COMMON ENTRANCE TEST - 2004

Subject : CHEMISTRY
DATE : 19.05.2004
TIME : 2.30 P.M. TO 3.50 P.M.
MAXIMUM MARKS : 60
MAXIMUM TIME : 80 MINUTES

Please fill your CET No. below				

QUESTION BOOKLET	
VERSION CODE	SERIAL NUMBER
A 1	039857

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5. During the subsequent 70 minutes :

   a) Read each question carefully.

   b) Determine the correct answer from out of the four available choices given under each question.

   c) **Completely darken / shade the relevant circle with a blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

   For example :

   Q. No. 14 : The product of 0.5 x 0.05 is : 1) 0.05 2) 0.005 3) 0.025 4) 0.25

   As the correct answer is option no. 3, the candidate should darken the circle corresponding to option no. 3 completely with a blue or black ink ballpoint pen on the OMR answer sheet, as shown below :

   ① ② ● ④

6. For each correct answer, one mark will be awarded. For each wrong answer, quarter (1/4) mark will be deducted and if more than one circle is darkened for a given question, one mark will be deducted. **Even a minute unintended dot will also be recognised and recorded by the scanner. Please avoid multiple markings of any kind.**

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CHEMISTRY

1. A nitrogen containing organic compound gave an oily liquid on heating with bromine and potassium hydroxide solution. On shaking the product with acetic anhydride, an antipyretic drug was obtained. The reactions indicate that the starting compound is :
   1) Acetamide
   2) Nitrobenzene
   3) Aniline
   4) Benzamide

2. The silver salt of a fatty acid on refluxing with an alkyl halide gives an :
   1) ether
   2) amine
   3) acid
   4) ester

3. Pick out the one which does not belong to the family :
   1) Ptyalin
   2) Lipase
   3) Pepsin
   4) Cellulose

4. Which of the following is wrongly matched ?
   1) Decomposition of H_2O_2 - First order reaction.
   2) Combination of H_2 and Br_2 to give HBr - Zero order reaction.
   3) Saponification of $CH_3COOC_2H_5$ - second order reaction.
   4) Hydrolysis of CH_3COOCH_3 - pseudo unimolecular reaction.

5. The diameter of colloidal particles range from :
   1) $10^3\ m$ to $10^{-3}m$
   2) $10^{-3}m$ to $10^{-6}\ m$
   3) $10^{-6}m$ to $10^{-9}m$
   4) $10^{-9}m$ to $10^{-12}m$

(Space for Rough Work)

6. The number of 2 p electrons having spin quantum number $S = -½$ are :
   1) 2
   2) 3
   3) 6
   4) 0

7. Pick out the alkane which differs from the other members of the group :
   1) 2 - methyl butane
   2) 2, 2 - dimethyl butane
   3) 2, 2 - dimethyl propane
   4) Pentane

8. 56 g of nitrogen and 8 g of hydrogen gas are heated in a closed vessel. At equilibrium 34 g of ammonia are present. The equilibrium number of moles of nitrogen, hydrogen and ammonia are respectively :
   1) 1, 1, 2
   2) 2, 1, 2
   3) 1, 2, 2
   4) 2, 2, 1

9. A process is taking place at constant temperature and pressure. Then :
   1) $\Delta H = 0$
   2) $\Delta S = 0$
   3) $\Delta H = \Delta E$
   4) $\Delta H = T\,\Delta S$

10. In a galvanic cell, the electrons flow from :
   1) Anode to cathode through the external circuit.
   2) Cathode to anode through the external circuit.
   3) Anode to cathode through the solution.
   4) Cathode to anode through the solution.

(Space for Rough Work)

11. On treating a mixture of two alkyl halides with sodium metal in dry ether, 2-methyl propane was obtained. The alkyl halides are :

1) Chloromethane and Chloroethane
2) Chloromethane and 1- Chloropropane
3) 2 - Chloropropane and Chloromethane
4) 2 - Chloropropane and Chloroethane

12. Which of the following statements about benzyl chloride is incorrect ?

1) It is a lachrymatory liquid and answers Beilstein's test.
2) It gives a white precipitate with alcoholic silver nitrate.
3) It is less reactive than alkyl halides.
4) It can be oxidised to benzaldehyde by boiling with copper nitrate solution.

13. The main product obtained when a solution of sodium carbonate reacts with mercuric chloride is :

1) $HgCO_3$
2) $HgCO_3 \cdot Hg(OH)_2$
3) $Hg(OH)_2$
4) $HgCO_3 \cdot HgO$

14. In the electrothermal process, the compound displaced by silica from calcium phosphate is :

1) Phosphorus
2) Phosphorus pentoxide
3) Calcium phosphide
4) Phosphine

15. The enthalpy of combustion of methane at 25°C is 890 kJ. The heat liberated when 3.2 g of methane is burnt in air is :

1) – 890 kJ
2) 178 kJ
3) 445 kJ
4) 278 kJ

(Space for Rough Work)

16. The pressure and temperature of 4 dm^3 of carbon dioxide gas are doubled. Then the volume of carbon dioxide gas would be :

1) 4 dm^3 2) 8 dm^3

3) 2 dm^3 4) 3 dm^3

17. 4g of copper was dissolved in concentrated nitric acid. The copper nitrate solution on strong heating gave 5g of its oxide. The equivalent weight of copper is :

1) 12 2) 20

3) 23 4) 32

18. In the manufacture of ammonia by the Haber's process,

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} + 92.3\,kJ$, which of the following conditions is unfavourable ?

