Sample Paper-03

Class 11th NEET (2024)

PHYSICS

SECTION-A

1. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R, so that it can complete the loop?

(1) $\sqrt{2gR}$ (2) $\sqrt{3gR}$

(3) $\sqrt{5gR}$ (4) $\sqrt{gR}$

2. A solid cylinder of mass M and radius R rolls down on an inclined plane of height h. The angular velocity of the cylinder when it reaches the bottom of the plane will be;

(1) $\frac{1}{2R}\sqrt{gh}$

(2) $\frac{1}{R}\sqrt{gh}$

(3) $\frac{2}{R}\sqrt{\frac{gh}{3}}$

(4) $\frac{2}{R}\sqrt{\frac{gh}{2}}$

3. A particle is projected vertically upwards from the surface of the earth (radius Re) with a speed equal to one fourth of escape velocity. What is the maximum height attained by it from the surface of the earth?

(1) $\frac{16}{15}R_e$ (2) $\frac{R_e}{15}$

(3) $\frac{4}{15}R_e$ (4) None of these

4. Two bodies of masses m and $4m$ are placed at a distance r. The gravitational potential at a point on the line joining them where the gravitational field is zero is;

(1) $-\frac{6Gm}{r}$

(2) $-\frac{9Gm}{r}$

(3) Zero

(4) $-\frac{4Gm}{r}$

5. If two forces of same magnitude F have angle of 240° between them, then the magnitude of their resultant will be $\frac{xF}{2}$. What is value of x?

(1) 2 (2) 3

(3) 4 (4) 5

6. A steel wire of cross-sectional area $3 \times 10^{-6}\ m^2$ can withstand a maximum strain of 10^{-3}. Young's modulus of steel is 2×10^{11} N/m^2. The maximum mass the wire can hold is;
(Take g = 10 m/s^2)

(1) 40 kg (2) 60 kg

(3) 80 kg (4) 100 kg

7. A block of wood floats in water with of its volume submerged. If the same block just floats (completely immersed) in a liquid, the density of the liquid (in kg m – 3) is;

(1) 1250 (2) 600

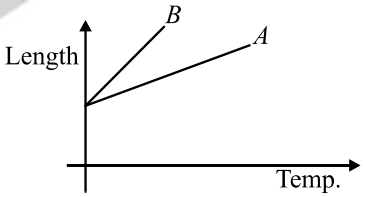
(3) 400 (4) 800

8. If a section of soap bubble (of radius R) by a plane through its center is considered, then force on one half due to surface tension is;

(1) $2\pi RT$ (2) $4\pi RT$

(3) $\pi R^2 T$ (4) $\frac{4T}{R}$

9. Length v/s Temperature graph of A & B is given below. Find the relation between α_A & α_B.



(1) $\alpha_A > \alpha_B$ (2) $\alpha_A = \alpha_B$

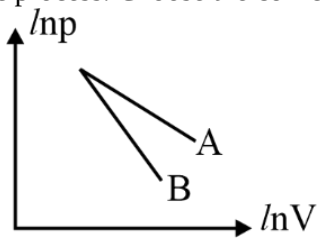
(3) $\alpha_A < \alpha_B$ (4) can't say

10. Calculate the time required to heat 20 kg of water from 10ºC to 35ºC using an immersion heater rated 1000 W. Assume that 80% of the power input is used to heat the water. (Specific heat capacity of water = 4200 J/kg – k)

(1) 40 min (2) 44 min

(3) 36 min (4) 48 min

11. Two ideal gases *A* & *B* are undergoing through adiabatic process. Choose the **correct** option.



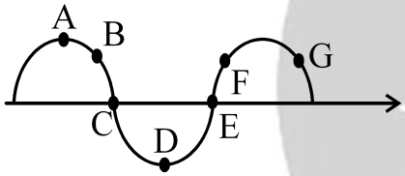
(1) both *A* & *B* are monoatomic.
(2) both *A* & *B* are diatomic.
(3) *B* is diatomic, *A* is monoatomic.
(4) *B* is monoatomic, *A* is diatomic.

