PHYSICS 2019

SOLUTION OF NUMERICALS

0.10. Given: Mass(m) = 50 gm or m = 50/1000 = 0.05 kg. Velocity of light C = 3 x 10^8 m/sec
Energy released E = ?

SOLUTION:

Formula E = mc2

E = 0.05 x (3 x 10^8)^2
= 0.05 x 9 x 10^{16}
= 0.45 x 10^{16}
= 4.5 x 10^{15} Joules

Q.11. Data: Frequency of Sound wave f = 200 Hz
Wave length λ = 300 cm = 300/100 = 3 metre
Velocity of wave V = ?

SOLUTION:

V = f λ
V = 200 x 3
V = 600 m / sec

Q.12. Data: Radius of earth Re = 6 x 10^6 metre
Given value of "g" = 10 m/sec^2 Orbital velocity V = ?

SOLUTION: Formula: v •= Re

$V = \sqrt{g\mathrm{Re}}$
$V = \sqrt{10 \times 6 \times 10^6}$
$V = \sqrt{60 \times 10^6}$
V = 7.746 x 10^3 $m/_{sec}$

Q13. Data: x-Component of force Fx = 50 N
Angle with x-axis, 0 = 60° Y-Component Fy = ? Resultant force R = ?

SOLUTION:

Fx = F Cos 0
50 = Fx cos 60°
50 = F x 0.5
F = 50/0.5
F = 100 N

To find y-component Fy
Fy = F Sin 0
Fy = 100 x Sin 60
Fy = 100 x 0866
Fy = 86.6 N
Resultant force is F
Which is 100 N
And Fy = 86.6 N

Q.14. Data: Mass of water m = 100 gm = 100/1000 = .1 kg
Sp. Heat of water C = 4200 J/Kg °c
Rise in temperature, 10° to 60° Or ΔT = 60 – 10 = 50°C
Heat required Q=?

SOLUTION: Heat required

Q = mc ΔT
Q = 0.1 x 4200 x 50
Q = 21000 Joules

0.15. Data: Initial velocity Vi = 0 m/sec
Time taken t = 10 second G = 9.8 m/sec^2
Height of Tower = ? Velocity of hitting the ground V_f = ?

SOLUTION:

To find the final velocity V_f
V_f Vi + gt
V_f= 0+9.8 x 10
V_f = 98 m/sec

To find height of tower H
H = S = Vit + 1/2 gt^2
= (0 x 10) + $^1/_2$ x 9.8 x (10)^2
= 0+ $^1/_2$ x 9.8 x100
= 490 metre

Q.16. Data: Mirror is Concave Its focal length f = 15 cm Nature of Image = Real
Magnification M = 3 Object distance P = ?

SOLUTION:

M = q/p
3 = q/P
q= 3p

Putting the value of q in mirror equation for real image

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}.$$

$$\frac{1}{15} = \frac{1}{p} + \frac{1}{3p}.$$

$\frac{1}{15} = \frac{3+1}{3p}$.

$\frac{1}{15} = \frac{4}{3p}$.

3p = 4 x 15

$p = \frac{4\times15}{3}$. $p = 20cm$

Q.17. Data: Resistance R = 20 ohm
Potential difference V = 220 volts
Current I=?
Power P = ?

SOLUTION:

First finding the current I by Ohm's law
V = 1 R
220 = I x 20
I = 220/20 I = 11 Ampere
P=V I
P= 220 x 11
P = 1420 Watts.

