Test Booklet Code

B

Important Instructions

1. The Answer Sheet is inside this test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The Test is of **3 hours** duration and Test Booklet contains **200** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **800.**
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must handover the Answer Sheet to the invigilator in the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **B**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklets and the Answer Sheets.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your roll no. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each Candidate must show on demand his/her Admission Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet the second time will be deemed not to have handed over Answer Sheet and dealt with as an unfair means case.
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance sheet.

Name of the Candidate (in Capital Letters): _____

Roll Number : in figure _____

: in words _____

Centre of Examination (in Capitals): _____

Candidate's Signature : _____ Invigilator's Signature _____

Fascimile signature stamp of Centre superintendent _____

CHEMISTRY CBSE - 2012 (Pre) CODE – B

1. CH_3CHO and $C_6H_5CH_2CHO$ can be distinguished chemically by

(1) Fehling solution test (2) Benedict test

(3) Iodoform test (4) Tollen's reagent test

Sol: [3] Aldehydes and ketones having $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-$ group give iodoform test.

$$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-H+3I_2+4NaOH \longrightarrow \underset{\text{Yellow ppt.}}{CHI_3}+HCOONa+3NaI+3H_2O$$

2. p_A and p_B are the vapour pressure of pure liquid components. A and B, respectively of an ideal binary solution. If x_A represents the mole fraction of component A, the total pressure of the solution will be

(1) $p_B + x_A (p_A - p_B)$ (2) $p_A + x_A (p_B - p_A)$ (3) $p_A + x_A (p_A - p_B)$ (4) $p_B + x_A (p_B - p_A)$

Sol: [1] $p_{Total} = p_A \cdot x_A + p_B \cdot x_B$

$x_B + x_A = 1$

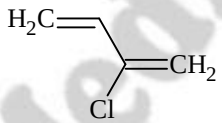
$x_B = 1 - x_A$

$p_{Total} = p_A \cdot x_A + p_B(1 - x_B)$

3. Which one of the following is **not** a condensation polymer?

(1) Neoprene (2) Melamine (3) Glyptal (4) Dacron

Sol: [1] Addition polymer of chloroprene is neoprene

Chloroprene is 

4. A metal crystallizes with a face-centered cubic lattice. The edge of the unit cell is 408 pm. The **diameter** of the metal atom is :

(1) 204 pm (2) 288 pm (3) 408 pm (4) 144 pm

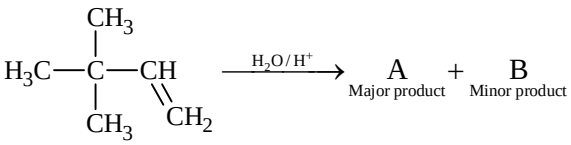
Sol: [2] $\sqrt{2}a = 4r \Rightarrow 2\pi = \frac{a}{\sqrt{2}} = \frac{408}{1.414} = 288\text{pm}$

5. Equimolar solutions of the following substances were prepared separately. Which one of these will record the highest pH value?

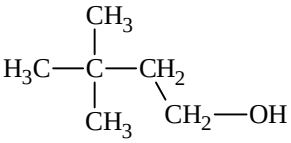
(1) $BeCl_2$ (2) $BaCl_2$ (3) $AlCl_3$ (4) LiCl

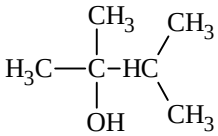
Sol: [2] Salt of strong acid and strong base

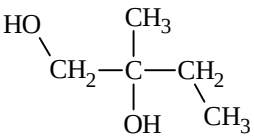
6. In the following reaction:

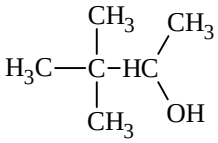


The major product is:

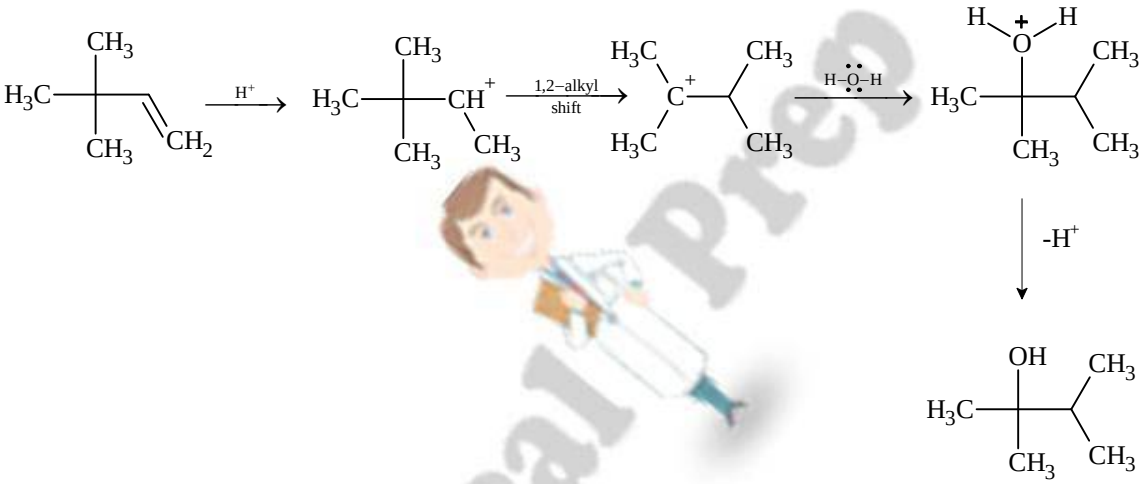
(1) 

(2) 

(3) 

(4) 

Sol: [2]



7. The enthalpy of fusion of water is 1.435 kcal/mol. The molar entropy change for the melting of ice at 0°C

(1) 0.526 cal/(mol K) (2) 10.52 cal / (mol K)

(3) 21.04 cal / (mol K) (4) 5.260 cal/(mol K)

Sol: [4] $\Delta S_{fusion} = \frac{\Delta H_f}{T} = \frac{1.435 \times 10^3}{273} = 5.256 \text{ cal/molK}$

8. Limiting molar conductivity of NH_4OH (i.e. $\wedge_m(NH_4OH)$) is equal to:

(1) $\wedge_m(NH_4Cl) + \wedge_m(NaOH) - \wedge_m(NaCl)$ (2) $\wedge_m(NH_4Cl) + \wedge_m(NaCl) - \wedge_m(NaOH)$

(3) $\wedge_m(NaOH) + \wedge_m(NaCl) - \wedge_m(NH_4Cl)$ (4) $\wedge_m(NH_4OH) + \wedge_m(NH_4Cl) - \wedge_m(HCl)$

Sol: [1] $\wedge_m^0(NH_4Cl) + \wedge_m^0(NaOH) - \wedge_m^0(NaCl)$

Self explained

9. Which one of the following is a mineral of iron?

(1) Magnetite (2) Malachite (3) Cassiterite (4) Pyrolusite

Sol: [1] Magnetite (Fe_3O_4)

10. In Freundlich Adsorption isotherm, the value of 1/*n* is:

(1) 1 in case of chemisorption (2) between 0 and 1 in all cases

(3) between 2 and 4 in all cases (4) 1 in case of physical adsorption

Sol: [2] $\frac{x}{m} = Kp^{1/n}$

11. Identify the alloy containing a non-metal as a constituent in it.

(1) Bronze (2) Invar (3) Steel (4) Bell metal

Sol: [3] In steel, C is also present

12. Buffer solutions have constant acidity and alkalinity because:

(1) they have fixed value of pH

(2) these give unionised acid or base on reaction with added acid or alkali

(3) acids and alkalies in these solutions are shielded from attack by other ions

(4) they have large excess of H^+ or OH^- ions

Sol: [2] Self explanatory

13. Which *one* of the following pairs is isostructural (i.e. having the same shape and hybridization)?

(1) [BF_4^- and NH_4^+] (2) [BCl_3 and $BaCl_3$] (3) [NH_3 and NO_3^-] (4) [NF_3 and BF_3]

Sol: [1] In both the compounds, central atom is sp^3 hybridized and structure is tetrahedral.

