INDIAN SCHOOL MUSCAT
FIRST ASSESSMENT

PHYSICS

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

12.09.2017 | Max. Marks: 70

General instructions

1. *All questions are compulsory. There are 26 questions in all.*
2. *This question paper has five sections: section A, section B, section C, section D and section E.*
3. *Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.*
4. *There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and in 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 constant wherever necessary: $g = 9.8\ m/s^2$*

SECTION A

1. If the magnitudes of $\vec{A} + \vec{B}$ and $\vec{A} - \vec{B}$ are equal, what is the angle between $\vec{A}$ and $\vec{B}$? 1

2. Write the dimensions of the following physical quantities: 1
   (a) coefficient of viscosity
   (b) universal gravitational constant

3. Name the fundamental forces, which have the shortest and the longest range. 1

4. Can there be motion in two dimensions with acceleration only in one dimension? If so give an example. 1

5. What happens to coefficient of limiting friction when the weight of the body is doubled? 1

SECTION B

6. The resistance of a material is given by $R = V/I$ where the potential difference $V = (100 \pm 5)$ V and $I = (10 \pm 0.2)$ A. Find the percentage error in R. 2

7. Give an example of 2
   (a) a physical quantity which has a unit but no dimensions.
   (b) a physical quantity which has neither unit nor dimensions.
   (c) a constant which has dimensions.
   (d) a constant which has no dimensions.

8. (a) Write the steps involved in scientific method. 2

(b) Write any two properties of the electromagnetic force.

9. Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum horizontal range. 2

(OR)

The horizontal range of a projectile is $4\sqrt{3}$ times its maximum height. Find the angle of projection

10. Two boys having the same mass are standing on ice skates at some distance apart on a frictionless surface. A rope is fastened around the body of a boy, the other end of which is in the hand of the second boy. What would happen if the second boy pulls the rope? 2

SECTION C

11. (a) Mention one method to increase friction and one method to decrease friction. (1) 3

(b) Draw a neat free body diagram of a body moving down in an inclined plane with uniform acceleration. Derive an expression for acceleration of this body. (2)

12. (a) State parallelogram law of vector addition. (1) 3

(b) With the help of a neat diagram show that vector addition is commutative. (2)

13. (a) Justify the statement: a uniform circular motion is an accelerated motion. 3

(1)

(b) Establish the relation between linear acceleration and angular acceleration in uniform circular motion. (2)

14. The frequency of vibration v of a string depends on the length of the string l, tension T in the string and linear density m of the string. By the method of dimensions, deduce an expression for frequency of the string. 3

15. With the help of suitable free body diagrams show that it is easier to pull a lawn mower than to push it. 3

16. (a) Derive the relation between impulse and linear momentum. (1 ½) 3

(b) A batsman deflecting a cricket ball of mass 0.2 kg through an angle of 60^0 without changing its initial speed of 108 km/h. What is the value of impulse imparted to the ball?

(1 ½)

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

18. (a)Draw position-time graphs for two objects having zero relative velocity. (1) 3

(b) Two parallel rail tracks run north-south. Train A moves north with a speed of 54 km/h and train B moves south with a speed of 90 km/h. What is the relative velocity of B with respect to A? Also find the relative velocity of ground with respect to B. (2)

19. (a) It is difficult to move a cycle along a road with its brakes on. Give reason. (1) 3

(b) Air is thrown on a sail attached to a boat from an electric fan placed on the boat. Will the boat start moving? Give reason. (2)

20. Draw the position - time, velocity-time and acceleration–time graphs for an object under free fall. 3

21. (a) Write any two advantages of S.I. system over other unit systems. (1) 3

(b) Distinguish between precision and accuracy of a measurement (any two points). (2)

22. With the help of a neat diagram, describe the parallax method for the determination of the distance of a nearby planet from the earth. 3

(OR)

With the help of a neat diagram, describe a method for determination of the diameter of moon.

SECTION D

23. (a) 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. Mention the values displayed by Ravi. (3) 4

(b)From the top of a tower 100 m in height, a ball is dropped and at the same time another ball is projected vertically upwards from the ground with a velocity of 25 m/s. Find when and where the two balls meet. (1)

SECTION E

24. (a) Draw the velocity – time graph of uniformly accelerated motion in one dimension. From the graph, derive an expression relating velocity and time. (3) 5

(b) A body covers a distance of 20 m in the 7^{th} second and 24 m in 9^{th} second. If the motion is uniformly accelerated, how much distance shall it cover in 15 seconds of its motion? (2)

OR

(a) Derive an expression for the distance travelled by a body during the n^{th} second of motion when moving with uniform acceleration. (3)

(b) On a two lane road, car A is travelling with a speed of 36 km/h. Two cars B and C approach car A in opposite directions with a speed of 54 km/h each. At a certain instant, when the distance AB is equal to AC, both being 1 km, B decides to overtake A before C does. What minimum acceleration for car B is required to avoid an accident? (2)

25. (a) What is the need for banking when a road is curved? A car of mass m is moving on a banked road of radius r. The coefficient of friction between the road and the tyre is μ. With the help of a neat diagram obtain an equation for maximum velocity and optimum velocity of the car. (3) 5

(b) A circular racetrack of radius 400 m is banked at an angle of 10°.If the coefficient of friction between the wheels of a race car and the road is 0.2, what is the optimum speed of the race car to avoid wear and tear on its tyres? (2)

(OR)

(a) State and prove the law of conservation of linear momentum. (3)

(b) A boy and a girl skater are at rest at the centre of a large ice rink. They push away from each other. The girl whose mass is 40 kg move off at 1.2 m/s. With what speed will the boy whose mass is 60 kg move off? (2)

26. (a) A projectile is fired with an angle θ with the horizontal. Obtain the expression for the maximum height and time of flight. (3) 5

(b) A shell is fired at an angle of 60^0 to the horizontal direction with a velocity of 392 m/s. Find the time of flight and maximum height attained. (2)

(OR)

(a) What is centripetal force? Derive an expression to find the magnitude and direction of centripetal force in case of a uniform circular motion of an object. (3)

(b) A ball is whirled around a circular path of radius 2 m. The ball makes 5 revolutions in 8 seconds. Calculate the centripetal acceleration of the ball. (2)

End of the Question Paper