# O. P. JINDAL SCHOOL, SAVITRI NAGAR Half Vearly Examination (2023 – 2024)

Class: XI Subject: Physics			MM: 70 Time: 3 Hrs.
(Fifteen Minutes Extra will be g	iven for reading the	e Question Pape	er) General Instructions:
<ul> <li>(3) All the sections are compulse</li> <li>(4) Section A contains sixteen question B contains five question D contains two case questions of five marks each</li> </ul>	sections: Section A ory. questions, twelve M estions of two marks e study based quest ch. However, an interna	A, Section B, Se ICQ and four A is each, Section ions of four man	ssertion C, Section D and Section E.  ssertion and Reasoning based of 1 mark each, C contains seven questions of three marks each, rks each and Section E contains three long answer
You have to attempt only or			
	SECTION	ON A	
<ul> <li>Q.1. The relationship between</li> <li>a) both have same magnit</li> <li>Q.2. The number of significant</li> <li>a) 5</li> <li>b) 4</li> <li>Q 3 The slope of acceleration</li> </ul>	tude b) both have t figures in 0.06900 c) 2 versus time will giv	0 is d) 3	c) both have opposite direction d) none
a) Displacement b) velocity  Q.4.cyclist moving on a circumal part b) 2ms <sup>-1</sup> Q.5.The sum of two vector is vector	e) 4π ms <sup>-1</sup>	40m completes l d) 8π ms <sup>-1</sup>	half a revolution in 40s. Its average velocity is
a)90° b) 0°	c) 45°	d) 180°	
Q.6. In a projectile motion the a) $90^{\circ}$ b) $0^{\circ}$	3520 554		d at an angle
<ul><li>Q.7.In equilibrium of particle</li><li>a) at rest</li><li>c) moving with uniform acc</li></ul>	when net external f b) movi eleration d) Both ody of mass 1kg at orce acts on the bod	ing with uniform (a) and (b). rest. During the ly is:	e time the body attains a velocity of 30m/s.
Q.9. The area under acceleration	ion versus time will	give	
a) Displacement  Q.10. The angle between $\overrightarrow{A} =$ a) $45^0$ b) $90^0$	b) velocity $(\hat{i} + \hat{j}) \text{ and } \vec{B} = (i + \hat{j}) -45^0$	(i-j) is	e d) None of these
Q.11. The magnitude of resultan		N j is that	

d) none

c) negative path length

Q.12. The displacement of a car is given as -240 m, Here -ve sign indicates

c) 5N

a) direction of displacement

b) initial position of the car

d) no significance of-ve sign

**Directions:** Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

- (a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
- (b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
- (c) Assertion is correct, reason is incorrect
- (d) Assertion is incorrect, reason is correct.

Q.13. Assertion: A rocket works on the principle of conservation of linear momentum.

**Reason:** Whenever there is change in momentum of one body, the same change occurs in the momentum of the second body of the same system but in the opposite direction.

Q.14.Assertion: A cricketer moves his hands forward to catch a ball so as to catch it easily without hurting.

Reason: He tries to decrease the distance travelled by the ball so that it hurts less.

**Q.15.Assertion:** In projectile motion, the angle between the instantaneous velocity and acceleration at the highestpoint is 180°.

Reason: At the highest point, velocity of projectile will be in horizontal direction only.

Q.16. Assertion: If dot product and cross product of  $\vec{A}$  and  $\vec{B}$  are zero, it implies that one of the vector  $\vec{A}$  and  $\vec{B}$  must be a null vector.

Reason: Null vector is a vector with zero magnitude.

# **SECTION-B**

Q.17. Action and reaction are equal and opposite. Why cannot they cancel each other?

Q.18.A body is projected at an angle of 60° from the horizontal. By what another angle it should be projected again with the same velocity to attain the same range as before?

Q.19.If velocity of the particle is v=2t+3 then find the displacement of it at t=2second. Initially particle is at origin.

#### OR

If acceleration is given by,  $a=t^2+t+1$ , find velocity at t=2sec, if at t=1sec body is moving with 2m/s in negative x- direction.

- **Q.20.** A boat is moving with a velocity  $(3\ell + 4j)$  with respect to the ground. The water in the river is moving with a velocity of  $(-3\ell 4j)$  with respect to the ground. What is the relative velocity of boat with respect to water?
- Q.21. A body is projected at an angle of 30° from the horizontal. By what another angle it should be projected again with the same velocity to attain the same range as before?

## SECTION-C

- **Q22.i)** Find the magnitude of  $\vec{A} \times \vec{B}$  if  $\vec{A} = \hat{i} + \hat{j} + 2\hat{k}$  and  $\vec{B} = 2\hat{i} + 3\hat{j} \hat{k}$ ii) Show that If  $\vec{A} = (2\hat{i} - 3\hat{j} - \hat{k})$  and  $\vec{B} = (-6\hat{i} + 9\hat{j} + 3\hat{k})$  are parallel
- Q.23.i)Check the correctness of the relation  $v^2 u^2 = 2as$  by method of dimensions. The symbols have their usual meaning.
  - ii) If  $x = a + bt + ct^2$ , where x is in meter and t in second, what are the units of a, b and c.

