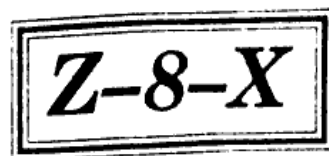


Roll No.



Total No. of Questions : 22]

[Total No. of Printed Pages : 8

11th ARM(SZ)JKUT2024

1208-X

PHYSICS

Time : 3 Hours]

[Maximum Marks : 70

Section-A

(Objective Type Questions)

1 each

1. (i) The number of significant numbers in 23.023 is :

(A) 2

(B) 3

(C) 4

☒ (D) 5

(ii) Planck's constant has same dimensions as that of :

(A) Energy

(B) Momentum

(C) Frequency

☒ (D) Angular momentum

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Turn Over

Z-8-X

(iii) A force F is given by $F = at + bt^2$, where (t) is time. What are dimensions of a and b ?

(A) MLT^{-3} and ML^2T^{-4}

(B) MLT^{-3} and MLT^{-4}

(C) MLT^{-1} and MLT^0

(D) MLT^{-4} and MLT^{-1}

(iv) A projectile will cover same horizontal distance, when the initial angles of projection are :

(A) $20^\circ, 60^\circ$

(B) $20^\circ, 70^\circ$

(C) $30^\circ, 40^\circ$

(D) $50^\circ, 60^\circ$

(v) A light and a heavy body have equal kinetic energy. Which has greater momentum ?

(A) Heavy body

(B) Light body

(C) Both have equal momentum

(D) Information is incomplete

(vi) Angular momentum is a :

(A) Polar vector

☒ (B) Axial vector

(C) Scalar

(D) None of these

(vii) There is no atmosphere on moon as :

(A) It is closer to earth

(B) It revolves around the earth

(C) It gets light from the sun

☒ (D) The escape velocity of gas molecules is less than their r.m.s. velocity on moon

(viii) The dimensional formula for the modulus of elasticity is same as that of :

☒ (A) Stress

(B) Strain

(C) Velocity

(D) Surface tension

(ix) During the free expansion of gas, the entropy of gas will :

- (A) Increase
- (B) Decrease
- (C) First increases, then decreases
- (D) Remain same

(x) The r.m.s. speed of hydrogen at 27°C is v . What will be the r.m.s. speed of oxygen at 300 K ?

- | | |
|-------------------|-------------------|
| (A) $2 v$ | (B) $4 v$ |
| (C) $\frac{v}{2}$ | (D) $\frac{v}{4}$ |

Section-B

(Very Short Answer Type Questions)

2 each

2. In Van der Waal's equation :

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

where P , V , R , T are pressure, volume, universal gas constant and temperature. What are dimensions of a and b ?

3. State Newton's three laws of motion.
4. Define Work and Power. Give their S.I. units.
5. Two bodies of mass 10 kg and 2 kg are moving with velocities $\left(2\hat{i} - 7\hat{j} + 3\hat{k}\right)$ m/s and $\left(-10\hat{i} + 35\hat{j} - 3\hat{k}\right)$ m/s respectively. Find velocity of centre of mass.
6. State Kepler's laws of planetary motion (any two).
7. Define streamline and turbulent flow.
8. State first law of thermodynamics in mathematical form.
9. Write down four postulates of kinetic theory of gases.
10. Distinguish between transverse and longitudinal wave motion.

Section-C

(Short Answer Type Questions)

3 each

11. A body covers first half of distance with a speed of 20 m/s and second half with a speed of 30 m/s. Find the average speed of the body.

12. A force $\vec{F} = (2 + x)\text{N}$ acts on a particle in x-direction in metre. Find the work done by this force during a displacement from $x = 1\text{ m}$ to $x = 2\text{ m}$.
13. Define centre of the mass. Find an expression for the position vector of centre of mass of a two particle system.
14. Define escape velocity. Derive an expression for it.
15. Derive an expression for viscous force acting on a body of radius (r) falling with a velocity (v) through a viscous liquid on the basis of dimensional analysis. <https://www.jkboseonline.com>
16. State Bernoulli's theorem in different forms. Explain its one application.
17. An electric heater supplies heat to a system at a rate of 100 W. If system performs work at a rate of 75 Joules per second, at what rate is internal energy increasing ?
18. State law of equipartition of energy. Write the number of degrees of freedom of monoatomic, diatomic and triatomic gas.

19. At what distance from the mean position is kinetic energy equal to potential energy ? Briefly explain in case of S.H.M.

