M.E.S. INDIAN SCHOOL, DOHA – QATAR
FIRST TERMINAL EXAMINATION – JUNE - 2014

SUBJECT : PHYSICS

Class : XI (CBSE) Time : 3 Hrs. Max. Marks: 70

SET : A

General Instructions :

a) All questions are compulsory.

b) There are **26** questions in total. Questions **1 to 5** are very short answer type questions and carry **one** mark each.

c) Questions **6 to 10**, carry **two** marks each, questions **11 to 22** carry **three** marks each, Question **23** is value based question carries **4** marks and questions **24 to 26** carry **five** marks each.

d) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.

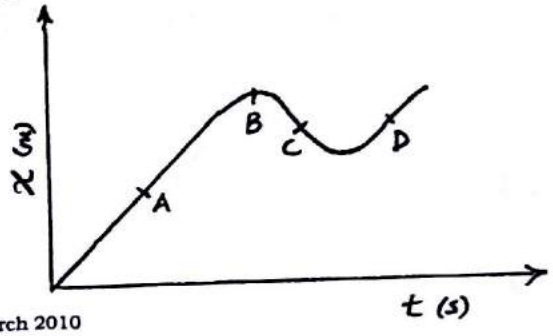
e) Take value of g = $10 m/s^2$

f) Use of calculators is not permitted. However, you may use log tables if necessary.

Questions 1 – 5 carry 1 mark each.

1. Write the dimensions of the physical quantity having unit pascal-second.

2. The displacement-time (x-t) graph of a moving particle is as shown in figure. At which point on the graph the instantaneous velocity of the particle is negative.



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3. A body is moving along a circular path such that its speed always remains constant. Should there be a force acting on the body ? Why ?

4. What are conservative forces. Give an example.

5. What happens to the kinetic energy of a body if its mass is halved and its speed is doubled.

Questions 6 – 10 carry 2 marks each.

6. Define significant figures. Which of the following measurements is the most accurate and why ?
   i) 20.0g (ii) 0.0002g (iii) 2.0g (iv) 2×10^{-6}g

7. What do you mean by uniform motion. Represent uniform motion graphically.

8. Define the following :
   i) unit vector (ii) null vector

9. State Newton's second law of motion. Show that it gives a measure of force.

OR

What do you mean by recoiling of guns ? Why does a heavy rifle not hit back as strongly as a light rifle using the same catridge.

10. Define power. Prove that the instantaneous power is equal to the scalar product of force and velocity.

Questions 11 – 22 carry 3 marks each.

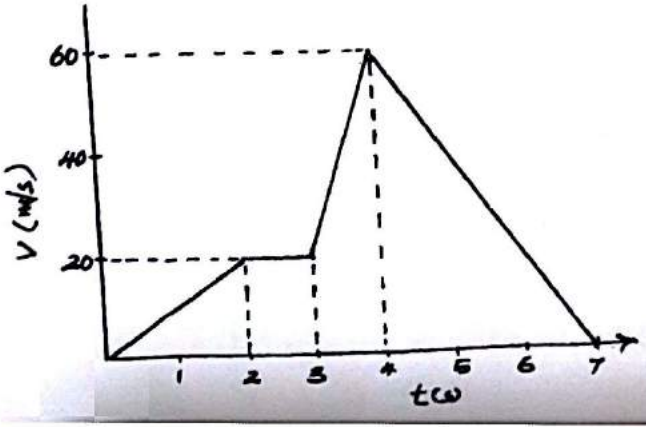
11. State the principle of homogeneity of dimensions. Show dimensionally that the time period of a simple pendulum is given by

$$T = 2\pi \sqrt{\frac{l}{g}}$$

where l is the length and g is the acceleration due to gravity.

12. Check the dimensional consistency in the case of following equations.
   i) $v^2 - u^2 = 2as$ (ii) $S = ut + 1/3\ at^2$

13. The velocity-time graph of an object moving along a straight line is shown in figure. Find the distance travelled by the object between t = 0s to t = 7s and the maximum value of acceleration during this interval .



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14. State the parallelogram law of vectors. Find expressions for the magnitude and direction of the resultant of two vectors $\vec{A}$ and $\vec{B}$.

15. Two bodies A (1 kg) and B (3kg) are dropped from heights of 16m and 25m respectively. Find the ratio of the time taken by them to reach the ground.

16. With the help of a neat labelled diagram derive an expression for the centripettal acceleration of an object in uniform circular motion. What will be the direction of the velocity and acceleration at any instant.

17. i) What do you mean by resolution of vectors.
ii) Rain is falling vertically with a speed of $35ms^{-1}$. Wind start blowing after sometime with a speed of $12ms^{-1}$ in east to west direction. In which direction should a boy waiting at the bus stop should hold his umbrella.

OR

Explain the scalar product of two vectors. Show that vectors $\vec{A} = 2i - 3j - k$ and $\vec{B} = -6i + 9j + 3k$ are parallel.

18. Define coefficient of static friction and angle of friction. Obtain the relation between them.

19. An electric bulb suspended from the roof of a carriage by a flexible wire shifts through an angle of 22°, when the train goes around a horizontal curved path of radius 180m. Find the speed of train.

20. A batsman defects a ball by an angle 45° without changing its initial speed which is equal to 54km/h. What is the impulse imparted to the ball ? Mass of the ball = 150g.

21. i) Derive an expression for the potential energy of a stretched spring.
ii) When a long spring is strethed by 2cm, potential energy, stored in it is U. If the spring is stretched by 10cm, what is the new potential energy.

22. A particle moves around a circle with a constant speed. Name the type of this motion. With the help of a neat labelled diagram obtain the relation between linear velocity and angular velocity.

Questions 23 is value based question carries 4 marks.

23. Dheeru arrived Mumbai Railway station along with his father to appear for the IIT Entrance Examination which was to be held in the next morning. They wished to go from the station to a hotel located 10km away in a straight road from the station. A dishonest cabman took them along a circuitous path 23 km long and reached the hotel in 28 min and claimed more money. Knowing that they are going to be cheated Dheeru suggested his father to contact the police immediately. Realising this the cabman got scared and left the place without making much argument. They went to the hotel room peacefully.

1) What according to you are the values exhibited by Dheeru.
2) What is the average speed of the taxi.
3) What is its average velocity.

Questions 24 – 26 carry 5 marks each.

24. i) What do you mean by a projectile. A projectile is fired with a velocity u making an angle θ with the horizontal. Show that its path is parablic

ii) A bullet fired at an angle 30° with the horizontal hits the ground 3.0 km away. By adjusting its angle of projection, can one hope to hit a target 5.0km away. Assume that the muzzle speed to be fixed, and neglecting the air resistance.

OR

i) Deduce the following relations graphically for a uniformly accelerated motion along a straight line where the letters have their usual meaning.
a) $v = u + at$ (b) $v^2 - u^2 = 2as$

ii) Starting from rest an aeroplane takes off after covering 0.7 km on the run way. If it takes off at $35 ms^{-1}$ calculate the
a) acceleration and (b) the time for which it moves along the run way.

25. i) State and prove the law of conservation of linear momentum using third law of motion.

ii) A 30 kg shell is flying at $48 ms^{-1}$. When it explodes its one part of 18kg stops while the remaining part flies on. Find the velocity of the latter.

