

# COMMON ENTRANCE TEST - 2008

DATE	SUBJECT	TIME
19 - 04 - 2008	PHYSICS & CHEMISTRY (COMBINED PAPER)	10.00 AM to 12.30 PM

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
120	150 MINUTES	140 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
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## IMPORTANT INSTRUCTIONS TO CANDIDATES

(Candidates are advised to read the following instructions carefully, before answering on OMR answer sheet.)

1. Ensure that CET No. has been entered and shaded the respective circles on the OMR answer sheet.
2. **ENSURE THAT THE TIMING, MARKS PRINTED ON THE OMR ANSWER SHEET ARE NOT DAMAGED/MUTILATED/SPOILED.**
3. This Question Booklet is issued to you by the invigilator after the 2<sup>nd</sup> Bell. i.e., after 10.00 a.m.
4. Enter the Serial Number of this question booklet on the OMR answer sheet.
5. Carefully enter the Version Code of this question booklet on the OMR answer sheet and SHADE the respective circles completely.
6. As answer sheets are designed to suit the Optical Mark Reader (OMR) system, please take special care while filling and shading the CET NO. & Version Code of this question booklet.
7. **DO NOT FORGET TO SIGN AT THE BOTTOM PORTION OF OMR ANSWER SHEET IN THE SPACE PROVIDED.**
8. Until the 3<sup>rd</sup> Bell is rung at 10.10 a.m. :
  - Do not remove the staple present on the right hand side of this question booklet.
  - Do not look inside this question booklet.
  - Do not start answering on the OMR answer sheet.
9. After the 3<sup>rd</sup> Bell is rung at 10.10 a.m., remove the staple present on the right hand side of this question booklet and start answering on the OMR answer sheet.
10. This question booklet contains 120 questions and each question will have four different options / choices.
11. During the subsequent 140 minutes :
  - Read each question carefully.
  - Determine the correct answer from out of the four available options / choices given under each question.
  - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALLPOINT PEN against the question number on the OMR answer sheet.**

**CORRECT METHOD OF SHADING THE CIRCLE ON THE OMR SHEET IS AS SHOWN BELOW :**



12. Please note that even a minute unintended ink dot on the OMR sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
13. Use the space provided on each page of the question booklet for Rough Work AND do not use the OMR answer sheet for the same.
14. After the last bell is rung at 12.30 p.m., stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
15. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
16. After separating and retaining the top sheet (KEA Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
17. Preserve the replica of the OMR answer sheet for a minimum period of One year.

# PHYSICS

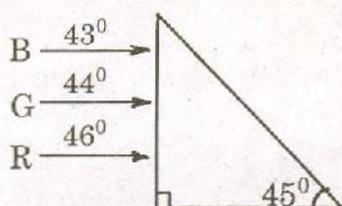
1. A ray of light enters from a rarer to a denser medium. The angle of incidence is  $i$ . Then the reflected and refracted rays are mutually perpendicular to each other. The critical angle for the pair of media is

- 1)  $\text{Sin}^{-1}(\text{Tan } i)$                       2)  $\text{Tan}^{-1}(\text{Sin } i)$   
 3)  $\text{Sin}^{-1}(\text{Cot } i)$                       4)  $\text{Cos}^{-1}(\text{Tan } i)$

2. A fish in water (refractive index  $n$ ) looks at a bird vertically above in the air. If  $y$  is the height of the bird and  $x$  is the depth of the fish from the surface, then the distance of the bird as estimated by the fish is

- 1)  $x + y \left(1 - \frac{1}{n}\right)$                       2)  $x + ny$   
 3)  $x + y \left(1 + \frac{1}{n}\right)$                       4)  $y + x \left(1 - \frac{1}{n}\right)$

3. Figure shows a mixture of blue, green and red coloured rays incident normally on a right angled prism. The critical angles of the material of the prism for red, green and blue are  $46^\circ$ ,  $44^\circ$  and  $43^\circ$  respectively. The arrangement will separate

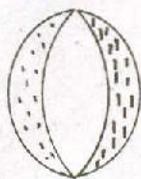


- 1) red colour from blue and green  
 2) blue colour from red and green  
 3) green colour from red and blue  
 4) all the three colours.

4. A convex and a concave lens separated by distance  $d$  are then put in contact. The focal length of the combination

- 1) decreases                                      2) increases  
 3) becomes 0                                      4) remains the same

5. A convex lens is made of 3 layers of glass of 3 different materials as in the figure. A point object is placed on its axis. The number of images of the object are



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

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(Space for Rough Work)

6. If  $\mu_0$  is permeability of free space and  $\epsilon_0$  is permittivity of free space, the speed of light in vacuum is given by

1)  $\sqrt{\mu_0 \epsilon_0}$

2)  $\sqrt{\mu_0 / \epsilon_0}$

3)  $\sqrt{\frac{1}{\mu_0 \epsilon_0}}$

4)  $\sqrt{\epsilon_0 / \mu_0}$

7. In Young's double slit experiment, a third slit is made in between the double slits. Then

- 1) intensity of fringes totally disappears.
- 2) only bright light is observed on the screen.
- 3) fringes of unequal width are formed.
- 4) contrast between bright and dark fringes is reduced.

