stress causes the stomata to close.

Sol.: Water stress also leads to the wilting of leaves, thus reducing their surface area as well as their metabolic activity.

103. Answer (4)

Hint: C_3 and C_4 plants respond differently to CO_2 concentrations.

Sol.: C_3 plants respond to higher CO_2 concentration by showing increased rates of photosynthesis.

104. Answer (1)

Hint: C_4 plants respond to higher temperature and show higher rate of photosynthesis as compare to C_3 plants.

Sol.: The dark reactions being enzymatic are temperature controlled.

105. Answer (4)

Hint: Antenna molecules or accessory pigments are also called the shield pigments.

Sol.: Action spectrum of photosynthesis closely corresponds to the absorption spectrum of the chief photosynthetic pigment, chlorophyll *a*

106. Answer (2)

Hint: Grana are absent in bundle sheath cells.

Sol.: Both bundle sheath cells and mesophyll cells are involved in CO_2 fixation.

107. Answer (4)

Sol.: The process of cyclic photophosphorylation cannot occur in absence of PS I.

108. Answer (2)

Hint: C_4 cycle and CAM pathway are restricted to certain plants.

Sol.: Calvin cycle is seen in all the plants.

109. Answer (4)

Hint: Within the chloroplast, protons in the stroma decrease in number, while in the lumen there is accumulation of protons.

Sol.: The H carrier removes a proton from the stroma while transporting an electron. When this molecule passes on its electrons to the electron carrier on the inner side of membrane, the proton is released into the lumen of membrane.

110. Answer (2)

Hint: Photorespiration occurs in C_3 plants.

Sol.: Binding of O_2 and CO_2 to RuBisCO is competitive. The substrate molecule for the activity of RuBisCO is a 5-Carbon compound, named RuBP (Ribulose bisphosphate). The plant or internal factors are dependent on the genetic predisposition and the growth of plants.

111. Answer (4)

Hint: Temperature is an external factor that affects the rate of photosynthesis.

Sol.: The plant factors include the number, size, age and orientation of leaves, mesophyll cells and chloroplasts, internal CO_2 concentration and the amount of chlorophyll.

112. Answer (3)

Hint: Ferredoxin accepts electrons from PS I

Sol.: Plastocyanin accepts the electrons from cytochrome b_6f in non-cyclic photophosphorylation.

113. Answer (2)

Hint: Assimilation of CO_2 to carbohydrates occurs in biosynthetic phase of photosynthesis.

Sol.: Light reaction involves formation of high-energy chemical intermediates, ATP and NADPH and include light absorption, water splitting and release of oxygen.

114. Answer (4)

Hint: *Sorghum* is a C_4 plant

Sol.: *Sorghum* being a C_4 plant has Kranz anatomy in their leaves.

115. Answer (1)

Hint: Jan Ingenhousz showed that in the presence of sunlight, it is only the green parts of the plants that could release oxygen.

Sol.:

Joseph Priestley	–	Plants restore the air whatever breathing animals and burning candle remove
T.W. Engelmann	–	Observed that the bacteria accumulated mainly in the region of blue and red light of the split spectrum

116. Answer (4)

Hint: Dictyosomes are separate units of Golgi body found in plant cells.

Sol.: Organelles involved in photorespiration are chloroplast, peroxisome and mitochondria.

117. Answer (3)

Hint: As electrons move through the photosystems, protons are transported across the thylakoid membrane.

Sol.: Primary acceptor of electron which is located towards the outer side of the thylakoid membrane transfers its electrons not to an electron carrier but to a H carrier.

118. Answer (2)

Hint: In gymnosperms, ovules are borne on megasporophylls which may be clustered to form female cones.

Sol.: Female cones are absent in *Cycas*.

119. Answer (2)

Hint: Sporophyte is the main plant body in pteridophytes.

Sol.: Zygote produces a multicellular well-differentiated sporophyte. In pteridophyte, development of zygote take place within the female gametophyte.

120. Answer (1)

Hint: Algin is a constituent of the cell wall of brown algae.

Sol.: Green algae usually have a rigid cell wall made up of an inner layer of cellulose and an outer layer of pectose.

121. Answer (4)

Hint: Artificial system of classification gave equal weightage to vegetative and sexual characteristics.

