HALF YEARLY EXAMINATION, 2018-19

PHYSICS

Time : 3 hrs. **Class - XI** **M.M. : 70**

Date – 18.09.2018 (Tuesday)

Name of the student _____ Section _____

General Instructions :

- All questions are compulsory.
- There are 26 questions in total. Q. Nos. **1 to 5** carry **1 mark** each, Q. nos. **6 to 10** carry **2 marks** each, Q. Nos. **11 to 22** carry **3 marks** each, Q. No. **23** is a value based question carrying **4 marks,** Q. Nos. **24 to 26** carry **5 marks** each.
- There is no overall choice. However internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks weightage.
- Attempt only one of the choices in such questions.
- Use of calculators is not permitted. However you may use log tables. If necessary.

Given :- $\tan 22^0\, 37' = 0.4167$, $\sin 53^0 = 0.8$, $\cos 53^0\, 45' = 0.6$, $\tan 29^0\, 45' = 0.5714$

Q.1 What is the need to take large number of readings in the experiments?

Q.2 What is the significance of the slope of x-t graph.

Q.3 If $\left|\vec{A}\times\vec{B}\right| = \vec{A}.\vec{B}$. What is the angle between $\vec{A}$ and $\vec{B}$.

Q.4 If two bodies have circular path of radius r_1 and r_2 and the time taken to complete one cycle are same, find the ratio of the angular speed.

Q.5 Action and reaction are equal and opposite. Why do they not balance each other?

Q.6 If n^{th} division of main scale coincides with $(n+1)^{th}$ division of vernier scale. Find the least count of the vernier. Given one main scale division is equal to 'a' units.

Q.7 Points P, Q and R are in a vertical line such that PQ=QR. A ball at P is allowed to fall freely. What is the ratio of the times of descent through PQ and QR ?

Q.8 For what value of 'a' are the vectors $\vec{A} = a\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{B} = 2a\hat{i} + a\hat{j} - 4\hat{k}$ perpendicular to each other ?

OR

The diagonals of a parallelogram are given by the vectors $3\hat{i} + \hat{j} + 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$. Find the area of the parallelogram.

Q.9 A ship is steaming due east at 12 m/sec. A woman runs across the deck at 5 m/sec in a direction at right angles to the direction of motion of the ship and then towards north. Calculate the velocity of the woman relative to sea.

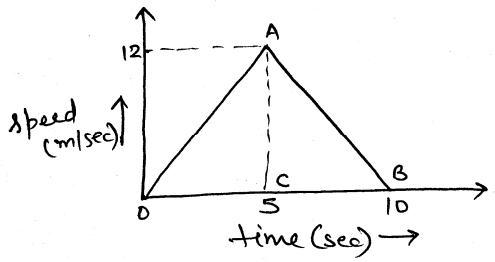
Q.10 The driver of a truck travelling with a velocity 'υ' suddenly notices a brick wall in front of him at a distance 'd'. Is it better for him to apply brakes or to make a circular turn without applying brakes in order to just avoid crashing into the wall? Why?

Q.11 If a body is moving with initial velocity 'u' is acted upon by a constant acceleration 'a' for time 't' then derive expression for final velocity 'υ' and distance travelled 's' in terms of given quantities using calculus method.

Q.12 The critical angular velocity ω_c f a cylinder inside another cylinder containing a liquid at which its turbulence occurs depends on viscosity 'η', density 'ρ' and the distance 'd' between the walls of the cylinder. Find an expression for ω_c.

Q.13 The specific resistance 'σ' of a thin wire of radius 'r' cm resistance RΩ and length L cm is given by $\sigma = \frac{\pi r^2 R}{L}$. If r = (0.26 ± 0.02) cm, R = (32 ± 1) Ω and L = (78 ± 0.01) cm, find the value of 'σ' with limits of percentage error.

Q.14 The speed-time graph of a particle moving along a fixed direction is shown. Obtain the distance travelled by the particle between (i) t=0 to 10 sec (ii) t=2 to 6 sec. What is the average speed of the particle in intervals in (i) and (ii) ?