PHYSICS 2018

SOLUTION OF NUMERICALS

Q:10. SOLUTION:

Radius in Km 0.53x10-"
1000
0.53x10`'1° -

0.53 x 10-" x103 = 0.53 x

10'3 Km Radius in mm

= 0.53 x $10^{4°}$ x 1000
= 0.53 x $10^{4°}$ x 10^3
.= 0.53 x 10^4 mm
Radius of Micrometer;
1 metre = 10^6 micrometer
r = 0.53 x $10^{4°}$ x 10^6
r = 0.53 x 10^4 micrometer Radius of Nanometer:
1 metre = 10- Nanometer
r = 0.53 x 10^{13} x 10^9
r = 0.53 x 10^4

Q:11. SOLUTION:

Data: S = 122.5 metre;
Vi = 0 m/sec; g = 9.8 m/s^2 x t = ?
S = Vi t +$^1/_2$ gt^2
122.5= (o x t) + ½ x 9.8 x t^2 122.5 = 4.9t^2

$$t^2 = \frac{122.5}{4.9}$$

$$t^2 = 25$$

$$t^2 = \sqrt{25} \quad = \quad 5 \text{ sec.}$$

Q:12. SOLUTION:

Data: n = 200 moles;
V = 50m^3 ; R = 8.31 J/mol/k
T = t + 2.73
T = 27 + 273 = 300k P = ?
According to general gas equation
PV = nRT
P x 50 = 200 x 8.31 x 300
P x 200 x 8.31 x 300

$$P = \frac{200 \times 8.31 \times 300}{50}$$

0.13. SOLUTION:

Data: T1 = 4 ohm;
R2 = 6 ohm;
Joined in Parallel Equivalent R
= ? E.m.t.V = 12 volts;
Total current I = ?
For parallel combination of resistances

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{6}$$

$$\frac{1}{R} = \frac{3+2}{12}$$

$$\frac{1}{R} = \frac{5}{12}$$

$$\frac{R}{1} = \frac{12}{5}$$

R = 2.4 Ohm

Now by Ohm's law
V = IR
12 = I x 2.4
I = 12/2.4
I = 5 Amp.1

Q.14. SOLUTION:

Data: Object in raised by sliding over an Inclined Plane W = 50 N; h = 2 metre;
e = 10 metre; P = ?
Mech. Adv W/P = ?
For Ideal machine

Input = Output
P x e=W x h
P x 10. = 50 x 2
P = 50x x 2 / 10
P = 10 Newton force

Mach. Adv. $\frac{W}{P} = \frac{l}{h}$

$$\frac{W}{P} = \frac{10}{2}$$

M.A = 5

Q.15. SOLUTION:

Data: Mass of body

A = m_1 = 5 Kg

Mass of body B

= m2 = 4 Kg

Acceleration due to gravity

G = 9.8 m/ s^2

Acceleration of bodies

a = ? ; Tension T = ?

Acceleration $a\frac{(m_1 - m_2)g}{m^1 + m^2}$

$$a\frac{(5-4)\times 9.8}{5+4}$$

$$a\frac{1\times 9.8}{9}$$

$$a = 1.088\ m/Sec2$$

Tention $T = \frac{(2m_1m_2)\times g}{m_1 + m_2}$

$$T = \frac{2\times 5\times 4\times 9.8}{5+4}$$

$$T = \frac{392}{9}$$

T = 43.55 N

0.16. SOLUTION:

Data: Lens Is Convex ;f = 18 cm ; Object distance p = 12 cm

Height of object ho = 5 cm;

q = ? ; hi = ? ; nature = ?

By law formula:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

$$\frac{1}{18} = \frac{1}{12} + \frac{1}{q}$$

$$\frac{1}{q} = \frac{1}{18} + \frac{1}{12}$$

$$\frac{1}{q} = \frac{2-3}{36}$$

$$\frac{1}{f} = -\frac{1}{36}$$

$$q = -36cm$$

Negative sign indicates that image is virtual

$$\frac{h_1}{h_o} = \frac{q}{p}$$

Now $\frac{h_1}{5} = \frac{36}{12}$

$$h_1 = \frac{5\ \times\ 36}{12}$$

h_1 = 15 cm

Q.17. SOLUTION:

Data: Number of vibrations 600;

Time taken = 60 Second Velocity of waves V = 2.5 m/Sec; T = ? ; f = ? Frequency f = Number of Vibrations completed in 1 Sec.

f = 600 / 60

f = 10 Hz

For wave length λ

Now V = f λ

2.5 = 10 x λ

λ = 2.5 / 10

λ = 0.25 metre

PHYSICS 2017

SOLUTION OF NUMERICALS

Q.5 . Data:

Initial velocity V_i= 0 m/sec
Final velocity V_f = 20 m/sec
Time taken t = 5 sec.
Distance covered S = ?

