PRE-MEDICAL : LEADER TEST SERIES / JOINT PACKAGE COURSE

TARGET : PRE-MEDICAL 2020

Test Type : **MAJOR TEST # 04** Test Pattern : **NEET(UG)**

TEST DATE : 17 - 08 - 2020

ANSWER KEY

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

HINT – SHEET

1. Electric potential $= \frac{w}{q} = \frac{ML^2T^{-2}}{AT} = ML^2A^{-1}T^{-3}$

Electric resistance $= \frac{V}{i} = \frac{ML^2A^{-1}T^{-3}}{A} = ML^2A^{-2}T^{-3}$

Specific resistance $= \frac{(R)A}{\ell} = [ML^2A^{-2}T^{-3}]L$

2. The interference fringes for two slits are hyperbolic.

3. The voltage V_L and V_C are equal and opposite so voltmeter reading will be zero.

Also R = 30Ω, $X_L = X_C = 25\Omega$

So, $i = \frac{V}{\sqrt{R^2 + (X_L - X_C)^2}} = \frac{V}{R} = \frac{240}{30} = 8A$

4. Potential due to dipole in general position is given by

$$V = \frac{k.p\cos\theta}{r^2} \Rightarrow V = \frac{k.p\cos\theta\, r}{r^3} = \frac{k.(\vec{p}.\vec{r})}{r^3}$$

5. For 1 kg gas energy, $E = \frac{f}{2}RT$

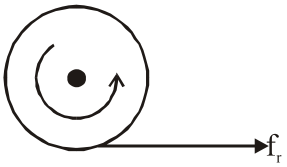
As P = ρRT therefore RT = P/ρ

$E = \frac{5}{2} \times \frac{8 \times 10^4}{4}$ [f=5 for diatomic gas]

$E = 5 \times 10^4$ Joule

6. If friction is absent then force on ball in horizontal direction will be zero so ball will remain in rest.

In presence of friction ball will moves towards right and roll backward.



7. Change in potential energy will be same for all three balls.

8. $eV = \frac{hc}{\lambda} - \frac{hc}{\lambda_0}$ ....(i)

$eV/4 = \frac{hc}{2\lambda} - \frac{hc}{\lambda_0}$ .....(ii)

From equation (i) and (ii)

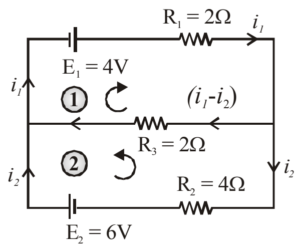
$\Rightarrow 4 = \dfrac{\frac{1}{\lambda} - \frac{1}{\lambda_0}}{\frac{1}{2\lambda} - \frac{1}{\lambda_0}}$ on solving $\lambda_0 = 3\lambda$

9. $E_0 = 66Vm^{-1}$

$B_0 = \frac{E_0}{C} = \frac{66}{3\times10^8} = 2.2\times10^{-7}T$

Since electromagnetic wave is of transverse nature. Hence if electric field is along y-axis, then magnetic field must be in z-axis. Since propagation is x-axis. Hence correct option is (4).

10. Applying Kirchhoff's law for the loops (1) and (2) as shown in figure



For loop (1)

$-2i_1-2(i_1-i_2) + 4 = 0$

$\Rightarrow 2i_1-i_2= 2$ .....(i)

For loop (2)

$-2(i_1-i_2) + 4i_2-6 = 0$

$\Rightarrow -i_1 + 3i_2 = 3$ .....(ii)

On solving equation (i) and (ii), $i_1 = 1.8$ A.

11. Efficiency of heat engine, $\eta = 1 - \frac{T_2}{T_1}$

For $\eta = 1$ (i.e. 100%) either, $T_1 = \infty$ or $T_2 = 0K$

As source at infinite temperature or sink at 0 K are not attainable, therefore heat engine cannot have efficiency 1.