1) Reducing the temperature 2) Removing ammonia as it is formed

3) Increasing the temperature 4) Increasing the pressure

19. The chemical equilibrium of a reversible reaction is not influenced by :

1) concentration of the reactants 2) Temperature

3) Pressure 4) Catalyst

20. Cumene process is the most important commercial method for the manufacture of phenol. Cumene is :

1) Vinyl benzene 2) Propyl benzene

3) 1 - Methyl ethyl benzene 4) Ethyl benzene

(Space for Rough Work)

21. A solution contains 1.2046×10^{24} hydrochloric acid molecules in one dm^3 of the solution. The strength of the solution is :

1) $4\,N$ 2) $8\,N$
3) $6\,N$ 4) $2\,N$

22. Nuclear theory of the atom was put forward by :

1) Neils Bohr 2) J. J. Thomson
3) Rutherford 4) Aston

23. In acetylene molecule, the two carbon atoms are linked by :

1) three sigma bonds 2) three pi bonds
3) one sigma bond and two pi bonds 4) two sigma and one pi bond

24. The enthalpy of the reaction,

$H_{2(g)} + \frac{1}{2} O_{2(g)} \rightarrow H_2O_{(g)}$ is ΔH_1 and that of

$H_{2(g)} + \frac{1}{2} O_{2(g)} \rightarrow H_2O_{(l)}$ is ΔH_2. Then

1) $\Delta H_1 > \Delta H_2$ 2) $\Delta H_1 = \Delta H_2$
3) $\Delta H_1 < \Delta H_2$ 4) $\Delta H_1 + \Delta H_2 = 0$

25. A radioactive isotope decays at such a rate that after 192 minutes only $\frac{1}{16}$ of the original amount remains. The half life of the radioactive isotope is :

1) 12 min 2) 24 min
3) 32 min 4) 48 min

(Space for Rough Work)

26. The reagent which does not give acid chloride on treating with a carboxylic acid is :

1) $SOCl_2$ 2) PCl_3

3) PCl_5 4) Cl_2

27. Among the halogens, the one which is oxidised by nitric acid is :

1) Chlorine 2) Bromine

3) Fluorine 4) Iodine

28. The metal which does not form ammonium nitrate by reaction with dilute nitric acid is :

1) *Pb* 2) *Mg*

3) *Al* 4) *Fe*

29. The elements with atomic numbers 9, 17, 35, 53, 85 are all :

1) Heavy metals 2) Light metals

3) Noble gases 4) Halogens

30. In the electrolytic method of obtaining aluminium from purified bauxite, cryolite is added to the charge in order to :

1) dissolve bauxite and render it conductor of electricity.

2) lower the melting point of bauxite.

3) minimise the heat loss due to radiation.

4) protect aluminium produced from oxygen.

(Space for Rough Work)

31. Which of the following is not an amphoteric substance ?

1) H_2O 2) NH_3

3) HNO_3 4) HCO_3^-

32. When 50 cm^3 of 0.2 N H_2SO_4 is mixed with 50 cm^3 of 1N KOH, the heat liberated is :

1) 573 kJ 2) 573 J

3) 11.46 kJ 4) 57.3 kJ

33. An artificial radioactive isotope gave $^{14}_{7}N$ after two successive β -particle emissions. The number of neutrons in the parent nucleus must be :

1) 5 2) 7

3) 9 4) 14

34. Stainless steel does not rust because :

1) Nickel present in it, does not rust

2) Iron forms a hard chemical compound with chromium present in it.

3) Chromium and nickel combine with iron.

4) Chromium forms an oxide layer and protects iron from rusting.

35. Which of the following combinations can be used to synthesise ethanol ?

1) CH_3MgI and $CH_3COOC_2H_5$

2) CH_3MgI and $HCOOC_2H_5$

3) CH_3MgI and CH_3COCH_3

4) CH_3MgI and C_2H_5OH

(Space for Rough Work)

36. The reaction, $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ is carried out in a 1 dm^3 vessel and 2 dm^3 vessel separately. The ratio of the reaction velocities will be :

1) 4 : 1 2) 8 : 1
3) 1 : 8 4) 1 : 4

37. In a mixture of acetic acid and sodium acetate the ratio of concentrations of the salt to the acid is increased ten times. Then the pH of the solution :

1) decreases ten fold 2) increases ten fold
3) increases by one 4) decreases by one

38. When a mixture of methane and oxygen is passed through heated molybdenum oxide, the main product formed is :

1) Methanol 2) Methanal
3) Methanoic acid 4) Ethanal

39. Benzene can be obtained by heating either benzoic acid with 'X' or phenol with 'Y'. 'X' and 'Y' are respectively :

1) Zinc dust and sodium hydroxide 2) Soda lime and copper
3) Zinc dust and soda lime 4) Soda lime and zinc dust

40. An organic compound is boiled with alcoholic potash. The product is cooled and acidified with *HCl*. A white solid separates out. The starting compound may be :

1) ethyl acetate 2) methyl acetate
3) ethyl benzoate 4) ethyl formate

(Space for Rough Work)

41. In qualitative analysis, in order to detect second group basic radical, H_2S gas is passed in the presence of dilute HCl to :

1) decrease the dissociation of H_2S
2) increase the dissociation of salt solution
3) increase the dissociation of H_2S
4) decrease the dissociation of salt solution

42. Aluminium displaces hydrogen from dilute HCl whereas silver does not. The E.M.F. of a cell prepared by combining Al / Al^{+3} and Ag / Ag^{+} is 2.46 V. The reduction potential of silver electrode is + 0.80 V. The reduction potential of aluminium electrode is :

1) 3.26 V
2) – 1.66 V
3) + 1.66 V
4) – 3.26 V

43. The first fraction obtained during the fractionation of petroleum is :

1) Gasoline
2) Diesel oil
3) Hydrocarbon gases
4) Kerosene oil

44. Which of the following compounds gives trichloromethane on distilling with bleaching powder ?

1) Ethanol
2) Methanol
3) Methanal
4) Phenol

45. Benzoin is :

1) α - hydroxy aldehyde
2) α - hydroxy ketone
3) compound containing an aldehyde and a ketonic group
4) α, β - unsaturated acid

(Space for Rough Work)

46. The velocity constant of a reaction at 290^0 K was found to be $3.2 \times 10^{-3} S^{-1}$. When the temperature is raised to 310^0 K, it will be about :

1) 9.6×10^{-3} 2) 1.28×10^{-2}

3) 6.4×10^{-3} 4) 3.2×10^{-4}

47. Select the pK_a value of the strongest acid from the following :

1) 2.0 2) 4.5

3) 1.0 4) 3.0

48. Pick out the unsaturated fatty acid from the following :

1) Oleic acid 2) Palmitic acid

3) Stearic acid 4) Lauric acid

49. Nylon is not a :

1) Copolymer 2) Homopolymer

3) Condensation polymer 4) Polyamide

50. The coal tar fraction which contains phenol is :

1) Heavy oil 2) Light oil

3) Middle oil 4) Green oil

(Space for Rough Work)

51. The compounds A and B are mixed in equimolar proportion to form the products, $A + B \rightleftharpoons C + D$. At equilibrium, one third of A and B are consumed. The equilibrium constant for the reaction is :

1) 2.5 2) 0.25
3) 0.5 4) 4.0

52. In froth floatation process for the purification of ores, the particles of ore float because :

1) They are insoluble
2) They bear electrostatic charge
3) Their surface is not easily wetted by water
4) They are light

53. Which of the following statements about amorphous solids is incorrect ?

1) There is no orderly arrangement of particles
2) They are rigid and incompressible.
3) They melt over a range of temperature.
4) They are anisotropic.