SOLUTION:

Formulae:
$S = V_it + {}^1/_2\ at^2$
$Vf = v_i + at$
First acceleration produced is found by
$V_f = V_j + at$
$20 = 0 + a \times 5$
$a \times 5 = 20$
$a = 20/5$
$a = 4\ m/sec^2$
Now $S — Vit + ½\ at^2$
$S = (0 \times 5) + ½ \times 4 \times (5)^2$
$S = 0 + 2 \times 25$
$S = 50$ metre

Q.11. Data:

Speed of car V = 20m/sec. Radius of circular tract r=30 m

Centripetal Acceleration $\frac{a}{c}$ = ?

SOLUTION:

Formulae:

$$a_c = \frac{V^2}{r}$$

$$a_c = \frac{(20)^2}{30}$$

$$a_c = \frac{20 \times 20}{30}$$

$$a_c = 13.33\ m/s^2$$

Q.13. Data:

Current Passing I = 0.60A Potential Difference V =90 volt . Resistance of the bulb R = ?

SOLUTION:

Formulae:
Ohm's law V = IR
$90 = 0.60 \times R$
$R = 90/0.60$
R= 150 Ohms

Q.16. Data:

Mass of the car m = 2000 kg Velocity of car V = 90 km/hr. Kinetic Energy KE = ?

SOLUTION:

Formula:

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

$$= \frac{1}{2} \times 2000 \times (90)^2$$

$$= \frac{2000 \times 90 \times 90}{2}$$

$$= \frac{16200000}{2}$$

$$K.E. = 8100000 \text{ Joules}$$

K. E.= 8100000 Joules

Q.20. Data:

Focal length of convex lens f = 15 cms
Magnification M = 3
Image is Real Object distance
P = ?

$$M = \frac{q}{p}$$

$$\frac{3}{1} = \frac{q}{p}$$

$$q = 3p$$

For Real Image

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

$$\frac{1}{15} = \frac{1}{p} + \frac{1}{3p}$$

$$\frac{1}{15} = \frac{3+1}{3p}$$

$$\frac{1}{15} = \frac{4}{3p}$$

$$3p = 4 \times 15$$

$$p = \frac{4 \times 15}{3}$$

p = 20 cm

Q.21. Data:

A Second Pendulum' has time period 2 sec.

T = 2 Seconds

Given g = 10m/sec^2

I = ?

$$T = 2\pi\sqrt{\frac{\ell}{q}}$$

$$2 = 2 \times \frac{22}{7}\sqrt{\frac{\ell}{10}}$$

Or

$$\sqrt{\frac{\ell}{10}} = \frac{2 \times 7}{2 \times 22}$$

Squarring

$$\frac{\ell}{10} = \frac{7 \times 7}{22 \times 22}$$

$$\ell = \frac{7 \times 7 \times 10}{22 \times 22}$$

$$\ell = \frac{490}{484}$$

$$\ell = 1.01\ metre$$

PHYSICS 2016

SOLUTION OF NUMERICALS

Q.3.Data: V_i = 0 m/sec. g = 10m/sec^2 t = 10 second Height H = ? or S = ?

SOLUTION:

Formula: $V_i + ½ gt^2$

H or S=(0 x 10) + ½ x 10 x (10)^2

S = 0 + 5 x 100

S = 500 metres

Q,4 Data: m^1 = 50 kg,

m^2 = 40 kg, r = 2 metre

G = 6.67 x 10^{-11} N-m^2/kg^2

F = ?

