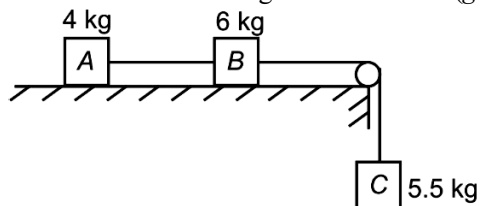
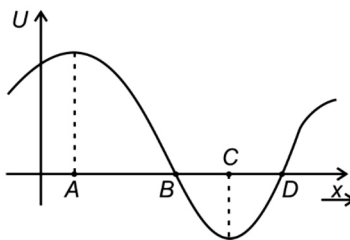


PHYSICS :

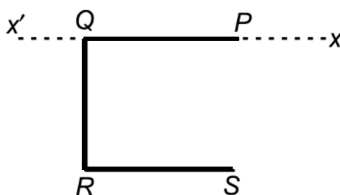
1. In an experiment four quantities a , b , c and d are measured with percentage error 2%, 3%, 1% and 0.5% respectively. A quantity Q is defined as $Q = \frac{a\sqrt{b}}{c^{3/2}d^4}$. Maximum percentage error in the calculation of Q will be
 (a) 5% (b) 6% (c) 7% (d) 9%
2. Three blocks A, B and C are placed on a rough horizontal surface. Friction coefficient between blocks and surface is 0.6. Acceleration of the block C in given situation is ($g = 10 \text{ m/s}^2$)



- (a) 3.5 m/s^2 (b) 0.5 m/s^2 (c) 4.5 m/s^2 (d) Zero
3. Given diagram represents the potential energy curve of particle in a field. Particle will be in equilibrium at position



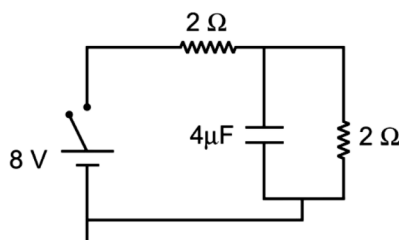
- (a) at B and D (b) at A and C (c) at A, B and C (d) at A, B, C and D
4. Three thin rods each of mass m and length L are joined to form as shown in the figure



Moment of inertia of the system about an axis xx' passing through rod PQ is

- (a) $\frac{2mL^2}{3}$ (b) $\frac{mL^2}{2}$ (c) $\frac{4mL^2}{3}$ (d) $\frac{3mL^2}{8}$
5. When an elastic material with young's modulus Y is subjected to a stretching stress ' S '. Elastic energy stored per unit volume of the material is
 (a) $\frac{S}{2Y}$ (b) $\frac{S^2}{2Y}$ (c) $\frac{S^2Y}{2}$ (d) $\frac{Y^2S}{2}$
6. An ideal gas is allowed to expands from volume V to $2V$ according to the law $VP^2 = \text{Constant}$. If initial temperature of the gas is ' T ' then its final temperature will be
 (a) T (b) $T\sqrt{2}$ (c) $\frac{T}{\sqrt{2}}$ (d) $2T$
7. The ratio of velocity of sound in oxygen to that in Argon at the same temperature is
 (a) $\sqrt{\frac{21}{20}}$ (b) $\sqrt{\frac{20}{21}}$ (c) $\sqrt{\frac{21}{25}}$ (d) $\sqrt{\frac{25}{21}}$

8. When the key is pressed at time $t = 0$, then charge on the capacitor after a very long time in given figure will be

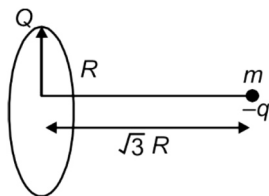


- (a) zero (b) $16 \mu C$ (c) $8 \mu C$ (d) $32 \mu C$
9. A charged particle is projected into a region where there may have an electric field \vec{E} and/or magnetic field \vec{B} . If the charged particle goes un-accelerated, then it is not possible that
- (a) $\vec{E} = 0, \vec{B} = 0$ (b) $\vec{E} \neq 0, \vec{B} = 0$ (c) $\vec{E} = 0, \vec{B} \neq 0$ (d) $\vec{E} \neq 0, \vec{B} \neq 0$
10. For the stability of any nucleus
- (a) Binding energy per nucleon should be more
 (b) Binding energy per nucleon should be less
 (c) Number of protons inside the nucleus should be more
 (d) Number of neutrons inside the nucleus should be more
11. The peak voltage in the output of a half wave diode rectifier fed with a sinusoidal signal without filter is $10 V$. The D.C. component of the output voltage is :
- (a) $\frac{10}{\sqrt{2}} V$ (b) $\frac{10}{\pi} V$ (c) $10 v$ (d) $\frac{20}{\pi} V$
12. The retarding potential for having zero photo-electron current
- (a) Is proportional to the wavelength of incident light
 (b) Increases uniformly with the increase in the wavelength of incident light
 (c) Is proportional to the frequency of incident light
 (d) Increases uniformly with the increase in the frequency of incident light wave
13. Three blocks each of mass m are hanged vertically with the help of inextensible strings and ideal spring. Initially the system was in equilibrium. At any instant lower most string is cut then acceleration of block B just after cutting the string is



- (a) g (b) $\frac{g}{2}$ (c) $\frac{2g}{3}$ (d) zero

14. A refrigerator, whose coefficient of performance is 7, extracts heat from the low temperature compartment at the rate of 250 J/cycle. Work done per cycle required to operate the refrigerator is nearly
 (a) 50 J (b) 36 J (c) 27 J (d) 63 J
15. A circular beam of light having a diameter 4 cm falls on a plane glass slab at angle of incidence 60° . If refractive index of the material of slab is $\mu = \frac{3}{2}$, then diameter of the refracted beam is
 (a) $10\sqrt{\frac{2}{3}}\text{ cm}$ (b) 2 cm (c) $8\sqrt{\frac{2}{3}}\text{ cm}$ (d) $4\sqrt{\frac{3}{2}}\text{ cm}$
16. A galvanometer has a resistance $100\ \Omega$. It gives full scale deflection on passing 10 mA current through it. To convert it into a voltmeter of range 0 – 10 V, the resistance to be added in series is
 (a) 8000 Ω (b) 900 Ω (c) 110 Ω (d) 90 Ω
17. A particle having charge $-q$ and mass m is released from rest on the axis of a fixed ring of total charge Q and radius R from a distance $\sqrt{3}R$. Its kinetic energy when it reaches the centre of ring is



