



CHRISTIAN MEDICAL
COLLEGE LUDHIANA

CMC Ludhiana

Sample Paper 2012





CMC Ludhiana

Medical Entrance Exam

Solved Paper 2012

Physics

- Let a body starts from rest with uniform acceleration and after n sec its velocity is v , its displacement in the last two seconds will be
 - $\frac{2v(n-1)}{n}$
 - $\frac{v(n-1)}{n}$
 - $\frac{2v(n+1)}{n}$
 - $\frac{v(n+1)}{n}$
- A car A travelling on a straight road with uniform speed of 60 kmh^{-1} is followed by another car B moving at a speed of 70 kmh^{-1} . If the distance between the two cars is 2.5 km and the car B starts deceleration at the rate of 20 kmh^{-2} , then after how much time will B catches A ?
 - $\frac{1}{8} \text{ h}$
 - $\frac{1}{4} \text{ h}$
 - $\frac{1}{2} \text{ h}$
 - 1 h
- If μ_0 and ϵ_0 denote the permeability and permittivity of free space, then the dimensions of $\mu_0 \epsilon_0$ are
 - $[M^0 L^{-2} T^{-2}]$
 - $[LT^{-1}]$
 - $[M^{-1} L^{-3} Q^2 T^{-2}]$
 - $[M^{-2} L^{-1} T^2]$
- If two masses of 2 kg and 3 kg are attached to the end of the string passed over a pulley fixed at the top, then the tension and the acceleration are
 - $\frac{21}{8} g, \frac{g}{8}$
 - $\frac{12g}{5}, \frac{g}{5}$
 - $\frac{21g}{8}, \frac{g}{5}$
 - $\frac{7g}{8}, \frac{g}{8}$
- When a motor cyclist moves in a circular track of radius 100 m , then the maximum velocity with which the cyclist can take the turn with leaning inwards is (Take coefficient of friction = 0.2)
 - 1.4 ms^{-1}
 - 14 ms^{-1}
 - 140 ms^{-1}
 - 280 ms^{-1}
- If three resistors each of 4Ω are connected together to form a network, then the equivalent resistance of the network cannot be
 - 3Ω
 - 6Ω
 - 12Ω
 - 1.33Ω
- A winding wire which is used to frame a solenoid can bear a maximum 10A current. If length of solenoid is 80 cm and its cross-sectional radius is 3 cm , then required length of winding wire is (Magnetic field due to solenoid = 0.2 T)
 - $1.2 \times 10^2 \text{ m}$
 - $2.4 \times 10^3 \text{ m}$
 - $4.8 \times 10^2 \text{ m}$
 - $6 \times 10^3 \text{ m}$
- Which of the following statement is true about X-rays and gamma rays?
 - Gamma rays have smaller frequency than that of X-rays
 - X-rays have smaller wavelength than that of gamma rays
 - X-rays have larger wavelength than that of gamma rays
 - Wavelength and frequency of X-rays are larger than that of gamma rays



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9. The work function of a metal is $1.6 \times 10^{-19} \text{ J}$, if a light of wavelength 6400 \AA falls on its surface, then the maximum kinetic energy of emitted photo electron will be
(Take Planck's constant $h = 6.4 \times 10^{-34} \text{ J-s}$)
(a) $1.4 \times 10^{-19} \text{ eV}$ (b) $1.4 \times 10^{-19} \text{ J}$
(c) $14 \times 10^{-19} \text{ J}$ (d) $2.8 \times 10^{-19} \text{ J}$
10. If an electron jumps from orbit $n = 4$ to the orbit $n = 2$ in an atom, then the wavelength of the emitted radiation is
(Take $R = \text{Rydberg's constant}$)
(a) $\frac{16}{9R}$ (b) $\frac{16}{7R}$
(c) $\frac{16}{5R}$ (d) $\frac{16}{3R}$
11. In case of a bcc lattice, the nearest distance between two atoms is equal to
(a) $\frac{a}{\sqrt{2}}$ (b) $\frac{a\sqrt{2}}{3}$
(c) $\frac{a\sqrt{3}}{2}$ (d) $a\sqrt{3}$
12. The correct relation between the linear magnification m , the object distance u and the focal length f , for a mirror is given by
(a) $m = \frac{f}{f-u}$ (b) $m = \frac{f-u}{f}$
(c) $m = \frac{f}{f+u}$ (d) $m = \frac{f+u}{f}$
13. The direction of magnetic lines of force inside a magnet are
(a) from N -pole to S -pole of the magnet
(b) from S -pole to N -pole of the magnet
(c) depends upon the area of cross-section of the bar magnet
(d) None of the above
14. When two bulbs connected in parallel, they together consume 48 W from a battery of 6 V . What is the value of resistance each bulb?
(a) $6.5 \ \Omega$ (b) $5.5 \ \Omega$
(c) $3.5 \ \Omega$ (d) $1.5 \ \Omega$
15. A cylindrical metal wire of length l and cross-sectional area S , has resistance R , conductance G , conductivity σ and resistivity ρ .
Which one of the following expression for σ is valid?
(a) $\frac{GS}{l}$ (b) $\frac{Rl}{S}$
(c) $\frac{GR}{\rho}$ (d) $\frac{\rho R}{G}$
16. A capacitor of capacitance $500 \ \mu\text{F}$ is charged at a steady rate of $100 \ \mu\text{C s}^{-1}$. The potential difference across the capacitor will be 10 V in time
(a) 25 s (b) 50 s
(c) 75 s (d) 100 s
17. If for a particle of mass 10 g executing SHM along a straight line, the time period is 2 s and amplitude is 10 cm then what will be its kinetic energy when it is at 5 cm from its equilibrium position?
(a) $0.375\pi^2 \text{ erg}$ (b) $3.75\pi^2 \text{ erg}$
(c) $37.5\pi^2 \text{ erg}$ (d) $375\pi^2 \text{ erg}$
18. The mean free path of gas molecules depends on
(a) d^{-2} (b) d^2
(c) d^{-1} (d) d
(where d is the molecular diameter)
19. If suddenly the force of earth's gravity disappears then,
(a) mass and weight will remain the same
(b) weight of body will become zero but mass remains the same
(c) mass of the body become zero but the weight remains the same
(d) both the mass and weight will be the same
20. A mass of 10 kg connected at the end of a rod of negligible mass is rotating in a circle of radius 30 cm with an angular velocity of 10 rads^{-1} . If the mass is brought to rest in 10 s by a brake, what is the magnitude of the torque applied?
(a) 0.5 N-m (b) 0.9 N-m
(c) 1.2 N-m (d) 2.3 N-m
21. Which one of the following statement about satellites is incorrect?
(a) Geostationary satellites are launched in the equatorial plane