SOLUTION:

According to law of gravitation:

$$F = G\frac{m_1\, m_2}{r_2}$$

$$F = \frac{6.67\ \times 10^{-11} \times 50 \times 40}{(2)^2}$$

$$F = \frac{6.67\ \times 50 \times 40}{4} \times\ 10^{-11}$$

$$F = \frac{13340}{4} \times\ 10^{-11}$$

F = 3335 x 10^{-11}

F = 3.335 x 103 x10^{-11}

F = 3.335 x 10^{-8} N

Q.7. Data: Mirror is concave

f =10 cm

Magnification M = 4

Object distance p = ?

Image is real

SOLUTION:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}\ and\ M = \frac{q}{p}$$

Since q is not known we have to start from the formula

$$M = \frac{q}{p}$$

$$4 = \frac{q}{p} \quad or \quad q = 4p$$

Putting the value of q in mirror formula

For real image,-

$$\frac{1}{10} = \frac{1}{p} + \frac{1}{4p}$$

$$\frac{1}{10} = \frac{4+1}{4p}$$

$$\frac{1}{10} = \frac{5}{4p}$$

or 4p = 10 x 5

4p = 50

p = 50/4

p= 12.5 cm

Q.12 Data: Charge q = 1800 coulombs

Time t = 3 min.

t = 3 x 60 180 Seconds

Current I = ?

Formula:

$$\mathrm{I} = \frac{q}{t}$$

$$\mathrm{I} = \frac{1800}{180}$$

I =10 Amp

Q.13 Data: Mass m = 100 kg Power P = 1960 watt, Velocity V = ?

SOLUTION: The mass of 100 kg will have weight

W = mg

W = 100 x 9.8

W = 980 Newton Weight is the downward force

Or W = F

Now P = F x V

1960 = 980 x V

$V = \frac{1960}{980}$

V = 2m/sec

Q.17 Data: Half life of $_{53}I^{131}$ = 8 days, Mass of Iodine = 100 gm Time passed = 16 days, Amount left = ?

SOLUTION:

Number of half life in 16 days = 16/8 = 2 Half lives

Amount of I after 1st Half life = ½ x 100 = 50 gm

Amount of I left after 2nd half life = ½ x 50 = 25 gm

Q.18 Data: Length of Pendulum ℓ = 288 cm = 288/100 = 2.88 m G = 9.8 m/sec^2, T = ?

SOLUTION:

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$$T = 2 \times 3.14\sqrt{\frac{2.88}{9.8}}$$

$$T = 2 \times 3.14\sqrt{\mathbf{0.2938}}$$

T = 2 x 3.14 x 0.542

T = 3.403 seconds

Q.21. **Data:** Number of moles of gas n = 2 moles

Temperature of gas T = 27°C or 27 + 273 = 300

Pressure of gas = 1 atmosphere or 1.01 x 10^5 N/m^2

Universal gas constant R = 8.314 J/mol-k

Volume of gas V = ?

SOLUTION:

PV = nRT

$V = \frac{nRT}{p}$

$V = \frac{2\times8.134\times300}{1.01\times10^5}$

$V = \frac{4988.4}{101000}$

V = 0.04939 or 0.0494

Volume - 0.0494 m^3

PHYSICS 2015

SOLUTION OF NUMERICALS

4. Data: Initial velocity of Car V_i= 0 km/hour
Final velocity of car V_f
= 108 km/hour
Time taken t = 5 minutes
Acceleration a = ?

SOLUTION:

Conversion of units:

V_f= 108 km1hrs = $\frac{108\times1000}{3600}$
= 30m / sec

Time t = 5 minutes = 5 x 60=300 sec.
Formula:
$V_f = V_i + at$
$30 = 0 + a \times 300$
Or $300\ a = 30$
$a = 30/300$
$= 0.1\ m/sec^2$

9. Data: Length of the string r = 2 metre
Mass of stone m = 100 gm
Circular speed of stone V = 2m/sec
Tension in, the string T = Fc = ?
m = 100 gm = $\frac{100}{1000}$ = 0.1 Kg
Tension = Centrifugal force = Centripetal force = Fc

$$T = F_c = \frac{mv^2}{r}$$

$$T = F_c = \frac{0.1 \times (2)^2}{2}$$

$$= \frac{0.1 \times 4}{2} = 0.2N$$

13. Data: Initial length of rod $/_1$ =10 metre
Initial temperature of rod t_1 _25°C
Final temperature of rod t_2 =35°C
Coeff. Of linear expn. Of steel $\propto$ = 1.1 x 10^{-5}/k
Increase in length $\Delta/$ = ?

