

## INSTITUTE OF ENGINEERING

### MODEL ENTRANCE EXAM

(SET – 3)

#### Instructions:

There are 100 multiple-choice questions, each having four choices of which only one choice is correct.

**Date :** 2081/02/26  
(June 08)

**Duration :** 2 hours  
**Time :** 8 A.M. – 10 A.M.

**SECTION – A (1 marks) (1\*60 = 60)**

- 1) A detective arrested him as soon as he got home.
  - a) An arrest was made by a detective as soon as he got home.
  - b) He was arrested by a detective as soon as he got home.
  - c) A detective was arrested by him as soon as he got home.
  - d) An arrest was detected by him as soon as he got home.
- 2) Bridle (Synonym):
  - a) to bow
  - b) insult
  - c) show anger
  - d) criticize
- 3) Five kilograms of sugar \_\_\_\_\_ required for the recipe.
  - a) are
  - b) is
  - c) were
  - d) have been
- 4) I hate \_\_\_\_\_ in public places.
  - a) to smoke
  - b) smokes
  - c) smoked
  - d) to smoking
- 5) Not all birds \_\_\_\_\_.
  - a) flew
  - b) fly
  - c) are flying
  - d) flies
- 6) He would rather that she \_\_\_\_\_ in the same store as he did.
  - a) worked
  - b) work
  - c) had worked
  - d) have worked
- 7) She was fined \_\_\_\_\_ parking in a wrong spot on the road.
  - a) at
  - b) of
  - c) for
  - d) in
- 8) I am keeping my fingers crossed about my test results tomorrow.
  - a) to look disappointed
  - b) to pretend to cry
  - c) to be generous
  - d) to wait eagerly
- 9) Equanimity (Antonym):
  - a) panic
  - b) poise
  - c) calmness
  - d) composure
- 10) I never read the financial news. The word **'financial'** has a stress primarily on its \_\_\_\_\_ syllable.
  - a) first
  - b) second
  - c) third
  - d) fourth
- 11) Transform the following sentence into a compound sentence. "If you work hard, you will win the prize."
  - a) Work hard and you will win the prize.
  - b) Though you work hard, you will not win the prize.
  - c) Those who work hard win the prize.
  - d) Prize winners are those who work hard.
- 12) Choose the correctly punctuated sentence.
  - a) The dogs bark is worse than its bite.
  - b) The dogs bark is worse than it's bite.
  - c) The dogs bark is worse than its' bite.
  - d) The dog's bark is worse than its bite.
- 13) The contrapositive of the statement "if p, then q" is:
  - a) if  $\sim p$ , then q
  - b) if p, then  $\sim q$
  - c) if q, then p
  - d) if  $\sim q$ , then  $\sim p$
- 14) The products of  $n^{\text{th}}$  roots of unity is:
  - a)  $(1)^{2n-1}$
  - b)  $(-1)^n$
  - c)  $(-1)^{n-1}$
  - d)  $(-1)^{2n-1}$
- 15) If the roots of the equation  $ax^2 + bx + c = 0$  are both positive, then:
  - a) whatever be the sign of b, signs of a and c should be opposite.
  - b) signs of a, b and c should be alike.
  - c) signs of a and c should be alike and opposite to the sign of b.
  - d) signs of b and c should be alike and opposite to the sign of a.
- 16) The principal value of  $\sin^{-1}\left(\sin\frac{5\pi}{3}\right)$  is:
  - a)  $\frac{\pi}{3}$
  - b)  $-\frac{5\pi}{3}$
  - c)  $-\frac{\pi}{3}$
  - d)  $\frac{4\pi}{3}$