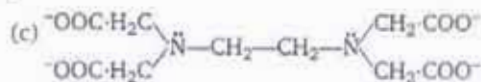
- (b) A satellite cannot move in a stable orbit in a plane passing through earth's centre
 (c) The speed of a satellite increases with an increase in the radius of its orbit
 (d) All are incorrect
22. An ideal gas is expanded adiabatically. How many times has the gas to be expanded to reduce the root mean square velocity of molecules two times? ($\gamma = 1.5$)
 (a) 2 times (b) 4 times
 (c) 8 times (d) 16 times
23. The two opposite faces of a cubical piece of iron are at 100°C and 0°C in ice. If the area of surface is 4 cm^2 , then the mass of ice melted in 10 min will be (Thermal conductivity of iron = 0.2 CGS units)
 (a) 5 g (b) 30 g
 (c) 50 g (d) 300 g
24. If two charges $+q$ and $-q$ are placed at certain distance apart, then at the point exactly midway between them
 (a) electric field is not zero but potential is zero
 (b) electric field and potential both are zero.
 (c) electric field is zero but potential is not zero
 (d) neither electric field nor potential is zero
25. In Young's double slit experiment, how many maxima can be obtained on a screen (with central maxima) on both sides of the central fringe if $d = 7000\text{ \AA}$ and $\lambda = 2000\text{ \AA}$
 (a) 7 (b) 10
 (c) 12 (d) 18

Chemistry



Here, Z is

- (a) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—OH}$
 (b) $(\text{CH}_3)_3\text{C—OH}$
 (c) $\begin{array}{c} \text{CH}_3\text{—CH—CH}_3 \\ | \\ \text{OH} \end{array}$
 (d) None of the above
2. Which one of the following statement is incorrect for the sucrose?
 (a) It is obtained from cane sugar
 (b) It is not reducing sugar
 (c) On hydrolysis, it gives equal quantities of D-glucose and D-fructose
 (d) It gives aspartame when it is heated at 210°C
3. Which ligand is useful for the removal of toxic effect of lead metal in body in chelate therapy treatment?
 (a) $\begin{array}{c} \text{COO}^- \\ | \\ \text{COO}^- \end{array}$
 (b) CH_3COO^-



(d) AsO_4^{3-}

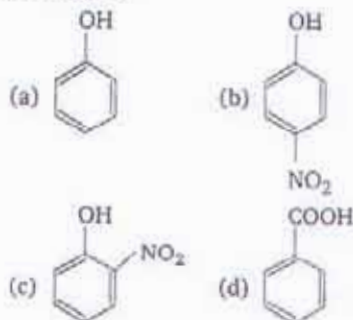
4. The heat of hydrogenation of $\text{CH}_2=\text{CH}_2$ is 30 kcal/mol, what is the heat of hydrogenation of 1,3 butadiene?
 (a) 63 kcal/mol (b) 57 kcal/mol
 (c) 60 kcal/mol (d) 30 kcal/mol
5. $\text{Cl}_2 + \text{H}_2\text{S} \rightleftharpoons 2\text{HCl} + \text{S}$. In this chemical reaction changes in oxidation number of sulphur is
 (a) 0 to 2 (b) -2 to 0
 (c) 2 to 0 (d) -2 to -1
6. The pH of water is 7. A substance dissolve in water then pH increase pH = 13 substance Y a salt is
 (a) strong acid and strong base
 (b) strong acid and weak base
 (c) weak acid and weak base
 (d) weak acid and strong base
7. The false name of NaCl is
 (a) Sodium chloride (b) Globar salt
 (c) Rock salt (d) None of these

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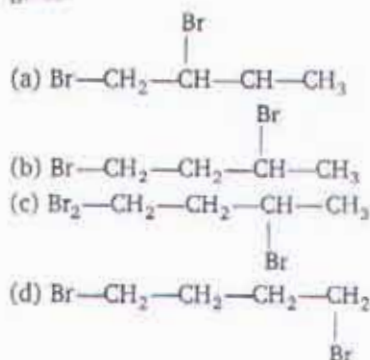
8. Which statement is incorrect of AgCl?
 (a) AgCl is the more soluble than KI
 (b) AgCl gives precipitate
 (c) AgCl is less soluble in water
 (d) AgI is less soluble than AgCl
9. The magnetic moment of complex $K_2[MnF_6]$ is 4.9 BM. What is the oxidation number of Mn and what is the value of n ?
 (a) M (V), $n = 1$ (b) Mn (II), $n = 4$
 (c) M (III), $n = 3$ (d) Mn (IV), $n = 2$
10. In which of the following is *para*-uranium element?
 (a) Po, Fm, Md (b) Bk, Cf, Am
 (c) Tm, Nd, Pm (d) Th, Np, Pu
11. The compound in which underlined carbon uses only its sp^3 hybrid orbitals for bond formation is
 (a) CH_3COOH (b) CH_3CONH_2
 (c) CH_3CH_2OH (d) $CH_3CH=CH_2$
12. How many numbers of possible stereoisomers are there of 2, 3, 4 trichloro pentanoic acid?
 (a) 8 (b) 12
 (c) 16 (d) 4
13. State the monomer of teflon
 (a) $CF_2=CF_2$
 (b) $CH_2=CH \cdot Cl$
 (c) $CH_2=C(Cl)-CH=CH_2$
 (d) $CH_2=CH \cdot CN$
14. Number of unpaired electrons in O_2 molecule is
 (a) zero (b) one
 (c) two (d) four
15. The minimum configuration of an element is $4s^1, 3d^{10}$ possible element is
 (a) element of a group 10th
 (b) a metal
 (c) a non-metal
 (d) liquid at $2981^\circ C$
16. An alkyl halide by the formation of its Grignard reagent and heating with water yields propane. What is the original alkyl halide?

