Muthuthevar Mukkulathore Hr. sec. School
Thirunagar, Madurai

Quarterly Examination - 2022.

Higher Secondary First Year	Physics Answer Key
பகுதி - I	PART - I
1. இ) திருப்பு விசை மற்றும் ஆற்றல்	b) torque and Energy
2. ஈ) 40	c) 40
3. அ) அதிகரிக்கும்	a) increases
5. ஈ) சுழியாக இருக்க வேண்டிய அவசியமில்லை.	d) Speed and magnitude of acceleration are constant
4. ஈ) துகளின் வேகம் மற்றும் முடுக்கத்தின் எண்மதிப்பு மாறிலி	b) need not be zero
6. அ) அதிகரிக்கும்	a) increases
7. இ) 1ஐ விட அதிகம்	c) greater than 1
8. ஈ) 1:2	d) 1:2
9. ஆ) $\sqrt{5gR}$	b) $\sqrt{5gR}$
10. ஆ) 3/2 K	b) 3/2 K
11. அ) சுழற்சி இயக்கம்	a) Pure rotation
12. ஈ) $L/\sqrt{2}$	d) $L/\sqrt{2}$
13. ஆ) $\sqrt{10/7\, gh}$	b) $\sqrt{\frac{10}{7} gh}$
14. ஆ) 1032	b) 1032
15. ஆ) குறையும்.	b) decreases.

PART-II

16. Dimensions of all the terms in a Physical expression Should be Same.

$$v^2 = u^2 + 2as$$

$$[LT^{-1}]^2 = [LT^{-1}]^2 + [LT^{-1}]^2 [L]$$

$$[L^2T^{-2}] = [L^2T^{-2}] + [L^2T^{-2}]$$

17. If two Vectors are orthogonal to each other, then their Scalar Product is zero (or) Vector Product is maximum.

18. i) identify the force acting on the object
ii) Represent the object as a Point.
iii) Draw the Vectors representing the force acting on the object.

19. The inability of objects to move on its own (or) change its State of motion.

20. Energy Can ~~be~~ neither be Created nor destroyed. It may be transformed from one form to another. total energy of an isolated System remains Constant.

21. $W_{weightlifter} = F_w h \cos\theta$

$= F_w h \cos 0°$

$= 5000 \times 5 \times 1$

$= 25,000$ joule

$W = 25$ kJ

22. When no external torque acts on the body, the net angular momentum of rotating rigid body remains Constant.

23. As a Point where the entire mass of the body appears to be Concentrated.

24. 'F' of attraction is directly Propotional to the Product of the masses and inversely Propotional to the distance between them.

$$F \propto \frac{m_1 m_2}{r^2}$$

PART-III

25) $\frac{1}{2}mv^2 = mgh$

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

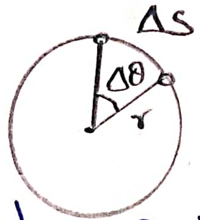
$[M][LT^{-2}][L] = [ML^2T^{-2}]$

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

Dimensionally Correct.

26) $\Delta s = r\Delta\theta$

$\frac{\Delta s}{\Delta t} = r \cdot \frac{\Delta\theta}{\Delta t}$



$\frac{ds}{dt} = r\omega$ $\quad \frac{ds}{dt} \Rightarrow$ linear Speed

$V = r\omega$ $\quad \boxed{\vec{V} = \vec{\omega} \times \vec{r}}$

$\omega \Rightarrow$ angular Speed

27) Newton's I law:

Every object Continues to be in the State of rest or of uniform motion, unless there is external force acting on it

II-law:-

$\vec{F} = \frac{d\vec{P}}{dt}$

$\vec{F} = m\vec{a}$

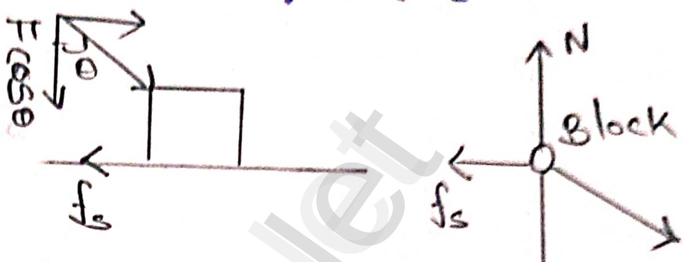
III-law:- For every action there is an equal and opposite reaction.

