Screening Test – 2020 (September)

Grade 13 *Enu*

Physics I

Time: 2 hours

★ Answer all the questions.

★ In each of the questions 1 - 50 pick one of the alternatives (1) , (2) , (3) , (4, (5) which is correct of most appropriate and mark your response on the answer sheet with a cross (x) on the number of the correct option.

★ Use of calculators is not allowed ($g = 10\ N\ kg^{-1}$)

(01) $k_1 \log_{10}(k_2 V + 1) = k_3 \frac{I}{V}$ In this equation I and V represent current and voltage respectively. k_1 is a dimensionless constant dimension of k_3 should be equal to dimension of

(1) Resistance (2) Reciprocal of resistance
(3) Current (4) Reciprocal of current (5) Voltage

(02) If $1\ g\ cm\ s^{-1} = x\ Ns$, the value of x should be ,

(1) 1×10^{-1} (2) 3.6×10^{-3} (3) 1×10^{-5} (4) 6×10^{-4} (5) 2×10^{-2}

(03) Length of a main scale division is a mm and there are b divisions in it. That amount is divided in to c divisions in vernier scale . The least count of instrument in mm

(1) $\frac{bc}{a}$ (2) $a(1 - \frac{b}{c})$ (3) $a(1 - \frac{c}{b})$ (4) $\frac{1}{a}(1 - \frac{b}{c})$ (5) $\frac{ac}{b}$

(04) True statement /statements made regarding longitudinal wave is ,

A - Satisfies equation $V = f\lambda$
B - All the particles in medium vibrates in same frequency.
C - Speed of each particle in medium should be same.

(1) Only A (2) Only A and B (3) Only B and C
(4) Only A and C (5) All A , B and C

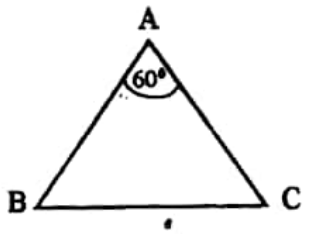
(05) On a truck moving horizontally at steady acceleration a , A block of mass M is placed. If it is at rest relative to the truck frictional force on block should be , (μ - coefficient of static friction.)

(1) μMa (2) Ma (3) $\mu M(a + g)$ (4) $\mu M(g - a)$ (5) mg

(06) Minimum frequency of generated X - ray in a chathode ray tube is controlled by,

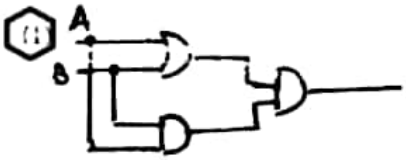
(1) Temperature of cathode (2) Potential difference between cathode and anode.
(3) Nature of the target (4) Size of the target
(5) Length of the X - ray tube.

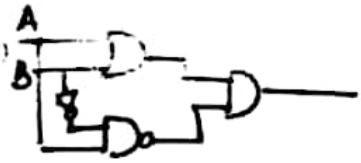
(07) A light ray falls on AB surface normally on ABC prism of prism angle 60° emerges along AC surface refractive index of prism is ,



(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$ (3) $\frac{1}{2}$ (4) 2 (5) 1

(08) Correct logic circuit for expression $F = (A + B)\overline{AB}$

(1)


(2)


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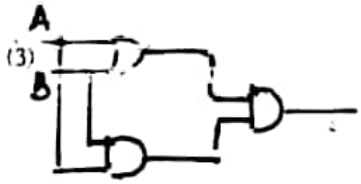

