SAFE HANDS & IIT-ian's PACE

MONTHLY MAJOR TEST-01 (NB-16 NEET) ANS KEY Dt. 26-07-2023

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

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MAJOR TEST-01 (NB-16 MEDICAL) Physics Answer key & Solutions

: ANSWER KEY :

1)	d	2)	c	3)	b	4)	a	29)	b	30)	b	31)	d	32)	b
5)	b	6)	b	7)	a	8)	d	33)	b	34)	b	35)	d	36)	d
9)	d	10)	b	11)	c	12)	c	37)	a	38)	b	39)	a	40)	d
13)	d	14)	b	15)	b	16)	a	41)	a	42)	a	43)	a	44)	c
17)	b	18)	b	19)	a	20)	a	45)	b	46)	a	47)	a	48)	c
21)	d	22)	d	23)	c	24)	a	49)	d	50)	a				
25)	b	26)	c	27)	b	28)	d								

: HINTS AND SOLUTIONS :

Single Correct Answer Type

2 **(c)**

$s = ut + \frac{1}{2}at^2$

For Ist body

$u = 0$ and $a = g$ [freely falling body]

Distance covered in 2 s,

$s_1 = 0 + \frac{1}{2}g(3)^2$

For IInd body

Distance covered in 2 s,

$s_2 = 0 + \frac{1}{2}g(2)^2$

$\therefore\ s_1 - s_2 = \frac{1}{2}g[(3)^2 - (2)^2]$

$= \frac{1}{2}g(9 - 4) = 25$ m

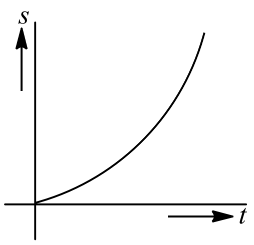
4 **(a)**

The equation of motion

$s = ut + \frac{1}{2}at^2$

$= 0 + \frac{1}{2}at^2 = \frac{1}{2}at^2$

The graph plot is as shown.



5 **(b)**

Speed of stone in a vertically upward direction is 4.9 m/s. So for vertical downward motion we will consider $u = -4.9\ m/s$

$h = ut + \frac{1}{2}gt^2 = -4.9 \times 2 + \frac{1}{2} \times 9.8 \times (2)^2$

$= 9.8\ m$

6 **(b)**

$x = \frac{1}{t+5} \Rightarrow v = \frac{dx}{dt} = -\frac{1}{(t+5)^2}$

Acceleration, $a = \frac{dv}{dt} = \frac{2}{(t+5)^3} \Rightarrow a \propto (\text{velocity})^{3/2}$

7 **(a)**

Distance between the balls = Distance travelled by first ball in 3 seconds – Distance travelled by second ball in 2 seconds $= \frac{1}{2}g(3)^2 - \frac{1}{2}g(2)^2 = 45 - 20 = 25\ m$

8 **(d)**

$v = \frac{ds}{dt} = 3t^2 - 12t + 3$ and $a = \frac{dv}{dt} = 6t - 12$

For $a = 0$, we have $t = 2$ and at $t = 2, v = -9\ ms^{-1}$

9 **(d)**

Man walks from his home to market with a speed of 5 km/h. Distance= 2.5 km and time $= \frac{d}{v} = \frac{2.5}{5} = \frac{1}{2}\ hr$ and he returns back with speed of 7.5 km/h in rest of time of 10 $minutes$

Distance $= 7.5 \times \frac{10}{60} = 1.25\ km$

So, Average speed $= \frac{\text{Total distance}}{\text{TOtal time}}$

$= \frac{(2.5 + 1.25)km}{(40/60)hr} = \frac{45}{8}\ km/hr$

10 **(b)**

Time average velocity $= \frac{v_1+v_2+v_3}{3} = \frac{3+4+5}{3} = 4m/s$

11 **(c)**

Force $F = qvB$

$[\text{MLT}^{-2}] = [\text{C}][\text{LT}^{-1}][\text{B}]$

$\Rightarrow \quad [\text{B}] = [\text{MC}^{-1}\text{T}^{-1}]$

12 **(c)**

From the principle of dimensional homogenity $[v] = [at] \Rightarrow [a] = [LT^{-2}]$. Similarly $[b] = [L]$ and $[c] = [T]$

13 **(d)**

$NSm^{-2} = Nm^{-2} \times S =$ Pascal-second

14 **(b)**

The height of a tree, building tower, hill etc, can be determined with the help of a sextant.

15 **(b)**

Volume $= (2.1 \times 10^{-2})^3 \text{m}^3 = 9.261 \times 10^{-6} \text{m}^3$. Rounding off two significant figures, we get $9.3 \times 10^{-6} \text{m}^3$.