- 17) Which of the following represents a pair of perpendicular lines?  
a)  $2x^2 = 2y(2x + y)$                       b)  $x^2 = (3 - y^2)$   
c)  $2x^2 = y(2x - y)$                       d)  $x^2 = (2x - y^2)$
- 18) The focal distance of a point P on the parabola  $y^2 = 12x$  if the ordinate of P is 6, is:  
a) 8                      b) 6                      c) 4                      d) 3
- 19) The value of  $\lim_{x \rightarrow \infty} x \tan \frac{1}{x}$  is:  
a) 0                      b)  $\infty$                       c) -1                      d) 1
- 20) If  $y = \sin^{-1}(\cos x)$ , then  $\frac{dy}{dx}$  is:  
a) 0                      b) -1                      c)  $\frac{\pi}{2}$                       d)  $\pi$
- 21)  $\int (1 + x + x^2 + x^3 + \dots + \infty) dx$  for  $|x| < 1$  is:  
a)  $\log_e(1 - x + x^2 - x^3 + \dots \infty) + c$  b)  $\frac{1}{1+x+x^2+x^3+\dots\infty} + c$   
c)  $\frac{1}{1-x+x^2-x^3+\dots\infty} + c$                       d)  $\log_e(1 + x + x^2 + x^3 + \dots \infty) + c$
- 22) If  $\vec{a}$  and  $\vec{b}$  are mutually perpendicular vectors of equal magnitude, then the angle between  $\vec{a}$  and  $(\vec{a} + \vec{b})$  is:  
a)  $\frac{\pi}{4}$                       b)  $\frac{\pi}{3}$                       c)  $\frac{\pi}{2}$                       d)  $\frac{2\pi}{3}$
- 23) A and B are two events such that  $P(A) = 0.45$ ,  $P(B) = 0.60$ ,  $P(A \cup B) = 0.90$  and  $P(A \cap B) = 0.15$ , then  $P(A|B) =$   
a)  $\frac{1}{2}$                       b)  $\frac{1}{3}$                       c)  $\frac{1}{4}$                       d)  $\frac{1}{5}$
- 24) If  $y = e^{1+\log_e x}$ , then the value of  $\frac{dy}{dx}$  is:  
a)  $e$                       b) 1                      c) 0                      d)  $\log x$
- 25)  $\int \frac{1}{\sqrt{x^2 - a^2}} dx =$   
a)  $\log(x + \sqrt{x^2 - a^2}) + c$                       b)  $\log(x - \sqrt{x^2 - a^2}) + c$   
c)  $\sin^{-1}\left(\frac{x}{a}\right) + c$                       d)  $\cos^{-1}\left(\frac{x}{a}\right) + c$
- 26) The distance of the point (x,y) from y-axis is:  
a) x                      b) y                      c) |x|                      d) |y|
- 27) Which of the following is horizontal ellipse?  
a)  $9x^2 + 4y^2 = 1$                       b)  $16 + 25y^2 = 1$   
c)  $16x^2 + 9y^2 = 1$                       d)  $4x^2 + y^2 = 1$
- 28) The inverse of coefficient matrix of the system of equation  $\begin{cases} 2x + 3y = 1 \\ 4x + 6y = 3 \end{cases}$  is:  
a)  $\begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$                       b)  $\begin{bmatrix} 6 & -3 \\ -4 & 2 \end{bmatrix}$                       c)  $\begin{bmatrix} -1 & 3 \\ 4 & -6 \end{bmatrix}$                       d) does not exist
- 29) The mode of the following items 0, 1, 6, 7, 2, 3, 7, 6, 6, 2, 6, 0, 5, 6, 0 is:  
a) 0                      b) 5                      c) 6                      d) 2
- 30) The value of  $\log\left(\frac{p}{q}\right) + \log\left(\frac{q}{r}\right) + \log\left(\frac{r}{p}\right)$  is:  
a) 1                      b) 0                      c) -1                      d)  $\frac{p^2}{qr}$
- 31) The value of  $1 - \log 2 + \frac{(\log 2)^2}{2!} - \frac{(\log 2)^3}{3!} + \dots \infty$  is:  
a) 2                      b)  $\frac{1}{2}$                       c)  $\log 3$                       d)  $e^2$
- 32) The minimum value of  $\frac{1}{3 \sin x - 4 \cos x + 5}$  is:  
a)  $\frac{1}{12}$                       b)  $\frac{1}{2}$                       c)  $\frac{1}{10}$                       d) 10
- 33) Penetrating power is greatest for:  
a)  $\alpha$ -particle                      b)  $\beta$ -particle                      c)  $\gamma$ -rays                      d) X-rays