12. $W = 0 - \left(-\frac{GMm}{R}\right) = \frac{GMm}{R}$

$= gR^2 \times \frac{m}{R} = mgR$

$= 1000 \times 10 \times 6400 \times 10^3$

$= 64 \times 10^9$ J

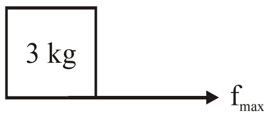
$= 6.4 \times 10^{10}$ J

13. Given F = 49 N, $M_A = 7kg$, $M_B = 3kg$, μ = ?

F = (3 + 7)a

a = 4.9 ms^{-2}

Free body diagram of B



$f_{max} = \mu(3g) = 3a$

$\mu = \frac{3a}{3g} = \frac{4.9}{9.8} = 0.5$

14. Work function $W_0 = h\nu_0 = 6.6 \times 10^{-34} \times 1.6\times10^{15}$

$= 1.056 \times 10^{-18}$ J

$= 6.6$ eV

From $E = W_0 + K_{max} \Rightarrow K_{max}\ E-W_0$

$= 8 - 6.6$

$\Rightarrow 1.4$ eV

15. $\delta_{net} = \delta_{mirror} + \delta_{prism}$

$= (180-2i) + (\mu-1)A$

$= (180 - 2\times45) + (1.5-1)\times4 = 92°$

16. Ferromagnetic substances, magnetised strongly in the direction of magnetic field, paramagnetic substances magnetised weakly in the direction of magnetic field. While diamagnetic substance is magnetised weakly in opposite direction of magnetic field.

17. Energy(E) $\propto$ (Amplitude)^2 (Frequency)^2

Amplitude is same in both the cases, but frequency 2ω in the second case is two times the frequency (ω) in the first case, Hence $E_2 = 4E_1$

18. Applying Bernoulli's theorem between free surface and orifice,

$$p_0 + \frac{1}{2}\rho V^2 + \rho gh = p_0 + \frac{1}{2}\rho v^2$$

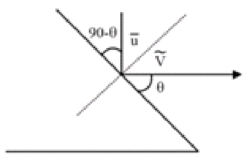
A >> a

So, V << v

$v = \sqrt{2gh}$

19. $\vec{u} = -\sqrt{2gh}\,\hat{j}$

$|\vec{v}| = |\vec{u}|$



$\vec{v} = \sqrt{2gh}\,\hat{i}$

u cos θ =v sin θ

tan θ =1

θ = 45°

20. Output of upper OR gate = W + X

Output of lower OR gate = W + Y

Net output F = (W+X) (W+Y)

= WW + WY + XW + XY [Since WW = W]

= W(1+Y) + XW + XY [Since 1+Y = 1]

= W + XW + XY = W (1+X) + XY = W+XY

21. Let nth minima of 400 nm coincides with mth minima of 560 nm then

(2n–1)400 = (2m–1)560

$$\Rightarrow \frac{2n-1}{2m-1} = \frac{7}{5} = \frac{14}{10} = \frac{21}{15}$$

i.e., 4th minima of 400 nm coincides with 3rd minima of 560 nm.

The location of this minima is

$$= \frac{7(1000)(400\times10^{-9})}{2\times0.1} = 14\text{mm}$$

Next, 11th minima of 400 nm will coincide with 8h minima of 560 nm

Location of this minima is

$$= \frac{21(1000)(400\times10^{-9})}{2\times0.1} = 42 \text{ mm}$$

$\therefore$ Required distance = 28 mm

22. Magnetic field at O due to bigger coil Y, is

$$B_Y = \frac{\mu_0}{4\pi}\cdot\frac{2\pi i(2r)^2}{\{d^2+(2r)^2\}^{3/2}} = \frac{\mu_0}{4\pi}\cdot\frac{8\pi ir^2}{(d^2+4r^2)^{3/2}}$$

Magnetic field at O due to smaller coil X is

$$B_X = \frac{\mu_0}{4\pi}\cdot\frac{2\pi ir^2}{\left\{\left(\frac{d}{2}\right)^2 + r^2\right\}^{3/2}} = \frac{\mu_0}{4\pi}\cdot\frac{16\pi ir^2}{(d^2+4r^2)^{3/2}}$$

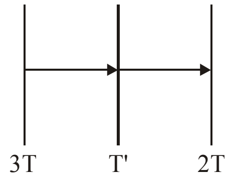
$$\Rightarrow \frac{B_Y}{B_X} = \frac{1}{2}$$

23. $\tau_1 = RC = \left(\frac{1\times2}{1+2}\right)\times\left(\frac{2\times4}{2+4}\right) = \frac{2}{3}\times\frac{8}{6} = 8/9\mu s$

τ_2 = RC = (1+2) (2+4) = 3×6 = 18μs

$\tau_3 = \left(\frac{1\times2}{1+2}\right)(2+4) = \frac{2}{3}\times6 = 4\mu s$

24.



