Taxila Central Collage - Horana

Grade 13

Pilot Test 1 - 2021 November

Physics I

Time 2 hours

$g = 10 Nkg^{-1}$

Answer all the questions.

1).Physical quantity X represents as $X = \varepsilon_\circ L^2 \frac{\Delta v}{\Delta t}$ where $\varepsilon_\circ$ absolute permittivity L length ΔV potential difference Δt time interval. Dimensions of X equals to dimensions of,

(1) Resistivity (2) Charge (3). Potential difference

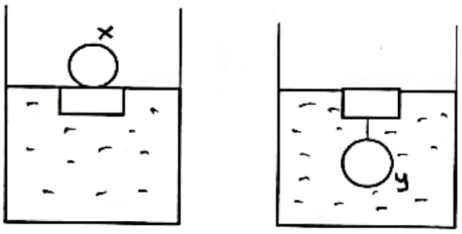
(4). Electric capacity (5).Current

2). When the unit called the Electron Wallet is divided by Kelvin is it similar to which of the following units?

(A). Boltzmann Constant (B) Heat Capacity (C). Specific heat capacity of a gas

(1). (A). (2). (B) (3). A & B (4). A & C (5). A, B & C

3).



Two identical wooden blocks are just immersed in water as shown in the figure using two spheres x and y .The ratio of the volumes of x and y if the relative density of the sphere material is s

(1). $1 - s$ (2). $\frac{s-1}{s}$ (3). $s + 1$

(4). $\frac{1}{s}$ (5). s

(4). Which of the following conditions/conditions are essential in the formation of laser light?

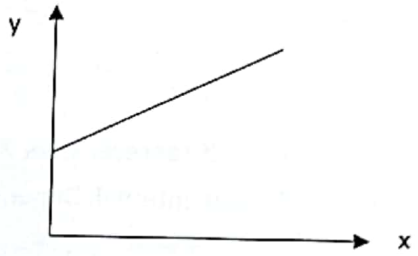
A. Presence of population inversion
B. Presence of two or more energy levels in the laser medium
C. Having at least one metastable level

(1). A (2). B (3). A & B (4). A& C (5). A, B & C

5). Which physical quantities are represented by the x-axis and y-axis of the following graph?

$I - intensity\ of\ sound \quad I_0 - threshold\ of\ hearing \quad L - Sound\ intensity\ level$

(1)	x - L	y -I
(2)	x - L	y -I^2
(3)	x - I^2	y -L
(4)	x - $\log_{10}(I)$	y -L
(5)	x - L	y - $\log_{10}(I)$



6). A particle undergoes a simple harmonic linear motion with a period of oscillation of 8 s and amplitude of 1cm in a straight line. The maximum acceleration of the particle is,

(1). $\frac{\pi}{2^2}$ (2). $\frac{\pi}{8^2}$ (3). $\frac{\pi}{4^2}$ (4). $\frac{\pi}{10^2}$ (5). $\frac{10^{-2}\pi^2}{16}$

7). The average value of the kinetic energy of a mass of ideal gas can be doubled

A. By doubling the absolute temperature.
B. By keeping the temperature constant and halving the pressure.
C. By keeping the temperature constant and halving the volume.

The correct statement/s

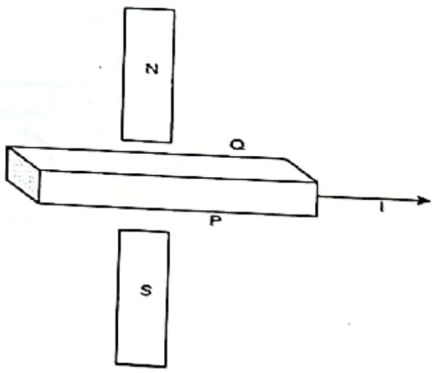
(1). (A). (2). (B) (3). C (4). A & C (5). A, B & C

8). A set up uses to demonstrate hole's effect is given below.

