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## PHYSICS

## NTA MOCK TESTS ENGLISH

## NTA JEE MOCK TEST 55

Physics

1. The speed $v$ of ripples on the surface of
water depends on surface tension $\sigma$, density $\rho$
and wavelength $\lambda$. The square of speed $v$ is proportional to
A. $\sqrt{\frac{\gamma a}{\rho}}$
B. $\sqrt{\frac{\gamma}{\rho \lambda}}$
C. $\left(\frac{\gamma}{\rho \lambda}\right)^{\frac{1}{3}}$
D. $\frac{\gamma}{\rho \lambda}$

Answer: B

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2. In a biprism experiment, the fifth dark fringe
is formed opposite to one of the slits. What is
the wavelength of light?

$$
\begin{aligned}
& \text { A. (a) } \frac{d^{2}}{6 D} \\
& \text { B. (b) } \frac{d^{2}}{5 D} \\
& \text { C. (c) } \frac{d^{2}}{15 D} \\
& \text { D. (d) } \frac{d^{2}}{9 D}
\end{aligned}
$$

Answer: D

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3. The apparent coefficients of volume expansion of a liquid when heated filled in
vessel $A$ and $B$ of identical volumes, are found to be $\gamma_{1}$ and $\gamma_{2}$ respectively. If $\alpha_{1}$ be the coefficient of liner expansion for A , then what will be the be the coefficient of linear expansion for B? (True expansion - vessel expansion = app.exp)

$$
\text { A. } \frac{\left(\gamma_{1}-\gamma_{2}\right)}{3}-\alpha_{1}
$$

$$
\text { B. } \frac{\left(\gamma_{2}-\gamma_{1}\right)}{3}+\alpha_{1}
$$

$$
\text { C. } \frac{\left(\gamma_{2}-\gamma_{1}\right)}{3}-\alpha_{1}
$$

$$
\text { D. } \frac{\left(\gamma_{1}-\gamma_{2}\right)}{3}+\alpha_{1}
$$

## Answer: B

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4. The gravitational potential of two homogeneous spherical shells $A$ and $B$ (separated by large distance ) of same surface mass density at their respective centers are in
the ratio 3:4. If the two shells coalesce into
single one such that surface mass density
remains same, then the ratio of potential at an internal point of the new shell A is equal to
A. $3: 2$
B. $4: 3$
C. $5: 3$
D. $5: 6$

Answer: C
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5. A point move with uniform acceleration and
$v_{1}, v_{2}$ and $v_{3}$ denote the average velocities in the three successive intervals of time $t_{1}, t_{2}$ and $t_{3}$. which of the following relations is correct ?

$$
\begin{aligned}
& \text { A. } \frac{v_{1}-v_{2}}{v_{2}-v_{3}}=\frac{t_{1}-t_{2}}{t_{2}+t_{3}} \\
& \text { B. } \frac{v_{1}-v_{2}}{v_{2}-v_{3}}=\frac{t_{1}-t_{2}}{t_{1}-t_{3}} \\
& \text { C. } \frac{v_{1}-v_{2}}{v_{2}-v_{3}}=\frac{t_{1}-t_{2}}{t_{2}-t_{3}} \\
& \text { D. } \frac{v_{1}-v_{2}}{v_{2}-v_{3}}=\frac{t_{1}+t_{2}}{t_{2}+t_{3}}
\end{aligned}
$$

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6. A small ring of mass $m$ is constrained to
slide along a horizontal wire fixed between
two rigid supports. The ring is connected to a particle of same mass by an ideal string \& the whole system is released from rest as shown in the figure. If the coefficient of friction between ring $A$ and wire is $\frac{3}{5}$, the ring will start sliding when the connecting string will make an angle $\theta$ with the vertical, then $\theta$ will be (particle is free to move and ring can slide

