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DIVISION: PRE-MEDICAL
Academic session: 2023-24

PERIODIC ASSESSMENT TEST (PAT)

STUDENT SUPPORT BOOKLET (SSB)

Answer Key (AK) | Standard Hints (SH) | Text Solutions (TS) | Weightage Sheet (WS)

CLASS	XI	COURSE NAME	SAKSHAM	COURSE CODE	MA
PHASE CODE(S)	02 MA	TOTAL PAGES	1	BATCH CODE(S)	02 MA

Target Examination & Year:

NEET 2025

TEST PATTERN	TEST TYPE	TEST CODE & SEQUENCE
NEET	CUMULATIVE TEST (CT)	CT-4

DATE & DAY:
24th December 2023 | Sunday

Duration & Time:
200 Minutes | 11:30 AM to 2:50 PM

Contents:

Scan QR Code for Video Solutions → Coming Soon

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APPLY ONLINE

ANSWER KEY (AK)

PAPER											
PART-A : CHEMISTRY	Q.No.	1	2	3	4	5	6	7	8	9	10
	Ans.	3	4	1	3	3	1	3	1	3	1
	Q.No.	11	12	13	14	15	16	17	18	19	20
	Ans.	2	4	2	4	2	3	4	3	4	1
	Q.No.	21	22	23	24	25	26	27	28	29	30
	Ans.	3	2	1	4	1	2	1	1	2	2
	Q.No.	31	32	33	34	35	36	37	38	39	40
	Ans.	3	2	2	4	1	3	4	1	4	1
	Q.No.	41	42	43	44	45	46	47	48	49	50
	Ans.	3	3	4	4	1	2	1	3	4	4
PART-B : PHYSICS	Q.No.	51	52	53	54	55	56	57	58	59	60
	Ans.	3	4	1	1	2	1	4	1	4	3
	Q.No.	61	62	63	64	65	66	67	68	69	70
	Ans.	4	2	2	4	3	1	4	4	2	2
	Q.No.	71	72	73	74	75	76	77	78	79	80
	Ans.	3	2	3	1	3	1	4	4	2	4
	Q.No.	81	82	83	84	85	86	87	88	89	90
	Ans.	1	2	1	2	3	4	1	2	1	1
	Q.No.	91	92	93	94	95	96	97	98	99	100
	Ans.	3	1	1	4	1	1	2	3	2	4
PART-C : BIOLOGY	Q.No.	101	102	103	104	105	106	107	108	109	110
	Ans.	2	4	4	3	3	2	1	3	4	3
	Q.No.	111	112	113	114	115	116	117	118	119	120
	Ans.	1	2	2	4	1	1	3	4	1	2
	Q.No.	121	122	123	124	125	126	127	128	129	130
	Ans.	2	1	3	3	2	2	4	4	4	4
	Q.No.	131	132	133	134	135	136	137	138	139	140
	Ans.	1	1	2	4	1	1	1	1	3	1
	Q.No.	141	142	143	144	145	146	147	148	149	150
	Ans.	3	2	1	4	3	4	4	4	4	3
	Q.No.	151	152	153	154	155	156	157	158	159	160
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	Q.No.	161	162	163	164	165	166	167	168	169	170
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	Q.No.	171	172	173	174	175	176	177	178	179	180
	Ans.	2	1	1	2	3	1	1	2	3	4
	Q.No.	181	182	183	184	185	186	187	188	189	190
	Ans.	2	2	2	2	1	3	2	1	3	4
	Q.No.	191	192	193	194	195	196	197	198	199	200
	Ans.	1	2	3	3	1	3	1	4	4	3

STUDENT'S SPACE

TEXT SOLUTIONS (TS)

