Class 11 physics sample papers with solutions

Maximum Marks: 70 Marks
Time Allowed: 3 hours
General Instructions

1. All questions are compulsory. There are 33 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. **Section A** contains 7 very short answer questions and seven MCQs of one mark each and
   Section B has two case study-based questions of 4 marks each,
   Section C contains nine short answer questions of 2 marks each,
   Section D contains five short answer questions of 3 marks each and
   Section E contains three long answer five marks each.
4. There is no overall choice. However internal choice is provided. You have to attempt only one of the
   choices in such questions.

Section A: All questions are compulsory 1

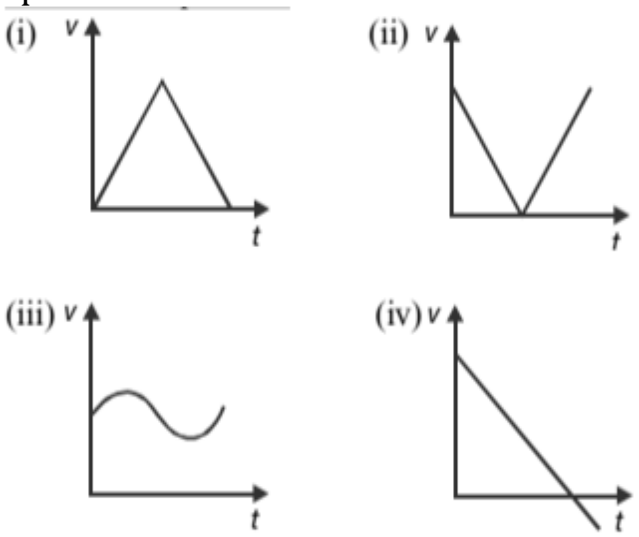
1 The pair of quantities having same dimensions is
(a) Impulse and Surface Tension
(b) Angular momentum and Work
(c) Work and Torque
(d) Young's modulus and Energy

2 Percentage errors in the measurement of mass and speed are 2% and 3% respectively. The error in the estimate of kinetic energy obtained by measuring mass and speed will be 1
(a) 8%
(b) 2%
(c) 12%
(d) 10%

3 A particle moves in a straight line covers half the distance with speed of 3 m/s. The other half of the distance is covered in two equal time intervals with speed of 4.5 m/s and 7.5 m/s, respectively. The 1

average speed of the particle during this motion is
(a) 4.0 m/s
(b) 5.0 m/s
(c) 5.5 m/s
(d) 4.8 m/s

4 Which of the following graphs show the v-t graph of a ball thrown upwards? 1



(a) (i)
(b) (ii)
(c) (iii)
(d) (iv)

5 In the following questions, a statement of assertion is followed by a statement of reason. You are required to choose the correct one out of the given five responses and mark it as 1
(a) If both assertion and reason are true and reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not correct explanation of the assertion.
(c) If assertion is true, but reason is false.
(d) If both assertion and reason are false.
(e) If reason is true but assertion is false.

Assertion: It is difficult to move a cycle along the road with its brakes on.
Reason: Sliding friction is greater than rolling friction.

6	A particle moves along a curve of unknown shape but magnitude of force $\vec{F}$ is constant and always acts along the tangent to the curve. Then, (a) $\vec{F}$ must be conservative (b)$\vec{F}$ may be conservative (c)$\vec{F}$ must be non-conservative (d)$\vec{F}$ may be non-conservative	1
7	Two springs P and Q are stretched by applying forces of equal magnitudes at the four ends. If the spring constant of P is 2 times greater than that of Q and the energy stored in P is E, then the energy stored in Q is (a) $\frac{E}{4}$ (b) $\frac{E}{2}$ (c) E (d) $2E$	1
8	Can the relative velocity of two bodies be greater than the absolute velocity of either?	1
9	What would be the numerical value of Youngs modulus for an ideal elastic body?	1
10	Can a system be heated and its temperature remains constant?	1
11	Is it possible that Centre of mass lie where there is no mass? Give one example.	1
12	Which object will cool faster when kept in open air, the one at 300^0C or the one of 100^C? Why?	1
13	A body is moving along a circular path. How much work is done by the centripetal force?	1
14	What is the minimum possible temperature on the basis of Charle's Law.	1

Section -B : Questions 15 and 16 are case study-based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

15 A seesaw, is a simple machine that explains the idea of balance and rotational equilibrium. It is made up of a board that is balanced on a

pivot point and may rotate back and forth. When two people of equal weight sit at opposite ends of a seesaw, their weights are balanced, and the seesaw maintains rotational equilibrium.

1. The balance in the beam is maintained when
(a) the clockwise moments about the pivot point is equal to the anticlockwise moment about that point.
(b) Weight of two people or the load on opposite ends of board must be same.
(c) Weight of two people or the load on opposite ends of board must be different.
(d) the clockwise moments about the pivot point is not equal to the anticlockwise moment about that point.