- 34) In photoelectric effect:  
a) Light energy is converted into heat energy  
b) Light energy is converted into electric energy  
c) Light energy is converted into sound energy  
d) Electric energy is converted into light energy
- 35) Lenz's law gives:  
a) direction of magnetic field  
b) direction of motion of conductor  
c) direction of induced circuit  
d) direction of current in any electrical circuit
- 36) When a current flows along a junction of two different metals in series, heat is developed or absorbed depending on the direction of current. This effect is called:  
a) Joule effect  
b) Seebeck effect  
c) Peltier effect  
d) Thomson effect
- 37) If electric field is uniform, then the electric lines of force are:  
a) divergent  
b) convergent  
c) circular  
d) parallel
- 38) If oil of higher density than that of water is used in place of water in a resonance tube, how does the frequency change?  
a) increases  
b) decreases  
c) remain unchanged  
d) first increases, becomes maximum and then decreases
- 39) Chromatic aberration of a lens is caused by:  
a) interference  
b) dispersion  
c) reflection  
d) diffraction
- 40) Deviation produced by a prism does not depend on:  
a) angle of prism  
b) material of prism  
c) angle of incidence  
d) size of prism
- 41) A sphere, a cube and a thin circular plate all made of same material and having the same mass are heated to a temperature of  $200^{\circ}\text{C}$ . When these are left in a room:  
a) the sphere reaches room temperature at last  
b) the cube reaches room temperature at last  
c) the circular plate reaches room temperature at last  
d) All will reach room temperature simultaneously
- 42) In the gas equation  $PV = nRT$ ,  $V$  stands for volume of:  
a) any amount of gas  
b) one gram of gas  
c) one gram mole of gas  
d) one litre of gas
- 43) A container partly filled with liquid is suspended from a spring balance. A small body is gently dropped in the container. The reading of spring balance will:  
a) increase  
b) decrease  
c) remain unchanged  
d) continue oscillating
- 44) In parallel combination of  $n$  cells, we obtain:  
a) more voltage  
b) more current  
c) less voltage  
d) less current
- 45) Moment of inertia depends on  
a) Torque  
b) axis of rotation  
c) Angular acceleration  
d) Angular velocity
- 46) A vector is represented by  $3\hat{i} + \hat{j} + 2\hat{k}$ . It's length in  $XY$ -plane is:  
a) 2  
b)  $\sqrt{14}$   
c)  $\sqrt{10}$   
d)  $\sqrt{5}$
- 47) Most basic among the following is:  
a)  $\text{R} - \text{NH}_2$   
b)  $\text{NH}_3$   
c)  $\text{C}_6\text{H}_5\text{NH}_2$   
d)  $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
- 48) The IUPAC name of Urea is:  
a) Carbamide  
b) Amino methanamide  
c) Diamine methyl ketone  
d) Amino ethanamide