14. pH of a saturated solution of $Ba(OH)_2$ is 12. The value of solubility product (K_{sp}) of $Ba(OH)_2$ is

(1) 5.0×10^{-6} (2) 3.3×10^{-7} (3) 5.0×10^{-7} (4) 4.0×10^{-6}

Sol: [3] pH = 12

pOH = 2 $\Rightarrow$ $[OH^-] = 10^{-2}$

$$Ba(OH)_2 \rightleftharpoons Ba^{2+} + 2OH^- \qquad \Rightarrow 2x = 10^{-2}$$

$$x \qquad 2x \qquad \Rightarrow x = 5 \times 10^{-3}$$

$$K_{sp} = x\,(2x)^2 = 5 \times 10^{-3} \times (10^{-2})^2 = 5 \times 10^{-7}$$

15. 50 mL of each gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar conditions. If molecular mass of gas B is 36, the molecular mass of gas A will be

(1) 64 (2) 96 (3) 128 (4) 32

Sol: [4] However question is wrong.

16. The protecting power of lyophilic colloidal sol is expressed in terms of

(1) Oxidation number (2) Coagulation value

(3) Gold number (4) Critical miscelle concentration

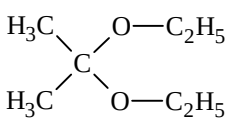
Sol: [3] Factual

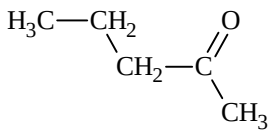
17. Deficiency of vitamin B_1 causes the disease

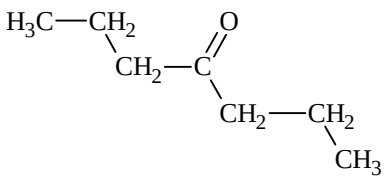
(1) Sterility (2) Convulsions (3) Beri-Beri (4) Cheilosis

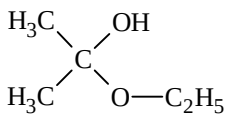
Sol: [3] Factual

18. Acetone is treated with excess of ethanol in the presence of hydrochloric acid. The product obtained is:

(1) 

(2) 

(3) 

(4) 

Sol: [1]

19. The ease of adsorption of the hydrated alkali metal ions on an ion-exchange resins follows the order:

(1) $Na^+ < Li^+ < K^+ < Rb^+$ (2) $Li^+ < K^+ < Na^+ < Rb^+$

(3) $Rb^+ < K^+ < Na^+ < Li^+$ (4) $K^+ < Na^+ < Rb^+ < Li^+$

Sol: [3] Greater the size of the hydrated ion, more will be the surface area and more will be its ease of adsorption.

20. Which one of the following statements is **incorrect** about enzyme catalysis?

(1) Enzymes are least reactive at optimum temperature

(2) Enzymes are mostly proteinous in nature

(3) Enzyme action is specific

(4) Enzymes are denaturated by ultraviolet rays and at high temperature

Sol: [1] Enzyme is most active at optimum temperature and pH

21. In which of the following compounds, nitrogen exhibits highest oxidation state?

(1) NH_2OH (2) N_2H_4 (3) NH_3 (4) N_3H

Sol: [4] Oxidation state of N is $N_3H = -1/3$

22. Bond order of 1.5 is shown by:

(1) O_2 (2) O_2^+ (3) O_2^- (4) O_2^{2-}

Sol: [3] Bond Order = $\frac{1}{2}(N_b - N_a) = \frac{1}{2}(10-7) = 1.5$

23. Maximum number of electrons in a subshell with $l = 3$ and $n = 4$ is:

(1) 12 (2) 14 (3) 16 (4) 10

Sol: [2] i.e. 4f maximum number of electrons that can be accommodated in f-subshell = 14