In steady state energy absorbed by middle plate is equal to energy released by middle plate.

$\sigma A(3T)^4 - \sigma A(T')^4 = \sigma A(T')^4 - \sigma A(2T)^4$

$(3T)^4 - (T')^4 = (T')^4 - (2T)^4$

$2(T')^4 = (16 + 81)T^4$

$$T' = \left(\frac{97}{2}\right)^{\frac{1}{4}} T$$

25. T = tension, W = weight and F = centrifugal force.

26. $\frac{1}{2}a_1 t_0^2 = \frac{1}{2}a_2(t_0 + t)^2$

$v_1 = a_1 t_0 \qquad v_2 = a_2(t_0 + t)$

$v = v_1 - v_2 = (a_1 - a_2)t_0 - a_2 t$

$$\sqrt{\frac{a_1}{a_2}}\, t_0 = t_0 + t$$

$$t_0 = \frac{t}{\sqrt{\frac{a_1}{a_2}} - 1}$$

$$v = (a_1 - a_2)\frac{t}{\sqrt{\frac{a_1}{a_2}} - 1} - a_2 t$$

$$= t\left(\frac{a_1\sqrt{a_2}}{\sqrt{a_1} - \sqrt{a_2}} - \frac{a_2\sqrt{a_2}}{\sqrt{a_1} - \sqrt{a_2}} - a_2\right)$$

$$= t\left(\frac{a_1\sqrt{a_2} - a_2\sqrt{a_1}}{\sqrt{a_1} - \sqrt{a_2}}\right) = t\sqrt{a_1}\sqrt{a_2}$$

27. $\frac{N_B}{N_A} = \frac{N_0(1 - e^{-\lambda t})}{N_0 e^{-\lambda t}}$

$0.3 = e^{\lambda t} - 1 \qquad T = \frac{\ell n(2)}{\lambda}$

$1.3 = e^{\lambda t} \qquad \lambda = \frac{\ell n(2)}{T}$

$\ell n(1.3) = \lambda t, \qquad t = \frac{\ell n(1.3)}{\ell n(2)} \times T$

28. By using $e = \frac{1}{2}Bl^2\omega$

For part AO ; $e_{OA} = e_O - e_A = \frac{1}{2}Bl^2\omega$

For part OC; $e_{OC} = e_O - e_C = \frac{1}{2}B(3l)^2\omega$

$\therefore\ e_A - e_C = 4Bl^2\omega$

29. In charging half of energy supplied by the battery is lost in the form of heat.

30. For cyclic process. Total work done

$= W_{AB} + W_{BC} + W_{CA}$

$= \Delta W_{AB} = P\Delta V = 10(2-1) = 10J$ and $\Delta W_{BC} = 0$

[as V =constant]

From FLOT, $\Delta Q = \Delta U + \Delta W$

$\Delta U = 0$ (process ABCA is cylic)

$\Rightarrow\ \Delta Q = \Delta W_{AB} + \Delta W_{BC} + \Delta W_{CA}$

$\Rightarrow\ 5 = 10 + 0 + \Delta W_{CA} \Rightarrow \Delta W_{CA} = -5$ J.

31. Torque, $\vec{\tau} = \vec{r} \times \vec{F}$

In magnitude, t = rF $\sin\theta$

Where θ is the angle between $\vec{r}$ and $\vec{F}$.

Here, F = 2.0 N, r = 3m, $\theta = 30^\circ$

$\therefore$ The magnitude of torque on P with respect to origin O is

$$\tau = (3m)\,(2.0N)\sin 30^\circ = (3m)\,(2.0N)\left(\frac{1}{2}\right) = 3Nm.$$

32. Assume block of mass 100 kg is moving upward with acceleration a with respect to ground and tension in the rope is T. Then

For man

$$T - 60g = 60\left(\frac{5g}{4} - a\right) \quad \text{.........(i)}$$

($\therefore$man is climbing on the rope with acceleratton 5g/4)

For block

$T - 100g = 100a \quad$ ....(ii)

Solving equation (i) and (ii)