When a constant current flows through the system then,

A. A potential difference is built up across PQ
B. Hole's voltage is increased when the applied magnetics flux is increased.
C. Hole's voltage is decreased when the thickness is decreased

The correct statement/s,

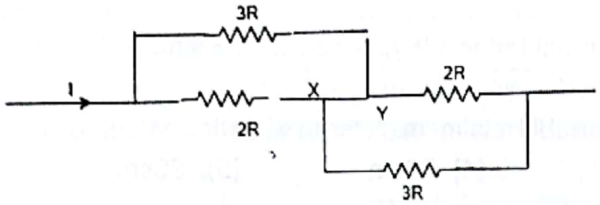


(1). A,B and C (2). A and B (3). B and C
(4). A (5). C

9). An object was projected at a velocity of V so that it gains its maximum range. What is the angular momentum about the projection point when the object is at the highest point in its trajectory?

(1). $\frac{\sqrt{2}mv^2}{2g}$ (2). $\frac{\sqrt{2}mV^2}{g}$ (3). $\frac{\sqrt{2}mV^3}{2g}$ (4). $\frac{\sqrt{2}mV^3}{8g}$ (5). $\frac{\sqrt{2}mV^3}{g}$

10). Which of the following statement is true of the current flowing through XY in a given circuit?



(1).A current flows from X to Y (2).There is no current through XY

(3). A current flows from Y to X (4). Answer unpredictable due to the unknown R

(5).None of above

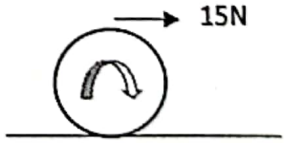
11). Three q charges are placed at each of the three vertices of an equilateral triangle. The system is in equilibrium when charge Q is kept at the center of the triangle. The charge Q should be equal to,

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

12). Where the tension of a wire between two immovable supports with a gap of 0.5m is T1 The fundamental frequency is 256 Hz. The fundamental frequency of this section of wire is raised to 512 Hz by changing the tension to T2. Which of the following is correct?

(1). $T_2 = 2T_1$ (2). $T_1 = 2T_2$ (3). $T_1 = 4T_2$ (4) $T_2 = 4T_1$ (5). $T_2 = 3T_1$ /4

13). The radius of a solid cylinder on a horizontal plane is 0.1m and the mass is 4kg.By applying 15N force to a solid cylinder as shown in the figure, the cylinder rotates without slipping. Acceleration of its center of mass is,



(1). $1ms^{-2}$ (2). $3ms^{-2}$ (3). $5ms^{-2}$ (4). $6ms^{-2}$ (5). $8ms^{-2}$

14). Water pumping out of a large reservoir by a water pump operating at maximum power. When the motor is operating in an area where gravitational field intensity is exactly half of the above value,
What is the fraction of the maximum power of the pump to the initial power?

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

15). The far point of a person who is suffering from long-sightedness (Hypermetropia) is infinite. This person wears a magnifying lens to observe objects close to the eye. Then an object placed between 80mm and 100mm to the lens can be clearly seen from the lens. His minimum distance of distinct vision is,

(1). 25cm (2). 30cm (3). 40cm (4). 50cm (5). 80cm

16). The figure shows a P-V graph of the cyclic process associated with a gaseous system.

A. In the process from A to B, work is done by the gas and it is positive (+).
B. In this cyclic process, effective work is done by the gas.
C. In process C to A, the work on the gas is positive (+)

Correct statement/s from above

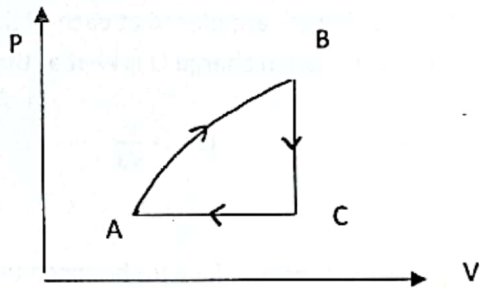
(1). a only

(2). b only

(3). a and. b only

(4). a and c only

(5). All a , b ,and c



17). When a proton and α particle accelerate at the same potential difference, what is the ratio between their de Broglie wavelength?

