INTERNATIONAL INDIAN SCHOOL DAMMAM

SECOND TERMINAL EXAMINATION 2011

Class - XI

Subject - Physics (Theory)

Time: 3 hours ***Max. Marks 70***

General Instructions

1. ***All questions are compulsory. Symbols have their usual meaning.***
2. ***Use of calculator is not permitted. However you may use log table, if required.***
3. ***Draw neat labelled diagram wherever necessary to explain your answer.***
4. ***Q.No. 1 to 8 are of very short answer type questions, carrying 1 mark each.***
5. ***Q.No.9 to 18 are of short answer type questions, carrying 2 marks each.***
6. ***Q. No. 19 to 27 carry 3 marks each. Q. No. 28 to 30 carry 5 marks each.***

Set A

1. What is the ratio of **A.B** to **A X B** when angle between **A** and **B** is 30^0?
2. What would be the excess pressure inside a water bubble of radius 0.5 mm?
   Surface tension of water at 20^0C is 72×10^{-3} N/m
3. What is the effect on surface tension of liquids when temperature is increased?
4. State Newton's universal law of gravitation and express it in vector form.
5. Two absolute scales A and B have triple points of water defined to be *200 A* and *350 B*. What is the relation between T_A and T_B .
6. A light body and heavy body have equal kinetic energy , which one have greater momentum?
7. Calculate the moment of inertia of a uniform disc of mass *300 g* and radius *15* cm, about its diameter.
8. Write down the dimensions of viscosity coefficient .
9. A physical quantity P is related to four observables a,b,c and d as follows ;
   $P = a^2b^3/c^4\sqrt{d}$. The percentage errors in a,b,c and d are *2%, 4% ,3%* and *2%* respectively. What is the percentage error in the quantity P .
10. Draw the Position – Time graph for following cases when
    (i) Object is moving with positive acceleration (ii) An object is under free fall

11. Explain following with proper reason.
    (a) Why blood pressure in humans is greater at the feet than at brain.
    (b) Water wets the glass surface while mercury does not.

12. Derive the necessary relation for safest velocity of an automobile on a banked road of radius ***r*** and friction coefficient μ.

13. The escape velocity (**v**) of a body depends upon the mass (***m***) of body, gravitational acceleration (***g***) and radius (***R***) of the planet . Derive the relation for escape velocity dimensionally.

14. State and Prove Work- Energy Theorem for variable force case.

OR

What do you mean by conservative and non conservative force. Give one example of each case.

15. Derive the necessary relation for orbital velocity of a satellite and prove that $T^2 \alpha R^3$ using it.

16. Explain with reason Why:

(a) A brass tumbler feels much colder than a wooden tray on a chilly day.

(b) The earth without its atmosphere would be inhospitably cold.

17. State Hooke's law. Explain Stress – Strain curve of a material when subjected under extended load.

18. A body of mass m_1 moving with velocity u_1 along a straight line collide with another body of mass m_2, perfect elastically, which is initially at rest. . Find their velocities after collision.

19. Define molar specific heat capacities at constant volume and pressure. Show that $C_P - C_V = R$. Where Symbols have their usual meaning.

20. State Parallelogram law of vector addition. Find the magnitude and direction of the resultant of two vectors **A** and **B** in terms of their magnitudes and angle between them.

21. (a) Three bodies of identical radii ,a ring a solid sphere and a solid cylinder roll down the same inclined plane without slipping. They start from rest. Which of the bodies reaches the ground with maximum velocity ?

(b) State the Parallel Axes theorem of moment of inertia.

OR

(a) A metal bar 70 cm long and 4 kg in mass supported on two knife edges placed 10 cm from each end. A 6 kg load is suspended at 30 cm from one end. Find the reactions at the knife edges. Assume the bar to be of uniform cross section and homogeneous.

(b) State the theorem of perpendicular axes of moment of inertia.

22. Two masses *8 kg* and *12 kg* are connected at the two ends of an inextensible string that passes over a frictionless pulley. Find the acceleration of the masses and tension in the string when masses are released.