Sol.: Natural system of classification was based on natural affinities among the organisms and considered not only the external features, but also internal features.

122. Answer (3)

Hint: Red algae lack motile structures.

Sol.: Both green algae and brown algae possess motile asexual spores.

123. Answer (2)

Hint: Prothallus is the free-living gametophyte in pteridophytes.

Sol.: In liverworts, spores germinate to form free-living gametophyte.

124. Answer (4)

Hint: In conifers, needle-like leaves are present.

Sol.: *Ginkgo* possesses fan-shaped leaves.

125. Answer (2)

Hint: In *Pinus,* roots have fungal association in the form of mycorrhiza.

Sol.: Coralloid roots of *Cycas* are associated with N_2 - fixing cyanobacteria.

126. Answer (1)

Hint: *Volvox* is a colonial alga.

Sol.:

Kelps	–	Profusely branched and possessing carotenoids
Selaginella	–	Female gametophyte retained on parent sporophyte for variable periods
Pinus	–	Male and female cone borne on the same tree

127. Answer (3)

Hint: The given figure represents *Dictyota*.

Sol.: *Dictyota* belongs to the class, phaeophyceae. Asexual reproduction in most brown algae takes place by biflagellate zoospores. Union of gametes may take place in water or within the oogonium in the oogamous species.

128. Answer (4)

Hint: In pteridophytes, main plant body is differentiated into true stem, leaves and roots.

Sol.: *Equisetum* is a pteridophyte.

129. Answer (2)

Hint: Biflagellated antherozoids are produced by bryophytes.

Sol.: Bryophytes are the first embryophytes and they lack vascular tissue.

130. Answer (4)

Hint: *Psilotum* belongs to the class Psilopsida.

Sol.:

Lycopsida	–	*Lycopodium, Selaginella*
Sphenopsida	–	*Equisetum*
Pteropsida	–	*Dryopteris, Pteris, Adiantum*

131. Answer (2)

Hint: Prothallus is the gametophytic stage in pteridophytes.

Sol.: The first stage in the life cycle of moss is protonema stage, which is a creeping, green, branched and frequently filamentous stage.

132. Answer (4)

Hint: In bryophytes, zygotes do not undergo reduction division immediately.

Sol.: The sporophyte in mosses is more elaborate than in liverworts.

133. Answer (3)

Hint: *Polysiphonia* is a red alga.

Sol.: Red algae reproduce vegetatively by fragmentation. They reproduce asexually by non-motile spores and sexually by non-motile gametes.

134. Answer (2)

Hint: Two gametes of dissimilar size are found in *Eudorina.*

Sol.: Similar sized, flagellated gametes are found in *Ulothrix* and non-flagellated gametes occur in *Spirogyra*. *Fucus* shows oogamy

135. Answer (3)

Hint: Pteridophytes are the first terrestrial plants to possess vascular tissue.

Sol.: In pteridophytes, dominant plant body is a sporophyte. Prothallus is the gametophytic stage of the pteridophytes which is multicellular, free-living and mostly photosynthetic. They have motile male gametes.

[ZOOLOGY]

136. Answer (2)

Hint: Function of gonadotrophins

Sol.: LH and FSH stimulate gonadal activity and are called gonadotrophins. They help in regulation of spermatogenesis in males.

ACTH stimulates the synthesis and secretion of glucocorticoids.

GH stimulates closure of epiphyseal plates after adolescence.

137. Answer (2)

Hint: Function of cerebellum

Sol.: Cerebellum, part of hindbrain has a very convoluted surface. It integrates the information received from semicircular canals of ear and auditory system. Medulla oblongata contains centres which control respiration, cardiovascular reflexes and gastric secretions. Hypothalamus controls urge for eating and drinking.

138. Answer (3)

Hint: Body form of jelly fish

Sol.: In cnidarians, two basic body forms are seen called polyp and medusa. Former is a sessile and cylindrical form like *Hydra*, whereas the latter is umbrella-shaped and free swimming. Alternation of generation between these two body forms is called metagenesis.

139. Answer (4)

Hint: Function of gills

Sol.: In molluscs, feather-like gills present in mantle cavity have respiratory and excretory functions.

140. Answer (2)

Hint: Exclusively present in mammals

Sol.: Cerebral hemispheres are connected by tract of nerve fibres called corpus callosum. Cerebral aqueduct is a canal which passes through midbrain. Corpora quadrigemina are four round swellings on dorsal portion of midbrain. Cranial meninges cover the brain inside the skull.

