18th March 2021 | Shift - 1
PHYSICS

SECTION – A

1. In a series LCR resonance circuit, if we change the resistance only, from a lower to higher value :
(1) The resonance frequency will increase
(2) The quality factor will increase
(3) The quality factor and the resonance frequency will remain constant
(4) The bandwidth of resonance circuit will increase

1. **(4)**

Sol. $\Omega_f = \dfrac{1}{\sqrt{LC}}$ frequency will not change

$Q = \dfrac{\omega L}{R}$ $R \uparrow Q \downarrow$

$Q = \dfrac{\omega L}{R} = \dfrac{\omega}{\Delta B}$

$\Delta\beta = \dfrac{R}{L}$ $R \uparrow \Delta B \uparrow$

So, band with of resonance circuit will increases.
By Motion Ans $\rightarrow$ 4
By NTA Ans $\rightarrow$ 4

2. A radioactive sample disintegrates via two independent decay processes having half lives $T^{(1)}_{\frac{1}{2}}$ and $T^{(2)}_{\frac{1}{2}}$ respectively. The effective half-life, $T_{\frac{1}{2}}$ of the nuclei is:

(1) None of the above

(2) $T_{\frac{1}{2}} = T^{(1)}_{\frac{1}{2}} + T^{(2)}_{\frac{1}{2}}$

(3) $T_{\frac{1}{2}} = \dfrac{T^{(1)}_{\frac{1}{2}} + T^{(2)}_{\frac{1}{2}}}{T^{(1)}_{\frac{1}{2}} - T^{(2)}_{\frac{1}{2}}}$

(4) $T_{\frac{1}{2}} = \dfrac{T^{(1)}_{\frac{1}{2}} T^{(2)}_{\frac{1}{2}}}{T^{(1)}_{\frac{1}{2}} + T^{(2)}_{\frac{1}{2}}}$

2. **(4)**

Sol. $\left(\dfrac{dN}{dt}\right)_1 = N\lambda_1$, $\left(\dfrac{dN}{dt}\right)_2 = N\lambda_2$

$\dfrac{dN}{dt} = \left(\dfrac{dN}{dt}\right)_1 + \left(\dfrac{dN}{dt}\right)_2$

$N\lambda_{eff} = N\lambda_1 \times N\lambda_2$

$\dfrac{1}{T_{eff}} = \dfrac{1}{T_1} + \dfrac{1}{T_2}$

$T_{eff} = \dfrac{T_1 T_2}{T_1 + T_2}$

By Motion Ans $\rightarrow$ 4
By NTA Ans $\rightarrow$ 4

3. In the experiment of Ohm's law, a potential difference of 5.0 V is applied across the end of a conductor of length 10.0 cm and diameter of 5.00mm. The measured current in the conductor is 2.00 A. The maximum permissible percentage error in the resistivity of the conductor is:
(1)7.5   (2)3.9   (3)8.4   (4)3.0

3. **(2)**

Sol. $V = IR$

$R = \rho \dfrac{\ell}{A}$

$V = I\left(\dfrac{\rho\ell}{A}\right)$

$\rho = \dfrac{VA}{I\ell}$

$\dfrac{\Delta\rho}{\rho} = \dfrac{\Delta V}{V} + \dfrac{\Delta I}{I} + \dfrac{\Delta\ell}{\ell} + 2\dfrac{\Delta d}{d}$

$= \dfrac{0.1}{5} + \dfrac{0.01}{2} + \dfrac{0.1}{10} + 2 \times \dfrac{0.01}{5}$

$\dfrac{\Delta\rho}{\rho} = 0.02 + 0.005 + 0.01 + 0.004$

$\dfrac{\Delta\rho}{\rho} = 0.039$

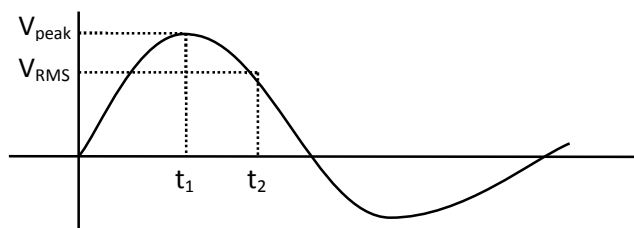$\dfrac{\Delta\rho}{\rho} \times 100 = 0.039 \times 100 = 3.9\%$

By Motion Ans $\rightarrow$ 4
By NTA Ans $\rightarrow$ 4

4. An AC source rated 220V, 50 Hz is connected to a resistor. The time taken by the current to change from its maximum to the rms value is:
(1) 0.25 ms   (2) 25 ms   (3)2.5 ms   (4)2.5 s