54. Hydrogen diffuses six times faster than gas A. The molar mass of gas A is :

1) 24 2) 36
3) 72 4) 6

55. Dulong and Petit's law is valid only for :

1) gaseous elements 2) solid elements
3) metals 4) non-metals

(Space for Rough Work)

56. Identify the gas which is readily adsorbed by activated charcoal :

1) H_2 2) O_2

3) N_2 4) SO_2

57. If the distance between Na^+ and Cl^- ions in sodium chloride crystal is X pm, the length of the edge of the unit cell is :

1) $\frac{X}{2}$ pm 2) $2X$ pm

3) $4X$ pm 4) $\frac{X}{4}$ pm

58. Which of the following statements is incorrect ?

1) In $K_4[Fe(CN)_6]$ the ligand has satisfied both primary and secondary valencies of ferrous ion.

2) In $[Cu(NH_3)_4]SO_4$, the ligand has satisfied only the secondary valency of copper.

3) In $K_3[Fe(CN)_6]$, the ligand has satisfied only the secondary valency of ferric ion.

4) In $K_3[Fe(CN)_6]$, the ligand has satisfied both primary and secondary valencies of ferric ion.

59. 2 - Acetoxy benzoic acid is used as an :

1) antiseptic 2) antipyretic

3) antimalarial 4) antidepressant

60. A nucleoside on hydrolysis gives :

1) an aldopentose and a heterocyclic base.

2) an aldopentose and orthophosphoric acid.

3) a heterocyclic base and orthophosphoric acid.

4) an aldopentose, a heterocyclic base and orthophosphoric acid

(Space for Rough Work)

A-1

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PHYSICS

1. A thin plano-convex lens acts like a concave mirror of focal length 0.2 m when silvered from its plane surface. The refractive index of the material of the lens is 1.5. The radius of curvature of the convex surface of the lens will be .....

   1) 0.4 m
   2) 0.2 m
   3) 0.1 m
   4) 0.75 m

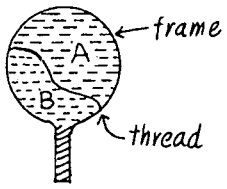
2. The physical quantity having the same dimensions as Planck's constant h is .....

   1) Boltzmann constant
   2) force
   3) linear momentum
   4) angular momentum

3. A balloon is rising vertically up with a velocity of $29 ms^{-1}$. A stone is dropped from it and it reaches the ground in 10 seconds. The height of the balloon when the stone was dropped from it is ($g = 9.8\ ms^{-2}$)

   1) 100 m
   2) 200 m
   3) 400 m
   4) 150 m

4. A thread is tied slightly loose to a wire frame as in figure and the frame is dipped into a soap solution and taken out. The frame is completely covered with the film. When the portion A is punctured with a pin, the thread .....



   1) becomes concave towards A
   2) becomes convex towards A
   3) remains in the initial position.
   4) either (1) or (2) depending on the size of A w.r.t. B

5. Oxygen is 16 times heavier than hydrogen. Equal volumes of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is .....

   1) $\sqrt{1/8}$
   2) $\sqrt{\frac{32}{17}}$
   3) $\sqrt{8}$
   4) $\sqrt{\frac{2}{17}}$

(Space for Rough Work)

6. When light is incident on a diffraction grating the zero order principal maximum will be .....
   1) one of the component colours 2) absent
   3) spectrum of the colours 4) white

7. H - polaroid is prepared by .....
   1) stretching polyvinyl alcohol and then heated with dehydrating agent
   2) stretching polyvinyl alcohol and then impregnating with iodine.
   3) orienting herapathite crystal in the same direction in nitrocellulose.
   4) by using thin tourmaline crystals.

8. SI unit of permittivity is .....
   1) $C^2 m^2 N^{-1}$ 2) $C^{-1} m^2 N^{-2}$
   3) $C^2 m^2 N^2$ 4) $C^2 m^{-2} N^{-1}$

9. A spherical drop of capacitance 1 μ F is broken into eight drops of equal radius. Then, the capacitance of each small drop is .....
   1) $\frac{1}{8}\mu F$ 2) $8\mu F$
   3) $\frac{1}{2}\mu F$ 4) $\frac{1}{4}\mu F$

10. Two equal forces (P each) act at a point inclined to each other at an angle of 120^0. The magnitude of their resultant is .....
   1) P 2) $2P$
   3) $P/2$ 4) $P/4$

(Space for Rough Work)

11. If two waves of the same frequency and amplitude respectively on superposition produce a resultant disturbance of the same amplitude the waves differ in phase by .....

1) $\pi/3$ 2) $2\pi/3$
3) π 4) zero

12. A man, standing between two cliffs, claps his hands and starts hearing a series of echoes at intervals of one second. If the speed of sound in air is 340 ms^{-1}, the distance between the cliffs is .....

1) 340 m 2) 1620 m
3) 680 m 4) 1700 m

13. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1mm wide and the resulting diffraction pattern is observed on a screen 2m away. The distance between the first dark fringes on either side of the central bright fringe is .....

1) 1.2 mm 2) 1.2 cm
3) 2.4 cm 4) 2.4 mm

14. Specific rotation of sugar solution is 0.01 SI units. 200 kgm^{-3} of impure sugar solution is taken in a polarimeter tube of length 0.25 m and an optical rotation of 0.4 rad is observed. The percentage of purity of sugar in the sample is .....

