PHYSICS

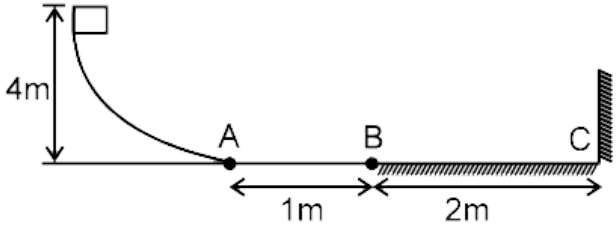
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 29

Physics

1. A block of mass m = 0.1 kg is released from a height of 4 m on a curved smooth surface. On the horizontal surface, path AB is smooth and path BC offers coefficient of friction $\mu = 0.1$. If the impact of block

with the vertical wall at C be perfectely elastic, the total distance covered by the block on the horizontal surface before coming to rest will be (take $g = 10ms^{-2}$) -



A. 29 m

B. 49 m

C. 59 m

D. 109 m

Answer: C

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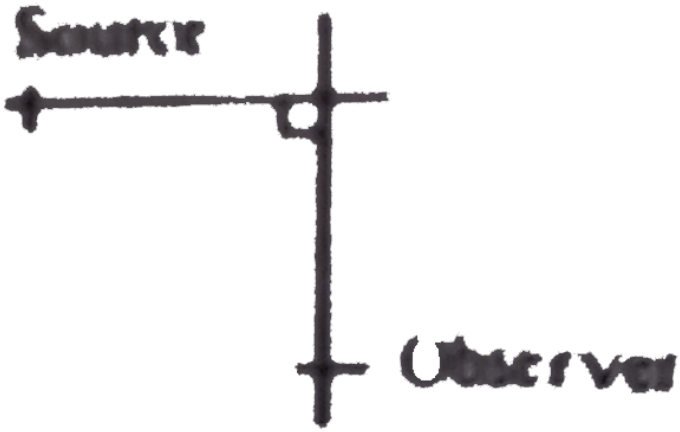
2. A source and an observer are situated on two perpendicular tracks as shown in the figure the observer is at rest and source is moving with a speed $50m/s$ the source emits sound waves of frequency 90Hz which travel in the medium with velocity $200m/s$ the frequency of sound heard by observer when the source crosses the origin is



A. 70 Hz

B. 80 Hz

C. 75 Hz

D. 85 Hz

Answer: B

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3. If speed (V),acceleration (A) and force (F) are considered as fundamental units, the dimesnion of Young 's modulus will be :

A. $\left[V^{-3}Fa\right]$

B. $\left[V^{-4}F^2a^2\right]$

C. $\left[V^{-4}Fa^2\right]$

D. $\left[V^{-4}F^2a\right]$

Answer: C

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4. Two identical calorimeters A and B contain an equal quantity of water at $20^\circ C$. A 5 g piece of metal X of specific heat $0.2\ \text{cal}\,\text{g}^{-1}.^\circ C^{-1}$ is dropped into A and 5 g piece of metal Y is dropped into B. The equilibrium temperature in A is $22^\circ C$ and that in B is $23^\circ C$. The intial temperature of both the metals was

$40^\circ C$. The specific heat of metal Y $\left(\text{in cal g}^{-1}.^\circ C^{-1}\right)$ is

A. $\frac{27}{85}$

B. $\frac{54}{85}$

C. $\frac{81}{85}$

D. 0.4

Answer: A

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5. In a CE transistor amplifier, the audio signal voltage across the collector resistance of $2k\Omega$ is $2V$. If the

base resistance is $1k\Omega$ and the current amplification of the transistor is 100, the input signal voltage is:

A. 10 mV

B. 1 mV

C. 0.1 V

D. 1 V

Answer: A

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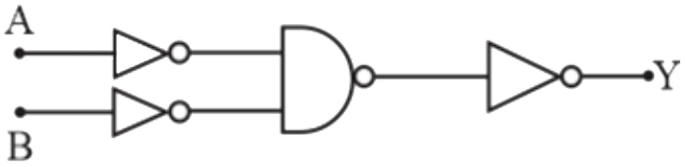
6. The following arrangement performs the logic function of



