Sample Paper-02

Class 11th NEET (2024)

PHYSICS

SECTION-A

1. Helium at 27°C has a volume of 8 litres. It is suddenly compressed to a volume of 1 litre. The temperature of the gas will be [$\gamma = 5/3$]

(1) 108°C (2) 9327°C

(3) 1200°C (4) 927°C

2. The depth d at which the value of acceleration due to gravity becomes $\frac{1}{n}$ times the value at the surface of the earth, is; [R = radius of the earth]

(1) $\frac{R}{n}$ (2) $R\left(\frac{n-1}{n}\right)$

(3) $\frac{R}{n^2}$ (4) $R\left(\frac{n}{n+1}\right)$

3. A mass of 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the rope at some point, the rope deviated at an angle of 45° at the roof point. If the suspended mass is at equilibrium, the magnitude of the force applied is; ($g = 10\ ms^{-2}$)

(1) 200 N (2) 140 N

(3) 70 N (4) 100 N

4. When a sphere rolls down an inclined plane, then identify the **correct** statement related to the work done by friction force.

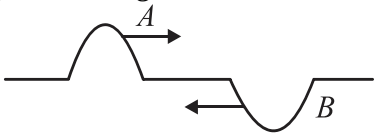
(1) The friction force does positive translational work.

(2) The friction force does negative rotational work.

(3) The net work done by friction is zero.

(4) All of the above

5. Two identical harmonic pulses travelling in opposite directions in a taut string approach each other. At the instant when they completely overlap, the total energy of the string will be;



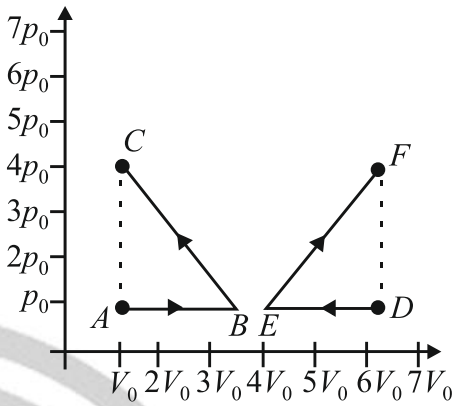
(1) Zero

(2) Partly kinetic and partlty potential

(3) Purely kinetic

(4) Purely potential

6. If W_{ABC} is the work done in process $A \rightarrow B \rightarrow C$ and W_{DEF} is work done in process $D \rightarrow E \rightarrow F$ as shown in the figure, then;



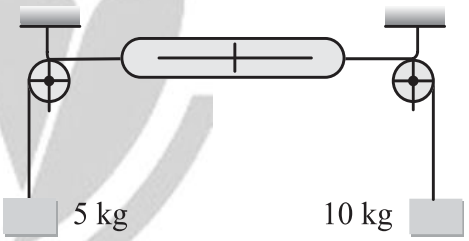
(1) $|W_{DEF}| > |W_{ABC}|$

(2) $|W_{DEF}| < |W_{ABC}|$

(3) $W_{DEF} = W_{ABC}$

(4) $W_{DEF} = -W_{ABC}$

7. For the arrangement shown in the figure, the reading of spring balance is;



(1) 50 N (2) 100 N

(3) 150 N (4) 200 / 3 N

8. Two particles are performing simple harmonic motion in a straight line about the same equilibrium point. The amplitude and time period for both particles are same and equal to A and T, respectively. At time $t = 0$ one particle has displacement A while the other one has displacement $\frac{-A}{2}$ and they are moving towards each other. If they cross each other at time t, then t is;

(1) $\frac{5T}{6}$ (2) $\frac{T}{3}$

(3) $\frac{T}{4}$ (4) $\frac{T}{6}$

9. The number of possible natural oscillation of air column in a pipe closed at one end of length 85 cm whose frequencies lie below 1250 Hz are;
(velocity of sound = 340 ms^{-1})
(1) 7 (2) 5
(3) 6 (4) 4

10. If T_1 and T_2 are the times of flight for two complementary angles, then the range of projectile R is given by;
(1) $R = 4g\ T_1T_2$ (2) $R = 2g\ T_1T_2$
(3) $R = \frac{1}{4}gT_1T_2$ (4) $R = \frac{1}{2}gT_1T_2$