1) 80% 2) 89%
3) 11% 4) 20%

15. An electron is accelerated through a pd of 45.5 volt. The velocity acquired by it is (in ms^{-1}).....

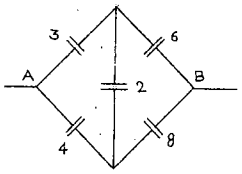
1) 4×10^6 2) 4×10^4
3) 10^6 4) zero

(Space for Rough Work)

16. When a body is earth connected, electrons from the earth flow into the body. This means the body is .....

1) uncharged
2) charged positively
3) charged negatively
4) an insulator

17. Effective capacitance between A and B in the figure shown is (all capacitances are in μF)



1) $21\,\mu F$
2) $23\,\mu F$
3) $\frac{3}{14}\mu F$
4) $\frac{14}{3}\mu F$

18. Which state of triply ionised Baryllium (Be^{+++}) has the same orbital radius as that of the ground state of hydrogen ?

1) $n = 1$
2) $n = 2$
3) $n = 3$
4) $n = 4$

19. If M is the atomic mass and A is the mass number, packing fraction is given by .....

1) $\frac{A}{M-A}$
2) $\frac{A-M}{A}$
3) $\frac{M}{M-A}$
4) $\frac{M-A}{A}$

20. A count rate meter shows a count of 240 per minute from a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half-life of the source is .....

1) 20 min
2) 30 min
3) 80 min
4) 120 min

(Space for Rough Work)

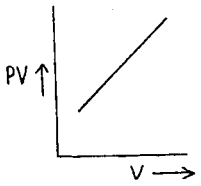
21. The refractive index of a particular material is 1.67 for blue light, 1.65 for yellow light and 1.63 for red light. The dispersive power of the material is .....

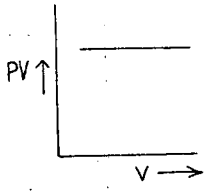
1) 0.0615
2) 0.024
3) 0.031
4) 1.60

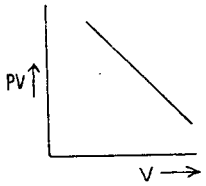
22. An ideal gas heat engine operates in a Carnot's cycle between 227°C and 127°C. It absorbs 6×10^4 J at high temperature. The amount of heat converted into work is .....

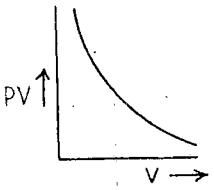
1) 4.8×10^4 J
2) 3.5×10^4 J
3) 1.6×10^4 J
4) 1.2×10^4 J

23. Which one of the following graphs represents the behaviour of an ideal gas ?

1) 

2) 

3) 

4) 

24. Rainbow is formed due to .....

1) refraction
2) dispersion and total internal reflection
3) total internal reflection
4) scattering

25. A beam of parallel rays is brought to a focus by a plano-convex lens. A thin concave lens of the same focal length is joined to the first lens. The effect of this is .....

1) the focal point shifts away from the lens by a small distance.
2) the focus remains undisturbed.
3) the focus shifts to infinity.
4) the focal point shifts towards the lens by a small distance.

(Space for Rough Work)

26. Two conductors of the same material have their diameters in the ratio 1 : 2 and their lengths in the ratio 2 : 1. If the temperature difference between their ends is the same, then the ratio of amounts of heat conducted per second through them will be -

1) 8 :1 2) 1 : 8

3) 4 : 1 4) 1 : 4

27. Blowing air with open mouth is an example of .....

1) isothermal process 2) adiabatic process

3) isobaric process 4) isochoric process

28. Sound waves in air are always longitudinal because,

1) air is a mixture of several gases
2) density of air is very small
3) of the inherent characteristics of sound waves in air.
4) air does not have a modulus of rigidity.

29. In Young's double slit experiment if monochromatic light used is replaced by white light, then .....

1) all bright fringes become white.
2) all bright fringes have colours between violet and red.
3) no fringes are observed.
4) only central fringe is white, all other fringes are coloured.

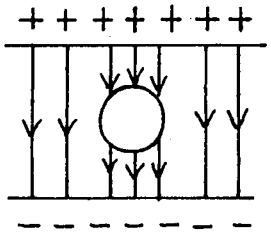
30. In a Young's double slit experiment, the separation between the two slits is 0.9 mm and the fringes are observed one metre away. If it produces the second dark fringe at a distance of 1 mm from the central fringe, the wavelength of the monochromatic source of light used is .....

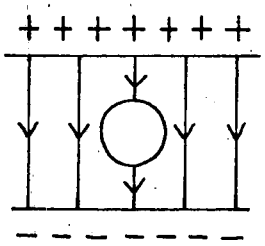
1) 500 nm 2) 600 nm

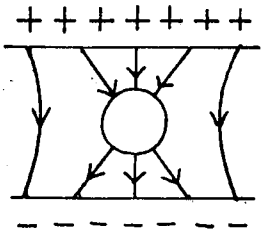
3) 450 nm 4) 400 nm

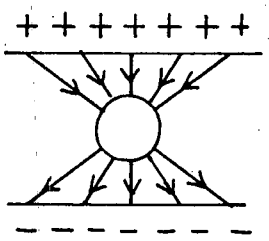
(Space for Rough Work)

31. An uncharged sphere of metal is placed inside a charged parallel plate capacitor. The lines of force will look like .....

1) 

2) 

3) 

4) 

32. A wire has a resistance of 6 Ω. It is cut into two parts and both half values are connected in parallel. The new resistance is .....

1) 12 Ω
2) 1.5 Ω
3) 3 Ω
4) 6 Ω

33. A current flows in a conductor from east to west. The direction of the magnetic field at a point above the conductor is .....

1) towards north
2) towards south
3) towards east
4) towards west

34. A bar magnet is equivalent to .....

1) solenoid carrying current
2) circular coil carrying current
3) torroid carrying current
4) straight conductor carrying current

35. Excitation energy of a hydrogen like ion in its first excitation state is 40.8 eV. Energy needed to remove the electron from the ion in ground state is .....

1) 54.4 eV
2) 13.6 eV
3) 40.8 eV
4) 27.2 eV

(Space for Rough Work)

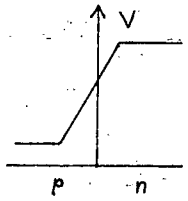
36. Threshold wavelength for photoelectric emission from a metal surface is 5200 $\overset{0}{A}$. Photoelectrons will be emitted when this surface is illuminated with monochromatic radiation from .....