- 49) Alkyl halide is treated with sodium alkoxide to give ether. This reaction is known as:  
a) Wurtz reaction  
b) Williamson's synthesis  
c) Markonikov's reaction  
d) Aldol condensation
- 50) Addition of HCN to aldehyde is governed by:  
a) Nucleophilic addition reaction  
b) Nucleophilic substitution reaction  
c) Electrophilic addition reaction  
d) Electrophilic substitution reaction
- 51) Which of the following is not a Lewis acid?  
a)  $\text{NH}_4^+$   
b)  $\text{Ag}^+$   
c)  $\text{Cu}^{++}$   
d)  $\text{Zn}^{++}$
- 52) What is the maximum number of electrons that can be associated with the following set of quantum numbers?  
 $n = 3, l = 1$  and  $m = -1$   
a) 4  
b) 2  
c) 10  
d) 6
- 53) The aqueous solution of which of the following salt will have lowest pH?  
a) NaClO  
b) NaClO<sub>3</sub>  
c) NaClO<sub>2</sub>  
d) NaClO<sub>4</sub>
- 54) The solution of silver nitrate become coloured when pieces of nickel are added to the solution of silver nitrate because:  
a) nickel is oxidised  
b) silver is oxidised  
c) nickel is reduced  
d) silver is precipitated
- 55) When a salt is dissolve in water, the pH of water becomes more than 7. The salt is formed by:  
a)  $\text{HCN} + \text{CH}_3\text{COOH}$   
b)  $\text{HCl} + \text{Na}_2\text{CO}_3$   
c)  $\text{KOH} + \text{HNO}_3$   
d)  $\text{CH}_3\text{COOH} + \text{NaOH}$
- 56) The units for the rate constant of first order reaction is:  
a)  $\text{s}^{-1}$   
b)  $\text{molL}^{-1}\text{s}^{-1}$   
c)  $\text{mols}^{-1}$   
d)  $\text{Lmol}^{-1}\text{s}^{-1}$
- 57) The atom of smallest atomic radius among the following is:  
a) Na  
b) K  
c) Br  
d) Li
- 58) The first step in the extraction of copper from copper pyrites is:  
a) reduction by carbon  
b) electrolysis of ore  
c) roasting of ore in  $\text{O}_2$   
d) magentic separation
- 59) Pure nitrogen gas is obtained from:  
a)  $\text{NH}_3 + \text{NaNO}_2$   
b)  $\text{NH}_4\text{Cl} + \text{NaNO}_2$   
c)  $\text{N}_2\text{O} + \text{Cu}$   
d)  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
- 60) Which of the following oxides is most acidic in nature?  
a) BeO  
b) MgO  
c) CaO  
d) BaO

**SECTION – B ( 2 marks) (2\*40=80)**

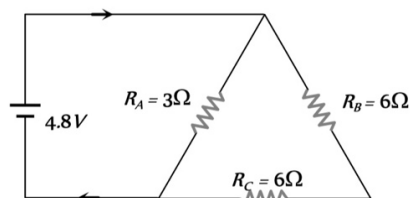
Read the following passages and answer the questions given below (61-64):

The first step is for us to realize that a city need to be a frustrater of life; it can be among other things, a mechanism for enhancing life, for producing possiblities of living which are not to be realized except through cities. But, for that to happen, deliberate and drastic planning is needed. Towns as much as animals, must have their system of organs – those for transport and circulation are an obvious example. What we need now are organ systems for recreation, leisure, culture, community expression. This means abundance of open space, easy access to unsploit Nature, beauty in parks and in fine buildings, gymnasia and swimming baths and recreation grounds in plenty, central spaces for celebrations and demonstrations, halls for citizens' meetings, concert halls and theatres and cinemas that belong to the city. And the buildings must not be built anyhow or dumped down anywhere, both they and their groupings should mean something important to the people of the place.