- (a) $\frac{Qq}{4\pi\epsilon_0 R}$ (b) $\frac{Qq}{8\pi\epsilon_0 R}$ (c) $\frac{Qq}{2\pi\epsilon_0 R}$ (d) $\frac{Qq}{16\pi\epsilon_0 R}$
18. Two short identical magnetic dipoles of magnetic moments 1 Am^2 each placed at a separation of 2 m with their axis perpendicular to each other. The resultant magnetic field at a point midway between the dipoles is
 (a) $5 \times 10^{-7}\text{ T}$ (b) $\sqrt{5} \times 10^{-7}\text{ T}$ (c) 10^{-7} T (d) $5\sqrt{5} \times 10^{-7}\text{ T}$
19. In covering a certain distance, the time decreases by 20%, if speed (uniform) increases by 20 m/s. Find the original speed.
 (a) 100 m/s (b) 60 m/s (c) 40 m/s (d) 80 m/s
20. The relation between acceleration and velocity for a body moving in straight line is $a \propto v^3$. Choose incorrect option. (x is position and t is time)
 (a) $\frac{1}{v^2} \propto t$ (b) $x^2 \propto t$ (c) $a^2 \propto \frac{1}{t^3}$ (d) $x \propto \frac{1}{v^2}$

CHEMISTRY:

21. From the following bond energies:

H–H bond energy : $431.37\text{ kJ mol}^{-1}$

C=C bond energy : $606.10\text{ kJ mol}^{-1}$

C–C bond energy : $336.49\text{ kJ mol}^{-1}$

C–H bond energy : $410.50\text{ kJ mol}^{-1}$

Enthalpy for the reaction, $\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{C} = \text{C} + \text{H} - \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array} \longrightarrow \begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H} - \text{C} - \text{C} - \text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$ will be

- (a) $1523.6\text{ kJ mol}^{-1}$ (b) $-243.6\text{ kJ mol}^{-1}$ (c) $-120.0\text{ kJ mol}^{-1}$ (d) 553.0 kJ mol^{-1}

22. The ionisation constant of ammonium hydroxide is 1.77×10^{-5} at 298 K. Hydrolysis constant of ammonium chloride is
- (a) 5.65×10^{-10} (b) 6.50×10^{-12} (c) 5.65×10^{-9} (d) 5.65×10^{-12}
23. Which of the following does not show optical isomerism? [en = ethylenediamine]
- (a) $[\text{Co}(\text{en})_2\text{Cl}_2]^+$ (b) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$ (c) $[\text{Co}(\text{en})\text{Cl}_2(\text{NH}_3)_2]^+$ (d) $[\text{Co}(\text{en})_3]^{3+}$
24. Half life period of a first order reaction is 1386 s. The specific reaction rate of the reaction is
- (a) $5.0 \times 10^{-3} \text{ s}^{-1}$ (b) $5.0 \times 10^{-2} \text{ s}^{-1}$ (c) $0.5 \times 10^{-3} \text{ s}^{-1}$ (d) None of these
25. Consider the following reaction, Phenol $\xrightarrow{\text{Zn dust}}$ X $\xrightarrow[\text{Anhydrous AlCl}_3]{\text{CH}_3\text{Cl}}$ Y $\xrightarrow[\text{KMnO}_4/\Delta]{\text{Alkaline}}$ Z, the product Z, is
- (a) Toluene (b) Benzaldehyde (c) Benzoic acid (d) Benzene
26. Copper crystallises in a face-centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm?
- (a) 128 (b) 157 (c) 181 (d) 108
27. According to MO theory which of the following lists ranks the nitrogen species in terms of increasing bond order?
- (a) $\text{N}_2^- < \text{N}_2 < \text{N}_2^{2-}$ (b) $\text{N}_2^{2-} < \text{N}_2^- < \text{N}_2$ (c) $\text{N}_2 < \text{N}_2^{2-} < \text{N}_2^-$ (d) $\text{N}_2^- < \text{N}_2^{2-} < \text{N}_2$
28. Among the following which is the strongest oxidising agent?
- (a) F_2 (b) Br_2 (c) I_2 (d) Cl_2
29. The equivalent conductance of M/32 solution of a weak monobasic acid is $8.0 \text{ mho cm}^2 \text{ eq}^{-1}$ and at infinite dilution is $400 \text{ mho cm}^2 \text{ eq}^{-1}$. The dissociation constant of this acid is approximately
- (a) 1.25×10^{-5} (b) 1.25×10^{-6} (c) 6.25×10^{-4} (d) 1.25×10^{-4}
30. Structures of some common polymers are given. Which one is not correctly presented ?
- (a) Teflon $-(\text{CF}_2 - \text{CF}_2)_n$
- (b) Neoprene $\left(-\text{CH}_2 - \underset{\text{Cl}}{\text{C}} = \text{CH} - \text{CH}_2 - \text{CH}_2 - \right)_n$
- (c) Terylene $\left(\text{OC} - \text{C}_6\text{H}_4 - \text{COOCH}_2 - \text{CH}_2 - \text{O} \right)_n$
- (d) Nylon 6,6 $-\left[\text{NH}(\text{CH}_2)_6 \text{NHCO}(\text{CH}_2)_4 - \text{CO} \right]_n$
31. The IUPAC name of the compound having the formula $\text{CH} \equiv \text{C} - \text{CH} = \text{CH}_2$ is
- (a) 3-butene-1-yne (b) 1-butyn-3-ene (c) but-1-yne-3-ene (d) 1-butene-3-yne
32. Amongst the elements with following electronic configurations, which one of them may have the highest ionisation energy?
- (a) $[\text{Ne}]3s^2 3p^3$ (b) $[\text{Ne}]3s^2 3p^2$ (c) $[\text{Ar}]3d^{10}, 4s^2 4p^3$ (d) $[\text{Ne}]3s^2 3p^1$

33. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4 . In the mixture, nitric acid acts as a/an
- (a) reducing agent (b) acid (c) base (d) catalyst
34. 10 g of hydrogen and 64 of oxygen were filled in a steel vessel and exploded. Amount of water produced in this reaction will be
- (a) 2 mol (b) 3 mol (c) 4 mol (d) 1 mol
35. The energy absorbed by each molecule (A_2) of a substance is $4.4 \times 10^{-19} \text{ J}$ and bond energy per molecule is $4.0 \times 10^{-19} \text{ J}$. The kinetic energy of the molecule per atom will be
- (a) $2.0 \times 10^{-20} \text{ J}$ (b) $2.2 \times 10^{-19} \text{ J}$ (c) $2.0 \times 10^{-19} \text{ J}$ (d) $4.0 \times 10^{-20} \text{ J}$
36. The straight chain polymer is formed by
- (a) hydrolysis of $(\text{CH}_3)_3\text{SiCl}$ followed by condensation polymerisation
 (b) hydrolysis of CH_3SiCl_3 followed by condensation polymerisation
 (c) hydrolysis of $(\text{CH}_3)_4\text{Si}$ by addition polymerisation
 (d) hydrolysis of $(\text{CH}_3)_2\text{SiCl}_2$ followed by condensation polymerisation.
37. Consider the following reaction, ethanol $\xrightarrow{\text{PBr}_3}$ X $\xrightarrow{\text{alc. KOH}}$ Y $\xrightarrow[\text{(ii) H}_2\text{O, heat}]{\text{(i) H}_2\text{SO}_4 \text{ cold.}}$ Z; the product Z, is
- (a) $\text{CH}_2 = \text{CH}_2$ (b) $\text{CH}_3\text{CH}_2 - \text{O} - \text{CH}_2 - \text{CH}_3$
 (c) $\text{CH}_3 - \text{CH}_2 - \text{O} - \text{SO}_3\text{H}$ (d) $\text{CH}_3\text{CH}_2\text{OH}$
38. What is the dominant intermolecular force or bond that must be overcome in converting liquid CH_3OH to a gas?
- (a) Hydrogen bonding (b) Dipole-dipole interaction
 (c) Covalent bonds (d) London dispersion force
39. Which of the following is not permissible arrangement of electrons in an atom?
- (a) $n = 4, \ell = 0, m = 0, s = -\frac{1}{2}$ (b) $n = 5, \ell = 3, m = 0, s = +\frac{1}{2}$
 (c) $n = 3, \ell = 2, m = -3, s = -\frac{1}{2}$ (d) $n = 3, \ell = 2, m = -2, s = -\frac{1}{2}$
40. Among the given compounds, the most susceptible to nucleophilic attack at the carbonyl group is
- (a) $\text{CH}_3\text{COOCH}_3$ (b) CH_3CONH_2 (c) $\text{CH}_3\text{COOCOCH}_3$ (d) CH_3COCl

BIOLOGY:

41. Which one of the following endocrine glands functions as a biological clock and neuro-secretory transducer?
- (a) Adrenal gland (b) Thyroid gland (c) Pineal gland (d) Thymus gland

42. A stimulus is received by a receptor, which initiates an impulse in the afferent neuron. The afferent neuron transmits the signal via _____ nerve root into _____ (at the level of spinal cord). The efferent neuron then carries signal from _____ to the _____.
- (a) ventral; CNS; PNS; sensory organs (b) ventral; CNS; CNS; effector
(c) dorsal; CNS; PNS; effector (d) dorsal; CNS; CNS; effector

43. Match Column-I with Column-II and choose the **correct** option.

Column-I		Column-II	
(a)	Tarsal	(i)	14
(b)	Phalanges	(ii)	1
(c)	Meta tarsal	(iii)	7
(d)	Femur	(iv)	5

- (a) (a) – (iii); (b) – (i); (c) – (iv); (d) – (ii) (b) (a) – (i); (b) – (ii); (c) – (iii); (d) – (iv)
(c) (a) – (iv); (b) – (i); (c) – (ii); (d) – (iii) (d) (a) – (iv); (b) – (i); (c) – (iii); (d) – (ii)
44. In uremia, artificial kidney is used for removing accumulated waste products like urea by the process called
- (a) micturition (b) haemolysis (c) ureotelism (d) haemodialysis
45. Which of the following is **correct** about human heart?
- (a) Volume of both atria > Volume of both ventricles
(b) Volume of both ventricles > Volume of both atria
(c) Volume of both atria = Volume of both ventricles
(d) Ventricles are upper chambers and atria are lower chambers in our heart
46. Why do human beings have difficulty in breathing at high elevations?
- (a) O₂ makes up lower percentage of air there. (b) The temperature is lower there
(c) The barometric pressure is higher there (d) pO₂ is lower there.
47. Hormonal control of the secretion of digestive juice is carried out by local _____ produced by _____ and _____ mucosa.
- (a) neurotransmitters; liver; pancreas (b) hormones; liver; pancreas
(c) hormones; gastric; intestinal (d) neurotransmitters; gastric; intestinal
48. Match Column-I with Column-II and select the **correct** option.

