JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON SATURDAY 24th JANUARY 2026) **TIME : 9:00 AM TO 12:00 NOON**

PHYSICS

TEST PAPER WITH SOLUTION

SECTION-A

26. Match the List-I with List-II

List-I		List-II	
A.	Magnetic induction	I.	$M L T^{-2}A^{-2}$
B.	Magnetic flux	II.	$M L^2 T^{-2}A^{-2}$
C.	Magnetic permeability	III.	$M L^0 T^{-2}A^{-1}$
D.	Self inductance	IV.	$M L^2 T^{-2}A^{-1}$

Choose the correct answer from the options given below:

(1) A-IV,B-III,C-I,D-II (2) A-III,B-IV,C-II,D-I

(3) A-I,B-III,C-IV,D-II (4) A-III,B-IV,C-I,D-II

Ans. (4)

Sol. Magnetic induction

$F = qvB$

$$[B] = \left[\frac{F}{qV}\right]$$

$[B] = [MT^{-2}A^{-1}]$

Magnetic Flux (ϕ)

$\phi = (B).(Area)$

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

Magnetic Permeability

$[\mu] = [MLT^{-2}A^{-2}]$

Self inductance

Using $U = \frac{1}{2}LI^2$

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

A – III, B – IV, C – I, D – II

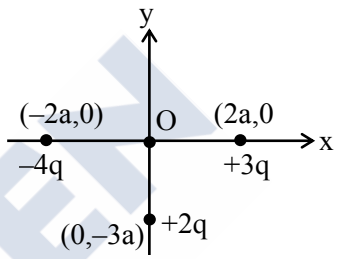
27. Three charges +2q. +3q and –4q are situated at (0,–3a), (2a, 0) and (–2a,0) respectively in the xy plane. The resultant dipole moment about origin is___

(1) $2qa\left(3\hat{j}-\hat{i}\right)$ (2) $2qa\left(3\hat{i}-7\hat{j}\right)$

(3) $2qa\left(7\hat{i}-3\hat{j}\right)$ (4) $2qa\left(3\hat{j}-7\hat{i}\right)$

Ans. (3)

Sol.



$$\vec{p} = q_1\vec{r}_1 + q_2\vec{r}_2 + q_3\vec{r}_3$$

$$\vec{p} = (2q)(-3a)\hat{j} + (3q)(2a)\hat{i} + (-4q)(-2a)\hat{i}$$

$$\vec{p} = 2qa\left(7\hat{i}-3\hat{j}\right)$$

28. A cylindrical block of mass M and area of cross section A is floating in a liquid of density ρ and with its axis vertical. When depressed a little and released the block starts oscillating. The period of oscillation is_____.

(1) $2\pi\sqrt{\frac{M}{\rho Ag}}$

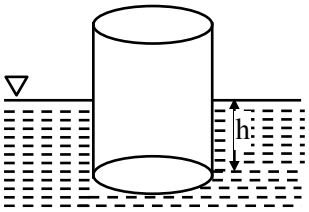
(2) $\pi\sqrt{\frac{2M}{\rho Ag}}$

(3) $\pi\sqrt{\frac{\rho A}{Mg}}$

(4) $2\pi\sqrt{\frac{\rho A}{Mg}}$

Ans. (1)

Sol.



At equilibrium

$\rho Ahg = Mg$

After displacing by x,

$Ma = -\rho A(h + x)g + Mg$

$Ma = -\rho Ahg - \rho Axg + Mg$

$Ma = -\rho Axg$

$a = \left(\frac{-\rho Ag}{M}\right)x$

on comparing with,

$a = -\omega^2 x$

$\omega = \sqrt{\frac{\rho Ag}{M}}$

$T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{M}{\rho Ag}}$

29. Density of water at 4°C and 20°C are 1000 kg/m^3 and respectively. The increase in internal energy of 4 kg water when it is heated from 4 °C to 20°C is____J.