SOLUTION:

Formula: $\Delta I = \propto I_1 \Delta T$ Here,
change in temp.
= AT = $t_2 - t_1$
= 35 - 25 = 10°C

$\Delta I = \frac{1.1\times10\times10}{10^5}$.
= 0.00111 metre

15. Data:
Length of Pendulum ℓ =100cm
π = 22/7 Or 3.14
g = 9.8 m/sec^2
Time Period t = ?

SOLUTION:

Length of pendulum in metres = 100 cm =1 metre Formula:

$$T = 2\,\pi\sqrt{\frac{\ell}{g}}$$

$$T = 2 \times 3.14\sqrt{\frac{1}{9.8}}$$

$$T = 2\ \times 3.14\frac{1}{3.13}$$

$$T = 2\ seconds\ appro.$$

17. Data:
Lens is convex object distance p =10 cm
focal length of lens f =
15 cm Position of Image q = ?. Magnification M = ?

SOLUTION:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

$$\frac{1}{15} = \frac{1}{10} + \frac{1}{q}$$

Or

$$\frac{1}{15} = \frac{1}{10} + \frac{1}{q}$$

$$\frac{1}{q} = \frac{2-3}{30} \qquad M = \frac{q}{p}$$

$$\frac{1}{q} = -\frac{1}{30} \qquad M = \frac{30}{10}$$

Q=-30 cm M = 3 times Image is virtual

19. **Data:** Parallel circuit

R_1 = 80 Ohm

R_2 = 20 Ohm

V =80 volts I

I = ?

R_e= ?

SOLUTION:

For parallel combination

$$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_e} = \frac{1}{80} + \frac{1}{20}$$

$$\frac{1}{R_e} = \frac{1+4}{80}$$

$$\frac{1}{R_e} = \frac{80}{5} \qquad = 16\ Ohm$$

To calculate current by Ohms law V = IR

80 = I x 16

I = 80/16 = 5 ampere

22. **Data:**

Energy rebased E = 9 x 10^{16}J Speed of light c = 3- x 10^8 m/sec.

Mass transformed into energy m = ?

SOLUTION: Formula:

$E = m c^2$

9 x 10^{18} = m y (3 x 10^8)^2

$$Or \qquad m = \frac{(9 \times 10^8)^2}{(3 \times 10^8)^2}$$

$$m = \frac{9 \times 10^{16}}{9 \times 10^{16}} \qquad = 1Kg$$

PHYSICS 2014

SOLUTION OF NUMERICALS

Q.3. Data:

Mass of Matter m = 20 gm Velocity of light c = 3 x 10^8 Energy released E = ? .

SOLUTION:

Mass m = 20 ÷1000 = 0.02 kg
Formula: E = mc^2
E = 0.02 x (3 No^8)^2
E= 0.02 x 9 x10^6
E = 0.18 No^{16}
E = 1.8 x 10^{15} Joules

Q.6. Data:

Mass of gun = 10 kg
Mass of bullet = 0.05 kg
Speed of bullet = 200 m/sec
Velocity of recoil of gun = 7

SOLUTION:

Momentum of bullet=0.05x200
" " = 10 kg m/soc.
Mass of gun = 10 kg
Back Speed of gun = Vm/sec Momentum of gun = 10 V kg m/sec
From law of conservation of Momentum
10V + 10 = 0
10V = -10 V=
10 ÷ 10 = -1 m/sec.
Or Gun will recoil with a speed of .1 m/sec.

Q.8. Data:

Length of beam = 5 m
Or Moment arm
Force applied = 100 N
Torque produced = ?

SOLUTION:

Torque = Force x Moment arm
= F x d
= 100 x 5
= 50 N-m

Q.11. Data: Mass of Ice=10kg Latent heat of fusion of Ice =336000 J/kg
Amount of heat needed = ?