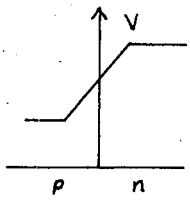
1) 50 W IR lamp
2) 10 W IR lamp
3) 1 W IR lamp
4) 50 W UV lamp

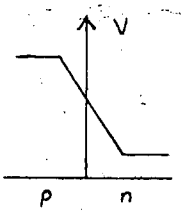
37. The emitter-base junction of a transistor is ..... biased while the collector-base junction is ..... biased.

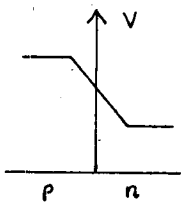
1) reverse, forward
2) reverse, reverse
3) forward, forward
4) forward, reverse

38. In a forward biased p-n junction diode, the potential barrier in the depletion region is of the form .....

1) 

2) 

3) 

4) 

39. A cylinder of radius r and length l is placed in an uniform electric field E parallel to the axis of the cylinder. The total flux for the surface of the cylinder is given by .....

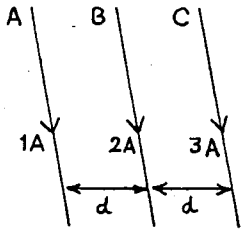
1) $\pi r^2 E$
2) $(\pi r^2 + \pi l^2)E$
3) zero
4) $2\pi r^2 E$

40. Two electric bulbs A and B are rated as 60 W and 100 W. They are connected in parallel to the same source. Then,

1) both draw the same current
2) A draws more current than B
3) B draws more current than A
4) current drawn are in the ratio of their resistances.

(Space for Rough Work)

41. Three long straight wires A, B and C are carrying currents as shown in figure. Then the resultant force on B is directed .....



1) towards A.
2) towards C.
3) perpendicular to the plane of paper and outward.
4) perpendicular to the plane of paper and inward.

42. Curie-Weiss law is obeyed by iron at a temperature .....

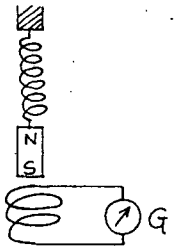
1) below Curie temperature
2) above Curie temperature
3) at Curie temperature only
4) at all temperatures

43. The dimensional formula for inductance is .....

1) $ML^2\ T^{-1}\ A^{-2}$
2) $ML^2\ T^{-2}A^{-1}$
3) $ML^2T^{-2}A^{-2}$
4) $ML^2\,T\,A^{-2}$

44. A magnet NS is suspended from a spring and while it oscillates, the magnet moves in and out of the coil C. The coil is connected to a galvanometer G. Then, as the magnet oscillates,

1) G shows deflection to the left and right with constant amplitude.
2) G shows deflection on one side.
3) G shows no deflection.
4) G shows deflection to the left and right but the amplitude steadily decreases.



45. The maximum current that can be measured by a galvanometer of resistance $40\,\Omega$ is 10 mA. It is converted into a voltmeter that can read upto 50 V. The resistance to be connected in series with the galvanometer is ..... (in ohm)

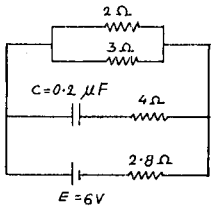
1) 5040
2) 4960
3) 2010
4) 4050

(Space for Rough Work)

46. An unknown resistance R_1 is connected in series with a resistance of $10\,\Omega$. This combination is connected to one gap of a metre bridge while a resistance R_2 is connected in the other gap. The balance point is at 50 cm. Now, when the $10\,\Omega$ resistance is removed the balance point shifts to 40 cm. The value of R_1 is (in ohm)

1) 60 2) 40
3) 20 4) 10

47. In the circuit shown, the internal resistance of the cell is negligible. The steady state current in the $2\,\Omega$ resistor is .....



1) 0.9 A 2) 1.5 A
3) 0.6 A 4) 1.2 A

48. A rectangular coil of 300 turns has an average area of 25 cm x 10 cm. The coil rotates with a speed of 50 cps in a uniform magnetic field of strength $4 \times 10^{-2}\,T$ about an axis perpendicular to the field. The peak value of the induced emf is (in volt)

1) $3\,\pi$ 2) $30\,\pi$
3) $300\,\pi$ 4) $3000\,\pi$

49. In a LCR circuit the pd between the terminals of the inductance is 60 V, between the terminals of the capacitor is 30 V and that between the terminals of resistance is 40 V. The supply voltage will be equal to .....

1) 50 V 2) 70 V
3) 130 V 4) 10 V

50. A vertical circular coil of radius 0.1 m and having 10 turns carries a steady current. When the plane of the coil is normal to the magnetic meridian, a neutral point is observed at the centre of the coil. If $B_H = 0.314 \times 10^{-4}\,T$, the current in the coil is .....

1) 2 A 2) 1 A
3) 0.5 A 4) 0.25 A

(Space for Rough Work)

51. The spectrum obtained from the chromosphere of the sun at the time of total solar eclipse is .....

1) continuous emission spectrum.
2) line absorption spectrum.
3) line emission spectrum.
4) band absorption spectrum

52. Heavy water is .....

1) water, in which soap does not lather
2) compound of heavy oxygen and heavy hydrogen
3) compound of deuterium and oxygen
4) water at 4^0C

53. The nuclear reactor at Kaiga is a .....

1) breeder reactor
2) power reactor
3) research reactor
4) fusion reactor

54. When a body moves in a circular path, no work is done by the force since,

1) there is no displacement
2) there is no net force
3) force and displacement are perpendicular to each other
4) the force is always away from the centre

55. A bullet moving with a speed of 100 ms^{-1} can just penetrate two planks of equal thickness. Then, the number of such planks penetrated by the same bullet when the speed is doubled will be .....