OR

i) What do you mean by banking of roads. With the help of a neat labelled diagram, explain how banking provides the necessry centripettal force for a car to move along a cicrular track. Also obtain the expression for the maximum velocity of the car to take the curve without skidding.

ii) Explain why the pilot of an aeroplane does not fall down, while taking a vertical loop.

26. i) State the principle of conservation of energy and prove it for a freely falling body.

ii) A particles moves from a point $\vec{r}_1 = 3i + 2j - 6k$ to position $\vec{r}_2 = 14i + 13j - 9k$ under the action of a force $F = 4i + j + 3k$ newton. If the displacement between the points is in m, calculate the work done.

OR

i) Define kinetic energy. Derive an expression for the kinetic energy of a moving object.

ii) A running man has half the kinetic energy that a boy of half his mass has. The man speeds up by 1m/s and then has the same kinetic energy as the boy. What were the original speeds of the man and the boy.

THE END

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FIRST TERMINAL EXAMINATION – JUNE - 2014

SUBJECT : PHYSICS

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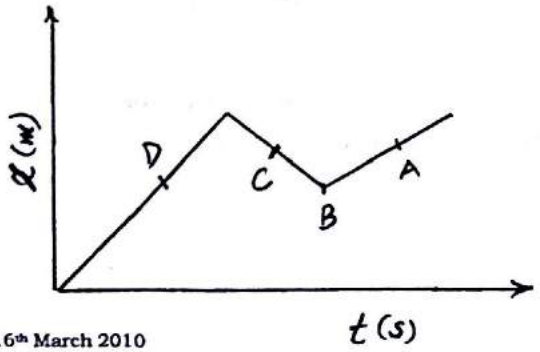
e) Take value of $g = 10 m/s^2$

f) Use of calculators is not permitted. However, you may use log tables if necessary.

Questions 1 – 5 carry 1 mark each.

1. Write the dimensions of the physical quantity having units joule - second.

2. The displacement-time (x-t) graph of a moving particle is as shown in figure. At which point on the graph the instantaneous velocity of the particle is negative.



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3. The resultant of two forces of 6N and 8N io 10N. What will be the angle between the forces.

4. What do you mean by impulse. Write its SI unit.

5. A light body and a heavy body have equal kinetic energy. Which one will have greater momentum.

Questions 6 – 10 carry 2 marks each.

6. Define significant figures. Which of the following measurements is the most accurate and why ?
   i) 20g (ii) 0.00200g (iii) 2.0g (iv) 2×10^{-9}g

7. What do you mean by uniformly accelerated motion. Represent the same graphically.

8. Define the following :
   i) position vector (ii) modulus of a vector

9. State Newton's second law of motion. Prove first law of motion from second law.

OR

What do you mean by recoiling of guns ? Why does a heavy rifle not hit back as strongly as a light rifle using the same catridge.

10. Define power. Prove that the instantaneous power is equal to the scalar product of force and velocity.

Questions 11 – 22 carry 3 marks each.

11. State any two limitations of dimensional analysis. Show dimensionally that the frequency of vibration of a stretched string is given by

$$\vartheta = \frac{1}{2l}\sqrt{\frac{F}{m}}$$

where the letters have their usual meanings

12. Check the dimensional consistency in the case of following equations.
   i) $v = u + at$ (ii) $S = ut + \frac{1}{2} at^2$

13. State the parallelogram law of vectors. Find expressions for the magnitude and direction of the resultant of two vectors $\vec{P}$ and $\vec{Q}$.

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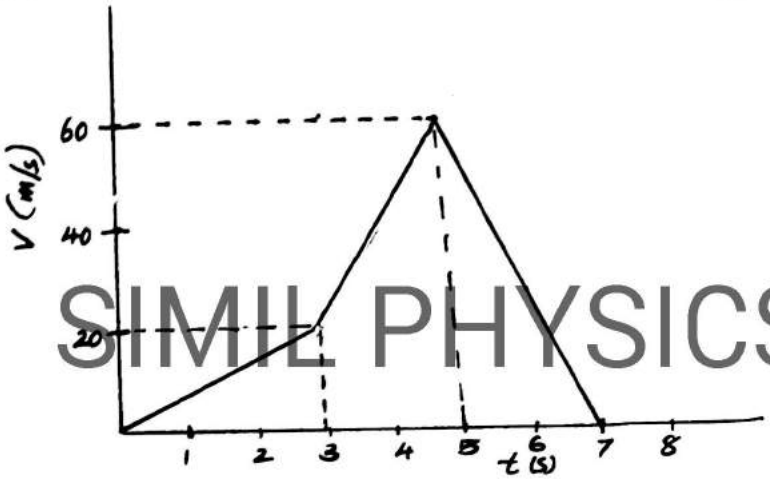

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ii) A bullet fired at an angle 30° with the horizontal hits the ground 3.0 km away. By adjusting its angle of projection, can one hope to hit a target 5.0km away. Assume that the muzzle speed to be fixed, and neglecting the air resistance.

OR

i) Deduce the following relations graphically for a uniformly accelerated motion along a straight line where the letters have their usual meaning.
a) $S = ut + \frac{1}{2}at^2$ (b) $v^2 - u^2 = 2aS$

ii) Starting from rest an aeroplane takes off after covering 0.7 km on the run way. If it takes off at 35 ms^{-1} calculate the
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ii) A particles moves from a point $\vec{r}_1 = 3\hat{i} + 2\hat{j} - 6\hat{k}$ to position $\vec{r}_2 = 14\hat{i} + 13\hat{j} - 9\hat{k}$ under the action of a force $\vec{F} = 4\hat{i} + \hat{j} + 3\hat{k}$ newton. If the displacement between the points is in m, calculate the work done.

OR

i) Define kinetic energy. Derive an expression for the kinetic energy of a moving object.

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e) Take value of $g = 10 m/s^2$

f) Use of calculators is not permitted. However, you may use log tables if necessary.

1. Write the dimensions of light year.

2. Can a quantity have dimensions but still have no unit. If yes give example.

3. Can x-t graph of an object moving in straight line be parallel to the time axis ? Why ?

4. A ball is thrown straight up. What is its velocity and acceleration at the top.

5. Use of ball-bearings between two moving parts of a machine is a common practice why ?

6. State the laws of static friction.

7. What do you mean by negative work?

8. The momentum of a body is 'p' and its kinetic energy is 'E'. What will be its kinetic energy when the momentum is 2p.

9. List any two limitations of dimensional analysis.

10. What do you mean by uniform motion. Represent it graphically.

11. Define the following:
    a) Unit vector (b) Equal vectors

12. Resultant of two equal forces acting at right angles to each other is 1414 dyne. Find the magnitude of each force.

13. A bullet is dropped from a certain height and at the same time another bullet is fired horizontally from the same height. Which one will hit the ground first and why ?

