



Roll No.	
Name	
Class & Section	

APEEJAY COMMON ANNUAL EXAMINATION, 2019-20

PHYSICS (042)

Time Allowed : 3.00 Hrs.

Class – XI

Maximum Marks : 70

General Instructions :

1. All Questions are compulsory. There are 37 questions in all.
2. This question paper has four sections : Section A, Section B, Section C and Section D
3. Section A contains 20 questions of one mark each, Section B contains 7 questions of two marks each, Section C contains 7 questions of three marks each and Section D contains 3 questions of five marks each.
4. There is no overall choice. However, internal choices have been provided in 2 questions of one mark, 2 questions of two marks, 2 questions of three marks and 3 questions of five marks. You have to attempt only one of the choices in such questions.
5. You may use the following values of physical constants wherever necessary.

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.63 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

$$m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$m_n = 1.675 \times 10^{-27} \text{ kg}$$

$$m_p = 1.673 \times 10^{-27} \text{ kg}$$

$$\text{Avogadro's number} = 6.023 \times 10^{23} \text{ per gram mole}$$

$$\text{Boltzmann constant} = 1.38 \times 10^{-23} \text{ JK}$$

Section-A

Directions (Q.Nos 1 - 10)

Select the most appropriate option from those given below each question.

1. Doppler's effect holds good for

1

- (a) Only sound waves.
- (b) Only electromagnetic waves.
- (c) Both (a) and (b).
- (d) None of these.

2. Two wave trains $Y_1 = \alpha \sin (4000\pi t)$ and $Y_2 = \alpha \sin (4008\pi t)$ are approaching each other. The number of beats heard per second is

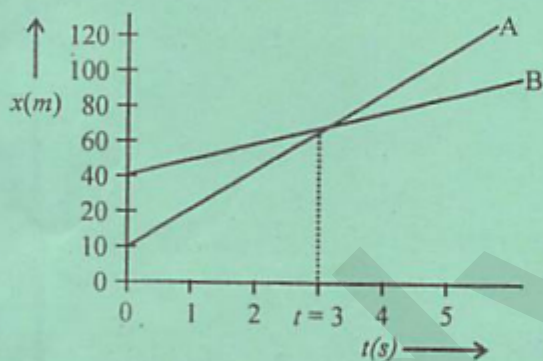
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- (a) 8
- (b) 4
- (c) 1
- (d) 0

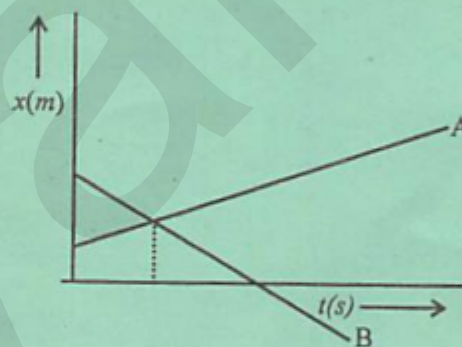
3. The average velocities of the objects A and B are V_A and V_B respectively. The velocities are related such that $V_A > V_B$. The position-time graph for this situation can be represented as

1

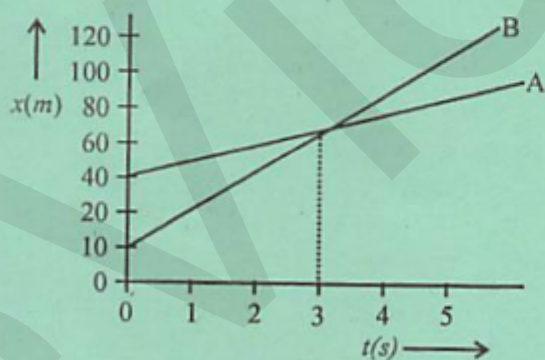
(a)



(b)