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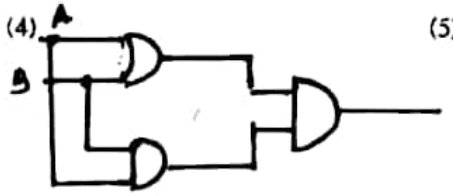
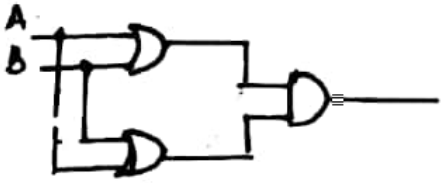
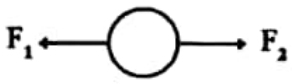
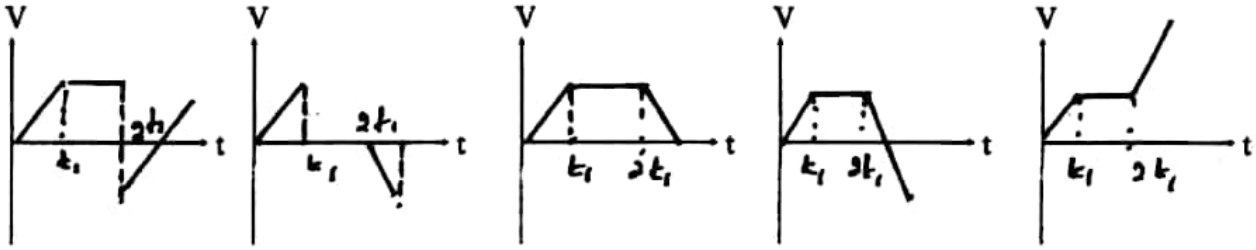


(5)


(09) As shown in figure at $t = 0$ two forces $F_1 (= 10\ N)$ and $F_2 (= 9\ N)$ are applied simultanously an object, when $t = t_1$ F_2 is increased to 10 N and at $t = 2t_1$. F_1 force is completly removed.
The correct variation of velocity V with time t,





(1) (2) (3) (4) (5)

(10) Each quark particle has charge (as a fraction of charge of an electron) as followings.

U $+\frac{2}{3}e$ C $+\frac{2}{3}e$ t $+\frac{2}{3}e$

d $-\frac{1}{3}e$ S' $-\frac{1}{3}e$ t $-\frac{1}{3}e$

Composition of quarks in a proton should be.

(1) uud (2) udd (3) $u\bar{u}u$ (4) uu (5) ud

(11) Lead bullet moving at speed $130\ ms^{-1}$ collides on a wooden block and gets embeded in it. If the specific heat capacity of lead is $130\ kg^{-1}C^{-1}$ The maximum increase of the temperature of bullet is,

(1) 45 °C (2) 55 °C (3) 65 °C (4) 75 °C (5) 85 °C

(12) In a close cylinder there is a mixture of H_2, N_2 and O_2. Pressure in the cylinder can be increased mostly by,

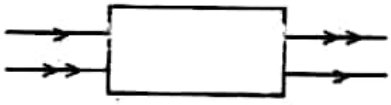
(1) When M grams of H_2 gas is added.
(2) When M grams of N_2 gas is added.
(3) When M grams of O_2 gas is added.
(4) When M grams of the mixture of H_2 and N_2 is added.
(5) When M grams of the mixture of N_2 and O_2 is added.

(13) $x = 0.2 \sin(4t + 1)$ is an equation of simple harmonic motion. Time period of oscillations is,

(1) 2s (2) $\frac{1}{2}$ s (3) $\frac{\pi}{4}$ s (4) $\frac{\pi}{2}$ s (5) π s

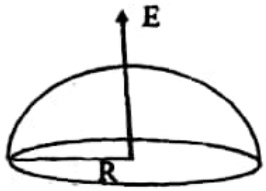
(14) Two parallel light rays move across component X as shown in figure X should be

(1) Concave lens and convex lens.
(2) Rectangular glass block.
(3) Convex lens and rectangular glass block.
(4) Two convex lenses.
(5) Two concave lenses.



(15) As shown in figure a hemisphere of radius R placed perpendicularly to an electric field of field intensity E. Effective electric flux is,

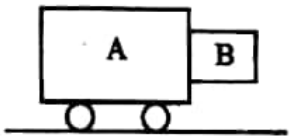
(1) 0 (2) $2\pi R^2E$ (3) πR^2E (4) $\frac{E}{2\varepsilon_0}$ (5) $\frac{2E}{\varepsilon_0}$