(1). $\sqrt{2}:1$ (2). $\sqrt{2}:2$ (3). 8 : 1 (4). 1 : 8 (5). $2\sqrt{2}:1$

18).In alpha decay and beta decay $^{238}_{92}U$ converts into $^{206}_{82}Pb$. The number of alpha particles released in such decay is,

(1). 4 (2). 5 (3). 6 (4). 8 (5). 10

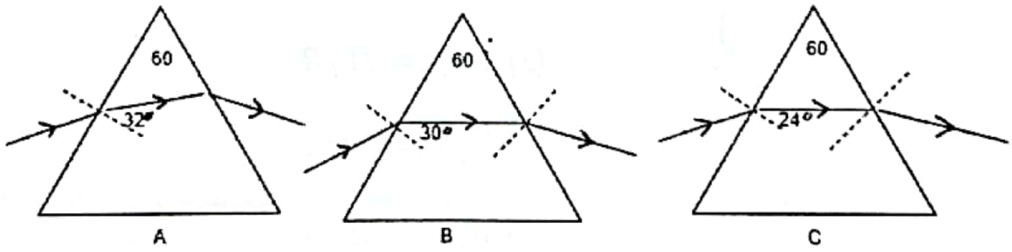
19). The cylindrical bowl is filled with water to a height of 0.2m. When a powder of a substance that contains spherical particles of density 4000kgm^{-3} is added to water and allowed to deposit in the bottom of the vessel, it takes 120s to deposit all the particles. The maximum possible diameter of a particle deposited in the vessel is,(Coefficient of viscosity 0.01Nsm^{-2} and the particles gain their terminal velocity instantly)

(1). 5×10^{-2}m (2). 5×10^{-5}m (3). 1×10^{-4}m (4). 2×10^{-5}m (5). 7×10^{-5}m

20). A metal sphere of radius 10cm is isolated and a large positive charge is given. The work done on a small charge which is taken to a point at 0.5m away from the center from infinity is W and the force on it is F .What would be the work done and force if the point is 1m away from the center?

	Work done	Force
1)	$\frac{W}{2}$	$\frac{F}{2}$
2)	$\frac{W}{2}$	$\frac{F}{4}$
3)	$\frac{W}{2}$	$\frac{F}{\sqrt{2}}$
4)	$\frac{W}{4}$	$\frac{F}{2}$
5)	$\frac{W}{4}$	$\frac{F}{4}$

21).



Diagrams A, B, and C show the three different paths of a light ray that passes through a prism of refractive angle 60^0. Refracting angles at the first refracting edge are 32^0,30^0, and 24^0 respectively. If the deviation due to the refraction at both edges at each instance is d_A, d_B, and d_C then the arrangement is,

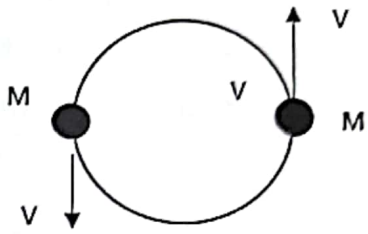
(1). $d_A > d_C > d_B$ (2). $d_C > d_A > d_B$ (3). $d_A > d_B > d_C$

(4). $d_C > d_B > d_A$ (5). $d_B > d_A > d_C$

22). The maximum frictional force between the road and the wheels of a motor car on a bend made without sloping the road is reduced to half on a rainy day as that of on a dry day. The maximum safe speed at which this car can bend is $20ms^{-1}$ on a dry day. The maximum safe speed at which this car can bend on a rainy day is,

(1). $3.5ms^{-1}$ (2). $5.2ms^{-1}$ (3). $7.0ms^{-1}$ (4). $10ms^{-1}$ (5). $14ms^{-1}$

23). Two equal stars each mass M rotates in an orbit of radius R about their common center of mass with equal velocity V as shown in the figure. The force exerts on each star is,