- (a) Methyl iodide (b) Ethyl iodide
 (c) Ethyl bromide (d) Propyl bromide

17. Most acidic is



18. Addition of Br_2 on $CH_2=CH-CH_2-CH_3$ gives



19. The following data are for the decomposition of ammonium nitrite in aqueous solution

Vol. of N_2 in cc	Time (min.)
6.55	10
9.00	15
11.40	20
13.65	25
35.65	∞

The order of reaction is

- (a) zero (b) one
 (c) two (d) three
20. Which Nernst equation is true to find out the potential of non-standard electrochemical cell from the following?



(a) $E_{cell} = E_{cell}^0 - \frac{0.592}{n} \log_{10} [Fe^{2+}] [I^-]^2$



$$(b) E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.0592}{n} \log_{10} [\text{Fe}^{2+}] [\Gamma^{-}]^2$$

$$(c) E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.0592}{n} \log_{10} [\text{Fe}^{2+}] [\Gamma^{-}]$$

$$(d) E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.0592}{n} \log_{10} \frac{[\text{Fe}^{2+}] [\Gamma^{-}]^2}{[\text{Fe}] [\text{I}_2]}$$

21. Half-life of radioactive substance is 4 days. Amount of the substance decayed in two days is

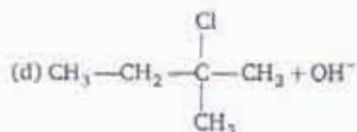
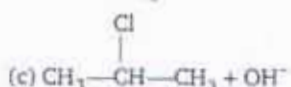
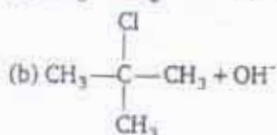
(a) $\frac{1}{\sqrt{2}}$

(b) $\left(1 - \frac{1}{\sqrt{2}}\right) N_0$

(c) 20%

(d) $\frac{1}{8}$

22. S_N2 mechanism is involved in the following substitution



23. On oxidation of organic compound A with $\text{Na}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 gives compound B, which on reduction with H_2 in presence of Ni catalyst gives ethyl alcohol. Give the name of compound A.

- (a) Ethanal (b) Ethanol
(c) Ethanoic acid (d) Ethene

24. Cu have the fcc unit cell and length is 362 pm, what will be density to copper?

- (a) 6.29 g/cm^3 (b) 2.23 g/cm^3
(c) 4.45 g/cm^3 (d) 8.92 g/cm^3

25. Which of the following configuration is correct for the nitrogen?

- (a) $1s^2, 2s^2 2p^2 x 2p^1$
(b) $1s^2, 2s^2 2p^2 x 2p^1 z$
(c) $1s^2, 2s^2 2p x^1 2p y^1 2p^1 z$
(d) $1s^2, 2s^2, 2p^3 x$

Biology

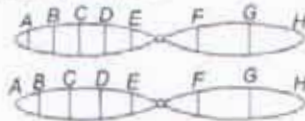
- Tautonymy is
 - unscientific explanation of a phenomenon
 - common name used as scientific name
 - non-latinised name
 - same name for genus and species
- Plasmid is
 - fungus
 - plastid
 - part of plasma membrane
 - extrachromosomal DNA in bacterial cell
- Viruses that infect bacteria, multiply and cause their lysis are
 - lysozymes
 - lipolytic
 - lytic
 - lysogenic
- Gymnosperms are naked seeded plants because there is no
 - fruit
 - ovule
 - fertilization
 - ovary and fruit
- Which of the following is an exclusive character of class-Mammalia?
 - Homiothermy
 - Internal fertilization
 - Presence of four chambered heart
 - Presence of muscular diaphragm
- Colchicine producing plant belongs to family
 - Liliaceae (b) Rubiaceae
 - Malvaceae (d) Solanaceae
- Diadelphous condition is found in
 - Rosaceae (b) Papilionaceae
 - Leguminosae (d) Cucurbitaceae



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8. Growth rings are formed due to activity of
 - (a) extrastelar cambium
 - (b) intrastelar cambium
 - (c) interstelar cambium
 - (d) Both (b) and (c)
9. Myelinated nerve fibres are white coloured because of
 - (a) chromidial substance
 - (b) neurolemma
 - (c) myelin
 - (d) None of the above
10. In which of the following tissues is the matrix not a product of synthesis of its cells?
 - (a) Muscular tissue
 - (b) Osseous tissue
 - (c) Loose connective tissue
 - (d) Adipose tissue
11. There are special proteins that helps to open up DNA double helix in the front of replication fork. These proteins are
 - (a) DNA ligase
 - (b) DNA gyrase
 - (c) DNA polymerase I
 - (d) None of these
12. Elaioplast store
 - (a) starch
 - (b) proteins
 - (c) fats
 - (d) essential amino acids
13. Which of the following is the site of lipid synthesis?
 - (a) Rough ER
 - (b) Smooth ER
 - (c) Golgi bodies
 - (d) Ribosomes
14. Which of the following statement is wrong?
 - (a) Sucrose is a diasaccharide
 - (b) Cellulose is a polysaccharide
 - (c) Glycine is sulphur containing amino acid
 - (d) Uracil is a pyrimidine
15. Phenomenon of crossing over in diploid organism is responsible for
 - (a) linkage between genes
 - (b) recombination between linked genes
 - (c) segregation between genes
 - (d) dominance of genes
16. Nitrates are converted into nitrogen by
 - (a) nitrogen fixing bacteria
 - (b) sulphur fixing bacteria
 - (c) denitrifying bacteria
 - (d) None of the above
17. During oxidative phosphorylation, the net gain of ATP is
 - (a) 40
 - (b) 38
 - (c) 34
 - (d) 30
18. Closure of lid of pitcher in pitcher plant is
 - (a) tropic movement
 - (b) paratonic movement
 - (c) turgor movement
 - (d) autonomous movement
19. What is the principle cation in human blood?
 - (a) Potassium
 - (b) Sodium
 - (c) Calcium
 - (d) Maganese
20. Which one of the following body functions is not performed by kidneys?
 - (a) Excretion
 - (b) Osmoregulation
 - (c) Regulation of blood volume
 - (d) Destruction of dead blood corpuscles
21. Endocrine glands are
 - (a) ductless glands whose secretions pour directly into blood
 - (b) have ducts and pour their secretion into blood directly
 - (c) have ducts which straight way pour secretions into target organs
 - (d) All of the above
22. Vegetative fertilization leading to the formation of endosperm refers to
 - (a) fusion of male gamete with diploid secondary nucleus
 - (b) fusion of female gamete with diploid secondary nucleus
 - (c) fusion of two diploid vegetative cells
 - (d) fusion of two male gametes
23. Regeneration of tail in lizard is an example of
 - (a) epimorphosis
 - (b) morphollaxis
 - (c) heteromorphosis
 - (d) parthenogenesis