PAPER

PART-A: CHEMISTRY

2. $16r_1 = \frac{r \times n^2}{z}$ (here z = 1)

therefore n = 4

$E_4 = -13.6\ \frac{z^2}{n^2}\ eV = -\frac{13.6}{16} = -0.853\ eV$

4. Z = 2

$n_1 = 1$

$n_2 = \infty$

$\bar{\nu} = R(2)^2\left(\frac{1}{1^2} - \frac{1}{\infty^2}\right) = 4R$

6. (1) $6 \rightarrow 3$ $\quad \Delta n = 3$

$\therefore$ no. of lines = $\frac{3(3+1)}{2} = 6$

All lines are in infrared region

(2) $7 \rightarrow 3$ $\quad \Delta n = 4$

$\therefore$ no. of lines = $\frac{4(4+1)}{2} = 10$

All lines are in infrared region

(3) $5 \rightarrow 2$ $\quad \Delta n = 3$

All lines are in visible region

(4) $6 \rightarrow 2$ $\quad \Delta n = 4$

All lines are in visible region

8. $1 \rightarrow r,\ 2 \rightarrow s,\ 3 \rightarrow p,\ 4 \rightarrow q$

10. Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

12. d_{z^2} has shape like baby soother.

14. Cu^{2+} : [Ar]$3d^9$ (One unpaired e)

Cr^{3+} : [Ar]$3d^3$ (Three unpaired e)

spin only magnetic moment = $\sqrt{3(3+2)}$

= $\sqrt{15}$

Ti^{4+} : [Ar] $3d^\circ\ 4s^\circ$ (0 unpaired e)

spin only magnetic moment = $\sqrt{0(0+2)}$

= 0

Ag^+ : [Kr] $3d^{10}$ (0 unpaired e)

16. ℓ should be $\geq$ 2 (as m = 2)

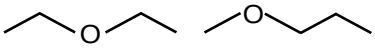
For p orbital ℓ = 1.

18. Element $1s^2\ 2s^2\ 2p^6\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^x$ For 3d, 4p, 5p ; n + ℓ = 5.

Cation (2+) $1s^2\ 2s^2\ 2p^6\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^0\ 4d^x$

20. 8

21. $C_4H_{10}O$ can show metamerism because its ether structure can make metamers.



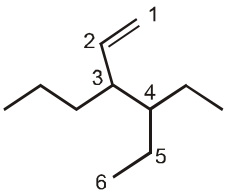
Metamers to each other

C_3H_{12}, C_3H_8O, C_3H_6O can not show metamerism because no change in alkyl group possible.

22.

Species	Bond order
O_2^+	2.5
O_2^-	1.5
O_2^{2-}	1
O_2	2

23.

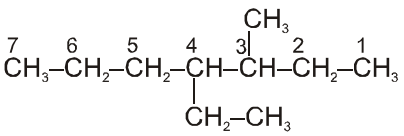


4-Ethyl-3-propylhex-1-ene.

24. BF_4^- hybridisation sp^3, tetrahedral structure.

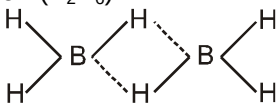
NH_4^+ hybridisation sp^3, tetrahedral structure.

25.



Correct IUPAC name is 4–Ethyl–3–methylheptane

26. $(BH_3)_2$ or (B_2H_6)



It contains two 3 centre-2 electron bonds.

27. Poor screening effect of *f*-orbital.

28. O_2^- superoxide has one unpaired electron by MOT.

$\sigma1s^2$, σ^*1s^2, $\sigma2s^2$, σ^*2s^2, $\sigma2p_z^2$, $\pi2p_x^2 = \pi2p_y^2$, $\pi^*2p_x^2 = \pi^*2p_y^1$

29. Ga^+ is more stable than Al^+ as inert pair effect becomes more effective down the group.

30. The order of repulsion force according to VSEPR theory :

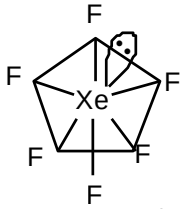
lone pair – lone pair > lone pair – bond pair > bond pair – bond pair

31. Correct order of I.E.

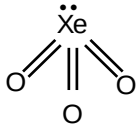
$C < O < N < F$

Half filled sp^3 configuration

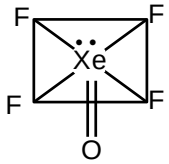
32. $XeF_6 \longrightarrow sp^3d^3 \longrightarrow$ distorted octahedral



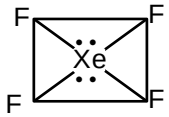
$XeO_3 \longrightarrow sp^3 \longrightarrow$ pyramidal