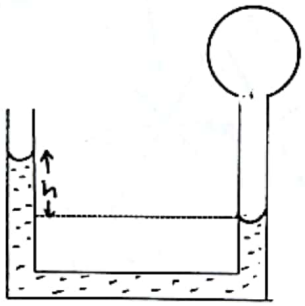


(1). 0 (2). $\frac{MV^2}{2R}$ (3). $\frac{2MV^2}{R}$ (4). $\frac{GM^2}{R^2}$ (5). $\frac{GM^2}{4R^2}$

24). Two homogeneous forces are exerted with d separation. When these two forces are interchanged the line of axion is displaced by $\frac{d}{3}$. The ratio of the forces is,

(1). 2 : 5 (2). 3:2 (3). 2 : 1 (4). 5:6 (5). 5:4

25). A liquid of density ρ and the surface tension $T$is poured into a narrow U tube of radius r.A soap bubble of radius R is formed at one end of the tube as shown in the figure. Which one of the following is true if the surface tension of the soap solution is γ,



(1). h $\rho g = 4T/R$

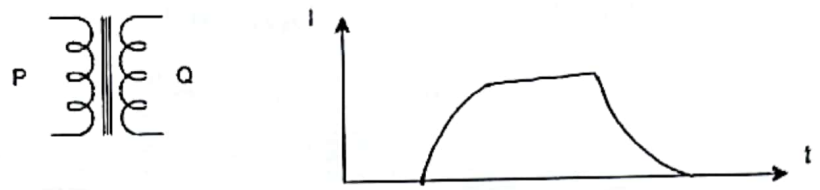
(2). h $\rho g = 2T/R$

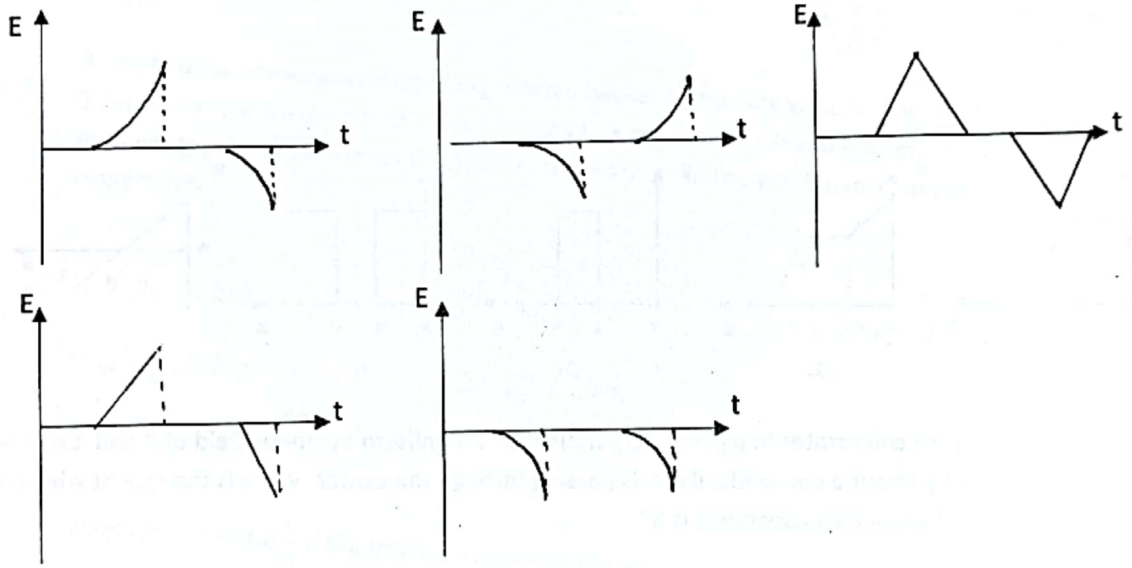
(3). h $\rho g = 4\gamma/R$

(4). h $\rho g = 2\gamma/R$

(5). h $\rho g = \frac{4T}{R} + \frac{4\gamma}{R}$

26).The following graph represents the variation of the current *I* through the coil P with time *t* . Which one of the following best represents the variation of the induced electromotive force E of the coil Q with time t.