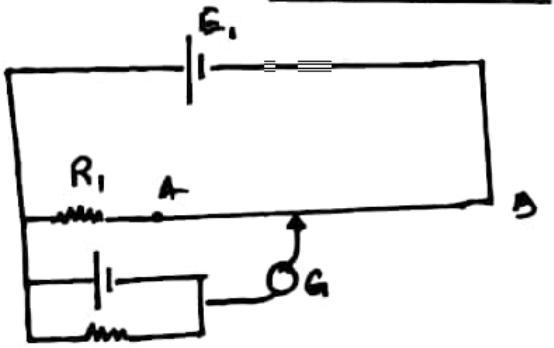
(16) A block of mass m is in a contact with trolley A which is moving horizontally. What should be the minimum acceleration of trolley to keep object B without falling down.
(μ = coefficient of static friction between A and B)

(1) $\frac{g}{\mu}$, toward right (2) g, toward right (3) $\frac{g}{\mu}$, toward left

(4) μg, toward right (5) $\frac{mg}{\mu}$, toward right



(17) Figure shows a method of drawing a water basket by using two ropes. What should be the correct variation ? Tension T of a cable with angle θ.



(1) (2) (3) (4) (5)

(18) Length of a cable is 30 cm when the tension is 3 N and it is 32 cm when the tension is 4 N. What should be the length of cable. When it is subjected to 7 N force.

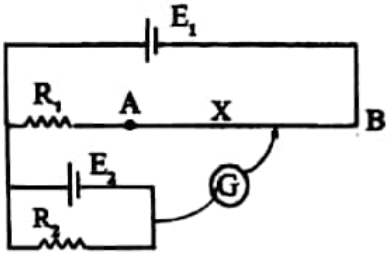
(1) 34 cm (2) 38 cm (3) 40 cm (4) 42 cm (5) 44 cm

(19) Internal resistance of two cells E_1 and E_2 are zero. Potentiometer is balanced when R_1 and R_2 are connected. Balance length l can be increased by

A - Increasing R_1 while keeping R_2 constant.
B - Increasing R_2 while keeping R_1 constant.e
C - Increasing both R_1 and R_2.

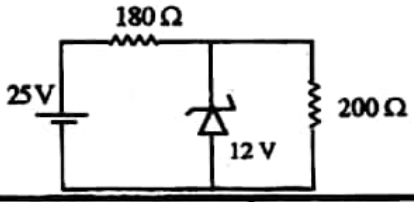
True statement /statements

(1) Only A (2) Only B (3) Only C (4) Only A and B (5) Only A and C



(20) Regulating circuit of zenar diode is given in figure current through 200 Ω resistance.

(1) 125 mA (2) 60 mA (3) 12.2 mA
(4) 100 mA (5) 50 mA



(21) +q charge is placed at the centre of a circle W_1 work is done, when q charge is brought from A to B and W_2 work is done, when above charge is brought from A to C.

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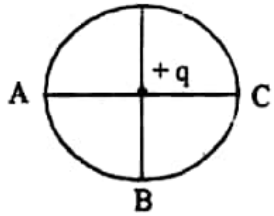
A - $W_1 > W_2$

B - work done = Charge × potential difference

C - Static electric potential difference between A, B and C should be zero.



True statement /statements

(1) Only A (2) Only B

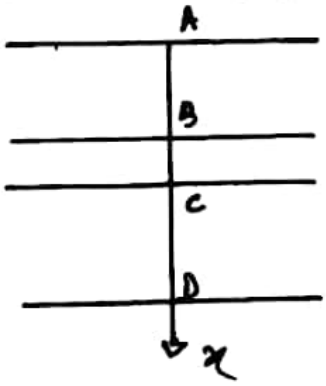
(3) Only A and B (4) Only B and C

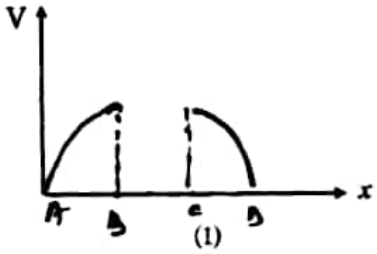
(5) All A, B and C

(22) 1 kg of water is a vessel having negligible heat capactiy is heated by a immersion heater of 1 kW within 100 s temperature rises from 25 °C to 45 °C. The rate of loosing heat to the surrounding is, (specific heat capactiy of water 4200 J kg^{-1} K^{-1})