141. Answer (2)

Hint: Its another name is *Dugesia*.

Sol.: In some platyhelminths like *Planaria*, high regeneration capacity is seen.

Wuchereria – Filarial worm

Octopus – Devil fish

Bombyx – Silk worm

142. Answer (1)

Hint: Deficiency of thyroid hormone

Sol.: Iodine is essential for the normal rate of hormone synthesis in the thyroid. Deficiency of iodine in our diet may result in hypothyroidism and enlargement of the thyroid gland called goitre.

143. Answer (2)

Hint: Secretion of corpus luteum

Sol.: In human females, corpus luteum is formed from ruptured follicle after ovulation which mainly secretes progesterone and in minor quantity estrogen. Estrogen is mainly secreted from growing ovarian follicles. Relaxin is secreted from ovary in later stages of pregnancy. Prolactin is secreted from pituitary gland.

144. Answer (3)

Hint: Annelid

Sol.: Closed circulatory system is seen in chordates and annelids.

Pheretima has closed circulatory system. *Apis* (Honeybee), *Musca* (Housefly) have open circulatory system.

145. Answer (3)

Hint: Peptide hormone

Sol.: Glucagon is a peptide hormone, secreted from α-cells of Islet of Langerhans of pancreas. It interacts with membrane-bound receptors.

Estradiol, aldosterone and cortisol are steroid hormones.

146. Answer (4)

Hint: Water goes out of the body through a large pore

Sol.: In sponges like *Sycon* and *Euspongia*, water enters through minute pores (ostia) in the body wall into a central cavity, spongocoel, from where it goes out through the osculum and their body is supported by skeleton made up of spicules.

147. Answer (3)

Hint: Symptoms of acromegaly

Sol.: Excess secretion of growth hormone in adults especially in middle age can result in severe disfigurement (especially of face) called acromegaly, which may lead to serious complications and premature death, if unchecked.

- Over-secretion of GH in children stimulates abnormal growth of the body leading to gigantism and low secretion of GH results in stunted growth resulting in pituitary dwarfism.
- Mental retardation is associated with cretinism.

148. Answer (3)

Hint: Aquatic annelid

Sol.: Aquatic annelid like *Nereis* possesses lateral appendages called parapodia which help in swimming.

Pheretima and *Hirudinaria* have longitudinal and circular muscles which help in locomotion.

Taenia has hooks and suckers for attachment.

149. Answer (2)

Hint: Exclude the disorder caused by deficiency of growth hormone

Sol.: Disorder caused due to deficiency of vasopressin is called diabetes insipidus, while disorders caused by deficiency of insulin, growth hormone and hormones of adrenal cortex are called diabetes mellitus, dwarfism and Addison's disease respectively.

150. Answer (1)

Hint: Functions of limbic lobe

Sol.: The inner parts of cerebral hemispheres and a group of associated deep structures like amygdala, hippocampus, *etc.*, form the complex structure called the limbic lobe or limbic system. Along with the hypothalamus, it is involved in the regulation of sexual behaviour, expression of emotional reactions (*e.g.* excitement, pleasure, rage and fear) and motivation.

151. Answer (1)

Hint: Function of midbrain

Sol.: Midbrain is located between the hypothalamus/thalamus of forebrain and pons of the hindbrain, they receive and integrate visual, tactile and auditory inputs.

152. Answer (3)

Hint: Not a function of parathormone

Sol.: Parathyroid glands secrete a peptide hormone called parathyroid hormone. The secretion of PTH is regulated by the circulating levels of calcium ions. PTH also stimulates reabsorption of Ca^{2+} by the renal tubules and increases Ca^{2+} absorption from the digested food.

153. Answer (4)

Hint: Location of thymus gland

Sol.: Thymus gland is responsible for development of cell mediated immunity and it is located between lungs behind sternum on the ventral side of aorta. Thyroid gland is located on either side of trachea.

154. Answer (2)

Hint: Neither clearly sensory nor motor.

Sol.: The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function called association areas responsible for complex functions like intersensory associations, memory and communication. Thalamus is major coordinating centre for sensory and motor signaling. The cerebral cortex is also referred to as grey matter.