4. **(3)**

$V = V_0 \sin \Omega t = 220\sqrt{2} \sin\left(2\pi + t_1\right)$

$220\sqrt{2} = 220\sqrt{2} \sin\left(100\pi t_1\right)$

$V = 220\sqrt{2} \sin\left(100\pi t_1\right)$

$1 = \sin\left(100\pi t_1\right)$

$\dfrac{\pi}{2} = 100\pi t_1$

$t_1 = \dfrac{1}{200}$

$\dfrac{200}{200\sqrt{2}} = \sin(\Omega t_2)$

$\dfrac{\pi}{4} = 2\pi + t_2$

$t_2 = \dfrac{1}{400}$

$\Delta t = t_1 - t_2 = \dfrac{1}{200} - \dfrac{1}{400}$

$\Delta t = \dfrac{1}{400}\,\text{sec} = 2.5\text{ms}$
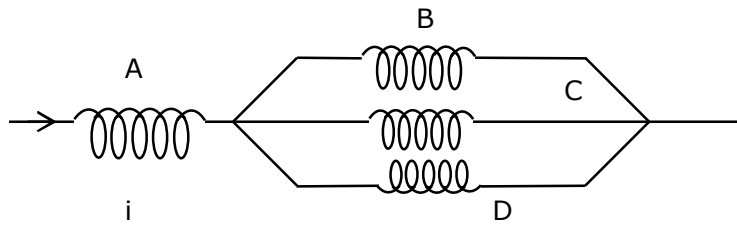
IInd Method

Phase different b/w

Max & RMS $= \dfrac{\pi}{4}$

So, $\Delta t = T/8$

$\Delta t = \dfrac{1}{8 \times 50} = \dfrac{1}{400}\,\text{sec}$

$\boxed{\Delta t = 2.5\,\text{ms}}$

5. Four identical long solenoids A, B, C and D are connected to each other as shown in the figure. If the magnetic field at the center of A is 3 T, the field at the center of C would be: (Assume that the magnetic field is confined with in the volume of respective solenoid.)
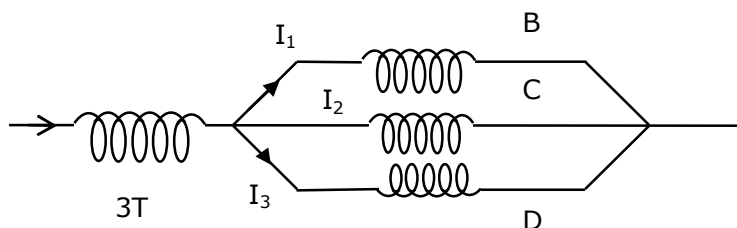

(1) 6T   (2) 12T   (3) 1T   (4) 9T

5. **(3)**

$3I_1 = I_0$

$I_1 = \dfrac{I_0}{3}$

$B = \mu_0 n I_0 = 3T$

$B_1 = \mu_0 n I_1$

$B' = \mu_0 n \dfrac{I_0}{3} = \dfrac{\mu_0 \times 70}{3} = \dfrac{3T}{3} = 1T$

B' = 1T
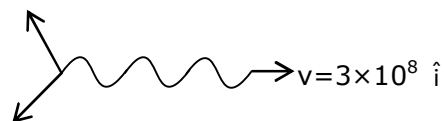By Motion Ans → 1
By NTA Ans → 1

6. A plane electromagnetic wave of frequency 100 MHz is travelling in vacuum along the x-direction. At a particular point in space and time, $\vec{B} = 2.0 \times 10^{-8} \hat{k}T$ (where, $\hat{k}$ is unit vector along z-direction). What is $\vec{E}$ at this point ? (speed of light c = 3 × 10^8 m/s)

(1) 0.6 $\hat{j}$ V/m   (2) 6.0$\hat{k}$ V/m   (3) 6.0 $\hat{j}$ V/m   (4) 0.6 $\hat{k}$ V/m

6. **(3)**

f = 100 MHz

v = 3×10^8 $\hat{i}$

$\vec{B} = 2 \times 10^{-8} T$

$\vec{E} = \vec{B} \times \vec{V}$

= (2 × 10^{-8} $\hat{k}$) × (3 × 10^8 $\hat{i}$)

= 6 $\left(\hat{k} \times \hat{i} \right)$ = 6$\hat{j}$ V/m

$\vec{E} = 6\hat{j} V/m$

By motion Ans → 3
By NTA Ans → 3

7. A particle is travelling, 4 times as fast as an electron. Assuming the ratio of de-Broglie wavelength of a particle to that of electron is 2:1, the mass of the particle is :

(1) $\frac{1}{16}$ times of mass of e$^-$ (2) 16 times the mass of e$^-$

(3) $\frac{1}{8}$ times the mass of e$^-$ (4) 8 times the mass of e$^-$

7. **(3)**

$\lambda = \frac{h}{p} = \frac{h}{mv}$

$\frac{\lambda_p}{\lambda_e} = \frac{\dfrac{h}{m_p v_p}}{\dfrac{h}{m_e v_e}} = \frac{m_e v_e}{m_p v_p}$

$\frac{2}{1} = \frac{M_e}{M_p} \times \frac{v_e}{4 v_e}$

$m_p = \frac{M_e}{8}$

$\frac{1}{8}$ times the mass of electron

By Motion Ans → 3
By NTA Ans → 3

8. What will be the average value of energy along one degree of freedom for an ideal gas in thermal equilibrium at a temperature T? (k_B is Boltzmann constant)

(1) $k_B T$ (2) $\frac{2}{3}k_B T$ (3) $\frac{3}{2}k_B T$ (4) $\frac{1}{2}k_B T$

8. **(4)**

Energy associated with each digress of freedom is $\frac{1}{2}$ $K_B T$.

