மொறட்டுவை பல்கலைக்கழக பொறியியற் பீட தமிழ் மாணவர்கள் நடாத்தும் க.பொ.த உயர்தர மாணவர்களுக்கான 8 வது

முன்னோடிப் பரீட்சை - 2017

பௌதிகவியல் பல்தேர்வு வினா விடைகள் / Physics M C Q Answers

பாடமும் பாட எண்ணும்
Subject and Subject No

PHYSICS 01

Prepared By
R.Kumaran *M.Sc* & R.Kugan *B.Sc*

(01) ②	(11) ③	(21) ③	(31) ②	(41) ③
(02) ④	(12) ②③	(22) ①	(32) ④	(42) ④
(03) ①	(13) ③	(23) ⑤	(33) ④	(43) ⑤
(04) ③	(14) ②	(24) ⑤	(34) ③	(44) ⑤
(05) ②	(15) ②	(25) ②	(35) ②	(45) ①
(06) ①	(16) ②	(26) ①	(36) ③	(46) ⑤
(07) ④	(17) ②	(27) ③	(37) ⑤	(47) ⑤
(08) ④	(18) ①	(28) ④	(38) ③	(48) ②
(09) ⑤	(19) ③	(29) ③	(39) ⑤	(49) ①
(10) ④	(20) ②	(30) ④	(40) ⑤	(50) ⑤

AL/2017/01/E-I,II

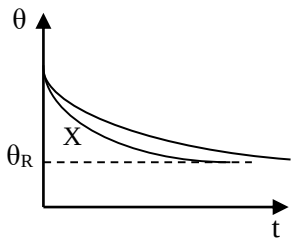
Part II (A) – Structured Essay

01. (a) stirrer, thermometer, stop watch …….. (2)
(2 marks for three correct answers and 1 mark for two correct answers)

(b) to reduce the heat transfer due to the conduction method …….. (1)

(c) taking the reading while stirring well with the stirrer …….. (1)

(d)

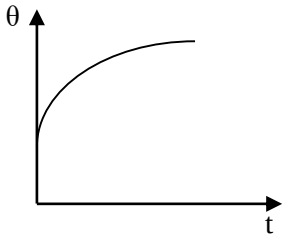


…...……... (1)

(e) for correct curve …….. (1)
(if the initial temperature is not same, it should be considered that the gradient of X is greater than the previous one for any certain temperature)

(f) gradient of the graph/ the rate of fall of temperature for various temperatures/ for excess temperature …….. (1)

(g) i.

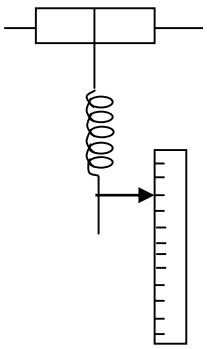


…….. (1)

ii. the rate loss of heat to the environment under certain temperature is equal to the power of the heater …….. (1)

iii. $R = 10(\theta - \theta_R)$
$500 = 10\ (\theta - 30)$
$\theta = 80^0C$ …….. (1)

02. (a)



(the most part of the meter ruler should be below the indicator perpendicularly, indicator should be in line with a scale)

…….. (1+1)

(b) $F = Ke$
$Mg = Ke$
$K = Mg/e$ …….. (1)

(c) placing the meter ruler near the spring and taking the reading corresponding to both ends ……. (1)

(d) i. 2e ……. (1)

ii K/2 ……. (1)

(e) i. $T = 2\pi\sqrt{\frac{M}{k}}$

$T^2 = \frac{4\pi^2}{K} \times M$ ……. (1)

$\downarrow \quad \downarrow \quad \downarrow$

$y \quad m \quad x$

ii. stop watch ……. (1)

iii. gradient ……. (1)

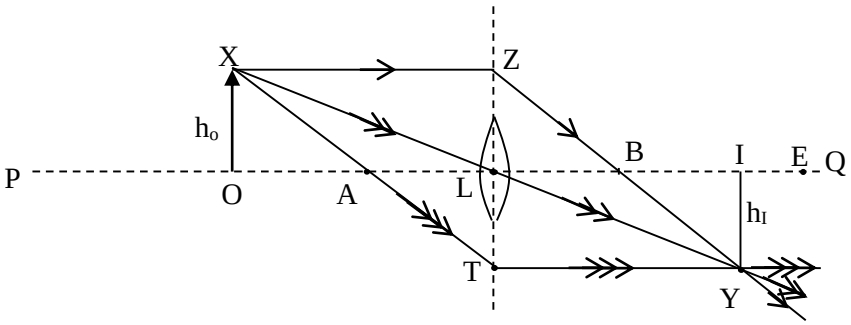
iv. percentage error = $\frac{\text{least count}}{\text{reading}}$ x 100