155. Answer (4)

Hint: Second largest animal phylum

Sol.:

(1)	Coelenterata	Cnidoblasts	Sea-pen, Sea-fan
(2)	Platyhelminthes	Dorso-ventrally flattened body	Liver fluke, Tapeworm
(3)	Echinodermata	Water vascular system	Sea lily, Sea urchin
(4)	Mollusca	Feather-like gills	Sea hare, cuttle fish

Choanocytes are characteristic cells of sponges.

Aschelminthes are circular in cross section. example- roundworm.

156. Answer (1)

Hint: Multipolar neurons have one axon and two or more dendrites

Sol.: Based on number of axon and dendrites, the neurons are divided into three types, *i.e.*, multipolar (found in cerebral cortex), bipolar (found in the retina of the eye) and unipolar (found usually in the embryonic stage).

Pseudounipolar neurons are found in the dorsal root ganglia of spinal nerves.

157. Answer (3)

Hint: Exclude the vector of filariasis

Sol.:

Living fossil – *Limulus*

Mosquitoes – *Culex, Anopheles* and *Aedes*

Gregarious pest – *Locusta*

Economically important insects – *Apis*, *Bombyx*, *Laccifer*

158. Answer (1)

Hint: Example is cortisol

Sol.: Glucocorticoids stimulate gluconeogenesis, lipolysis and proteolysis. They inhibit cellular uptake and utilisation of amino acids. They stimulate RBCs production and produce anti inflammatory reactions by suppressing immune responses.

159. Answer (2)

Hint: Action of peptide hormone

Sol.: ANF is a peptide hormone secreted from atrial wall of human heart which decreases blood pressure by causing dilation of the blood vessels.

Erythropoietin stimulates erythropoiesis. Thyroxine binds to the intracellular receptors and ANF binds to the membrane-bound receptors in target cells.

160. Answer (4)

Hint: Circulatory system in arthropods

Sol.: In hemichordates, a structure similar to notochord called stomochord is present. They have gills for respiration, fertilisation is external with indirect development. Circulatory system is of open type.

161. Answer (2)

Hint.: Members of phylum Echinodermata

Sol: The most distinctive features of echinoderms is presence of water vascular system.

- *Asterias*, *Ophiura*, *Antedon*, *Echinus*, *Cucumaria* – Echinoderm
- *Ancyclostoma* – Aschelminth
- *Gorgonia*, *Adamsia* – Coelenterates
- *Aplysia*, *Sepia* – Molluscs

162. Answer (3)

Hint: Hormone which acts on exocrine pancreas

Sol.:

Gastrin	–	Stimulates secretion of gastric gland
CCK (cholecystokinin)	–	Stimulates the secretion of pancreatic enzymes and bile juice
Secretin	–	Stimulates secretion of water and bicarbonate ions from exocrine pancreas
GIP (Gastric inhibitory peptide)	–	Inhibits gastric secretion and motility

163. Answer (4)

Hint: Feature of chemical synapse

Solution: Chemicals called neurotransmitters filled in the vesicles in axon terminals are involved in the transmission of impulse in chemical synapse.

Electrical synapse is rare in our system.

Transmission of impulse in electrical synapse is very similar to impulse conduction along a single axon.

164. Answer (4)

Hint: Role of thyroid gland

Sol.: Patient is suffering from exopthalmic goitre, a form of hyperthyroidism. Thyroid hormones influence the maintenance of water and electrolyte balance.

Thyroid gland also secretes a peptide hormone called thyrocalcitonin which regulates the blood calcium level.

Androgens stimulate the growth of facial and axillary hair in males.

165. Answer (3)

Hint: Seminiferous tubules are present in testis

Sol.: The thyroid gland is composed of thyroid follicles and stromal tissues.

Both the lobes of the gland are interconnected with a thin flap of connective tissue called isthmus.

166. Answer (2)

Hint: Source of emergency hormones

Sol.: The adrenal medulla secretes two hormones called adrenaline and noradrenaline which are commonly called catecholamines. The adrenal cortex can be divided into three layers, called zona reticularis (inner layer), zona fasciculata (middle layer) and zona glomerulosa (outer layer).

167. Answer (3)

Hint: Prolonged hyperglycaemia

Sol.: Prolonged hyperglycaemia leads to a complex disorder called diabetes mellitus which is associated with loss of glucose through urine and formation of harmful compounds known as ketone bodies.