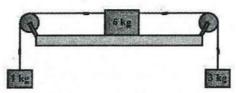
#### OR

- i) Define inertia and its type with one example of each.
- ii) How Newton's first law defines inertia?
- Q.24.A man can swim with a speed of 4km/h in still water. How long does he take to cross the river 1 km wide, if the river flows steadily 3km/h and he makes his strokes normal to the river current? How far down the river does he go when he reaches the other bank?

- Q25. i)State and prove the law of conservation of momentum.
  - ii) Find the magnitude of sum of  $\overrightarrow{A}$  and  $\overrightarrow{B}$  having magnitude 5 and 4 unit respectively and angle between them is  $60^{\circ}$ .
- **Q26.i)**The position of a moving particle is given by  $S = 6 + 18t + 9t^2$ . What is the velocity at t = 2s.? ii)Two vectors of magnitude 3 units and 4 units are at an angle  $60^0$  between them. Find the magnitude of their sum.
- Q.27. The rain is falling vertically downward at speed of 60km/hr and a man is travelling horizontal on a road at speed of 80km/hr. By what angle he should open the umbrella from vertical so that he will be protected from rain.
- Q.28.i)State the parallelogram law of two vectors.
  - ii) Two vectors A and B in x-y plane are given by  $\overrightarrow{A} = A\hat{x}i + Ay\hat{j}$  and  $\overrightarrow{B} = B_x\hat{i} + By\hat{j}$ .
  - (a) Write in the vector form representing the sum of the two vectors.
  - (b) Show by a diagram representing  $\overrightarrow{A}$ ,  $\overrightarrow{B}$  and their sum
  - (c) Write the magnitude of its sum.

### **SECTION-D**

- Q.29. Three masses of 1kg, 6kg and 3 kg are connected to each other with threads and are placed on table as shown in figure. (i) What is the acceleration with which the system is moving?
  - ii)Find tension force in the string.



- Q.30 A monkey of mass 40kg climbs on a rope which can stand a maximum tension of 600 N. In which of the following cases will the rope break? The monkey
  - i) Climbs up with an acceleration of 6ms-2.
  - ii) Climbs down with an acceleration of 4 m/s<sup>2</sup>.
  - iii) Climbs up with a uniform speed of 5 m/s.

#### OR

A cricket ball of mass 150 g is moving with a velocity of 12 m/s and is hit by a bat so that the ball is turned back with a velocity of 20 m/s.

- (i) If duration on contact between the ball and bat is 0.01 s the impulse of force is (a)7.4 Ns (b) 4.8 Ns (c) 1.2 Ns (d) 4.7 Ns
- (ii) Average force exerted by the bat is
  - (a) 480 N (b)120 N (c)1200 N (d)840 N
- (iii) The retardation of ball is
  - (a)  $1600 \text{ m/s}^2(\text{b})320 \text{ m/s}^2$  (c)  $3200 \text{ m/s}^2$  (d)  $160 \text{ m/s}^2$
- (iv) The force acting on the whose linear momentum changes by 20 kg m/s in 10 s is
  - (a) 2N (b)20 N (c)200N (d)0.2N

# **SECTION-E**

- Q.31(i) A man of mass 70 kg stands on a weighing scale in a lift which is moving
  - (a)moving up with a uniform acceleration of 5m/s<sup>2</sup>
  - (b)moving down with a uniform acceleration of 5m/s<sup>2</sup>
  - (c)moving up with uniform speed of 10 m/s

what would be the reading of the scale in each case?

- (ii) The odometer of a car reads 1700 km at the start of a trip and 2500 km at the end of the trip. The trip took 16 h. What is the average speed of car in ms<sup>-1</sup>?
- Q.32 (i) A ball moving along +x axis with velocity 5m/s and strikes a wall and turns back at x=1m, then find the change in momentum of the ball and the direction of force exerted by ball and wall on each other?
  - (ii) A man can swim at a speed of 3km/h in still water. He want to cross a 500m wide river at 2km/h. He keeps himself at an angle of 120° with river flow while swimming.
  - (a) Find the time he takes to cross the river.
    - (b) At what point on the opposite bank will he arrive
- Q.33. The acceleration of an object is said to be uniform acceleration if its velocity changes by equal amount in equal interval of time, however small these time intervals may be. A particle is moving with uniform acceleration in x-direction, the displacement x of particle varies with time t as,  $x = 4t^2-15t+25$ . m
  - (i) The position of particle at t = 0,
    - (a) 14 m. (b) 18 m
- (c) 20 m
- (d) 25 m
- (ii) Velocity of particle at t = 2 s
  - (a) -15 m/s
- (b) 1 m/s
- (c) 3 m/s
- (d) 31 m/s
- (iii) Acceleration of particle at t = 2 s
  - (a) 0 ms-2
- (b) 8 ms-2
- (c) 10 ms-2
- (d) 20 ms-2
- (iv) The velocity of particle will become zero at time t equal to
  - (a) 2.975 s.
- (b) 1.875 s.
- (c) 2 s.
- (d) 1 s.
- (v) The particle has a uniform acceleration 'a 'when
  - (a) acceleration does not depend on time t
- (b) acceleration depends on time t
- (c) velocity changes by unequal amount in equal interval of time,
- (d) None of these