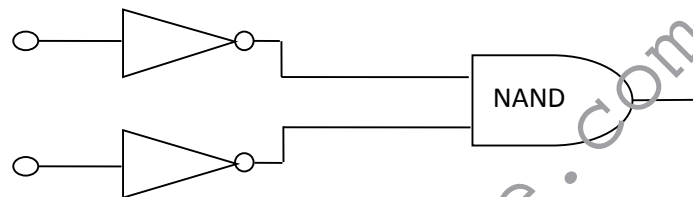## ECAT Past Paper 2015

PHYSICS

1. A thermostat with negative temperature co-efficient is placed in a furnace. When temperature of furnace increases the resistance?
   a. Decrease
   b. Increase
   c. Remain Unchanged
   d. None of Above

2. The following system is equalent to which gate?
   a. NOR
   b. NAND
   c. OR
   d. XOR

3. Reception of particular radio station is selected by tuning the tuning knob of radio, tuning the tuning knob changes the?
   a. Inductance
   b. Capacitance
   c. Impedance
   d. All

4. AC voltage is passed through single diode rectifier, the output of the bridge rectifier is?
   a. Full wave DC voltage
   b. Half wave DC voltage
   c. Double frequency AC voltage
   d. None

5. In amplitude modulation, the amplitude of carrier waves in proportion to:
   a. The amplitude of the modulating signal
   b. The sign of the modulating signal
   c. The frequency of the modulating signal
   d. All of above

6. As the water falls from the tab, the cross sectional area should decrease according to?
   a. Bernoulli Equation
   b. Equation of continuity
   c. Venturi relation
   d. None

7. Density of oxygen is about 16 times that of hydrogen. Therefore if speed of hydrogen is x, then speed of oxygen?

a. Greater than x
b. Less than x
c. The same
d. Depending upon pressure of gasses

8. A police motor cycle running at 140km/hr sounds a siren of 10 kHz frequency while chasing a car at 150Km/hr. The apparent frequency heard by the car driver is?
   a. Greater than 10kHz
   b. 10 kHz
   c. The siren will not be heard
   d. Less than 10kHz

9. The relationship between X and Y in the following system
   a. y = x
   b. y' = x
   c. y = x'
   d. both b and c

NAND
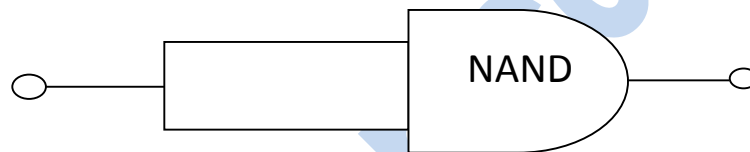
10. You have 20 inductors available each of 15H. You need an inductor of 1H in a circuit. You achieve it by combination?
    a. 15 inductor in parallel
    b. 20 inductor in series
    c. 15 inductor in series
    d. 20 inductor in parallel

11. In circuit X, L=100mH and C=100μF are attached in series. In circuit Y, L=100mH C=10μH are attached in parallel. The resonating frequency f_χ and f_γ are related as?
    a. $f_\chi = f_\gamma$
    b. $f_\chi = 10f_\gamma$
    c. $f_\chi = 0.01f_\gamma$
    d. cannot be determined

12. A transformer has 100 turns on the input side 500 turns on the output side. If rms value of input voltage are 220V and 5A respectively. The output power is?
    a. 500Watt
    b. 1100Watt
    c. 1440Watt
    d. 50Watt

13. When you drop a ball it accelerates at 9.8m/sec^2. If you instead throw it downwards then it accelerates immediately after leaving our hand assuming no air resistance?
    a. 9.8
    b. More than 9.8
    c. Less than 9.8
    d. Depending throwing speed

MEGA LECTURE

14. A truk of mass 5000kg and a car of mass 1000kg are both travelling at a speed of 36km/hr. assume the time required to stop the truk in 10sec is X Newton and the force required to stop the car in 10 sec is Y Newton. The difference X and Y is equal to?
    a. Maga Newton
    b. 4 Kilo Newton
    c. 14.4 Kilo Newton
    d. 14.4 Mega Newton

15. A tight wire is clamped at two points 2m apart. It is plucked near one end, What are three longest wavelength produced on the vibrating wire?
    a. 2m, 1m, 0.67m
    b. 4m, 2m, 1.33m
    c. 4m, 2m, 1m
    d. 1m, 0.5m, 0.33m

16. When using optical fiber in data transmission, the angle of incidence o_i of the light source on the glass fiber should be?
    a. Less then critical angle
    b. Greater than critical angle
    c. Less than angle of refraction
    d. Greater than angle of refraction