$\vec{F}_{12} = -\vec{F}_{21}$

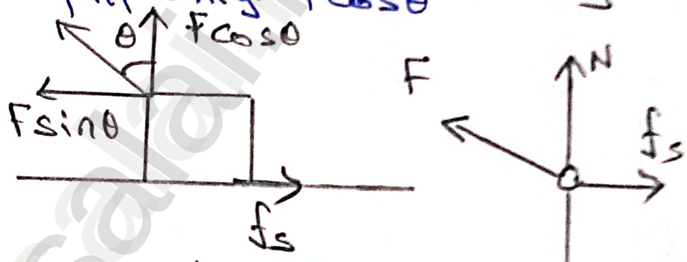
28) $N_{push} = mg + F\cos\theta$

$f_s^{max} = \mu_s N_{push}$

$F\sin\theta = \mu_s(mg + F\cos\theta)$



$N_{pull} = mg - F\cos\theta$



Easier to pull an object than to push to make it move.

29)

Conservative force ஆற்றல் மாற்றா விசை	Non-Conservative force ஆற்றல் மாற்றும் விசை
i) $W \Rightarrow$ independent of Path செய்யப்பட்ட வேலை பாதையை சார்ந்ததல்ல	$W \Rightarrow$ depends on the Path. செய்யப்பட்ட வேலை பாதையை சார்ந்தது
ii) Total Energy remains Constant மொத்த ஆற்றல் மாறாது	Energy is dissapiated as heat energy. வெப்ப ஆற்றலாக இழக்கப்படுகிறது.
iii) $W \Rightarrow$ Completely recoverable செய்யப்பட்ட வேலை முழுவதும் திரும்ப பெற முடியும்	$W \Rightarrow$ not Completely recoverable. செய்யப்பட்ட வேலை முழுவதும் திரும்ப பெற முடியாது.

30) $W = f \cdot s$

$f = ma$

$v^2 = u^2 + 2as$

$a = \frac{v^2 - u^2}{2s}$

$F = m\left(\frac{v^2 - u^2}{2s}\right)$

$W = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$

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

$\boxed{W = \Delta K.E.}$

31. i) The Point of the rolling object which comes in Contact with the surface is at momentary rest.

ii) All the Points on the edge, one by one come in contact with surface, the Path of Cycloid.

32. Kepler's law:

i) Each planets moves around the Sun in an elliptical orbit.

ii) the line joining the sun to a planets sweeps equal areas in equal interval of time.

iii) $T^2 \propto a^3$

$\boxed{\frac{T^2}{a^3} = \text{Constant}}$

33) $\tan\theta = \frac{v^2}{rg}$

$r = \frac{v^2}{\tan\theta}$

$r = \frac{20 \times 20}{\tan 30 \times 10}$

$r = \frac{400}{(1/\sqrt{3}) \times 10}$

$r = \sqrt{3} \times 40 = 1.732 \times 40$

$\boxed{r = 69.28\,m}$

PART-IV

34) a) $dI = (dm)x^2$

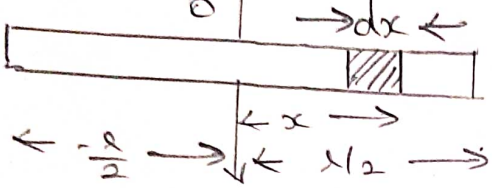
$\lambda = M/\ell$

$dm = \lambda\, dx = \frac{M}{\ell} \cdot dx$

$I = \int dI = \int (dm)x^2$

$I = \int \left(\frac{M}{\ell}\right) dx \cdot x^2$

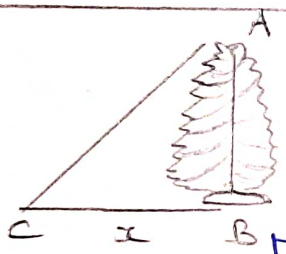
$I = \frac{M}{\ell} \int x^2 dx$



$I = \frac{M}{\ell}\left[2\left(\ell^3/24\right)\right]$

$I = \frac{1}{12} m\ell^2$

b)