(Specific heat capacity of water = 4.2 J/kg. and 1 atmospheric pressure = 10^5 Pa)

(1) 315826.2

(2) 234699.2

(3) 258700.8

(4) 268799.2

Ans. (4)

Sol. $Q = mS\Delta T = 4 \times 4200 \times 16\ J = 268800\ J$

$W = P\Delta V$

$\Delta V = \left(\frac{m}{\rho_f} - \frac{m}{\rho_i}\right) = 4\left[\frac{1}{998} - \frac{1}{1000}\right]$

$P = 10^5$ Pa.

$\therefore\ W = 10^5 \times 4 \times \left[\frac{1}{998} - \frac{1}{1000}\right] = \frac{8 \times 10^5}{10^3 \times 998} \approx 0.8\ J$

$\Delta U = Q - W = 268799.2\ J$

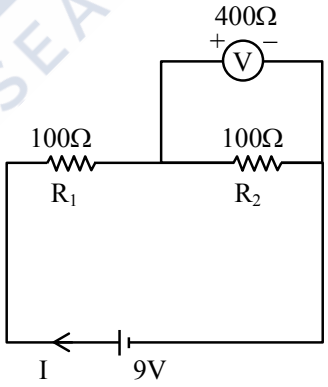
30. Two resistors of 100 Ω each are connected in series with a 9V battery. A voltmeter of 400Ω resistance is connected to measure the voltage drop across one of the resistors. The voltmeter reading is____V.

(1) 3 (2) 4.5

(3) 4 (2) 2

Ans. (3)

Sol.



Current in circuit.

$I = \frac{E}{Req}$

$Req = 100 + \frac{400 \times 100}{400 + 100} = 180\Omega$

$\therefore I = \frac{9}{180} = \frac{1}{20}A$

Reading of voltmeter = $V = I \times 80 = \frac{1}{20} \times 80 = 4V$

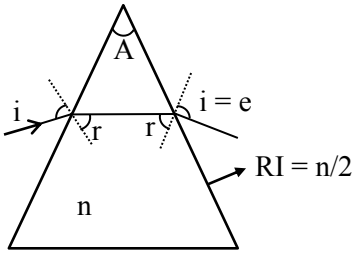
31. The exit surface of a prism with refractive index n is coated with a material having refractive index $\frac{n}{2}$. When this prism is set for minimum angle of deviation it exactly meets the condition of critical angle. The prism angle is____

(1) 60° (2) 15°

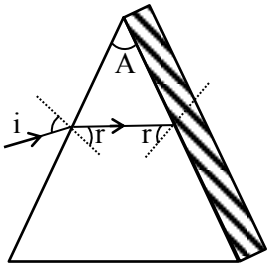
(3) 30° (4) 45°

Ans. **(1)**

Sol. i = e & r = A/2 for minimum deviation



For TIR ; $r = \theta_C$



$\text{Sin } r = \text{Sin } \theta_C$

$\text{Sin } r = \frac{n/2}{n}$

$\text{Sin } r = \frac{1}{2}$

$\text{Sin } \frac{A}{2} = \sin 30°$

$\frac{A}{2} = 30°$

$A = 60°$

32. Two electrons are moving in orbits of two hydrogen like atoms with speeds 3×10^5 m/s and 2.5×10^5 m/s respectively. If the radii of these orbits are nearly same then the possible order of energy states are_____ respectively.

(1) 6 and 5 (2) 9 and 8

(3) 8 and 10 (4) 10 and 12

Ans. **(1)**

Sol. $V \propto \frac{Z}{n}$

$r \propto \frac{n^2}{Z}$

Thus ; $r \propto \frac{n}{V}$

Radii are same then

$\frac{n_1}{V_1} = \frac{n_2}{V_2}$

$\frac{n_1}{n_2} = \frac{3\times10^5}{2.5\times10^5} = \frac{6}{5}$

Possible order is 6 and 5

33. In a microscope of tube length 10 cm two convex lenses are arranged with focal length of 2 cm and 5 cm. Total magnification obtained with this system for normal adjustment is $(5)^k$. The value of k is_____