24. Given below is a representation of a kind of chromosomal mutation. What is the kind of mutation represented?



- (a) Deletion
(b) Duplication
(c) Inversion
(d) Reciprocal translocation
25. The maximum growth rate occurs in
(a) stationary phase (b) senescent phase
(c) lag phase (d) exponential phase

General Ability

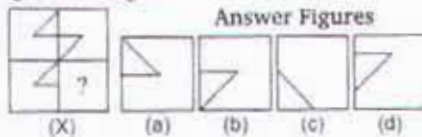
Directions Select the one which is different from the other three responses.

1. (a) Flute (b) Violin
(c) Guitar (d) Sitar

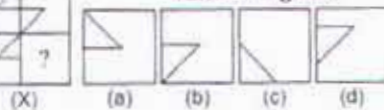
Directions Which one of the given responses would be a meaningful order of the following words in ascending order?

2. 1. Neonate 2. Child
3. Infant 4. Embryo
(a) 1, 3, 2, 4 (b) 4, 1, 3, 2
(c) 4, 3, 1, 2 (d) 3, 1, 4, 2
3. Find the wrong number in the given series
16, 22, 30, 45, 52, 66
(a) 30 (b) 45
(c) 52 (d) 66
4. In a row of boys, if A who is tenth from the left and B who is ninth from the right interchange their positions. Now, A becomes fifteenth from the left. How many boys are there in the row?
(a) 23 (b) 27
(c) 28 (d) 31
5. Which answer figure will complete the pattern of given question figure?

Question Figure



Answer Figures



6. Which one among the following countries has the lowest GDP per capita?
(a) China (b) India
(c) Indonesia (d) Sri Lanka

7. The Constitution of India was adopted on
(a) 26th January, 1950
(b) 26th January, 1949
(c) 26th November, 1949
(d) 15th August, 1947
8. How many states and union territories are there in India?
(a) 25 states and 7 union territories
(b) 28 states and 7 union territories (including National capital territory II)
(c) 24 states and 6 union territory
(d) None of the Above
9. All of the following statements regarding the Indus Valley civilization are correct except
(a) The Indus Valley civilization was an advanced urban civilization
(b) Iron was not known to the people
(c) It is difficult to say which race the people belonged
(d) The people know nothing about agriculture
10. The principle that distinguishes Jainism from Buddhism is the
(a) practice of the eight-fold path
(b) rejection of the infallibility of the Vedas
(c) attribution of a soul to all beings and things
(d) belief in rebirth
11. Light year is unit of
(a) time (b) speed of light
(c) distance (d) mass
12. Pick out the only vector quantity.
(a) pressure
(b) impulse
(c) gravitational
(d) coefficient of friction potential



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13. The computer's processor consists of the following parts
(a) CPU and Main Memory
(b) Hard Disk and Floppy Drive
(c) Main Memory and Storage
(d) Operating System and Applications
14. Soft copy is an intangible output, so then what is a hard copy?
(a) The physical parts of the computer
(b) The printed parts of the computer
(c) The printed output
(d) The physical output device
15. Which of the following is considered a hotspot of biodiversity in India?
(a) Aravali hills
(b) Western Ghats
(c) Indo-gangetic plain
(d) Eastern Ghats
16. First National park developed in India is
(a) Gir (b) Kaziranga
(c) Jim Corbett (d) None of these
17. The First-Earth Sumti was held at
(a) Buenos Aires
(b) Rio de Janeiro
(c) Dar-es-salam
(d) None of the above
18. What is the name of Kalhana's book?
(a) Arthashastra
(b) Indica
(c) Purana
(d) Rajtarangini
19. 1st Tuesday of may is observed as
(a) Global Family Day
(b) World Asthma Day
(c) World Mother's Day
(d) International Human Solidarity Day
20. With which game does Davis cup is associated?
(a) Hockey
(b) Table Tennis
(c) Lawn Tennis
(d) Polo
21. Which is the greatest out of the following numbers?
(a) $(2 + 2 + 2)^2$ (b) $[(2 + 2)^2]^2$
(c) $(2 \times 2 \times 2)^2$ (d) 4^2
22. If after the payment of $\frac{3}{4}$ of a laon, ₹ 500 still remain to pay, what is whole amount of the loan?
(a) ₹ 2000 (b) ₹ 2100
(c) ₹ 1700 (d) ₹ 1500
- Directions** In given sentence to find out whether there is any grammatical error in it. The error, if any, will be in one part of the sentence. The number of that part is the answer. If there is no error, the answer is (d), i.e., 'No error'. (Ignore the errors of punctuation, if any)
23. I am grateful to you and all your friends (a) / for they showed sympathy (b) / and kindness towards me. (c) /No error (d)
- Directions** In each sentence below a word is printed in bold. Below each sentence, four words/ group of words are suggested, one of which can replace the bold word, without changing the meaning of the sentence. Find out the appropriate word/ group of words in each case.
24. His **inflexible** attitude is the root cause of most of his problems.
(a) negative (b) nasty
(c) hesitant (d) rigid
- Directions** In each question below three words are given numbered as (a), (b) and (c). One of these three words may be wrongly spelt. Find out the word which is wrongly spelt, if there is any. The number of that word is your answer. If all the words are correctly spelt, mark (d), i.e., 'All correct' as your answer.
25. (a) Adventure (b) Demonstration
(c) Innosent (d) All correct