16 **(a)**

$$V = \frac{W}{Q} = [ML^2T^{-2}Q^{-1}]$$

18 **(b)**

We know that kinetic energy $= \frac{1}{2}mv^2$

Required percentage error is 2%+2× 3% *ie*, 8%

19 **(a)**

$$I = \frac{Q}{t} = \frac{[Q]}{[T]} = [M^0L^0T^{-1}Q]$$

20 **(a)**

Quantities having different dimensions can only be divided or multiplied but they cannot be added or subtracted

21 **(d)**

$$s = 0 \times 1 + \frac{1}{2} \times 9.8 \times 1 \times 1 = 4.9 \text{ m}$$

23 **(c)**

If a particle is projected with velocity u at an angle θ with the horizontal, the velocity of the particle at the highest point is

$v = u\cos\theta = 200\cos 60° = 100 \text{ ms}^{-1}$

If m is the mass of the particle, then its initial momentum at highest point in the horizontal direction $= mv = m \times 100$. It means at the highest point, initially the particle has no momentum vertically upwards or downwards. Therefore, after explosion, the final momentum of the particles going upwards and downwards must be zero. Hence, the final momentum after explosion is the momentum of the third particle, in the horizontal direction. If the third particle moves with velocity v', then its momentum $= \frac{mv'}{3}$,

According to law of conservation of linear momentum,

We have $\frac{mv'}{3} = m \times 100$ or $v' = 300 \text{ ms}^{-1}$

24 **(a)**

$H_1 = \frac{u^2\sin^2\theta}{2g}$ and $H_2 = \frac{u^2\sin^2(90-\theta)}{2g} = \frac{u^2\cos^2\theta}{2g}$

$$H_1H_2 = \frac{u^2\sin^2\theta}{2g} \times \frac{u^2\cos^2\theta}{2g} = \frac{(u^2\sin 2\theta)^2}{16g^2} = \frac{R^2}{16}$$

$$\therefore R = 4\sqrt{H_1H_2}$$

25 **(b)**

Range $= \frac{u^2\sin 2\theta}{g}$. It is clear that range is proportional to the direction (angle) and the initial speed.

26 **(c)**

For weightlessness state of a body on equator

$mg = mR\omega^2$

or $\omega = \sqrt{\frac{g}{R}} = \sqrt{\frac{10}{6400\times100}} = \frac{1}{800} \text{ rads}^{-1}$

27 **(b)**

$$\omega^2R = 4\pi^2n^2r = 4\pi^2\left(\frac{1200}{60}\right)^2 \times 30 \times 10^{-2}$$

$$= 4732 \, m/s^2$$

28 **(d)**

From force diagram shown in figure

$T_1\cos 30° + T_2\cos 45° = mg$ ...(i)

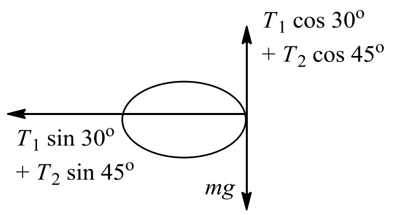
$T_1\sin 30° + T_2\sin 45° = \frac{mv^2}{r}$ ...(ii)

After solving Eq. (i) and eq. (ii), we get

$$T_1 = \frac{mg - \frac{mv^2}{r}}{\left(\frac{\sqrt{3}-1}{2}\right)}$$

But $T_1 > 0$

$$\therefore \frac{mg - \frac{mv^2}{r}}{\frac{\sqrt{3}-1}{2}} > 0$$



or $mg > \frac{mv^2}{r}$

or $v < \sqrt{rg}$

$\therefore v_{\max} = \sqrt{rg} = \sqrt{1.6 \times 9.8} = 3.96 \text{ ms}^{-1}$

29 **(b)**

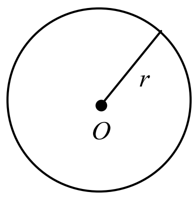
The time taken by the particle for one complete revolution.

$$t = \frac{2\pi r}{\text{speed}}$$

$$= \frac{2 \times 3.14 \times 100}{31.4} = 20\text{s}$$

Hence, averge speed is

$$v_{\text{av}} = \frac{2 \times 3.14 \times 100}{20} = 31.4 \text{ ms}^{-1}$$



30 **(b)**

$$\vec{L} = \vec{r} \times m\vec{v} = H\, mv\cos\theta = \frac{v\sin^2\theta}{2g} mv\cos\theta$$

$$= \frac{mv^3}{4\sqrt{2}g}$$

Matrix Match Type

31 **(d)**

Dimensions of Pa-s is

$= [ML^{-1}T^{-2}].[T]$

$= [ML^{-1}T^{-1}]$

Dimensions of Nm K^{-1} is

$= [MLT^{-2}][L][K^{-1}]$

$= [ML^2T^{-2}K^{-1}]$

Dimensions of $J - kg^{-1}K^{-1}$

$= [ML^2T^{-2}][M^{-1}][K^{-1}]$

$= [L^2T^{-2}K^{-1}]$

Dimensions of $Wm^{-1}K^{-1}$

$= [ML^2T^{-2}A^{-1}][L^{-1}][K^{-1}]$

$= [MLT^{-2}A^{-1}K^{-1}]$

32 **(b)**

(A) $GM_eM_s\}F = \frac{GM_eM_s}{r^2}$

$\therefore GM_eM_s = F.r^2 = (N.m^2) = [ML^3T^{-2}]$

(B) $\frac{3RT}{M}\}\ v = \sqrt{\frac{3RT}{M}};\ \therefore \frac{3RT}{M} = v^2$

Hence, $[LT^{-1}]^2 = [M^0L^2T^{-2}]$

(c) $\frac{F^2}{q^2B^2}\}\ F = qvB \Rightarrow \left(\frac{F}{qB}\right)^2 = v^2$