12. A small mass executes linear S.H.M. about *O* with amplitude and period *T*. Its displacement from *O* at time *T*/8 after passing through *O* is;

(1) $\frac{a}{8}$ (2) $\frac{a}{2\sqrt{2}}$

(3) $\frac{a}{2}$ (4) $\frac{a}{\sqrt{2}}$

13. The following figure depicts a wave travelling in a medium. Which pair of particles are in phase?



(1) *A* and *D* (2) *B* and *F*
(3) *C* and *E* (4) *B* and *G*

14. A simple pendulum has a time period *T* in vacuum. Its time period when it is completely immersed in a liquid of density $\frac{1^{th}}{8}$ of material of the bob is;

(1) $\sqrt{\frac{7}{8}}T$ (2) $\sqrt{\frac{5}{8}}T$

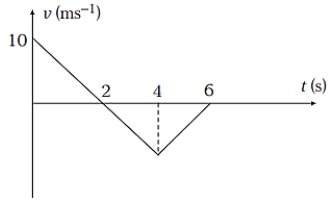
(3) $\sqrt{\frac{3}{8}}T$ (4) $\sqrt{\frac{8}{7}}T$

15. A system is shown in the figure. The time period for small oscillations of the two blocks will be;

(1) $2\pi\sqrt{\frac{3m}{k}}$ (2) $2\pi\sqrt{\frac{3m}{2k}}$

(3) $2\pi\sqrt{\frac{3m}{4k}}$ (4) $2\pi\sqrt{\frac{3m}{8k}}$

16. For the velocity-time graph as shown in the figure, in a time interval from $t = 0$ to $t = 6$ s, match the following columns and mark the **correct** option from the codes given below.



	Column-I		Column-II
(A)	Change in velocity	(I)	– 5/3 SI unit
(B)	Average acceleration	(II)	– 20 SI unit
(C)	Total displacement	(III)	– 10 SI unit
(D)	Acceleration at t = 3 s	(IV)	– 5 SI unit

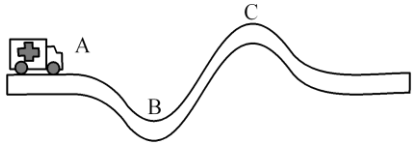
Codes

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

17. What is the phase difference between the displacement wave and pressure wave in sound wave?

(1) Zero
(2) $\frac{\pi}{2}$
(3) π
(4) $\frac{\pi}{4}$

18. A vehicle is moving on a track with constant speed as shown in Fig. The normal reaction between the tyres and road is;



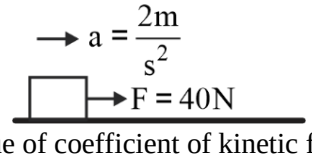
(1) maximum at A
(2) maximum at B
(3) maximum at C
(4) same at A, B and C

19. **Assertion:** A body falling freely under the force of gravity has constant acceleration (9.81 m/sec^2).
Reason: Earth attracts everybody towards its centre by the same force.
(1) Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are 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.

20. **Assertion:** To cross the river in minimum time, man should swim in perpendicular to the direction of flow of river.
Reason: In this case along the perpendicular direction to river flow, the component of velocity of man becomes maximum.
(1) Both **Assertion (A)** and **Reason (R)** are true and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are 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.

21. **Statement-I:** No work is done on a revolving electron around the nucleus of an atom.
Statement-II: Work done by centripetal force is always zero.
(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.

22. A block of mass 10kg, moving with acceleration 2m/s^2 on horizontal rough surface is shown in figure,



The value of coefficient of kinetic friction is;
(1) 0.2 (2) 0.4
(3) 0.5 (4) 0.1

23. **Statement-I:** The relation between Celsius & Kelvin temperature is given by $t°C = (t + 273.15)k$.
Statement-II: Relation between Celsius & Fahrenheit temperature is $\frac{C}{9}=\frac{F-32}{5}$.
(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. Two physical quantities have same dimensions then their magnitude;
(1) cannot be multiplied.
(2) may be added.
(3) can always be added.
(4) cannot be added or subtracted.

25. A ball is dropped downwards, after 1 sec another ball is dropped downwards from the same point. What is the distance between them, after 3 sec, the first ball has fallen?
(1) 25 m (2) 20 m
(3) 50 m (4) 9.8 m

26. The velocity of water in a river is 18 km/h near the surface. If the river is 5m deep, find the shearing stress between the horizontal layers of water. The co-efficient of viscosity of water is 10^{-2} poise;
(1) 10^{-1} N/m^2
(2) 10^{-2} N/m^2
(3) 10^{-3} N/m^2
(4) 10^{-4} N/m^2

27. Two vectors A and B have equal magnitude x. Angle between them is 60°. Then, match the following two columns and mark the **correct** option from the codes given below.