Column-I		Column-II	
(a)	Auxin	(i)	Root hair formation
(b)	Cytokinin	(ii)	Plant growth and development
(c)	Ethylene	(iii)	Xylem differentiation
(d)	ABA	(iv)	Nutrient mobilisation

- (a) (a) – (iv); (b) – (ii); (c) – (iii); (d) – (i) (b) (a) – (ii); (b) – (iii); (c) – (i); (d) – (iv)
(c) (a) – (i); (b) – (iii); (c) – (ii); (d) – (iv) (d) (a) – (iii); (b) – (iv); (c) – (i); (d) – (ii)

49. Choose the **correct** statement.
- (a) Fats are never used as a respiratory substrate
 (b) The value of respiratory quotient for organic acids is always less than one
 (c) Proteins are used as a respiratory substrate when the plant is in starving conditions.
 (d) Oxidative phosphorylation takes place in the mitochondrial matrix.
50. _____ is the basic pathway that results in the formation of the sugars and is common to the C_3 and C_4 plants.
- (a) Photorespiration (b) TCA cycle (c) HMP shunt (d) Calvin cycle
51. Which statement about the light reactions of photosynthesis is **false** ?
- (a) PS I and PS II are located in stroma of the chloroplast.
 (b) PS I and PS II are linked by e^- carriers.
 (c) Chlorophylls have an absorption spectrum with pronounced peaks in red and blue light.
 (d) Protons diffuse through protein channels which are ATP synthetase molecule.
52. C, H and O are mainly obtained from
- (a) soil and H_2O . (b) soil only. (c) H_2O and CO_2 . (d) CO_2 only.
53. A student is performing a chemical analysis of xylem sap. This student should not expect to find much of
- (a) nitrogen (b) sugar (c) phosphorus (d) water
54. If a cell A with DPD 4 bars is connected to cells B, C and D whose values of osmotic pressure and turgor pressure are respectively 4 and 4, 10 and 5, 7 and 3 bar, the flow of water will be
- (a) B to A, D to C (b) A to D, C to B (c) C to A, B to D (d) A to B, C to D
55. If there are 30 chromosomes in G_1 phase, then what will be the number of bivalents in zygotene stage ?
- (a) 30 (b) 15 (c) 45 (d) 60
56. Haeme is prosthetic group of _____ enzyme.
- (a) peroxidase (b) catalase (c) Both (1) and (2) (d) None of these
57. Match Column-I with Column-II and select the correct option.
- | Column-I | | Column-II | |
|----------|------------------------------|-----------|----------------------|
| (a) | Lysosomes | (i) | Protein synthesis |
| (b) | Ribosomes | (ii) | Hydrolytic enzymes |
| (c) | Smooth endoplasmic reticulum | (iii) | Steroid synthesis |
| (d) | Centriole | (iv) | Formation of spindle |
- (a) (a) – (ii); (b) – (i); (c) – (iii); (d) – (iv) (b) (a) – (i); (b) – (iii); (c) – (iv); (d) – (ii)
 (c) (a) – (i); (b) – (iv); (c) – (iii); (d) – (ii) (d) (a) – (iv); (b) – (iii); (c) – (i); (d) – (ii)
58. Bone dissolving cells are
- (a) osteocyte (b) osteoclast (c) osteoblast (d) fibroblast
59. Which of the following cells helps in maintaining the pressure gradient in the sieve tubes?
- (a) Phloem parenchyma (b) Bast fibre (c) Companion cells (d) Wood fibre

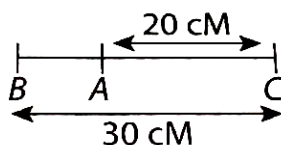
60. Mango develops from
 (a) monocarpellary inferior ovary (b) monocarpellary superior ovary
 (c) multicarpellary inferior ovary (d) multicarpellary superior ovary.
61. All of them are characteristics of urochordates, except
 (a) neural gland as excretory organ. (b) open type of circulatory system
 (c) cranium is absent (d) development is direct

62. Match Column-I with Column-II and select the correct option.

Column-I		Column-II	
(a)	Physalia	(i)	Brain coral
(b)	Adamsia	(ii)	Sea fan
(c)	Pennatula	(iii)	Sea pen
(d)	Gorgonia	(iv)	Sea anemone
(e)	Meandrina	(v)	Portuguese man-of-war
(f)	Aurelia	(vi)	Jellyfish

- (a) (a) – (v); (b) – (iv); (c) – (ii); (d) – (iii); (e) – (i); (f) – (vi)
 (b) (a) – (v); (b) – (iv); (c) – (iii); (d) – (ii); (e) – (i); (f) – (vi)
 (c) (a) – (v); (b) – (iv); (c) – (ii); (d) – (i); (e) – (ii); (f) – (vi)
 (d) (a) – (v); (b) – (iii); (c) – (iv); (d) – (ii); (e) – (i); (f) – (vi)
63. Select the **correct** options about algae.
 (a) Some algae are associated with fungi (in lichen) and animals (on sloth bear)
 (b) Great range in form and size
 (c) Reproduce by vegetative, asexual and sexual method.
 (d) All of these
64. Characteristic feature of euglenoids are
 (A) Presence of cell wall (B) Presence of two flagella
 (C) Photosynthetic in presence of sunlight (D) Presence of pellicle on their cell
 (a) (A) and (D) (b) (B) and (D)
 (c) All except (A) (d) All of these
65. In typical embryo sac, the nuclei are arranged as
 (a) 3 + 2 + 3 (b) 3 + 3 + 2 (c) 2 + 3 + 3 (d) 2 + 4 + 2
66. Which of the following statements is **correct**?
 (a) Double fertilisation is a characteristic of angiosperms.
 (b) Double fertilisation or triple fusion was discovered by Nawaschin.
 (c) Pollen tube shows tip growth and chemotropic movement
 (d) All of these

67. What induces the completion of the meiotic division of the secondary oocyte?
- Contact of the sperm with the zona pellucida layer of the ovum.
 - The entry of the sperm into the cytoplasm of the ovum through the zona pellucida and the plasma membrane.
 - Entry of the sperm in the ampullary isthmic junction.
 - Copulation.
68. At which phase, both LH and FSH attain a peak level?
- Menstrual phase
 - Follicular phase
 - Ovulatory phase
 - Luteal phase
69. What is the function of copper ions in copper releasing IUDs?
- They increase phagocytosis of sperm within the uterus.
 - They suppress sperm motility and the fertilising capacity of sperms.
 - They make the uterus unsuitable for implantation.
 - They inhibit ovulation.
70. In the given diagram what is the frequency of recombination between AB gene?



