PACE EDUCATIONAL TRUST
PACE JUNIOR SCIENCE COLLEGE ,THANE
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NTPJC SENIOR (2012-2014)

SUMMER VACTION ASSIGNMENT

NOTICE: - 1. All the assignments should be done in SAME register.
2. Complete the Computer Science assignment in class note book as instructed.

PHYSICS

1) For a conical pendulum prove that $\tan\theta = \frac{v^2}{rg}$.
2) What is banking of roads? Obtain an expression for the maximum safety speed of a vehicle moving along a curve in vertical circular motion.
3) An object of mass 2 kg attached to a wire of length 5 cm is revolved in horizontal circle. If it makes 60 r.p.m. find its Angular momentum, Linear speed, Centripetal acceleration & Centripetal force.
4) A car is moving along a horizontal curve of radius 20m, and coefficient of friction between the road and wheels of the car is 0.25. If the acceleration due to gravity is 9.8 m/s^2, then its maximum speed is……
   (a) 3 m/s (b) 5 m/s (c) 7 m/s (d) 9 m/s
5) Out of the following equation which is **WRONG?**
   (a) $\vec{\tau} = \vec{r} \times \vec{F}$ (b) $\vec{a_r} = \vec{w} \times \vec{v}$ (c) $\vec{a_t} = \vec{\alpha} \times \vec{r}$ (d) $\vec{v} = \vec{r} \times \vec{w}$
6) Discuss the variation of 'g' with depth and derive the necessary formula.
7) Define binding energy and obtain an expression for binding energy of a satellite revolving in a circular orbit round the earth.
8) If the earth were made of wood, the mass of wooden earth is 10 % as much as it is now, without the change in its diameter. Calculate the escape velocity of spaceshot from the surface of wooden earth. Radius of earth: R = 6400 km,
9) Mass of earth: M= 6x10^{24} kg, Constant of gravitation: G= 6.67X 10 $^{-11}$ Nm^2 / kg^2.
10) The time period 'T' of the artificial satellite of earth depends on average density ρ of the earth.
   (a) $t \alpha p$ (b) $t\alpha\sqrt{p}$ (c) $t\alpha\frac{1}{\sqrt{p}}$ (d) $t\alpha\frac{1}{p}$
11) Acceleration due to gravity above the earth's surface at a height equal to the radius of the earth is
   (a) 2.5 m/s^2 (b) $5m/s^2$ (c) $9.8m/s^2$ (d) 10 m/s^2
12) Define the radius of gyration, explain its physical significance.
13) State and prove the law of conservation of angular momentum.
14) Moment of inertia of a disc about an axis passing through its centre and perpendicular to its plan is 10 $kg - m^2$. Find its moment of inertia about diameter.
15) The radius of gyration of a ring of radius R about a tangent perpendicular to its to its plane is
   (a) $\sqrt{2}R$ (b) $2R$ (c) $\frac{R}{\sqrt{2}}$ (d) $\frac{R}{2}$

16) Two S.H.M. are represented by $x_1 = a_1 \sin(wt + a_1)$ and $x_2 = a_2 \sin\sin(wt + a_1)$. obtain the expressions the displacement , amplitude and initial phase of the resultant motion.
17) Give graphical representation of S.H.M. when particle start from the positive extreme position.
18) The period of simple of pendulum is found to increase by 50% when the length of the pendulum in increased by 0.6m. Calculate the initial length and initial period of oscillation at place where g=9.8 m/s^2
19) An amplitude of a simple pendulum of the period *T* and length *L* in increased by 5%. The new period that pendulum will be……..

(a) $\frac{T}{8}$ (b) $\frac{T}{4}$ (c) $\frac{T}{2}$ (d) T

20) The displacement of a particle performing linear S.H.M. in one time period is ……

(a) a (b) $2a$ (c) 0 (d) $4a$

21) State and prove Gauss's theorem in an electrostatics.
22) Describe the construction of Van-de-Graaf generator.
23) Derive an expression for electric intensity of point outside a charged spherical conductor.
24) State Gauss theorem and state it's any two applications.
25) Energy stored in a charged capacitor of capacity 25 PF is 4J. Find the charge on its plate.
26) A condenser of capacity 100 μ F is charged to potential of 1kV. Calculate the energy stored in the condenser.
27) Condenser is a device used to store……..

(a) Large charge at low potential (b) Large charge at high potential
(c) Less charge at low potential (d) Less charge at high potential.