$XeF_4 \longrightarrow sp^3d^2 \longrightarrow$ square pyramidal



$XeF_4 \longrightarrow sp^3d^2 \longrightarrow$ square planar



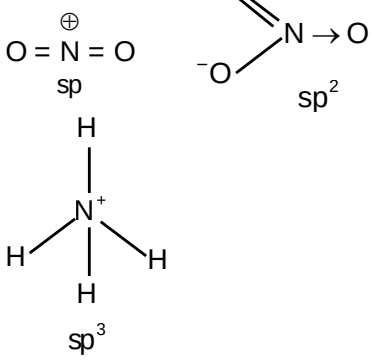
33. In case of isoelectronic species the radius decrease with increase in nuclear charge

	Ca^{2+}	<	K^+	<	Ar
electrons	18		18		18
Proton	20		19		18

$\frac{z}{e}$ $\frac{20}{18}=1.11$ $\frac{19}{18}=1.05$ $\frac{18}{18}=1$

Ionic radius $\alpha \frac{1}{(Z/e)}$

34.



35. Both **Assertion** and **Reason** are true and **Reason** is the correct explanation of **Assertion**.

37. $\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{V_2}{V_1}} = \sqrt{\frac{50}{100}}$

39. $^{78}_{34}Se$

41. Infrared lines = total lines – visible lines – UV lines $= \frac{6(6-1)}{2} - 4 - 5 = 15 - 9 = 6$.

(visible lines = 4 $6\rightarrow2$, $5\rightarrow2$, $4\rightarrow2$, $3\rightarrow2$)

(UV lines = 5 $6\rightarrow1$, $5\rightarrow1$, $4\rightarrow1$, $3\rightarrow1$, $2\rightarrow1$)

43. $n = 4$, $m = -3$ $\therefore$ only possible value of ℓ is 3.

$\therefore$ Orbital angular momentum $= \sqrt{\ell(\ell+1)}\ \frac{h}{2\pi} = \frac{2\sqrt{3}\,h}{2\pi} = \frac{\sqrt{3}\,h}{\pi}$.

46. $\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{CH_2}-\overset{5}{C}\equiv\overset{6}{CH}$

1-Hexen-5-yne

47. CO

No of electron in CO = 6 + 8 = 14

(i) $CO \longrightarrow \sigma1S^2,\ \sigma^*1S^2,\ \sigma\ 2S^2,\ \sigma^*2S^2,\ \left[\pi2P_x^2=\pi2P_y^2\right]\sigma2P_Z^2$

All electrons are paired so diamagnetic

(ii) $O_2 \longrightarrow \sigma1S^2,\ \sigma^*1S^2,\ \sigma\ 2S^2,\ \sigma^*2S^2,\ \sigma2P_Z{}^2\left[\pi2P_x^2=\pi2P_y^2\right],\ \left[\pi^*2P_x^1=\pi^*2P_y^1\right]$

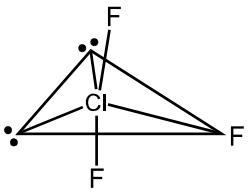
Unpaired electron = 2 (Paramagnetic)

(iii) $B_2 \longrightarrow \sigma1S^2,\ \sigma^*1S^2,\ \sigma2S^2,\ \sigma^*2S^2\ \left[\pi2P_x^1=\pi2P_y^1\right]$(Paramagnetic)

(iv) $NO \longrightarrow \sigma1S^2,\ \sigma^*1S^2,\ \sigma2S^2,\ \sigma^*2S^2,\ \sigma2P_Z{}^2\ \left[\pi2P_x^2=\pi2P_y^2\right],\left[\pi^*2P_x^1=\pi^*2P_y^0\right]$(Paramagnetic)

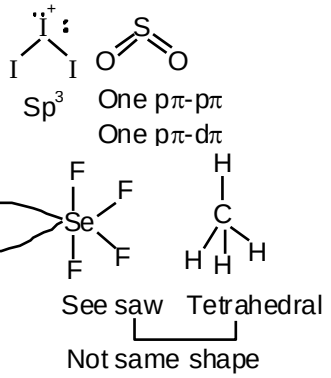
48. Be has completely filled stable $2s^2$ orbital and thus Be has higher ionisation energy than B. 2s orbital has less energy than 2p orbital. (From $(n+\ell)$ rule)

49. $\boxed{AB_3L_2}$ ClF_3



the number of lone pairs of electrons on cetral atom 'Cl' is 2.