(1) 2 (2) 5

(3) 3.5 (4) 4

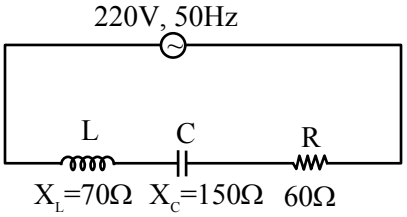
Ans. **(1)**

Sol. $f_0 = 2$ cm, fe = 5 cm

$\ell = 10$ cm, D = 25 cm

$M = \frac{\ell}{f_0}.\frac{D}{f_e} = 25$

34. For the series LCR circuit connected with 220 V, 50 Hz a.c source as shown in the figure, the power factor is $\frac{\alpha}{10}$. The value of α is_____



(1) 4 (2) 10

(3) 6 (4) 8

Ans. **(3)**

Sol. Power factor $= \frac{R}{Z}$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$= \sqrt{60^2 + (150-70)^2} = 100\Omega$$

$$\therefore \text{ Power factor} = \frac{60}{100} = \frac{6}{10}$$

Then a = 6

35. Match the **List-I** with **List-II**

List-I		List-II	
A	Radio-wave	I	is produced by Magnetron value
B	Micro-wave	II	Due to change in the vibrational modes of atoms
C	Infrared-wave	III	Due to inner shell electrons moving from higher energy level to lower energy level
D	X-ray	IV	Due to rapid acceleration of electrons

Choose the **correct** answer from the options given below:

(1) A-II,B-IV,C-III,D-I (2) A-IV,B-III,C-I,D-II

(3) A-IV,B-I,C-II,D-III (4) A-IV,B-II,C-I,D-III

Ans. (3)

Sol. Radio wave $\Rightarrow$ Produced by rapid acceleration of electrons

Micro wave $\Rightarrow$ By magnetron valve

Infrared wave $\Rightarrow$ Change in vibrational modes

X ray $\Rightarrow$ Transition of inner shell electrons from high energy level to low energy level.

A – IV, B – I, C – II, D – III

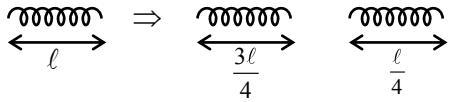
36. A spring of force constant 15 N/m is cut into two pieces. If the ratio of their length is 1:3, then the force constant of smaller piece is____N/m

(1) 15 (2) 20

(3) 60 (4) 45

Ans. (3)

Sol.



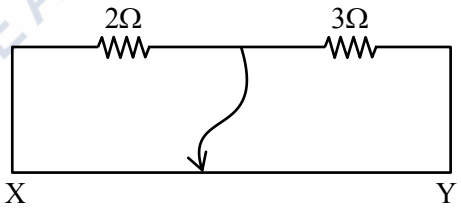
$K\ell$ = constant

$$K\ell = K'\left(\frac{\ell}{4}\right)$$

K' = 4 K

K' = 60 N/m

37. Two resistors 2Ω and 3Ω are connected in the gaps of bridge as shown in figure. The null point is obtained with the contact of jockey at some point on wire XY. When an unknown resistor is connected in parallel with 3Ω resistor, the null point is shifted by 22.5 cm toward Y. The resistance of unknown resistor is____Ω.



(1) 3 (2) 2

(3) 4 (4) 1

Ans. (2)

Sol. Initially , $\frac{2}{3} = \frac{x}{100-x}$

$\Rightarrow x = 40$ cm

Now when 'R' connected in parallel

$$\frac{2}{\frac{3R}{3+R}} = \frac{40+22.5}{60-22.5} = \frac{62.5}{37.5}$$

$\therefore R = 2\Omega$

38. Given below are two statements:

Statement I : For all elements, greater the mass of the nucleus, greater is the binding energy per nucleon.

