Roll Number		

SET B

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION
PHYSICS

CLASS: XI | Sub. Code: 042 | Time Allotted: 3 Hrs

16.09.2019 | Max. 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 multiple choice 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 three questions of five marks each.
4. There is no overall choice. However, an internal choice has been provided in two questions of two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.
5. You may use the following values of physical constants wherever necessary: $g = 9.8 m/s^2$

SECTION A

1 A physical quantity P is given $P = \frac{a^3 b^2}{\sqrt{c}\, d}$ .The percentage errors in a, b, c and d are 1% , 3%, 4% and 3% respectively. Find the percentage error in P. 1

(a) 13% (b) 12% (c) 14% (d) 11%

2 The number of significant figures in the distance of one light year 9.4605×10^{15} m is 1

(a) Three (b) four (c) five (d) fifteen

3 Which is the fundamental force of nature that operates among all objects in the universe? 1

(a) Weak nuclear force (b) Strong nuclear force
(c) Gravitational force (d) Electromagnetic force

4 Parsec is the unit of 1

(a) Time (b) distance (c) frequency (d) angular acceleration

5 Which one of the following does not have the same dimensions? 1

(a) Tension and surface tension (b) Impulse and momentum
(c) Work and torque (d) velocity and speed

6 When a horse pulls a wagon, the force that causes the horse to move forward is the force 1

(a) That ground exerts on the horse (b) That horse exerts on the ground

(c) That wagon exerts on the horse (d) That horse exerts on the wagon.

7 An athlete runs some distance before taking a long jump, because 1

(a) He gains energy to take him through long distance.

(b) It helps to apply large force.

(c) By running, he gives himself larger inertia of motion.

(d) By running, action and reaction forces increase.

8 While walking on ice, one should take small steps to avoid slipping. This is because, smaller steps ensure 1

(a) Larger friction (b) smaller friction

(c) larger normal force (d) smaller normal force.

9 A man of mass 75kg is standing on a spring balance inside a lift. If the lift falls freely downwards, then, the reading of the spring balance will be 1

(a) Zero (b) 75kgf (c) >75kgf (d) <75kgf

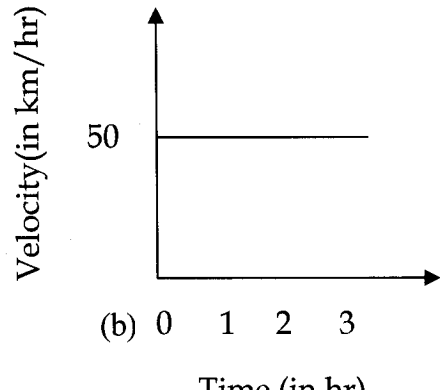
10 A graph is drawn with force along Y-axis and time along X-axis. The area under the graph represents 1

(a) Impulse of the force (b) displacement (c) work (d) energy

11 The mean length of an object is 5cm. Which of the following measurements is most accurate? 1

(a) 4.9cm (b) 4.805 (c) 5.25cm (d) 5.4cm

12 Velocity-time graph for the uniform motion of a car is shown in figure. The displacement of the car in the first 2 hours is 1



(a) 150km (b) 50km (c) 50km (d) 25km

13 An object is released from rest and falls in the absence of air resistance. Which of the following is true about its motion? 1

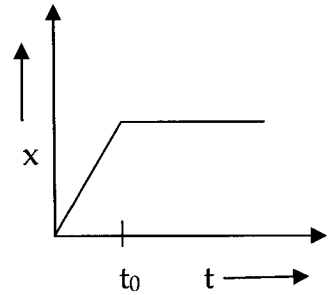
(a) Its acceleration is zero (b) Its acceleration is constant

(c) Its velocity is decreasing (d) Its acceleration is increasing

14 A particle moves in a circular path of radius 'r'. In half the period of revolution, its displacement and distance covered are 1

(a) $2r,\ 2\pi r$ (b) $r/\sqrt{2},\ \pi r$ (c) $2r,\ \pi r$ (d) $r,\ \pi r$

15 Figure shows the displacement-time graph of a particle moving along X-axis. Which of the following statement is correct? 1



(a) The particle is continuously going in positive X- direction.
(b) The particle is at rest.
(c) The velocity increases upto time t_0 and then becomes constant.
(d) The particle moves at a constant velocity upto time t_0 and then stops.

16 Two bodies are moving in opposite direction with speed 'v'. What is the magnitude of their relative velocity? 1

(a) 0 (b) v (c) v/2 (d) 2v

17 The angle between $\vec{A} = \hat{i} + \hat{j}$ and $\vec{B} = \hat{i} - \hat{j}$ is 1

(a) 45^0 (b) -45^0 (c) 90^0 (d) 180^0

18 Which of the following does not confirm to a projectile? 1

(a) A bullet fired from a gun.
(b) A stone thrown horizontally from the top of a tower.
(c) Taking of an aircraft.
(d) Throwing a cricket ball from one player to another.