Answers

Physics

1. (a) 2. (c) 3. (a) 4. (b) 5. (b) 6. (a) 7. (b) 8. (c) 9. (b) 10. (d)
11. (c) 12. (a) 13. (b) 14. (d) 15. (c) 16. (b) 17. (d) 18. (a) 19. (b) 20. (b)
21. (c) 22. (d) 23. (d) 24. (a) 25. (a)

Chemistry

1. (c) 2. (d) 3. (c) 4. (b) 5. (b) 6. (d) 7. (b) 8. (a) 9. (d) 10. (b)
11. (c) 12. (a) 13. (a) 14. (c) 15. (b) 16. (d) 17. (d) 18. (b) 19. (b) 20. (b)
21. (b) 22. (a) 23. (b) 24. (b) 25. (c)

Biology

1. (d) 2. (d) 3. (c) 4. (d) 5. (d) 6. (a) 7. (c) 8. (b) 9. (c) 10. (a)
11. (b) 12. (c) 13. (b) 14. (c) 15. (b) 16. (c) 17. (c) 18. (b) 19. (b) 20. (d)
21. (a) 22. (a) 23. (a) 24. (d) 25. (a)

General Ability

1. (a) 2. (b) 3. (b) 4. (a) 5. (b) 6. (b) 7. (c) 8. (b) 9. (d) 10. (c)
11. (c) 12. (a) 13. (c) 14. (c) 15. (b) 16. (c) 17. (b) 18. (d) 19. (b) 20. (c)
21. (b) 22. (a) 23. (b) 24. (d) 25. (c)

Hints & Solutions

Physics

1. By using relation,

$$v = u + at$$

$$\therefore v = 0 + an$$

$$\text{or } a = \frac{v}{n}$$

...(i)

Distance travelled in n sec

$$S_n = \frac{1}{2}an^2, \text{ and}$$

Distance travelled in $(n-2)$ sec

$$S_{n-2} = \frac{1}{2}a(n-2)^2$$

\therefore Distance travelled in last two seconds

$$S_n - S_{n-2} = \frac{1}{2}an^2 - \frac{1}{2}a(n-2)^2$$

$$= \frac{a}{2}[n^2 - (n-2)^2]$$

$$= \frac{a}{2}[n + (n-2)][n - (n-2)]$$

$$= a(2n-2)$$

Substituting value of a from Eq. (i), we have

$$S_n - S_{n-2} = \frac{v}{n}(2n-2)$$

$$= \frac{2v(n-1)}{n}$$

2. Let car B catches car A after t sec, then

Distance travelled by A in t sec = Distance travelled by B in t sec

$$\Rightarrow 60t + 2.5 = 70t - \frac{1}{2} \times 20t^2$$

$$\Rightarrow 10t^2 - 10t + 2.5 = 0$$

$$\Rightarrow t^2 - t + 0.25 = 0$$

$$\text{or } t = \frac{1 \pm \sqrt{1 - 4 \times (0.25)}}{2} = \frac{1}{2} \text{ h}$$



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3. We know that, $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$
(where c is the velocity of light)

$$\Rightarrow \mu_0 \epsilon_0 = \frac{1}{c^2}$$

$$\therefore [\mu_0 \epsilon_0] = [L^{-2}T^2]$$

4. Tension in the string, $T = \frac{2m_1 m_2}{m_1 + m_2} g$

$$= \frac{2 \times 2 \times 3}{2 + 3} g = \frac{12}{5} g$$

and acceleration

$$a = \left(\frac{m_2 - m_1}{m_1 + m_2} \right) g = \left(\frac{3 - 2}{3 + 2} \right) g = \frac{g}{5}$$

5. Maximum velocity, $v = \sqrt{\mu r g}$

$$= \sqrt{0.2 \times 100 \times 10}$$

$$= 10\sqrt{2} = 14 \text{ ms}^{-1}$$

6. If all of them are connected in series, then $R_{\text{eq}} = 12 \Omega$

If all are in parallel then $R_{\text{eq}} = \frac{4}{3} \Omega = 1.33 \Omega$

If two are in series then parallel with third,

$$R_{\text{eq}} = \frac{8}{3} = 2.6 \Omega$$

If two are in parallel then series with third,

$$R_{\text{eq}} = 6 \Omega$$

7. The magnetic field due to a solenoid,

$$B = \frac{\mu_0 N i}{l}$$

where, N = number of turns and
 l = length of solenoid.

$$0.2 = \frac{4\pi \times 10^{-7} \times N \times 10}{0.8}$$

$$N = \frac{0.8 \times 0.2}{4 \times \pi \times 10^{-6}}$$

$$= \frac{4 \times 10^4}{\pi}$$

Total length of the wire (L) = $2\pi r \times N$

$$= 2\pi \times 3 \times 10^{-2} \times \frac{4 \times 10^4}{\pi}$$

$$= 2.4 \times 10^3 \text{ m}$$

8. In general, X-rays have larger wavelength than that of gamma rays.

$$\begin{aligned} 9. \text{ Maximum kinetic energy } K_{\text{max}} &= \frac{hc}{\lambda} - W_0 \\ &= \frac{6.4 \times 10^{-34} \times 3 \times 10^8}{6400 \times 10^{-10}} - 1.6 \times 10^{-19} \\ &= 1.4 \times 10^{-19} \text{ J} \end{aligned}$$

10. Wavelength of the emitted radiations

$$\frac{1}{\lambda} = R \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$$

$$= R \left[\frac{1}{(2)^2} - \frac{1}{(4)^2} \right]$$

$$= R \left[\frac{1}{4} - \frac{1}{16} \right]$$

$$\text{or } \lambda = \frac{16}{3R}$$

11. The nearest distance between two atoms for a bcc lattice

$$= 2 \times \text{atomic radius}$$

$$= 2 \times \left(\frac{\sqrt{3}a}{4} \right) = \frac{a\sqrt{3}}{2}$$

12. Magnification, $m = \frac{-v}{u}$

$$\text{But } \frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad (\text{Mirror formula})$$

$$\Rightarrow \frac{u}{f} = \frac{u}{v} + 1$$

$$\Rightarrow -\frac{u}{v} = 1 - \frac{u}{f}$$

$$\Rightarrow \frac{-v}{u} = \frac{f}{f-u}$$

$$\text{So, } m = \frac{f}{f-u}$$

13. Outside a magnet the direction of magnetic lines of force is from N -pole to S -pole, where as inside a magnet their direction is from S -pole to N -pole.

