



PHYSICS

BOOKS - CHHAYA PHYSICS (BENGALI ENGLISH)

WBCHSE QUESTION PAPER -2019

Section I

1. IF the error in the measurement of mass and speed of a particle are



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2. IF the error in the measurement of mass and speed of a particle are 0.1% and 0.2% respectively then the error in the determination of kinetic energy of the particle will be

A. 0.3 %

B. 0.4 %

C. 0.5 %

D. 0.6 %

Answer:



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3. A car travels a distance x km with a speed 36 km / h and another x km with 45 km / h . The average speed of the car is

A. 40.5 km / h

B. 40 km / h

C. $42\text{km} / \text{h}$

D. dependent on x

Answer:



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4. In case of a projectile, speed of the particle at the top most position is half of its initial speed. The angle of projection with horizontal plane is

A. 30°

B. 45°

C. 60°

D. $\tan^{-1}\left(\frac{1}{2}\right)$

Answer:



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5. T_1 , T_2 and T_3 are tensions in the three strings. Then $T_1 : T_2$ is

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A. $\sqrt{3}:2$

B. $\sqrt{3}:1$

C. $2:1$

D. $1:2$

Answer:



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6. IF mass speed and linear momentum of a particle are m , v and p respectively . Then kinetic energy of the particle is

A. $\frac{p^2}{2m}$

B. $\frac{pv}{2m}$

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

D. $\frac{p^2}{2v}$

Answer:



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7. A particle tied to a string of length l is describing a vertical circle its speed at the bottommost point is $\sqrt{7gl}$. Then its speed at the topmost point will be

A. \sqrt{gl}

B. $\sqrt{2gl}$

C. $\sqrt{3gl}$

D. $\sqrt{5gl}$

Answer:



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8. The acceleration due to gravity at a height R (radius of the earth) from the earth' s surface is

A. $\frac{g}{2}$

B. $\frac{g}{3}$

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

D. $\frac{g}{16}$

Answer:



9. A spring of spring constant K is cut into two identical pieces . Then spring constant of each piece will be

A. K

B. $2K$

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

D. K^2

Answer:



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10. A cylinder contains a liquid upto a height 2.5 m . If now a small hole is made at bottom . Liquid comes out with a velocity

A. $5m / s$

B. $6m / s$

C. $7m / s$

D. $2m / s$

Answer:



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11. The wavelength of radiation of maximum intensity is λ when the temperature of a body is 2000 K . If now temperature is raised to 4000K. the wavelength of radiation of maximum intensity will be

A. λ

B. 2λ

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

D. 4λ

Answer:



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12. A carnot engine absorbs 40 cal heat from source having temperature 320 K and rejects 30 cal heat to sink . The temperature of the is

A. $200K$

B. $270K$

C. $240K$

D. $300K$

Answer:



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13. The equation of an *SHM* is $x=8 \sin \omega t + 15 \cos \omega t$, where x is displacement and t is time . The amplitude will be

A. 23

B. 7

C. 10

D. 17

Answer:



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14. The equation of a progressive wave in a medium is $y = a \sin\left(100\pi t + \frac{\pi}{10}x\right)$, where x is in metre and t is in second . The velocity of wave in the medium is

A. $1Km / s$

B. $5km / s$

C. $100m / s$

D. $50m / s$

Answer:



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Section Ii Group A

1. If $a = 10.5$ and $b = 2.01$, considering significant digits write the value of $a + b$.



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2. Can we derive $v = u + at$, using dimensional analysis?



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3. Write the value of $(5\hat{i} + 3\hat{j}) \cdot (5\hat{i} - 3\hat{j})$



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4. Relative density of kerosence is 0.8 . Write the density of kerosence in SI unit



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5. Write the dimensions of surface tension .



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6. If wavelength of a stationary wave is λ then write the distance between two consecutive antinodes .



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Section II Group B

1. A particle moves with uniform acceleration and the distance travelled in t - th second is

$s_t = 3 + 2t$. Find the initial velocity of the particle .



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2. IF $\hat{a} + \hat{b} = \hat{c}$ [$\hat{a}, \hat{b}, \hat{c}$ are unit vectors] find the angle between \hat{a} and \hat{b} .



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3. A block of mass 2 Kg is placed on a horizontal road . Coefficient of friction

between the block and the road is 0.2 if 6 N force acts on the block horizontally find the distance travelled by the in first second .

$$[\text{Take } g = 10 \text{ m} \cdot \text{s}^{-2}]$$



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4. A block of mass 2 Kg is placed on a smooth inclined plane of inclination 30° with the horizontal plane . Find (i) acceleration of the block and (ii) normal reaction supplied by the inclined plane on the block .



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5.

Write two properties of an ideal fluid .



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6. What is incompressible fluid ? What is critical velocity



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7. Prove that $pV^\gamma = \text{constant}$ in adiabatic process .