## only)


A. $30^{\circ}$
B. $45^{\circ}$
C. $60^{\circ}$
D. None of these

Answer: B

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## 7. Suppose the earth was covered by an oceam

 of uniform depth $h,(h \ll R)$ Let $\sigma$ be densityof ocean and $p$ be mean density of earth. Let $\Delta g$ be the approxemate difference of value of net acceleration duet to gravity between the bottom of the ocean and top$\left(\Delta g=g_{\mathrm{top}}-g_{\mathrm{bottom}}\right)$. Choose the correct option.

$$
\begin{aligned}
& \text { A. } \Delta g=\frac{4}{3} \pi G h[2 \rho-3 \sigma] \\
& \text { B. } \Delta g=\frac{4}{3} G \pi h[3 \sigma-2 \rho] \\
& \text { C. } \Delta g=\frac{4}{3} G \pi h[2 \sigma-3 \rho]
\end{aligned}
$$

$$
\text { D. } \Delta g=\frac{4}{3} G \pi h[3 \rho-3 \sigma]
$$

## Answer: B

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8. Two uniform wires of a the same material are vibrating under the same tension. If the
first overtone of the first wire is equal to the second overtone of the second wire and radius of the first wire is twice the radius of
the second wire, then the ratio of the lengths
of the first wire to second wire is

> A. $\frac{1}{3}$
> B. $\frac{1}{4}$
> C. $\frac{1}{5}$
> D. $\frac{1}{6}$

Answer: A

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9. An inductor coil, a capacitor and an AC source of rms voltage 24 V are connected in
series. When the frequency of the sources is
varied, a maximum rms current of 6 A is
observed. If this inductor coil is connected to a
battery of emf 12 V and internal resistance
$4.0 \Omega$. what will be the current?

$$
\begin{aligned}
& \text { A. } \frac{150}{17} A \\
& \text { B. } 2.5 A \\
& \text { C. } \frac{125}{33} A
\end{aligned}
$$

D. $\frac{125}{99} A$

## Answer: A

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10. A conducting loop (as shown) has total
resistance R. A uniform magnetic field $B=\gamma t$
is applied perpendicular to plane of the loop
where $\gamma$ is a constant and t is time. The
induced current flowing through loop is

A. (a) $\frac{\left(b^{2}+a^{2}\right) \gamma t}{R}$
B. (b) $\frac{\left(b^{2}-a^{2}\right) \gamma}{R}$
C. (c) $\frac{\left(b^{2}-a^{2}\right) \gamma t}{R}$
D. (d) $\frac{\left(b^{2}+a^{2}\right) \gamma}{R}$

Answer: B

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11. Two identical capacitors $C_{1}$ and $C_{2}$ of capacitance $10 \mu F$ are connected in series to a cell of emf 12 V . Capacitor $C_{2}$ is filled with dielectric of dielectric constant $\varepsilon_{r}=4$. The energy stored in capacitor $C_{2}$ is
A. $\frac{K V}{(K+1)}$
B. $\frac{V}{K+1}$
c. $\frac{(K-1) V}{K}$
D. $\frac{V}{K(K+1)}$

Answer: A

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12. The ratio of minimum wavelengths of

Lyman and Balmer series will be

A. 1.25
B. 0.25
C. 5
D. 10

Answer: B

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13. When ${ }_{90} T h^{228}$ gets converted into ${ }_{83} B i^{212}$,
then the number of $\alpha-$ and $\beta-$ particles
emitted will respectively be
A. $8 \alpha, 7 \beta$
B. $4 \alpha, 7 \beta$
C. $4 \alpha, 4 \beta$
D. $4 \alpha, 1 \beta$

## Answer: D

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14. Two particles are executing simple harmonic of the same amplitude (A) and frequency $\omega$ along the x-axis. Their mean position is separated by distance 'Xo. (Xo>A). If
the maximum separation between them is (Xo+A), the phase difference between their motion is:

$$
\begin{aligned}
& \text { A. } \frac{2 \pi}{3} \\
& \text { B. } \frac{\pi}{4} \\
& \text { C. } \frac{\pi}{6} \\
& \text { D. } \frac{\pi}{2}
\end{aligned}
$$