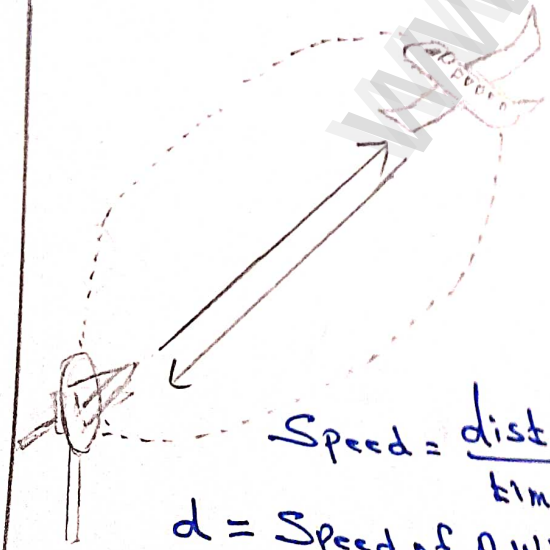


$\angle ACB = \theta$

$\tan\theta = \frac{AB}{BC}$

$\tan\theta = h/x$

$h = x\tan\theta$



Speed = $\frac{\text{dist. travelled}}{\text{time taken}}$

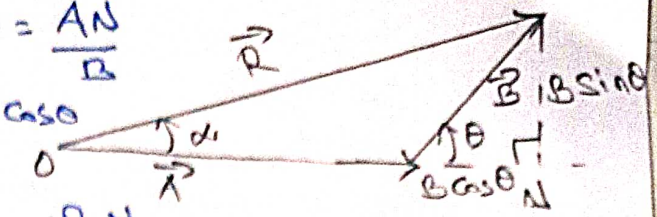
d = Speed of R.W × T.T

$d = v \times t$

35) a) Triangle law of Vector addition

$\cos\theta = \frac{AN}{B}$

$AN = B\cos\theta$



$\sin\theta = \frac{BN}{B}$; $BN = B\sin\theta$

ΔOBN; $OB^2 = ON^2 + BN^2$

$R^2 = (A + B\cos\theta)^2 + (B\sin\theta)^2$

$R^2 = A^2 + B^2\cos^2\theta + 2AB\cos\theta + B^2\sin^2\theta$

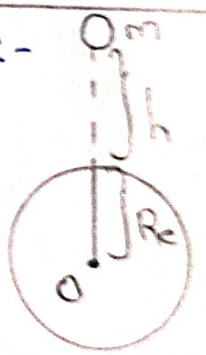
$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$

$\tan\alpha = \frac{BN}{ON} = \frac{BN}{OA + AN}$

$\tan\alpha = \frac{B\sin\theta}{A + B\cos\theta}$

$\alpha = \tan^{-1}\left[\frac{B\sin\theta}{A + B\cos\theta}\right]$

b) g with altitude:-



$g' = \frac{GM}{(R_e + h)^2}$

$g' = \frac{GM}{R_e^2\left[1 + h/R_e\right]^2}$

$g' = \frac{GM}{R_e^2}\left(1 + h/R_e\right)^{-2}$

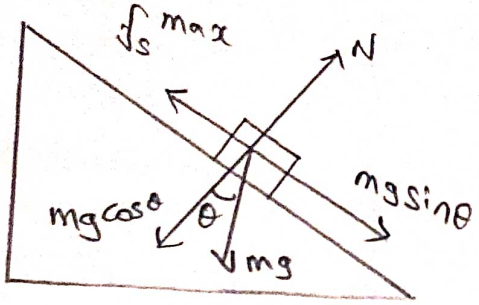
h ↑ g ↓

$g' = \frac{GM}{R_e^2}\left[1 - 2\,h/R_e\right]$

$g' = g\left[1 - 2h/R_e\right]$

$g' < g$

36) a) $\tan\theta = \mu_s$



$N = mg\cos\theta$

$f_s = f_s^{max} = \mu_s N = \mu_s mg\cos\theta$

$f_s^{max} = mg\sin\theta$

$\mu_s = \frac{\sin\theta}{\cos\theta}$

$\boxed{\tan\theta = \mu_s}$ θ is angle of friction.

b) K.E:- Energy Possessed by a body due to its motion.