A. AND

B. OR

C. NAND

D. NOR

Answer: D

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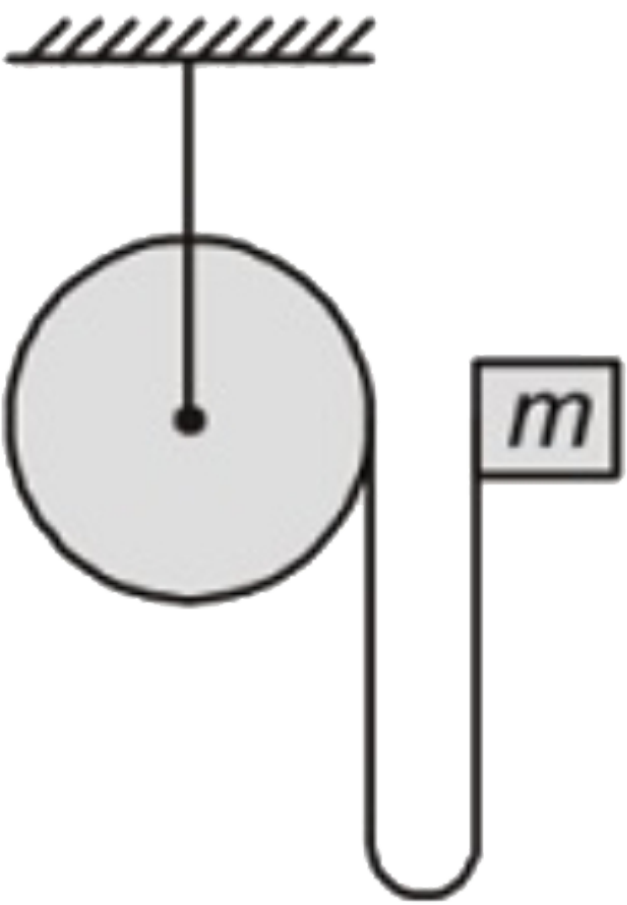
7. A block of mass m is attached to one end of a light string which is wrapped on a disc of mass 2m and radius R. The total length of the slack portion of the string is 1. The block is released from rest. The angular velocity of the disc just after the string becomes taut

is



A. $\sqrt{\frac{gl}{R^3}}$

B. $\sqrt{\frac{gl}{2R^2}}$

C. $\sqrt{\frac{2gl}{3R^2}}$

D. $\sqrt{\frac{3gl}{2R^2}}$

Answer: B

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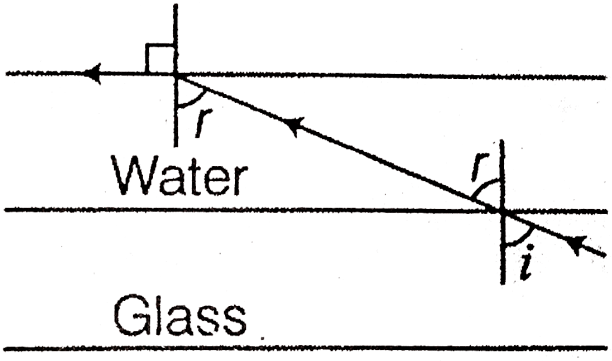
8.



A ray of light is incident at the glass-water interface at

an angle i it emerges finnaly parallel to the surface of water, then the value of μ_g would be

A. $\left(\frac{4}{3}\right)\sin(i)$

B. $\frac{1}{\sin(i)}$

C. $\frac{4}{3}$

D. 1

Answer: B

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9. A hemispherical bowl just floats without sinking in a liquid of density $1.2 \times 10^3 kg/m^3$. If outer diameter

and the density of the bowl are $1m$ and $2 \times 10^4 kg/m^3$ respectively, then the inner diameter of bowl will be