Column-I		Column-II	
(A)	$\lvert A+B\rvert$	(I)	$\frac{\sqrt{3}}{2}x^2$
(B)	$\lvert A-B\rvert$	(II)	x
(C)	$A.B$	(III)	$\sqrt{3}x$
(D)	$\lvert A\times B\rvert$	(IV)	None

Codes

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

28. An automobile travelling with a speed of 60 km/h, can brake to stop within a distance of 20m. If the car is going twice as fast i.e., 120 km/h, the stopping distance will be;

(1) 60 m (2) 40 m

(3) 20 m (4) 80 m

29. Out of the following quantities, which one has dimensions different from the remaining three?

(1) Energy per unit volume

(2) Force per unit area

(3) Product of voltage and charge per unit volume

(4) Angular momentum

30. A body of mass M is kept on a rough horizontal surface (friction coefficient μ). A person is trying to pull the body by applying a horizontal force but the body is not moving. The force by the surface on the body is F, then

(1) $F = Mg$

(2) $F = \mu Mg$

(3) $Mg < F \leq Mg\sqrt{1+\mu^2}$

(4) $Mg \geq F \geq Mg\sqrt{1+\mu^2}$

31. The ratio between the values of acceleration due to gravity at a height 1 km above and at a depth of 1 km below the Earth's surface is (radius of Earth is R)

(1) $\frac{R-2}{R-1}$ (2) $\frac{R}{R-1}$

(3) $\frac{R-2}{R}$ (4) 1

32. The moment of inertia of a body about a given axis is 1.2 kg/m^2. Initially, the body is at rest. In order to produce a rotational kinetic energy of 1500 joule, an angular acceleration of 25 radian/sec^2 must be applied about that axis for a duration of;

(1) 4 seconds

(2) 2 seconds

(3) 8 seconds

(4) 10 seconds

33. A metal ball of mass 2 kg moving with a velocity of 36 km/h has a head on collision with a stationary ball of mass 3 kg. If after the collision, the two balls move together, the loss in kinetic energy due to collision;

(1) 140 J

(2) 100 J

(3) 60 J

(4) 40 J

34. A steel ring of radius r and cross-sectional area A is fitted into a wooden disc of radius $R(R > r)$. If the Young's modulus of steel is Y, then the force with which the steel ring is expanded is?

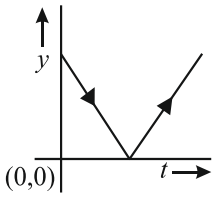
(1) $A\,Y\,(R/r)$

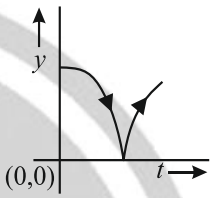
(2) $A\,Y\,(R - r)/r$

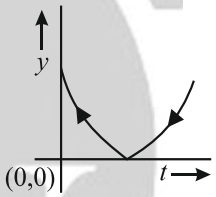
(3) $(Y/A)[R - r/r]$

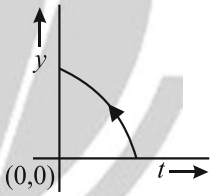
(4) $Y\,r/A\,R$

35. A ball is dropped on a floor and bounces back to a height somewhat less than the original height. Which of the curves depicts its motion **correctly**?

(1) 

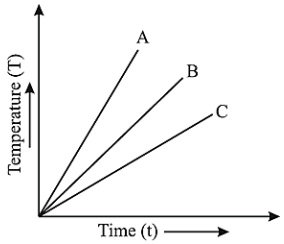
(2) 

(3) 

(4) 

SECTION-B

36. Which of the substances A, B and C has the lowest heat capacity? If heat is supplied to all of them at equal rates, the temperature versus time graph is shown below?



(1) A

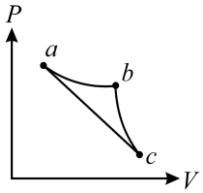
(2) B

(3) C

(4) All have equal specific heat

37. The escape velocity of an object launched from the surface of the earth;
(1) depends on the mass of object.
(2) depends on the mass of planet towards which, it is moving.
(3) does not depend on the mass of earth.
(4) does not depend on the mass of object.