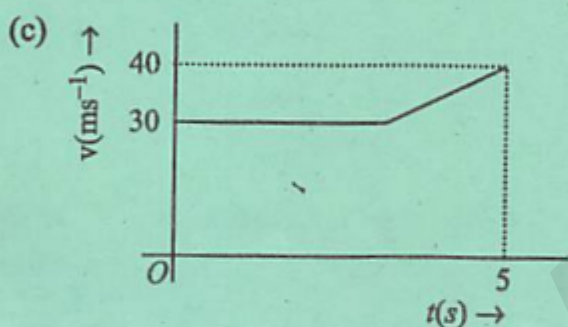
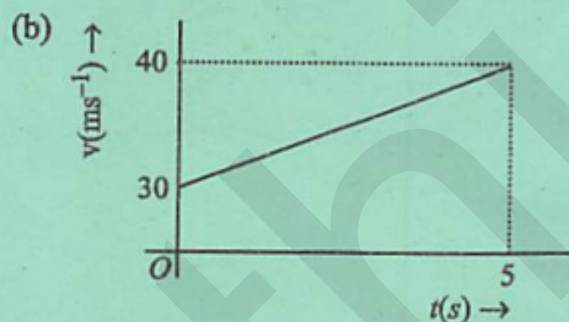
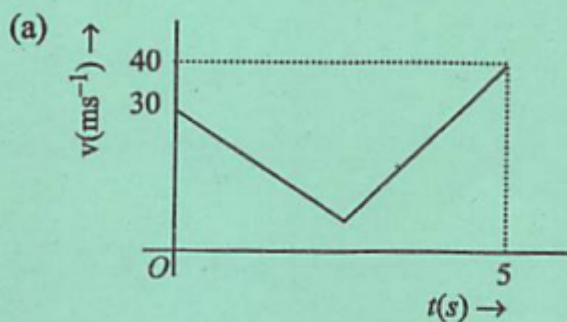
(c)



(d) None of these

OR

An object is moving with an initial velocity of 30 m/s with uniform acceleration. The velocity of the object increases to 40 m/s in next 5 s . The v - t graph which least represents this situation is



(d) None of these

4. Which of the following has unit but no dimension?

1

- | | |
|-----------------------|----------------------|
| (a) Angle | (b) Strain |
| (c) Relative velocity | (d) Relative Density |

5. A body falling freely under the action of gravity alone. Which of the following quantities remains constant during the fall?

- | | |
|-----------------------------|---------------------------|
| (a) Kinetic energy | (b) Potential energy |
| (c) Total mechanical energy | (d) Total linear momentum |

6. A wire is stretched to double its length. The strain is

1

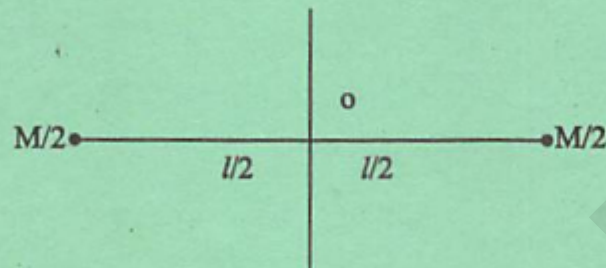
- | | |
|-------|---------|
| (a) 2 | (b) 1 |
| (c) 0 | (d) 0.5 |

7. Carnot engine is a

1

- | | |
|-------------------------|-------------------|
| (a) irreversible engine | (b) Petrol engine |
| (c) reversible engine | (d) diesel engine |

8. The PE i.e $U(x)$ can be assumed zero when (or at) 1
- $x = 0$.
 - gravitational force is constant.
 - infinite distance from the gravitational source.
 - All of the above .
9. Two masses are joined with a light rod and the system is rotating about the fixed axis as shown in figure. 1



The MI of the system about the axis is

- $MI^2/2$
 - $MI^2/4$
 - MI^2
 - $MI^2/6$
10. Change of state from solid to vapour state without passing through the liquid state is called : 1
- Regelation
 - Sublimation
 - Condensation
 - Sedimentation

Directions (Q. Nos 11-15)

Answer in brief

11. Give the number of significant figures in 6.200×10^{10} sec. 1
12. The total momentum of universe remains constant. Is the statement true? State with reason. 1

In the following questions 13, 14 and 15, a statement is Assertion which is followed by a statement of Reason. Mark the correct choice as (a) Assertion is true statement, Reason is false statement or (b) Assertion and Reason both are true statements and Reason is the correct explanation Assertion or (c) Assertion and Reason both are true statements but Reason is not the correct explanation of Assertion or (d) Assertion is false statement but Reason is true statement or (e) Assertion and Reason both are false statements.

13. **Assertion :** A light body and a heavy body have same momentum. Then they also have same kinetic energy.

Reason : Kinetic energy does not depend on mass of the body. 1

14. **Assertion :** for a system of particles under central force field, the total angular momentum is conserved.

Reason : The torque acting on such system is zero. 1

15. **Assertion :** At the centre of earth, a body has centre of mass but no centre of gravity.