23. What do you mean by acceleration due to gravity? Derive the necessary relation for variation of ***g*** with depth.

24. State Stokes' law and derive the expression for critical velocity in case of a small Spherical body falling through a viscous fluid like Glycerine.

25. State Pascal's law. How it can be used in Hydraulic lift.

26. Define Centre of mass. A body projected into space explodes. What will be the nature of path of its core?

27. If Earth were suddenly shrink to ½ of its present radius without change in mass, What is the effect on duration of day?

28. (a) Derive the equation $S = ut + \frac{1}{2} at^2$ using graphical method.

(b) A ball is thrown vertically upward with a velocity 20 m/s from the top of a multistory building. The height of the point from where the ball is thrown is 25 m from the ground, i) How high the ball rise? ii) With what velocity strike the ground ?

OR

(a) A projectile is fired in air making an angle θ with horizontal. Show that (i) Its path is parabolic in nature. (ii) $\tan\theta = 4H/R$ where H is maximum height attained and R is the range of projectile.

(b) An aircraft executes a horizontal loop of radius 1.00 km with a steady speed of 900 km/h. Compare its centripetal acceleration with the acceleration due to gravity.

29. Answer any three from following.

(a) Suggest some ways to minimize friction.

(b) Explain why it is easier to pull a roller than to push it.

(c) A constant force acting on a body of mass 3 kg changes its speed from 2.0 ms^{-1} to 3.5 ms^{-1} in 25 s. The direction of the motion of the body remains unchanged. What is the magnitude and direction of the force.

OR

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

suddenly.

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

(c) An aircraft executes a horizontal loop at a speed of 720 km/h with its wings banked at 15^0. What is the radius of the loop.

30. (a) What is angle of contact? When it is obtuse ? When it is acute?

(b) Show that excess pressure inside a drop of radius r is $P_i - P_o = 2S/R$.

OR

State and prove Bernoulli's theorem. Explain any one application of it.

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7. *Draw neat labelled diagram wherever necessary to explain your answer.*

Set B

1. What is the ratio of **A.B** to **A X B** when angle between **A** and **B** is $\mathbf{60^0}$?
2. Write down the dimensions of universal gravitation constant .
3. What is the effect on viscosity of gases when temperature is increased?
4. A light body and heavy body have equal momentum , which one have greater Kinetic energy ?
5. Two absolute scales A and B have triple points of water defined to be *275 A* and *50 B*. What is the relation between T_A and T_B .
6. State Newton's universal law of gravitation and express it in vector form.
7. Calculate the moment of inertia of a uniform ring of mass *200 g* and radius *20* cm, about one of its tangent which is perpendicular to the plane of ring.
8. What would be the excess pressure inside a mercury drop of radius 0.8 mm? Surface tension of mercury at 20^0C is $465 X 10^{-3}$ N/m
9. A physical quantity P is related to four observables a,b,c and d as follows ; $P = \sqrt{ab^4 / c^2 d^3}$. The percentage errors in a,b,c and d are *2%, 4% ,3%* and *2%* respectively. What is the percentage error in the quantity P .
10. Draw the Velocity – Time graph for following cases when
    (i) Object is moving with positive acceleration (ii) An object is under free fall
11. Explain following with proper reason.
    (a) Why blood pressure in humans is greater at the feet than at brain.
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12. Derive the necessary relation for safest velocity of an automobile on a banked road of radius ***r*** and friction coefficient μ.

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15. Derive the necessary relation for orbital velocity of a satellite and prove that $T^2 \alpha R^3$ using it.

16. The Energy of a body executing SHM depends on the mass ***m***, its frequency ***f*** and amplitude ***a.*** Derive the relation for energy using dimension methos.

17. State Hooke's law. Explain Stress – Strain curve of a material when subjected under extended load.

18. A body of mass m_1 moving with velocity u_1 along a straight line collide with another body of mass m_2, perfect elastically, which is initially at rest. . Find their velocities after collision.

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