19 A body is projected at an angle of projection 35^0. To get the same range with the same velocity of projection, the body should be projected at an angle 1

(a) 70^0 (b) 55^0 (c) 65^0 (d) 53^0

20 An aeroplane is flying horizontally at a velocity 'u'. It drops a packet from a height 'h'. The time taken by the packet to reach the ground will be 1

(a) $\sqrt{2hg}$ b) $\sqrt{\frac{2h}{g}}$ (c) $\sqrt{\frac{h}{2g}}$ (d) $\sqrt{\frac{u}{h}}$

SECTION B

21 Check whether equation $s = ut + \frac{1}{2}at^2$ is dimensionally correct, where 'u' is initial velocity, 'a' is uniform acceleration, 't' the time taken and 's' the distance travelled. 2

22 During rate of cooling experiment suddenly air conditioner in the lab is switched on. What kind of error will occur? How can this error be minimized? 2

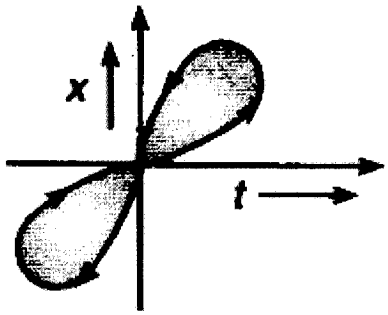
23 (i) State polygon law of vector addition. 2
(ii) Define displacement vector and unit vector.

OR

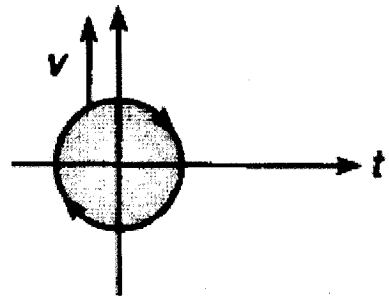
(i) State parallelogram law of vector addition.
(ii) Define equal vector and null vector.

24 State whether the two given graphs represent one-dimensional motion of a particle. If not give reason in each case. 2

(i)



(ii)



25 Define angle of repose. Prove that angle of repose is equal to coefficient of static friction. 2

26 (i) Why are wheels made circular? Explain. 2
(ii) Why are shockers used in scooters and cars?

OR

(i) Why is it difficult to move a cycle along a road with its brakes on?
(ii)Why are cars, buses, trucks and bogies of train provided with a spring system?

27 (i)Give any two differences between gravitational force and electromagnetic force. 2
(ii)Write the four fundamental forces in the ascending order of their strength.

SECTION C

28 Show that the path followed by a projectile is a parabola, when it is projected at an angle θ with the horizontal. 3

29 Derive an expression for acceleration of a body sliding down a rough inclined plane with the help of free body diagram. 3

30 (i) State any two advantages of SI system over other systems of units. 3

(ii) Find the dimensions of 'a' and 'b' in the equation $F = a\sqrt{x} + bt^2$, where 'F' is force , 'x' is distance and 't' is time.

OR

(i) Write any two limitations of the method of dimensional analysis.

(ii) If $x = a + bt + ct^2$, where' x 'is in metre and 't' in seconds, find the units of 'b' and 'c'.

31 A projectile is fired horizontally with a velocity of 98m/s from a cliff 490m high. Calculate (i) the time taken to reach the ground (ii) distance of the target from the cliff. 3

(iii)the velocity with which the projectile hits the ground.

OR

A body is projected such that its kinetic energy at the top is $3/4^{th}$ of its kinetic energy. What is the initial angle of the projectile with the horizontal?

32 (i) What is the angular velocity of the minute hand of a clock? 3

(ii) Prove that the vector addition is commutative.

33 Define instantaneous acceleration. Derive an expression for the distance travelled by a uniformly accelerated body in the n^{th} second. 3

34 It is easier to pull a lawn mower than to push it. Explain with the help of necessary free body diagrams. 3

SECTION D

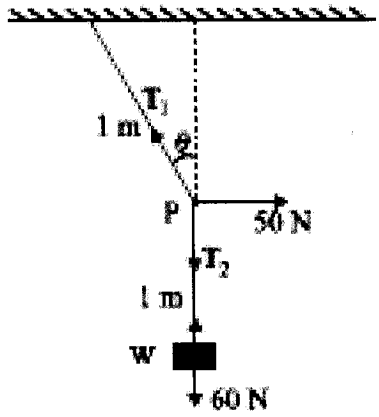
35 (i) State Newton's second law of motion. Prove that the second law is the real law of motion. 5

(ii) A car of mass 1000 kg is moving with a velocity of 10 m/s and is acted upon by a forward force of 1000 N due to engine and retarding force of 500 N due to friction. What will be the velocity after 10 seconds?

OR

(ii) State and prove law of conservation of linear momentum.

(iii)A mass of 6kg is suspended by a rope of length 2m from a ceiling. A force of 50N in the horizontal direction is applied at the midpoint of the rope as shown in the diagram. What is the angle the rope makes with the vertical in equilibrium? Neglect the mass of the rope.



36 (i) Draw the position-time graphs for uniform motion of two objects initially occupying different positions but having zero relative velocity. 5

(ii) Two balls of different masses (one lighter and other heavier) are thrown vertically upward with same initial speed. Which one will rise to the greater height? Explain.

(iii)Draw velocity-time graph of uniform motion and prove that the displacement of an object in a time interval is equal to the area under velocity-time graph in that time interval.

OR

(i) Draw the position-time graphs for uniform motion of two objects initially occupying different positions but having non-zero relative velocity.

(ii) Is it possible for a body to be accelerated without speeding up or slowing down? Give an example for the situation.

(iii)Derive the relation $v^2 = u^2 + 2as$ for uniformly accelerated motion of an object along a straight line.

37 (i) Derive an expression for centripetal acceleration of an object in uniform circular motion in a plane. 5

(ii) Find the angle of projection at which the horizontal range and maximum height of a projectile are equal.

OR

(i) A body is projected at an angle θ with the horizontal. Derive an expression for time of flight, horizontal range and maximum height attained.

(ii) An aeroplane takes off at an angle of 30^0 to the horizontal. If the component of its velocity along the horizontal is 250km/hr, what is its actual velocity? Also find the vertical component of its velocity.

End of the Question Paper