14. What is meant by recoil of a gun? Write an equation for the recoil velocity.

15. The outer rail of a curved railway track is generally raised over the inner. Why ?

16. Friction is a non conservative force. Explain.

OR

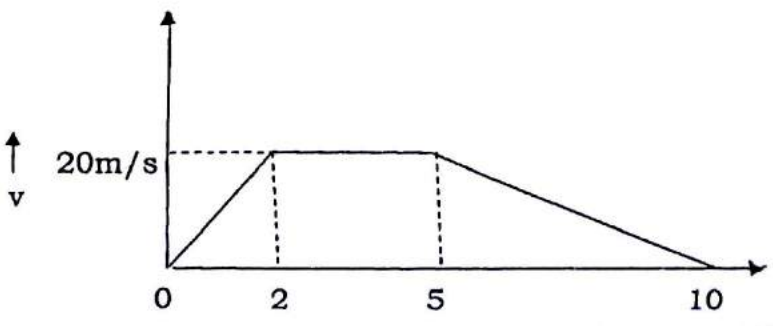
Show graphically that friction is a self adjusting force.

17. Define the terms.
    i) Mean absolute error
    ii) Relative error
    iii) Percentage error
    How are they calculated ?

18. Show dimensionally that the time period of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$ where 'l' is the length of the pendulum and 'g' is the acceleration due to gravity.

19. Derive the second equation of motion graphically.

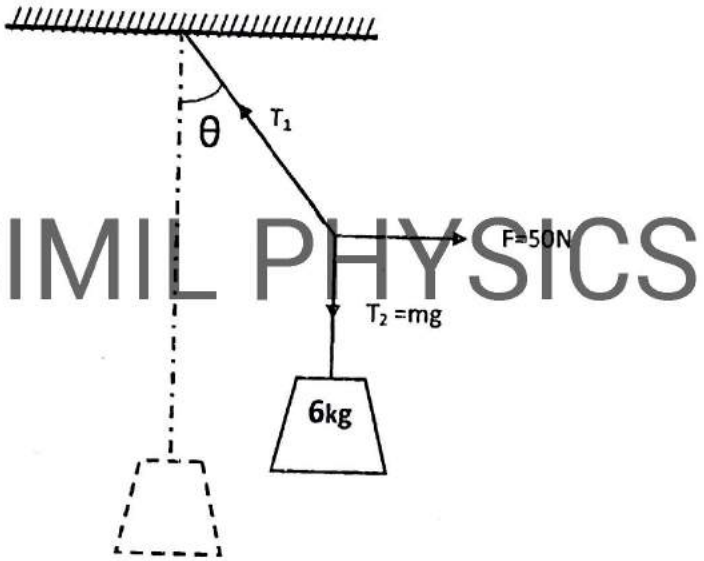
20. The velocity –time graph of an object moving along a straight line is shown in figure. Calculate the acceleration of the object during the time intervals.
    (i) 0 – 2s (ii) 2 – 5s (iii) 5 -10s



21. Define the terms momentum and impulse. Obtain the relation between them.

22. Define angle of repose. Show that $\tan\theta = \mu$ where θ is the angle of repose and μ is the coefficient of static friction.

23. A body of mass 5 kg 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 figure.



What is the angle the rope makes with the vertical in equilibrium, take $g = 10ms^{-2}$. Neglect the mass of the rope

24. State and prove work-energy theorem.

OR

Define kinetic energy. Derive an expression for the kinetic energy of a body of mass 'm' moving with a velocity 'v'.

25. What do you mean by scalar product.

ii) Show that the vectors $\vec{A} = 2i - 3j - k$ and $\vec{B} = -6i + 9j + 3k$ are parallel to each other.

26. Depak was on his way back home from school. He was walking beside a railway track. Looking down he found a crack in one of the rail joints. With a shiver of fear he understood the fact that the Chennai-Mangalore Express train was approaching with a speed of about 72km/hr. Searching for ideas he realised that he was wearing the school blazer which was red in colour. He pulled it out and waved in air standing beside the track. Fortunately the engine driver saw the red cloth at a distance of about 400m and was able to stop the train just before reaching the crack in 10s and could save the lives of hundreds of passengers. Everyone praised Deepak for his timely act.

i) List any two values shown by Deepak in this situation.
ii) What could be the deceleration produced by the breaks to the motion of the train.

Contd....4

27. A projectile is fired with a velocity 'u' making an angle 'θ' with the horizontal. Show that its path is a parabola. Also find expressions for
    i) Maximum height attained (ii) Time of flight.

OR

i) Derive an expression for the centripetal acceleration of an object in uniform circular motion.

ii) If both speed and radius of the circular path of the object are doubled, what will happen to centripetal acceleration.

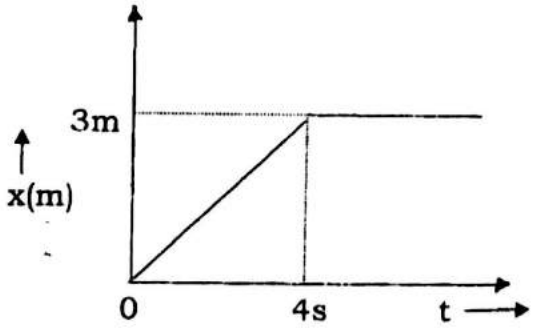
28. i) State and prove the law of conservation of linear momentum using Newton's third law of motion.

ii) A batsman hits back a ball straight in the direction of the bowler without changing its speed of 16m/s. if the mass of the ball is 250g, determine the impulse imparted to the ball.

OR

i) State Newton's second law of motion. With the help of the law establish a relationship between the force and acceleration produced on an object.

ii) The position- time graph of a particle of mass 4 kg moving in one dimension is shown in figure. What is the force on the particle for
(a) T < 0s (b) 0 < t < 4 s and (c) t > 4s.



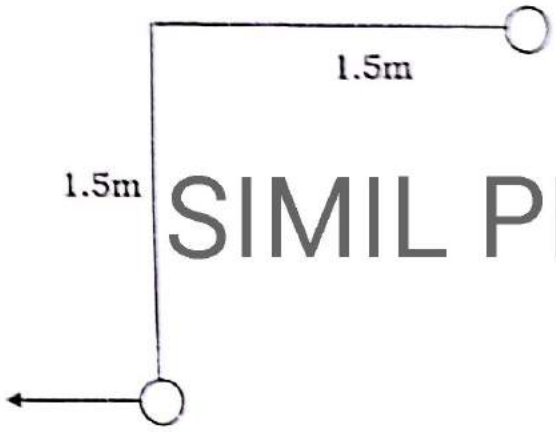
29. i) State the principle of conservation of energy. Prove it for a freely falling object.

ii) The mass of an aeroplane is 480 quintal (1quintal = 100 kg). It starts from rest and develops a speed of 42m/s just before the take off. If the length of the runway is 2km, Calculate the power developed at the time of take off.

OR

Contd.....5

i) Define power. Write its SI units and dimensions.
ii) Derive an expression to find power in terms of force and velocity.
iii)The bob of a pendulum is released from a horizontal position as shown in figure. If the length of the pendulum is 1.5m, what is the speed with which the bob reaches the lowermost Point B (Neglect air resistance)



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e) Take value of $g = 10 m/s^2$

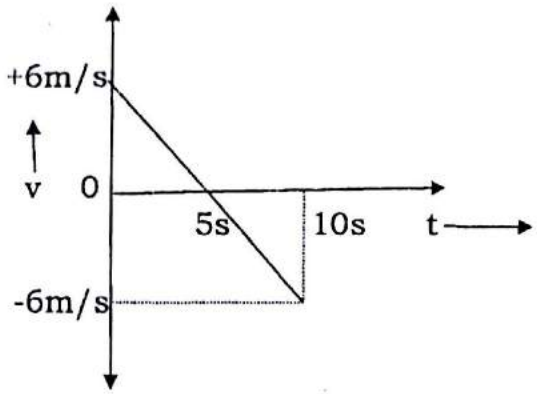
f) Use of calculators is not permitted. However, you may use log tables if necessary.