11. An open knife of mass m is dropped from a height h on a wooden floor. If the blade penetrates up to the depth d into the wood, the average resistance offered by the wood to the knife edge is;
(1) $mg\left(1+\frac{h}{d}\right)$ (2) $mg\left(1+\frac{h}{d}\right)^2$
(3) $mg\left(1-\frac{h}{d}\right)$ (4) $mg\left(1+\frac{d}{h}\right)$

12. Moment of inertia of a uniform rod of length L and mass M, about an axis passing through $L/4$ from one end and perpendicular to its length is;
(1) $\frac{7}{36}ML^2$ (2) $\frac{7}{48}ML^2$
(3) $\frac{11}{48}ML^2$ (4) $\frac{ML^2}{12}$

13. For a satellite orbiting close to the surface of earth the period of revolution is 84 min. The time period of another satellite orbiting at a height three times the radius of earth from its surface will be;
(1) $84 \times 2\sqrt{2}$min (2) 84 × 8 min
(3) $84 \times 3\sqrt{3}$ min (4) $84 \times 8\sqrt{2}$ min

14. A point moves along a circle having a radius 20 cm with a constant tangential acceleration 5 cm/s^2. How much time is needed after motion begins for the normal acceleration of the point to be equal to tangential acceleration?
(1) 1 s (2) 2 s
(3) 3 s (4) 4 s

15. **Assertion (A):** Sine and cosine functions are periodic functions.
Reason (R): Sinusoidal functions repeats it values after a definite interval of time.
(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A).**
(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

16. **Assertion (A):** Heat absorbed in a cyclic process is zero.
Reason (R): work done in a cyclic process is non zero.
(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A).**
(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

17. The momentum of a system is defined;
(1) as the product of mass of the system and the velocity of centre of mass.
(2) as the vector sum of the momentum of individual particles.
(3) for bodies undergoing translational, rotational and oscillatory motion.
(4) All of the above

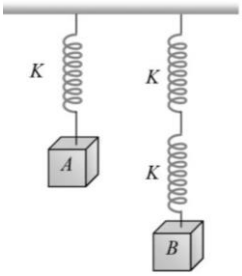
18. The horizontal and vertical displacements of a particle moving along a curved line are given by $x = 5t$ and $y = 2t^2 + t$. Time after which its velocity vector makes an angle of 45° with the horizontal is;
(1) 0.5 s (2) 1 s
(3) 2 s (4) 1.5 s

19. A black body at 1227°C emits radiations with maximum intensity at a wavelength of 5000Å. If the temperature of the body is increased by 1000°C, the maximum intensity will be observed at;
(1) 5000 Å (2) 6000 Å
(3) 3000 Å (4) 4000 Å

20. If there is a straight line parallel to volume axis in a *P*-*V* diagram, then it is a graph:

(1) isochoric (2) isobaric
(3) isothermal (4) none of these

21. The springs shown are identical. When A = 4 kg, the elongation of spring is 1 cm. If B = 6 kg, the elongation produced by it is



(1) 4 cm (2) 3 cm
(3) 2 cm (4) 1 cm

22. **Statement I:** The reflection coefficient of a black body is zero.
Statement II: Black body absorbs all the radiation incident on it.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

23. **Statement I:** Work done by the gravitational force is positive when the two-point masses are brought from infinity to any two points in space.
Statement II: Gravitational potential energy increases during the above process.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect

24. **Statement I**: Atomizer is based on the principle of Bernoulli's theorem.
Statement II: Bernoulli's theorem is not based on the conservation of energy

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect

25. Two soap bubbles in vacuum of radius 3 cm and 4 cm coalesce to form a single bubble under isothermal conditions. Then the radius of bigger bubble is;

(1) 7 cm (2) $\frac{12}{7}$ cm
(3) 12 cm (4) 5 cm

26. Internal forces acting in a system of particle can change;

(1) the kinetic energy but not linear momentum of the system.
(2) neither linear momentum nor kinetic energy of the system.
(3) both kinetic energy and linear momentum of the system.
(4) the linear momentum but not the kinetic energy of system.