17. Consider two spheres A and B or radii Υ_a and Υ_b both concentric with point charge Q. if $\Upsilon_a > \Upsilon_b$ then the total flux passing normally through the sphere A and B is related as?
    a. Flux through Aisgreater
    b. Flux through both sphere is equal
    c. Flux through Amay be greater or less than Q depending on radius
    d. Flux through sphere B is greater

18. A mixture of twogases at constant temperature contains molecules of two kinds. The first kind of mass m_1 and rms speed c_1 and the second molecule has mass m_2 and rms speed c_2. The ratio c_1/c_2 is?
    a. m_1/m_2
    b. m_2/m_1
    c. $\left[\dfrac{m_1}{m_2}\right]^{1/2}$
    d. $\left[\dfrac{m_2}{m_1}\right]^{1/2}$

19. In an inelastic collision between two bodies, following is reserved?
    a. Energy
    b. Momentum
    c. Both a and b
    d. None

MATHEMATICS

20. What is the valid root x in the expression $\log 4\sqrt{27} = 0$?

   a. 1/4
   b. 3/4
   c. 1/2
   d. 5/2

21. The gradient of a curve $y = \dfrac{ax+b}{x2}$ at (2,5) is 2. The value of a and b are?

   a. 7,4
   b. 7,2
   c. $\dfrac{7}{3}, \dfrac{4}{3}$
   d. $\dfrac{7}{3}, \dfrac{2}{3}$

22. Differentiating the equation $\dfrac{e2x}{x+1}$ with respect to x is given by?

   a. $\dfrac{2e^{2x}}{(x+1)2}$
   b. $\dfrac{(2x+1)e^{2x}}{(x+1)2}$
   c. $\dfrac{2xe^{2x}}{(x+1)2}$
   d. $\dfrac{(x+1)e^{2x}}{(x+1)2}$

23. If $\dfrac{dy}{dx} = x^2 + 2$ then y is given by?

   a. $Y = \dfrac{x^3}{3} + 2x + c$
   b. $Y = 2x + c$
   c. $Y = 2x + 2 + c$
   d. $\dfrac{x^3}{3} + x + c$

24. $A = \begin{bmatrix} 3 & -4 \\ 2 & -2 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ given that AB = C. then the matrix B is given by?

   a. $\begin{bmatrix} -1 & 2 \\ 2 & -2 \end{bmatrix}$
   b. $\begin{bmatrix} 2 & -1 \\ 2 & -1 \end{bmatrix}$
   c. $\begin{bmatrix} 3 & 4 \\ -2 & 2 \end{bmatrix}$
   d. $\begin{bmatrix} 1 & 2 \\ -1 & \frac{3}{2} \end{bmatrix}$

25. Find all the angles between 0 and 360 degree such that $\sin x = \dfrac{-1}{2}$?

   a. 210,330
   b. 30,150
   c. 30,210

d. 330,150

26. On simplying the the equation $\frac{1+\cos x}{1+\sec x'}$ then result is?

    a. Sin x
    b. Cos x
    c. Csc x
    d. Sec x

27. Binomial expansion of an expression A gives $1-8x + 24x^2 - 32x^3 -16x^4$. The expansion A is given by?

    a. $(1-2x)^4$
    b. $(1-4x)^4$
    c. $(1+2x)^4$
    d. $(1+4x)^4$

28. Differentiating the equation $(x-1)(x-2)^3$ with respect to x gives?

    a. $2x(x+2)$
    b. $2(x-1)(x+2)$
    c. $2(x-1)$
    d. $3x(x+2)$

29. $2^{2x} - 3+2^{x+1} + 32 = 0$ gives value of x?

    a. (3,4)
    b. (8,4)
    c. (2,3)
    d. (5,9)

30. The area enclosed by a curve y=cos x and x axis from x=0 to x=$\frac{\pi}{2}$ is the same as?

    a. $\int_{\frac{\pi}{2}}^{\pi} \sin x \, dx$
    b. $\int_{\pi}^{\frac{\pi}{2}} \sin x \, dx$
    c. $-\int_{\frac{\pi}{2}}^{\pi} \cos x \, dx$
    d. All of these

31. A particle moving in a straight line with velocity v = $(4-t^2)$ where t is the time from a fixed point. Then acceleration of the particle after 4sec is?