1. Can a quantity have neither units nor dimensions? If yes give an example.

2. In the equation $\left(p+\frac{a}{v^2}\right)(v-b)$ = constant what is the unit of 'a'

3. Can a body in one dimensional motion with zero velocity have non-zero acceleration at the same time ? If yes give example.

4. The v-t graph of an object is shown below.



What will be the displacement covered in 10s ?

5. What is the unit of coefficient of static friction.

6. Why does an electric fan continue to rotate for sometime after the current is switched off.

7. How will the momentum of a body change if its kinetic energy is doubled.

8. Define horse power.

9. State the principle of homogeneity of dimensions.

10. What do you mean by instantaneous velocity. Express it mathematically.

OR

Define instantaneous acceleration. Write the mathematical expression for the same.

11. Define the following:
    (i) Orthonormal unit vector (ii) null vector

12. Two equal forces each of magnitude F are acting at right angles. Show that their resultant is $\sqrt{2}$ times F.

13. Outline the principle of rocket propulsion.

14. Why does a cyclist lean inward while negotiating a curve.

15. A bullet 'A' is dropped from a certain height and at the same time another bullet'B' is fired horizontally from the same height. Which one will hit the ground first and why ?

16. Write any two methods to reduce friction.

17. Using dimensions convert 9.8N into dyne.

OR

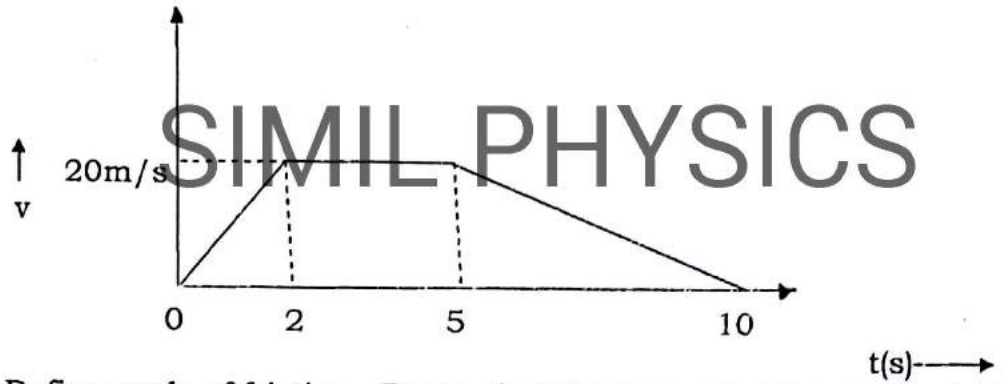
Using dimensions prove that $1J = 10^7 erg$.

18. Show dimensionally that the centripetal force acting on a body of mass 'm' moving with a velocity 'v' is given by $F_c = \frac{kmv^2}{r}$ where r is the radius of the circular path.

19. Derive the third equation of motion graphically.

20. The velocity –time graph of an object moving along a straight line is shown in figure. Calculate the acceleration of the object during the time intervals.

(i) 0 – 2s (ii) 2 – 5s (iii) 5 -10s

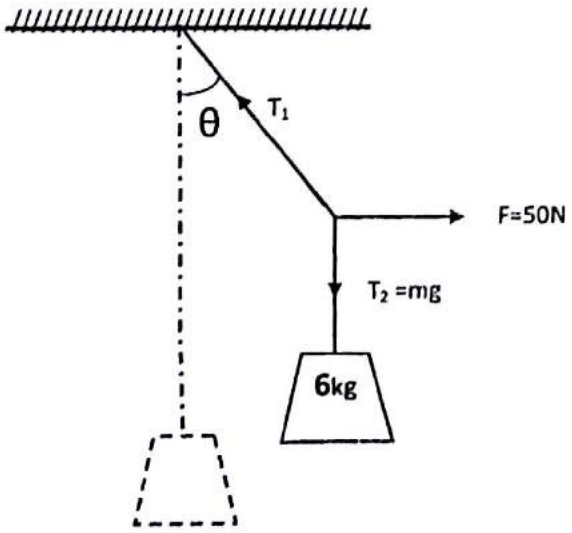


21. Define angle of friction. Prove that the tangent of the angle of friction is numerically equal to the coefficient of static friction.

22. Define the terms momentum and impulse. Obtain the relation between them.

23. State and prove work-energy theorem.

24. A body of mass 6 kg 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 figure.



What is the angle the rope makes with the vertical in equilibrium, take g = 10ms^{-2}. Neglect the mass of the rope

25. What do you mean by cross product of two vectors.

ii) Show that the vectors $\vec{A} = (4\hat{i} - 3\hat{j} + 2\hat{k})$ and $\vec{B} = (3\hat{i} + 2\hat{j} - 3\hat{k})$ are perpendicular to each other.

26. Depak was on his way back home from school. He was walking beside a railway track. Looking down he found a crack in one of the rail joints. With a shiver of fear he understood the fact that the Chennai-Mangalore Express train was approaching with a speed of about 72km/hr. Searching for ideas he realised that he was wearing the school blazer which was red in colour. He pulled it out and waved in air standing beside the track. Fortunately the engine driver saw the red cloth at a distance of about 400m and was able to stop the train just before reaching the crack in 10s and could save the lives of hundreds of passengers. Everyone praised Deepak for his timely act.

i) List any two values shown by Deepak in this situation.
ii) What could be the deceleration produced by the breaks to the motion of the train.

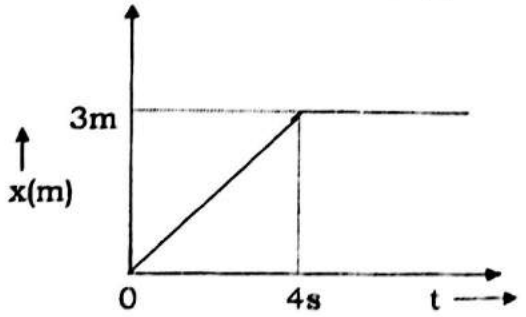
27. i) State and prove the law of conservation of linear momentum using Newton's third law of motion.

ii) A batsman hits back a ball straight in the direction of the bowler without changing its speed of 16m/s. if the mass of the ball is 250g, determine the impulse imparted to the ball.

OR

i) State Newton's second law of motion. With the help of the law establish a relationship between the force and acceleration produced on an object.

ii) The position- time graph of a particle of mass 4 kg moving in one dimension is shown in figure. What is the force on the particle for
(a) T < 0s (b) 0 < t < 4 s and (c) t > 4s.



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28. A projectile is fired with a velocity 'u' making an angle 'θ' with the horizontal. Show that its path is a parabola. Also find expressions for
    i) Maximum height attained (ii) Time of flight.

