

C 4030

INTEGRATED P.G. ENTRANCE EXAMINATION, APRIL 2021

PHYSICS AND CHEMISTRY

Time : Two Hours

Maximum : 400 Marks

Instructions to Candidates

- Candidates are provided with a Question Booklet and an OMR Answer Sheet to mark the responses. Write the Register Number, Date of Examination and the integrated programme chosen by the candidate (Physics/Chemistry) in the space provided on the top of this booklet. Read carefully all the instructions given on the OMR sheet.
- This Question booklet contains of 100 objective type questions, with 30 questions in Section A : Physics, 30 questions in Section B : Chemistry, 20 questions in Section C : Mathematics, 10 questions in Section D : Biology and 10 questions in Section E : Computer Science. Each right and wrong answer will carry 4 and - 1 mark respectively.

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Section A (Physics)

- A simple pendulum completes 20 oscillations in 25 s. The time is measured with a stop watch least count 0.1 s. The error in the measurement of time is :
 - 1.6 %.
 - 1.2 %.
 - 0.8 %.
 - 0.4 %.
- The dimensional formula for latent heat is :
 - $M^0 L^2 T^{-2}$.
 - $ML^2 T^{-2}$.
 - MLT^{-2} .
 - $ML^2 T^{-1}$.
- Find the ratio of distance covered to the displacement covered by a body along a semicircle of radius r :
 - 2π .
 - $\pi/2$.
 - π .
 - 3π .
- The direction of motion of a projectile at the highest point of its trajectory is :
 - Horizontal.
 - Vertical.
 - Tangential.
 - None of these.
- A hunter has a machine gun that can fire 50 g bullets with a velocity of 150 ms^{-1} . A 60 kg tiger springs at him with a velocity of 10 ms^{-1} . How many bullets must the hunter fire into the tiger in order to stop him in his track ?
 - 80.
 - 10.
 - 32.
 - 96.
- The working of a rocket is based on the principle of :
 - Elasticity.
 - Newtons Law.
 - Kepler's Law.
 - Conservation of momentum.

Turn over

15. The speed of sound will be greatest in :

- a) Air.
- b) Vacuum.
- c) Water.
- d) Metal.

16. The point charges Q and $-2Q$ are placed at some distance apart. If the electric field at the location of Q is E , then the electric field at the location of $-2Q$ will be :

- a) $-E/2$.
- b) $-3E/2$.
- c) $-E$.
- d) $-2E$.

17. 27 drops of same size are charged at 220 V each. They coalesce to form a bigger drop. Calculate the potential of the bigger drop :

- a) 110 V.
- b) 340 V.
- c) 1980 V.
- d) 2341 V.

18. Ten identical wires each having a resistance of 1Ω are connected in parallel. The combination will have a resistance of :

- a) 10Ω .
- b) 1Ω .
- c) 0.1Ω .
- d) 0.01Ω .

19. If the horizontal components of earth's magnetic field at a place is $0.3 \times 10^{-4} \text{ T}$. If the angle of dip is 60° , what is the total magnetic field of earth ?

- a) $0.4 \times 10^{-4} \text{ T}$.
- b) $0.34 \times 10^{-4} \text{ T}$.
- c) $0.8 \times 10^{-4} \text{ T}$.
- d) $0.6 \times 10^{-4} \text{ T}$.

20. At curie point, a ferromagnetic material becomes :

- a) Non-magnetic.
- b) Diamagnetic.
- c) Paramagnetic.
- d) Ferrimagnetic.

21. A 44 mH inductor is connected to 220 V, 50 Hz a.c. supply. Determine the r.m.s. value of current in the circuit :

- a) 15.9 A.
- b) 16.4 A.
- c) 16.7 A.
- d) 7.8 A.

22. Velocity of light is equal to :

a) $\sqrt{\epsilon_0 \mu_0}$.

b) ϵ_0 / μ_0 .

c) $\sqrt{\epsilon_0 / \mu_0}$.

d) $1 / \sqrt{\epsilon_0 / \mu_0}$.

23. In a Young's double slit experiment, two wavelengths of 500 nm and 700 nm are used. What is the maximum distance from the central maximum, where their maxima coincide again ? Take $D/d = 10^3$. Symbols have their usual meaning :

a) 4.3 mm.

b) 3.5 mm.

c) 3.7 mm.

d) 8.2 mm.

24. Two mirrors are kept at 60° to each other and a body is placed at middle. The total number of images formed is :

a) Six.

b) Four.

c) Five.

d) Three.

25. An endoscope is employed by a physician to view the internal parts of a body organ. It is based on the principle of :

a) Refraction.

b) Reflection.

c) Total internal reflection.

d) Dispersion.