24. The correct set of four quantum numbers for the valence electron of rubidium atom (Z = 37) is

(1) 5, 1, 0, +1/2 (2) 5, 1, 1, +1/2 (3) 6, 0, 0, +1/2 (4) 5, 0, 0, +1/2

Sol: [4] i.e. $[Kr]5s^1$ so $n = 5$, $l = 0$, $m = 0$, $s = +1/2$

25. In a reaction, A + B → Product, rate is doubled when the concentration of B is doubled, and rate increases by a factor of 8 when the concentrations of both the reactants (A and B) are doubled, rate law for the reaction can be written as:

(1) Rate = $k[A]^2[B]$ (2) Rate = $k[A][B]^2$ (3) Rate = $k[A]^2[B]^2$ (4) Rate = $k[A][B]$

Sol: [1] A + B → Product

$$r_1 = [A]^x[B]^y$$

$$r_2 = [A]^x[2B]^y = 2r_1 = 2\times[A]^x[B]^y \Rightarrow 2^y = 2 \Rightarrow y = 1$$

$$r_3 = [2A]^x[2B]^y = 8r_1 = 8\times[A]^x[B]^y$$

$$= 2^x \times 2^y = 2^3 = 2^x = 2^2$$

Rate = $k[A]^2[B]$

26. A mixture of potassium chlorate, oxalic acid and sulphuric acid is heated. During the reaction which element undergoes maximum change in the oxidation number?

(1) C (2) S (3) H (4) Cl

Sol: [4] ClO_3^- changes to Cl^-

$$Cl^{5+} \longrightarrow Cl^{-1}$$

27. Which one of the following sets of monosaccharides forms sucrose?

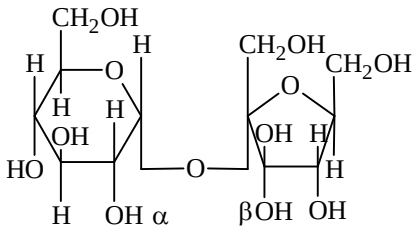
(1) α-D-Glucopyranose and β-D-fructopyranose

(2) α-D-Galactopyranose and α-D-Glucopyranose

(3) α-D-Glucopyranose and β-D-fructofuranose

(4) β-D-Glucopyranose and α-D-fructofuranose

Sol: [3]



28. Which one of the following statements regarding photochemical smog is **not** correct?

(1) Photochemical smog does not cause irritation in eyes and throat

(2) Carbon monoxide does not play any role in photochemical smog formation

(3) Photochemical smog is an oxidizing agent in character

(4) Photochemical smog is formed through photochemical reaction involving solar energy.

Sol: [1] Factual

29. Which of the following statements is **not** valid for oxoacids of phosphorus?

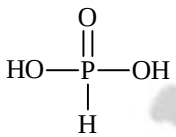
(1) All oxoacids contain atleast one P = O unit and one P – OH group

(2) Orthophosphoric acid is used in the manufacture of triple superphosphate.

(3) Hypophosphorous acid is a diprotic acid.

(4) All oxoacids contain tetrahedral four coordinated phosphorous

Sol: [2]



30. In the following sequence of reactions $CH_3-Br \xrightarrow{KCN} A \xrightarrow{H_3O^+} B \xrightarrow[ether]{LiAlH_4} C$, the end product (C) is

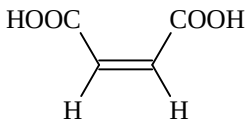
(1) Ethyl alcohol (2) Acetone (3) Methane (4) Acetaldehyde

Sol: [a] $CH_3-Br \xrightarrow{KCN} \underset{(A)}{CH_3CN} \xrightarrow{H_3O^+} \underset{(B)}{CH_3COOH} \xrightarrow{LiAlH_4} \underset{(C)}{CH_3-CH_2-OH}$