1) 4
2) 8
3) 6
4) 10

(Space for Rough Work)

56. Two bodies of masses 1 kg and 2 kg have equal momentum. Then, the ratio of their kinetic energies is .....

1) 1 : 3 2) 1 : 1
3) 2 : 1 4) 3 : 1

57. The loudness and pitch of a sound note depends on .....

1) intensity and frequency 2) frequency and number of harmonics
3) Intensity and velocity 4) frequency and velocity

58. Absorption co-efficient of an open window is .....

1) zero 2) 0.5
3) 1 4) 0.25

59. In Melde's experiment in the transverse mode, the frequency of the tuning fork and the frequency of the waves in the string are in the ratio .....

1) 1 : 1 2) 1 : 2
3) 2 : 1 4) 4 : 1

60. The difference between the apparant frequency of a source of sound as perceived by the observer during its approach and recession is 2% of the frequency of the source. If the speed of sound in air is 300 ms^{-1} the velocity of the source is .....

1) 6 ms^{-1} 2) 3 ms^{-1}
3) 1.5 ms^{-1} 4) 12 ms^{-1}

(Space for Rough Work)

(Space for Rough Work)

A-1

COMMON ENTRANCE TEST - 2004

Subject : MATHEMATICS
DATE : 18.05.2004
TIME : 2.30 P.M. TO 3.50 P.M.
MAXIMUM MARKS : 60
MAXIMUM TIME : 80 MINUTES

Please fill your CET No. below				

QUESTION BOOKLET	
VERSION CODE	SERIAL NUMBER
A 1	057185

IMPORTANT INSTRUCTIONS TO CANDIDATES

(Please read the following instructions carefully, before you start answering on the OMR answer sheet)

1. The OMR answer sheet is issued at the start of the examination at 2.15 p.m., the candidate should first enter only Name and CET No. on the OMR answer sheet.

2. After the 2nd bell at 2.30 p.m. the Question Papers will be issued. Now, the candidate should enter the Version Code and Serial Number of question booklet on the OMR answer sheet. But, he shall not remove the staples on the right side of this booklet OR look inside the question booklet OR start answering on the OMR answer sheet until the 3rd bell rings.

   As answer sheets are designed to suit the Optical Mark Reader (OMR) system, special care should be taken to fill those items accurately.

   DO NOT DAMAGE OR MUTILATE THE TIMING, MARKS ON THE OMR ANSWER SHEETS.

3. Remove the staples at the right side to open the question paper booklet only after the 3rd bell at 2.40 p.m.

4. This question booklet contains 60 questions.

5. During the subsequent 70 minutes :
   a) Read each question carefully.
   b) Determine the correct answer from out of the four available choices given under each question.
   c) **Completely darken / shade the relevant circle with a blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

   For example :

   Q. No. 14 : The product of 0.5 x 0.05 is : 1) 0.05 2) 0.005 3) 0.025 4) 0.25

   As the correct answer is option no. 3, the candidate should darken the circle corresponding to option no. 3 completely with a blue or black ink ballpoint pen on the OMR answer sheet, as shown below :

6. For each correct answer, one mark will be awarded. For each wrong answer, quarter (1/4) mark will be deducted and if more than one circle is darkened for a given question, one mark will be deducted. **Even a minute unintended dot will also be recognised and recorded by the scanner. Please avoid multiple markings of any kind.**

7. Rough work should be done only on the blank space provided on each page of the question booklet. Rough work should not be done on the OMR answer sheet.

8. Please stop writing when the last bell rings at 3.50 p.m. Hand over the OMR answer paper set to the invigilator, who will separate the top sheet and will retain the same with him and return the bottom sheet replica to you to carry home.

NOTE : The candidate should safely preserve the replica of the OMR answer sheet for a minimum period of one year from the date of Common Entrance Test.

MATHEMATICS

1. If $\frac{Log\,x}{a-b} = \frac{Log\,y}{b-c} = \frac{Log\,z}{c-a}$ then xyz =

   1) 0 2) 1
   3) -1 4) 2

2. The last digit in 7^{300} is .....

   1) 7 2) 9
   3) 1 4) 3

3. How many numbers of 6 digits can be formed from the digits of the number 112233 ?

   1) 30 2) 60
   3) 90 4) 120

4. The number of solutions for the equation $x^2 - 5|x| + 6 = 0$ is .....

   1) 4 2) 3
   3) 2 4) 1

5. 0.5737373 ..... =

   1) $\frac{284}{497}$ 2) $\frac{284}{495}$
   3) $\frac{568}{999}$ 4) $\frac{567}{990}$

(Space for Rough Work)

6. If $ax^2 - y^2 + 4x - y = 0$ represents a pair of lines then a = ...

1) -16 2) 16

3) 4 4) -4

7. What is the equation of the locus of a point which moves such that 4 times its distance from the x - axis is the square of its distance from the origin ?

1) $x^2+y^2-4y=0$ 2) $x^2+y^2-4|y|=0$

3) $x^2+y^2-4x=0$ 4) $x^2+y^2-4|x|=0$

8. Equation of the straight line making equal intercepts on the axes and passing through the point (2, 4) is .....

1) $4x-y-4=0$ 2) $2x+y-8=0$

3) $x+y-6=0$ 4) $x+2y-10=0$

9. If the area of the triangle with vertices $(x, 0)$, $(1,1)$ and $(0,2)$ is 4 square units then a value of x is .....

1) -2 2) -4

3) -6 4) 8

10. $\lim_{\theta \to \frac{\pi}{2}} \frac{\frac{\pi}{2} - \theta}{Cot\ \theta}$ =

1) 0 2) -1

3) 1 4) ∞

(Space for Rough Work)

11. $\lim_{x \to \infty} \left(1 - \frac{4}{x-1}\right)^{3x-1} =$

1) e^{12} 2) e^{-12}

3) e^{4} 4) e^{3}

12. If $A + B + C = 180^0$ then $\sum Tan \frac{A}{2} Tan \frac{B}{2} =$

1) 0 2) 1

3) 2 4) 3

13. In a triangle ABC if $b = 2$, $B = 30^0$ then the area of the circumcircle of triangle ABC in square units is .....

1) π 2) 2π

3) 4π 4) 6π

14. If $Sin\,x + Sin^2 x = 1$ then, $Cos^{12} x + 3Cos^{10} x + 3Cos^8 x + Cos^6 x =$

1) 1 2) 2

3) 3 4) 0

15. If R denotes the set of all real numbers then the function $f : R \to R$ defined by $f(x) = |x|$ is .....

1) one - one only 2) onto only

3) both one-one and onto 4) neither one-one nor onto

(Space for Rough Work)

16. Which of the following is the inverse of the proposition : "If a number is a prime then it is odd" ?

1) If a number is not a prime then it is odd.
2) If a number is not a prime then it is not odd.
3) If a number is not odd then it is not a prime.
4) If a number is odd then it is a prime.