8. The maximum number of possible interference maxima when slit separation is equal to 4 times the wavelength of light used in a double slit experiment is

1)  $\infty$

2) 9

3) 8

4) 4

9. In a Fraunhofer diffraction experiment at a single slit using a light of wavelength 400 nm, the first minimum is formed at an angle of  $30^\circ$ . The direction  $\theta$  of the first secondary maximum is given by

1)  $\sin^{-1} \frac{2}{3}$

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

3)  $\sin^{-1} \frac{1}{4}$

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

10. Maximum diffraction takes place in a given slit for

1)  $\gamma$ - rays

2) ultraviolet light

3) infrared light

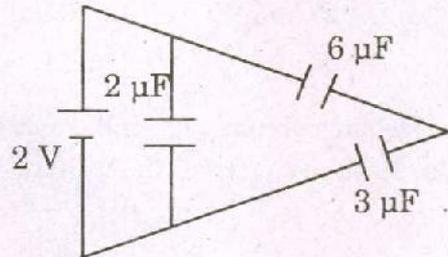
4) radio waves

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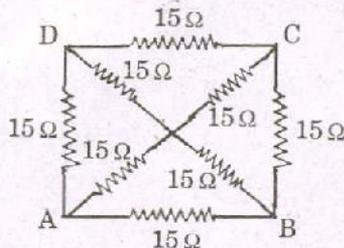
(Space for Rough Work)



16. How many  $6\mu F$ , 200 V condensers are needed to make a condenser of  $18\mu F$ , 600 V?  
 1) 9  
 2) 18  
 3) 3  
 4) 27
17. The total energy stored in the condenser system shown in the figure will be



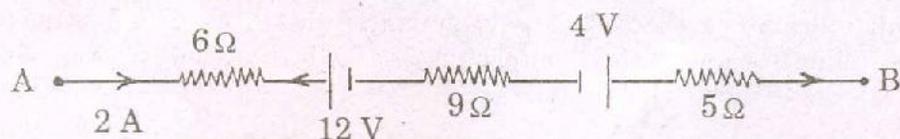
- 1)  $2\mu J$   
 2)  $4\mu J$   
 3)  $8\mu J$   
 4)  $16\mu J$
18. A metal wire is subjected to a constant potential difference. When the temperature of the metal wire increases, the drift velocity of the electron in it  
 1) increases, thermal velocity of the electron decreases  
 2) decreases, thermal velocity of the electron decreases  
 3) increases, thermal velocity of the electron increases  
 4) decreases, thermal velocity of the electron increases
19. The equivalent resistance between the points A and B will be (each resistance is  $15\Omega$ )



- 1)  $30\Omega$   
 2)  $8\Omega$   
 3)  $10\Omega$   
 4)  $40\Omega$
20. The terminals of a 18 V battery with an internal resistance of  $24\Omega$  are connected to a circular wire of resistance  $24\Omega$  at two points distant at one quarter of the circumference of a circular wire. The current through the bigger arc of the circle will be  
 1) 0.75 A  
 2) 1.5 A  
 3) 2.25 A  
 4) 3 A

(Space for Rough Work)

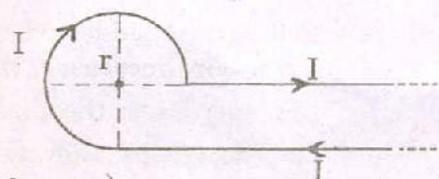
21. The potential difference between A and B in the following figure is



- 1) 32 V  
2) 48 V  
3) 24 V  
4) 14 V
22. The magnetic field at the centre of a circular current carrying conductor of radius  $r$  is  $B_c$ . The magnetic field on its axis at a distance  $r$  from the centre is  $B_a$ . The value of  $B_c : B_a$  will be

- 1)  $1 : \sqrt{2}$   
2)  $1 : 2\sqrt{2}$   
3)  $2\sqrt{2} : 1$   
4)  $\sqrt{2} : 1$

23. Current  $I$  is flowing in a conductor shaped as shown in the figure. The radius of the curved part is  $r$  and the length of straight portion is very large. The value of the magnetic field at the centre  $O$  will be