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8. What is stationary wave ? In stationary wave , what is the phase difference wave ? In stationary wave , what is the phase different between two particles of two consecutive loops ?



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Section II Group C

1. What are the advantages of friction ?



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2. What is angle of repose



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3. What is cone of friction





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4. static frictional force is self - controlled .

Explain it .



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5. On a horizontal surface . 2 kg block is placed eastward and 4 Kg blocks are now connected with a horizontal string . If 12N horizontal force is applied on 4 Kg block along west

direction , find (i) common acceleration of two blocks (ii) tension in the string



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6. A bomb of mass 8 Kg explodes on a smooth horizontal surface , into three fragments of masses 1 Kg , 3 Kg and 4Kg . 4Kg fragment moves with a speed 1 m/ s along eastward and 3 Kg fragment moves with a speed 1 m/s along northward . find the magnitude and direction of the velocity of 1Kg fragment .



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7. the bob of simple pendulum is released when string makes an angle θ with the vertical . If m be the mass of the bob then find the tension when the bob is at the bottommost position .



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8. Three particles of masses 2 Kg and 4Kg are placed at $(2,0)$, $(0,3)$ and $(-1,2)$ respectively

find the co-ordinates of centre of mass of these three point masses .



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9. For the mountain Himalayas , between centre of mass and centre of gravity which one remains below and why ?



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10. A light metre scale is placed horizontally on two supports at 10 cm mark and 80 cm mark .
If 70 g mass is hanged from 50 cm mark , find force supplied by the support at 10 cm mark , on the scale .



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11. A ring rolls on horizontal without slipping .
Prove that its translational kinetic energy is equal to rotational kinetic energy .





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12. A disc of mass 2 Kg and radius 1 m rotates about its own axis with an angular speed 60 rpm. Find its kinetic energy and angular momentum .



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13. If g is the acceleration due to gravity on the earth's surface , then at a depth x

acceleration due to gravity will be $g\left(1 - \frac{x}{R}\right)$

- prove it . [R is the radius of the earth]



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14. what is the value of acceleration due to gravity at the centre of the earth ?



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15. State Kepler's third law of planetary motion and prove it considering circular orbits of

planets .



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16. Prove is the rate of change of angular momentum of the earth about the sun ?



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17. When 1g H_2 is mixed with 1 g He than find

(1) $\gamma \left(= \frac{C_p}{C_v} \right)$ of the mixture

(ii) c_p (molar specific heat at constant pressure) of the gas mixture



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18. A gas changes its state from (p_0, V_0) to $(2p_0, 3V_0)$ in such a way that $p \sim V$ graph is a straight line . Find the work done .



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19. Is work a thermodynamic variable ?



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20. A diatomic gas expands adiabatically and final volume is 32 times of its volume . If initial temperature of the gas is 127°C , find the final temperature .



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21. In adiabatic expansion , what is the source of energy to do the work ?



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Section II Group D

1. Equations of trajectory of a projectile are $x=4t$, $y = 3t - 5t^2$, where x and y are in metre and t is in second. Find (i) maximum height attained by the projectile, (ii) horizontal range of the projectile.



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2. write the unit of rate of change of acceleration with respect to time .



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3. On a straight road a policeman in a jeep chases a thief with a speed v . When the thief is a distance d from the police - jeep , the thief escapes with a bike with a constant acceleration a . The police can catch the thief if

$v^2 \geq 2ad$ – prove it .





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4. A particle is released from a height 20 m from the ground . After how much time and with what speed the particle hits time and with what speed the particle hits the ground ?

[Take : $g = 10m \cdot s^{-2}$]



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5. A piece of stone weight 18 g in water . 20 n in gerosence (relative density of kerosence

$= 0.8$) . Find (i) mass of stone - piece , (ii) volume of stone - piece and (iii) density of stone - piece .

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6. α , β and γ are coefficients of thermal expansion in length , area and volume , prove

that $a = \frac{\beta}{2} = \frac{\gamma}{3}$.

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7. When 99.8cm^3 water at 4°C changes its temperature to 0°C , its volume becomes 100cm^3 . Calculate average value of coefficient of volume expansion of water in the range 0°C to 4°C .



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8. A Particle of mass 2Kg executes k an SHM where displacement x (in metre) and time t (in second) are related as $x = 2 \sin \pi t$, find

(I) Frequency ,

(ii) velocity at $t = \frac{1}{4}$ second and

(iii) kinetic energy at $t = \frac{1}{2}$ second



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9. Velocity of sound in air at $0^{\circ}C$ is 330 m/s .

What will be the velocity of sound in air at $10^{\circ}C$

?



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10. A uniform wire of length 1 m has mass 1 g .

Under the tension 40 N . Find the velocity of sound wave (transverse) in the wire .



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