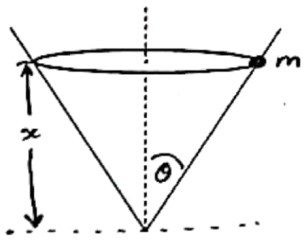


27). The length of a metal wire when it undergoes a tension of T_1 is l_1 and that of when it undergoes a tension of T_2 is l_2. If this wire does not exceed the proportional limit what would be the amount of energy stored due to this elongation?

(1). $(T_2 - T_1)(L_2 - L_1)$ (2). $(T_2 - T_1)(L_2 - L_1)/2$ (3). $(T_2 + T_1)(L_2 - L_1)/2$

(4). $(T_2 + T_1)(L_2 - L_1)/4$ (5). $(T_2 + T_1)(L_2 + L_1)/2$

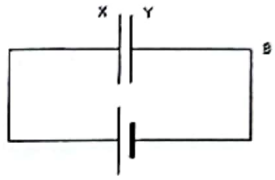
28). The speed of a particle of mass m that follows a circular path at an X-height from the top of a conical bowl is,

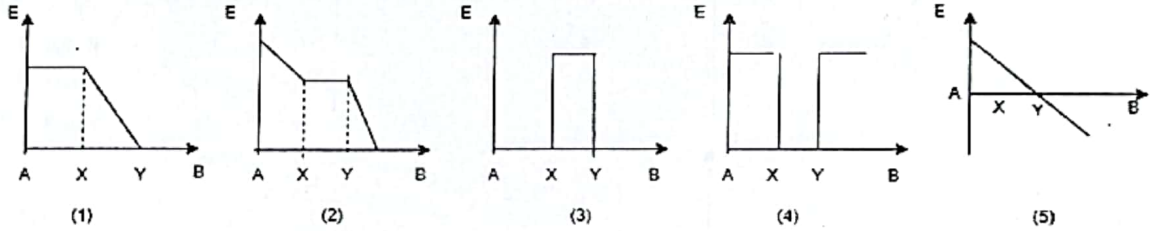


(1). $\sqrt{gxtan\theta}$ (2). $\sqrt{\frac{gx}{tan\theta}}$ (3). $\sqrt{gx}$

(4). $\sqrt{\frac{gx}{m}}$ (4). $\sqrt{\frac{gxtan\theta}{m}}$

29). The parallel plate capacitor xy shown in the figure is connected across a cell. Which one of the following best represents the variation of the electrostatic field intensity E from A to B when the capacitor is at the steady-state?





30). A semicircular wire coil rotates in a plane perpendicular to a uniform magnetic field of B and it rotates at a ω angular velocity about a perpendicular axis passing through the center. What is the rate at which heat is produced from the coil if its resistance is R?

(1). $\frac{B\pi r^2\omega}{2R}$ (2) $\frac{(B\pi r\omega)^2}{8R}$ (3). $\frac{(Br^2\omega)^2}{4R}$ (4). $\frac{(B\pi r^2\omega)^2}{8R}$ (5). $\frac{B\pi r^2\omega}{8R}$

at 30°C

31). When an object heated to 80°C is placed in an environment, the starting temperature of the object drops at a rate of $5°Cs^{-1}$. If the room temperature is reduced by 10°C, its starting temperature downfall rate is,

(1) $3°Cs^{-1}$ (2) $4°Cs^{-1}$ (3) $5°Cs^{-1}$ (4) $6°Cs^{-1}$ (5) $12°Cs^{-1}$

32). The length of the mercury column inside a mercury-glass thermometer is 3.60cm when the bulb is at the temperature corresponding to the triple point of the water. What would be the height when the bulb is at 341.15K?

(1) 2.88 cm (2) 3.20cm (3) 3.60cm (4) 4.50cm (5) 7.20cm

33). If a child in a balloon moves vertically upwards with an acceleration of $2ms^{-2}$ throws a ball vertically upwards with $12ms^{-1}$ relative to the balloon when the velocity of the balloon is $8ms^{-1}$. What is the time that it takes to reach the balloon again?