OR

i) Derive an expression for the centripetal acceleration of an object in uniform circular motion.

ii) If both speed and radius of the circular path of the object are doubled, what will happen to centripetal acceleration.

29. i) State the principle of conservation of energy. Prove it for a freely falling object.

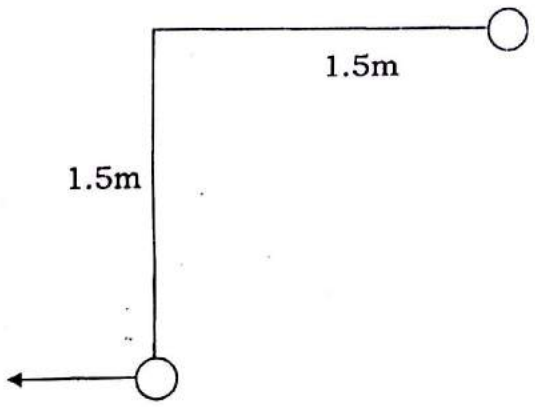
ii) The mass of an aeroplane is 480 quintal (1quintal = 100 kg). It starts from rest and develops a speed of 42m/s just before the take off. If the length of the runway is 2km, Calculate the power developed at the time of take off.

OR

i) Define power. Write its SI units and dimensions .

ii) Derive an expression to find power in terms of force and velocity.

iii)The bob of a pendulum is released from a horizontal position as shown in figure. If the length of the pendulum is 1.5m. What is the speed with which the bob reaches the lowermost Point B (Neglect air resistance)



THE END

M.E.S. INDIAN SCHOOL, DOHA – QATAR

FIRST TERMINAL EXAMINATION – JUNE - 2012

SUBJECT : PHYSICS

Class : XI (CBSE) Time : 3 Hrs. Max. Marks: 70

SET : A

General Instructions :

a) *All questions are compulsory.*

b) *There are 30 questions in total. Questions **1 to 8** are very short answer type questions and carry **one** mark each.*

c) *Questions **9 to 18**, carry **two** marks each, questions **19 to 27** carry **three** marks each and questions **28 to 30** carry five marks each.*

d) *There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.*

e) *Use of calculators is not permitted. However, you may use log tables if necessary.*

1. What is the work done by the centripetal force in moving a body on a circular path of radius r ? (1)

2. At what angle of projection should an athlete throw a ball for maximum horizontal distance ? (1)

3. Why are the vehicles provided with wheels and ball-bearings ? (1)

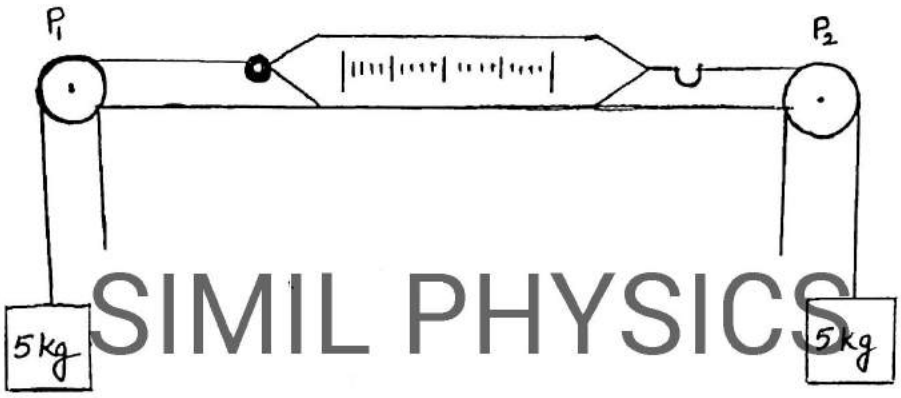
4. Give an example for a dimensional constant and write its dimensional formula. (1)

5. Can a body have a finite acceleration even if its velocity is zero ? Justify. (1)

6. Which of the following measurements is more accurate ? 2.0 kg or 2.000 kg? Justify. (1)

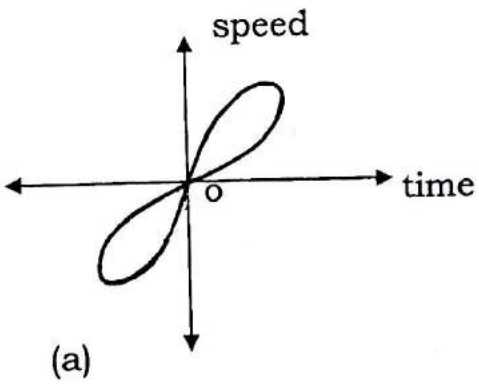
7. Give two examples of scalar product of two vertors. (1)

8. Two 5kg weights are attached to a spring scale as in fig. What is the reading of the scale? (1)

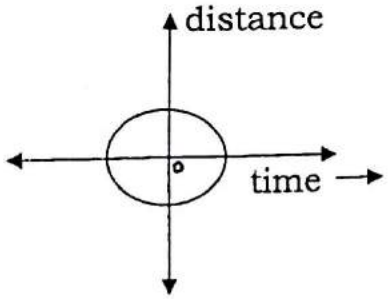


9. From the equation $\left(P+\frac{a}{V^2}\right)(V-b)=RT$, find the dimensions of a and b if, P is pressure of the gas, V is its volume, R is gas constant and T is the temperature. (2)

10. Look at the following graphs (a) to (d). Justify why none of them represent 1 – D motion of the particle.

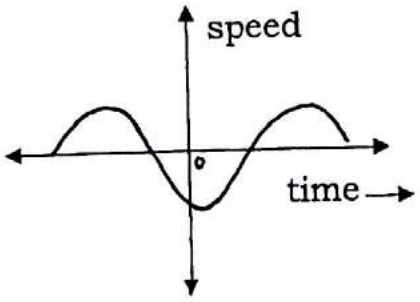


(a)

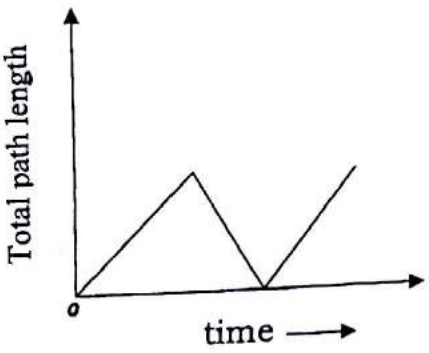


(b)

(2)



(c)



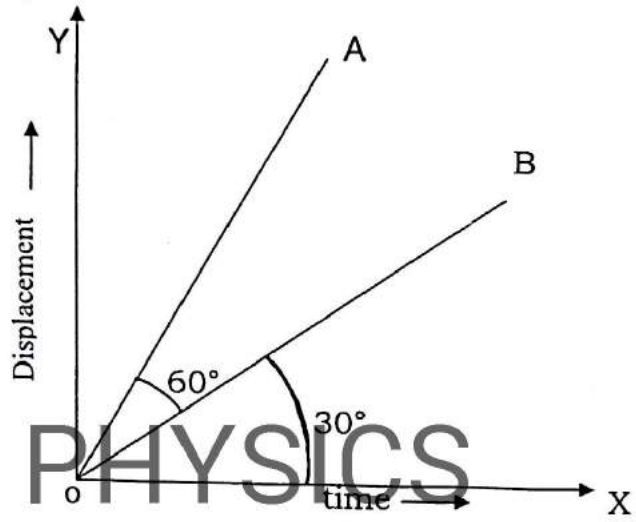
(d)