SOLUTION:

Amount of Heat
Q = Mass x Latent heat
= 10 x 336000
= 3360000 Joules
= 3.36 x 106

Q.14. Data: Lens is convex Let size of object = 1 cm Size of Image given = 2 Focal length f = 20 cm Object distance p = ?

$$\frac{hi}{ho} = \frac{q}{p} \qquad \frac{2}{1} = \frac{q}{p} \qquad or \quad q = 2p$$

Now $\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$ $\frac{1}{20} + \frac{2+1}{2p}$

Or $\frac{3}{2p} = \frac{1}{20}$

$2p = 3 \times 20$

$p \frac{3 \times 20}{2}$ $p = 30cm$

Q.16. Data: Charge = +2.5 μcQ= 2.5x 10^{-6}C • Potential of A = 60 V
Potential of B = 10 V

SOLUTION:

Work done in carrying the charge W_{AB} = ?
$V_A - V_B = V_{AB} = W_{AB}/q$
$W_{AB}/q = V_A - V_S$

$$\frac{W_{AB}}{2.5 \times 10^{-60}} = -60 - 10$$

W_{AB} = 2.5 x 10^{-6} x 70
W_{AB} = 1750 x 10^{-6}
W_{AB} = 1.75 x 10^{-4} Joule

Q.20. Data:

Mass of body A = rn_1 = 5 kg
Mass of body B = m_2 = 4 kg
G = 10 m/s^2
Acceleration a = ?

SOLUTION:

$$a = \frac{(m_1 - m_2)g}{m_1 + m_2}$$

$$a = \frac{(5-4) \times 10}{5+4}$$

$a = \frac{1}{9} \times 10$ $a = 1.1\, {}^{m}/_{s^2}$

Q.22. Data:

Waves passing in 1 sec. is its frequency = 20

F = 20 Hz
Velocity of waves V = 3.5 m/s
Waves length = ?

SOLUTION:

$V=f\lambda$

$3.5 = 20 \times \lambda$

$\lambda = \frac{3.5}{20}$.

$\lambda = 0.175$ metre

PHYSICS 2013

SOLUTION OF NUMERICALS

Q.4. **Data:** a = 2m/s^2 V_i ? Vf = 20m/sec t = 5 seconds

SOLUTION: $V_f = V_i + at$

$20 = V_i + (2 \times 5)$

$20 = Vi + 10$

$V_i = 20 - 10 = 10$ m/sec

Q.9. Data: F = 100 N

0=60° F_x=? F_y= ?

SOLUTION:

$F_x = F \cos 0$, $F_x = 100 \cos 60°$

$F_x = 100 \times 0.5$ $F_x = 50$ N

$F_y = F \sin 0$, $Fy = 100 \sin 60°$

$F_y = 100 \times 0.866$ Fy= 86.6 N

Q.12. A 2nd pendulum is that whose time period is 2 sec.

Data: t = 2 sec.

g = 9.8 m/s2 L = ?

SOLUTION:

$T=2.\pi\sqrt{\frac{\ell}{g}}$ $\quad 2 = 2 \times \frac{22}{7}\sqrt{\frac{\ell}{9.8}}$

Or $\sqrt{\frac{\ell}{9.8}} = \frac{7\times7}{22\times22}$

$Squarring \ \frac{\ell}{9.8} = \frac{7\times7}{22\times22}$

$\ell = \frac{7\times7\times9.8}{22\times22}$

$\ell = 0.994 \ metre$

Q.14. **Data**: lens is Convex P=5 cm Q=10 cm

Image is virtual f = ?

SOLUTION:

$$\frac{1}{f} = \frac{1}{p} - \frac{1}{q}$$

$$\frac{1}{f} = \frac{1}{5} - \frac{1}{10}$$

$$\frac{1}{f} = \frac{2-1}{10} \qquad \frac{1}{f} = \frac{1}{10}$$

$$f = 10cms$$

Q.18. **Data**: R_1 = 4 Ω2, R_2= 6Ω Connected in Parallel

R_3 = 12Ω 0, V = 6 volts, I = ?