Answer: A

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15. An electron of mass $m$ has de Broglie wavelength $\lambda$ when accelerated through a potential difference $V$. When a proton of mass
$M$ is accelerated through a potential difference 9 V , the de Broglie wavelength associated with it will be (Assume that wavelength is determined at low voltage ).
A. $\frac{\lambda}{3} \sqrt{\frac{M}{m}}$
B. $\frac{\lambda}{3} \cdot \frac{M}{m}$
C. $\frac{\lambda}{3} \sqrt{\frac{m}{M}}$
D. $\frac{\lambda}{3} \cdot \frac{m}{M}$

## Answer: C

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16. The minimum force required to move a
body up an inclined plane is three times the minimum force required to prevent it from
sliding down the plane. If the coefficient of friction between the body and the inclined plane is $\frac{1}{2 \sqrt{3}}$, then the angle of the inclined plane is
A. $60^{\circ}$
B. $45^{\circ}$
C. $30^{\circ}$
D. $15^{\circ}$

## Answer: C

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17. For a concrete sphere of radius $R$ having a cavity of radius $r$ packed with sawdust, to float with its entire volume submerged under water
what will be the ratio of mass of concrete to mass of sawdust ? Given the specific gravities of concrete and sawdust are respectively 2.4 and 0.3.
A. 2
B. 3
C. 4
D. 6

## Answer: C

18. The pressure applied from all direction on a cube is P . How much its temperature should be raised to maintain the original volume ? The volume elasticity of the cube is $\beta$ and the coefficient of volume expansion is $\alpha$
A. $\frac{p}{\alpha \beta}$
B. $\frac{p \alpha}{\beta}$
C. $\frac{p \beta}{\alpha}$
D. $\frac{\alpha \beta}{p}$

## Answer: A

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19. Particle of masses $m, 2 m, 3 m, \ldots, n m$ grams are placed on the same line at distance $l, 2 l, 3 l, \ldots ., n l c m$ from a fixed point. The distance of centre of mass of the particles from the fixed point in centimeters is :
A. $\frac{(2 n+1) L}{4}$
B. $\frac{L}{(2 n+1)}$

> C. $\frac{n\left(n^{2}+1\right) L}{2}$
> D. $\frac{(2 n+1) L}{3}$

## Answer: D

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20. In the following common emitter configuration NPN transistor with current gain
$\beta=100$ is used. The output voltage of the
amplifier will be

A. 10 mV
B. 0.1 mV
C. 1.0 V
D. 10 V

Answer: C

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21. In balanced meter bridge, the resistance of bridge wire is $0.1 \Omega \mathrm{~cm}$. Unknown resistance X
is connected in left gap and $6 \Omega$ in right gap, null point divides the wire in the ratio $2: 3$.

Find the current drawn the battery of 5 V having negligible resistance

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22. Given that, velocity of light in quartz
$=1.5 \times 10^{8} \mathrm{~m} / \mathrm{s}$ and velocity of light in
glycerine $=\left(9 / 4 \times 10^{8} \mathrm{~m} / \mathrm{s}\right.$. Now a slab
made of quartz is placed in glycerine as
shown. The shift of the object produced by
slab is

23. $A \operatorname{rod} A B$ is 1 m long. The temperature of its one end A is maintained at $100^{\circ} \mathrm{C}$ and other end B at $10^{\circ} \mathrm{C}$, the temperature at a distance of 60 cm from point $B$ is

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24. A boy throws a ball at an angle $\theta$ with the vertical. If the vertical component of the initial
velocity is $20 \mathrm{~ms}^{-1}$ and the wind imparts a horizontal acceleration of $8 m s^{-2}$ to the left,
the angle at which the ball must be thrown so that the ball returns to the boy's hand is $\theta$. What is the value of $10(\tan \theta)$

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25. One mole of monatomic ideal gas
undergoes an adiabatic expansion in which its
volume becomes eight times it initial value. If
the initial temperature of the gas is 100 K and
the universal gas constant $8.0 \mathrm{Jmol}^{-1} \mathrm{~K}^{-1}$, the decrease in its internal energy, in Joule, is