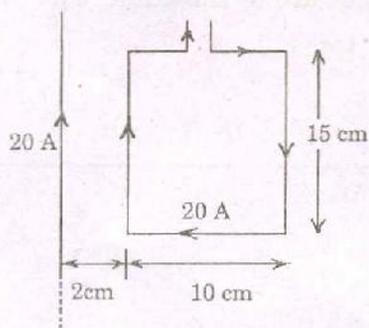


- 1)  $\frac{\mu_0 I}{4\pi r} \left( \frac{3\pi}{2} + 1 \right)$   
2)  $\frac{\mu_0 I}{4\pi r} \left( \frac{3\pi}{2} - 1 \right)$   
3)  $\frac{\mu_0 I}{4\pi r} \left( \frac{\pi}{2} + 1 \right)$   
4)  $\frac{\mu_0 I}{4\pi r} \left( \frac{\pi}{2} - 1 \right)$

24. Two tangent galvanometers A and B are identical except in their number of turns. They are connected in series. On passing a current through them, deflections of  $60^\circ$  and  $30^\circ$  are produced. The ratio of the number of turns in A and B is

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

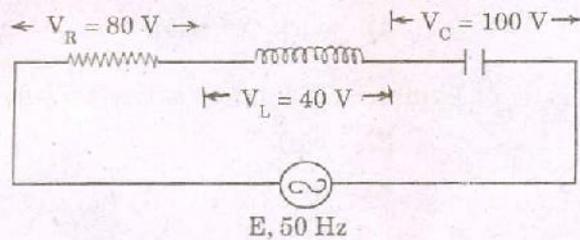
25. The resultant force on the current loop PQRS due to a long current carrying conductor will be



- 1)  $10^{-4} N$   
2)  $3.6 \times 10^{-4} N$   
3)  $1.8 \times 10^{-4} N$   
4)  $5 \times 10^{-4} N$

(Space for Rough Work)

26. A certain current on passing through a galvanometer produces a deflection of 100 divisions. When a shunt of one ohm is connected, the deflection reduces to 1 division. The galvanometer resistance is
- 1)  $100 \Omega$
  - 2)  $99 \Omega$
  - 3)  $10 \Omega$
  - 4)  $9.9 \Omega$
27. Two similar circular loops carry equal currents in the same direction. On moving the coils further apart, the electric current will
- 1) increase in both
  - 2) decrease in both
  - 3) remain unaltered
  - 4) increases in one and decreases in the second
28. The value of alternating emf  $E$  in the given circuit will be



- 1) 220 V
  - 2) 140 V
  - 3) 100 V
  - 4) 20 V
29. A current of 5A is flowing at 220 V in the primary coil of a transformer. If the voltage produced in the secondary coil is 2200 V and 50% of power is lost, then the current in the secondary will be
- 1) 2.5 A
  - 2) 5 A
  - 3) 0.25 A
  - 4) 0.5 A
30. For a series LCR circuit at resonance, the statement which is not true is
- 1) Peak energy stored by a capacitor = peak energy stored by an inductor
  - 2) Average power = apparent power
  - 3) Wattless current is zero
  - 4) Power factor is zero

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(Space for Rough Work)



31. Solar spectrum is an example for
- 1) line emission spectrum
  - 2) continuous emission spectrum
  - 3) band absorption spectrum
  - 4) line absorption spectrum
32. When a piece of metal is illuminated by a monochromatic light of wavelength  $\lambda$ , then stopping potential is  $3Vs$ . When same surface is illuminated by light of wavelength  $2\lambda$ , then stopping potential becomes  $Vs$ . The value of threshold wavelength for photoelectric emission will be
- 1)  $4\lambda$
  - 2)  $8\lambda$
  - 3)  $\frac{4}{3}\lambda$
  - 4)  $6\lambda$
33. The maximum kinetic energy of emitted electrons in a photoelectric effect does not depend upon
- 1) wavelength
  - 2) frequency
  - 3) intensity
  - 4) work function
34. The ratio of minimum wavelengths of Lyman and Balmer series will be
- 1) 1.25
  - 2) 0.25
  - 3) 5
  - 4) 10
35. Hydrogen atom does not emit X-rays because
- 1) it contains only a single electron
  - 2) energy levels in it are far apart
  - 3) its size is very small
  - 4) energy levels in it are very close to each other

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(Space for Rough Work)