SOLUTION:

For parallel combination

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12}$$

$$\frac{1}{R} = \frac{3+2+1}{12} = \frac{1}{R} = \frac{6}{12} = \frac{1}{R} = \frac{1}{2} N$$

$$R = 2\Omega$$

ow from Ohm's Law V = IR 6 = I x 2

I = 6/2

Now from Ohm's Law V = IR 6 =I x 2

I = 6/2 = 3 Amp

Q.21 Data: Half life of Radium = 1600 years Initial mass = 60 gms Time in years = 4800 years Amount left at end = ?

SOLUTION:

Number of Half lives in the given time 4800 Years =4800/1600 = 3 half lives

Amount of Radium- after 1st half life = ½ x 60 = 30 gms. Amount of Radium after 2nd half life = ½ x 30 = 15 gms. Amount of Radium after 3rd half life = ½ x 15 = 7.5 gms.

Q.22. Data: Mass of Iron m = 800 gms

$$= \frac{800}{1000} = 0.8kg.$$

$$C = \frac{\Delta Q}{m\Delta t} \qquad Or\ \Delta Q\ mc\Delta c$$

.*. AQ = 0.8 x 499.8 x 50

AQ = 19992.0 Joules.

PHYSICS 2012

SOLUTION OF NUMERICALS

Q.5. Data: Vi = 5m/sec

a = 3m/s^2 t = 4 seconds

V_f = 7

Solution: $V_f = V_I + at$

V_f 74 5 + (3x4)

V_f= 5+12

V_f = 17 m/sec

Q.9. Data:

Mass of water = 100 gm

$$M = \frac{100}{1000} = 0.1kg$$

Specific heat of water c = 4200 J/Kg

Change of temperature

t = (80 - 20)

t = 60° C

Amount of heat required Q = ?

Formula Q = m ct

Q=0.1 x4200 x 60

Q = 24200 Joules

Q.11. Data: Force F = 588 N Distance moved S = 4 meter time taken t = 40 seconds Power P = ?

Formula:

Power= $\frac{Workdone}{Time\ taken}$

Power= $\frac{FxS}{t}$

Power = $\frac{588 \times 4}{40}$

Power = 58.8 Watt

Q.17. Data:

Current I = 0.6 Ampere Potential difference V = 90 volt Resistance R = ?

Formula, By ohm's Law V = IR

90 = 0.6 x R

By cross multiply R = 90/0.6

R= 150 ohm

Q.19

SOLUTION:

M=$\frac{q}{p}$

2=$\frac{q}{p}$ $or\ \ q = 2p$

Mirror Formula, for real image

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

Also f = $\frac{R}{2}$ $\qquad f = \frac{20}{2} = 10cm$

$$\frac{1}{10} = \frac{1}{p} + \frac{1}{2p}$$

$$\frac{1}{10} = \frac{2+1}{2p}$$

$$\frac{1}{10} = \frac{3}{2p}$$

Or 2p=10 x 3

$$p = \frac{10 \times 3}{2} \qquad p = 15cm$$

Q.21. Formula:

Horizontal Component F_x
= F Cos 0
= 100 Cos 60°
= 100 x 0.5
Fx = 50.0 N

Vertical Component F_y
= F Sin 0
F_y = 100 Sin 60°
= 100 x 0.866
F_y = 86.6 N

PHYSICS 2011

SOLUTION OF NUMERICALS

Q.3.Data:

W=25N, μ= 0.4, F = 0

SOLUTION:. W = R = 25N

Formulae: F = μ R

F=0.4 x 25= 10 N

Q.10 Data: Mass m = 20 Kg Speed V = 15 m/sec Momentum P = ?

SOLUTION:

Formula ,P=mxv Momentum P = 20 x 15
P = 300 Kg m/sec

Q.11 Data:

Mass of iron m = 100 Kg Rise in temp. Δt = 10°C Specific heat of iron C = 499.8 J/Kg°C
Heat required ΔQ = ?