By Motion Ans → 4
By NTA Ans → 4

9. Your friend is having eye sight problem. She is not able to see clearly a distant uniform window mesh and it appears to her as non-uniform and distorted. The doctor diagnosed the problem as:
(1) Myopia and hypermetropia   (2) Astigmatism
(3) Myopia with astigmatism   (4) presbyopia with astigmatism

9. **(3)**
By theory
By motion Ans → 3
By NTA Ans → 3

10. The time period of a simple pendulum is given by T = $2\pi\sqrt{\dfrac{l}{g}}$. The measured value of the length of pendulum is 10 cm known to a 1 mm accuracy. The time for 200 oscillations of the pendulum is found to be 100 second using a clock of 1s resolution. The percentage accuracy in the determination of 'g' using this pendulum is 'x'. The value of 'x' to the nearest integer is .
(1) 5%   (2) 4%`   (3) 3%   (4) 2%

10. **(3)**

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

$$T^2 = 2\pi\left(\frac{l}{g}\right)$$

$$g = 2\pi\frac{l}{T^2}$$

$$\frac{\Delta g}{g} = \frac{\Delta l}{l} + \frac{2\Delta T}{T}$$

$$\frac{\Delta g}{g} = \frac{1\times10^{-3}}{1\times10^{-2}} + \frac{2\times1}{100}$$

$$\frac{\Delta g}{g} = 0.02 + 0.01 = 0.03$$

$$100\times\frac{\Delta g}{g} = 0.03\times100 = 3\%$$

$$\frac{\Delta g}{g}\times100 = 3\%$$

By motion Ans → 3
By NTA Ans → 3

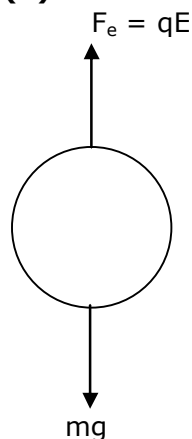**11.** An oil drop of radius 2 mm with a density 3 g cm^{-3} is held stationary under a constant electric field 3.55×10^5 V m^{-1} in the millikan's oil drop experiment. What is the number of excess electrons that the oil drop will possess?
Consider g = 9.81 m/s^2
(1) 1.73×10^{10} (2) 48.8×10^{11} (3) 1.73×10^{12} (4) 17.3×10^{10}

11. **(1)**

$F_e = qE = (ne)E$

$F_e = mg$

$(ne)E = mg$

$$n = \frac{mg}{eE} = \frac{\rho \frac{4}{3}\pi R^3 \times g}{eE}$$

$$n = \frac{3000 \times \frac{4}{3} \times 3.14 \times 8 \times 10^{-9} \times 9.8}{1.6 \times 10^{-19} \times 3.55 \times 10^5}$$

$$n = \frac{984704 \times 10^5}{5.68} = 1.73 \times 10^{10}$$

$n = 1.73 \times 10^{10}$

By Motion Ans → 1

By NTA Ans → 1

12. The time period of a satellite in a circular orbit of radius R is T . the period of another satellite in a circular orbit of radius 9R is :
(1) 3T   (2) 9 T   (3) 27 T   (4) 12T

12. **(3)**

$T^2 \propto R^3$

$$\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{\frac{3}{2}}$$

$$\frac{T_1}{T_2} = \left(\frac{R}{9R}\right)^{\frac{3}{2}}$$

$$\frac{T}{T_2} = \frac{1}{27}$$

$T_2 = 27T$

By motion Ans → 3
By NTA Ans → 3

13. A loop of flexible wire of irregular shape carrying current is placed in an external magnetic field. Identify the effect of the field on the wire
(1) Loop assumes circular shape with its plane parallel to the field
(2) shape of the loop remains unchanged
(3) wire gets stretched to become straight.
(4) loop assumes circular shape with its plane normal to the field

13. (1)
Force on each wire be along radially outward and equal so, it will take the shape of circle and parallel to the field.
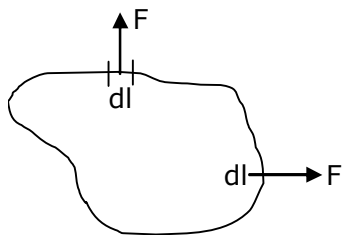
14. In Young's double slit arrangement, slits are separated by a gap of 0.5mm, and the screen is placed at a distance of 0.5 m from them. The distance between the first and the third bright fringe formed when the slits are illuminated by a monochromatic light of 5890 Å is:
(1) 1178×10^{-6} m   (2) 1178×10^{-9} m   (3) 5890×10^{-7} m   (4) 1178×10^{-12} m