$T = 1218.7\ N \approx 1218N$

33. The frequency υ of the emitted electromagnetic radiation, when a hydrogen atom de- excites from the level n_2 to n_1 is

$$\upsilon = RCZ^2\left(\frac{1}{n_1^2}-\frac{1}{n_2^2}\right)$$

when the transition take place from $n_2 = 2$ to $n_1 = 1$

Then

$$2.7 \times 10^{15} = RCZ^2\left(\frac{1}{1^2}-\frac{1}{2^2}\right) \quad \text{........(i)}$$

when the transition take place from $n_2 = 3$ to $n_1 = 1$ then the frequency

$$\upsilon = RCZ^2\left(\frac{1}{1^2}-\frac{1}{3^2}\right) \quad \text{........(ii)}$$

From equation (i) and (ii) we get

$$\upsilon = \frac{32\times 2.7\times 10^{15}}{27} = 3.2 \times 10^{15}\ \text{Hz}$$

34. Distance of object from mirror

$$= 15 + \frac{33.25}{4}\times 3 = 39.93\ \text{cm}$$

Distance of image from mirror

$$= 15 + \frac{25}{4} \times 3 = 33.75$$

For mirror, $\frac{1}{v}+\frac{1}{u} = \frac{1}{f}$

$$\Rightarrow \frac{1}{-33.75}-\frac{1}{39.93}=\frac{1}{f} \Rightarrow f \approx -18.3\text{cm}$$

35. From the figure net resistance

$R_1 = 1\text{ohm}$, $R_2 = \frac{1}{2}\text{ohm}$, $R_3 = 3\text{ohm}$

It is clear that $R_3 > R_1 > R_2$

$$\therefore P_3 < P_1 < P_2 \left[\text{As } P=\frac{V^2}{R}\right]$$

36. In stationary lift $T = 2\pi\sqrt{\frac{\ell}{g}}$

In upward moving life $T' = 2\pi\sqrt{\frac{\ell}{(g+a)}}$

(a = Acceleration of lift)

$$\Rightarrow \frac{T'}{T} = \sqrt{\frac{g}{g+a}} = \sqrt{\frac{g}{\left(g+\frac{g}{4}\right)}} = \sqrt{\frac{4}{5}}$$

$$\Rightarrow T' = \frac{2T}{\sqrt{5}}$$

37. Work done to increase the diameter to bubble from d to D

$W = 2\pi(D^2-d^2)T = 2\pi[(2D)^2-(D)^2]T$

$= 6\pi D^2T$

38. Fraction of length of the chain hanging from the

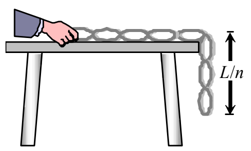


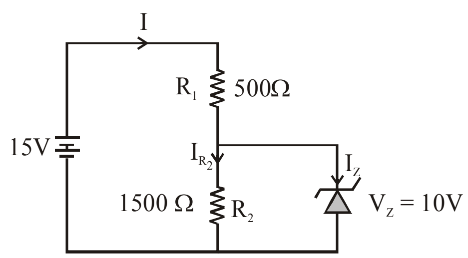
table $= \frac{1}{n} = \frac{60\text{cm}}{200\text{cm}} = \frac{3}{10} \Rightarrow n = \frac{10}{3}$

Work done is pulling the chain on the table

$$W = \frac{mgL}{2n^2} = \frac{4\times 10\times 2}{2\times (10/3)^2} = 3.6\ \text{J}$$

39. The voltage drop across R_2 is

$V_{R_2} = V_Z = 10V$



The current through R_2 is

$$I_{R_2} = \frac{V_{R_2}}{R_2} = \frac{10V}{1500\Omega} = 0.667\times 10^{-2}\,A$$

$= 6.67 \times 10^{-3}$ A = 6.67 mA

The voltage drop across R_1 is :

$VR_1 = 15\text{ V} - VR_2 = 15\text{V} - 10\text{V} = 5\text{V}$

The current through R_1 is

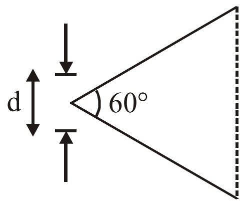
$$I_{R_1} = \frac{V_{R_1}}{R_1} = \frac{5V}{500\Omega} = 10^{-2}A = 10\times10^{-3}\text{ A} = 10\text{mA}$$