$1 = \frac{0.1}{n \times 2} \times 100$

2n = 10

n =5 ……. (1)

03. (a)



i. ……. (1)

ii. A, B ……. (1)

iii. in the triangles AOX and ALY,

$h_I/h_O = f/x$ ……..(a)

in the triangles LZB and BIY,

$h_I/h_O = y/f$ ……..(b)

from (a) & (b) => $f^2 = xy$ ……. (1)

iv. $xy = f^2$

$(u-t)(v-f) = f^2$ ……. (1)

v. in between A and L ……. (1)

vi. along the line joining ZB ……. (1)

vii.

1. M-(f,0) , N- (0,f) …….. (1)
2. real object , real image (+)
   virtual object , virtual image (-) …….. (1)

viii.

1. between AO …….. (1)
2. increase …….. (1)

04. (a) i. in pure water - series …….. (1)
in marine water - parallel …….. (1)

ii. high electric current in parallel connection for low resistance (marine water)
…….. (1)
high electric current in series connection for resistance (pure water) …….(1)

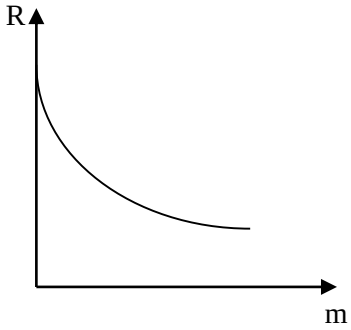
iii. V = E-Ir
3.3 = 6.9 – 1.5 x 5r
r = 0.48Ω …….. (1)

(b) i. $R = \frac{Pl}{A}$

$1.2 \times 10^3 = \frac{P \times 12 \times 10^{-2}}{0.5 \times 3 \times 10^{-4}}$

$P = 1.5\Omega m$ …….. (1)

ii.



…….. (1)

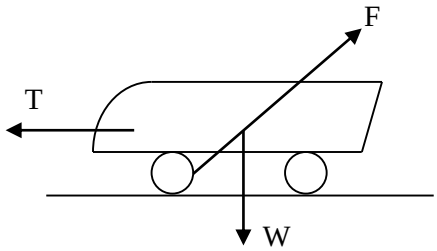
(c) (i) energy = EQ
= EItn
= $45 \times 0.12 \times 5 \times 10^{-3} = 10.8J$ …….. (1)

(ii) resistivity should be low, to reduce the loss of electric energy in the body part ..…. (1)

(iii) decrease of electric density with distance …….. (1)

Part II (B) - Essay

05. (a)



…….. (1+1)

(provide 1 mark for the three forces to be correct and 1 mark for the three forces to meet at one point)

(no marks if the three foces do not meet at one point)

(b) i. $\overleftarrow{F} = ma.$

$30 \times 10^3 = 6000a$

$a = 5ms^{-2}$ ……..…(1)

$\overleftarrow{V^2} = u^2 + 2as$

$50^2 = 0 + 2 \times 5S$ …….(1)

$S = \frac{2500}{10}$

$= 250m$ …….(1)

Another method

Force x Distance = Gain in Kinetic Energy

$30 \times 10^3 \times s = \frac{1}{2} \times 6000 \times 50^2$

$s = 250m$

ii. The air resistance against the motion has not been considered in the calculation/ the average acceleration of the jet plane is less than $5ms^{-2}$ due to air resistance …… (1)

(c) i. $L\,Cos30^o = 6x10^4$ …….. (1)

$L = \frac{12}{\sqrt{3}} \times 10^4$

$= 4\sqrt{3} \times 10^4 N$ …….. (1)

ii. towards the center

$\overleftarrow{F} = ma$

$L\,Sin30^o = m \times \frac{V^2}{r}$ …….. (1)

$= \frac{6000 \times 80^2 \times 2}{4\sqrt{3} \times 10^4}$

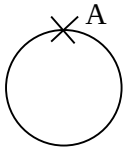
$= \frac{1920}{4\sqrt{3}}$

…….. (1)

iii. speed should increase above $80ms^{-1}$ …….. (1)

angle of tilt should increase above 30^o …….. (1)

(d) i. 1.



…….. (1)

2.