36. If an electron and a proton have the same de-Broglie wavelength, then the kinetic energy of the electron is
- 1) zero
  - 2) less than that of a proton
  - 3) more than that of a proton
  - 4) equal to that of a proton
37. Two protons are kept at a separation of  $40 \text{ \AA}$ .  $F_n$  is the nuclear force and  $F_e$  is the electrostatic force between them. Then
- 1)  $F_n \gg F_e$
  - 2)  $F_n = F_e$
  - 3)  $F_n \ll F_e$
  - 4)  $F_n \approx F_e$
38. Blue colour of sea water is due to
- 1) interference of sunlight reflected from the water surface
  - 2) scattering of sunlight by the water molecules
  - 3) image of sky in water
  - 4) refraction of sunlight
39. The ratio of the nuclear radii of elements with mass numbers 216 and 125 is
- 1) 216 : 125
  - 2)  $\sqrt{216} : \sqrt{125}$
  - 3) 6 : 5
  - 4) none of these
40. On bombarding  $U^{235}$  by slow neutron, 200 MeV energy is released. If the power output of atomic reactor is 1.6 MW, then the rate of fission will be
- 1)  $5 \times 10^{22} / s$
  - 2)  $5 \times 10^{16} / s$
  - 3)  $8 \times 10^{16} / s$
  - 4)  $20 \times 10^{16} / s$

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(Space for Rough Work)



46. Dimensional formula for the universal gravitational constant  $G$  is

1)  $M^{-1}L^2T^{-2}$

2)  $M^0L^0T^0$

3)  $M^{-1}L^3T^{-2}$

4)  $M^{-1}L^3T^{-1}$

47. A body is projected vertically upwards. The times corresponding to height  $h$  while ascending and while descending are  $t_1$  and  $t_2$  respectively. Then the velocity of projection is ( $g$  is acceleration due to gravity)

1)  $g\sqrt{t_1t_2}$

2)  $\frac{gt_1t_2}{t_1+t_2}$

3)  $\frac{g\sqrt{t_1t_2}}{2}$

4)  $\frac{g(t_1+t_2)}{2}$

48. A mass of 10 kg is suspended from a spring balance. It is pulled aside by a horizontal string so that it makes an angle of  $60^\circ$  with the vertical. The new reading of the balance is

1) 20 kg.wt

2) 10 kg.wt

3)  $10\sqrt{3}$  kg.wt

4)  $20\sqrt{3}$  kg.wt

49. A body weighs 50 grams in air and 40 grams in water. How much would it weigh in a liquid of specific gravity 1.5?

1) 30 grams

2) 35 grams

3) 65 grams

4) 45 grams

50. A body of mass 4 kg is accelerated upon by a constant force, travels a distance of 5 m in the first second and a distance of 2 m in the third second. The force acting on the body is

1) 2 N

2) 4 N

3) 6 N

4) 8 N

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(Space for Rough Work)





# CHEMISTRY

61. The correct order in which the first ionisation potential increases is
- 1) *Na, K, Be*
  - 2) *K, Na, Be*
  - 3) *K, Be, Na*
  - 4) *Be, Na, K*
62. 10 cm<sup>3</sup> of 0.1 N monobasic acid requires 15 cm<sup>3</sup> of sodium hydroxide solution whose normality is
- 1) 1.5 N
  - 2) 0.15 N
  - 3) 0.066 N
  - 4) 0.66 N
63. The IUPAC name for tertiary butyl iodide is
- 1) 4-Iodobutane
  - 2) 2-Iodobutane
  - 3) 1-Iodo, 3-methyl propane
  - 4) 2-Iodo 2-methyl propane
64. When sulphur dioxide is passed in an acidified  $K_2Cr_2O_7$  solution, the oxidation state of sulphur is changed from
- 1) + 4 to 0
  - 2) + 4 to + 2
  - 3) + 4 to + 6
  - 4) + 6 to + 4
65. Mass of 0.1 mole of Methane is
- 1) 1 g
  - 2) 16 g
  - 3) 1.6 g
  - 4) 0.1 g

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(Space for Rough Work)



66. Methoxy methane and ethanol are
- 1) Position isomers
  - 2) Chain isomers
  - 3) Functional isomers
  - 4) Optical isomers
67. When the azimuthal quantum number has the value of 2, the number of orbitals possible are
- 1) 7
  - 2) 5
  - 3) 3
  - 4) 0
68. For the reaction  $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$  the volume of carbon monoxide required to reduce one mole of ferric oxide is
- 1)  $22.4 \text{ dm}^3$
  - 2)  $44.8 \text{ dm}^3$
  - 3)  $67.2 \text{ dm}^3$
  - 4)  $11.2 \text{ dm}^3$
69. The monomers of Buna-S rubber are
- 1) vinyl chloride and sulphur
  - 2) butadiene
  - 3) styrene and butadiene
  - 4) isoprene and butadiene
70. An element with atomic number 21 is a
- 1) halogen
  - 2) representative element
  - 3) transition element
  - 4) alkali metal

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(Space for Rough Work)