26. A radioactive element has a half-life period of 1600 years. After 6400 years what amount will remain ?

a) $1/2$.

b) $1/16$.

c) $1/8$.

d) $1/4$.

27. In terms of Bohr radius a_0 , the radius of the second Bohr orbit of a hydrogen atom is given by :

a) $4 a_0$.

b) $8 a_0$.

c) $6 a_0$.

d) $2 a_0$.

28. An intrinsic semiconductor, at absolute zero temperature behaves like :

a) Insulator.

b) Superconductor.

c) n -type semiconductor.

d) p -type semiconductor.

34. Which of the following condition is not satisfied by an ideal solution ?

- a) $\Delta H_{\text{mixing}} = 0$.
 b) $\Delta V_{\text{mixing}} = 0$.
 c) Raoult's Law is obeyed.
 d) Formation of an azeotropic mixture.

35. Ester hydrolysis of ethyl acetate is :

- a) First order reaction.
 b) Second order reaction.
 c) Pseudo-first order reaction.
 d) Pseudo second order reaction.

36. The rate of a certain hypothetical reaction $A + B + C \rightarrow P$ is given by

$$\text{Rate} = -d[A]/dt = k[A]^{1/2}[B]^{1/3}[C]^{1/4}. \text{ Then the order of the reaction is :}$$

- a) 1/24.
 b) 3/9.
 c) 13/12.
 d) 3.

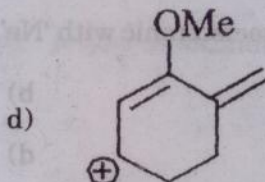
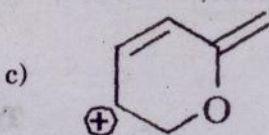
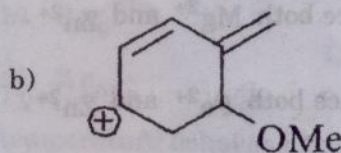
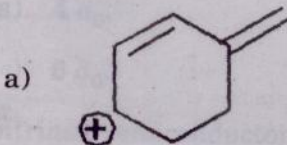
37. The radius of second orbit of hydrogen atom is given by (in A^0) :

- a) 0.53.
 b) 1.06.
 c) 2.12.
 d) 4.24.

38. Plot of $\log(x/m)$ against $\log P$ is a straight line inclined at an angle of 45° . When the pressure is 0.5 atm and Fraundlich parameters k is 10, then the amount of solute adsorbed per gram of adsorbent will be ($\log 5 = 0.96$) :

- a) 1 g.
 b) 2 g.
 c) 3 g.
 d) 5 g.

39. Most stable carbocation is :



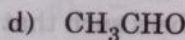
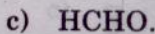
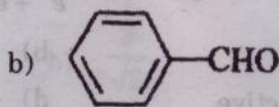
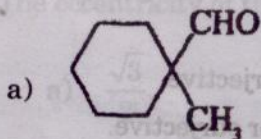
40. A real gas is expected to be ideal at :
- Low temperature and low pressure.
 - Low temperature and high pressure.
 - High temperature and low pressure.
 - High temperature and high pressure.
41. The correct statement regarding with the molecules NH_3 , H_2O , and CH_4 is :
- They have same number of lone pair electrons.
 - They have tetrahedral geometry.
 - They have same bond angle.
 - All of them are showing sp^3 hybridization.
42. Which one the following is aromatic ?
- Cyclopentadienyl cation.
 - Cyclopropenyl anion.
 - Cycloheptatrienyl cation.
 - Cyclopentadiene.
43. The correct acidic order from the following is :
- $\text{BF}_3 < \text{BCl}_3 < \text{BBr}_3 < \text{BI}_3$.
 - $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$.
 - $\text{BCl}_3 < \text{BF}_3 < \text{BBr}_3 < \text{BI}_3$.
 - $\text{BCl}_3 > \text{BF}_3 > \text{BBr}_3 > \text{BI}_3$.
44. The ratio of shortest distance between cation and anion in NaCl to that of CsCl is :
- $(3)^{-1/2}$.
 - $1/\sqrt{2}$.
 - $\sqrt{2}/\sqrt{3}$.
 - 1.
45. The electronic configuration of central metal ion in $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is :
- $t_{2g}^6 e_g^0$.
 - $t_{2g}^3 e_g^3$.
 - $t_{2g}^4 e_g^2$.
 - $t_{2g}^2 e_g^4$.

51. The incorrect statement in the following is :
- Transition state is formed during S_N^1 reaction.
 - Carbocation is formed in S_N^1 reaction.
 - Inversion takes place during S_N^2 reaction.
 - S_N^2 reaction is a single step reaction.