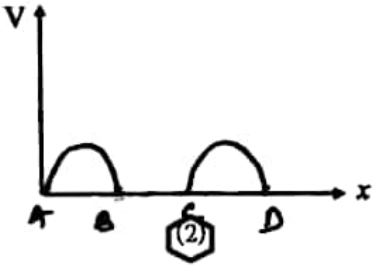
(1) 40 W (2) 80 W (3) 160 W (4) 320 W (5) 640 W

(23) Thin cylindrical cable is placed coaxially in a capillery tube (Diameter of cable is represented by AB)
What is the correct variation of velocity V of liquid layers when viscos flow of fluid is moving along the tube?

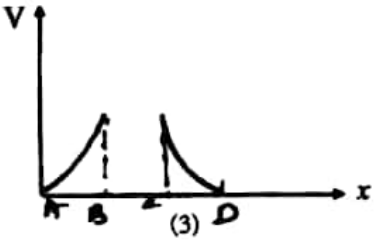




(1)



(2)



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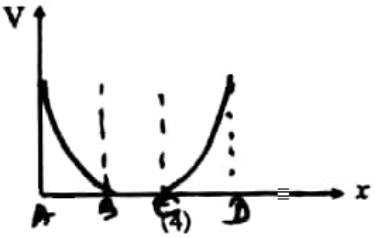
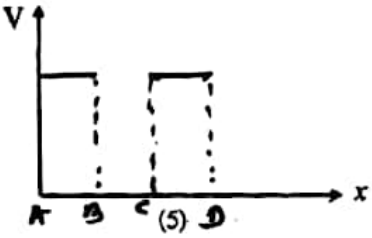


(4)



(5)

(24) Escape velocity on the surface of earth is 11 km s^{-1}. The escape velocity on an another planet having same mean density and whose diameter is two times that of the earth.

(1) 22 km s^{-1} (2) 11 km s^{-1} (3) 5.5 km s^{-1} (4) 15.5 km s^{-1} (5) 20 km s^{-1}

(25) Fish observes a circular bright patch of diameter 10 m when it is at 4m depth refractive index of water should be,

(1) $\tan^{-1}\left(\frac{5}{4}\right)$ (2) $\tan^{-1}\left(\frac{5}{2}\right)$ (3) $\frac{1}{\sin[\tan^{-1}(\frac{4}{5})]}$ (4) $\frac{1}{\sin[\tan^{-1}(\frac{5}{4})]}$ (5) $\frac{1}{\sin[\tan^{-1}(\frac{5}{2})]}$

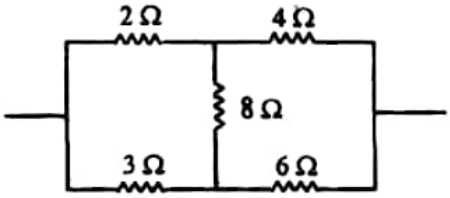
(26) Half a volume of tube, whose one end is closed is filled by using mercury volume expansivities of mercury and glass are γ_g and γ_m respectively. Required temperature increase to occupy this mercury volume entirely in vessel.

(1) $\frac{1}{\gamma_g}$ (2) $\frac{1}{\gamma_m}$ (3) $\frac{1}{\gamma_g - \gamma_m}$ (4) $\frac{1}{\gamma_m - 2\gamma_g}$ (5) $\frac{1}{\gamma_g + \gamma_m}$

(27) Fundametal frequency of transverse vibrations of a string of length 1 m is 320 Hz. The second cable of same length and subjected to same tension having diameter 4 times of initial cable is vibrating fundamental frequency of 2 nd cable is ,