- 61) Cities can be made to provide full facilities for life, only if:  
 a) these can be mechanically developed.  
 b) proper transport system is introduced.  
 c) cinemas, theatres and concert halls are established here.  
 d) these are thoughtfully and vigorously designed to serve people's needs.
- 62) Which one of the following has the opposite meaning to the word 'frustrater' in the passage?  
 a) promoter                      b) applauder                      c) approver                      d) executer
- 63) The author talks about 'Unsploit Nature'. In what way can Nature remain unsploit?  
 a) If Nature is not allowed to interfere with people's day-to-day life.  
 b) By building cities with the system of organs like those of animals.  
 c) By allowing free access to parks and open spaces.  
 d) By allowing Nature to retain its primitive, domesticated character.
- 64) According to the author, the function of a city is to:  
 a) provide adequate community expression.  
 b) make available centres of recreation and public gatherings.  
 c) facilitate traffic and communication.  
 d) raise the tone of life and make it more meaningful.
- 65) If  $f(x) = \frac{x}{1-x}$ ,  $x \neq 1$ , then the range of f is:  
 a)  $(-\infty, \infty)$                       b)  $(-1, 1) \cup (1, \infty)$   
 c)  $(-\infty, 1) \cup (1, \infty)$                       d)  $(-\infty, -1) \cup (-1, \infty)$
- 66) The number of ways in which a mixed double badminton game can be organized between 10 players consisting of 6 men and 4 women is:  
 a) 180                      b) 90                      c) 48                      d) 24
- 67) The  $n^{\text{th}}$  term of the series  $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$  is:  
 a)  $\frac{n(n+1)(2n+1)}{6}$                       b)  $\frac{n^2+n}{3}$                       c)  $\frac{1}{4}n(n^2 - 1)$                       d)  $\frac{n(n^2+3)}{2}$
- 68) The variance of data 2, 4, 6, 8, 10 is:  
 a) 6                      b) 7                      c) 8                      d) 5
- 69) In a binomial distribution, if  $q = 0.50$  and  $n = 40$ , then the mean and standard deviation are:  
 a) 20, 3.16                      b) 40, 4.2                      c) 20, 5.4                      d) 30, 2.5
- 70) If the radius of in-circle of a triangle with its side  $5k$ ,  $6k$  and  $5k$  is 6, then the value of  $k$  is:  
 a) 3                      b) 4                      c) 5                      d) 6
- 71) The differential equation of the family of curves  $y = a \cos(x + b)$  is:  
 a)  $\frac{d^2y}{dx^2} - y = 0$                       b)  $\frac{d^2y}{dx^2} + y = 0$   
 c)  $\frac{d^2y}{dx^2} + 2y = 0$                       d)  $\frac{dy}{dx} + \frac{y}{x} = 0$
- 72) The circle  $x^2 + y^2 + 2gx + 2fy + c = 0$  touches x-axis if:  
 a)  $g = c^2$                       b)  $f = c^2$                       c)  $f^2 = c$                       d)  $g^2 = c$
- 73) In the ellipse,  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ , the angle between the lines joining the foci with the positive end of minor axis is a right angle. Then the eccentricity of the ellipse is:  
 a)  $\frac{\sqrt{3}}{2}$                       b)  $\sqrt{2}$                       c)  $\frac{1}{\sqrt{2}}$                       d)  $\frac{1}{\sqrt{3}}$
- 74) If  $P = (0, 1, 0)$  and  $Q = (0, 0, 1)$  be the given points, then the projection of PQ on the plane  $x + y + z = 3$  is:  
 a)  $\sqrt{2}$                       b) 3                      c)  $\sqrt{3}$                       d) 2
- 75) If  $f'(x_0)$  exists, then  $\lim_{\Delta x \rightarrow 0} \frac{f(x_0 + \Delta x) - f(x_0 - \Delta x)}{2\Delta x}$  is equal to:  
 a)  $\frac{1}{2}f'(x_0)$                       b)  $f'(x_0)$                       c)  $2f'(x_0)$                       d)  $\{f'(x_0)\}^2$