Statement II : For all elements, nuclei with less binding energy per nucleon transforms to nuclei with greater binding energy per nucleon.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both **Statement I** and **Statement II** are true

(2) **Statement I** is true but **Statement II** is false

(3) Both **Statement I** and **Statement II** are false

(4) **Statement I** is false but **Statement II** is true

Ans. **(4)**

Sol. Theoretical

39. A brass wire of length 2m and radius 1mm at 27°C is held taut between two rigid supports. Initially it was cooled to a temperature of –43°C creating a tension T in the wire. The temperature to which the wire has to be cooled in order to increase the tension in it to 1.4T, is ____°C

(1) –86 (2) –71

(3) –65 (4) –80

Ans. **(2)**

Sol. $T = \alpha YA(27 - (-43)$ .....(i)

$1.4\ T = \alpha YA(27 - \theta)$ ....(ii)

using (ii)/(i)

$$1.4 = \frac{27-\theta}{70}$$

$27 - \theta = 98 \quad \therefore \theta = -71°C$

40. The electrostatic potential in a charged spherical region of radius r varies as $V = ar^3 + b$, where a and b are constants. The total charge in the sphere of unit radius is $\alpha \times \pi a \in_0$. The value of α is _____.

(permittivity of vacuum is $\in_0$)

(1) –12 (2) –6

(3) –9 (4) –8

Ans. **(1)**

Sol. $v = ar^3 + b$

$$E = -\frac{dv}{dr} = -3ar^2$$

$$\phi_{closed} = \frac{q_{enc}}{\varepsilon_0}$$

$q_{enc} = \varepsilon_0 .E.A$

$= \varepsilon_0 \left(-3a.(1)^2\right) 4\pi (1)^2$

$= -12\pi a\varepsilon_0$

$\therefore x = -12$

41. Two masses 400 g and 350 g are suspended from the ends of a light string passing over a heavy pulley of radius 2 cm. When released from rest the heavier mass is observed to fall 81 cm in 9 s. The rotational inertia of the pulley is _____ $kg.m^2$.

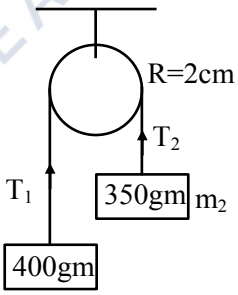
$(g = 9.8\ m/s^2)$

(1) 9.5×10^{-3} (2) 4.75×10^{-3}

(3) 1.86×10^{-2} (4) 8.3×10^{-3}

Ans. **(1)**

Sol.



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

$$a = \frac{2s}{t^2} = \frac{2\times 0.81}{81} = 0.02\ m/s^2$$

$m_1 g - T_1 = m_1 a$

$T_2 - m_2 g = m_2 a$

$$(T_1 - T_2)\, R = I.\frac{a}{R}$$

$$\therefore a = \frac{(m_1 - m_2)g}{m_1 + m_2 + \frac{I}{R^2}}$$

$$0.02 = \frac{(400-350)(10^{-3})g}{(400+350)(10^{-3})+\frac{I}{R^2}}$$

$$\frac{I}{R^2} = \frac{50\times10^{-3}g}{0.02} - 750\times10^{-3} = 23.75$$

$I = 23.75 \times 4 \times 10^{-4} = 9.5 \times 10^{-3}$ kg–m^2

42. An unpolarised light is incident at an interface of two dielectric media having refractive indices of 2 (incident medium) and $2\sqrt{3}$ (medium) respectively. To satisfy the condition that reflected and refracted rays are perpendicular to each other, the angle of incidence is _____.

(1) 60° (2) 10° (3) 30° (4) 45°

Ans. (1)

Sol. Brewester's law

$\tan\theta = \mu_{rel} = \sqrt{3}$

$\theta = 60°$

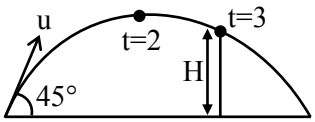
43. A boy thrown a ball into air at 45° from the horizontal to land it on a roof of a building of height H. If the ball attains maximum height in 2 s and lands on the building in 3 s after launch, then value of H is _____ m.