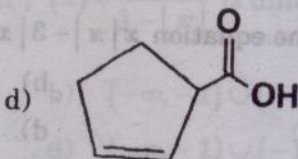
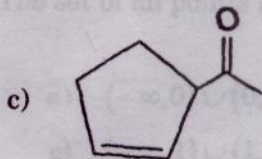
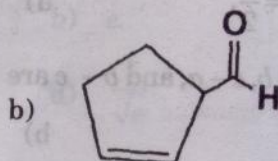
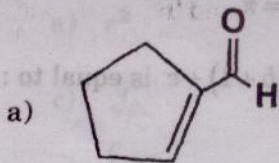
52. The order of basicity of methyl substituted amines in aqueous solution is :
- $3^\circ > 2^\circ > 1^\circ$.
 - $2^\circ > 1^\circ > 3^\circ$.
 - $1^\circ > 2^\circ > 3^\circ$.
 - $2^\circ > 3^\circ > 1^\circ$.

53. Which of the following has magnetic moment value of 5.9 ?
- Cu^{2+} .
 - Cr^{2+} .
 - Fe^{2+} .
 - Fe^{3+} .

54. Cannizzaro reaction is not given by :



55. Ozonolysis followed by Zn/H_2O treatment of cyclohexene yield compound 'A'. Which upon treatment with KOH , compound 'B' is formed. Compound 'B' is :



56. The process occur under adiabatic condition, the correct condition is :

a) $\Delta V = 0$.

b) $w = 0$.

c) $\Delta T = 0$.

d) $q = 0$.

Turn over

74. $\int_0^1 \tan^{-1} x \, dx$ is equal to :

a) $\frac{\pi}{4} + \frac{1}{2} \log 2.$

b) $\frac{\pi}{4} - \frac{1}{2} \log 2.$

c) $\frac{\pi}{4}.$

d) $\frac{\pi}{4} + \log 2.$

75. If $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = -2\hat{i} - \hat{j} + \hat{k}$ and \vec{c} is a vector such that $\vec{a} \cdot \vec{c} = 0$ and $\vec{a} \times \vec{c} = \vec{b}$, then \vec{c} is equal to :

a) $-\hat{i} - \hat{j}.$

b) $\hat{i} - \hat{k}.$

c) $\hat{j} + \hat{k}.$

d) $\hat{i} + \hat{j}.$

76. The angle between the lines $\frac{x-2}{3} = \frac{y+1}{-2}, z=2$ and $\frac{x-1}{1} = \frac{2y+3}{3} = \frac{z+5}{2}$ is :

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

b) $\frac{\pi}{2}.$

c) $\frac{\pi}{6}.$

d) $\frac{\pi}{4}.$

77. Out of 30 consecutive integers, three are selected at random. Then the probability of the sum of the selected numbers is divisible by 3 is equal to :

a) $\frac{2}{3}.$

b) $\frac{136}{416}.$

c) $\frac{68}{203}.$

d) $\frac{146}{406}.$

78. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then A^{13} is equal to :

a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}.$

b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}.$

c) $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}.$

d) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}.$

79. Solution of the differential equation $\frac{dy}{dx} + y \tan x = \sec x$ is :

a) $y = \sin x + c \cos x.$

b) $y = -\sin x + c \cos x.$

c) $y = \cos x + c \sin x.$

d) $y = \tan x + c \cot x.$

Section E (Computer Science)

91. FIFO policy is associated with _____ data structure.
- a) Queue.
 - b) Stack.
 - c) Tree.
 - d) Array.
92. In Hexadecimal number system has _____ symbols.
- a) 10.
 - b) 12.
 - c) 15.
 - d) 16.
93. _____ IP address is an example for loopback address.
- a) 127.0.0.1.
 - b) 127.0.1.0.
 - c) 127.1.0.0.
 - d) 255.0.0.
94. HTML stands for _____.
- a) Higher Text Makeup Language.
 - b) Hyper Text Markup Language.
 - c) Higher Text Markup Language.
 - d) Hyper Text Making Language.
95. 1 KB means _____ bytes.
- a) 1000.
 - b) 2000.
 - c) 1024.
 - d) 8.
96. Which of the following is an example of system software ?
- a) MS-Office.
 - b) MS-Windows.
 - c) MS-Calc.
 - d) MS-Excel.
97. Which of the following software is most suitable for making resume/biodata ?
- a) C++.
 - b) MS-PowerPoint.
 - c) MS-Excel.
 - d) MS-Word.
98. Which feature of the Object Oriented Programming Language derives the class from another class ?
- a) Inheritance.
 - b) Data Encapsulation.
 - c) Polymorphism.
 - d) Virtualization.
99. A program that is used to view website is called as _____.
- a) Web viewer.
 - b) Word processor.
 - c) Browser.
 - d) Spreadsheet.
100. The term _____ is used to refer to a row in a table.
- a) Attribute.
 - b) Field.
 - c) Tuple.
 - d) Instance.