71. The maximum number of hydrogen bonds that a molecule of water can have is
- 1) 1
  - 2) 2
  - 3) 3
  - 4) 4
72. A gas deviates from ideal behaviour at a high pressure because its molecules
- 1) attract one another
  - 2) show the Tyndall effect
  - 3) have kinetic energy
  - 4) are bound by covalent bonds
73. The reagent used to convert an alkyne to alkene is
- 1)  $Zn / HCl$
  - 2)  $Sn / HCl$
  - 3)  $Zn-Hg / HCl$
  - 4)  $Pd / H_2$
74. When compared to  $\Delta G^0$  for the formation of  $Al_2O_3$ , the  $\Delta G^0$  for the formation of  $Cr_2O_3$  is
- 1) higher
  - 2) lower
  - 3) same
  - 4) unpredictable
75. In order to increase the volume of a gas by 10%, the pressure of the gas should be
- 1) increased by 10 %
  - 2) increased by 1 %
  - 3) decreased by 10 %
  - 4) decreased by 1 %

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(Space for Rough Work)

76. Catalytic dehydrogenation of a primary alcohol gives a
- 1) secondary alcohol
  - 2) aldehyde
  - 3) ketone
  - 4) ester
77. Excess of  $PCl_5$  reacts with conc.  $H_2SO_4$  giving
- 1) chlorosulphonic acid
  - 2) thionyl chloride
  - 3) sulphuryl chloride
  - 4) sulphurous acid
78. If one mole of ammonia and one mole of hydrogen chloride are mixed in a closed container to form ammonium chloride gas, then
- 1)  $\Delta H > \Delta u$
  - 2)  $\Delta H = \Delta u$
  - 3)  $\Delta H < \Delta u$
  - 4) there is no relationship
79. The compound on dehydrogenation gives a ketone. The original compound is
- 1) primary alcohol
  - 2) secondary alcohol
  - 3) tertiary alcohol
  - 4) carboxylic acid
80. Which is the most easily liquifiable rare gas ?
- 1)  $Xe$
  - 2)  $Kr$
  - 3)  $Ar$
  - 4)  $Ne$

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(Space for Rough Work)

81. Mesomeric effect involves delocalisation of
- 1)  $\pi$  electrons
  - 2) sigma electrons
  - 3) protons
  - 4) none of these
82. Which of the following has the maximum number of unpaired 'd' electrons ?
- 1)  $Zn^{2+}$
  - 2)  $Fe^{2+}$
  - 3)  $Ni^{3+}$
  - 4)  $Cu^+$
83. One mole of which of the following has the highest entropy?
- 1) liquid nitrogen
  - 2) hydrogen gas
  - 3) mercury
  - 4) diamond
84. Which of the following species does not exert a resonance effect ?
- 1)  $C_6H_5NH_2$
  - 2)  $C_6H_5NH_3^+$
  - 3)  $C_6H_5OH$
  - 4)  $C_6H_5Cl$
85. A complex compound in which the oxidation number of a metal is zero is
- 1)  $K_4[Fe(CN)_6]$
  - 2)  $K_3[Fe(CN)_6]$
  - 3)  $[Ni(CO)_4]$
  - 4)  $[Pt(NH_3)_4]Cl_2$

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(Space for Rough Work)



91. The number of nodal planes present in  $\sigma^*s$  antibonding orbitals is
- 1) 1
  - 2) 2
  - 3) 0
  - 4) 3
92. Which of the following electrolytic solutions has the least specific conductance ?
- 1) 0.02 N
  - 2) 0.2 N
  - 3) 2 N
  - 4) 0.002 N
93. The overlapping of orbitals in benzene is of the type
- 1)  $sp-sp$
  - 2)  $p-p$
  - 3)  $sp^2-sp^2$
  - 4)  $sp^3-sp^3$
94. The calculated bond order of superoxide ion ( $O_2^-$ ) is
- 1) 2.5
  - 2) 2
  - 3) 1.5
  - 4) 1
95. Which of the following can be measured by the Ostwald-Walker dynamic method ?
- 1) Relative lowering of vapour pressure
  - 2) Lowering of vapour pressure
  - 3) Vapour pressure of the solvent
  - 4) all of these

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(Space for Rough Work)

