JEE Main 2024 Physics Question Paper April 5 Shift 2

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :90

Physics

1. In the given figure, find out A and B so that output will be 0.

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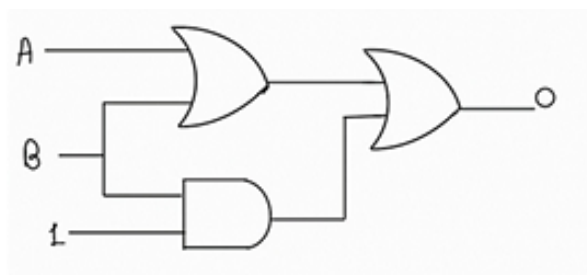
2. In real gas equation $\left[P + \frac{an^2}{v^2}\right][v - nb] = nRT$, find dimensional formula of ab^{-1}.

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3. A man revolving in a circle has completed 120 rev in 3 minutes. Find the centripetal acceleration of the monkey sitting on the shoulder of the man if the radius

of the circle is 9 m. (Constant angular velocity)

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4. A constant power P is delivered to a particle of mass m. If motion starts from rest at $t = 0$, find the distance travelled by the particle as a function of time t.

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5. A particle is projected from horizontal at an angle such that maximum possible range is 64 m. Keeping angle of projection same, if velocity of projection becomes half, then calculate new value of maximum possible range.

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6. A uniform wire having resistance 20Ω is divided into 10 equal parts. Now each part is connected in parallel. Find equivalent resistance of the new combination.

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7. If there is a charge q travelling in an electric field E and magnetic field B with speed v. Find out force due to electric field and magnetic field on the charge.

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8. If λ_{min} of Lyman series is 915 Å, find the λ_{max} of Balmer series.

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9. If 20 division of vernier scale coincide with 19th division of main scale then find out main scale division (given 0.1 mm is the least count of vernier callipers).

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10. In a series RL circuit having resistance 14Ω and an inductance of 10mH, applied source voltage is 220 V having frequency 50Hz. Find RMS value of current in the circuit.

L = 10mH   R = 14 Ω

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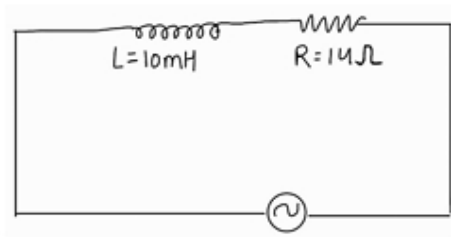
11. Which of the following is incorrect -

(1) Stopping potential depends on frequency of incident light
(2) Stopping potential increases by increasing intensity
(3) Stopping potential depends on nature of material
(4) Stopping potential is equal to $\frac{K.E}{e}$

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12. Current flowing in a coil depends on time t given by $i = 3t + 2$, where t is in sec. If induced emf in the coil is 12mV, then find self inductance (in mH) of the coil.

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13. A geostationary satellite with time period of 6 hrs, orbiting around a planet of mass m_e (where m_e is the mass of the earth). If R_e is the radius of earth, then find the radius of orbit.

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14. It is given that $P \propto T^3$, then find the value of $\frac{C_p}{C_v}$ (process is adiabatic).

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15. A hollow sphere is performing pure rolling on the ground, find the ratio of rotational kinetic energy and total kinetic energy.

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16. If the small diameter of piston is $d_1 = 1.4\,\text{cm}$ and the larger diameter of piston is $d_2 = 14\,\text{cm}$. If force of 10N is applied on small piston, then find out F_2 required

to maintain the same level.

$F_2 = ?$ 10N
14cm   1.4cm
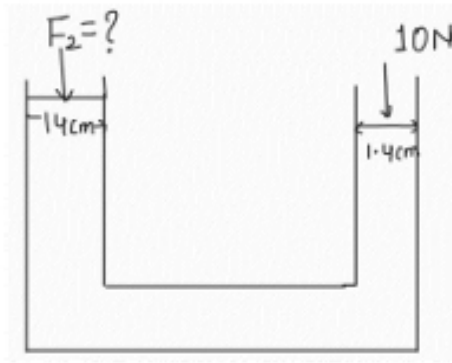
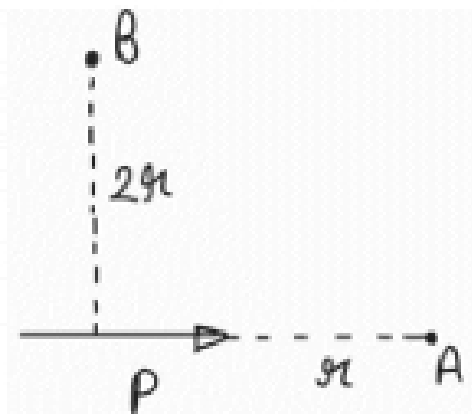**17. A block having mass 50 kg moving with velocity v, if the coefficient of kinetic friction is 0.3, then find the force due to kinetic friction (take $g = 9.8\,\text{m/s}^2$).**
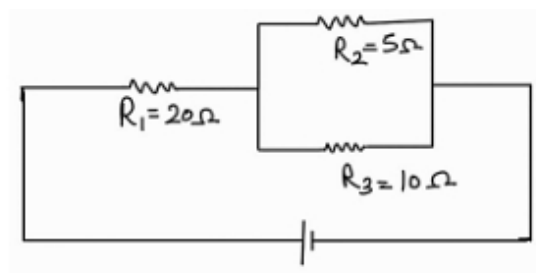

50 kg → v

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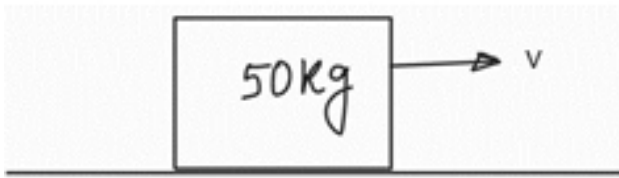
18. Find the ratio of electric field at points A and B, produced by an electric dipole.

B
2r
P   r   A

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19. Match the column of order of wavelength of infrared, γ-rays, X-rays, and UV rays.

List-I	List-II
(a) Infrared	(i) Less than 10^{-3} nm
(b) γ-rays	(ii) 10^{-3} to 1 nm
(c) X-rays	(iii) 1 to 300 nm
(d) UV-rays	(iv) 300 to 600 nm

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20. The ratio of heat dissipated per second through $5\,\Omega$ and $10\,\Omega$ will be –

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21. Why metal chain hangs at the rear part of tankers containing inflammable liquid.

(1) To make it look fancy
(2) To inform other vehicles about tanker
(3) So that extra electrons can be transferred to earth.
(4) To protect the Tyre from damage.

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22. A Force acts on a body such that momentum $\vec{p} = \cos(kt)\hat{i} - \sin(kt)\hat{j}$. Find the angle between $\vec{p}$ and $\vec{F}$.

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23. A sonometer wire of length 90cm, whose fundamental frequency is 400Hz. Wire has the same tension and now, fundamental frequency changed to 600Hz. Find the new length of the wire.

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24. A galvanometer having resistance $100\,\Omega$ is connected in series with $400\,\Omega$ resistance and measures a maximum of 10V, and now the galvanometer is converted

into an ammeter. What should be the value of the shunt resistance so that it can measure a maximum current of 10A?

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25. Find the expression for the mean free path of a gas molecule of number density n and diameter d of the molecule.