31. Which of the following acids does **not** exhibit optical isomerism?

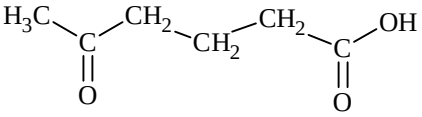
(1) Tartaric acid (2) Maleic acid (3) α-amino acids (4) Lactic acid

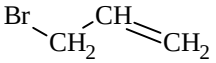
Sol: [2]

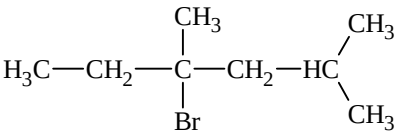


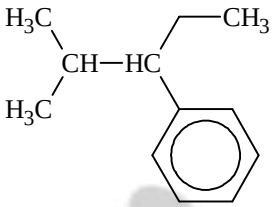
Maleic acid will not show optical isomerism due to absence of chirality.

32. Which nomenclature is **not** according to IUPAC system?

(1) 
5-oxohexanoic acid

(2) 
1-Bromo-prop-2-ene

(3) 
4-bromo-2,4-dimethylhexane

(4) 
2-methylpentan-3-ylbenzene

Sol: [2] The correct name of compound will be 3-Bromoprop-1-ene

33. The pair of species with the same bond order is

(1) N_2, O_2 (2) O_2^{2-}, B_2 (3) O_2^{+}, NO^{+} (4) NO, CO

Sol: [2] $O_2^{2-} \longrightarrow B.O. = 1$

$B_2 \longrightarrow B.O. = 1$

34. In the extraction of copper from its sulphide ore, the metal is finally obtained by the reduction of cuprous oxide with:

(1) Carbon monoxide (CO) (2) Copper (I) sulphide (Cu_2S)

(3) Sulphur dioxide (SO_2) (4) Iron sulphide (FeS)

Sol: [2] Cu_2O is reduced with Cu_2S

It is self reduction phenomena

35. The correct order of decreasing acid strength of trichloroacetic acid (A), trifluoroacetic acid (B), acetic acid (C) and formic acid (D) is:

(1) A > C > B > D (2) B > A > D > C (3) B > D > C > A (4) A > B > C > D

Sol: [2] Due to –I effect.

36. Aluminium is extracted from alumina (Al_2O_3) by electrolysis of a molten mixture of :

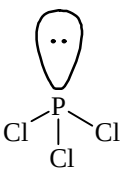
(1) $Al_2O_3 + KF + Na_3AlF_6$ (2) $Al_2O_3 + HF + NaAlF_4$

(3) $Al_2O_3 + CaF_2 + NaAlF_4$ (4) $Al_2O_3 + Na_3AlF_6 + CaF_2$

Sol: [4] Alumina + Fluorspar + Cryolite

37. Which of the following species contains three bond pairs and one lone pair around the central atom?

(1) PCl_3 (2) H_2O (3) BF_3 (4) NH_2^-

Sol: [1] 

38. Which of the following statements is **false**?

(1) Both starch and cellulose are polymers of glucose

(2) Artificial silk is derived from cellulose

(3) Nylon-66 is an example of elastomer

(4) The repeat unit in natural rubber is isoprene

Sol: [3] Factual

39. The number of octahedral void(s) per atom present in a cubic close-packed structure is

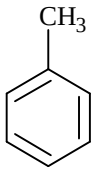
(1) 4 (2) 1 (3) 3 (4) 2

Sol: [2] In ccp the no. of atoms present per unit cell is 4 and total no. of O.V = 4

$\Rightarrow$ per atom the no. of O.V. = 1

40. Among the following compounds the one that is most reactive towards electrophilic nitration is:

(1) Benzene (2) Benzoic acid (3) Nitrobenzene (4) Toluene

Sol: [4] In 

, CH_3 is ortho para directing and also ring activator.