(1) 4s (2) 1s (3) 2s (4) 1.5s (5) 3s

34). A balloon with constant volume contains gas at 100 ^{0}C. Which fraction of the gas will remove from the balloon when the temperature of the balloon is raised by 1K under constant pressure?

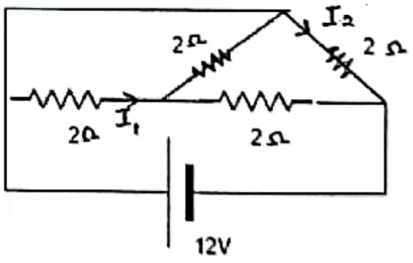
(1) $\frac{1}{373}$ (2) $\frac{1}{374}$ (3) $\frac{1}{100}$ (4) $\frac{374}{273}$ (5) $\frac{101}{100}$

35). A pan balance shows a reading of 5kg when a beaker containing water is kept on it. An object of mass of 1.5kg and a relative density of 7.5 is attached to a spring balance and fully immersed in water so that it does not touch the bottom of the beaker. The readings of the pan balance and the spring balance are respectively,

(1). 5.2kg , 1.5kg (2). 5kg , 1.3kg (3). 5kg , 1.5kg

(4). 5.2kg , 1.3kg (5). 1.5kg , 5kg

36). What would be the $\frac{I_1}{I_2}$ if the internal resistance of the cell is too small?



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

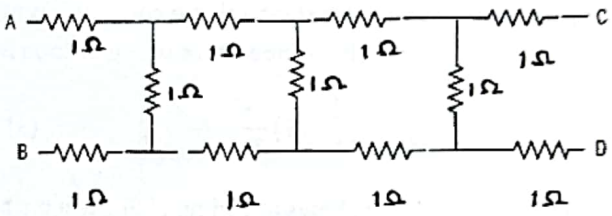
37). A uniform level circular stage of mass $200kg$ revolves at a rate of $10\ rpm$ about a vertical axis through the center of the stage. A boy of mass $50kg$ stands at the outer edge of the stage. What would be the new revolution rate when he walks to the center of the stage?

(1). 15 (2). 12.5 (3). 7.5 (4). 20 (5). 17.5

38) A capacitor of capacitance $10\mu F$ is charged using a power supply of 30 V and connects across an uncharged capacitor of capacitance $50\mu F$.The new potential difference of the circuit is,

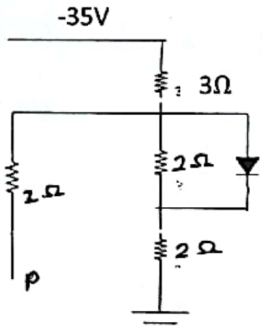
(1). 10V (2). 5V (3). 1.5V (4). 0.5V (5). 2V

39). The required potential difference across AB to get 1V potential difference across CD is,



(1). 5V (2). 12V (3). 27V (4). 30V (5). 41V

40). If the given diode is an ideal the potential at P is,



(1). 0 V

(2). -7 V

(3). -14 V

(4). -20 V

(5).-35 V

41). A fighter aircraft releases a bomb when it is flying with 300ms^{-1} and 500m above the ground level. The bomb takes t time interval to move a range x . Then t and x would be,

(1). 5s, 300m (2). 5s, 1km (3). 10s, 3km

(4). 10s, 6km (5). 10s, 30km

figure 1

42). The ~~given~~ voltage is given as the input AB of the circuit and the zener diodes are identical. Which one of the following best represents the variation of the output V_{out} ($V_1 > V_2$)with time t? zener voltage is V_z