($g = 10$ m/s^2)

(1) 20 (2) 10 (3) 25 (4) 15

Ans. (4)

Sol. $T = \frac{2u_y}{g} = 4$



$\Rightarrow u_y = \frac{40}{2} = 20$ m/s

$y = u_y\Delta t - \frac{1}{2}g(\Delta t)^2$

$\Rightarrow H = 20 \times 3 - 5 \times 9$

$= 60 - 45$

$= 15$ m

44. There are three co-centric conducting spherical shells A, B and C of radii a, b and c respectively. The potential of the spheres A, B and C respectively, are :

(1) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{a}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{b}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

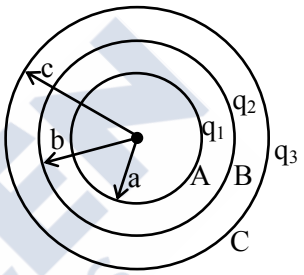
(2) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{a}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$

(3) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

(4) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{b}\right), \frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

Ans. (3)

Sol.



$$V_A = \frac{Kq_1}{a}+\frac{Kq_2}{b}+\frac{Kq_3}{c} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$$

$$V_B = \frac{Kq_1}{b}+\frac{Kq_2}{b}+\frac{Kq_3}{c} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right)$$

$$V_C = \frac{Kq_1}{c}+\frac{Kq_2}{c}+\frac{Kq_3}{c} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$$

45. Three masses 200 kg, 300 kg and 400 kg are placed at the vertices of an equilateral triangle with sides 20 m. They are rearranged on the vertices of a bigger triangle of side 25 m and with the same centre. The work done in this process _____ J.

(Gravitational constant $G = 6.7 \times 10^{-11}$ N m^2 / kg^2)

(1) 9.86×10^{-6}

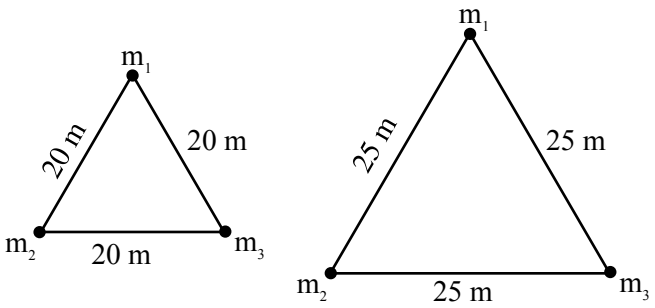
(2) 2.85×10^{-7}

(3) 1.74×10^{-7}

(4) 4.77×10^{-7}

Ans. (3)

Sol



Work done by external agent :

$w_{ext} = \Delta U$

$U_i = -\frac{Gm_1m_2}{r_i} - \frac{Gm_2m_3}{r_i} - \frac{Gm_1m_3}{r_i} : r_i = 20\ m$

$U_f = -\frac{Gm_1m_2}{r_f} - \frac{Gm_2m_3}{r_f} - \frac{Gm_1m_3}{r_f} : r_f = 25\ m$

$U_i = \frac{-6.67\times10^{-11}}{20}\ [200\times300+300\times400+200\times400]$

$= \frac{-6.67\times10^{-11}}{20}\times26\times10^4 = -86.71\times10^{-8}\ J$

$U_f = \frac{-6.67\times10^{-11}}{0.25}\ [200\times300+300\times400+200\times400]$

$= \frac{-6.67\times10^{-11}}{0.25}\times26\times10^4 = -693.68\times10^{-9}$

$= -69.36\times10^{-8}\ J$

$\Delta U = U_f - U_i = 1.74\times10^{-7}\ J$

SECTION-B

46. A short bar magnet placed with its axis at 30° with an external field of 800 Gauss, experiences a torque of 0.016 N.m. The work done in moving it from most stable to most unstable position is $\alpha\times10^{-3}$ J. The value of α is _____.