50.



Sp^3 One $p\pi$-$p\pi$ bond

One $p\pi$-$d\pi$ bond

See saw Tetrahedral

Not same shape

PART-B: PHYSICS

51. $R_{max} = \frac{u^2}{g} = 100 \Rightarrow u = 10\sqrt{10} = 32 m/s$

52. $\vec{r} = \vec{r}_2 - \vec{r}_1 = (-2\hat{i} - 2\hat{j} + 0\hat{k}) - (4\hat{i} - 4\hat{j} + 0\hat{k})$

$\Rightarrow \vec{r} = -6\hat{i} + 2\hat{j} + 0\hat{k}$

$\therefore$

$|\vec{r}| = \sqrt{(-6)^2 + (2)^2 + 0^2} = \sqrt{36+4} = \sqrt{40} = 2\sqrt{10}$

53. For both cases $t = \sqrt{\frac{2h}{g}} =$ constant.

54. $y = x^2 \sin x$

$dy/dx = x^2 . \cos x + (2x) \sin x$.

55. Vector addition of two vectors is commutative i.e. $\vec{A} + \vec{B} = \vec{B} + \vec{A}$.

56. Given $\overrightarrow{OA} = \vec{a} = 3\hat{i} - 6\hat{j} + 2\hat{k}$ and तथा $\overrightarrow{OB} = \vec{b} = 2\hat{i} + \hat{j} - 2\hat{k}$

$$\therefore (\vec{a} \times \vec{b}) = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -6 & 2 \\ 2 & 1 & -2 \end{vmatrix}$$

$= (12-2)\hat{i} + (4+6)\hat{j} + (3+12)\hat{k}$

$= 10\hat{i} + 10\hat{j} + 15\hat{k} \Rightarrow |\vec{a} \times \vec{b}| = \sqrt{10^2 + 10^2 + 15^2}$

$= \sqrt{425} = 5\sqrt{17}$

Area of $\Delta OAB = \frac{1}{2}|\vec{a} \times \vec{b}| = \frac{5\sqrt{17}}{2}$ sq.unit.

57. $y = x\tan\theta - \frac{gx^2}{2u^2\cos^2\theta}$

58. Since velocity is a vector quantity, hence as its direction changes keeping magnitude constant, velocity is said to be changed. But for constant speed in equal time interval distance travelled should be equal.

59. $x \propto t^3 \quad \therefore x = Kt^3$

$\Rightarrow v = \frac{dx}{dt} = 3Kt^2$ and $\Rightarrow a = \frac{dv}{dt} = 6Kt$

i.e. $a \propto t$

60. u = 0, $v = 27.5 m/s$ and एवं t = 10 sec

$\therefore a = \frac{27.5 - 0}{10} = 2.75 m/s^2$

Now, the distance traveled in next 10 sec,

$S = ut + \frac{1}{2}at^2 = 27.5 \times 10 + \frac{1}{2} \times 2.75 \times 100$

= 275 + 137.5 = 412.5 m

61. Because acceleration due to gravity is constant so the slope of line will be constant i.e. velocity time curve for a body projected vertically upwards is straight line.

62. When the man is at rest w.r.t. the ground, the rain comes to him at an angle 30° with the vertical. This is the direction of the velocity of raindrops with respect to the ground.

Here $\vec{v}_{rg}$ = velocity of rain with respect to the ground

$\vec{v}_{mg}$ = velocity of the man with respect to the ground.

and $\vec{v}_{rm}$ = velocity of the rain with respect to the man,

We have $\vec{v}_{rg} = \vec{v}_{rm} + \vec{v}_{mg}$ .....(i)

Taking horizontal components equation (i) gives

$v_{rg} \sin 30° = v_{mg} = 10 km/hr$

or $v_{rg} = \frac{10}{\sin 30°} = 20 km/hr$

63. Boat covers distance of 16km in a still water in 2 hours.

i.e. $v_B = \frac{16}{2} = 8 km/hr$

Now velocity of water $\Rightarrow v_w = 4 km/hr$.