14. (1)
D = 0.5 m
d = 0.5 mm
λ = 5890Å

distance between first and third bright fringe = $2\beta = \dfrac{2\lambda D}{d}$

$= 2 \times 5890 \times 10^{-10} \times \dfrac{0.5}{0.5 \times 10^{-3}}$

$= 1178 \times 10^{-6}$ m

15. Match List – I with List – II

List – I		**List – II**	
(a)	10 km height over earth's surface	(i)	Thermosphere
(b)	70 km height over earth's surface	(ii)	Mesosphere
(c)	180 km height over earth's surface	(iii)	stratosphere
(d)	270 km height over earth's surface	(iv)	Troposphere

(1) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)
(2) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)
(3) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)
(4) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)

15. **(2)**
    Troposphere
    The troposphere starts at the Earth's surface and extends 8 to 14.5 kilometers high
    (6 to 9 miles).
    Stratosphere
    The stratosphere starts just above the troposphere and extends to 50 kilometers (31 miles) high.
    Mesosphere
    The mesosphere starts just above the stratosphere and extends to 85 kilometers (53 miles) high.
    Thermosphere
    The Thermosphere starts just above the mesosphere and extends to 600 kilometers (372 miles) high.
    Ionosphere
    The ionosphere is an abundant layer of electrons and ionized atoms and molecules that stretches from abut 48 kilometers (30 miles) above the surface to the edge of space at about 965 km (600 mi).
    Exosphere
    This is the upper limit of our atmosphere. It extends from the top of the thermosphere up to 10000 km (6200mi).
    By NTA Asn. $\rightarrow$ 2

16. A constant power delivering machine has towed a box, which was initially at rest, along a horizontal straight line. The distance moved by the box in time 't' is proportional to:
    (1) t　　　　　(2) $t^{3/2}$　　　　　(3) $t^{1/2}$　　　　　(4) $t^{2/3}$

16. **(2)**
    $P = F.v = mav$

    $P = \dfrac{mvdv}{dt}$

    $\displaystyle\int_0^t Pdt = m\int_0^v vdv$

    $Pt = \dfrac{mv^2}{2}$

    $v = \sqrt{\dfrac{2Pt}{m}}$

    $\dfrac{dx}{dt} = \sqrt{\dfrac{2Pt}{m}}$

    $\displaystyle\int dx = \int \sqrt{\dfrac{2Pt}{m}}\ dt$

    $x \propto t^{3/2}$

17. A thin circular ring of mass M and radius r is rotating about its axis with an angular speed ω. Two particles having mass m each are now attached at diametrically opposite points. The angular speed of the ring will become:

(1) $\omega \dfrac{M}{M + 2m}$ (2) $\omega \dfrac{M}{M + m}$ (3) $\omega \dfrac{M + 2m}{M}$ (4) $\omega \dfrac{M - 2m}{M + 2m}$

17. **(1)**

τ_{net} = 0, so angular momentum is conserved

By angular momentum conservation

$I_i \omega_i = I_f \omega_f$

$(MR^2)\omega = (MR^2 + 2MR^2)\, \omega_f$

$\omega_f = \dfrac{(MR^2)\omega}{MR^2 + 2MR^2} = \dfrac{M\omega}{M + 2m}$

$\omega_f = \dfrac{M\omega}{M + 2m}$

18. Imagine that the electron in a hydrogen atom is replaced by a muon (μ). The mass of muon particle is 207 times that of an electron and charge is equal to the charge of an electron. The ionization potential of this hydrogen atom will be:

(1) 27.2 eV (2) 331.2 eV (3) 13.6 eV (4) 2815.2 eV

18. **(4)**

$E_n = -13.6 \times \dfrac{\mu}{m_e}\, eV$

$\mu = \dfrac{(1836 m_e)(207 m_e)}{(1836 + 207)m_e}$

$= \dfrac{1836 \times 207}{2043} = 186 m_e$

$\therefore$ Ionization energy = 13.6 × 186eV

19. The P-V diagram of a diatomic ideal gas system going under cyclic process as shown in figure. The work done during an adiabatic process CD is (use $\gamma = 1.4$):
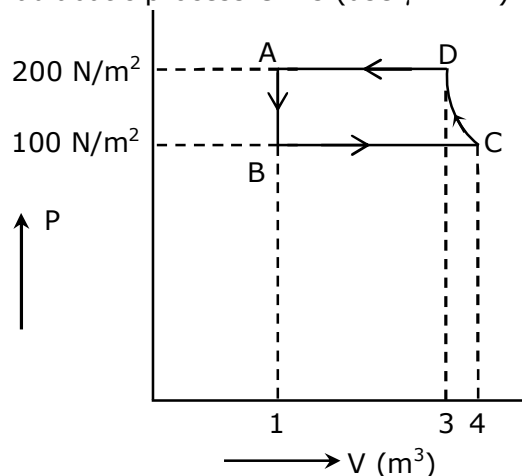
(1) 200 J (2) −500 J (3) − 400 J (4) 400 J