$V^2/_r = g$

$r = \left(V^2/_g\right)$ …….. (1)

ii. The resultant of P and W might be directed towards the center …….. (1)

06. (a) 1. identifying the environment
detecting the obstacles in their path
finding out the position of the prey …….. (1)
(for any two answers)

2. distance – from the time taken for the echo to be heard back
position – by the part of the ear which the echo is heard
size – by the intensity of echo
motion – by the frequency …….. (2)
(1 mark for any three answers)

ii. 1. loss in dispersion while sound leaves and enters
absorption by the medium in both travel
absorption by the surface where the echo is formed …….. (2)
(1 mark for any two answers)

2. intensity of produced sound
distance to the surface where reflection occurs
nature of the medium through which sound travels
size of the reflecting surface
(for any two answers) ……..…. (2)

iii. high frequency ultra sound/ low wavelength ultra sound can also be reflected in small objects …….. (1)

(b) i. S = ut
2x = 340 x 0.1
x =17m …….. (1)

ii. 1. $f = \left(\frac{C-V_0}{C-V_s}\right) fo$
frequency observed by the insect
$f = \frac{340}{340-10} f$
$= \left(\frac{34}{33}\right) fo$ …….. (1)
frequency of the echo observed by the bat
$70 = \frac{340+10}{340-10} \times \left(\frac{34}{33}\right) \times fo$
$fo = 66kHz$ …….. (1)

2. frequency observed by the insect

$$f = \frac{340-V}{340-10} \times fo$$

$$= \left(\frac{340-v}{330}\right) \times 66$$

$$= \left(\frac{340-v}{5}\right)$$ ……(1)

frequency of the echo observed by the bat

$$\frac{(340+10)}{(340+v)} x\left(\frac{(340-v)}{5}\right) = 65$$ ……(1)

v = 12.6 ms^{-1} ……(1)

3. right side ……(1)

07. (a) i. energy required to break the bond between two liquid molecules ……(1)

ii. $-E_o$ ……(2)

iii. n/2 ……(1)

iv. surface energy = ½ NnE_oA ……(1)

(b) i. number of 1kg water molecules

$$L = \frac{W}{M} \times N_A$$ ……(1)

$$= \frac{1}{0.018} \times 6 \times 10^{23}$$

$$= \frac{1}{3} \times 10^{26}$$

$$2.3 \times 10^6 = \frac{1}{2} \times \left(\frac{1}{3} \times 10^{26}\right) \times 10 \times E_0$$ ……(1)

$$E_0 = 1.38 \times 10^{-20} J$$ ……(1)

ii. $T = \frac{1}{4} NnE_0$

$$= \frac{1}{4} \times 2 \times 10^{18} \times 10 \times 1.38 \times 10^{20}$$ ……(1)

$$= 6.9 \times 10^{-2} Nm^{-1}$$ ……(1)

iii. for the equilibrium of the insect,

Mg = 2πr T cos θ x 6 ……(1)

m x10 = 2x0.3 x 3 $x10^{-5}$ x 6.9 $x10^{-2}$ x 0.8 x6 ……(1)

m = 5.96 $x10^{-6}$kg ……(1)

iv. because of the vertically upward resultant force by the surface tension is less than the weight of the insect due to the variation in contact angle/ because of that the liquid wets the legs ……(2)

08. (a) i. $P.E = -\frac{GM_E m}{r}$ ……....(1)

ii. Escape velocity is the minimum velocity with which an object should be projected from the surface of the planet such that it does not reach the planet again ……..……(1)

iii. Escape velocity

$M.E_i = M.E_f$ ……..……..(1)

$$\frac{-GM_E m}{R_E} + \frac{1}{2}mV_e^2 = O + O$$

$V_e^2 = \frac{2GM_e}{R_E}$ ……..…(1)

$M.E_c = M.E_f$ …..……..(1)

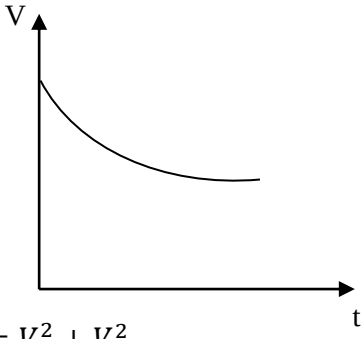
$-\frac{GM_E m}{R_E} + \frac{1}{2}mV_0^2 = 0 + \frac{1}{2}mV_f^2$ ……....(1)

$$-\frac{2GM_E}{R_E} + V_0^2 = V_f^2$$

$-V_0^2 + V_0^2 = V_f^2$ ….……..(1)

$V_0^2 = V_f^2 + V_e^2$

iv.