14. As the bulbs are connected in parallel, hence each bulb consumed = $\frac{48}{2} = 24 \text{ W}$.



∴ By using the relation $\frac{V^2}{R} = P$

$$R = \frac{V^2}{P} = \frac{6 \times 6}{24} = 1.5 \Omega$$

15. We know that, conductivity

$$\sigma = \frac{1}{\rho} \quad \dots(i)$$

and conductance, $G = \frac{1}{R} \quad \dots(ii)$

$$\Rightarrow GR = 1$$

From Eqs. (i) and (ii), we get

$$\sigma = \frac{GR}{\rho}$$

16. For the potential difference of 10 V, charge required by capacitor

$$q = CV$$

$$q = 500 \times 10^{-6} \times 10 = 5 \times 10^{-3} \text{C}$$

$$\therefore \text{Required time} = \frac{5 \times 10^{-3}}{100 \times 10^{-6}} = 50 \text{ s}$$

17. Kinetic energy of a particle executing SHM is

$$\begin{aligned} K &= \frac{1}{2} m \omega^2 (a^2 - y^2) \\ &= \frac{1}{2} \times 10 \left(\frac{2\pi}{2} \right)^2 [(10)^2 - (5)^2] \\ &= 375 \pi^2 \text{ erg} \end{aligned}$$

18. Mean free path, $\lambda = \frac{1}{\sqrt{2} n d^2}$

$$\lambda \propto d^{-2}$$

19. In the absence of gravity, weight of the body will become zero but mass will not change.

20. Given, $\omega_1 = 10 \text{ rad s}^{-1}$,

$$\omega_2 = 0,$$

$$t = 10 \text{ s}$$

$$\begin{aligned} \therefore \alpha &= \frac{\omega_2 - \omega_1}{t} = \frac{0 - 10}{10} \\ &= -1 \text{ rad s}^{-2} \end{aligned}$$

(Negative sign shows retardation)

$$\begin{aligned} \text{Now, moment of inertia } I &= mr^2, \\ &= 10 \times (0.3)^2 = 0.9 \text{ kg}\cdot\text{m}^2 \end{aligned}$$

$$\therefore \text{Torque, } \tau = I \alpha = 0.9 \times 1 = 0.9 \text{ N}\cdot\text{m}$$

21. The speed of a satellite, $v \propto \frac{1}{\sqrt{r}}$

So, as the r increases, v decreases.

22. The root mean square velocity,

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}} \Rightarrow v_{\text{rms}} \propto \sqrt{T}$$

So, to reduce v_{rms} velocity 2 times, then temperature of the gas is to be reduced four times.

$$\text{i.e., } \frac{T'}{T} = \frac{1}{4}$$

During adiabatic process $TV^{\gamma-1} = T'V'^{\gamma-1}$

$$\begin{aligned} \Rightarrow \frac{V'}{V} &= \left(\frac{T}{T'} \right)^{\frac{1}{\gamma-1}} = (4)^{\frac{1}{1.5-1}} \\ &= (4)^2 = 16 \Rightarrow V' = 16 V \end{aligned}$$

$$\begin{aligned} 23. Q &= mL = KA \frac{(\theta_1 - \theta_2)}{l} t \\ &= m = \frac{1}{L} \times KA \frac{(\theta_1 - \theta_2)}{l} \times t \\ &= \frac{1}{80} \times 0.2 \times 4 \times \frac{(100 - 0)}{\sqrt{4}} \times 10 \times 60 \\ & \quad (\because l^2 = 4 \Rightarrow l = \sqrt{4}) \\ &= \frac{0.2 \times 4 \times 100 \times 600}{80 \times 2} = 300 \text{ g} \end{aligned}$$

24. The situation can be shown as



At O, $E \neq 0$ but $V = 0$

25. For maximum intensity on the screen

$$d \sin \theta = n\lambda$$

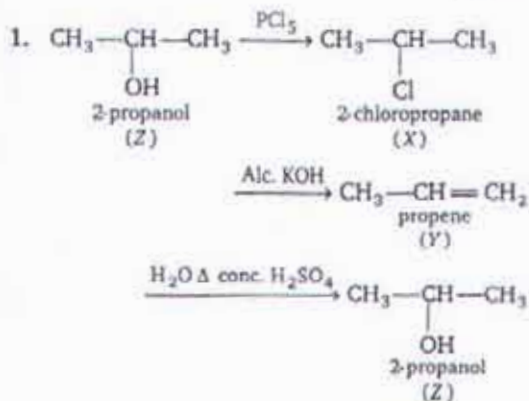
$$\text{or } \sin \theta = \frac{n\lambda}{d} = \frac{n(2000)}{7000} = \frac{n}{3.5}$$

Since the maximum value of $\sin \theta = 1$

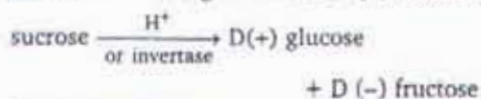
∴ $n = 0, 1, 2$ and 3 only

So, only seven maximas can be obtained on both sides of the screen.

Chemistry



2. Sucrose obtained from canesugar. On hydrolysis of sucrose it gives equimolar mixture of D (+) glucose and D (-) fructose.



In sucrose, glucose is present in the pyranose form and fructose in the furanose form. Further since C₁ - α of glucose is connected to C₂ - β of fructose, therefore sucrose is a non-reducing sugar.

3. EDTA (ethylene diamine tetra acetate) is used for removal of the toxic effect of lead metal in body in chelate therapy treatment because it forms complex with lead.