- 50%
 - 30%
 - 15%
 - 10%
71. Choose the **wrong** statement.
- Failure of segregation of chromatids during cell division results in aneuploidy.
 - Additional copy of X chromosome in males results in Klinefelter's syndrome.
 - Closely located genes in a chromosome always assort independently resulting in recombination.
 - Failure of cytokinesis after DNA replication results in polyploidy.
72. Calculate the length of DNA sample, if it had 240 bp.
- 340 Å
 - 816 Å
 - 1024 Å
 - 120 Å
73. What would be the **correct** base sequence in mRNA for the given DNA strand?
- 5'-AATGCCTTAAGC-3'
- 5'-GCUUAAGGCAUU-3'
 - 5'-UUACGGAATTCG-3'
 - 3'-UUACGGAAUUCG-5'
 - 5'-AAUGCCUUAAGC-3'
74. Which of the following is **not** produced by *E.coli* in the lactose medium?
- β -galactosidase
 - Transacetylase
 - Lactose dehydrogenase
 - Permease
75. Out of the following diseases which are caused due to bacterial infection?
- Typhoid
 - Elephantiasis
 - Cholera
 - Tuberculosis
- (A) and (B)
 - (B) and (C)
 - (A), (C) and (D)
 - All of these

76. If a quick immune response is needed as in tetanus infection, preformed antibodies or antitoxin is injected into the patient body. This type of immunisation is called
- (a) active immunisation (b) passive immunisation
(c) innate immunity (d) humoral immunity
77. All are correct with respect to BOD (biochemical oxygen demand) except one. Identify it.
- (a) It refers to the amount of oxygen that would be consumed if all the organic matter in one litre of water were oxidized by bacteria.
(b) The BOD test is a measure of the organic matter present in the water.
(c) The greater the BOD of waste water, less is its polluting potential.
(d) Waste water is treated till BOD is reduced significantly.
78. Each restriction endonuclease functions by inspecting the length of a DNA sequence. It cleaves _____.
- (a) only the master strand to produce sticky end.
(b) sense strand of DNA to produce sticky ends.
(c) each of the two strands of the double helix at specific points in their sugar phosphate backbones.
(d) messenger RNA to remove exons.
79. Protein encoded by the gene *cryIAb* controls
- (a) cotton bollworm. (b) beetles (c) corn borer (d) flies.
80. Species diversity _____ as we move away from the equator towards the poles.
- (a) increases (b) decreases
(c) first increases then decreases (d) first decreases then increases

CATJEE

BETTER EDUCATION THROUGH RESEARCH

G-20 TARGET TEST PAPER (HELD ON 6TH OCTOBER 2021)

ANSWER KEY

NEET SET - A

PHYS	14.	B	27.	B	BIO	54.	A	68.	C		
1.	C	15.	C	28.	A	41.	C	69.	B		
2.	D	16.	B	29.	A	42.	D	70.	D		
3.	B	17.	B	30.	B	43.	A	71.	C		
4.	C	18.	B	31.	D	44.	D	72.	B		
5.	B	19.	D	32.	A	45.	B	73.	D		
6.	B	20.	B	33.	C	46.	D	74.	C		
7.	A	CHEM	34.	C	47.	C	61.	D	75.	C	
8.	B	21.	C	35.	A	48.	D	62.	B	76.	B
9.	B	22.	A	36.	D	49.	C	63.	D	77.	C
10.	A	23.	B	37.	D	50.	D	64.	C	78.	C
11.	B	24.	C	38.	A	51.	A	65.	A	79.	C
12.	D	25.	C	39.	C	52.	C	66.	D	80.	B
13.	A	26.	A	40.	D	53.	B	67.	B		

PHYSICS :

1. C

$$\frac{\Delta Q}{Q} = 2 \frac{\Delta a}{a} + \frac{1}{2} \frac{\Delta b}{b} + \frac{3}{2} \frac{\Delta c}{c} + 4 \frac{\Delta d}{d}$$

$$\left(\frac{\Delta Q}{Q} \right) \times 100 = \left(2 + \frac{1}{2} \times 3 + \frac{3}{2} \times 1 + 4 \times \frac{1}{2} \right) \%$$

$$= \left(2 + \frac{3}{2} + \frac{3}{2} + 2 \right) \%$$

$$= 7\%$$

2. D

$$f_A, \text{ max} = 0.6 \times 40 = 24 \text{ N}$$

$$f_B, \text{ max} = 0.6 \times 60 = 36 \text{ N}$$

$$f_{\text{total}} \geq 5.5 \text{ g}$$

So no block will move in this situation.

3. B

For equilibrium $f = 0$

$$\frac{-dU}{dx} = 0 \Rightarrow \frac{dU}{dx} = 0$$

\Rightarrow slope = 0 at A & C

4. C

$$l = \frac{mL^2}{3} + mL^2$$

$$= \frac{4mL^2}{3}$$

5. B

$$u = \frac{1}{2} \text{ stress} \times \text{strain}$$

$$= \frac{1}{2} S \times \frac{S}{Y} = \frac{S^2}{2Y}$$

6. B

$$\left. \begin{array}{l} P^2V = \text{constant} = K \\ PV = nRT \end{array} \right\} \text{hence } \sqrt{V} = \frac{nRT}{K}$$

$$\sqrt{\frac{V}{2V}} = \frac{T}{T'}$$

$$\Rightarrow T' = \sqrt{2}T$$

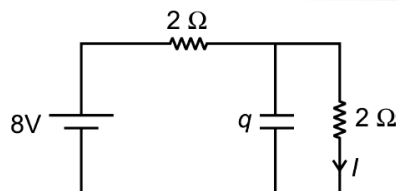
7. A

$$v = \sqrt{\frac{\gamma RT}{M}}$$

$$\frac{v_1}{v_2} = \sqrt{\frac{\gamma_1 M_2}{M_1 \gamma_2}}$$

$$= \sqrt{\frac{7}{5} \times \frac{3}{5} \times \frac{40}{32}} = \sqrt{\frac{21}{25} \times \frac{5}{4}} = \sqrt{\frac{21}{20}}$$

8. B



$$I = \frac{8}{4} = 2A$$

$$q = CV$$

$$4 \mu F \times 4 = 16 \mu C$$

9. B

Lorentz force

$$\vec{F} = q\vec{E} + q(\vec{v} \times \vec{B})$$

$$\vec{F} = 0, \text{ if particle was unaccelerated.}$$

10. A

For stability binding energy per Nucleon should be more.