- 76) The value of  $\int \frac{dx}{(x-1)\sqrt{x^2-1}}$  is equal to:  
 a)  $-\sqrt{\frac{x-1}{x+1}} + c$                       b)  $\sqrt{\frac{x-1}{x+1}} + c$   
 c)  $\sqrt{\frac{x+1}{x-1}} + c$                       d)  $-\sqrt{\frac{x+1}{x-1}} + c$
- 77) If  $\Delta ABC$ ,  $\angle C$  is right angle. The maximum value of  $\cos A \cdot \cos B$  is:  
 a)  $1/2$                       b)  $5/3$                       c)  $2/3$                       d)  $1/3$
- 78) Area bounded by parabola  $y^2 = x$  and straight line  $2y = x$  in square unit is:  
 a)  $4/3$                       b)  $5/3$                       c)  $2/3$                       d)  $1/3$
- 79) If  $a\vec{i} + \vec{j} + \vec{k}$ ,  $\vec{i} + b\vec{j} + \vec{k}$  and  $\vec{i} + \vec{j} + c\vec{k}$  are coplanar, then:  
 a)  $a + b + c = 0$                       b)  $abc = 1$   
 c)  $a + b + c = abc + 2$                       d)  $a + b + c \neq 0$
- 80) An organic compound A on treatment with alcoholic KOH followed by ozonolysis gives two molecules of acetaldehyde. Compound A is:  
 a)  $\text{CH}_3\text{CH}_2\text{OH}$                       b)  $\text{CH}_2 = \text{CH}_2$                       c)  $\text{CH}_3\text{CH}_2\text{Cl}$                       d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
- 81)  $\text{CH}_3\text{COOH} \xrightarrow{\text{NH}_3} \text{A} \xrightarrow{\Delta} \text{B}$ . Here, B is:  
 a)  $\text{CH}_3\text{COONH}_4$                       b)  $\text{CH}_3\text{CONH}_2$   
 c)  $\text{CH}_3\text{CN}$                       d)  $\text{CH}_3\text{CH}_2\text{NH}_2$
- 82) Given  
 $E^0_{\text{Cr}^{3+}|\text{Cr}} = -0.74 \text{ V}$ ;                       $E^0_{\text{MnO}_4^-|\text{Mn}^{2+}} = 1.51 \text{ V}$   
 $E^0_{\text{Cr}_2\text{O}_7^{2-}|\text{Cr}^{3+}} = 1.33 \text{ V}$                        $E^0_{\text{Cl}|\text{Cl}^-} = 1.36 \text{ V}$   
 Based on the data given above, strongest oxidizing agent will be:  
 a)  $\text{MnO}_4^-$                       b)  $\text{Cl}^-$                       c)  $\text{Cr}^{3+}$                       d)  $\text{Mn}^{2+}$
- 83) How many moles of magnesium phosphate,  $\text{Mg}_3(\text{PO}_4)_2$  will contain 0.25 mole of oxygen atoms?  
 a)  $3.125 \times 10^{-2}$                       b)  $1.25 \times 10^{-2}$                       c)  $2.5 \times 10^{-2}$                       d) 0.02
- 84) A gaseous mixture was prepared by taking equal mole of CO and  $\text{N}_2$ . If the total pressure of the mixture was found 1 atmosphere, the partial pressure of the nitrogen ( $\text{N}_2$ ) in the mixture is:  
 a) 0.5 atm                      b) 0.8 atm                      c) 0.9 atm                      d) 1 atm
- 85) The pH of a solution obtained by mixing 50 mL of 1 N HCl and 30 mL of 1 N NaOH is:  
 a) 0.979                      b) 0.6021                      c) 1.2042                      d) 0.3979
- 86) The product obtained on heating  $\text{LiNO}_3$  will be:  
 a)  $\text{Li}_2\text{O} + \text{NO}_2 + \text{O}_2$                       b)  $\text{Li}_3\text{N} + \text{O}_2$   
 c)  $\text{Li}_2\text{O} + \text{NO} + \text{O}_2$                       d)  $\text{LiNO}_2 + \text{O}_2$
- 87) If  $\text{Cl}_2$  is passed through hot aqueous NaOH, the products formed have Cl in different oxidation states. These are indicated as:  
 a) -1 and +1                      b) -1 and +5                      c) +1 and +5                      d) -1 and +3
- 88) A ball is released from the top of a tower of height  $h$  metres. If it takes  $T$  seconds to reach the ground, the position of the ball at time  $T/3$  is:  
 a)  $\frac{h}{9}$  m from the ground                      b)  $\frac{7h}{9}$  m from the ground  
 c)  $\frac{8h}{9}$  m from the ground                      d)  $\frac{17h}{18}$  m from the ground
- 89) A block is lying on an inclined plane which makes an angle of  $60^\circ$  with the horizontal. If coefficient of friction between the block and the plane is 0.25 and  $g = 10 \text{ m/s}^2$ , the acceleration of block when it moves along the plane will be:  
 a)  $2.50 \text{ m/s}^2$                       b)  $5.00 \text{ m/s}^2$                       c)  $7.40 \text{ m/s}^2$                       d)  $8.66 \text{ m/s}^2$