K.E & P:-

$K.E = \frac{1}{2}mv^2 = \frac{1}{2}m(\vec{v}.\vec{v})$

$K.E = \frac{1}{2}\frac{m^2(\vec{v}.\vec{v})}{m}$

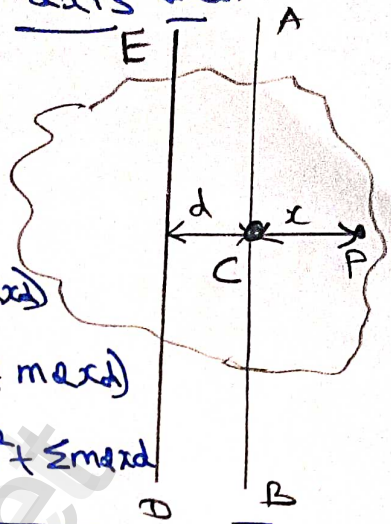
$K.E = \frac{1}{2}\frac{(m\vec{v}.m\vec{v})}{m}$

$K.E = \frac{\vec{p}.\vec{p}}{2m}$

$\boxed{K.E = \frac{p^2}{2m}}$

$p = \sqrt{2mK.E}$

37) a) Parallel axis theorem.



$I = I_c + Md^2$

$I = \Sigma m(x+d)^2$

$I = \Sigma m(x^2+d^2+2xd)$

$I = \Sigma(mx^2+md^2+m2xd)$

$I = \Sigma mx^2 + \Sigma md^2 + \Sigma m2xd$

$\boxed{\Sigma mx = 0}$

$\boxed{I = I_c + Md^2}$

b) i) If the digit to be dropped is smaller than 5, the Preceding digit left unchanged.

ex:- 2.43 is 2.4

ii) If the digit to be dropped is greater than 5, the Preceedy digit should be increased 1

ex:- 27.6 is 2.8

iii) If the digit is dropped is 5, which is followed by non-zero digits, the Preceding digit should be raised 1.

ex:- 6.325 is 6.4

iv) If the digit is 5 or 5 followed by zeros, the Preceding digit is not changed if it is even

ex:- 6.45 is 6.4

38) a) **Banking of tracks:-**

In a levelled circular road skidding mainly depends on μ_s. μ_s depends on nature of surface.

Outer edge of the road is slightly raised to inner edge.

i) mg (ii) N

$$N \cos\theta = mg$$

$$N \sin\theta = \frac{mv^2}{r}$$

$$\tan\theta = v^2/rg$$

θ is banking angle

$$v = \sqrt{rg\tan\theta}$$

b) Scalar:- i) Only magnitude.
எண்மதிப்பு மட்டும்

ex: distance, mass, temp.
தொலைவு, நிறை, வெப்பநிலை

Vector:- i) Both magnitude and direction.
எண்மதிப்பு மற்றும் திசை

ex: Force, Velocity,
விசை, திசைவேகம்.

Properties of Vector Product

i) Not Commutative
பரிமாற்று விதிக்கு உட்படாது

$\vec{A} \times \vec{B} \neq \vec{B} \times \vec{A}$

ii) Two vectors are ||el. its minimum. ($\theta = 0°$) anti ||el ($\theta = 180°$)
இரண்டு வெக்டர் இணை ($\theta = 0°$) எதிர் இணையாக ($\theta = 180°$) $\vec{A} \times \vec{B} = 0$ = சிறுமம்

iii) $\theta = 90°$
$\vec{A} \times \vec{B} = A \cdot B\hat{n}$ = பெருமம்

iv) $\vec{A} \cdot \vec{A} = AA \sin 0° \hat{n} = 0$

v) $\hat{i} \times \hat{i} = \hat{j} \times \hat{j} = \hat{k} \times \hat{k} = 0$

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