..……..(1)

v. $V_0^2 = V_f^2 + V_e^2$

$5000^2 = V_f^2 \quad + 3000^2$ ….……..(1)

$V_f^2 = 4000^2$

$V_f \ = 4000ms^{-1}$ ...……..(1)

(b) i. towards the earth ……..(1)

ii. $M.E_i = M.E_f$

$-1.3 \times 10^6 m + 0 = -62.3 \times 10^6 m + \frac{1}{2} mv^2$ ……...……..(1)

$V^2 = 122 \times 10^6$

$V = \sqrt{122} \times 10^3 ms^{-1}$ ……(1)

iii. $\sqrt{122} \times 10^3 ms^{-1}$ ...……..(1)

iv. yes, throw in order to reach the point resembling the point O by throwing in the selected direction ……..……..(1)

09. (A)

(a) Advantage 1 its efficiency is approximately 3 times also in fuel cars
2. its motion does not depend on fuel and oil
3. no air pollution and sound pollution
4. low maintenance cost ……..…(1)

(for any two answers)

Disadvantage 1. greater consumption cost
2. more time taken for the recharging of the cell
3. need for the charging of the cells after travelling short distance
4. its usage is an obstacle for those who travel along the road. ..……..…(1)

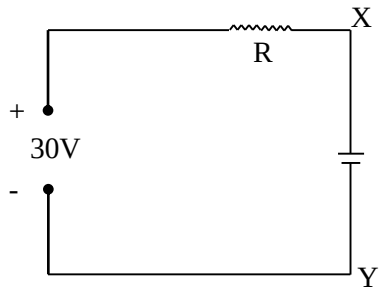
(for any two answers)

(b) i. Electromotive force of a cell is the work done required to pass unit charge through closed circuit ……..……(1)

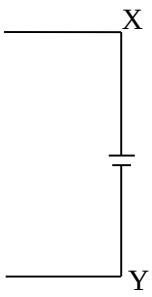
ii. I= Q/t
Q = It
= 200 x 4x3600 ……(1)
= $2.88x10^6$C ……(1)

iii. E = QV
= $2.88 \times 10^6 \times 24$
= 6.9×10^7J ……..(1)

(c) i.



OR



……..…..(2)

ii. $R = \frac{V}{I}$
$= \frac{30-24}{120}$
= 0.05Ω ……..…….(1)

iii. P =VI
= 6 x 120
= 720W ……(1)

iv. $t = \frac{Q}{I}$

$= \frac{2.88\times10^6}{120}$ …..……..(1)

$= 24 \times 10^3 s = \frac{24\times10^3}{3600} = 6.7h$ ……(1)

(d) i. $\frac{N_o}{N_i} = \frac{240}{30}$

= 8 ……(1)

ii. $V_i i_i = V_o i_o$

$240 i_1$ = 30 x120

i_1 =15A ……..……..(1)

iii. P = VI

= 240 x (40-15)

= 6000W ..……..(1)

(B)

(a)

i. V_C = 3V ..……..(1)

ii. $V_{CC} = I_C R_L + V_C$

6 = 3x R_L + V_C …..……..(1)

R_L = 1kΩ ..……..(1)

iii. $I_C = \beta I_B$

3 = 100I_B

I_B = 30μA ..……..(1)

$V_{CC} = I_B R_B + V_B E$

6 = 30 x$10^{-3}$$R_B$ + 0.6 ..……..(1)

$R_B = \left(\frac{5.4}{3\times10^{-3}}\right)$

=1.8 x10^5Ω = 180kΩ ..……..(1)

iv. $\Delta V_0 = \frac{\beta \Delta V_i}{2\times10^3} \times R_L$

$\frac{\Delta V_0}{V_i} = \frac{\beta R_L}{2\times10^3}$

$= \frac{100\times10^3}{2\times10^3}$ ..……..(1)

$= 50$ ..……..(1)

v. $V_{in} = \frac{\Delta V_0}{50}$

$= \frac{3}{50}$

$= 60mVolt$ ..……..(1)

(b) i. NO – gate ……..(1)

ii.