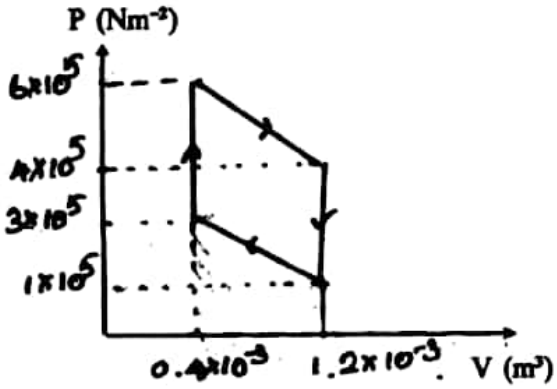
(1) 80 Hz (2) 160 Hz (3) 320 Hz (4) 640 Hz (5) 1280 Hz

(28) When this circuit is connected to power supply 2 Ω resistance dissipates power at rate 2W.
Total power of the circuit



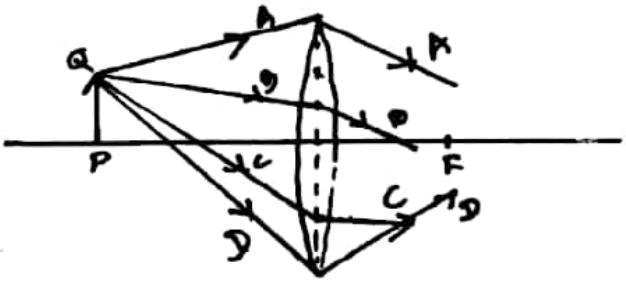
(1) 9 W (2) 10 W (3) 12 W
(4) 15 W (5) 18 W

(29) As shown in figure (P -V curve) system undergoes to cyclic process. Work done by the process from A to B and B to C.



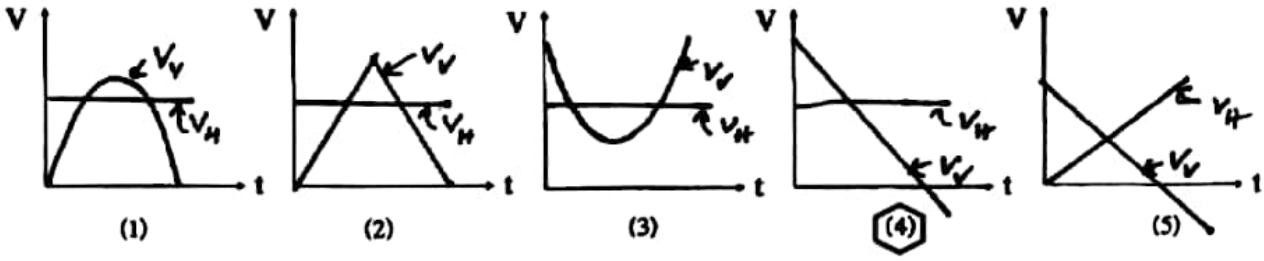
(1) 520 J , 0
(2) 400 J , 0
(3) 400 J , 360 J
(4) 480 J , 360 J
(5) 480 J , 0

(30) Object PQ is placed before a thin convex lens as show in figure. Four rays drawn by a boy is given by A , B , C and D . Which of the following ray will go through the image of point Q ?

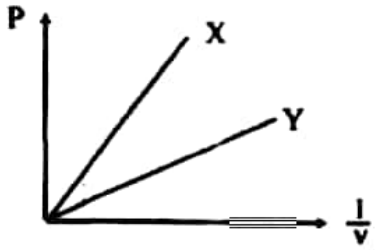


(1) Only A and B .
(2) Only B and C.
(3) Only C and D.
(4) Only A , B and C.
(5) Only B , C and D.

(31) A particle is thrown in gravity as it makes angle θ with horizontal. What is the correct variation of vertical component of velocity (V_V) and horizontal component of velocity (V_H) with time.



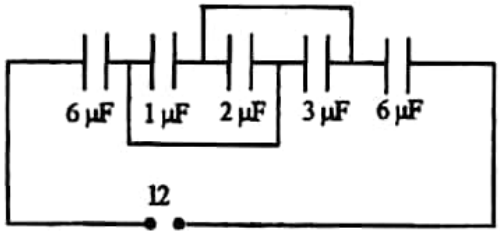
(32) Variation of pressure (P) with volume ($\frac{1}{V}$) for two different samples of gasses X and Y is shown in the graph.
Consider following statements



A - Number of moles of gas X is higher than that of Y.
B - Graph of X curve coincid with graph of Y when certain amount of gas X is removed.
C - Molar mass of gas Y is greater than molar mass of X.