A. 0.88 m

B. 0.78 m

C. 0.98 m

D. 0.68 m

Answer: C

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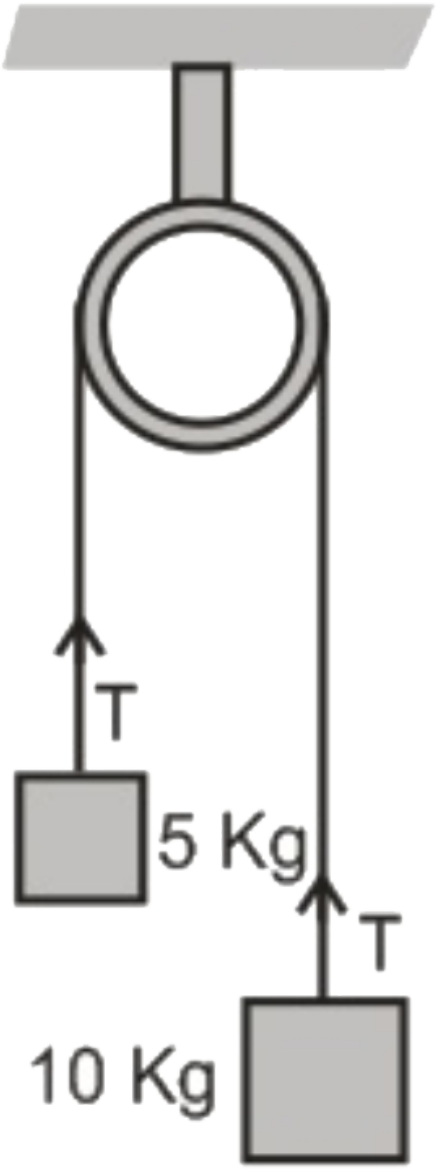
10. Two blocks of masses 5 kg and 10 kg are connected by a metal wire going over a smooth pulley as shown in the figure. The breaking stress of the metal wire is $2 \times 10^9 \mathrm{N\ m}^{-2}$. If $g = 10ms^{-2}$, then what is the

minimum radius of the wire which will not break



A. 0.1 mm

B. 0.2 mm

C. 0.05 mm

D. 0.25 mm

Answer: A

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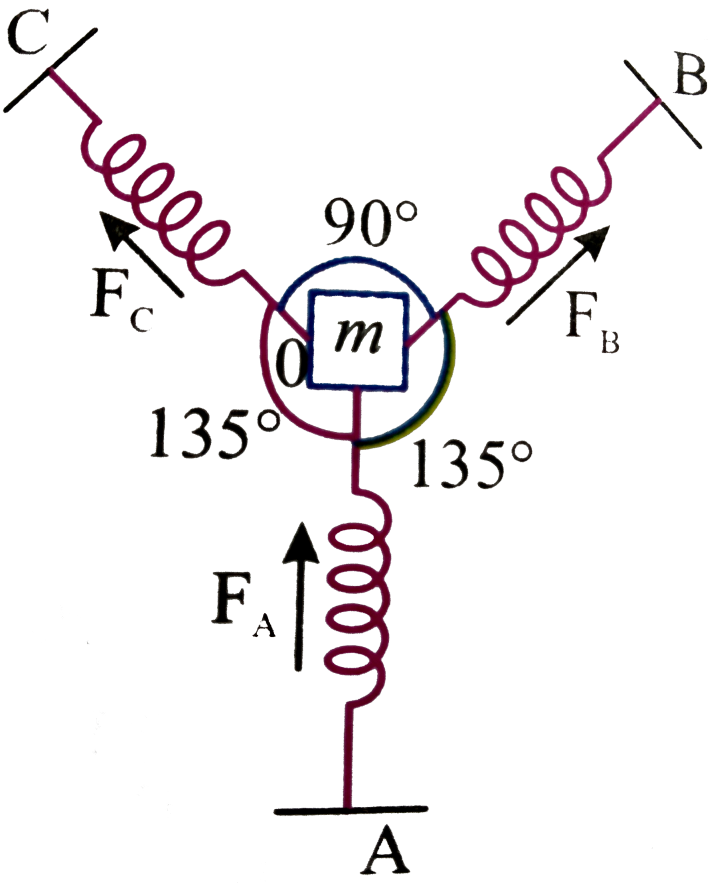
11. A particle of mass 'm' is attached to three identical springs A, B and C each of force constant 'K' as shown in figure. If the particle of mass 'm' is pushed slightly against the spring 'A' and released the period

of oscillations is



A. $2\pi\sqrt{\frac{2m}{k}}$

B. $2\pi\sqrt{\frac{m}{2k}}$

C. $2\pi\sqrt{\frac{m}{k}}$

D. $2\pi\sqrt{\frac{m}{3k}}$

Answer: B

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12. The x and y coordinates of a particle at any time t are given by $x = 7t + 4t^2$ and $y = 5t$, where x and t is seconds. The acceleration of particle at $t = 5$s is