27. A satellite is moving with a constant speed '*V*' in a circular orbit about the earth. An object of mass '*m*' is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is;

(1) $\frac{1}{2}mV^2$ (2) mV^2
(3) $\frac{3}{2}mV^2$ (4) $2mV^2$

28. When forces F_1, F_2, F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually perpendicular, then the particle remains stationary. If the force F_1 is now removed, then the acceleration of the particle is;

(1) F_1/m (2) F_2F_3/mF_1
(3) $(F_2 - F_3)/m$ (4) F_2/m

29. A solid sphere rolls down two different inclined planes of the same height but of different inclinations;

(1) in both cases the speeds and time of descend will be same.
(2) the speeds will be same but time of descend will be different.
(3) the speeds will be different but time of descend will be same.
(4) speeds and time of descend both will be different.

30. In a stationary wave system, all the particles of the medium;
(1) have zero displacement simultaneously at some instant.
(2) have maximum displacement simultaneously at some instant.
(3) are at rest simultaneously at some instant.
(4) All of the above

31. Two liquids are at temperatures 20°C and 40°C. When same mass of both of them is mixed, the temperature of the mixture is 32°C. What is the ratio of their specific heats?
(1) $\frac{1}{3}$ (2) $\frac{2}{5}$
(3) $\frac{3}{2}$ (4) $\frac{2}{3}$

32. A force F_1 accelerates a particle from rest to a velocity v. Another force F_2 decelerates the same particle from v to rest, then;
(1) F_1 is always equal to F_2.
(2) F_2 is greater than F_1.
(3) F_2 may be smaller than, greater than or equal to F_1.
(4) F_2 cannot be equal to F_1.

33. A point particle of mass 0.1 kg is executing S.H.M. of amplitude of 0.1 m. When the particle passes through the mean position, its kinetic energy is 8×10^{-3} joule. Obtain the equation of motion of this particle if this initial phase of oscillation is 45°.
(1) $y = 0.1\sin\left(4t + \frac{\pi}{4}\right)$
(2) $y = 0.2\sin\left(4t + \frac{\pi}{4}\right)$
(3) $y = 0.1\sin\left(2t + \frac{\pi}{4}\right)$
(4) $y = 0.2\sin\left(2t + \frac{\pi}{4}\right)$

34. Match **List-I** with **List-II** to find out the correct option.

List-I		List-II	
(A)	Isobaric process	(I)	No heat exchange
(B)	Isothermal process	(II)	Constant pressure
(C)	Adiabatic process	(III)	Constant internal Energy
(D)	Isochoric process	(IV)	Work done is zero

(1) (A) → III, (B) → II, (C) → I, (D) → IV
(2) (A) → II, (B) → III, (C) → I, (D) → IV
(3) (A) → I, (B) → III, (C) → II, (D) → IV
(4) (A) → IV, (B) → III, (C) → I, (D) → II

35. Two stones are projected with the same speed but making different angles with the horizontal. Their horizontal ranges are equal. The angle of projection of one is $\pi/3$ and the maximum height reached by it is 102 m. Then the maximum height reached by the other (in metres) is;
(1) 76 (2) 84
(3) 56 (4) 34

SECTION-B

36. A bullet moving with a speed of 100 ms^{-1} can just penetrate into two planks of equal thickness. Then the number of such planks, if speed is doubled will be;
(1) 6 (2) 10
(3) 4 (4) 8

37. A spring having a spring constant 'K' is loaded with a mass 'm'. The spring is cut into two equal parts and one of these is loaded again with the same mass. The new spring constant is
(1) $K/2$ (2) K
(3) $2K$ (4) K^2

38. A body of mass m is lifted up from the surface of earth to a height three times the radius of the earth R. The change in potential energy of the body is;
(1) $3\,mgR$ (2) $\frac{5}{4}mgR$
(3) $\frac{3}{4}mgR$ (4) $2\,mgR$

39. The superposing waves are represented by following equations
$y_1 = 5 \sin 2\pi (10t - 0.1x)$
$y_2 = 10 \sin 2\pi (10t - 0.1x)$
find I_{max}/I_{min}
(1) 16/9 (2) 9/1
(3) 4/9 (4) 25/9