True statement,
(1) Only A (2) Only A and B (3) Only B and C
(4) Only A and C (5) All A, B and C

(33) Stored charge in 2 μF capacitor given in figure
(1) 6 μc (2) 8 μc (3) 12 μc
(4) 10 μc (5) 12.5 μc

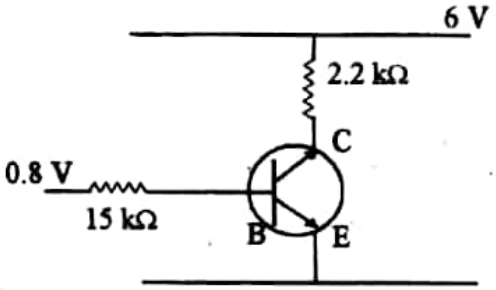


(34) Capilery tube of length l and radius r is connected to an another tube of length $2l$ and radius 2r. A steady flow of air is flowing in the tube.
The ratio $\frac{\text{The pressure difference across } 1^{st} \text{ tube}}{\text{The pressure difference across } 2^{nd} \text{ tube}}$ would be

(1) 8 (2) 2 (3) 4 (4) $\frac{1}{8}$ (5) $\frac{1}{4}$

(35) Half life of ^{215}At is 100×10^{-6} s. How long will it takes to decay this sample up to $\frac{1}{16}$ of original value.
(1) 400×10^{-6} s (2) 6.3×10^{-6} s (3) 40×10^{-6} s
(4) 300×10^{-6} s (5) None of the above.

(36) For the transistor given in figure $V_{BE} = 0.17$ V and current gain $\beta = 150$ output voltage for input voltage.
(1) 0 V (2) 3.0 V (3) 3.8 V
(4) 4.9 V (5) 6.0 V



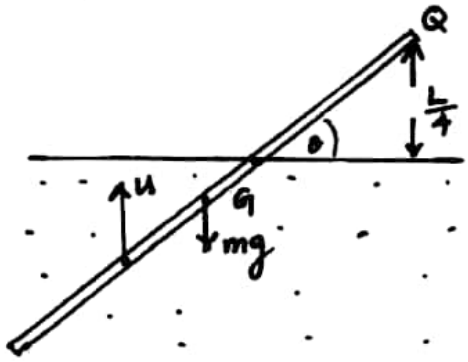
(37) As shown in figure three point charges +q, +q and +2q are placed on vertices of traingle. Electric field intensity of point P should be,
(1) $\frac{q}{\pi\varepsilon_0 a^2}$ (2) $\frac{2q}{\pi\varepsilon_0 a^2}$ (3) $\frac{q}{2\pi\varepsilon_0 a^2}$
(4) $\frac{q}{\sqrt{2}\pi\varepsilon_0 a^2}$ (5) $\frac{q}{2\sqrt{2}\pi\varepsilon_0 a^2}$

(38) A train passed a stationary observer sounding its horn. The ratio between observed frequencies before and after passing observer is 6 : 5. If the speed of sound in air is 330 ms^{-1} Speed of train will be,
(1) 10 ms^{-1} (2) 15 ms^{-1} (3) 20 ms^{-1} (4) 25 ms^{-1} (5) 30 ms^{-1}

(39) Relative humidity of a closed room is 50% when there are several person if increases to 70 %. The percentage value of water vapour

(1) Increased by 10 %. (2) Increased by 20 %.
(3) Increased by 30 %. (4) Increased by 40 %.
(5) Increased by 50 %.