    a. $-8^{m}/sec^2$
    b. $-8^{m}/sec$
    c. $-4^{m}/sec$
    d. $-4^{m}/sec^2$

32. A complex number $(1+i\sqrt{3})$ can be expressed as?

    a. 2cos30+isin30
    b. Cos60+isin60
    c. 2(cos60+isin60)

d. Sin30+icos30

33. If matrix $\begin{bmatrix} 0 & 0 \\ 0 & \rho \end{bmatrix}$ then the value of the expression $A+A^{-1} = KI$ is?

    a. 1,2
    b. -1,2
    c. Not valid for any value
    d. 01

34. Given that y=$x^2 \sqrt{2x-1}$ then $\frac{dy}{dx} = \frac{x(2x+2)}{\sqrt{2x-1}}$. Then result of $\int_0^5 \frac{x(2x+2)}{\sqrt{2x-1}}$ is?

    a. 78
    b. 75
    c. 33
    d. 34

35. Which one the valid root of $3x^3 - 8x^2 - 5x + 8$?

    a. 4
    b. 3
    c. 8
    d. Both a and b

36. Find the set of value of m for which expression $2x^2 - mx + 2 = 0$ have real roots?

    a. m≤ -4
    b. -4≤m≤4
    c. m≥4
    d. None

37. There are 50 students in a class out of these 38 used desktop computers, 16 out of these used laptops. It is noticed that five students neither used laptop or computer. The students having both laptop and computer are A. based on the information find out the greatest value of A?

    a. 36
    b. 4
    c. 16
    d. 30

38. There are 50 students in a class out of these 38 used desktop computers, 16 out of these used laptops. It is noticed that five students neither used laptop or computer. The student having both laptop and computer is A. based on the information find out the smallest value of A?

    a. 16
    b. 8
    c. 4
    d. 0

39. Which of the following point is point of intersection of the curve $x^2 + y^2 = 8$ and the straight line $2x - y = 2$?
    a. -2, -2
    b. 2, 2
    c. 0.4, 2.8
    d. 0, 1

40. Two straight lines are given as

    M : $y = 3x + 1$ and N: $y = \frac{-1}{3}x + 2$. Which of the following statement is correct?
    a. M and N are parallel
    b. M and N are perpendicular
    c. M and N not intersect
    d. M and N intersect at multiple points

41. Let the real valued function F and G be defined by $f(x) = 2x + 1$ and $g(x)x^2 - x$. The expression fg(x) is given by?
    a. $2x^2 - x + 1$
    b. $2x^2 - 2x + 2$
    c. $2x^2 - 2x + 2$
    d. $x^2 - 2x + 1$

42. The y intercepts and the slope of the line expressed by $3x - 2y + 6 = 0$ is?
    a. $\frac{3}{2}$, -3
    b. $-3, \frac{-3}{2}$
    c. $\frac{-3}{3}, \frac{-3}{2}$
    d. -3, -3

CHEMISTRY

43. In microwave owen, the wave energy produced is absorbed by certain polar molecule. In which molecule out of the given molecules would absorb maximum energy?
    a. SiO2
    b. C2H5OH
    c. NaCl
    d. None of these

44. Which of the following statement regarding CATHODE RAY is correct?
    a. Coathode ray can ionize gas
    b. Cathode ray can possess momentum
    c. Cathode ray cannot cause chemical changes
    d. All of these

45. Ionization energy does not increase?
    a. With small atomic radious of atom
    b. It increase in no of electronic shells

c. By increase in proton no of atom

d. None of these

46. Which of the molecule does not exhibit TETRAHEDRAL arrangement of electron pairs?

   a. H2O

   b. SiCl2

   c. NH3

   d. None of these

47. The change in enthalpy of reaction NaOH+HCl→NaCl+H2O is?

   a. Heat of reaction

   b. Heat of fusion

   c. Heat of neutralization

   d. Heat of combustion

48. In which reaction HYDROGEN behave as oxidizing agent?

   a. H2+Cl2→2HCl

   b. 2Na+H2→2NaH

   c. C2H2CHO+H2→C2H5H2OH

   d. C2H4+H2→C2H6

49. How many atoms of carbon are there in 18g of C6H12O6?

   a. 6.02×10^{23}

   b. 6.02×10^{22}

   c. 3.6×10^{23}

   d. 3.6×10^{22}

50. (8) in an experiment 0.10g of gas found to occupy 83.1cm3 measured at standard pressure(1.0*105pa) and 27 degree. The relative molecular mass is?