- 90) The escape velocity from the earth is about 11 km/second. The escape velocity from a planet having double the radius and the same mean density as that of the earth is:  
 a) 22 km/second      b) 11 km/second      c) 5.5 km/second      d) 15.5 km/second
- 91) A vessel contains a liquid (density 1.2 g/cc) over mercury (density 13.5 g/cc). A homogenous sphere floats with one-third of its volume immersed in mercury and the other two-thirds in liquid. The density of the material of the sphere in g/cc is:  
 a) 7.3      b) 9.4      c) 5.3      d) 14.7
- 92) A steel rod and a copper rod have the same difference in length at all temperatures ( $\alpha_{\text{copper}} = 18 \times 10^{-6} \text{K}^{-1}$ ,  $\alpha_{\text{steel}} = 12 \times 10^{-6} \text{K}^{-1}$ ). If the length of copper rod is 16 cm, the length of steel rod is:  
 a) 20 cm      b) 18 cm      c) 24 cm      d) 30 cm
- 93) If the pressure of an ideal gas contained in a vessel is increased by 0.5 %, the increase in temperature is  $2^\circ\text{C}$ . The initial temperature of the gas is:  
 a)  $27^\circ\text{C}$       b)  $127^\circ\text{C}$       c)  $300^\circ\text{C}$       d)  $400^\circ\text{C}$
- 94) An organ pipe  $P_1$  closed at one end and vibrating in its first overtone and another pipe  $P_2$  open at both ends vibrating in its second overtone are in resonance. The ratio of lengths of  $P_1$  to that of  $P_2$  is:  
 a) 1      b) 1/2      c) 1/3      d) 3/4
- 95) A wave of light of wavelength  $6000 \text{ \AA}$  falls on a plane surface ( $\mu = \sqrt{3}$ ). If the reflected and refracted rays are perpendicular to each other, the angle of incidence is:  
 a)  $30^\circ$       b)  $45^\circ$       c)  $60^\circ$       d)  $90^\circ$
- 96) A screen is placed 50 cm from a single slit which is illuminated with light of wavelength  $6000 \text{ \AA}$ . If the distance between first and third minima in the diffraction patterns is 3.0 mm, the width of slit is:  
 a)  $1 \times 10^{-4} \text{ m}$       b)  $2 \times 10^{-4} \text{ m}$       c)  $0.5 \times 10^{-4} \text{ m}$       d)  $4 \times 10^{-4} \text{ m}$
- 97) A uniformly charged conducting sphere of 4.4 m diameter has a surface charge density of  $60 \mu\text{C m}^{-2}$ . The charge on the sphere is:  
 a)  $8.6 \times 10^{-3} \text{ C}$       b)  $4.7 \times 10^{-3} \text{ C}$       c)  $5.7 \times 10^{-3} \text{ C}$       d)  $3.7 \times 10^{-3} \text{ C}$
- 98) The current in the given circuit is:



- a) 8.31 A      b) 6.82 A      c) 4.92 A      d) 2 A
- 99) Through two parallel wires A and B, 10 and 2 amperes of currents are passed respectively in opposite direction. If the wire A is infinitely long and the length of the wire B is 2 m, the force on the conductor B, which is situated at 10 cm distance from A will be:  
 a)  $8 \times 10^{-5} \text{ N}$       b)  $4 \times 10^{-7} \text{ N}$       c)  $4 \times 10^{-5} \text{ N}$       d)  $8 \times 10^{-7} \text{ N}$
- 100) If the wavelength of first line of the Balmer series of hydrogen is  $6561 \text{ \AA}$ , the wavelength of the second line of series should be:  
 a)  $13122 \text{ \AA}$       b)  $3280 \text{ \AA}$       c)  $4860 \text{ \AA}$       d)  $2187 \text{ \AA}$