17. $\sim p \wedge q$ is logically equivalent to .....

1) $p \rightarrow q$
2) $q \rightarrow p$
3) $\sim (p \rightarrow q)$
4) $\sim (q \rightarrow p)$

18. What must be the matrix X if $2X + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$?

1) $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$
2) $\begin{bmatrix} 1 & -3 \\ 2 & -1 \end{bmatrix}$
3) $\begin{bmatrix} 2 & 6 \\ 4 & -2 \end{bmatrix}$
4) $\begin{bmatrix} 2 & -6 \\ 4 & -2 \end{bmatrix}$

19. The value of $\begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ b+c & c+a & a+b \end{vmatrix}$ is .....

1) 1
2) 0
3) $(a-b)(b-c)(c-a)$
4) $(a+b)(b+c)(c+a)$

20. The value of $\begin{vmatrix} 441 & 442 & 443 \\ 445 & 446 & 447 \\ 449 & 450 & 451 \end{vmatrix}$ is .....

1) $441 \times 446 \times 451$
2) 0
3) -1
4) 1

(Space for Rough Work)

21. Inverse of the matrix $\begin{bmatrix} Cos\,2\theta & -Sin\,2\theta \\ Sin\,2\theta & Cos\,2\theta \end{bmatrix}$ is .....

1) $\begin{bmatrix} Cos\,2\theta & -Sin\,2\theta \\ Sin\,2\theta & Cos\,2\theta \end{bmatrix}$ 2) $\begin{bmatrix} Cos\,2\theta & Sin\,2\theta \\ Sin\,2\theta & -Cos\,2\theta \end{bmatrix}$

3) $\begin{bmatrix} Cos\,2\theta & Sin\,2\theta \\ Sin\,2\theta & Cos\,2\theta \end{bmatrix}$ 4) $\begin{bmatrix} Cos\,2\theta & Sin\,2\theta \\ -Sin\,2\theta & Cos\,2\theta \end{bmatrix}$

22. If $\left|\vec{a}\right| = 3$, $\left|\vec{b}\right| = 4$ then a value of λ for which $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{a} - \lambda\vec{b}$ is .....

1) $\frac{9}{16}$ 2) $\frac{3}{4}$

3) $\frac{3}{2}$ 4) $\frac{4}{3}$

23. $\left(\vec{a}\cdot\hat{i}\right)\hat{i} + \left(\vec{a}\cdot\hat{j}\right)\hat{j} + \left(\vec{a}\cdot\hat{k}\right)\hat{k} =$

1) $\vec{a}$ 2) $2\,\vec{a}$

3) $3\,\vec{a}$ 4) $\vec{0}$

24. The projection of $\vec{a} = 2\hat{i} + 3\hat{j} - 2\hat{k}$ on $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ is

1) $\frac{1}{\sqrt{14}}$ 2) $\frac{2}{\sqrt{14}}$

3) $\sqrt{14}$ 4) $\frac{-2}{\sqrt{14}}$

25. In the group $\{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7, $2^{-1} \times 4 =$

1) 1 2) 4

3) 2 4) 3

(Space for Rough Work)

26. If Q_1 is the set of all rationals other than 1 with the binary operation $*$ defined by $a * b = a + b - ab$ for all a, b in Q_1 then the identity in Q_1 w.r.t. $*$ is

1) 1 2) 0

3) -1 4) 2

27. Which of the following is true ?

1) The set of all fourth roots of unity is a multiplicative group.

2) The set of all cube roots of unity is an additive group.

3) $(ab)^{-1} = a^{-1}b^{-1}$ for all a, b in any group G.

4) If $(ab)^2 = a^2b^2$ for all a, b in any group G, then the group G is nonabelian.

28. The set of all integral multiples of 5 is a subgroup of

1) The set of all rational numbers under multiplication.

2) The set of all integers under multiplication.

3) The set of all nonzero rational numbers under multiplication.

4) The set of all integers under addition.

29. The circle $x^2 + y^2 - 8x + 4y + 4 = 0$ touches

1) x – axis 2) y – axis

3) both axes 4) neither x – axis nor y – axis

30. The value of k so that $x^2 + y^2 + kx + 4y + 2 = 0$ and $2(x^2 + y^2) - 4x - 3y + k = 0$ cut orthogonally is

1) $\frac{10}{3}$ 2) $\frac{-8}{3}$

3) $\frac{-10}{3}$ 4) $\frac{8}{3}$

(Space for Rough Work)

31. The coaxal system of circles given by $x^2 + y^2 + 2gx + c = 0$ for $c < 0$ represents.

1) intersecting circles
2) non intersecting circles
3) touching circles
4) touching or non intersecting circles

32. The radius of the circle passing through the point (6, 2) and two of whose diameters are $x + y = 6$ and $x + 2y = 4$ is

1) 4
2) 6
3) 20
4) $\sqrt{20}$

33. If (0, 6) and (0, 3) are respectively the vertex and focus of a parabola then its equation is

1) $x^2 + 12y = 72$
2) $x^2 - 12y = 72$
3) $y^2 - 12x = 72$
4) $y^2 + 12x = 72$

34. For the ellipse $25x^2 + 9y^2 - 150x - 90y + 225 = 0$ the eccentricity, e =

1) $\frac{2}{5}$
2) $\frac{3}{5}$
3) $\frac{4}{5}$
4) $\frac{1}{5}$

35. If the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} - \frac{y^2}{81} = \frac{1}{25}$ coincide then the value of b^2 is

1) 1
2) 7
3) 5
4) 9

(Space for Rough Work)