   a. $\dfrac{(0.10)(8.31)(27)}{(1.0x10^3)(83.3)}$

   b. $\dfrac{(0.10)(8.31)(27)}{(1.0x10^3)(83.1x10^{-3})}$

   c. $\dfrac{(0.10)(8.31)(300)}{(1.0x10^3)(83.1x10^{-6})}$

   d. $\dfrac{(0.10)(8.31)(300)}{(1.0x10^3)(83.1)}$

51. Which of the following consist of atoms and molecules and are held together by WANDER WALL forces?

   a. H_2O

   b. Cu

   c. CO_2

   d. MgO

52. Which molecule out of given molecules will not form hydrogen bond with another of the given molecules?

   a. NH3

b. CH₂NH₃

c. CH₃OH

d. CH₂CHO

53. Which of the following is strongest reducing agent?

   a. Cl-

   b. Ar

   c. K+

   d. Ca+2

54. Which of the following hydride is ionic in nature?

   a. NaH

   b. NH4

   c. CH4

   d. H2S

55. Which of the following equation represents reaction when Lithium nitrate is heated?

   a. 2LiNO3→Li2O+NO2

   b. 4LiNO3→2Li2O+4NO2

   c. 4LiNO3→4LiO2+4NO2+O2

   d. 4LiNO3→2Li2O+4NO2+O2

56. Which compound out the following is used in breathing equipment's as it absorbs CO2 and gives out O2 at the same time?

   a. Na2O2

   b. MgO

   c. KO2

   d. BaO

57. Which of the following represents decomposition of red lead accompanied by concentrated nitric acid?

   a. Pb₃O₄+4HNO₃→2PB(NO₃)3PbO₂+2H₂O

58. The equation of the rate of forward reaction is?

   a. Kf

   b. Kr(A)(B)

   c. Kf[C][D]

   d. $\dfrac{Kr(A)(B)}{Kf[C][D]}$

59. The function of salt bridge in galvanic cell is?

   a. To prevent accumulation of ions in two half's

   b. To block flow of ions between two half's

   c. To add salt ions in two half's

   d. None of these

60. In the reaction 6NaOH+3Cl→5NaCl+H2O+NaClO3, Chlorine is?

   a. Oxidized

b. Reduced
c. Both
d. None

61. Tetrahedral lead added to petrol act as?
    a. Auto catalyst
    b. Activator
    c. Inhibitor
    d. All of these

62. The stamen regarding effect of catalyst on a reversible reaction is?
    a. To increase equilibrium constant for forward reaction
    b. To increase yield of product in equilibrium
    c. To increase the rate constant for both reactions
    d. To increase the rate of only forward reaction

63. In the reaction between chlorine and U.V the propagation step is?
    a. $CH_4 + Cl \bullet \rightarrow CH_3 \bullet + HCl$
    b. $CH_4 + Cl \bullet \rightarrow CH_3Cl + H \bullet$
    c. $CH_4 + Cl \bullet \rightarrow CH_3Cl$
    d. $H \bullet + Cl_2 \rightarrow Cl \bullet + HCl$

64. How many isomers are possible for $C_2H_2Cl_2$?
    a. 1
    b. 2
    c. 3
    d. 4

65. The reaction $CH_3Br + OH^- \rightarrow CH_3OH + Br^-$ is best described by?
    a. Electrophilic substitution
    b. Nucleophilic substitution biomolecular
    c. Nucleophilic substitution unimolecular
    d. Addition reaction

66. The common reagent used in oxidation of Alcohols is?
    a. $K_2Cr_2O_7$
    b. H_2SO_4
    c. $K_2CrO_4 + H_2SO_4$
    d. $K_2Cr_2O_7 + H_2SO_4$

67. Complete reduction of acids to alkanes is carried out with?
    a. Hydrogen iodide
    b. Lithium ammonium hydride
    c. Red phosphorous
    d. Both B and C

68. Which of the following oxide is unlikely to be dissolved in Sodium hydroxide?

a. Al2O3

b. MgO

c. SiO2

d. NO2

69. Which statement about oxygen and sulphur is not correct?

a. Both have same outer electronic configuration

b. Both are typical non metals

c. Both help in combustion

d. Both exhibit allotropic forms

70. Which of the following is used as dehydrating agent for drying gases?

a. Phosphoric acid

b. Carboxylic acid

c. Sulphuric acid

d. Nitric acid

71. Which of the following product is obtained when chlorine bubbled less hot concentrated aqueous sodium hydroxide?

a. NaCl&NaClO3&H2O

b. NaClO&H2O

c. NaCl&NaClO&H2O

d. NaClO3&H2O

72. A crystalline solid that is used for preparation of yellow oil color due to its solubility is?

a. K2MnO4

b. PbcrO4

c. Al3(SO4)3

d. None