Time taken for going upstream

$t_1 = \frac{8}{v_B - v_w} = \frac{8}{8-4} = 2hr$

(As water current oppose the motion of boat)

Time taken for going down stream

$t_2 = \frac{8}{v_B + v_w} = \frac{8}{8+4} = \frac{8}{12} hr$

(As water current helps the motion of boat)

$\therefore$ Total time $= t_1 + t_2 = \left(2 + \frac{8}{12}\right)$hr

or 2hr 40min

64. Light year measures distance and year measures time. One light year is the distance traveled by light in one year.

65. $ML^{-1}T^{-2}$

66. $\eta = \frac{F}{av} = \frac{[MLT^{-2}]}{[L][LT^{-1}]} = [ML^{-1}T^{-1}]$

67. It is by standard definition.

68. ct^2 must have dimensions of L

$\Rightarrow$ c must have dimensions of L/T^2

i.e. LT^{-2}.

69. $\therefore E = \frac{1}{2}mv^2$

$\therefore$% Error in K.E.

= % error in mass + 2 × % error in velocity

= 2 + 2 × 3 = 8 %

70. Number of significant figures are 3, because 10^3 is decimal multiplier.

71. Percentage error is unit less

72. Percentage error

73. Since for 50.14 cm, significant number = 4 and for 0.00025, significant numbers = 2

74. When two particles moves towards each other then $v_1 + v_2 = 6$ ...(i)

When these particles moves in the same direction then $v_1 - v_2 = 4$ ...(ii)

By solving $v_1 = 5$ and $v_2 = 1 m/s$

75. Newton's third law of motion

76. A only

77. $T_2 = (m_1 + m_2) \times \frac{T_3}{m_1 + m_2 + m_3} = \frac{(10+6)\times 40}{20} = 32\ N$

78. All of these

79. $a = \frac{m_2}{m_1 + m_2} g = \frac{3}{7+3} 10 = 3 m/s^2$

80. The fictitious force will act downwards. So the reading of spring balance will increase. In case of physical balance, the fictitious force will act on both the pans, so the equilibrium is not affected.

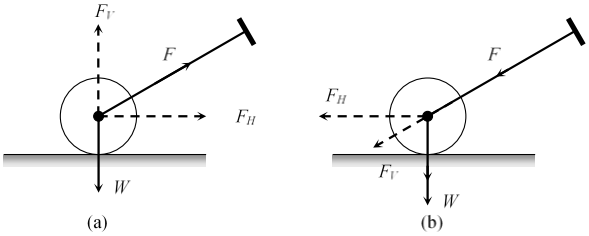
81. $a = g(\sin\theta - \mu\cos\theta) = 9.8(\sin 45^o - 0.5\cos 45^o)$

$= \frac{4.9}{\sqrt{2}} m/sec^2$

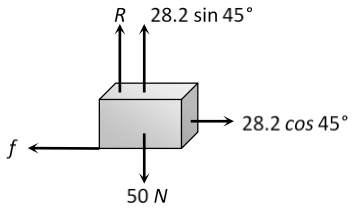
82. $F_k = \mu_k R = \mu_k mg\cos\theta$

$F_k = 1.7 \times 0.1 \times 10 \times \cos 30° = 1.7 \times \frac{\sqrt{3}}{2} \times \frac{1}{2} N$

83. Suppose the roller is pushed as in figure (2). The force F is resolved into two components, horizontal component F_H which helps the roller to move forward, and the vertical component acting downwards adds to the weight. Thus weight is increased. But in the case of pull [fig (1)] the vertical component is opposite to its weight. Thus weight is reduced. So pulling is easier than pushing the lawn roller.



84.