OR

The motion of two bodies A and B are represented by two straight lines drawn on the same displacement - time graph, making angles 60° and 30° with time – axis respectively. (2)

i) Which body has greater velocity ?

ii) Find the ratio, $\frac{V_A}{V_B}$



11. Quote the number of significant figures in the following :
a) 0.00650 (b) 30400 (c) 430.00 (d) 4.39×10^{-9}m. (2)

12. What are conservative and non-conservative forces ? Give an example for each. (2)

13. A ball of mass m moves in a circular path of radius r_1 and r_2 with speeds V_1 and V_2 respectively. If $r_1 < r_2$, find the relation V_1 and V_2, when the centripetal acceleration is same in both cases. (2)

14. What do you mean by impulsive force? Show that impulse is equal to the change in momentum. (2)

15. On a certain rainy day, rain falls vertically downward with a speed of 35m/s. A wind starts blowing after sometime with a speed of 12m/s in east to west direction. Draw the vector diagram and find in which direction, should a boy waiting at a bus stop hold his umbrella? (2)

16. A physical quantity $X = \frac{a^2 b^3}{\sqrt{c^5 d^2}}$. The % error in the measurement of a, b, c and d are 1%, 2%, 4% and 3% respectively. What is the % error in quantity X ? If the value of X calculated on the basis of above relation is 2.763, to what value should you round off the result ? (2)

17. Why does the gun recoil ? Derive the recoil velocity of the gun. (2)

18. If the magnitude of two vectors $\vec{A}$ and $\vec{B}$ are 3 and 4, and the value of their scalar product is 6, then find the angle between the vectors. (2)

19. State and explain law of conservation of linear momentum on the basis of Newton's III law of motion. (3)

Contd....4

20. The time period (T) of a simple pendulum may possibly depend on the factors like mass of the bob (m), length of the pendulum (l) and acceleration due to gravity (g). Use the method of dimensions to derive an expression for the time period of the simple penduluim. (Take the value of constant $K = 2\pi$)

OR

While measuring the time period (T) of a simple pendulum, the successive readings come out to be 2.56 s, 2.42 s, 2.63 s 2.71 s and 2.80s. Calculate.

i) the mean absolute rror.
ii) relative error and
iii) % error in T. (3)

21. State and prove work-energy theorem. (3)

22. A man weighing 70 kg stands on a weighing scale in an elevator, that is moving,
a) upwards with a uniform speed of 10m/s
b) downwards with a uniform acceleration of 5m/s.
c) upwards with a uniform acceleration of 5 m/s.
What would be the reading of the scale **in each case**.(Take $g = 10m/s^2$). (3)

23. What do you mean by angle of repose of an inclined plane ? Show that angle of repose of an inclined plane is equal to the angle of friction, for a body sliding down the plane. (3)

24. Prove that, total mechanical energy remins constant for all positions, when a ball of mass m is dropped from a tower of height h. Also sketch the energy distance graph for the same. (3)

25. What is a projectile motion ? Show that the trajectory of a projectile motion of a body is a parabola. (3)

26. A boy pulls his friend in a home-made trolley by means of a rope inclined at 30° to the horizontal. If the tension in the rope is 200N,

a) Draw the vertical and horizontal components of tension (T) in the rope
b) Find the effective force pulling the trolley along the ground.
c) Find the force tending to lift the trolley off the ground. (3)

27. The position of an abject from an arbitrary origin is given by $x = 5t^3 + 4t^2 + 9$ (x is in metre and t is in second). Find the acceleration of the object as a function of time t. Calculate its value at (3)
(i) t =1s
(ii) t = 2s.

M.E.S. INDIAN SCHOOL, DOHA – QATAR

FIRST TERMINAL EXAMINATION – JUNE - 2012

SUBJECT : PHYSICS

Class : XI (CBSE) Time : 3 Hrs. Max. Marks: 70

SET : B

General Instructions :

a) *All questions are compulsory.*

b) *There are 30 questions in total. Questions* ***1 to 8*** *are very short answer type questions and carry* ***one*** *mark each.*

c) *Questions* ***9 to 18****, carry* ***two*** *marks each, questions* ***19 to 27*** *carry* ***three*** *marks each and questions* ***28 to 30*** *carry five marks each.*

d) *There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.*

e) *Use of calculators is not permitted. However, you may use log tables if necessary.*

1. Can a body have a constant velocity, but varying speed ? Why ? (1)

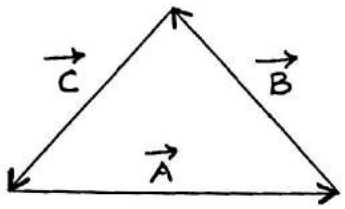
2. Action and reaction are equal and opposite. Yet, they do not cancel each other. Why ? (1)

3. State the principle of homogeneity. (1)

4. Give two examples of dot product of two vectors. (1)

5. What is the other angle of projection possible for same horizontal range with same initial speed, when a body is thrown up at an angle α with the horizontal ? (1)

6. What is the resultant of the three vectors lying on a plane as in fig.



(1)

7. What is the work done by the car moving with uniform speed on a smooth leveled road ? (Neglect air resistance). Justify. (1)

8. Draw x-t graph for nonzero relative velocity ($v_a > v_b$) of two bodie A and B. (1)

9. Find the dimensions of $\frac{ac}{b}$ from the equation $x = a+bt + ct^2$; where x is in metre and t in second. Name the physical quantity obtained .

OR

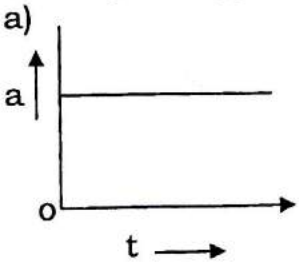
Check the correctness of the equation $K.E = \frac{1}{2}mv^2 + ma^2t^2$. dimensionally. (2)

10. A boatman can row with a speed of 10km/hr in still water. If the river flows steadily at 5 km/hr, in which direction should the boatman row in order to reach a point on the other bank directly opposite to the point from where he started ? The width of the river is 2km. (2)

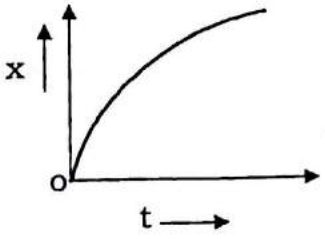
11. If the magnitude of two vectors $\vec{P}$ and $\vec{Q}$ are 4 and 5, and the value of their scalar product is 10, then find the angle between the two vectors. (2)

12. Identify the type of motion from the graphs shown. (2)

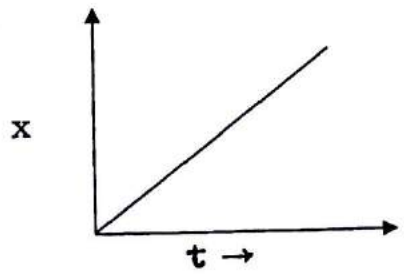
a)