4. The heat of hydrogenation of 1, 3-butadiene is 57 kcal/mol due to the conjugation in 1, 3-butadiene.



Let the oxidation number of S in H₂S = x

$$2(+1) + x = 0$$

$$+ 2 + x = 0$$

$$x = -2$$

oxidation number of S in s = 0

Thus, in reaction, oxidation number of sulphur changes from -2 to 0.

6. If pH become 13 then weak acid and strong base combined and formation of salt because its pH is pH > 7.

7. Gobar salt Na₂SO₄·10H₂O

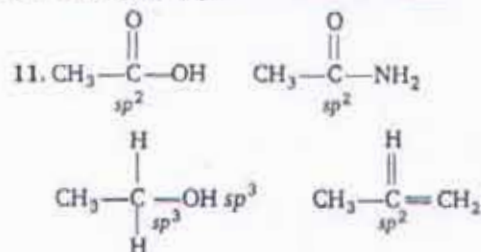
8. AgCl is not more soluble than KI.

9. In K₃[MnF₆] is n = 3 because the magnetic moment of Mn³⁺ is 4.9

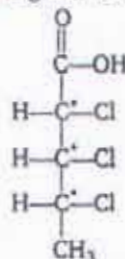
$$2\sqrt{S(S+1)} = 2\sqrt{2(2+1)} = 4.9$$

$$n = 2$$

10. Bk, Cf, Am is para uranium element.



12. The structural formula of 2, 3, 4-trichloropentanoic acid is given below.



Number of optical active isomers = 2ⁿ

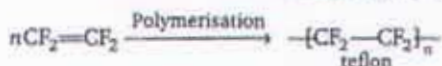
where, n = number of asymmetric carbon atom.

2, 3, 4-trichloropentanoic acid has three asymmetric carbon atoms.

So, number of optical active isomers = 2³

∴ Number of optical active isomers = 8

13. Tetra fluoroethene is a monomer of Teflon.



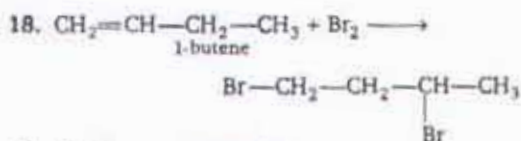
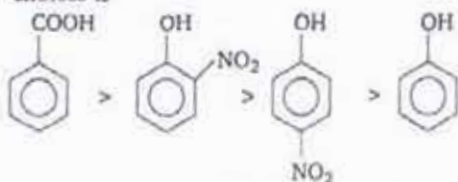
14. O₂ = 8 + 8 = 16

$$= \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2,$$

$$\pi 2p_y^2, \pi 2p_x^2, \pi^* 2p_y^1, \pi^* 2p_x^1$$

∴ Number of unpaired electrons = 2

15. Electronic configuration of Cu is $4s^1, 3d^{10}$.
16. In the formation of an alkane from Grignard reagent, alkyl group always comes from Grignard reagent. Hence, the number of carbon atoms in the Grignard reagent and alkane formed from Grignard reagent will be identical. So, the original alkyl halide is propyl bromide.
17. Carboxylic acids are more acidic than phenol. Phenols are acidic and their acidity increases by the presence withdrawing group. The effect of group is more at *o*-position due to nearness.
 \therefore Decreasing order of acidity among given choices is



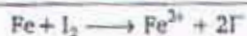
19. For first order reaction

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

$$a = V_{\infty} (35.05) \text{ and } x = V_t$$

constant values of k calculated for different times shows first order reaction.

20. Cell reaction of a given cell is



According to Nernst equation

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} + \frac{0.0592}{n} \log_{10} \frac{[\text{Fe}][\text{I}_2]}{[\text{Fe}^{2+}][\text{I}^-]^2}$$

$$[\text{Fe}] = [\text{I}_2] = 1$$

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.0592}{n} \log_{10} [\text{Fe}^{2+}][\text{I}^-]^2$$

$$21. \frac{N}{N_0} = \left(\frac{1}{2}\right)^n \text{ and } n = \frac{T}{t_{1/2}}$$

$$\text{So, } \frac{N}{N_0} = \left(\frac{1}{2}\right)^{T/t_{1/2}}$$

Where, N_0 = initial amount of radioactive substance

N = amount of radioactive substance left after time T

T = time = 2 days

$t_{1/2}$ = half-life = 4 days

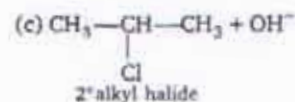
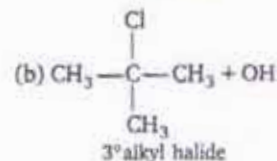
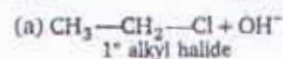
$$\therefore \frac{N}{N_0} = \left(\frac{1}{2}\right)^{2/4}$$

$$\therefore \frac{N}{N_0} = \frac{1}{\sqrt{2}}$$

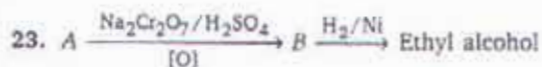
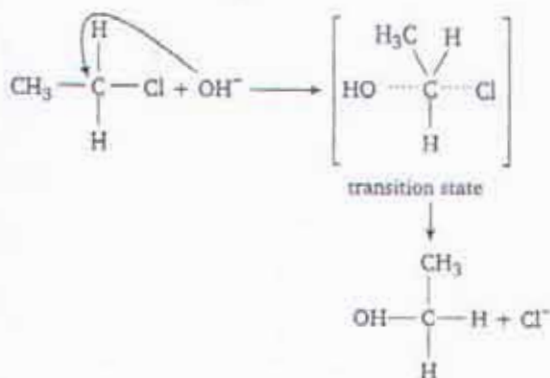
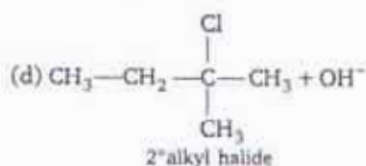
$$\therefore N = N_0 \times \frac{1}{\sqrt{2}}$$

\therefore Amount of substance decayed in two days will be $N_0 - N_0 \times \frac{1}{\sqrt{2}} = \left(1 - \frac{1}{\sqrt{2}}\right)N_0$

22. S_N2 mechanism means bimolecular nucleophilic substitution mechanism. In this, rate of reaction is determined by concentration of two molecules. It is characteristic of 1° alkyl halides.