38. In the $P - V$ diagram shown, the gas does 5J of work along isothermal a, b and 4J along adiabatic b and c. What is the change in the internal energy of the gas if the gas traverses the straight path from a to c?

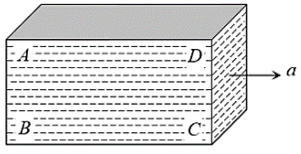


(1) 1 J (2) 4 J
(3) 5 J (4) 9 J

39. A sonometer wire supports a 4 kg load and vibrates in fundamental mode with a tuning fork of frequency 416 Hz. The length of the wire between the bridges is now doubled. In order to maintain fundamental mode, the load should be changed to;
(1) 1 kg (2) 2 kg
(3) 4 kg (4) 16 kg

40. Tension in the cable supporting and elevator, is equal to the weight of the elevator. From this, we can conclude that the elevator is going up or down with a;
(1) uniform velocity
(2) uniform acceleration
(3) variable acceleration
(4) either (2) or (3)

41. A closed rectangular tank is completely filled with water and is accelerated horizontally with an acceleration a towards right. Pressure is
(i) maximum at, and (ii) minimum at



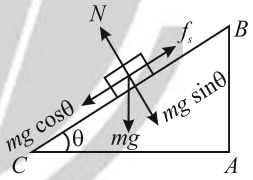
(1) (i) B (ii) D
(2) (i) C (ii) D
(3) (i) B (ii) C
(4) (i) B (ii) A

42. If T is the surface tension of a liquid, the energy needed to break a liquid drop of radius R into 64 drops in;
(1) $6\pi R^2T$
(2) πR^2T
(3) $12\pi R^2T$
(4) $8\pi R^2T$

43. A mass of M kg is suspended by a weightless string of length L. The work done by the horizontal force F required to displace the string to an angle of 45° with the initial vertical direction;
(1) $FL\sqrt{2}$ (2) $2\sqrt{2}FL$
(3) $\frac{FL}{2\sqrt{2}}$ (4) $\frac{FL}{\sqrt{2}}$

44. A car moving on a horizontal road may be thrown out of the road in taking a turn;
(1) by the gravitational force.
(2) due to the lack of proper centripetal force.
(3) due to the rolling frictional force between the tyre and road.
(4) due to the reaction of the ground.

45. Which figure shows the **correct** force acting on the body sliding down an inclined plane?
($m \rightarrow$ mass, $f_s \rightarrow$ force of friction)

(1)


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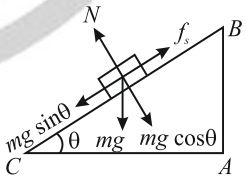
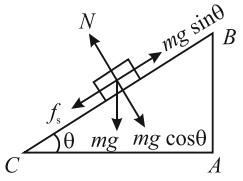


(3)


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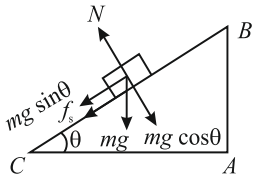

46. The work of 146 kJ is performed in order to compress one kilo mole of gas adiabatically and in this process the temperature of the gas increases by 7°C. The gas is (R = 8.3 J mol^{-1} K^{-1});

(1) diatomic
(2) triatomic
(3) a mixture of monoatomic and diatomic
(4) monoatomic

47. The total K.E. of one mole of an ideal gas is $E = (3/2)RT$. Then C_p will be;

(1) 0.5 R (2) 0.1 R
(3) 1.5 R (4) 2.5 R

48. The force acting on a particle varies with displacement x as $F = kx$ then work done by the force in displacing particle from (0, 0) to (x, 0) will be proportional to;

(1) $x^{2/3}$ (2) x^2
(3) x^3 (4) x

49. A force of 10 N acts on a body of mass 20 kg for 10 seconds. Change in its momentum is;

(1) 5 kg m/s
(2) 100 kg m/s
(3) 200 kg m/s
(4) 1000 kg m/s

50. Energy of simple harmonic motion is proportional to (symbols have their usual meanings)

(1) $\frac{1}{\omega^2}$
(2) ω
(3) A^2
(4) $\frac{1}{A^2}$