19. **(2)**
work done for adiabatic process is

$$\omega_{CD} = \frac{nR\Delta T}{1-\gamma} = \frac{e_f v_f - p_i v_i}{1-\gamma} = \frac{200 \times 3 - 4 \times 100}{1-1.4}$$

$$\omega_{CD} = \frac{600-400}{-0.4} = \frac{2000}{0.4} = \text{-500 J}$$

$$\omega_{CD} = \text{-500 J}$$

20. The position, velocity and acceleration of a particle moving with a constant acceleration can be represented by:
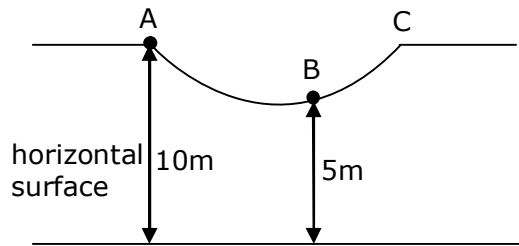
(1)

(2)

(3)

(4)
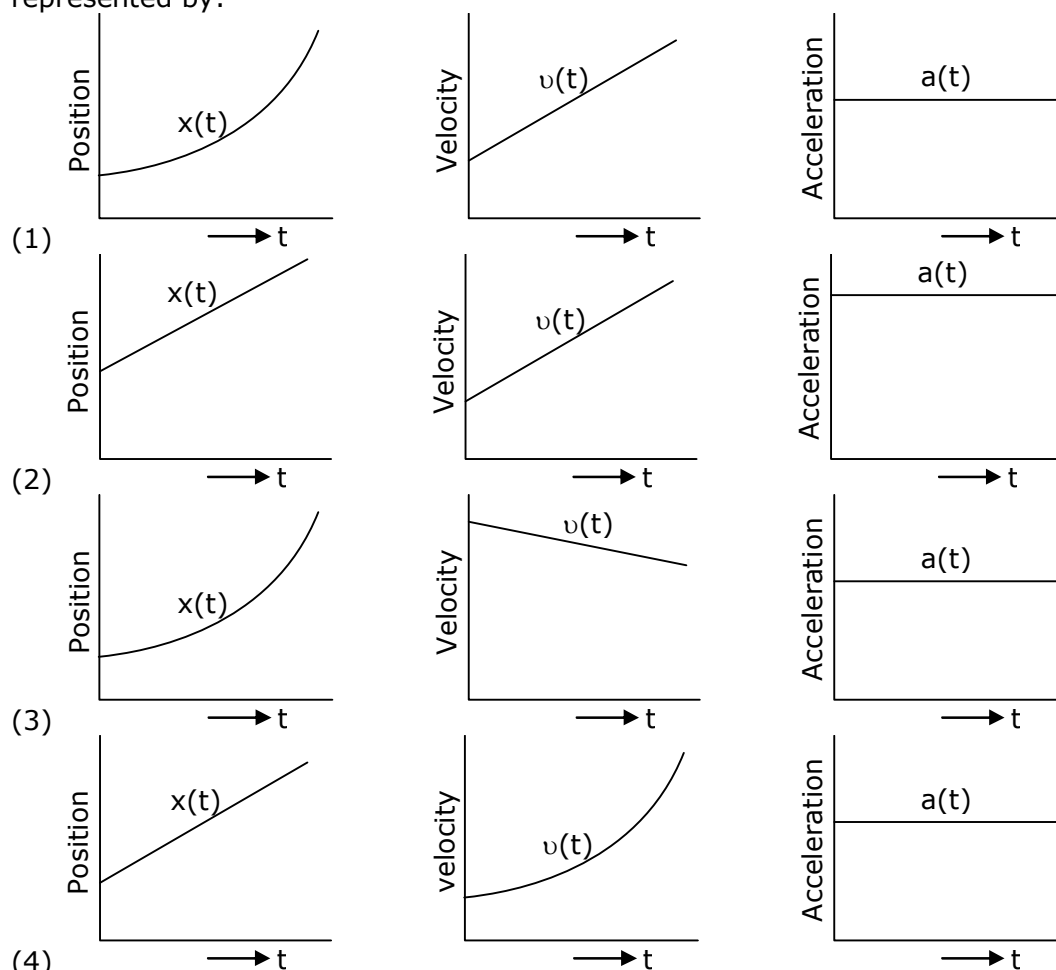
20. **(1)**
Acceleration is constant
a = constant
$v \propto t$ (straight line graph)
$x \propto t^2$ (parabolic graph)

SECTION – B

1. As shown in the figure, a particle of mass 10 kg is placed at a point A. when the particle is slightly displaced to its right, it starts moving and reaches the point B. The speed of the particle at B is x m/s.
    (Take g = 10 m/s^2)
    The value of 'x' to the nearest integer is _____.