Q.15 State and prove the law used for addition of two vectors. (Any one)

Q.16 Find the area of the triangle formed by the tips of the vectors $\vec{a} = \hat{i} - \hat{j} - 3\hat{k}, \vec{b} = 4\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$.

OR

To a man walking due east at the rate of 2 km/hr, rain appears to fall vertically. When he increases his speed to 4 km/hr, it appears to meet him at an angle of 45^0. Find the real direction and speed of rain.

Q.17 It is easier to pull a lawn roller than to push it. Explain with diagram.

Q.18 A hunter aims his gun and fires a bullet directly at a monkey on a tree. At the instant the bullet leaves the barrel of the gun, the monkey drops. Will the bullet hit the monkey? Substantiate your answer with proper reasoning.

Q.19 Define centripetal acceleration. Derive an expression for centripetal acceleration of a particle moving with uniform speed 'v' along a circular path of radius 'r'.

Q.20 Obtain an expression for the maximum speed with which a vehicle can safely negotiate a curved road banked at an angle θ. The coefficient of friction between the wheels and the road is μ.

Q.21 How can you show that Newton's first and third laws of motion follows from the Newton's second law of motion?

Q.22 Two masses 'M' and 'm' are connected at the two ends of an inextensible string. The string passes over a smooth frictionless pulley. Calculate the acceleration of the masses & tension in the string. Given (M > m)

Q.23 Ram was going to market when he saw that a person was showing antics of his monkey and people gathered there were enjoying it. Monkey was following all the commands of his owner. After the show, Ram went to the owner of monkey and asked him why he was showing so much cruelty to the monkey. Cruelty to animals is a crime and he can be jailed for that. He should set the monkey free and search for same job. Ram also offered him a job in his factory.

a) What qualities of Ram do you appreciate?

b) A monkey of mass 40kg climbs on a rope which can withstand maximum tension of 600N. In which case, the rope will break when the monkey –

i) climbs up with an acceleration of 6 m/sec^2 ?

ii) climbs up with a uniform speed of 5 m/sec ?

c) Which is better-keeping animals as pets or let them live in their natural habitat? Justify.

Q.24 a) Show that for a projectile the angle between the velocity and the x-axis as a function of time is given by $\theta(t) = \tan^{-1}\left(\frac{v_{0y} - gt}{v_{0x}}\right)$

b) A projectile is fired at an angle θ with the horizontal. Obtain expression for maximum height attained, time of flight and range.

OR

a) Prove the following statement "For elevations which exceed or fall short of 45^0 by equal amounts, the ranges are equal".

b) A bomber, flying upwards at an angle of 53^0 with the vertical, releases a bomb at an altitude of 800 m. The bomb strikes the ground 20 sec after its release. Find :

i) the velocity of the bomber at the time of release of bomb

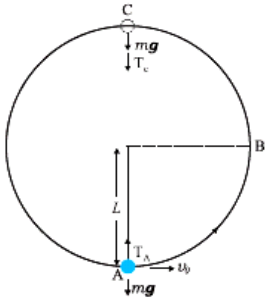
ii) the maximum height attained by the bomb.

iii) the horizontal distance travelled by the bomb before it strikes the ground. ($g = 10 m/s^2$)

Q.25 A body tied to one end of a string is made to revolve in a vertical circle. Derive the expression for the velocity of the body and tension in the string at any point. Hence find tension at the bottom and top of the circle. Also find the minimum velocity at the lowest point so that it is just able to loop the loop.

OR

A bob of mass 'm' is suspended by a light string 'L'. It is imparted a horizontal velocity 'υ_0' at the lowest point A such that it completes a semi-circular trajectory in the vertical plane with the string becoming slack only on reaching the topmost point C. This is shown in figure. Obtain an expression for (i) υ_0 (ii) speed at B and C (iii) find the ratio of kinetic energies (k_b/k_c) at B and C.



Q.26 a) Find an expression for the work done in sliding a body upward over a rough inclined plane.

b) Find an expression for the work done against friction when a body is made to slide down an inclined plane?

OR

a) State the law of conservation of momentum and prove it by Newton's thirds law.

b) A man of mass 'm' is standing on the floor of a lift. Find his apparent weight when lift is -

i) moving upwards with uniform acceleration 'a'

ii) moving downwards with uniform acceleration 'a'