96. *n*-propyl bromide on treating with alcoholic *KOH* produces
- 1) propane
  - 2) propene
  - 3) propyne
  - 4) propanol
97. Mercury is a liquid metal because
- 1) it has a completely filled *s*-orbital
  - 2) it has a small atomic size
  - 3) it has a completely filled *d*-orbital that prevents *d-d* overlapping of orbitals
  - 4) it has a completely filled *d*-orbital that causes *d-d* overlapping
98. A compound is formed by elements *A* and *B*. This crystallises in the cubic structure where the *A* atoms are at the corners of the cube and *B* atoms are at the body centres. The simplest formula of the compound is
- 1)  $AB$
  - 2)  $A_6B$
  - 3)  $A_8B_4$
  - 4)  $AB_6$
99. Anisole can be prepared by the action of methyl iodide on sodium phenate. The reaction is called
- 1) Wurtz's reaction
  - 2) Williamson's reaction
  - 3) Fittig's reaction
  - 4) Etard's reaction
100. Malleability and ductility of metals can be accounted due to
- 1) the presence of electrostatic force
  - 2) the crystalline structure in metal
  - 3) the capacity of layers of metal ions to slide over the other
  - 4) the interaction of electrons with metal ions in the lattice

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(Space for Rough Work)

101. An ionic compound is expected to have tetrahedral structure if  $r_+/r_-$  lies in the range of
- 1) 0.414 to 0.732
  - 2) 0.225 to 0.414
  - 3) 0.155 to 0.225
  - 4) 0.732 to 1
102. Among the following, which is least acidic ?
- 1) phenol
  - 2) O-cresol
  - 3) p-nitrophenol
  - 4) p-chlorophenol
103. A ligand can also be regarded as
- 1) Lewis acid
  - 2) Bronsted base
  - 3) Lewis base
  - 4) Bronsted acid
104. The colour of sky is due to
- 1) transmission of light
  - 2) wavelength of scattered light
  - 3) absorption of light by atmospheric gases
  - 4) All of these
105. Which of the following organic compounds answers to both iodoform test and Fehling's test?
- 1) ethanol
  - 2) methanal
  - 3) ethanal
  - 4) propanone

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(Space for Rough Work)

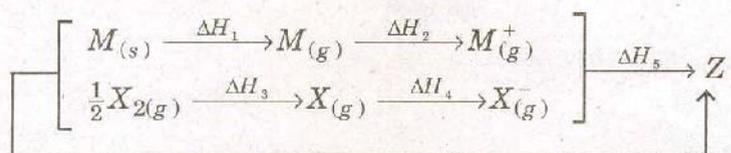


106. Helium is used in balloons in place of hydrogen because it is
- 1) incombustible
  - 2) lighter than hydrogen
  - 3) radioactive
  - 4) more abundant than hydrogen
107. The basic principle of Cottrell's precipitator is
- 1) Le-chatelier's principle
  - 2) peptisation
  - 3) neutralisation of charge on colloidal particles
  - 4) scattering of light
108. When carbon monoxide is passed over solid caustic soda heated to  $200^{\circ}\text{C}$ , it forms
- 1)  $\text{Na}_2\text{CO}_3$
  - 2)  $\text{NaHCO}_3$
  - 3)  $\text{HCOONa}$
  - 4)  $\text{CH}_3\text{COONa}$
109.  $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3 + \text{heat}$ . What is the effect of the increase of temperature on the equilibrium of the reaction?
- 1) equilibrium is shifted to the left
  - 2) equilibrium is shifted to the right
  - 3) equilibrium is unaltered
  - 4) reaction rate does not change
110. Hydrogen gas is not liberated when the following metal is added to dil.  $\text{HCl}$
- 1)  $\text{Ag}$
  - 2)  $\text{Zn}$
  - 3)  $\text{Mg}$
  - 4)  $\text{Sn}$

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(Space for Rough Work)

111. Consider the Born-Haber cycle for the formation of an ionic compound given below and identify the compound (Z) formed.



- |             |                   |
|-------------|-------------------|
| 1) $M^+X^-$ | 2) $M^-X_{(s)}^-$ |
| 3) $MX$     | 4) $M^+X_{(g)}^-$ |

112. In the brown ring test, the brown colour of the ring is due to

- |                                 |                            |
|---------------------------------|----------------------------|
| 1) ferrous nitrate              | 2) ferric nitrate          |
| 3) a mixture of $NO$ and $NO_2$ | 4) nitrosoferrous sulphate |

113. Amines behave as

- |                 |                     |
|-----------------|---------------------|
| 1) Lewis acids  | 2) Lewis base       |
| 3) aprotic acid | 4) neutral compound |

114. Dalda is prepared from oils by

- |               |                 |
|---------------|-----------------|
| 1) oxidation  | 2) reduction    |
| 3) hydrolysis | 4) distillation |

115. The chemical name of anisole is

- |                  |                    |
|------------------|--------------------|
| 1) Ethanoic acid | 2) Methoxy benzene |
| 3) Propanone     | 4) Acetone         |

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(Space for Rough Work)





6. On the set  $Z$ , of all integers  $*$  is defined by  $a * b = a + b - 5$ . If  $2 * (x * 3) = 5$  then  $x =$

1) 0

2) 3

3) 5

4) 10

7. Which of the following is false ?

1) Addition is commutative in  $N$ .