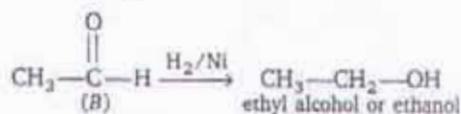
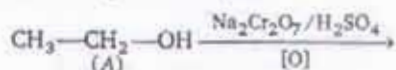


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Compound B on reduction with H_2 /in presence of Ni given ethyl alcohol it means compound B is ethanal, because aldehyde on reduction gives primary alcohol. Again

compound B obtained from oxidation of A it means A is ethanol, because primary alcohol on oxidation gives aldehyde.



24. Density of copper

$$= \frac{Z \times M}{a^3 \times N_0 \times 10^{-30}} \text{ g cm}^{-3}$$

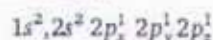
Here, $a = 362 \text{ pm}$, $N_0 = 6.09 \times 10^{23}$

$Z = 12$ in fcc, $M = 63.546$

$$\text{Density} = \frac{12 \times 63.546}{(362)^3 \times 6.09 \times 10^{23} \times 10^{-30}}$$

$$= 2.23 \text{ g cm}^{-3}$$

25. Electronic configuration of nitrogen of minimum state is



Biology

- When the specific name repeats the unaltered generic name. This is called tautonym, e.g., *Malus malus*.
- Plasmid is a extrachromosomal DNA present in bacterial cell. It has its own of replication and resistance marker genes commonly used as vector in recombinant DNA technology.
- Viruses which infect bacteria, multiply and cause their lysis are lytic viruses.
In lysogeny viruses integrates into the host bacterial chromosome and exist as prophage.
- Gymnosperms are naked seeded plants because they have no ovary and fruit. These are cone bearing plants, where female gametophyte is an archegonium.
- Muscular diaphragm is the exclusive character of mammals. A complete muscular partition separates the thoracic cavity housing the heart and the lungs from the abdominal cavity containing all other viscera. It is called diaphragm. It increases the efficiency of breathing. Homoiothermy (warm blooded) and four-chambered heart is also present in birds. Fertilization is internal in most of the animals.
- Diadelphous condition is found in family-Papilionaceae.
- Colchicine is produced by plant *Colchicum autumnale*, which belongs to family-Liliaceae. Colchicine is used to arrest cell at metaphase stage and arrest the cell division.

8. Intrastelar cambium is the cambium present between xylem and phloem (*i.e.*, within the stele) and the interstellar cambium present between steles (vascular bundle) and show growth ring formation.
9. The myelein sheath appears as tube around the axon. It is filled with the complex mixture of lipids and proteins called myelin. Due to this myelinated nerve fibre appear white in colour.
10. Matrix is not a product of synthesis of its cells in muscular tissue. It is the fibroblast cells of connective tissue, which form fibres and matrix both.
11. DNA gyrases is the type of class II topoisomerase, which helps to open a DNA double helix in front of replicaton fork. It causes negative supercoiling of DNA.
DNA polymerase is involved in synthesis of new DNA strand.
DNA ligases joins the nicks present in between Okazaki fragments.
12. Elaioplast is the type of leucoplast which store fats. Apart from it other leucoplast are amyloplast. These store starch proteinoplast. These store proteins.
13. Smooth endoplasmic reticulum is the site of lipid synthesis.
Rough endoplasmic reticulum is the site of protein synthesis.
14. Except glycine all the amino acid contain asymmetric carbon. It is the simplest amino acid. Cysteine and methionine are the sulphur containing amino acids.
Cellulose is a polysaccharide (β -glucose) sucrose is a diasaccharide of fructose and glucose.
15. Recombination of genes on the same chromosome is accomplished by crossing over a process by which parts of homologous chromosomes are inter changed. Crossing over take place between non-sister chromatids of homologous chromosome in pachytene stage of meiosis-I.
16. Denitrifying bacteria breaks down nitrites and nitrates anaerobically to produce free nitrogen, *e.g.*, *Bacillus denitrificans*.
17. 34 molecules of ATP (30 through NADH and 4 through FADH₂) are obtained as a result of oxidative phosphorylation.
18. Paratonic movements are produced in response to some external stimulus. Those are said to be positive if directed towards the stimulus and negative if away from stimulus. In pitcher plant, stimulus is provided by the insect.
19. The main inorganic constituent of blood plasma are chloride and bicarbonate salts of sodium (principle cation). Traces of some other salts like phosphates, bicarbonates sulphates and iodides of calcium, magnesium and potassium are also found.
20. Kidneys are chief excretory organ, which plays an important role in osmoregulation and regulation of blood volume. Destruction of dead blood corpuscles occurs in spleen also known as 'graveyard of red blood cells'.
21. Endocrine glands (ductless glands) or glands of internal secretion have no ducts and their secretion get absorbed into intermediate surrounding blood circulation to reach the specific organ to initiate a particular metabolic change.
22. Formation of endosperm refers to the fusion of male gamete with the diploid central cell. This is called triple fusion and endosperm is triploid.
23. Regeneration of tail in lizards is an example of epimorphosis. Epimorphosis take place by the proliferation of the new tissue cell from the surface of wound.
24. Inversion involves a reverse order of genes in part of chromosomes. In figure, break occurs between A and E. Remain at the broken ends may lead to inversion of segment BCD into DCB.



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In deletion, a section of chromosome is lost.

In duplication, a section of chromosome is duplicated.

In reciprocal translocation an exchange of chromosome fragment occurs in between two non-homologous chromosomes.

25. Maximum growth rate occurs in lag phase. At this stage microbes follows an exponential

growth rate cell divides in multiple of two and follows geometric progression.

Lag phase is the preparatory phase when the cell prepares itself for cell division. In stationary phase rate of death of cells and rate of division of cells is same. Secondary metabolites began to accumulate at this stage. Senescent phase is the death phase.