Section-D

(Long Answer Type Questions)

5 each

20. Derive :

$$(i) \quad v = u + at$$

$$(ii) \quad s = ut + \frac{1}{2}at^2$$

Where letters have their usual meanings.

Or

Define Projectile. Derive an expression for maximum height, time of flight and horizontal range of a projectile fired at an angle with the horizontal.

21. State and explain principle of conservation of linear momentum with the help of an example.

Or

Define Centripetal Force. Derive an expression for it.

22. Define Simple Harmonic Motion. Derive an expression for displacement, velocity and acceleration of a particle executing S.H.M.

Or

What is a Plane progressive wave ? Derive an expression for displacement of plane progressive wave.

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Z-8-Y

Total No. of Questions : 22]

[Total No. of Printed Pages : 8

11th ARM(SZ) JKUT2024

1208-Y

PHYSICS

Time : 3 Hours]

[Maximum Marks : 70

Section-A

(Objective Type Questions)

1 each

1. (i) The number of significant numbers in 0.0003 or 3×10^{-4} is :

(A) 1

(B) 2

(C) 3

(D) 4

(ii) Which of the following does not have the dimensions of force ?

(A) Potential gradient

(B) Energy gradient

(C) Weight

(D) Rate of change in linear momentum

Z-8-Y

11th ARM(SZ) JKUT2024 - 1208-Y

Turn Over

(iii) A system has basic dimensions as density (ρ), velocity (v) and area

(A), then dimensional representation of force in this system is :

(A) $(A v^2 \rho)$

(B) $(A^2 v \rho)$

(C) $(A v \rho^2)$

(D) $(A^2 v^2 \rho)$

(iv) A particle moving with uniform speed can possess :

(A) Radial acceleration

(B) Tangential acceleration

(C) Both of them

(D) None of these

(v) A light and a heavy body have equal momentum. Which has greater kinetic energy ?

(A) Heavy body

(B) Light body

(C) Both have equal kinetic energy

(D) Information is incomplete

(vi) Angular momentum of a particle rotating with central force is constant due to :

- (A) Constant force (B) Constant torque
(C) Zero torque (D) Constant linear momentum

(vii) Where will it be profitable to purchase 1 kg sugar ?

- (A) At poles (B) At equators
(C) At 45° latitude (D) At 40° latitude

(viii) The work done in stretching an elastic wire per unit volume in a stretched wire is :

- (A) Stress $\times$ Strain (B) $\frac{1}{2}$ Stress $\times$ Strain
(C) $\frac{\text{Stress}}{\text{Strain}}$ (D) None of these

(ix) A real gas behaves as an ideal gas at :

- (A) Very low pressure and high temperature
- (B) High pressure and low temperature
- (C) High pressure and high temperature
- (D) Low pressure and low temperature

(x) When heat is given to a gas in an isobaric process, then :

- (A) Work is done by the gas
- (B) Internal energy of gas increases
- (C) Both of them
- (D) None of these

Section-B

(Very Short Answer Type Questions)

2 each

The rotational kinetic energy of a body is given by $\frac{1}{2} I \omega^2$. Use this equation to obtain the dimensions of I.

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3. Show that Newton's second law is the real law of motion.
4. Derive work-energy theorem.
5. Two bodies of mass 200 g and 500 g possess velocities $(10\hat{i} + 2\hat{j})$ and $(3\hat{i} + 5\hat{j})$ m/s respectively. Find the velocity of centre of mass.
6. State Kepler's laws of planetary motion (any two).
7. Define streamline and turbulent flow.
8. State first law of thermodynamics in mathematical form.
9. Write down four postulates of kinetic theory of gases.
10. Distinguish between transverse and longitudinal wave motion.

Section-C

(Short Answer Type Questions)

3 each

11. A particle moves with a velocity of $\vec{v} = (6\hat{i} - 4\hat{j} + 3\hat{k})$ m/s under the influence of a constant force :

$$\vec{F} = (20\hat{i} + 15\hat{j} - 5\hat{k}) \text{ N.}$$

Find the instantaneous power applied to the particle.

12. A force $\vec{F} = (2 + x)\text{N}$ acts on a particle in x -direction in metre. Find the work done by this force during a displacement from $x = 1\text{ m}$ to $x = 2\text{ m}$.
13. Define centre of the mass. Find an expression for the position vector of centre of mass of a two particle system.
14. Define escape velocity. Derive an expression for it.
15. Derive an expression for viscous force acting on a body of radius (r) falling with a velocity (v) through a viscous liquid on the basis of dimensional analysis. <https://www.jkboseonline.com>
16. State Bernoulli's theorem in different forms. Explain its one application.
17. An electric heater supplies heat to a system at a rate of 100 W. If system performs work at a rate of 75 Joules per second, at what rate is internal energy increasing ?
18. State law of equipartition of energy. Write the number of degrees of freedom of monoatomic, diatomic and triatomic gas.