(40) A uniform rod of length L float in a liquid of relative density $\frac{3}{4}$ as point Q lies $\frac{L}{4}$ vertically up from the liquid level what should be value of θ that the rod makes with liquid surface

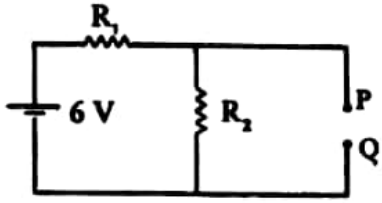


(1) 30° (2) 45° (3) 60°
(4) 90° (5) 75°

(41) A sonometer cable vibrates simultaneously with 122 cm and 120 cm length of an another sonometer cable. In both occasion second sonometer cable is subjected to the same tension vibrates in same overtone. If it produces 2 beats per second in both cases. Frequency of first sonometer cable is,

(1) 238 Hz (2) 240 Hz (3) 242 Hz (4) 244 Hz (5) 246 Hz

(42) When an ideal voltmeter is connected between P and Q it rods 4 V and when an ideal ammeter is connected it rods 0.6 A. Values of R_1 and R_2

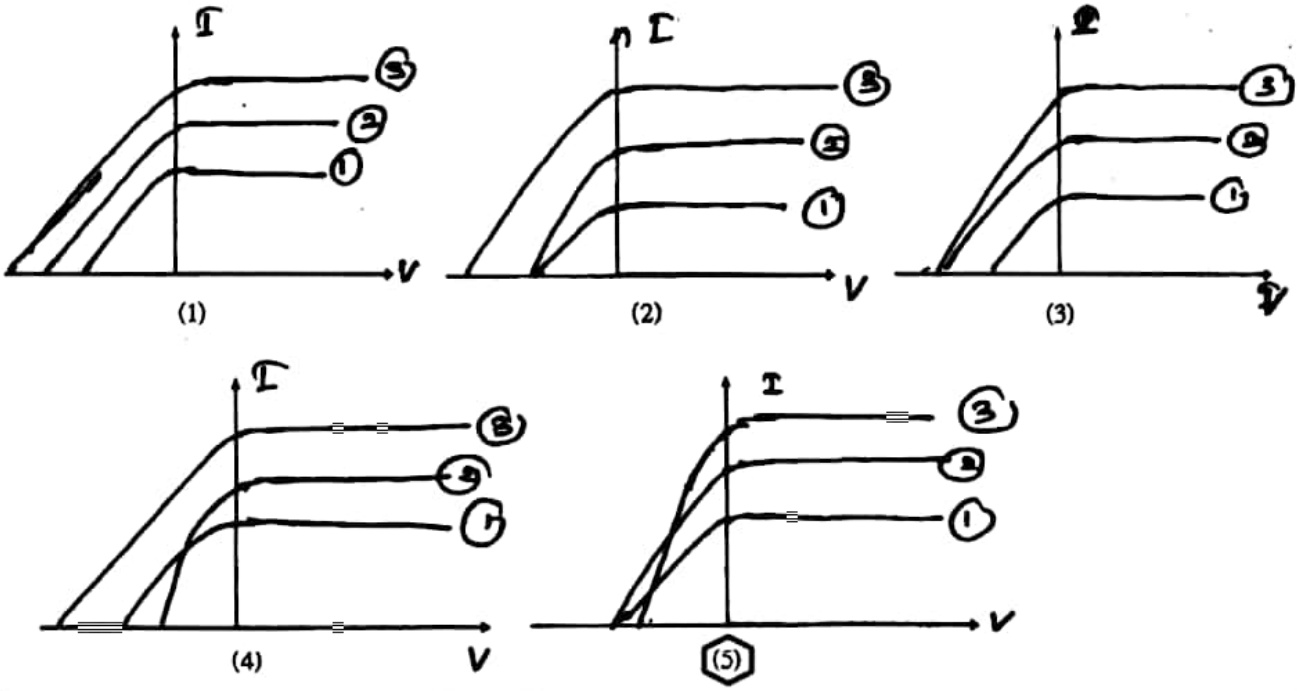


(1) 10 Ω , 10 Ω (2) 10 Ω , 20 Ω (3) 20 Ω , 10 Ω
(4) 30 Ω , 20 Ω (5) 20 Ω , 40 Ω

(43) Using three different sources three experiments regarding photo electric effect is done by a student

	Intensity	wave length
1.	I	λ
2.	2I	λ
3.	3I	$\frac{2\lambda}{3}$

Correct variation of photo current I with applied potential difference (V).