$\therefore [LT^{-1}]^2 = [M^0L^2T^{-2}]$

(D) $\frac{GM_e}{R_e}\}\frac{U}{m} = \frac{GM_e}{R_e}$

$$\therefore \frac{joule}{kg} = \frac{ML^2T^{-2}}{M} = [L^2T^{-2}]$$

Thus compare the dimension

35 **(d)**

(1) Planck's constant

$$[h] = \frac{[E]}{[v]}$$

$$= \frac{[ML^2T^{-2}]}{[T^{-1}]} = [ML^2T^{-1}]$$

(2) Gravitational constant

$$[G] = \frac{[Fr^2]}{[m_1m_2]}$$

$$= \frac{[MLT^{-2}][L^2]}{[M^2]}$$

$$= [M^{-1}L^3T^{-2}]$$

(3) Bulk modulus

$$[B] = \frac{[\text{Normal stress}]}{[\text{Volumetric strain}]}$$

$$= [ML^{-1}T^{-2}]$$

(4) Coefficient of viscosity,

$$\eta = \frac{[F]}{[A][dvdy]} = \frac{[MLT^{-2}][L]}{[L^2][LT^{-1}]}$$

$$= [ML^{-1}T^{-1}]$$

Assertion - Reasoning Type

36 **(d)**

For distance-time graph, a straight line inclined to tome axis measures uniform speed for which acceleration is zero and for uniformly accelerated motion $S \propto t^2$

37 **(a)**

A body has no relative motion with respect to itself. Hence if a frame of reference of the body is fixed, then the body will be always at relative rest in this frame of reference

38 **(b)**

Statement 1 is based on visual experience. Statement 2 is formula of relative velocity. But it does not explains Statement 1. The correct explanation of Statement 1 is due to visual perception of motion (due angular velocity). The object appears to be faster when its angular velocity is greater w.r.t. observer

39 **(a)**
According to definition, displacement= velocity × time

Since displacement is a vector quantity so its value is equal to the vector sum of the area under velocity-time graph

40 **(d)**
As per definition, acceleration is the rate of change of velocity, $i.e. \vec{a} = \frac{d\vec{v}}{dt}$.

If velocity is constant $d\vec{v}/dt = 0, \therefore \vec{a} = 0$

Therefore, if a body has constant velocity it cannot have non zero acceleration

41 **(a)**
Avogadro number has the unit per gram mole. So, it is not diamensionless.

42 **(a)**
According to statement of reason, as the graph is a straight line, $P \propto Q$, or $P = \text{constant } \times \text{Q}$

$i.e. \frac{P}{Q} = \text{constant}$

43 **(a)**
Au is an astronomical unit. This is the mean distance between earth and sun

$1AU = 1.496 \times 10^{11}\ M = 1.5 \times 10)\text{^}11\ M$

Å *is angstrom units 1* Å$=10^{-10}m$

44 **(c)**
$A = 4\pi r^2$ [error will not be involved in constant 4π]

Fractional error $\frac{\Delta A}{A} = \frac{2\Delta r}{r}$

$\frac{\Delta A}{A} \times 100 = 2 \times 0.3\% = 0.6\%$

But $\frac{\Delta A}{A} = \frac{4\Delta r}{r}$ is false

45 **(b)**
The last number is most accurate because it has greatest significant figure (3)

46 **(a)**
Maximum height $= \frac{u^2 \sin^2 \theta}{2g}$

$= \frac{\left(2\sqrt{gh}\right)^2 \sin^2 60°}{2g} = \frac{4gh \times 3/4}{2g} = \frac{3h}{2}$

47 **(a)**
$H = \frac{u^2 \sin^2 \theta}{2g}$ $i.e.$ it is independent of mass of projectile

48 **(c)**
$\tan \theta = \frac{v^2}{rg}$

When v is large and r is small $\tan \theta$ increases. Therefore θ increases, chances of skidding increase. Choice (c) is correct

49 **(d)**
Within a certain speed of the turn table the frictional force between the coin and the turn table supplies the necessary centripetal force required for circular motion. On further increase of speed, the frictional force cannot supply the necessary centripetal force. Therefore the coin files off tangentially

50 **(a)**
$OA = OC$

$\overrightarrow{OC} + \overrightarrow{OC}$ is along $\overrightarrow{OB}$ (bisector) and its magnitudes is

$2R \cos 45° = R\sqrt{2}$

$\left(\overrightarrow{OC} + \overrightarrow{OC}\right) + \overrightarrow{OB}$ is along $\overrightarrow{OB}$ and its magnitudes is

$R\sqrt{2} + R = R(1 + \sqrt{2})$