Insulin enhances rapid movement of glucose from blood to hepatocytes and adipocytes resulting in decreased glucose levels and stimulates conversion of glucose to glycogen (glycogenesis).

168. Answer (2)

Hint: Location of unmyelinated nerve fibres

Sol.: Unmyelinated nerve fibre is enclosed by a Schwann cell that does not form a myelin sheath around the axon and is commonly found in autonomous and the somatic neural systems which are parts of peripheral nervous system.

169. Answer (3)

Hint: Feature of echinoderms

Sol.: Echinoderms (spiny bodied) are animals that have an endoskeleton of calcareous ossicles. The most distinctive feature is presence of water vascular system. An excretory system is absent. Reproduction is sexual. The adult echinoderms are radially symmetrical but their larvae are bilaterally symmetrical.

- Water canal system is distinctive feature of sponges.

170. Answer (4)

Hint: Characteristic features of molluscs

Sol.: Phylum Mollusca is the second largest animal phylum. Body of most of the molluscs is covered by calcareous shell and is unsegmented with a distinct head, muscular foot and visceral hump. Their mouth contains a file-like rasping organ for feeding called radula.

Examples of molluscs: *Pila* (Apple snail), *Pinctada* (Pearl oyster)

171. Answer (1)

Hint: Causes ascariasis

Sol.: In *Ascaris* (Roundworm), sexes are separate *i.e*., males and females are distinct, often females are longer than males. *Taenia* (Tapeworm), *Pheretima* (Earthworm) and *Hirudinaria* (blood sucking leech) are monoecious.

172. Answer (1)

Hint: Also called Leydig cells

Sol.: Leydig cells also called interstitial cells are present in intertubular spaces in testis and produce a group of hormones called androgens.

- Testis is composed of seminiferous tubules and stromal tissue.
- Male accessory sex organs are epididymis, vas deferens, seminal vesicles, prostate gland, *etc*.

173. Answer (3)

Hint: Gland which secretes thymosin

Sol.: Hypothalamus possesses the center for control of body temperature. Thyroid gland plays an important role in regulation of BMR, thus, influences body temperature. Pineal gland also influences body temperature. Thymus gland secretes thymosins which play major role in the differentiation of T-lymphocytes.

174. Answer (3)

Hint: Birth hormone

Sol.: Neurohypophysis (pars nervosa) stores and releases two hormones called oxytocin and vasopressin, which are actually synthesised by the hypothalamus and are transported axonally to neurohypophysis. ADH acts mainly at kidney and stimulates reabsorption of water. Somatostatin inhibits the release of growth hormone from pituitary.

175. Answer (2)

Hint: Active transport

Sol.: Ionic gradient across resting membrane is maintained by sodium potassium pump by active transport of ions which transport Na^+ and K^+. Voltage gated channels are involved during repolarization and depolarization after stimulation.

176. Answer (2)

Hint: A coelenterate

Sol.: Ctenophores (*Ctenoplana*) are exclusively marine, radially symmetrical and diploblastic organisms.

Cnidarians are mostly marine with some fresh water forms like *Hydra*. *Ophiura* and *Balanoglossus* are found in marine water.

177. Answer (1)

Hint: Dorsal to pituitary gland

Sol.: Hypothalamus is the basal part of diencephalon, forebrain and it regulates a wide spectrum of body functions. It contains several groups of neurosecretory cells called nuclei which produce hormones.

178. Answer (3)

Hint: Member of the phylum Platyhelminthes

Sol.: *Fasciola* belongs to the phylum Platyhelminthes. Animals belonging to this group are bilaterally symmetrical, triploblastic and acoelomates.

Meandrina, *Adamsia* and *Gorgonia* belong to the phylum Coelenterata. They are radially symmetrical.

179. Answer (3)

Hint: Exhibiting bilateral symmetry

Sol.: Bilateral symmetry is seen in annelids, arthropods, *etc*. Sponges are mostly asymmetrical whereas radial symmetry is seen in coelenterates, ctenophores and adult echinoderms.

180. Answer (4)

Hint: Exclude the enzymes

Sol.: Hormones are released from endocrine glands, they are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts. Enzymes act as biocatalysts.

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