PHYSOL-3 EXAMINATION SERIES

Exam-1 CHAPTERS 1,2 & 3

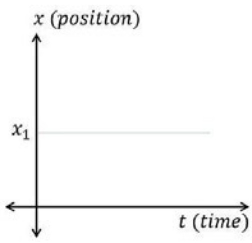
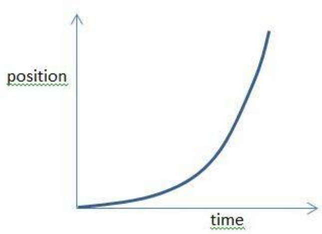
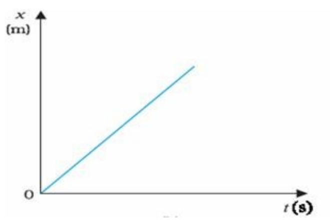
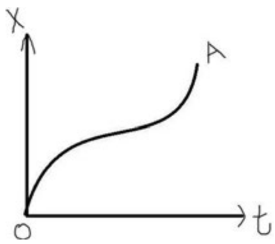
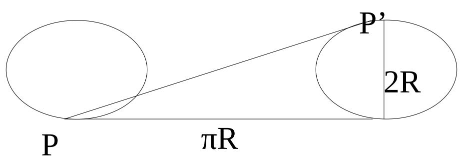
SUNDAY 01-05-2022 @ 7.00pm

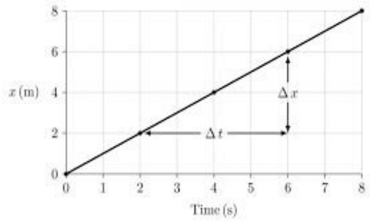
Answerkey

Answer any 3 questions from 1 to 4 each carries 1 score

1	(iii)Gravitation force	**1**
2	Charge	**1**
3	d) $\geq$ 1	**1**
4	Displacement	**1**

Answer any 5 questions from 5 to 10 each carries 2 score

5	1. Momentum and Impulse. 2. Work, energy,Torque 3. Angular momentum and Planck’s constant 4. Pressure and Stress	**2**
6	Dimension of [T] = $[T^1]$ Dimension of $\sqrt{\frac{g}{l}} = \sqrt{\frac{L^1T^{-2}}{L^1}}$ $=[T^{-1}]$ Dimension of LHS not equal to Dimension of RHS. Thus the equation is wrong.	**2**
7	$g=GM/r^2$ if r is reduced by 4% ,then percentage change in g = 2 x 4% = 8%.	**2**
8	a) State of rest 	**1**
	b) State of Motion 	**1**
9		

	Distance=πR Displacement = $PP' = \sqrt{(\pi R^2)+(2R^2)}$ = $R\sqrt{\pi^2+4}$	
10	The slope is given by $Slope = \tan\theta$ = $\frac{\Delta x}{\Delta t}$ = velocity.  That is the slope of position time graph gives the Velocity.	

Answer any 4 questions from 11 to 14 each carries 3 score

11	<table><tr><td>Coefficient of viscosity</td><td>Force/area x velocity gradient</td><td>$[ML^{-1}T^{-1}]$</td></tr><tr><td>Gravitational constant</td><td>Force x $(distance)^2/(mass)^2$</td><td>$[M^{-1}L^3T^{-2}]$</td></tr><tr><td>Modulus of elasticity</td><td>Force/area x number</td><td>$[ML^{-1}T^{-2}]$</td></tr></table>	3
12	Centripetal force $F \propto m^a v^b r^c$ ie., $F = k\, m^a v^b r^c$ --------(1) Taking dimensions $M^1L^1T^{-2} = (M^1)^a\ (L^1T^{-1})^b\ (L^1)^c$ $M^1L^1T^{-2} = M^a L^b T^{-b} L^c$ $M^1L^1T^{-2} = M^a L^{b+c} T^{-b}$ Equating dimensions on both sides a=1 b =2 c = -1 also given k=1 Thus equation (1) becomes $F = \frac{mv^2}{r}$	
13	Average velocity = 0 (because total displacement =0) $Average\ speed = \frac{Total\ distance}{Total\ time}$ = $\frac{S+S}{t_1+t_2}$ = $\frac{2S}{\frac{S}{V_1}+\frac{S}{V_2}}$ = $\frac{2V_1V_2}{V_1+V_2}$ = $\frac{2\,x\,60\,x\,90}{150}$ =72 km/hr	
14	a) By the equation of motion, $v^2 = u^2 + 2as$ Here v=0 a=-a retardation , S--> Stopping distances Therefore $0 = u^2 - 2as$ Stopping distance $S = \frac{u^2}{2a}$	1 1 1

b) Stopping distance $S=\frac{u^2}{2a}$

If u = 2u, then $S'=\frac{(2u)^2}{2a}=\frac{4u^2}{2a}=4S$

That is Stopping distance becomes four times.

Answer any 2 questions from 15 to 17 each carries 2 score

15 a)It states that " For the correctness of an equation the dimension all the terms should be same" 1

b) (i) Principle of homogeneity of dimensions. 1

(ii) Dimension of LHS [PV] $= ML^{-1}T^{-2}L^{3}$

$= ML^{2}T^{-2}$

Dimens ion of RHS [Fx] $= ML^{1}T^{-2}L^{1}$ 2

$= ML^{2}T^{-2}$

ie. Dimension of LHS = Dimension of RHS

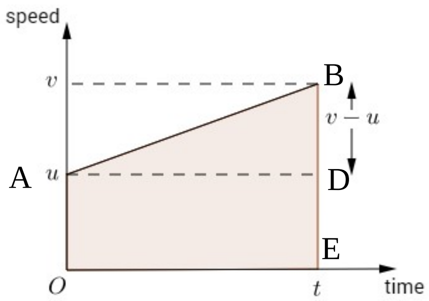
Thus the equation is correct.

16 a) iii) a straight line inclined to the time axis. 1

b) Second equation of motion OR Displacement time relation:

From the graph

Displacement S = Area under the graph AB 2



= Area of rectangle OADE + Area of triangle ADB

$$= OA\times OE+\frac{1}{2}DB\times AD$$

$$= u\times t+\frac{1}{2}(v-u)\times t$$

$$= ut+\frac{1}{2}at\times t$$

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

	This is the displacement – time relation. c) i) An object with constant velocity has always constant speed.	1
17	a) Velocity-time relation: $v=u+at$ Let u--> initial velocity v-->final velocity a-->acceleration t-->time. We have $acceleration=\frac{Change\,in\,velocity}{time}$ $a=\frac{v-u}{t}$ $v-u=at$ $v=u+at$ This is the velocity -time relation. b) Velocity-Displacement relation: $v^2=u^2+2as$ Let S-> Displacement u->initial velocity v--> final velocity a->acceleration t->time. We have $Average\,velocity=\frac{Total\,displacement}{Time}$ $V_{av}=\frac{S}{t}$ Also $V_{av}=\frac{v+u}{2}$ Therefore $\frac{s}{t}=\frac{v+u}{2}$ That is $v+u=\frac{2S}{t}$ ---------(1) But $v-u=at$ ---------(2) Multiplying (1) and (2) $(v+u)(v-u)=\frac{2S}{t}at$ $v^2-u^2=2aS$ $V^2=u^2+2as$ This is the velocity-displacement relation.	1 $1\frac{1}{2}$ $1\frac{1}{2}$