11. B

$$V_{dc} = V_{avg} = \frac{V_m}{\pi} \text{ (for H.W.R)}$$

$$V_{dc} = \frac{10}{\pi} V$$

12. D

$$\text{Retarding potential } V_0 = \frac{h}{e}(v - v_0)$$

13. A

Spring force will not change its value instantly after any disturbance.

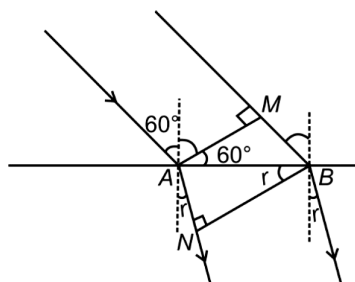
$$2mg - mg = ma$$

$$a = g$$

14. B

$$\beta = \frac{Q_L}{W} \Rightarrow 7 = \frac{250}{W} \Rightarrow W = \frac{250}{7} = 35.7 \approx 36$$

15. C



$$1 \sin 60^\circ = \frac{3}{2} \sin r$$

$$\frac{\sqrt{3}}{2} = \frac{3}{2} \sin r$$

$$\sin r = \frac{1}{\sqrt{3}} \Rightarrow \cos r = \sqrt{\frac{2}{3}}$$

From geometry $\frac{AM}{AB} = \cos 60^\circ \dots (i)$

$$\frac{AB}{BN} = \sec r \dots (ii)$$

From (i) and (ii)

$$\frac{AM}{BN \sec r} = \cos 60^\circ$$

$$\Rightarrow \frac{4\sqrt{\frac{2}{3}}}{BN} = \frac{1}{2} \Rightarrow BN = 8\sqrt{\frac{2}{3}}$$

16. B

$$R = \frac{V}{I_g} - G = \frac{10}{10 \times 10^{-3}} - 100 = 900 \Omega$$

17. B

$$\frac{kQ(-q)}{\sqrt{R^2 + x^2}} = \frac{kQ(-q)}{R} + \frac{1}{2}mv^2$$

$$\frac{1}{2}mv^2 = \frac{1}{4\pi\epsilon_0} \frac{qQ}{2R}$$

18. B

$$B_1 = \frac{\mu_0}{4\pi} \times \frac{2M}{r^3} = 10^{-7} \times \frac{2 \times 1}{1^3} = 2 \times 10^{-7} \text{ T}$$

$$B_2 = \frac{\mu_0}{4\pi} \times \frac{M}{r^3} = 10^{-7} \times \frac{1}{1^3} = 10^{-7} \text{ T}$$

$$B = \sqrt{B_1^2 + B_2^2} = \sqrt{5} \times 10^{-7} \text{ T}$$

19. D

$$s = u \times t \quad \dots (i)$$

$$\text{and } s = (u + 20) \left(\frac{80}{100} t \right) \quad \dots (ii)$$

$$\Rightarrow (u + 20) \left(\frac{80}{100} t \right) = u \times t$$

$$\Rightarrow 4u + 80 = 5u$$

$$\Rightarrow u = 80 \text{ m/s}$$

20. B

$$a \propto v^3$$

$$\frac{dv}{dt} \propto v^3$$

$$\int \frac{dv}{v^3} \propto \int dt$$

$$\Rightarrow \frac{v^{-2}}{-2} \propto t$$

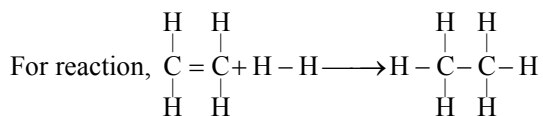
$$\Rightarrow \frac{1}{v^2} \propto t$$

$$\Rightarrow v \propto \frac{1}{\sqrt{t}}$$

CHEMISTRY:

21.[c]

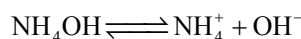
$$\text{Enthalpy of reaction} = \Sigma \text{BE}_{\text{Reactants}} - \Sigma \text{BE}_{\text{Products}}$$



$$\begin{aligned} \Delta H_r &= [4 \times \text{BE}_{(\text{C}-\text{H})} + 1 \times \text{BE}_{(\text{C}=\text{C})} + 1 \times \text{BE}_{(\text{H}-\text{H})}] - [6 \times \text{BE}_{(\text{C}-\text{H})} + 1 \times \text{BE}_{(\text{C}-\text{C})}] \\ &= (4 \times 410.50 + 1 \times 606.10 + 1 \times 431.37) - [(6 \times 410.50) + (1 \times 336.49)] \\ &= -120.0 \text{ kJ mol}^{-1} \end{aligned}$$

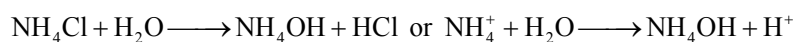
22.[a]

$$\text{Given, } K_a(\text{NH}_4\text{OH}) = 1.77 \times 10^{-5}$$



$$K_a = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_4\text{OH}]} = 1.77 \times 10^{-5} \dots\dots\dots(\text{i})$$

Hydrolysis of NH_4Cl takes place as



$$\text{Hydrolysis constant, } K_h = \frac{[\text{NH}_4\text{OH}][\text{H}^+]}{[\text{NH}_4^+]} \dots\dots\dots(\text{ii})$$

$$\text{or } K_h = \frac{[\text{NH}_4\text{OH}][\text{H}^+][\text{OH}^-]}{[\text{NH}_4^+][\text{OH}^-]} \dots\dots\dots(\text{iii})$$

From Eq. (i) and (iii)

$$K_h = \frac{K_w}{K_a} \quad [\because [\text{H}^+][\text{OH}^-] = K_w]$$

$$= \frac{10^{-14}}{1.77 \times 10^{-5}} = 5.65 \times 10^{-10}$$

23.[b]

Optical isomerism is exhibited by only those complexes in which elements of symmetry are absent. Octahedral complexes of the types $[\text{M}(\text{aa})_3]$, $[\text{M}(\text{aa})_2\text{x}_2\text{y}_2]$ and $[\text{M}(\text{aa})_2\text{x}_2]$ have absence of elements of symmetry, thus exhibit optical isomerism. Here, aa represents bidentate ligand, x or y represents monodentate ligand and M represents central metal ion.