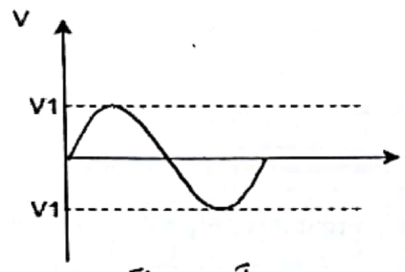
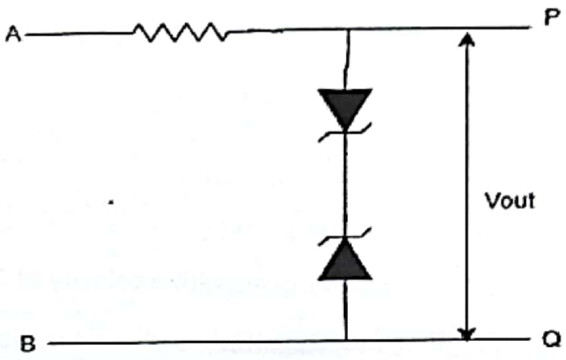
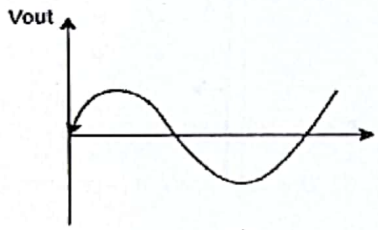


Figure 1





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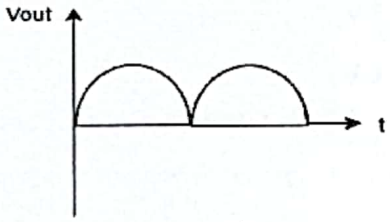

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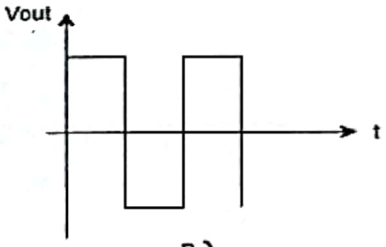

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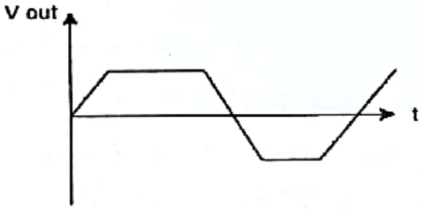

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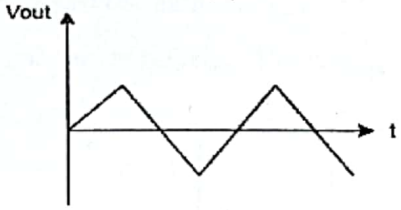
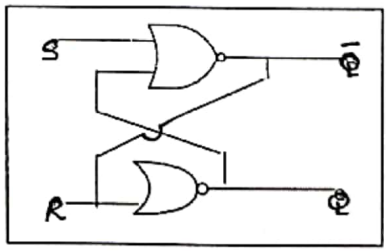


5)

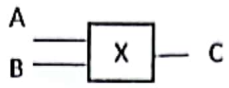
43). The given is a SR flip-flop. For which S and R values will the $Q = 0$ and $\bar{Q}$=1?

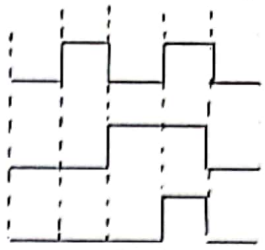
(1) S =0 R = 0
(2) S =1 R = 0
(3) S =1 R = 1
(4) S =0 R = 0
(5) S =0 or R = 1



4). The inputs A and B supplied to the given gate is shown in i and ii and the C output is given by iii. The corresponding gate would be

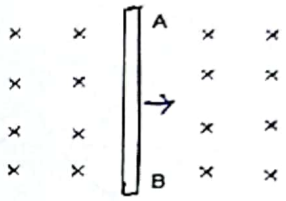
(1) OR
(2) NOR
(3) AND
(4) NAND
(5) EXOR



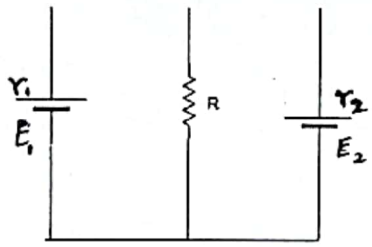


45).A conductor AB of length 80cm moves with a velocity of $10ms^{-1}$so that it is perpendicular to a uniform Magnetic field of 4.5×10^{-1} T .Magnitude and the direction of the induced electromotive force are,