2. Assume two people of equal weight sit on opposing sides of a seesaw. We have now cut the distance between the pivot point and the board on the left side in half when compared to the board on the right side. Select the correct statement based on this situation.
(a) moment of force is greater on the left hand side
(b) moment of force is same on both the sides
(c) moment of force is more on the right hand side
(d) moment of force on left hand side is double of what it is on right hand side.

3. We now have a seesaw with two children seated at equal distances from the pivot point. Now weight of child on left hand side is more then that of the child on right hand side. Select the correct statement based on this situation.
(a) Child on right would lift the other child easily.
(b) Child on left would lift the other child easily
(c) Both of them would use same effort to lift one another
(d) None of the options are correct

4. The moment of couple is equal to the product of either of the forces and the perpendicular distance, called the arm of the couple, between the line of action. Hence moment of a couple is
(a) dependent of the choice of point of rotation
(b) independent of perpendicular distance between the forces
(c) independent of the choice of point of rotation.

(d) depends on the perpendicular distance between the forces and the choice of point of rotation.

16 In a refrigerator, the heat energy is transferred from the inside of the refrigerator to the outside, making the inside of the refrigerator cooler. The first law of thermodynamics is the general law of energy conservation that applies to every system that involves energy transfer from or to the surroundings (by heat and work). It states that the energy given to the system is used to improve the system's internal energy and the remainder is used to work on the environment.
Cooling of Refrigerator also follows first law of thermodynamics.
Mathematically,
$\Delta Q = \Delta U + \Delta W$ where ΔQ is the heat supplied to the system, ΔW is the work done by the system and ΔU is the change in internal energy of the system.
ΔQ and ΔW depend on the path taken to go from initial to final states, but the combination $\Delta Q - \Delta W$ is path independent.
1. The first law of thermodynamics is concerned with conservation of
(a) number of molecules
(b) number of moles
(c) energy
(d) temperature
2. Which of the following is not a path function ?
(a) ΔQ
(b) $\Delta Q + \Delta W$
(c) ΔW
(d) $\Delta Q - \Delta W$
3. Which of the following is true in case of adiabatic expansion
(a) $\Delta U=0$
(b) ΔU=negative
(c) ΔU=positive
(d) $\Delta W=0$

4. The heat given to an ideal gas in isothermal conditions is used to
(a) increase temperature
(b) do external work

(c) increase temperature in doing external work
(d) increase internal energy

SECTION C : All questions are compulsory. In case of internal choices, attempt any one of them

17 If force F, length L and time T are taken as fundamental units then what would be the dimensions of mass. 2
OR
Magnitude of force F experienced by a certain object moving with a speed v is given by relation $F = kv$, where k is a constant. Find the dimensions of k

18 Prove that the horizontal range is same when angle of projection is 2
(1) greater than 45^0 by certain value
(2) less than 45^0 by same value

19 State the law of conservation of linear momentum. What is the necessary condition to conserve it? 2

20 Why does a solid sphere have smaller moment of inertia than a hollow cylinder of same mass and radius about an axis passing through their axis of symmetry. 2

21 What is gravitational potential energy of a body at height h from the Earth's surface? 2

22 A liquid drop breaks into 27 small drops. If surface tension of the liquid is S, then find the energy released. 2

23 Write two limitations of first law of Thermodynamics. 2

24 The maximum acceleration of a simple harmonic oscillator is a_0 and the maximum velocity is v_0. What is the displacement amplitude? 2

25 You have a light spring, a meter scale and a known mass. How will you find time period of vibration of mass without the use of clock? 2

SECTION D : All questions are compulsory.

26 A capacitor of capacitance $C = (2.0 \pm 0.1)\mu F$ is charged to a voltage $V = (20 \pm 0.5)V$. Calculate the charge Q with error limits. (relation between these three quantities is $Q = CV$) 3

27 Define centripetal acceleration. Find the expression for it. Give one example of centripetal force. 3

28	Two protons are brought towards each other. Will the potential energy of the system decrease or increase? If proton and electron are brought nearer, then?	3
29	Two stationary particles of masses M_1 and M_2 are a distance d apart. A third particle lying on the line joining the particles, experiences no resultant gravitational force. What is the distance of this particle from M_1?	3
30	Calculate the average kinetic energy for one molecule of gas at constant volume.	3
	SECTION E : All questions are compulsory.	
31	Derive three equation of motion using graphical method. Which physical quantity is obtained? 1. Slope of velocity time graph 2. Area under the velocity time graph.	5
32	Write Bernoulli's principle what are the limitations of Bernoulli principle with the help of labeled diagram derive its formula mathematical give two examples for applications where Bernoulli principle is applied in daily life.	5
33	For a travelling harmonic wave $$y(x,t) = 2.0\cos 2\pi[10t - 0.0080x + 0.35]$$ where x, and y are in cm and t in seconds. Calculate the phase difference between oscillatory motion of two points separated by a distance of (a) 4 cm (b) 0.5 m (c) $\frac{\lambda}{2}$ (d) $\frac{3\lambda}{2}$	5