Reason : At the centre of earth, acceleration due to gravity $g = 0$. 1

Directions (Q.Nos 16-20)

Fill in the blanks :

16. The value of escape speed at the surface of a planet depends upon and 1
17. The angular momentum of mass m moving with velocity v along a circular path of radius r is given by 1
18. If two bodies stick together after a collision and move as a single body with a common velocity, then the collision is said to be 1
19. When the circular road is banked at an angle θ and there is no friction between the road and the tyres of a car, $\mu = 0$, then the safe limit for maximum speed is 1
20. Two bodies are projected at an angle θ and $(\pi/2 - \theta)$ to the horizontal with the same speed. The ratio of their time of flight is 1

OR

A body is projected at an angle 45° with a velocity of 9.8 m/s . The horizontal range will be

Section-B

21. Find the dimensions of $[a/b]$ in the equation $F = a\sqrt{x} + bt^2$, where F is force, x is distance and t is time. 2
22. Draw a velocity time graph for an object in uniform motion. Show that the area under the velocity time graph gives the displacement of the object in the given time interval. 2

OR

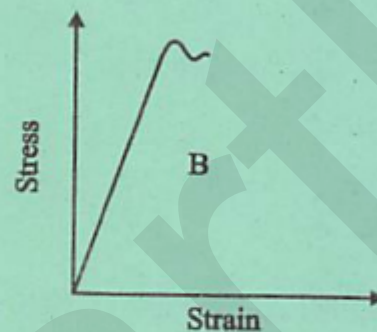
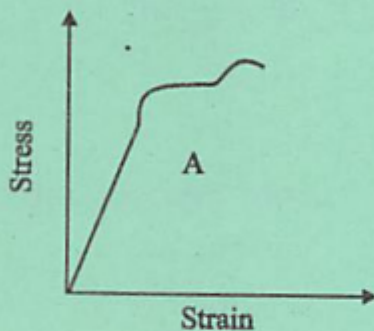
Two parallel rail tracks run north-south. Train A moves north with a speed of 54 km/h and train B moves south with a speed of 90 km/h . What is the relative velocity of B with respect to A?

23. A block slides down on an inclined plane of inclination 30° with an acceleration equal to $g/4$. Find the coefficient of kinetic friction. 2
24. Show that the gravitational force is a conservative force. 2

OR

Give important characteristics of elastic collision.

25. The stress strain graphs for materials A and B are shown in figure. 2



The graphs are drawn on the same scale. State with reason.

1. Which of the material has greater Young's modulus?
 2. Which of the two is the stronger material?
26. Two bodies of specific heats C_1 and C_2 having same heat capacities are combined to form a single composite body. What is the specific heat of the composite body? 2
27. State Boyle's law on the basis of kinetic theory of gases. Draw P-V and P-1/V graph for a given mass of a gas at a constant temperature. 2

Section-C

28. A Jet plane beginning its take off moves down the run way at a constant acceleration of 4 m/s^2 . Find 3
- (i) The position and velocity of the plane 5 s after it begins to move.
 - (ii) If a speed of 70 m/s is required for the plane to leave the ground, how long the runway is required?
29. Derive Newton's third law of motion from the law of conservation of energy. 3

OR

Define angle of friction. Deduce its relation with coefficient of friction.

30. Four bodies have been arranged at corners of a rectangle of length a and breadth b . Find the centre of mass of the system. 3

OR

State theorem of parallel axis with its expression. Find moment of inertia of a ring about a tangent in its plane.

31. A body weighs 63 N on the surface of the earth. What is the gravitational force on it due to the earth at a height equal to half the radius of the earth? 3
32. State Bernoulli's theorem. Write its expression. Apply Bernoulli principle to determine the speed of efflux from the side of a container when its top is open. 3

OR

What is capillarity? Derive an expression for the height to which the liquid rise in a capillary tube of radius r .

33. Explain why (or how)
- (a) Bats can ascertain distances, directions, nature and sizes of the obstacles without any eyes?
 - (b) A violin note and sitar note may have the same frequency, yet we can distinguish between the two notes? 3
 - (c) Solids can support both longitudinal and transverse waves but only longitudinal waves can propagate in gases?
34. From a certain apparatus, the diffusion rate of hydrogen has an average value of $28.7\text{cm}^3/\text{s}$. The diffusion of another gas under the same conditions is measured to have an average rate of $7.2\text{cm}^3/\text{s}$. Identify the gas. 3

Section-D

35. Derive the expression for the kinetic and potential energies of a harmonic oscillator. Draw graphs for 5
- (a) Energy vs. time
 - (b) Energy vs. displacement

OR

- (a) What is the main difference between forced oscillation and resonance?
- (b) What will be the change in time period of a loaded spring, when taken to moon?

evidyarthi