MATHEMATICS

1) Prove that the acute angle θ between the pair of the straight lines $ax^2 + 2xy + by^2 = 0$ is given by $\tan\theta = \left|\frac{2\sqrt{h^2-ab}}{a+b}\right|$ where, $a + b \neq \theta$.
2) Find k if one of the lines given by $kx^2 + 10xy + 8y^2 = 0$ is perpendicular to $2x - y = 5$.
3) Find k , if the equation $kxy + 10x + 6y + 4 = 0$ represent a pairs of lines.
4) Find the combined equation of pair of lines passing through the origin and making an angle $30°$ with line $2x - y = 5$.
5) Find the values of p and q if the equation $12x^2 + 7xy - py^2 + 18x + 9y + 6 = 0$ represents a pair of perpendicular lines.
6) Show that every homogeneous equation of second degree in x and y represents a pair of straight lines passing through the origin.
7) Find the acute angle between the lines given by $x^2 - 4xy + y^2 = 0$
8) Find the joint equation of the pair of lines through (1,3) and parallel to the line represented by the equation $3x^2 + 10xy + 8y^2 = 0$
9) If a function is continuous at x=0 where,

$f(x) = \frac{\sin 3x}{5x} + a$, for $x < 0$

$= x + 4 - b$, for $x \geq 0$ find the value of a+b.

10) If $f(x) = \frac{\sqrt{3}-\tan x}{\pi-3x}$, when $x \neq \frac{\pi}{3}$

$= \frac{4}{3}$, when $x = \frac{\pi}{3}$. Discuss the continuity of the at $x = \frac{\pi}{3}$

11) Given: $f(x) = \frac{\log x - \log 3}{x-34}$ for $x \neq 3$. If $f(x)$ is continuous at $x = 3$, find $f(x)$

12) Test the continuity of the function f at $x = 0$ where $f(x) = x^2 \sin(\frac{1}{x})$ for $x \neq 0$

$= 1.$ for $x = 0$

13) Find *k,* if the function

$f(x) = 3x - 4,$ for $0 \leq x \leq 2$

$= 2x+k,$ for, $2 \leq x \leq 4$

is continuous at x=2.

14) If $f(x) = \frac{(5^{\sin x}-1)^2}{x \log(1+2x)} : x \neq 0$ is continuous at x = 0, then find $f(0)$

15) Discuss the continuity of the following function at $x = 1$.

$f(x) = \frac{1}{1-x} - \frac{3}{1-x^3} + \frac{7}{4}$ when $x < 1.$

$= \frac{3}{4}$ when $x = 1.$

$= \frac{\log x}{x-1} - \frac{1}{4}$ when $x > 1.$

CHEMISTRY

1. Define the terms : **(i)** Enthalpy of fusion **(ii)** Enthalpy of solution
2. State and explain Hess's law of constant heat summation .
3. What do you mean by chemical thermodynamics ? Mention its limitations.
4. Explain bond enthalpy. How is average C-H bond enthalpy in CH_4 calculated ?
5. Explain the first law of thermodynamics, mathematically.
6. Describe the conductivity cell. Explain the terms involved in $k = \frac{b}{R}$.
7. State Faraday's First law of electrolysis. Using-this, How the mass of the substance produced is calculated.
8. What are the advantage of secondary reference electrode ?
9. What is electrolytic cell? Write the half and overall cell reaction during electrolysis of molten NaCl.

5. Distinguish between electrolytic and voltaic cell.

6. Show the reaction between conductivity and degree of dissociation of weak electrolyte.

7. What are standard potentials? Define standard emf.

8. Explain H_2–O_2 fuel cell.

9. Derive an expression for the integrated rate law for the first for the order reaction.

10. Show that half life of a first order reaction is independent of ractant concentration.

11. What is the pseudo first order reaction ? Give an example to illustrate the pseudo first order behavior of the reactions?

12. What are the methods used for the determination of activation energy of chemical reaction ?

13. What is an order of a reaction ? Write the rate law of the reaction with no order.

14. Explain with the help of potential energy barrier how does a catalyst increases the speed of a reaction.

15. Explain the coordination isomerism with example.

16. Explain cis-trans isomerism, with reference to $[Pt(NH_3)_2Cl_2]$

17. Explain the following types of isomerism with reference to coordination compounds :

    (a) Ionisation isomerism **(b)** Linkage isomerism.

18. What is ion exchange isomerism ? Write the structure of trans-isomer of $[Co\text{-}Cl_2(en)_2]^+$

19. Explain why, under ordinary and normal condition, aryl halides do not undergo nucleophilic substitution reaction.

20. Explain the terms (a) Transition state (b) Energy of activation.

21. Explain that substitution in chlorobenzene takes place at ortho at ortho and para positions only.

22. State Markownikoffs Rule. Explain giving an example of Anti-Markownikoffs Rule.

23. Explain the graphical mechanism of the alkaline hydrolysis of bromomethane .

24. Distinguish netweenSN^1 and SN^2 reactions.