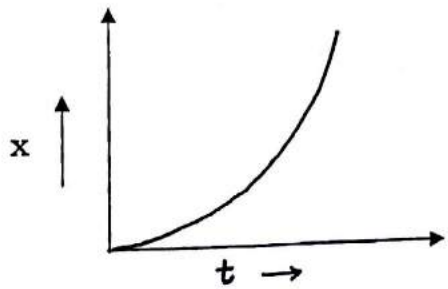
b)



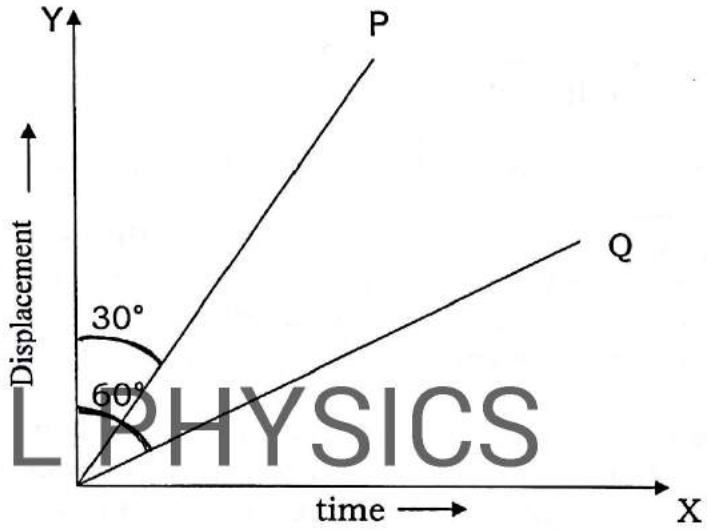
c)



d)



13. The motion of two bodies P and Q are represented by two straight lines drawn on the same displacement time graph making angles 30° and 60° with y- axis respectively.
i) Which body has greater velocity ?
ii) Find the ratio, $\frac{Vp}{Vq}$



(2)

14. What are inertial and non- inertial frames of reference ? (2)

15. A hiker stands on the edge of a cliff 490m above the ground and throws a stone horizontally with an initial speed of 15m/s. Neglecting air resistance, find (i) the time taken by the stone to reach the ground (ii) the vertical component of final velocity with which it hits the ground. (2)

16. The radius of a sphere is measured with an error of ±2%. What would be the % error in the volume of the sphere ? (2)

17. Derive the equation F = ma as the consequence of Newton's II law of motion. (2)

18. What kind of energy is stored in a stretched spring. Derive it by graphical method. (2)

19 What is a projectile motion ? Show that the trajectory of a projectile motion of a body is a parabola. (3)

20. What do you mean by angle of repose of an inclined plane ? Show that the angle of repose of an inclined plane is equal to the angle of friction, for a body sliding down the plane. (3)

21. A boy pulls his friend in a home-made trolley by means of a rope inclined at 30° to the horizontal. If the tension in the rope is 200N, (3)

a) Draw the vertical and horizontal components of tension (T) in the rope
b) Find the effective force pulling the trolley along the ground.
c) Find the force tending to lift the trolley off the ground.

22. Prove that, total mechanical energy remins constant for all positions, when a ball of mass m is dropped from a tower of height h. Also sketch the energy distance graph for the same. (3)

23. State and explain law of conservation of linear momentum on th basis of Newton's III law of motion. (3)

24. A man weighing 70 kg stands on a weighing scale in an elevator, that is moving,
a) upwards with a uniform speed of 10m/s
b) downwards with a uniform acceleration of 5m/s.
c) upwards with a uniform acceleration of 5 m/s.
What would be the reading of the scale **in each case**.(Take $g = 10m/s^2$). (3)

25. The position of an abject from an arbitrary origin is given by $x = 5t^3 + 4t^2 + 9$ in metre unit. Find the acceleration of the object as a function of time t. Calculate its value at (i) t =1s (ii) t = 2s. (3)

26. State and prove work-energy theorem. (3)

27. The viscous force F act on a body of radius r moving with a velocity v through a liquid medium of coefficient of viscositgy η. Derive an expression for viscous force by the method of dimensions. (Take the value of proportionality, $K = 6\pi$)

OR

Compute mean absolute error and percentage error of the following observations of the focal length (f) of a convex lens measured as 17.2 cm, 17.9 cm, 18.3 cm, 18.1 cm , 18.0 cm and 17.8 cm. How is the focal length expressed accurately ? (3)

28. a) The sum and difference of two vectors $\vec{A}$ and $\vec{B}$ are (5)
$\vec{A} + \vec{B} = (2\hat{i} + 6\hat{j} + \hat{k})$ and $\vec{A} - \vec{B} = (4\hat{i} + 2\hat{j} - 11\hat{k})$.
Find (i) $\vec{A} \cdot \vec{B}$ (ii) $\vec{A} \times \vec{B}$.

b) Show that $\vec{P} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ is parallel to $Q = -4\hat{i} + 6\hat{j} - 8\hat{k}$.
(3+2=5)

OR

State the parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector in terms of other two vectors that form the arms of a parallelogram. How is the magnitude and direction of the resultant vector modify when the two given vectors orient perpendicular to each other.

29. i) A body is projected with a velocity u at an angle θ with the horizontal. Obtain expressions for (a) time of flight (T) (b) Maximum vertical range (H) and (c) maximum horizontal range (R).

ii) A cricketer can throw a ball to a maximum horizontal distance of 100m. How much high above the ground can he throw the same ball. (3+2)

OR

a) A particle of mass m is moving on a circular path of radius r, with a uniform angular speed (ω). Define centripetal acceleration. Derive an expression for it and show that its acceleration ($r\omega^2$) is directed towards the centre.

b) An aircraft executes a horizontal loop of radius 1 km with a steady speed of 900km/hr. Compare the centripetal acceleration with the acceleration with the acceleration due to gravity. (3+2)

30. a) Drive the equations of motion for a uniformly accelerated (non-uniform) motion of a body by the graphical method. (3)

b) A particle starting from origin goes along x-axis to the point (20 m, 0m) and then returns along the same line to the point (-20m, 0m) in 10s. Calculate (i) the distance and the displacement of the particle during the trip. (ii) Average speed and average velocity of the particle during the entire trip. (3+2)

Jr.

THE END

M.E.S. INDIAN SCHOOL, DOHA – QATAR

FIRST TERMINAL EXAMINATION – JUNE - 2011

SUBJECT : PHYSICS

Class : XI (CBSE) Time : 3 Hrs. Max. Marks: 70

General Instructions :

a) *All questions are compulsory.*

b) *There are 30 questions in total. Questions* ***1 to 8*** *are very short answer type questions and carry* ***one*** *mark each.*

c) *Questions* ***9 to 18****, carry* ***two*** *marks each, questions* ***19 to 27*** *carry* ***three*** *marks each and questions* ***28 to 30*** *carry five marks each.*

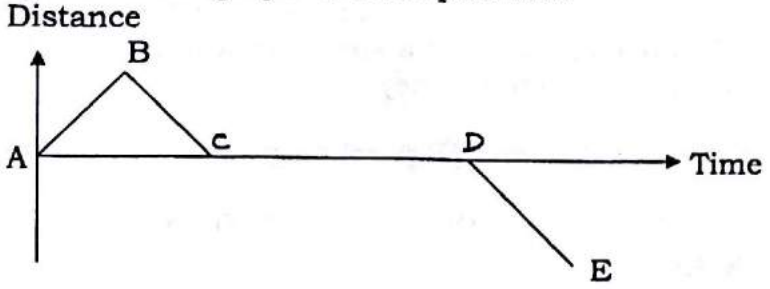
d) *There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.*

e) *Use of calculators is not permitted. However, you may use log tables if necessary.*

1. Mention a scalar and a vector physical quantity having same dimensions. (1)

2. A body makes 5 complete revolutions in a circle of radius 1m. Find the distance and displacement of the body. (1)

3. Which two parts of the graph are not possible. (1)



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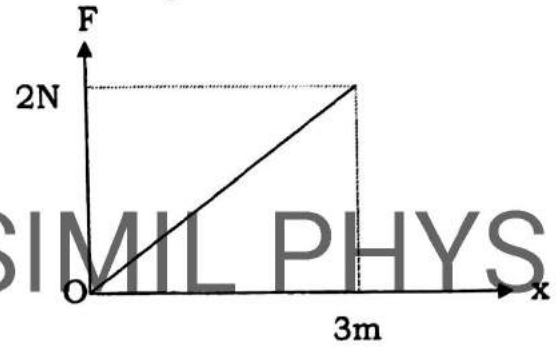
4. A bus is running with a constant velocity. A passenger drops a ball from the window. What is the trajectory of the ball (a) as seen by the passenger (b) as seen by an observer on the ground ? (1)

5. If a man jumps from a roof with a brief case on his head then, what is the force exerted by the briefcase on the head of the man ? (1)

6. Find the work done by a variable force shown by the graph. (1)



7. Can we change momentum of a body without changing its kinetic energy ? (1)

8. Define power and give its S. I unit. (1)

9. The velocity 'v' of a particle depends upon the time 't' according to the equation. (2)

$V = a + bt + \frac{c}{d+t}$. Determine the dimensions of a,b,c, and d.

10. The temperature of two blocks are measured by two different devices as follows. (2)

$\theta_1 = (21.0 \pm 0.1)°C$ and $\theta_2 = (41.0 \pm 0.2)°C$

Find $\theta_2 - \theta_1$.

OR

Convert 1 dyne into newton using the method of dimensions.

11. A body travels a distance of 5km with a unifom speed of 5km/h and then a distance of 10 km at a speed 20 km/h. Find the average speed for the complete journey. (2)

12. State (i) triangle law and (ii) parallelogram law of addition of vectors. (2)

13. For a particle moving with uniform velocity plot (i) x-t graph and (ii) v-t graph. (2)

14. Prove that range for any number of degree greater than 45° will be equal to the range for an equal number of degree less than 45°. (2)

15. A hammer weighing 3 Kg moving with velocity of 100ms^{-1} strikes against the head of a spike and drive it into a block of wood. If the hammer comes to rest in 0.025 s, find (2)

    (i) the impulse (ii) the average driving force on the spike

16. Justify the following statements. (2)

    a) "It is easier to make a body roll over the surface of another than to make it slide".
    b) "The proper inflation of tyre saves pertol".

17. Find the workdone in moving a particle along a vector $\vec{S} = 4\hat{i} - \hat{j} + 7\hat{k}$ if the applied force is $\vec{F} = \hat{i} - 2\hat{j} + \hat{k}$ (2)

18. a) A train is moving with a constant speed of 10m/s on a straight railway track. If the force exerted by the engine is 500N, find the power of the engine. (2)

    b) Write the dimensional formula for (i) power (ii) force.

19. A planet moves round the sun in a ciruclar orbit, the time period of revolution T of the planet depends on (i) radius of the orbit R, (ii_) mass of the sun M (iii) gravitational constant G. Prove dimensionally that $T^2 \propto R^2$ (3)

20. A body covers 12m in 2nd second and 20m in 4th second. What is the distance covered in 7th second ? (3)

OR

A constant force acts on a particle and its displacement y (in cm) is related to t(in s) by the equation, $t = \sqrt{y} + 3$. What is the displacement of the particle when its velocity is zero ?

21. Show that the centripetal acceleration of a body moving in a uniform circular motion is $a = \frac{v^2}{r}$. (3)

22. A football player kicks a ball at an angle of 30° with an initial speed of 20m/s. Assuming that the ball travels in a vertical plane, calcualte (a) the maximum height reached (b) the horizontal range of the ball and (c) the time for which the ball is in the air ($g = 10m/s^2$). (3)

23. Show that the resultant of two vectors $\vec{P}$ and $\vec{Q}$ which make acute angle between them is $\vec{R} = \sqrt{P^2 + Q^2 + 2PQCos\theta}$ (3)

24. Derive an expression for the recoil velocity of a gun. (3)

25. A man weighs 70 kg. He stands on a weighing machine in a lift, which is moving (3)
(a) upwards with a uniform speed of $10ms^{-1}$
(b) downwards with a uniform acceleration of $5m/s^2$
(c) upwards with a uniform acceleration of $5\ m/s^2$. (Take $g = 10m/s^2$)

What would be the readings on the scale in each case ? What would be the reading if the lift mechanism failed and it came down freely under gravity ?

26. a) State the laws of limiting static friction. (3)
b) What is the angle between frictional force and instantaneous velocity of the body moving over a rough surface ?

27. What are (i) conservative (ii) non-conservative forces. Give one example for each. (3)

28. Derive the following equations of motion graphically. (5)

i) $v = u + at$ (ii) $S = ut + \frac{1}{2}at^2$ (iii) $v^2 = u^2 + 2as$
Where the symbols have their usual meaning.

OR

a) Show that the displacement of an object in nth second is $S_{n^{th}} = u + \frac{a}{2}(2n-1)$.

b) A bus starts from rest and moves with a constant acceleration of $2m/s^2$. Find the distance traveled by the bus in

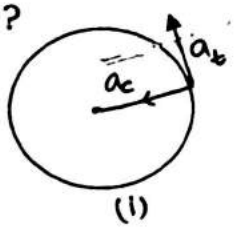
(i) 3 seconds (ii) 3rd second.

29. A stone is projected with a velocity 'u' in a direction making an angle 'θ' with the horizontal. Find (i) the maximum height attained (ii) time for which the projectile remains in air (iii) the horizontal range. (5)

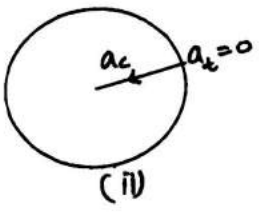
OR

a) Show that a body projected at angle θ with the vertical follows a parabolic path. At what angle of projection, will the maximum range be obtained?

b) Which of the following figures depicts uniform circular motion and why ?



(i)



(ii)

30. a) Deduce Newton's I law and III law from II law of motion.

b) State and prove the law of conservation of linear momentum. (5)

OR

a) State (i) angle of friction (ii) angle of repose.
b) Show that angle of friction is equal to the angle of repose. Support your answer with necessary diagrams.

Jr.

THE END