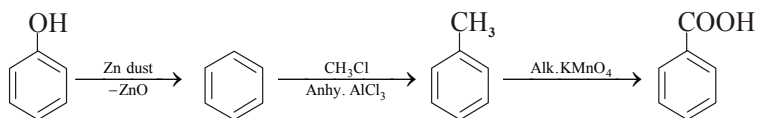
Hence, $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]^0$ due to presence of symmetry elements does not exhibit optical isomerism.

24.[c]

$$\text{Specific rate constant, } k = \frac{0.693}{t_{1/2}} = \frac{0.693}{1386} = 0.5 \times 10^{-3} \text{ s}^{-1}$$

25.[c]

- (i) Zn dust converts $-\text{OH}$ group into $-\text{H}$.
- (ii) Reaction with CH_3Cl in presence of anhy. AlCl_3 is called Friedel-Craft's alkylation.
- (iii) Alkaline KMnO_4 converts complete carbon chain which is directly attached with benzene ring, into $-\text{COOH}$ group.



26.[a]

In case of face-centred cubic lattice, radius = $\frac{\sqrt{2}a}{4}$

$$\therefore \text{Radius of copper atom (fcc lattice)} = \frac{\sqrt{2} \times 361}{4} = 128 \text{ pm.}$$

27.[b]

$$\text{Bond order} = \frac{N_b - N_a}{2}$$

Where, N_b = number of electrons in bonding MO N_a = number of electrons in anti bonding MO.

$$N_2 (7 + 7 = 14) = \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \pi 2p_x^2 = \pi 2p_y^2, \sigma 2p_z^2$$

$$\text{Bond order} = \frac{10 - 4}{2} = 3$$

$$N_2^- (7 + 7 + 1 = 15) = \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 \approx \pi 2p_y^2, \sigma 2p_x^1$$

$$\text{Bond order} = \frac{10 - 5}{2} = 2.5$$

$$N_2^{2-} (7 + 7 + 2 = 16) = \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 \approx \pi 2p_y^2, \pi^* 2p_x^1 \approx \pi^* 2p_y^1$$

$$\text{Bond order} = \frac{10 - 6}{2} = 2$$

Hence, the increasing order of Bond order is, $N_2^{2-} < N_2^- < N_2$

28.[a]

Element having higher tendency to get reduced or to accept an electron, is strong oxidising agent.

Fluorine is the most electronegative element because electronegativity decreases on moving down the group. Hence, it gets reduced readily into F^- ion and is a strongest oxidising agent.

29.[a]

$$\text{Degree of dissociation, } \alpha = \frac{\Lambda^c}{\Lambda^\infty}$$

Where, Λ^c and Λ^∞ are equivalent conductances at a given concentration and at infinite dilution respectively.

$$\Rightarrow \alpha = \frac{8.0}{400} = 2 \times 10^{-2}$$

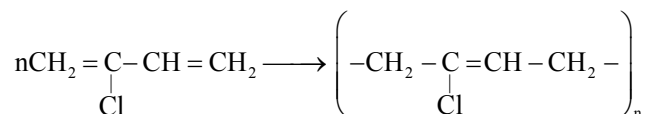
From Ostwald's dilution law (for weak monobasic acid)

$$K_a = \frac{C\alpha^2}{(1-\alpha)} \text{ or } = C\alpha^2 \quad (\because 1 \gg \alpha)$$

$$= \frac{1}{32} (2 \times 10^{-2})^2 \text{ or } = 1.25 \times 10^{-5}$$

30.[b]

Neoprene is a polymer of chloroprene (2-chlorobuta-1,3-diene)



31.[d]

Double bond having preference over triple bond while naming is:



32.[a]

Ionisation energy usually increases from left to right in a period with decrease in atomic size and decrease from up to down in a group with increase in atomic size.

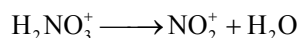
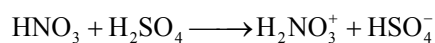
Electronic configuration	Group
[Ne] 3s ² 3p ³	V
[Ne] 3s ² 3p ²	IV
[Ar] 3d ¹⁰ 4s ² , 4p ³	V
[Ne] 3s ² 3p ¹	III

Since ionization energy increases in a period and decreases in a group, [Ne] 3s² 3p³ configuration has the highest ionization energy among the given.

33.[c]

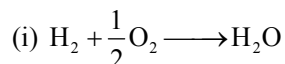
Proton donor are acids and proton acceptor are bases.

Conc. H₂SO₄ and conc. HNO₃ react in the following manner:

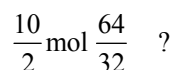
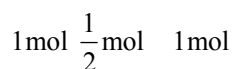
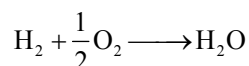


Hence, in this reaction HNO₃ acts as a base and H₂SO₄ as an acid.