(1). A to B 1.8 V
(2). B to A 1.8 V
(3). A to B 3.6 V
(4). B to A 3.6 V
(5). 0V



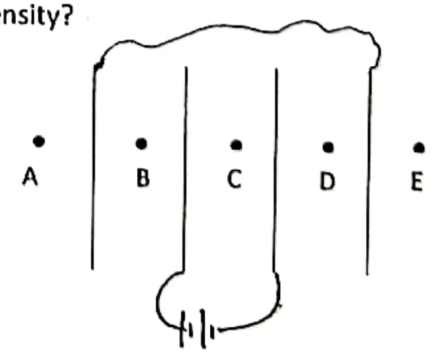
46).Electromotive forces of two cells are E_1 and E_2 and internal resistors are r_1 and r_2 .When do you obtain the maximum power dissipation across R ?



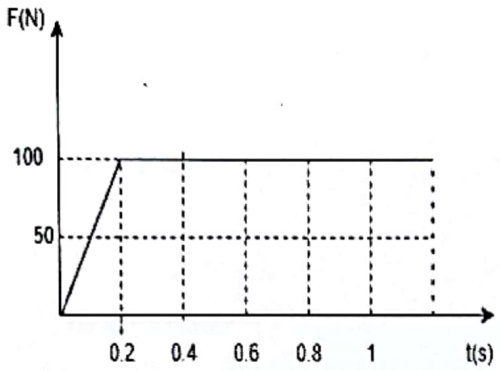
(1). $\sqrt{r_1 r_2}$
(2). $\sqrt[2]{r_1^2 + r_2^2}$
(3) $r_1r_2 / r_1 + r_2$
(4). $\sqrt[3]{(r_1^3 + r_2^3)}$
(5). $r_1 r_2$

47). Four identical metal plates are kept with equal separations as shown in the figure and V potential difference is applied across inner plates and outer plates are connected using a conducting wire. At which point do you get the maximum field intensity?

(1). A (2). B (3). C
(4). D (5). E



48)



The following graph represents the variation of horizontal force F on and object of mass 10kg with time t .What would be the velocity of the object exactly one second later that it initiates its motion (Coefficient of friction between the object and the surface is 0.5.)

(1). $1.25ms^{-1}$ (2). $1ms^{-1}$ (3). $1.5ms^{-1}$ (4). $3ms^{-1}$ (5). $3.5ms^{-1}$

49).The velocity of sound in dry air is V_d and that of in wet air is V_m at constant pressure and the temperature' Which one of the following is a completely correct statement?

(1). $V_d > V_m$ because the density of the dry air is less than that of wet air

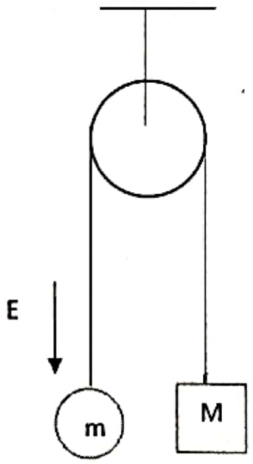
(2). $V_d < V_m$ because the density of the wet air is less than that of dry air

(3). $V_d > V_m$ because molar mass of the dry air is less

(4). $V_d < V_m$ because molar mass of the wet air is high

(5). $V_d = V_m$ because the velocity of sound does not depends on the being dry or wet the air

50).



m and M are equally charge with +q

M>m and system moves without friction. The acceleration of the each mass is

(1) $\frac{(M-m)g}{(M+m)}$ (2). $\frac{(M-m)(g+E)}{(M+m)}$ 3). $\frac{(M-m)(g+qE)}{(M+m)m}$

(4) $\frac{(M+m)gE}{(M+m)}$ (5) $\frac{(m-M)g}{(M+m)}$