40. An electric motor creates a tension of 4500 N in a hoisting cable and reels it in at the rate of 2 m/s. What is the power of electric motor?
(1) 15 kW
(2) 9 kW
(3) 225 kW
(4) 9000 HP

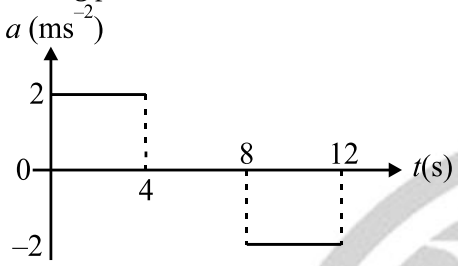
41. Two sound waves of wavelength 1 m and 1.01 m in a gas produce 10 beats in 3 s. The velocity of sound in the gas is:

(1) 330 m/s (2) 337 m/s
(3) 360 m/s (4) 300 m/s

42. The average resisting force that must act on a 5 kg mass to reduce its speed from 65 ms^{-1} to 15 ms^{-1} in 2s is;

(1) 12.5 *N* (2) 125 *N*
(3) 1250 *N* (4) None of the above

43. A lift starts from rest. Its acceleration is plotted against time. When it comes to rest its height above its starting point is:



(1) 20 m (2) 64 m
(3) 32 m (4) 36 m

44. In the stable equilibrium position a body has:

(1) Maximum potential energy
(2) Minimum potential energy
(3) Minimum kinetic energy
(4) Zero kinetic energy

45. The equation of motion of the particle is described in **List-I**. At $t = 0$, particle is at origin and at rest. Match the **List-II** with the statement of **List-II**.

List-I		List-II	
(A)	$v = 8t$ m/s	(I)	Particle will change its direction after some time
(B)	$v = 6t - 3t^2$	(II)	Particle moves with variable acceleration
(C)	$x = (3t^2 + 2t)m$	(III)	Velocity of particle at $t = 1$ s is 8 m/s
(D)	$a = 16\,t$	(IV)	Particle moves with uniform acceleration

(1) A → (III, IV); B → (I, II); C → (III, IV); D → (II, III)
(2) A → (II, IV); B → (II, III); C → (I, IV); D → (II, IV)
(3) A → (II, III); B → (I, III); C → (I, IV); D → (II, IV)
(4) A → (I, III); B → (II, IV); C → (I, III); D → (I, IV)

46. A car is moving at a speed of 40 m/s on a circular track of radius 400 m. The speed is increasing at the rate of 3 m/s^2. The net acceleration of car is $x^{1/3}$. What is x?

(1) 124 (2) 127
(3) 125 (4) 123

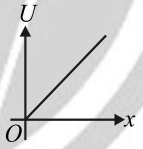
47. Two particles are projected in air with same speed *u* at an angle θ_1 and θ_2 (both acute) to the vertical, respectively. If the maximum height reached by the first particle is equal to that of second, then which of the following is **correct**?
(T_1 and T_2 are time of flight of two particles respectively)

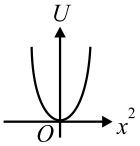
(1) $\theta_1 < \theta_2$ (2) $\theta_1 > \theta_2$
(3) $T_1 > T_2$ (4) $T_1 = T_2$

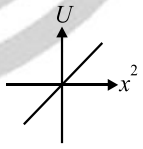
48. The velocity of a particle moving along the *x*-axis is given by $v = 5x^2 + 9$, where *v* is in m/s and *x* is in metre. The acceleration of the particle when passing through point $x = 1$ *m*, is:

(1) Zero (2) 95 m/s^2
(3) 140 m/s^2 (4) 150 m/s^2

49. Identify the correct variation of potential energy *U* as a function of displacement *x* from mean position (or x^2) of a harmonic oscillator (*U* at mean position = 0)

(1) 

(2) 

(3) 

(4) None of these

50. A steel ball of mass *m* falls in a viscous liquid with terminal velocity *v*, then the steel ball of mass 8*m* will fall in the same liquid with terminal velocity?

(1) *v* (2) 4*v*
(3) 8*v* (4) $16\sqrt{2}v$