A. zero

B. $8ms^{-2}$

C. $20ms^{-2}$

D. $40ms^{-2}$

Answer: B

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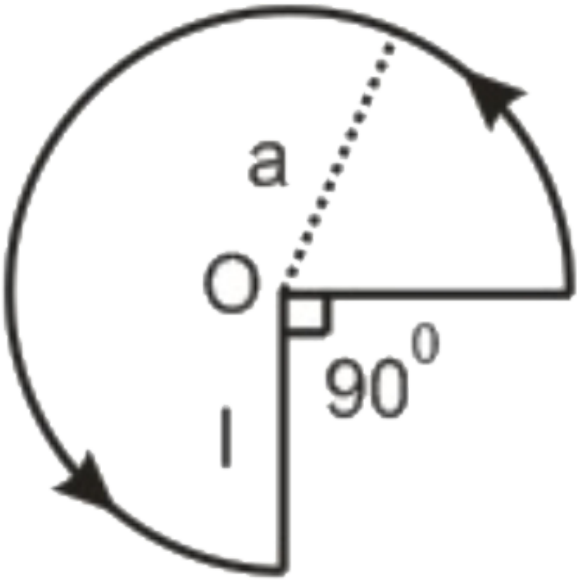
13. The figure shows a current- carrying loop, some part of which is circular and some part is a line

segement. The magnetic induction at the centre is



A. $\frac{3\mu_0}{4a}$

B. $\frac{\mu_0 l}{4\pi a}(1+\pi)$

C. $\frac{\mu_0 l}{8\pi a}$

D. $\frac{3\mu_0 l}{8a}$

Answer: D

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14. The work of 146 kJ is performed in order to compress one kilo mole of a gas adiabatically and in this process the temperature of the gas increases by $7^{\circ}C$. The gas is $\left(R = 8.3ml^{-1}Jmol^{-1}K^{-1}\right)$

A. monoatomic

B. diatomic

C. triatomic

D. a mixture of monoatomic and diatomic

Answer: B

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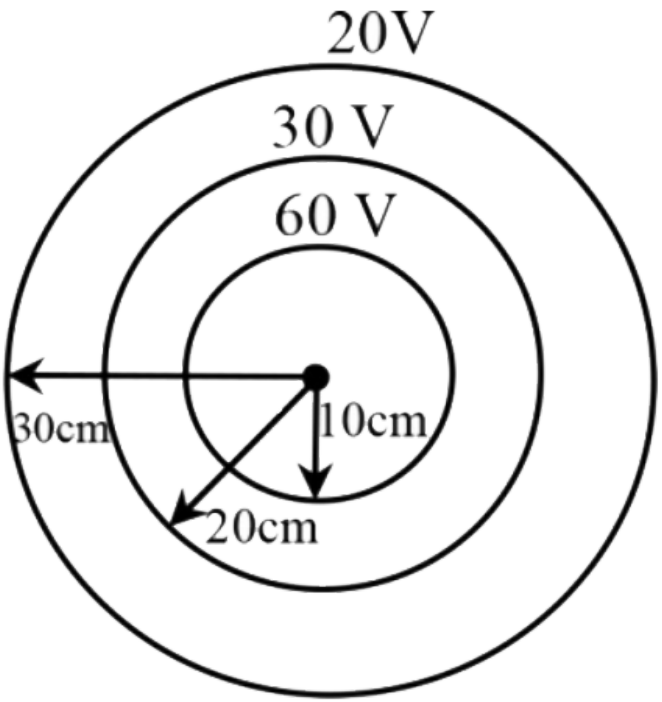
15. A few spherical equipotential surfaces are shown in the figure. The electric field at any point, at a distance

x from the centre, is



A. $\frac{6}{x^2}$ perpendicular to the plane of paper

B. $\frac{600}{x^2}$ perpendicular to the plane of paper

C. $\frac{6}{x^2}$ radially

D. $\frac{600}{x^2}$ radially

Answer: C

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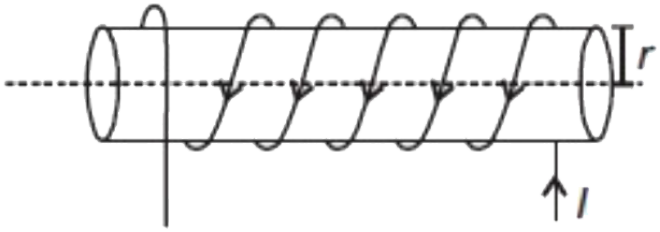
16. The magnetic field within a long, straight solenoid with a circular cross - section of radius r is (as shown) increasing at a rate of α.