34.[c]



(ii) Amount of water produced is decided by limited reactant (i.e., the reactant which is used in small amount)



$$= 5 \text{ mol} = 2 \text{ mol}$$

$$\therefore \frac{1}{2} \text{ mol O}_2 \text{ will give} = 1 \times 2 \times 2 = 4 \text{ mol}$$

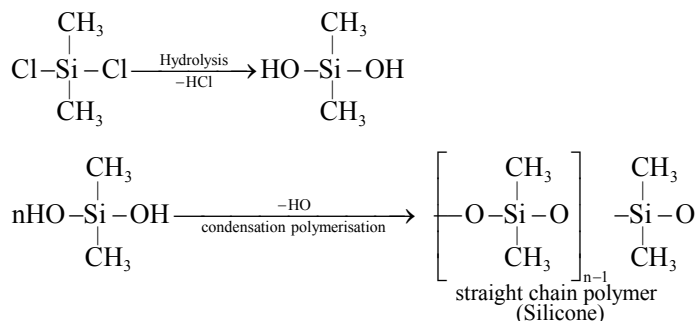
35.[a]

K.E. of molecule = energy absorbed by molecule – BE per molecule

$$= [(4.4 \times 10^{-19}) - (4.0 \times 10^{-19})] \text{ J} = 0.4 \times 10^{-19}$$

$$\text{K.E. per atom} = \frac{0.4 \times 10^{-19}}{2} \text{ J} = 2.0 \times 10^{-20} \text{ J}$$

36.[d]



RSiCl_3 (trichloro derivatives) on hydrolysis followed by condensation polymerisation yields branched chain silicones.

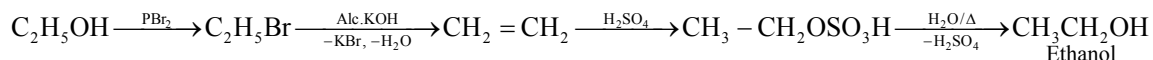
Straight chain silance are silicone oils. These are more stable at high temperature than mineral oils and have less tendency to chicken at low temperature.

37.[d]

(i) PBr_3 is a halogenating agent, i.e., converts $-\text{OH}$ group into $-\text{Br}$.

(ii) Alc. KOH is a dehydrohalogenating agent.

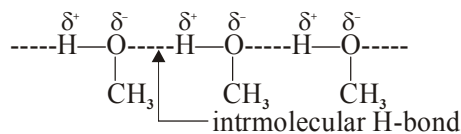
(iii) H_2SO_4 and H_2O converts an olefin into alcohol.



38.[a]

When H atom is directly linked with N or F, inter or intermolecular H-bonding is formed.

In between CH_3OH molecules intermolecular H-bonding exist.



Hence, it is the intermolecular H-bonding that must be overcome in converting liquid CH_3OH to gas.

39.[c]

For an electron, n may be 0, 1, 2,[a] and $\ell = 0$ to $n-1$ and $m = -\ell$ to $+\ell$ (including 0) and $s = \pm \frac{1}{2}$

Hence, if $n = 3$, $\ell = 0$ to $(-1) = 0, 1, 2$,

$m = -\ell$ to $+\ell = -2, -1, +1, +2$

$$s = \pm \frac{1}{2}$$

Therefore, option [c] is not a permissible set of quantum numbers.

40.[d]

Lesser the electron density of acyl carbon atom, more will be the susceptibility of nucleophile to attack it.

The Cl atom has strong $-I$ effect and weakest $+R$ effect because of the weak π -bond between the small size C-atom and large size Cl atom. Thus, in CH_3COCl , acyl carbon has least electron density and hence, more susceptible for nucleophilic attack.

BIOLOGY:

41. C Pineal gland secrete one hormone, melatonin. Melatonin concentration in the blood appears to flow a diurnal (day-night) cycle as it arises in the evening and through the night and drops to a low around noon. Hence it is called Biological clock.

42. D

43. A

44. D

45. B In the human heart, the volume of both the ventricles is always more than the volume of both the atria.

46. D

47. C

48. D

49. C

50. D The Calvin cycle is the only way to synthesise carbohydrates (starch, sugar etc.) in plants. So, whether it may be C_3 plants or C_4 plants or CAM plants, food synthesis always occur by Calvin cycle.

51. A

52. C Carbon, hydrogen and oxygen are the macronutrients which are mainly obtained through water (H_2O) and carbon-dioxide (CO_2). The other macronutrients are absorbed from the soil by the process of mineral nutrition.

53. B Through xylem, the water and minerals move upwards. But the sugar (complex organic molecules) travels through the phloem.

54. A.

Cell	OP (bar)	TP (bar)	DPD (OP – TP)
A			4 bars (given)
B	4	4	0 bars
C	10	5	5 bars
D	7	3	4 bars

We know that the movement of water takes place from low DPD to high DPD. Hence, the order of movement of water will be: from Cell B to Cell A; Cell C and Cell D.

55. B Bivalent is a pair of homologous chromosomes which show synapsis. Synapsis is observed during zygotene sub stage of prophase I of meiotic division. Thus, if there are 30 chromosomes, then there will be 15 bivalents present.

56. C

57. A

58. B
59. C
60. B
61. D
62. B
63. D
64. C
65. A In a typical embryo sac, the nuclei are arranged as 3 (three nuclei of three antipodal cells) + 2 (two polar nuclei of central cell) + 3 (three nuclei of egg apparatus).
66. D
67. B The entry of the sperm into the cytoplasm of the ovum through the zona pellucida and the plasma membrane induces the completion of the meiotic division of the secondary oocyte.
68. C
69. B Copper acts as a spermicide. Copper containing IUDs suppress sperm motility and the fertilising capacity of sperms.
70. D The frequency of recombination between AB gene = Frequency between BC genes – Frequency between AC genes
 $= 30 \text{ cM} - 20 \text{ cM} = 10 \text{ cM} = 10\%$
71. C
72. B Length of DNA sample = $240 \text{ bp} \times 3.4 \text{ \AA} = 816 \text{ \AA}$.
73. D
74. C
75. C
76. B
77. C
78. C Each restriction endonuclease functions by inspecting the length of a DNA sequence. Once it finds its specific recognition sequence, it will bind to that sequence of DNA and cut each of the two strands of the double helix at specific points in their sugar-phosphate backbones.
79. C *Cry* genes are of many types. The proteins encoded by the genes *cryIAc* and *cryIIAb* control the cotton bollworms, and that of *cryIAb* controls corn borer insects.
80. B The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution. In general, species diversity decreases as we move away from the equator towards the poles