36. The equation of the director circle of the hyperbola $\frac{x^2}{16} - \frac{y^2}{4} = 1$ is given by .....

1) $x^2 + y^2 = 16$ 2) $x^2 + y^2 = 4$

3) $x^2 + y^2 = 20$ 4) $x^2 + y^2 = 12$

37. If $0 \leq x \leq \pi$ and $81^{Sin^2 x} + 81^{Cos^2 x} = 30$ then $x =$

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{2}$

3) $\frac{\pi}{4}$ 4) $\frac{3\pi}{4}$

38. If $Sin^{-1}\frac{x}{5} + Cosec^{-1}\frac{5}{4} = \frac{\pi}{2}$ then $x =$

1) 1 2) 4

3) 3 4) 5

39. If $Cos^{-1} p + Cos^{-1} q + Cos^{-1} r = \pi$ then $p^2 + q^2 + r^2 + 2pqr =$

1) 3 2) 1

3) 2 4) -1

40. The smallest positive integer n for which $(1+i)^{2n} = (1-i)^{2n}$ is

1) 1 2) 2

3) 3 4) 4

(Space for Rough Work)

41. If $x + \frac{1}{x} = 2\,Cos\,\alpha$ then $x^n + \frac{1}{x^n} =$

1) $2^n\,Cos\,\alpha$ 2) $2^n\,Cos\,n\alpha$

3) $2i\,Sin\,n\alpha$ 4) $2Cos\,n\alpha$

42. If $w = \frac{-1+\sqrt{3}\,i}{2}$ then $\left(3 + w + 3w^2\right)^4 =$

1) 16 2) -16

3) $16\,w$ 4) $16w^2$

43. If $f(x) = \begin{cases} \frac{1-Cos\,x}{x} & , x \neq 0 \\ k & , x = 0 \end{cases}$ is continuous at $x = 0$, then $k =$

1) 0 2) $\frac{1}{2}$

3) $\frac{1}{4}$ 4) $-\frac{1}{2}$

44. If $y = Tan^{-1}\left(Sec\,x - Tan\,x\right)$ then $\frac{dy}{dx} =$

1) 2 2) -2

3) $\frac{1}{2}$ 4) $-\frac{1}{2}$

45. The differential coefficient of $f(Sin\,x)$ w.r.t. x where $f(x) = log\,x$ is

1) $Tan\,x$ 2) $Cot\,x$

3) $f(Cos\,x)$ 4) $\frac{1}{x}$

(Space for Rough Work)

46. If $x = a\left(t - \frac{1}{t}\right)$, $y = a\left(t + \frac{1}{t}\right)$ then $\frac{dy}{dx} =$

1) $\frac{y}{x}$ 2) $\frac{-y}{x}$

3) $\frac{x}{y}$ 4) $\frac{-x}{y}$

47. If $x = A\ Cos\ 4t + B\ Sin\ 4t$ then $\frac{d^2x}{dt^2} =$

1) $-16x$ 2) $16x$

3) x 4) $-x$

48. For the curve $y^n = a^{n-1}x$ if the subnormal at any point is a constant then $n =$

1) 1 2) 2

3) -2 4) -1

49. If the distance 's' metres traversed by a particle in 't' seconds is given by $s = t^3 - 3t^2$, then the velocity of the particle when the acceleration is zero, in metres/sec is -

1) 3 2) -2

3) -3 4) 2

50. The maximum of the function $3\ Cos\ x - 4\ Sin\ x$ is

1) 2 2) 3

3) 4 4) 5

(Space for Rough Work)

51. If a tangent to the curve $y = 6x - x^2$ is parallel to the line $4x - 2y - 1 = 0$, then the point of tangency on the curve is

1) (2, 8) 2) (8, 2)
3) (6, –1) 4) (4, 2)

52. $\int \frac{dx}{x^2+2x+2} =$

1) $Sin^{-1}(x+1)+c$ 2) $Sinh^{-1}(x+1)+c$
3) $Tanh^{-1}(x+1)+c$ 4) $Tan^{-1}(x+1)+c$

53. $\int \sqrt{x}\, e^{\sqrt{x}}\, dx =$

1) $2\sqrt{x} - e^{\sqrt{x}} - 4\sqrt{x}\, e^{\sqrt{x}} + c$ 2) $\left(2x - 4\sqrt{x} + 4\right)e^{\sqrt{x}} + c$
3) $\left(2x + 4\sqrt{x} + 4\right)e^{\sqrt{x}} + c$ 4) $\left(1 - 4\sqrt{x}\right)e^{\sqrt{x}} + c$

54. $\int \frac{dx}{x\left(x^7+1\right)} =$

1) $Log\left(\frac{x^7}{x^7+1}\right)+c$ 2) $\frac{1}{7}Log\left(\frac{x^7}{x^7+1}\right)+c$
3) $Log\left(\frac{x^7+1}{x^7}\right)+c$ 4) $\frac{1}{7}Log\left(\frac{x^7+1}{x^7}\right)+c$

55. $\int_{-1}^{1} |1-x|\, dx =$

1) – 2 2) 0
3) 2 4) 4

(Space for Rough Work)

56. $\int_0^{\pi/2} \frac{Cos\,x - Sin\,x}{1+Cos\,x\,Sin\,x}\,dx =$

1) 0 2) $\frac{\pi}{2}$

3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

57. $\int_0^{\pi/8} Cos^3 4\theta\, d\theta =$

1) $\frac{2}{3}$ 2) $\frac{1}{4}$

3) $\frac{1}{3}$ 4) $\frac{1}{6}$

58. The area enclosed between the curves $y = x^3$ and $y = \sqrt{x}$ is, in square units

1) $\frac{5}{3}$ 2) $\frac{5}{4}$

3) $\frac{5}{12}$ 4) $\frac{12}{5}$

59. The degree of the differential equation $\left(1+\left(\frac{dy}{dx}\right)^2\right)^{3/4} = \left(\frac{d^2y}{dx^2}\right)^{1/3}$ is

1) $\frac{1}{3}$ 2) 4

3) 9 4) $\frac{3}{4}$

60. The general solution of the differential equation $\frac{dy}{dx} + \frac{1+Cos\,2y}{1-Cos\,2x} = 0$ is given by

1) $Tan\,y + Cot\,x = c$ 2) $Tan\,y - Cot\,x = c$

3) $Tan\,x - Cot\,y = c$ 4) $Tan\,x + Cot\,y = c$

(Space for Rough Work)

(Space for Rough Work)

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