SOLUTION:.

Formula $C = \frac{\Delta Q}{m\Delta\Delta}$

Or ΔQ =mCΔt
ΔQ = 100 x 499.8 x 10
ΔQ= 499800 Joule

Q.14. Data:

Charge q = 1800 Coulomb Time t = 3 min
= 3 x 60 = 180 Sec. Current I = q/t
1= 1800/180 = 10 Ampere

Q.17. Data:

Time t = 5 sec., g = 9.8 m/s^2 Height H or S = ?, V_1=0

SOLUTION: Formula:

S = $V_i t + ½ gt^2$
S = (0 x 5) + ½ X 9.8 x $(5)^2$
S = 4.9 x 25
S = 122.5 metre

Q.20. Data:

Frequency f = 400 Hz Time period t = ?

SOLUTION: Formula:

T = 1/f

T = 1/400

T = 0.0025 second

Q.22. Data:

Energy E = 9 x 10^{10} Uoule Speed of light C=3 x 10^8 m/sec

Mass m = ?

SOLUTION: Formula:

$E = mc^2$

9 x 10^{10} = m x (3 x 10^8)^2

9 x 10^{10}= m x 9 x 10^{18}

$$m = \frac{9 \times 10^{10}}{9 \times 10^{16}}$$

m = 10^{10-16}

m = 10^{-6} Kg.

Q.16. Data:

Mirror is Concave Object distance P = 5cm

Image distance q = 10 cm Image is Virtual

Focal length f = ?

SOLUTION: For virtual Image .

$$\frac{1}{f} = \frac{1}{p} - \frac{1}{q}$$

$$\frac{1}{f} = \frac{1}{5} + \frac{1}{10}$$

$$\frac{1}{f} = \frac{2-1}{10}$$

$$\frac{1}{f} = \frac{1}{10}$$

So f = 10cm

PHYSICS 2010

SOLUTION OF NUMERICALS

Q:9 Data:

Mass of stone = 200 gm.

Or M = 200 ÷ 1000 = 0.2 kg.

Length of string r = 50 cm

Or 50 ÷100 = 0.5 metre

Constant speed V = 2m/sec.

Tension T = ?

SOLUTION:

T = Fc = $\frac{mv^2}{r} = \frac{0.2 \times (2)^2}{0.5}$

T= 1.6 N Ans.

Q.10. Data:

Length of the handle d = 42 cm Or d = 42 ÷ 100 = 0.42 m

Pitch of the screw h = 0.001 m Mechanical Advantage M.A. = ?

SOLUTION:

M.A. of screw Jack = $\frac{2\pi d}{h}$

$$= \frac{\frac{2 \times 22}{7} \times 0.42}{0.001m}$$

$$= \frac{2 \times 22 \times 0.06}{0.001}$$

M.A. = 2640Ans.

Q.12. Data:

Mass of silver m = 10 gm

" " = 10/1000 = 0.01 kg

Temperature charge Δt = 50°C Heat used up ΔQ = 117.6 J Specific heat C = ?

SOLUTION: Formula:

Specific heat C = $\frac{\Delta Q}{m\Delta\Delta}$

$$= \frac{117.6}{0.01 \times 50}$$

= 235.2 J/kg°c

Q.15. Data:

Kind of Lens = Convex Object distance P = 5cm Image distance q = 10cm Nature of Image = Virtual Focal length f = ?

SOLUTION:

As the image is virtual

$$\frac{1}{f} = \frac{1}{p} - \frac{1}{q}$$

$$\frac{1}{f} = \frac{1}{5} + \frac{1}{10}$$

$$\frac{1}{f} = \frac{2-1}{10}$$

$$\frac{1}{f} = \frac{1}{10}$$

So f = 10cmd

Q.19. Data:

Power of the bulb P=10 Watt Potential diff. V = 220 Volts Current passing I = ?

SOLUTION: Formulae

P =VI

100 = 220 x I

Or I= 100 / 220

I = 0.454 Amp.