The current through the zener diode is

$$I_Z = I_{R_1} - I_{R_2} = (10-6.67)\text{mA} = 3.33\text{mA}$$

40. In diffraction d sin30° = λ

$$\lambda = \frac{d}{2}$$



Young's fringe width (d' is the separation between two slits)

$$\beta = \frac{\lambda \times D}{d'}$$

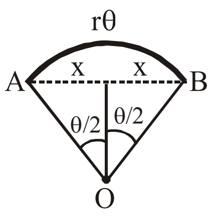
$$10^{-2} = \frac{d}{2} \times \frac{50\times10^{-2}}{d'}$$

$$10^{-2} = \frac{10^{-6}}{2} \times \frac{50\times10^{-2}}{d'}$$

D' = 25 μm

41. From figure

$$\sin\frac{\theta}{2} = \frac{x}{r}$$



$r\theta = \ell$

$r = \frac{\ell}{\theta}$

$$\Rightarrow\ x = r\sin\frac{\theta}{2}$$

Hence new magnetic moment M'

$$= m(2x) = m.2r\sin\frac{\theta}{2}$$

$$= m.\frac{2l}{\theta}\sin\frac{\theta}{2} = \frac{2ml\sin\theta/2}{\theta} = \frac{2M\sin(\pi/6)}{\pi/3} = \frac{3M}{\pi}$$

42. Particle velocity (v_p) = –v × slope of the graph at that point

At point 1 : Slope of the curve is positive, hence particle velocity is negative or downward (↓)

At point 2 : Slope negative, hence particle velocity is positive or upwards (↑)

At point 3 : Again slope of the curve is positive, hence particle velocity is negative or downward (↓)

43. Let the final temperature be T°C

Total heat supplied by the three liquids in coming down to 0°C

$= m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3$ ....(i)

Total heat used by three liquids in raising temperature from 0°C to T°C

$= m_1c_1T + m_2c_2T + m_3c_3T$ ......(ii)

By equating (i) and (ii) we get

$(m_1c_1 + m_2c_2 + m_3c_3)$ T

$= m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3$

$$\Rightarrow T = \frac{m_1c_1T_1 + m_2c_2T_2 + m_3c_3T_3}{m_1c_1 + m_2c_2 + m_3c_3}$$

44. Let distance of man from the floor be (10+x)m. As centre of mass of system remains at 10m above the floor.

so 50(x) = 0.5(10) ⇒ x = 0.1m

⇒ distance of the man above the floor

= 10 + 0.1

= 10.1 m

45. Consider the case when Ge and Si diodes are connected as shown in the given figure.

Equivalent voltage drop across the combination Ge and Si diode = 0.3 V

∴ Out put voltage V_0 = 12 – 0.3

= 11.7 V

Now consider the case when diode connection are reversed. In this case voltage drop across the diode's combination = 0.7 V

∴ V_{out} = 12 – 0.7 = 11.3 V

Hence charge in the valve of

V_0 = 11.7 – 11.3 = 0.4 V

91. NCERT (XI) Pg. # 7
93. NCERT-XIIth Pg# (E)-127, (H)-137
94. NCERT (XII) Pg. # 135
106. NCERT (XI) Pg. # 18
108. NCERT (XI) Pg. # 38, Para 3.4
112. NCERT XII Pg. # 09
113. NCERT XIth Pg # 97
117. NCERT (XII) Pg. # 24, 36
119. NCERT (XII) Pg. # 130,131
122. NCERT (XII) Pg. # 135
124. NCERT (XI) Pg. # 42
127. NCERT (XII) Pg. # 140,141
132. NCERT Pg# 113, 114, Para-6.6.1
134. NCERT- Pg# 293, para-2
136. NCERT (XI) Pg. # 26
137. NCERT (XII) Pg.#213(E), 231(H)
138. NCERT (XII) Pg. # 51
139. NCERT Pg. # 101
141. NCERT (XI) Pg. # 20
143. NCERT (XII) Pg. # 140, 141
148. NCERT (XII) Pg.#115,116
149. NCERT Pg. # 54
154. NCERT (XII) Pg. # 130 Fig (7.2)
156. NCERT (XII) Pg.#196(E), 213(H)
157. NCERT Pg. # 80 (5.9.2)
160. NCERT (XII) Pg.#173,175,176,177(E), Pg.#188,190,191,192(H)
165. NCERT-Eng, Pg. # 53
168. NCERT Pg. # 86 (6.1.2.1)
172. NCERT Pg# 119, 122, Para-6.9
173. NCERT- Pg# 293, para-1
174. NCERT Pg. # 52