2) Multiplication is associative in  $N$ .

3) If  $a * b = a^b$  for all  $a, b \in N$  then  $*$  is commutative in  $N$ .

4) Addition is associative in  $N$ .

8. If  $\vec{a} \cdot \hat{i} = \vec{a} \cdot (\hat{i} + \hat{j}) = \vec{a} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$  then  $\vec{a} =$

1)  $\hat{i} + \hat{j}$

2)  $\hat{i} - \hat{k}$

3)  $\hat{i}$

4)  $\hat{i} + \hat{j} - \hat{k}$

9. If  $\vec{a}$  and  $\vec{b}$  are unit vectors and  $|\vec{a} + \vec{b}| = 1$  then  $|\vec{a} - \vec{b}|$  is equal to

1)  $\sqrt{2}$

2) 1

3)  $\sqrt{5}$

4)  $\sqrt{3}$

10. The projection of  $\vec{a} = 3\hat{i} - \hat{j} + 5\hat{k}$  on  $\vec{b} = 2\hat{i} + 3\hat{j} + \hat{k}$  is

1)  $\frac{8}{\sqrt{35}}$

2)  $\frac{8}{\sqrt{39}}$

3)  $\frac{8}{\sqrt{14}}$

4)  $\sqrt{14}$

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(Space for Rough Work)



16. The equation  $\frac{x^2}{2-\lambda} - \frac{y^2}{\lambda-5} - 1 = 0$  represents an ellipse if

1)  $\lambda > 5$

2)  $\lambda < 2$

3)  $2 < \lambda < 5$

4)  $2 > \lambda > 5$

17. The equation to the normal to the hyperbola  $\frac{x^2}{16} - \frac{y^2}{9} = 1$  at  $(-4, 0)$  is

1)  $2x - 3y = 1$

2)  $x = 0$

3)  $x = 1$

4)  $y = 0$

18. The converse of the contrapositive of the conditional  $p \rightarrow \sim q$  is

1)  $p \rightarrow q$

2)  $\sim p \rightarrow \sim q$

3)  $\sim q \rightarrow p$

4)  $\sim p \rightarrow q$

19. The perimeter of a certain sector of a circle is equal to the length of the arc of the semicircle. Then the angle at the centre of the sector in radians is

1)  $\pi - 2$

2)  $\pi + 2$

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

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

20. The value of  $\tan 67\frac{1}{2}^\circ + \cot 67\frac{1}{2}^\circ$  is

1)  $\sqrt{2}$

2)  $3\sqrt{2}$

3)  $2\sqrt{2}$

4)  $2 - \sqrt{2}$

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(Space for Rough Work)

21. If  $e_1$  and  $e_2$  are the eccentricities of a hyperbola  $3x^2 - 3y^2 = 25$  and its conjugate, then

1)  $e_1^2 + e_2^2 = 2$

2)  $e_1^2 + e_2^2 = 4$

3)  $e_1 + e_2 = 4$

4)  $e_1 + e_2 = \sqrt{2}$

22. If  $p$  and  $q$  are prime numbers satisfying the condition  $p^2 - 2q^2 = 1$ , then the value of  $p^2 + 2q^2$  is

1) 5

2) 15

3) 16

4) 17

23. If  $A(\text{adj } A) = 5I$  where  $I$  is the identity matrix of order 3, then  $|\text{adj } A|$  is equal to

1) 125

2) 25

3) 5

4) 10

24. The number of solutions for the equation  $\text{Sin } 2x + \text{Cos } 4x = 2$  is

1) 0

2) 1

3) 2

4) Infinite

25.  $\int e^x \cdot x^5 dx$  is

1)  $e^x [x^5 + 5x^4 + 20x^3 + 60x^2 + 120x + 120] + C$

2)  $e^x [x^5 - 5x^4 - 20x^3 - 60x^2 - 120x - 120] + C$

3)  $e^x [x^5 - 5x^4 + 20x^3 - 60x^2 + 120x - 120] + C$

4)  $e^x [x^5 + 5x^4 + 20x^3 - 60x^2 - 120x + 120] + C$

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(Space for Rough Work)