Frictional force = $f = 28.2\cos 45°$

$= 28.2 \times \frac{1}{\sqrt{2}} = 20\ N$

Normal reaction $R = 50 - 28.2\sin 45° = 30\ N$

85. For given condition we can apply direct formula

$I_1 = \left(\frac{\mu}{\mu + 1}\right) I$

86. Work done by friction can be positive, negative and zero depending upon the situation.

87. $\frac{21}{5} MR^2$

88. Potential energy of water = kinetic energy at turbine

$$mgh = \frac{1}{2}mv^2 \Rightarrow$$

$$v = \sqrt{2gh} = \sqrt{2\times 9.8\times 19.6} = 19.6 m/s$$

89. Max. K.E. of the system = Max. P.E. of the system

$$\frac{1}{2}kx^2 = = \frac{1}{2}\times(16)\times(5\times10^{-2})^2 = 2\times10^{-2}\,J$$

90. Work output of engine = mgh = $100\times10\times10 = 10^4 J$

Efficiency (η) = $\frac{output}{input}$

$\therefore$ Input energy = $\frac{outupt}{\eta}$

$$= \frac{10^4}{60}\times100 = \frac{10^5}{6} J$$

$\therefore$ Power = $\frac{input\,energy}{time}$

$$= \frac{10^5/6}{5} = \frac{10^5}{30} = 3.3\,kW$$

91. Centripetal force is defined from formula

$$F = \frac{mv^2}{r} \Rightarrow F \propto \frac{v^2}{r}$$

If v and r both are doubled then F also gets doubled.

92. Critical velocity at highest point = $\sqrt{gR} = \sqrt{10\times1.6}$ =4m/s

93. $$I = \frac{1}{2}MR^2 = \frac{1}{2}\times(\pi R^2 t\times\rho)\times R^2$$

$$\Rightarrow I \propto R^4$$

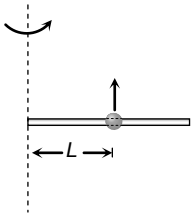
$$\therefore \frac{I_1}{I_2} = \left(\frac{R_1}{R_2}\right)^4 = \left(\frac{0.2}{0.6}\right)^4 = \frac{1}{81}$$

94. $v = \sqrt{\mu rg} = \sqrt{0.25\times40\times10} = 10 m/s$

95. Let the bead starts slipping after time t

For critical condition

Frictional force provides the centripetal force



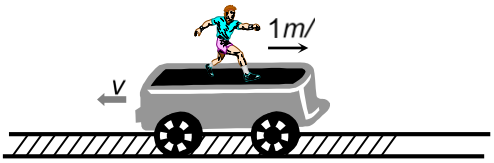
$$m\omega^2 L = \mu R = \mu m\times a_t = \mu Lm\alpha$$

$$\Rightarrow m(\alpha t)^2 L = \mu mL\alpha \Rightarrow t = \sqrt{\frac{\mu}{\alpha}}$$

96. Refer to Answer Key

97. Refer to Answer Key

98. If the man starts walking on the trolley in the forward direction then whole system will move in backward direction with same momentum.



Momentum of man in forward direction = Momentum of system (man + trolley) in backward direction

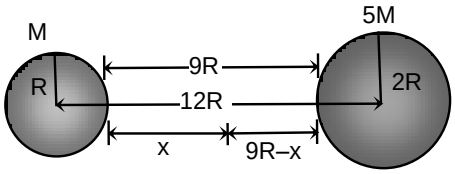
$\Rightarrow 80\times1 = (80+320)\times v \Rightarrow v = 0.2\,m/s$

So the velocity of man w.r.t. ground $1.0 - 0.2 = 0.8\,m/s$

$\therefore$ Displacement of man w.r.t. ground $= 0.8\times4 = 3.2\,m$

99. For a given mass $P \propto v$. If the momentum is constant then it's velocity must have constant.

100. As the spherical bodies have their own size so the distance covered by both the body 12R – 3R = 9R , but individual distance covered by each body depends upon their masses



We know that bodies are moving under the effect of mutual attraction only, so their position of centre
of mass remains unaffected.
Let smaller body cover distance x just before collision From $m_1r_1 = m_2r_2$ we get

$\Rightarrow Mx = 5M(9R - x) \Rightarrow x = 7.5R$

--- TEXT SOLUTIONS (TS) END ---