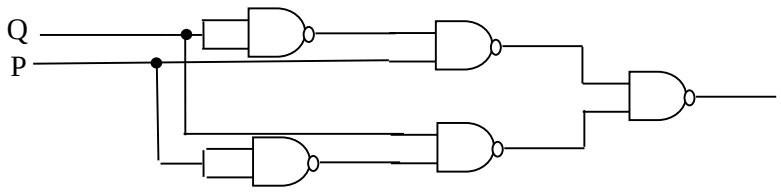
Liquid level	P	Q	R	F
Overfilled	0	1	0	1
Acceptable level	1	0	0	0
Underfilled	1	0	1	1

……..(1+1)

iii. 1. if the table is correct ……..(1)

2. $F = \overline{Q}R + Q\overline{R}$ ……..(1)

3



……..(1)

10. (A)

(a) When temperature of a fixed mass of gas is unchanged, its pressure is inversely proportional to volume ..…….(1)

(b) i. 1. Force = $(P_{in} – P_{out})\ (A_1\text{-}A_2)$ ……(1)

= $(2x10^5 – 1x10^5)\ (2x10^{-3}\text{-}1x10^{-3})$

= 100N ……(1)

← Or to the left ……(1)

2. for the equilibrium of the piston L,

$T = (P_{in}\text{-}\ P_{out})A_2$

$= (2\ x10^5 – 1x10^5)\ 1x10^{-3}$

= 100N ..……..(1)

ii. Pistons move to the right side while containers move to the left side or center of gravity of the system is at rest while containers and pistons move ……(1)

iii. 1. $\Delta V = (2x10^{-3} – 1x10^{-3}) \times 0.1$

$= 1x10^{-4}\ m^3$ ……(1)

2. $P_1V_1 = P_2V_2$
   $7x10^{-4}P = 6x10^{-4} \times 2x10^5$ ……(1)
   $P = 1.71 \times 10^5 Pa$ ……(1)

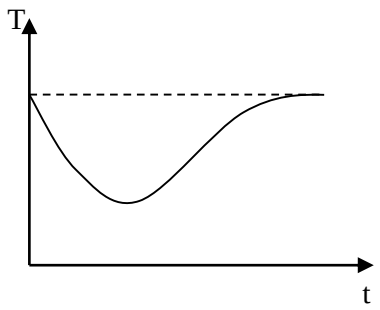
3. Pressure of the gas is greater than the atmospheric pressure although the gas in the container A is removed ……(1)

iv. $W = P\Delta V$
   $= 1 \times 10^5 \times 1x10^{-4}$
   $= 10J$ ……(1)

v. According to the first law of thermodynamics,
   $\Delta Q = \Delta U + \Delta W$ ……(1)
   $= 0 + 10$
   $\Delta Q = 10J$ ……(1)

vi. Internal energy of the gas decreases when the work is done by the gas. Therefore, temperature decreases and heat is absorbed from the environment ……(1)

V.



……(1)

(B)

(a) i. perpendicularly out of the plane ……(1)

ii. negative ……(1)

iii. 1. magnetic force always acts perpendicular to the direction of motion of charge ……(1)

2. Gain in Kinetic Energy = Loss of Electric Potential Energy
   $E = nV_oe$ ……(1)

3. Towards the center
   $F = ma$ ……(1)
   $BeV_A = m\frac{V^2}{R}$
   $R = \left(^{mv}/_{Be}\right)$ ……(1)

4. $t = s/v$
   $= \frac{\pi \times Mv/Be}{V}$
   $= \left(\frac{\pi m}{Be}\right)$ ……(1)

(b)

i. $^{18}_{8}O + ^{1}_{1}P \rightarrow ^{18}_{9}F + ^{1}_{1}n$ ……(1)

ii. I= ne

$n = I/e$

$= \frac{30\times10^{-6}}{1.6\times10^{-14}}$

$= 1.875 \times 10^{14} Cm^{-2}s^{-1}$ ……(1)

iii. $\lambda = \frac{0.7}{T_{1/2}}$

$= \frac{0.7}{110 \times 60}$

$= 1.06 \times 10^{-4} s^{-1}$ ……(1)

iv. $A = In6(1-e^{-\lambda t})$

$= 1.875 \times 10^{14} \times 2.17 \times 10^{23} \times 2 \times 10^{-4} (1-e^{-1.06 \times 10-4 \times 360})$ ……(1)

$= 3.84 \times 10^{12} s^{-1}$ ……(1)

v. $10^{8} s^{-1}$ ……(1)

vi. γ rays have the ability to penetrate into the body ……(1)

vii. for the conservation of momentum ……(1)

***