(44) A hollow cylinder of radius r is rotating about a vertical axis which goes through its centre. A small object is in contact with cylinder without falling down if the coefficient friction is μ frequency of the cylinder is,

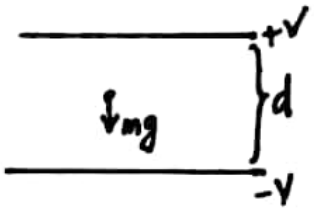
(1) $2\pi\sqrt{\frac{g}{\mu R}}$ (2) $\frac{1}{2\pi}\sqrt{\frac{g}{\mu R}}$ (3) $\sqrt{\frac{g}{\mu R}}$ (4) $2\pi\sqrt{\frac{\mu R}{g}}$ (5) $\sqrt{\frac{\mu R}{g}}$

(45) Relative humidity in closed room of volume V and at room temperature θ_0 is X %. Then temperature and relative humidity is reduced to θ_1 and Y % by air conditioner. Absolute humidities at dewpoints corresponding to θ_0 and θ_1 are A_0 and A_1. What will be mass of water vapour removed by air conditoner.

(1) $\left(\frac{XA_0}{V} - \frac{YA_1}{V}\right)100$ (2) $\frac{(XA_0 - YA_1)V}{100}$ (3) $\left(\frac{X}{A_0V} - \frac{Y}{A_1V}\right)\frac{1}{100}$

(4) $\left(\frac{A_0V}{X} - \frac{A_1V}{Y}\right)100$ (5) $\left(\frac{XV}{A_0} - \frac{YV}{A_1}\right)100$

(46) As shown in figure a charged oil drop having charge - q is at rest, in the space between two parallel plates seperated by distance d upper plate is subjected potential + V and lower plate to potential - V magnitude of weight of the oil drop is.



(1) $\frac{Vq}{d}$ (2) $\frac{2Vq}{d}$ (3) $\frac{Vd}{q}$ (4) $\frac{2Vd}{q}$ (5) $\frac{Vq}{2d}$

(47)

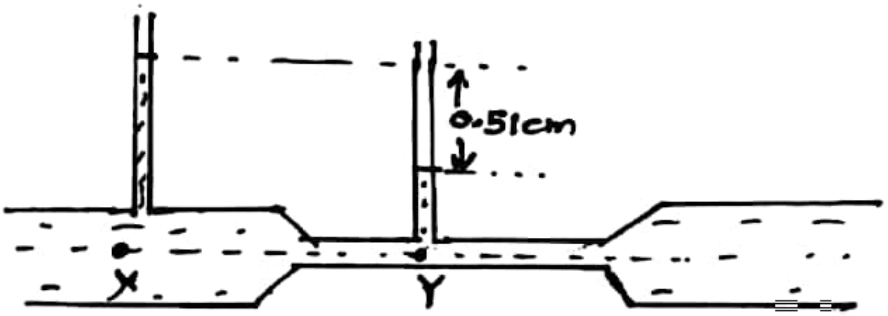


Figure shows a venturimeter. If the speed of flow of X is $2\ ms^{-1}$. Speed of flow at Y should be,

(1) $32\ cm\ s^{-1}$ (2) $64\ cm\ s^{-1}$ (3) $202\ cm\ s^{-1}$ (4) $1020\ cm\ s^{-1}$ (5) $1024\ cm\ s^{-1}$

(48) A metalic tank having surface area $4\ m^2$ and having thin wall is heated by an immersion heater of power 1 kW. This tank is insulated by a thin insulating layer of thickness 4 cm and having thermal conductivitiy $0.2\ Wm^{-1}W^{-1}$. What should be temperature of water at steady state if the temperature of outer surface is 20 °C ?

(1) 35 °C (2) 50 °C (3) 60 °C (4) 70 °C (5) 80 °C

(49) Focal length of a objective lens is 2 cm and eye lens is 6.25 cm of a compound microscope. What should be the object length from objective lens, when microscope at normal adjustment, (least distance of distinct vision 25 cm).

(1) 1.5 cm (2) 2.5 cm (3) 3 cm (4) 4 cm (5) 5 cm