31. The locus of a point which moves such that the sum of its distances from two fixed points is a constant is
- 1) a circle
  - 2) a parabola
  - 3) an ellipse
  - 4) a hyperbola
32. The centroid of the triangle  $ABC$  where  $A \equiv (2, 3)$ ,  $B \equiv (8, 10)$  and  $C \equiv (5, 5)$  is
- 1)  $(5, 6)$
  - 2)  $(6, 5)$
  - 3)  $(6, 6)$
  - 4)  $(15, 18)$
33. If  $3x^2 + xy - y^2 - 3x + 6y + K = 0$  represents a pair of lines, then  $K =$
- 1) 0
  - 2) 9
  - 3) 1
  - 4) -9
34. The equation of the smallest circle passing through the points  $(2, 2)$  and  $(3, 3)$  is
- 1)  $x^2 + y^2 + 5x + 5y + 12 = 0$
  - 2)  $x^2 + y^2 - 5x - 5y + 12 = 0$
  - 3)  $x^2 + y^2 + 5x - 5y + 12 = 0$
  - 4)  $x^2 + y^2 - 5x + 5y - 12 = 0$
35. The characteristic roots of the matrix  $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 4 & 5 & 6 \end{bmatrix}$  are
- 1) 1, 3, 6
  - 2) 1, 2, 4
  - 3) 4, 5, 6
  - 4) 2, 4, 6

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(Space for Rough Work)

36. If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ , then  $A^{-1} =$

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

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

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

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

37. The set  $\{-1, 0, 1\}$  is not a multiplicative group because of the failure of

1) Closure law

2) Associative law

3) Identity law

4) Inverse law

38. The angle of elevation of the top of a TV tower from three points  $A, B$  and  $C$  in a straight line through the foot of the tower are  $\alpha, 2\alpha$  and  $3\alpha$  respectively. If  $AB = a$ , the height of the tower is

1)  $a \tan \alpha$

2)  $a \sin \alpha$

3)  $a \sin 2\alpha$

4)  $a \sin 3\alpha$

39. The angles  $A, B$  and  $C$  of a triangle  $ABC$  are in A.P. If  $b : c = \sqrt{3} : \sqrt{2}$ , then the angle  $A$  is

1)  $30^\circ$

2)  $15^\circ$

3)  $75^\circ$

4)  $45^\circ$

40.  $\sin \left( 2 \sin^{-1} \sqrt{\frac{63}{65}} \right) =$

1)  $\frac{2\sqrt{126}}{65}$

2)  $\frac{4\sqrt{65}}{65}$

3)  $\frac{8\sqrt{63}}{65}$

4)  $\frac{\sqrt{63}}{65}$

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(Space for Rough Work)

41. The general solution of  $|\sin x| = \cos x$  is (when  $n \in Z$ ) given by

1)  $n\pi + \frac{\pi}{4}$

2)  $2n\pi \pm \frac{\pi}{4}$

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

4)  $n\pi - \frac{\pi}{4}$

42. The real root of the equation  $x^3 - 6x + 9 = 0$  is

1) -6

2) -9

3) 6

4) -3

43. The digit in the unit's place of  $5^{834}$  is

1) 0

2) 1

3) 3

4) 5

44. The remainder when  $3^{100} \times 2^{50}$  is divided by 5 is

1) 1

2) 2

3) 3

4) 4

45.  $\int \frac{\sin x \cos x}{\sqrt{1 - \sin^4 x}} dx =$

1)  $\frac{1}{2} \sin^{-1}(\sin^2 x) + C$

2)  $\frac{1}{2} \cos^{-1}(\sin^2 x) + C$

3)  $\tan^{-1}(\sin^2 x) + C$

4)  $\tan^{-1}(2 \sin x) + C$

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(Space for Rough Work)





56. The maximum value of  $\frac{\text{Log } x}{x}$  in  $(2, \infty)$  is

1) 1

2)  $\frac{2}{e}$

3)  $e$

4)  $\frac{1}{e}$

57. If  $f(x) = be^{ax} + ae^{bx}$ , then  $f''(0) =$

1) 0

2)  $2ab$

3)  $ab(a+b)$

4)  $ab$

58. If  $\sqrt{\frac{1+\text{Cos } A}{1-\text{Cos } A}} = \frac{x}{y}$ , then the value of  $\text{Tan } A =$

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

2)  $\frac{2xy}{x^2 + y^2}$

3)  $\frac{2xy}{x^2 - y^2}$

4)  $\frac{2xy}{y^2 - x^2}$

59.  $\int \frac{\text{Sec } x}{\text{Sec } x + \text{Tan } x} dx =$

1)  $\text{Tan } x - \text{Sec } x + C$

2)  $\text{Log } (1 + \text{Sin } x) + C$

3)  $\text{Sec } x + \text{Tan } x + C$

4)  $\text{Log } \text{Sin } x + \text{Log } \text{Cos } x + C$

60. If  $\int f(x) dx = g(x)$ , then  $\int f(x) g(x) dx =$

1)  $\frac{1}{2} f^2(x)$

2)  $\frac{1}{2} g^2(x)$

3)  $\frac{1}{2} [g'(x)]^2$

4)  $f'(x) g(x)$

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(Space for Rough Work)