1. **10**
    By energy conservation
    $K_i + U_i = K_f + U_f$

    $0 + 10 \times 10 \times 10 = \dfrac{1}{2} \times 10 \times v_B^2 + 10 \times 10 \times 5$

    $1000 = 5v_B^2 + 500$

    $v_B^2 = \dfrac{500}{5} = 100$

    $V_B = 10$ m/s
    x = 10

2. A parallel plate capacitor has plate area 100 m^2 and plate separation of 10 m. The space between the plates is filled up to a thickness 5m with a material of dielectric constant of 10. The resultant capacitance of the system is 'x' pF.
    The value of $\varepsilon_0 = 8.85 \times 10^{-12}$ F.m^{-1}
    The value of 'x' to the nearest integer is _____.

2. **161**
    Area = 100m^2
    Separation (d) = 10m
    Thickness = 5m
    Dielectric constant (K) = 10
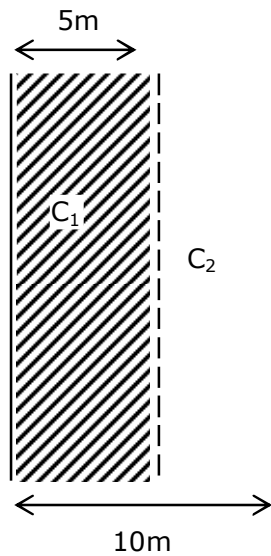
$$c_1 = \frac{KA\varepsilon_0}{d}, \quad c_2 = \frac{K\varepsilon_0}{d}$$

$$c_{eq} = \frac{c_1 c_2}{c_1 + c_2} = \frac{\dfrac{KA\varepsilon_0}{d} \times \dfrac{A\varepsilon_0}{d}}{\dfrac{KA\varepsilon_0}{d} + \dfrac{A\varepsilon_0}{d}}$$

$$c_{eq} = \frac{KA^2\varepsilon_0^2}{d^2} \times \frac{d}{A\varepsilon_0(1+K)}$$

$$c_{eq} = \frac{KA\varepsilon_0}{d(1+K)} = \frac{10 \times 100 \times 8.85 \times 10^{-12}}{5(1+10)}$$

$$c_{eq} = \frac{8.85 \times 10^{-9}}{55} = 0.1609090 \times 10^{-9}$$

$C_{eq} = 160.90 \times 10^{-12}$

$C_{eq.} = 161\ PF$

3. An npn transistor operates as a common emitter amplifier with a power gain of 10^6. The input circuit resistance is 100 Ω and the output load resistance is 10kΩ. The common emitter current gain 'β' will be _____. (Round off to the nearest integer)

3. **100**

Power gain = 10^6

Input resistance = 100Ω

Output load resistance = $10K\Omega$

Power gain = $B^2 \times \dfrac{r_{out}}{R_{in}}$

$10^6 = \beta^2 = \dfrac{10 \times 10^3}{100}$

$B^2 = 10^4$

$B = 100$

4. The voltage across the 10Ω resistor in the given circuit is x volt.

50Ω

10Ω

20Ω

170V
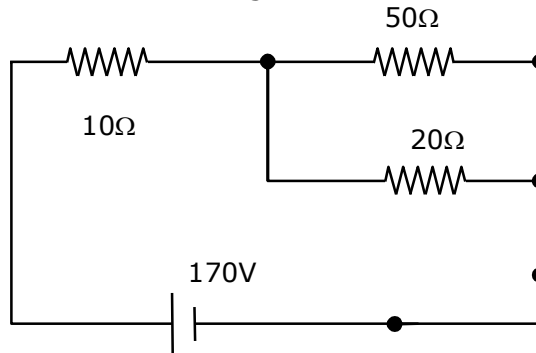
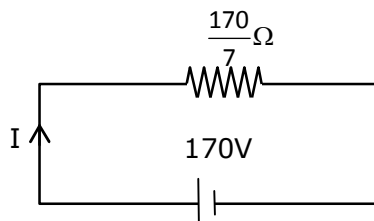The value of 'x' to the nearest integer is_____.