19. At what distance from the mean position is kinetic energy equal to potential energy? Briefly explain in case of S.H.M.

Section-D

(Long Answer Type Questions)

5 each

20. Derive :

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

Where letters have their usual meanings.

Or

Define Projectile. Derive an expression for maximum height, time of flight and horizontal range of a projectile fired at an angle with the horizontal.

21. State and explain principle of conservation of linear momentum with the help of an example.

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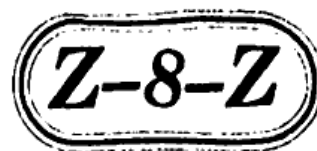
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Total No. of Questions : 22]

[Total No. of Printed Pages : 8

11th ARM(SZ)JKUT2024

1208-Z

PHYSICS

Time : 3 Hours]

[Maximum Marks : 70

Section-A

(Objective Type Questions)

1 each

1. (i) The number of significant numbers in 2.1×10^{-3} is :
- (A) 2 (B) 3
- (C) 4 (D) 5
- (ii) Out of the following pair, which one does not have identical dimensions ?
- (A) Angular momentum and Planck's constant
- (B) Impulse and momentum
- (C) Moment of inertia and torque
- (D) Work and torque

Z-8-Z

11th ARM(SZ)JKUT2024 – 1208-Z

Turn Over

(iii) In the relation $y = 2A \sin \omega t \cos kx$, dimensions of $\frac{y}{A}$ are different than that of :

(A) $\frac{\omega}{k}$

(B) ωt

(C) $\frac{\omega t}{kx}$

(D) kx

(iv) The area under acceleration-time graph gives :

(A) Distance travelled

(B) Force acting

~~(C)~~ Change in velocity

~~(D)~~ Change in acceleration

(v) Two bodies of same mass have different kinetic energy, which has more momentum :

(A) Body having more kinetic energy

(B) Body having less kinetic energy

(C) Both have same momentum

~~(D)~~ Information is incomplete

(vi) The angular momentum of a moving body remains constant, if :

- (A) Net external force is applied
- (B) Net external torque is not applied
- (C) Net pressure is applied
- (D) Net external torque is applied

(vii) The time period of an earth satellite in circular orbit is independent of :

- (A) The mass of the satellite
- (B) Radius of its orbit
- (C) Both mass and radius of orbit
- ☒ (D) Neither mass of satellite nor the radius of its orbit

(viii) The modulus of rigidity of a liquid is :

- (A) Zero
- (B) 1
- (C) Infinity
- (D) None of these

(ix) The internal energy of an ideal gas depends upon :

- (A) Pressure
- (B) Volume
- (C) Temperature
- (D) Size of molecules

(x) The temperature at which r.m.s. of a hydrogen molecule is equal to that of an oxygen molecule at 47°C is :

- (A) 80 K
- (B) -73 K
- (C) 3 K
- (D) 20 K

Section-B

(Very Short Answer Type Questions)

2 each

2. The value of Stefan's constant is $\sigma = 5.67 \times 10^{-8} \text{ Js}^{-1}\text{K}^{-4} \text{ m}^{-2}$. Find its values in CGS system.

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Z-8-Z

3. Define Friction. State laws of limiting friction.
4. Define coefficient of restitution. How does it define elastic and inelastic collision ?
5. Two spheres have identical masses and moment of inertia. One of them is solid and the other is hollow. Find the ratio of the radius of solid sphere to that of hollow sphere.
6. State Kepler's laws of planetary motion (any two).
7. Define streamline and turbulent flow.
8. State first law of thermodynamics in mathematical form.
9. Write down four postulates of kinetic theory of gases.
10. Distinguish between transverse and longitudinal wave motion.

Section-C

(Short Answer Type Questions)

3 each

11. A force of 50 N acts on a particle at an angle of 60° with horizontal.

Calculate its two rectangular components.

12. A force $\vec{F} = (2 + x)\text{N}$ acts on a particle in x -direction in metre. Find the work done by this force during a displacement from $x = 1\text{ m}$ to $x = 2\text{ m}$.
13. Define centre of the mass. Find an expression for the position vector of centre of mass of a two particle system.
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(Long Answer Type Questions)

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