41. Identify the **wrong** statement in the following:

(1) Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table

(2) Amongst isoelectronic species, smaller the positive charge on the carbon, smaller is the ionic radius

(3) Amongst isoelectronic species, greater the negative charge on the anion, larger is the ionic radius

(4) Atomic radius of the elements increases as one moves down the first group of the periodic table.

Sol: [2] With increasing positive charge, effective nuclear charge increases so ionic radii decreases.

42. In a zero-order reaction for every 10° rise of temperature, the rate is doubled. If the temperature is increased from 10°C to 100°C, the rate of the reaction will become:

(1) 128 times (2) 256 times (3) 512 times (4) 64 times

Sol: [3] $\frac{r_2}{r_1} = 2$ for every 10°

Temperature is raised from 10° to 100°

So $\frac{r_n}{r_1} = 2^{\frac{\Delta T}{10}} = 2^9$

$r_n = r_1 \times 512$

43. Which of the statements is **not** true?

(1) $K_2Cr_2O_7$ solution becomes yellow on increasing the pH beyond 7

(2) On passing H_2S through acidified $K_2Cr_2O_7$ solution, a milky colour is observed

(3) $Na_2Cr_2O_7$ is preferred over $K_2Cr_2O_7$ in volumetric analysis

(4) $K_2Cr_2O_7$ solution in acidic medium is orange

Sol: [3] Factual

44. In which of the following reactions, standard reaction entropy change (ΔS°) is positive and standard Gibb's energy change (ΔG°) decreases sharply with increasing temperature?

(1) $\frac{1}{2}\text{C graphite} + \frac{1}{2}O_2(g) \longrightarrow \frac{1}{2}CO_2(g)$

(2) $\text{C graphite} + \frac{1}{2}O_2(g) \longrightarrow CO(g)$

(3) $CO(g) + \frac{1}{2}O_2(g) \longrightarrow CO_2(g)$

(4) $Mg(s) + \frac{1}{2}O_2(g) \longrightarrow MgO(s)$

Sol: [2] $C(g) + \frac{1}{2}O_2(g) \longrightarrow CO(g)$

$\Delta S^\circ = +ve$

45. When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from

(1) Zero to + 1 and zero to –3

(2) Zero to +1 and zero to –5

(3) Zero to –1 and zero to + 5

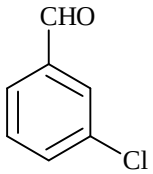
(4) Zero –1 and zero to + 3

Sol: [3] $Cl_2 + NaOH(\text{hot conc.}) \longrightarrow NaCl + NaClO_3$

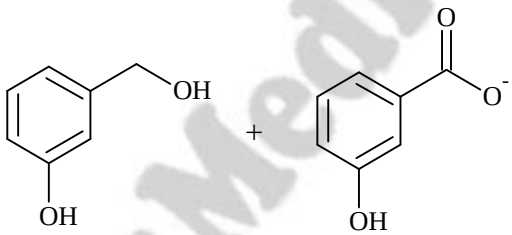
In NaCl , oxidation no. of Cl is –1

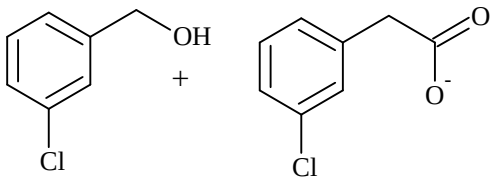
and in ClO_3^- , oxidation no. of Cl is +5

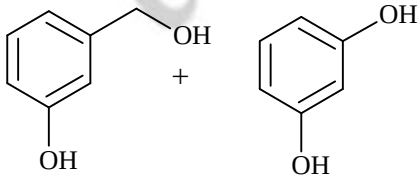
46. Predict the products in the given reaction