4. **70**

50Ω

10Ω

20Ω

170V
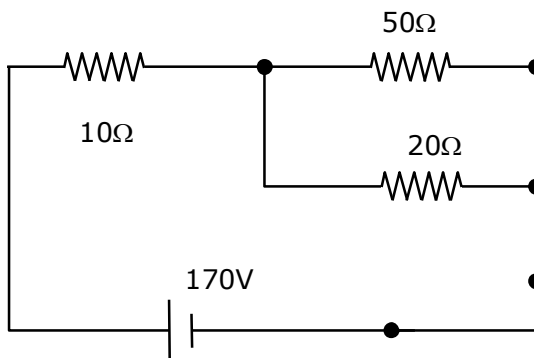
$$R_{eq} = \frac{50 \times 20}{50 + 20}$$

$$R_{eq} = \frac{1000}{70} = \frac{100}{7}\Omega$$
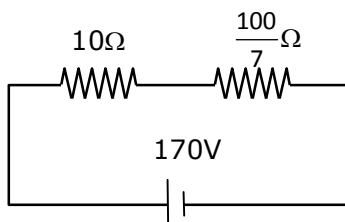
10Ω $\frac{100}{7}\Omega$

170V

$$R_{ef} = 10 + \frac{100}{7} = \frac{170}{7}\Omega$$

$\frac{170}{7}\Omega$

I

170V

$$I = \frac{V}{R} = \frac{170/7}{170} = \frac{170}{170/7}$$

$$I = 7A$$

Potential Across 10Ω resister

$V_{10} = IR = 7 \times 10 = 70V$

$V_{10} = 70V$

5. Two separate wires A and B are stretched by 2 mm and 4mm respectively, when they are subjected to a force of 2 N . Assume that both the wires are made up of same material and the radius of wire B is 4 times that of the radius of wire A. The length of the wires A and B are in the ratio of a:b, Then $\dfrac{a}{b}$ can be expressed as $\dfrac{1}{x}$ where x is .

5. **32**

$\rho_A = \rho_B$

$\gamma_B = 4\gamma_A$

$\Delta l_a = 2mm$

$\Delta l_B = 4mm$

$y = \dfrac{stress}{strain} = \dfrac{F/A}{\Delta l/l}$

$\dfrac{\Delta l}{l} = \dfrac{F}{A4}$

$L = \dfrac{Ay\Delta l}{F}$

$\dfrac{l_a}{l_b} = \dfrac{\pi r_a^2 \times y \times \Delta l_a \times F}{\pi r_b^2 \times y \times \Delta l_b \times F}$

$\dfrac{l_a}{l_b} = \dfrac{r_a^2 \times \Delta l_a}{r_b^2 \times \Delta l_b} = \dfrac{r_a^2 \times 2}{(4r_a)^2 \times 4} = \dfrac{r_a^2}{16r_a^2 \times 2}$

$\dfrac{l_a}{l_b} = \dfrac{1}{32}$

X = 32

6. A bullet of mass 0.1 kg is fired on a wooden block to pierce through it, but it stops after moving a distance of 50 cm into it. If the velocity of bullet before hitting the wood is 10 m/s and it slows down with uniform deceleration, then the magnitude of effective retarding force on the bullet is 'x' N.
The value of 'x' to the nearest integer is

6. **10**

$M_{bullet} = 0.1kg$

Wooden block

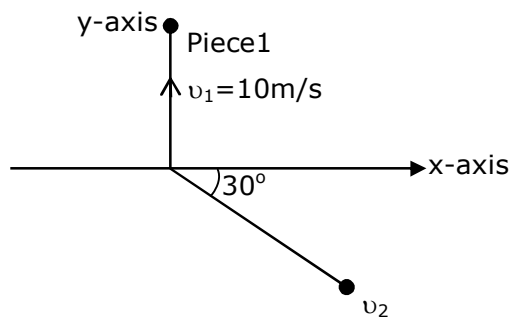

a

10m/s   10m/s   ← V=0

m=0.1kg

50cm
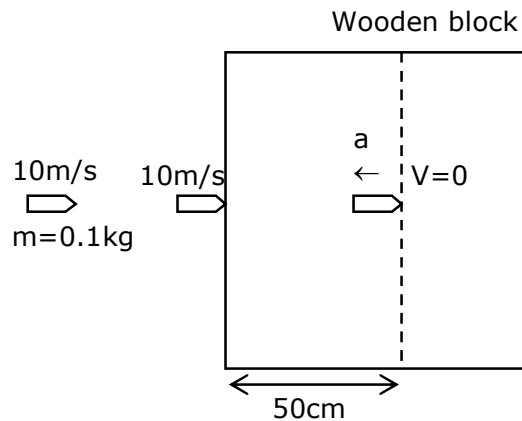
$V^2 = 4^4 + 2(-a) \times 5$

$= (10)^2 - 2a \times (0.5)$

Retardation (a) = $\dfrac{1000}{2 \times 5} = 100 \text{m}/\text{s}^2$
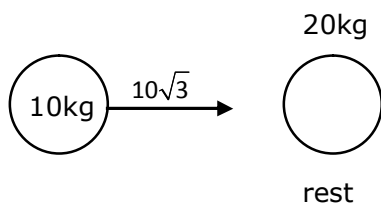
Retarding force (F) = ma = 0.1 × 100

F_R = 10N

7. A ball of mass 10kg moving with a velocity $10\sqrt{3}$ m/s along the x-axis, hits another ball of mass 20kg which is at rest. After the collision, first ball comes to rest while the second ball disintegrates into two equal pieces. One piece starts moving along y-axis with a speed of 10 m/s. The second piece starts moving at an angle of 30° with respect to the x – axis. The velocity of the ball moving at 30° with x-axis is x m/s.

The configuration of pieces after collision is shown in the figure below The value of x to the nearest integer is _____

y-axis   Piece1

υ_1=10m/s

30°   x-axis

υ_2

7.   **20**

Before collision

20kg

10kg $10\sqrt{3}$

rest

In x – direction

$P_i = 0 \times 10\sqrt{3} \quad 20 \times 0$

$P_i = 100\sqrt{3}$ kg m/s

After collision
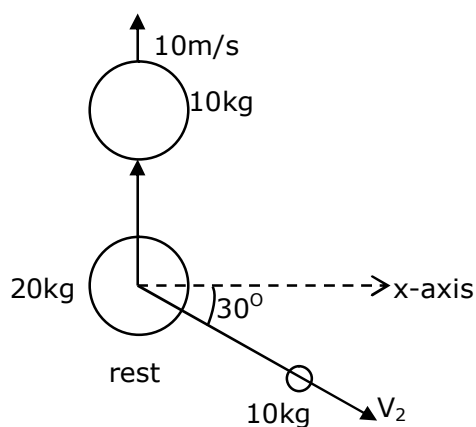
In x – direction

$P_f = 10 \times v_2 \cos 30^o$

In y direction

$P_f = 10 \times 10 - 10\, v_2 \sin 30^o$

$P_f = 100 - 5v_2$

Apply momentum conservation in x-direction

$P_i = p_f$

$100\sqrt{3} = \dfrac{10\sqrt{3}}{2} v_2$
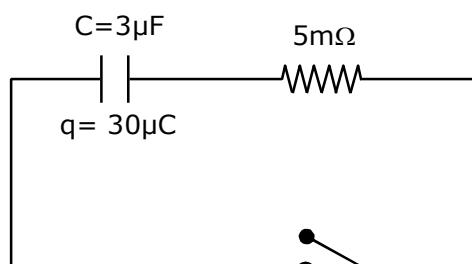
$V_2 = 20$ m/s

Apply momentum conservation in y direction

$P_i = p_f$

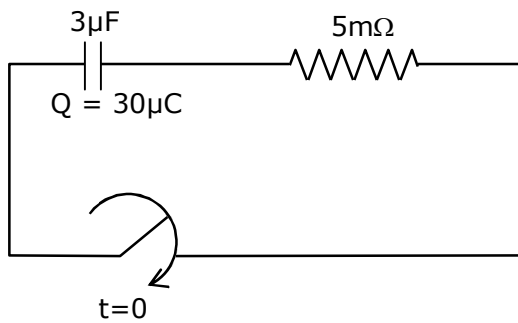$0 = 100 - 5 \times 20$

$= 0$

So, answer is $v_2 = 20$ m/s

8.

The circuit shown in the figure consists of a charged capacitor of capacity 3 µF and a charge of 30 µC. At time t = 0, when the key is closed, the value of current flowing through the 5MΩ resistor is 'x' µA.

The value of 'x' to the nearest integer is _____.

8.   **2**

$I = Qe^{-t/RC}$

$I = \dfrac{Q}{Rc}e^{-t/RC}$
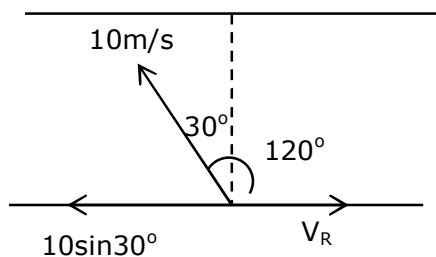
at $t = 0$, $I = \dfrac{Q}{Rc}e^{-O/RC}$

$I = \dfrac{Q}{Rc} = \dfrac{30}{5\times10^6 \times 3} = 2 \times 10^{-6}$

$I = 2\mu A$

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9.   A person is swimming with a speed of 10 m/s at an angle of 120° with the flow and reaches to a point directly opposite on the other side of the river. Then speed of the flow is 'x' m/s.
The value of 'x' to the nearest integer is _____.

9.   **5**

$V_R = 10 \sin 30^0$

$V_R = \dfrac{10}{2} = 5m/s$

$V_R = 5$ m/s

10.   A particle performs simple harmonic motion with a period of 2 second. The time taken by the particle to cover a displacement equal to half of its amplitude from the mean position is $\dfrac{1}{a}$ s.
The value of 'a' to the nearest integer is _____.

10. **6**

Time period (T) = 2 sec.

$X = A \sin(\omega t + \phi)$ ($\phi = 0$ at M.P.)

$X = A \sin \dfrac{2\pi}{T} t$

$\dfrac{2\pi}{2} t = \dfrac{\pi}{6}$

$t = \dfrac{1}{6}$

$a = 6$