Ans. (64)

Sol. $\tau = \mu B\sin\theta \Rightarrow 0.016 = \mu\times B\times\frac{1}{2}$

$\Rightarrow \mu = \frac{0.032}{B}$

$W_{ext} = U_f - U_i = \mu B - (\mu B) = 2\mu B$

$= 2\times\frac{0.032}{B}\times B$

$= 0.064\ J$

47. A gas of certain mass filled in a closed cylinder at a pressure of 3.23 kPa has temperature 50°C. The gas is now heated to double its temperature. The modified pressure is _____ Pa.

Ans. (3730)

Sol. As per NTA

V = constant

so $P \propto T$

$T_i = 50°C = 323\ K$

$T_f = 100°C = 373\ K$

$\Rightarrow \frac{P_f}{P_i} = \frac{T_f}{T_i}$

$\Rightarrow \frac{P_f}{3.23kPa} = \frac{373}{323}$

$\Rightarrow P_f = 3730\ Pa$

Other Solution :

As volume is constant

$\therefore P \propto T$

Since T is doubled (must be in Kelvin) so pressure must be doubled.

$\therefore P_f = 2P_i$

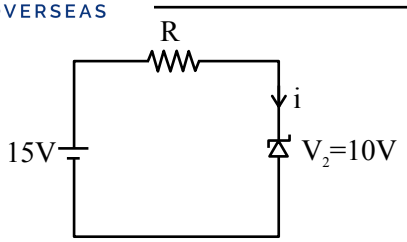
$P_f = 2\times3.23 = 6.46\ KPa$

$P_f = 6460\ Pa$

48. A voltage regulating circuit consisting of Zener diode, having break-down voltage of 10 V and maximum power dissipation of 0.4 W, is operated at 15 V. The approximate value of protective resistance in this circuit is _____ Ω.

Ans. (125)

Sol.

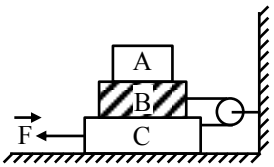


$P_D = 0.4W = 10i$

$i = 0.04A$

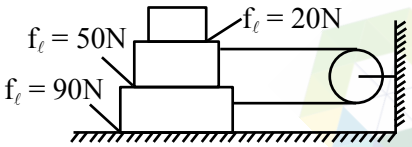
$R = \frac{15-10}{0.04} = \frac{5}{0.04} = 125\ \Omega$

49. In the given figure the blocks A, B and C weigh 4 kg, 6 kg and 8 kg respectively. The co-efficient of sliding friction between any two surfaces is 0.5. The force $\vec{F}$ required to slide the block C with constant speed is _____ N. (Used $g = 10\ m/s^2$)



Ans. (210)

Sol. For 8kg to move with constant velocity $F_{net} = 0$.



$\therefore F = 90 + T + 50$ (for 8kg block)

$T = 20 + 50$ (for 6kg block)

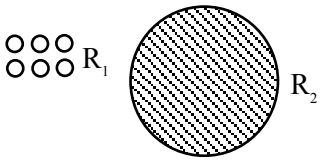
$\therefore F = 210$ N.

50. Sixty four rain drops of radius 1 mm each falling down with a terminal velocity of 10 cm/s coalesce to form a bigger drop. The terminal velocity of bigger drop is _____ cm/s.

Ans. (160)

Sol. $V_T = \frac{2r^2g}{9n}[\sigma - \rho]$

$V_T \propto r^2$



64 drop

$64\left(\frac{4}{3}\pi R_1^3\right) = \frac{4}{3}\pi R_2^3$

$R_2 = 4R_1$

$\frac{(V_T)_1}{(V_T)_2} = \left(\frac{R_1}{R_2}\right)^2 = \left(\frac{1}{4}\right)^2$

$\frac{10}{(V_T)_2} = \frac{1}{16}$

$(V_T)_2 = 160$ cm/sec