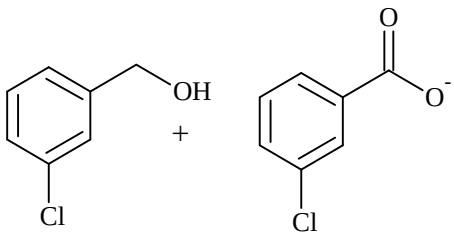


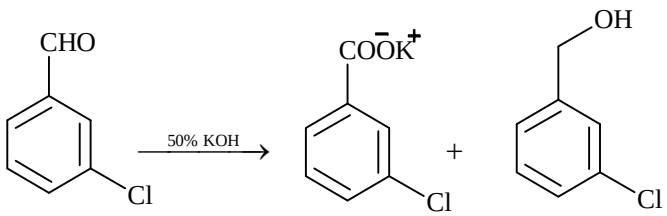
50% KOH →

(1)


(2)


(3)


(4)


Sol: [4]


47. Which one of the alkali metals, forms only, the normal oxide, M_2O on heating in air

(1) Na (2) Rb (3) K (4) Li

Sol: [4] $Li + O_2 \longrightarrow Li_2O$

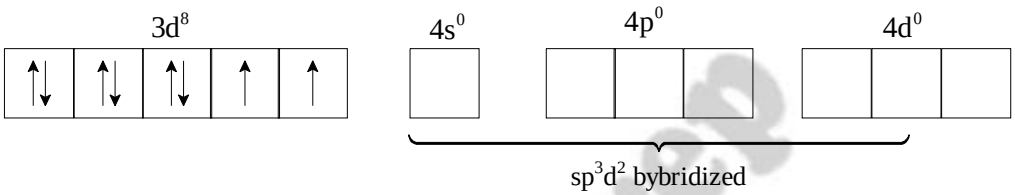
Other forms peroxides and super oxides also

48. Which *one* of the following is an outer orbital complex and exhibits paramagnetic behaviour?

(1) $[Co(NH_3)_6]^{3+}$ (2) $[Ni(NH_3)_6]^{2+}$ (3) $[Zn(NH_3)_6]^{2+}$ (4) $[Cr(NH_3)_6]^{3+}$

Sol: [2] $[Ni(NH_3)_6]^{2+}$

Here in Ni^{2+} the configuration is



Hence it gives outer orbital octahedral complex which is paramagnetic

49. Sulphur trioxide can be obtained by which of the following reaction:

(1) $H_2SO_4 + PCl_5 \xrightarrow{\Delta}$ (2) $CaSO_4 + C \xrightarrow{\Delta}$

(3) $Fe_2(SO_4)_3 \xrightarrow{\Delta}$ (4) $S + H_2SO_4 \xrightarrow{\Delta}$

Sol: [3] $Fe_2(SO_4)_3 \xrightarrow{\Delta} 3SO_3 + Fe_2O_3$

50. Standard enthalpy of vapourisation $\Delta_{vap}H^-$ for water at 100°C is 40.66 kJmol^{-1}. The internal energy of vapourisation of water at 100°C (in kJ mol^{-1}) is

(1) +40.66 (2) +37.56 (3) –43.76 (4) +43.76

Sol: [2] $H_2O(l) \longrightarrow H_2O(g)$

V_1 of liq. H_2O = 18 ml

and V_2 of H_2O (vap) = $\frac{nRT}{P}$

$$= \frac{1 \times 0.0821 \times 373}{1} = 30.6233 \text{ lit}$$

ΔV = (30623.3 ml – 18 ml)

= 30605.3 ml = 30.605 lit

$\Delta E = \Delta H - P\Delta V$

$= 40.66 \times 10^3 J - 1 \times 30.605 \times 101.325$ J

= 36557.9 = 37.5589 kJ mol^{-1}

51. Removal of introns and joining of exons in a defined order during transcription in called

(1) Splicing (2) Looping (3) Inducing (4) Slicing

Ans. [1]

52. Common cold differs from pneumonia in, that

(1) