International Indian School Dammam

First Terminal Examinations June 2012

Class XI

Subject -- Physics (Theory)

Time 3 Hours | Max Marks 70

General Instructions:

i. *Attempt All questions. There is NO overall choice in question. Although internal choice is given in one question of 3 marks and all three questions of 5 marks. Draw necessary diagram to explain your answer.*

ii. *Symbols have their usual meaning .Allotted marks to each question indicated against questions. All parts of a question attempt together.*

iii. *Question No. 1 to 8 carry one marks each. Que. No. 9 to 18 carry two marks each. Que. No. 19 to 27 carry three marks each. Que. No. 28 to 30 carry five marks each.*

iv. *Use of calculator not allowed. You may use log tables for calculations.*

v. *Use $g = 10\ m/s^2$ in numerical .Neglect air resistance.*

Set A

1. Which fundamental force is (i) strongest and (ii) Weakest .
2. Write down the significant figures in (i) 5.24×10^{-3} m (ii) 0.2370 g cm^{-3}.
3. What is the magnitude and direction of acceleration at highest point when a ball thrown vertically upward.
4. Two vectors **A** and $\sqrt{3}$ **A** are acting perpendicular to each other. What is the angle of resultant vector with **A** .
5. Pick out ***only*** vector quantity in the following list.

   current, impulse, charge, angular frequency, relative velocity.
6. Draw position- time for an object moving with (i) positive acceleration and (ii) negative acceleration.
7. Arrange the following frictional forces in decreasing order of magnitudes.

   Rolling friction, Static friction, kinetic friction
8. Two bodies of mass m_1 and m_2 are acted upon equal force. What is the ratio of $a_1 : a_2$.

9. A pebble of mass 0.05 kg is thrown vertically upward. Give the direction and magnitude of the net force on the pebble during its upward motion.

10. Name the base quantities and mention their SI units.

11. A physical quantity $Y = a\sqrt{b} / c^{3/2}$. If the percentage error in a , b and c are 1% , 3 % and 2% respectively then find the percentage error in Y.

12. What are the sources of systematic errors. How can we minimise these errors in measurement

13. Define Null vector and give its properties.

14. A constant retarding force of 50 N is applied on a body of mass 5 kg moving initially with a speed of 10 m/s. How long does it take to come in rest.

15. Derive following equations of motion using velocity – time graph.

    (i) $S = ut + (1/2)\, at^2$ (ii) $v^2 = u^2 + 2as$.

16. "Friction is a necessary evil." Explain it with examples.

17. Draw position – time graph of two objects when moving with (i) zero relative velocity and (ii) unequal velocities in opposite directions , showing their time of meeting. Consider their motion as straight line motion.

18. An aircraft executes a horizontal loop of radius 1.oo km with a steady speed of 900 km/h. Compare its centripetal acceleration with acceleration due to gravity.

19. What would be the weight of a man of mass 60 kg stands on a weighing scale in a lift which is moving

    (i) upward with a uniform speed of 10 m/s (ii) downwards with a uniform acceleration of 5 m/s^2. Show your mathematical work.

20. What is Parallax method to find distance of a planet ? With help of a suitable diagram point out Parallactic angle and basis.

21. The centripetal force F acting on a body during circular motion depends on mass of the body m , speed of revolution v and radius of path r. Derive the relation for centripetal force dimensionally.

22. Draw the *position –time, velocity –time* and *acceleration – time* graph of a body under free fall.

23. Define uniform circular motion and derive the relation for velocity and acceleration of an object in uniform circular motion using suitable diagram.

24. The position of a particle is given by $\mathbf{r = 3.0t\ i + 2.0t^2 j + 5.o\ k}$ where t is in second and the coefficients have the proper units for r to be in metres. Find **v** and **a** of the particle.

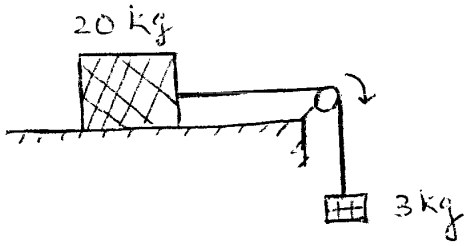
25. State Newton's 3rd law of motion and derive Newton's 2nd law of motion using it.

26. Two trains of lengths 109 m and 91 m are moving in opposite directions on parallel tracks with velocities 34km/h and 38 km/h respectively. In what time the two trains will completely cross each other? Choose the most logical reference point for time measurement.

27. Two masses 8 kg and 12 kg are connected at the two ends of a light inextensible string that goes over a frictionless pulley. Find the acceleration of the masses and tension in the string when the masses are released. Draw the diagram to show the various forces acting.

OR

What is the acceleration of the block and trolley system shown in the figure. If the coefficient of kinetic friction between the trolley and the surface is 0.04 ? What is the tension in the string ?. Neglect the mass of the string.



28. (i) State the parallelogram law of vector addition. Find the magnitude and direction of the resultant vector when two vectors P and Q are acting making an angle Θ between them.

(ii) A car travels 50 km at a uniform speed of 40 km/h and next 30 km at a uniform speed of 20 km/h. Find its average Speed.

OR

(i) With help of vector diagram show that (a) $A + B = B + A$ (b) $(A + B) + C = A + (B + C)$

(ii) Show $A + B$ and $A - B$ in common vector diagram.

(iii) A car travels 50 km in 30 min and then next 30 km in 20 min. Find its average speed during journey.

29. (i) What do you mean by the term banking of roads? Obtain an expression for the maximum speed with which a body can take a turn safely on a banked rough road. Draw the suitable diagram to show various forces acting on the body.

(ii) A shell of mass 20 g is fired by a gun of mass 100 kg. If the muzzle speed of the shell is 80 m/s, What is the recoil speed of the gun.

OR

(a) Explain Why (i) A horse cannot pull a cart and run in empty space.

(ii) Passengers are thrown forward from their seats when a speeding bus stops suddenly.

(iii) A cricketer moves his hands backwards while holding a catch.

(b) Two billiard balls each of mass 20 g moving in opposite directions with speed 6 m/s collide and rebound with the same speed. What is the impulse imparted to each ball due to the other.

30. (i) Define projectile and projectile motion.

(ii) An object is projected at an angle Θ with initial velocity u from ground then obtain expression for its equation of path and time of flight. Draw suitable diagram to explain your answer.

(iii) An insect trapped in a circular groove of radius 12 cm moves along the groove steadily and Completes 7 revolutions in 100 s. What is the angular speed, linear speed and acceleration of the Motion.

OR

(i) An object is fired making an angle Θ with horizontal in air from ground. Derive the relation for its range R and height H_{max} attained using suitable diagram.

(ii) Show that the angle of projection Θ for a projectile launched from the origin is given by

$\Theta = \tan^{-1} (4 H_{max} / R)$

(iii) A cricket ball is thrown at a speed of 28 m/s in a direction 30^0 above the horizontal. Calculate the maximum height attained and time taken by the ball to return to the same level.

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vi. *Use $g = 10\ m/s^2$ in numerical. Neglect air resistance.*

Set B

1. Arrange the following frictional forces in increasing order of magnitudes.

   Rolling friction, Static friction, kinetic friction

2. Write down the significant figures in (i) 2.99×10^8 m/s (ii) 0.02023 g cm^{-3}.

3. What is the magnitude and direction of acceleration at highest point when a ball thrown vertically upward.

4. Two vectors $\sqrt{3}$ **A** and **A** are acting perpendicular to each other. What is the angle of resultant vector with **A** .

5. Pick out ***only*** scalar quantity in the following list.

   current, impulse, angular frequency, relative velocity.

6. Draw position- time for an object moving with (i) positive acceleration and (ii) negative acceleration.

7. Which fundamental force is (i) strongest and (ii) weakest .

26. Two trains of lengths 109 m and 91 m are moving in opposite directions with velocities 34km/h and 38 km/h respectively on parallel tracks. In what time the two trains will completely cross each other? Choose the most logical reference point for time measurement.

27. Two masses 2 kg and 3 kg are connected at the two ends of a light inextensible string that goes over a frictionless pulley. Find the acceleration of the masses and tension in the string when the masses are released.

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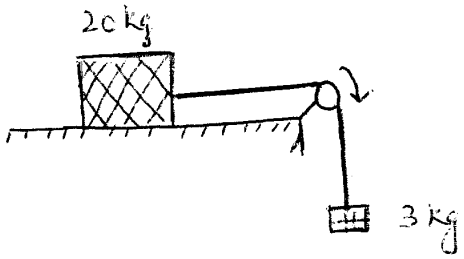
What is the acceleration of the block and trolley system shown in the figure. If the coefficient of kinetic friction between the trolley and the surface is 0.04? What is the tension in the string?. Neglect the mass of the string.



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29. (i) What do you mean by the term banking of roads? Obtain an expression for the maximum speed with which a body can take a turn safely on a banked rough road. Draw the suitable diagram to show various forces acting on the body.

(ii) A shell of mass 30 g is fired by a gun of mass 90 kg. If the muzzle speed of the shell is 90 m/s, What is the recoil speed of the gun.

OR

(a) Explain Why (i) A horse cannot pull a cart and run in empty space.

(ii) Passengers are thrown forward from their seats when a speeding bus stops suddenly.

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(ii) Show $\mathbf{A} + \mathbf{B}$ and $\mathbf{A} - \mathbf{B}$ in common vector diagram.

(iii) A car travels 60 km in 30 min and then next 40 km in 20 min. Find its average speed during journey.

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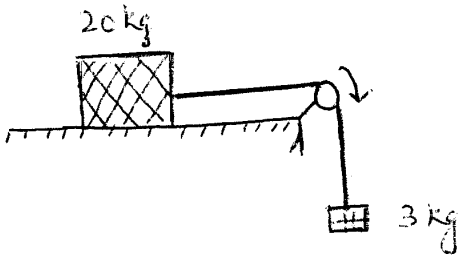

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