International Indian School Dammam

First Terminal Examination – July 2017

Class XI

Time allowed: 3 Hours **Physics (Theory)** **Maximum Marks: 70**

Set A

General Instructions

1. All questions are compulsory. There are 26 questions in all
2. This question paper contains five questions of one mark each, five questions of two marks each, twelve questions of three marks each, one value based question of four marks and three questions of five marks each

Q No. 1-5 1 mark, Q.No. 6-10 2 mark, Q.No. 11-22 3 mark,
Q.No. 23 4 mark, Q.No. 24-26 5 mark.

3. 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 given choices in such questions.
4. Use of calculators not permitted
5. Attempt all parts of a question together. Symbols have their usual meanings. Draw necessary diagrams to explain your answer.

---

1. Name two advancements made in technology on the basis of physics.
2. Why a cyclist has to bend inwards while going on a circular track?
3. Four balls are thrown with same initial velocity at angles 25^0, 35^0, 45^0, and 69.7^0 with the horizontal. Which ball would come back to the ground at the earliest and why?
4. Give two important advantages of S.I units over other systems of units.
5. What is the angle between the directions of velocity and acceleration at the highest point of the trajectory of a projectile?
6. Prove that the impulse received during an impact is equal to the total change in momentum produced during the impact?

   OR

   It is difficult to move a cycle along a road with its brakes on. Explain.

7. A calorie is a unit of heat energy equals 4.2 J, where 1J =1 Kg m^2 s^{-2}. suppose we employ a system of in which the unit of mass equals α kg, the unit of length equals β metre, the unit of time is γ second. Show that a calorie has a magnitude 4.2 α^{-1} β^{-2} γ^2 in terms of the new units.
8. State the number of significant figures in the following

   (i) 600900 (ii) 978.850 (iii) 9.1×10^{-31} (iv) 0.0006032

9. Rain is falling vertically with a speed of 30m/s. A woman rides a bicycle with a speed of 10m/s in the north to south direction. What is the direction in which she should hold her umbrella so as to protect herself from the rain?
10. The position of particle moving along a straight line is given by $x = 2-5t+6t^3$. Find the acceleration when t=2s.
11. Deduce Newton's first and third law from second law?
12. Assuming that the escape velocity of a planet depends on gravitational constant (G), radius (r), and also its density (ρ). Derive an expression for escape velocity from dimensional considerations.
13. State the law of conservation of momentum and prove it using Newton's third law of motion.
14. Find the value of 100 dyne on a system based on metre, kilogram and minute as fundamental units.
15. What provides the necessary centripetal force to a vehicle moving along a leveled circular road? With the help of a neat diagram, obtain the expression for the maximum velocity with which the vehicle can be moved without skidding.

    OR

    Prove that the coefficient of static friction is tangent of the angle of repose.
16. Find the magnitude and the direction of the resultant of two vectors **P** and **Q** in terms of their magnitude and angle between them.
17. Prove that the vectors **A= 2i+ 3j –k , B= 6i+9j+3k** are parallel.
18. The horizontal Range of a projectile is $4\ 3^{1/2}$ times of the maximum height. Calculate the angle of projection?
19. The following observations were made during an experiment to find the radius of curvature of concave mirror using a spherometer ; l= 4.4 cm ; h = 0.085 cm. the distance l between the legs of the spherometer was measured with a metre rod and the least count of the spherometer was 0.001 cm. Calculate the maximum possible error in the radius of curvature.
20. State the laws of static friction.
21. Draw the following graphs for an object under free fall:
    (a) Variation of acceleration with respect to time
    b) Variation of velocity of with respect to time
    (c) Variation of distance with respect to time
22. What are concurrent forces? Obtain the condition for equilibrium of three concurrent forces?
23. Having seen a big stone falling from the top of a tower, Ravi pulled his friend Kiran away. The stone hit Ravi slightly and he got hurt. But he was saved from a major accident
    (a) What values could you find in Ravi?
    (b) From the top of a tower 100m in height, a ball is dropped and at the same time another ball is projected with a velocity of 25m/s. Find when and where the two balls meet. (Take $g = 9.8m/s^2$)

24. (a) What is meant by banking of roads? What is the need of banking of roads? Obtain an expression for the maximum speed with which a vehicle can safely negotiate a curved road banked at angle θ

OR

(a) Establish the relation between linear velocity and angular velocity of a body in uniform circular motion.

(b) Derive an expression for centripetal acceleration of an object in uniform circular motion in a plane. What will be the directions of the velocity and acceleration at any instant?

25. What do you mean by a projectile? A projectile is fired with a velocity V_0 making an angle θ with the horizontal. Find the expression for

(i) maximum height (ii) time of flight and (iii) horizontal range

OR

(a) A projectile is fired with velocity V_0 making an angle θ with the horizontal. Show that its path is parabolic? (b) There are two angles of projection for which the horizontal range is the same. Prove that the sum of the maximum heights for these two angles does not depend upon the angle of projection

26. (a) Derive the relation $S=ut+1/2at^2$ graphically, where the letters have usual meanings.

(b) A jet air plane travelling at the speed of 500 km/h ejects its products of combustion at the speed of 1500 km/h relative to the jet plane. What is the speed of the latter with respect to an observer on the ground?

OR

(a) Derive the relation $v^2 - u^2 = 2aS$ graphically, where the letters have usual meanings.

(b) An insect trapped in a circular groove of radius 12 cm moves along the groove steadily and completes 7 revolutions in 100 second. (a) What is the angular speed, and the linear speed of the motion? (b) Is the acceleration vector a constant vector? What is its magnitude?