The rate of change of flux through a circle with radius a inside the solenoid and with centre on the solenoid axis is

A. $\sqrt{2}\pi a^2\alpha$

B. $\frac{1}{2}\pi a^2\alpha$

C. $\pi a^2\alpha$

D. $\frac{3}{2}\pi\alpha$

Answer: C

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17. n identical cells are joined in series with two cells A and B with reversed polarities. EMF of each cell is E and internal resistance is r. Potential difference across cell A or B is (n gt 4)

A. $\frac{2E}{n}$

B. $2E\left(\frac{1-(1)}{n}\right)$

C. $\frac{4E}{n}$

D. $2E\left(1-\frac{2}{n}\right)$

Answer: D

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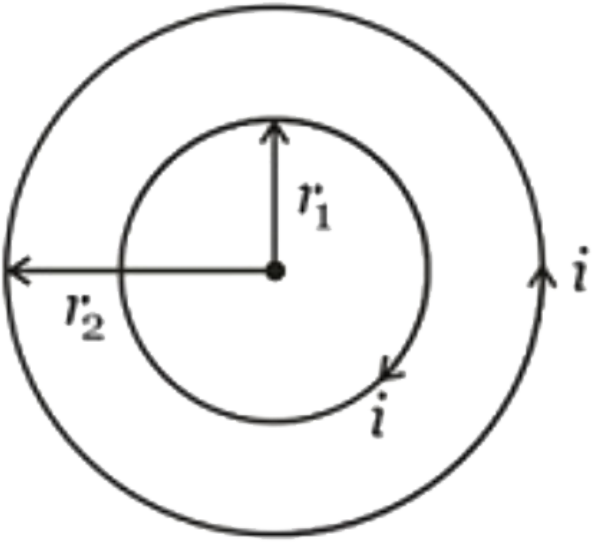
18. Two circular concentric loops of radii $r_1 = 20cm, r_2 = 30cm$ are placed in the $X-Y$ plane as shown in the figure. A current I= 7 A is flowing through them. The magnetic moment of this loop

system is



A. $+0.4\hat{k}\left(Am^2\right)$

B. $-1.5\hat{k}\left(Am^2\right)$

C. $+1.1\hat{k}\left(Am^2\right)$

D. $+1.3\hat{j}\left(Am^2\right)$

Answer: C

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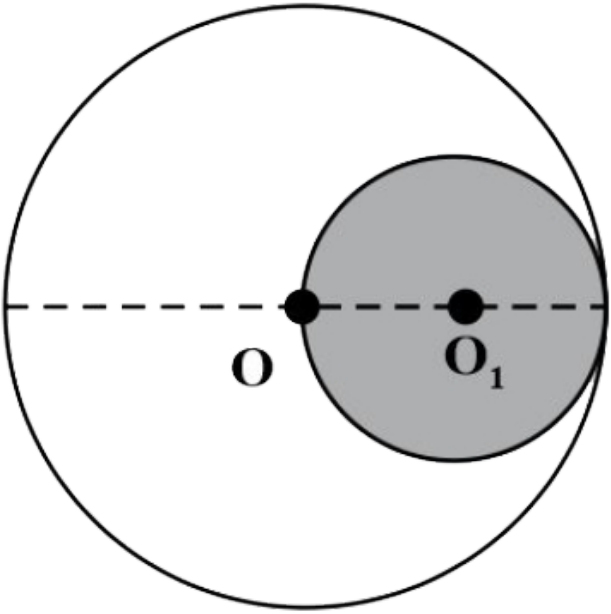
19. A spherical cavity is made in a lead sphere of radius R such that its surface touches the outsides surface of lead sphere and passes through the centre. The shift in the centre of mass of the lead sphere as a result of

this following, is



A. $\frac{R}{7}$

B. $\frac{R}{14}$

C. $\frac{R}{2}$

D. R

Answer: B

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20. Identify the missingf product in the given reaction

$$_{92}{}^{235}U + {}_{0}{}^{1}n \rightarrow \ ? + {}_{36}{}^{92}Kr + 3{}_{0}{}^{1}n$$

A. $._{56}^{141}Ba$

B. $._{56}^{130}Ba$

C. $\_\ (54)^{139}Ba$

D. $._{54}^{141}Ba$

Answer: A

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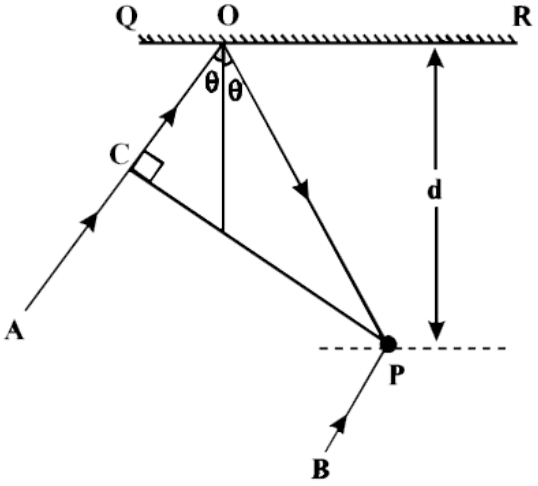
21. In the adjacent diagram, CP represents a wavefront and AO & BP, the corresponding two rays. Find the condition on θ for constructive interference at P between the ray BP and reflected ray OP.



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22. A silver of radius $1cm$ and work function $4.7eV$ is suspended from an insulating thread in freepace. It is under continuous illumination of $200nm$ wavelength light. As photoelectron are emitted the sphere gas charged and acquired a potential . The maximum number of photoelectron emitted from the sphere is $A \times 10^e (where 1 < A < 10)$ The value of z is

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23. An astronaut whose height is 1.50 m floats "feet down" in an orbiting space shuttle at a distance $r = \sqrt[3]{6.67} \times 10^6 m$ away from the centre of Earth.

The gravitational acceleration at her feet and at her head is found to be $N \times 10^{-6} ms^{-2}$. What is the value of N ?

$\left[M_E = 6 \times 10^{24} \text{ kg and } G = 6.67 \times 10^{-11} \text{N m}^2\text{kg}^{-2}\right]$

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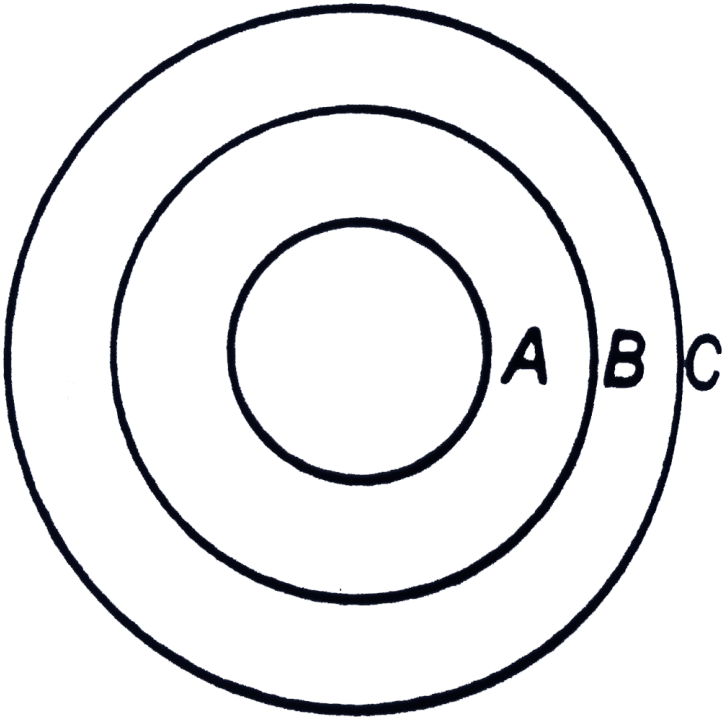
24. Charges $Q, 2Q,$ and $-Q$ are given to three concentric conducting sphereical shells A, B and C respectively as shown in figure. The ratio of charge on

the inner and outer surface of shell C will be



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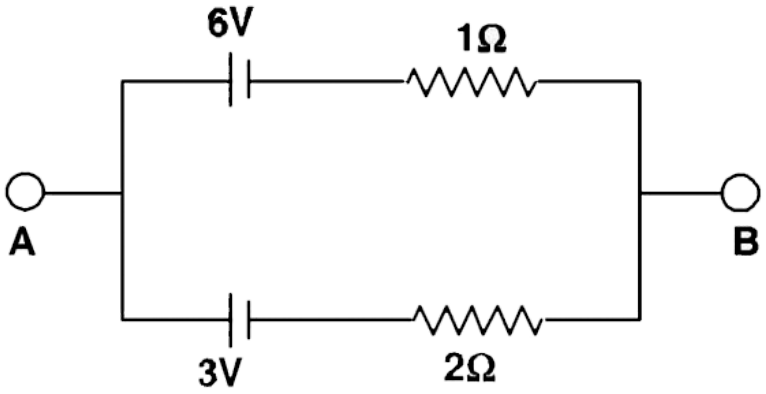
25. Two batteries of different emfs and different internal resistances are connected as shown. The

voltage across AB in volts is.



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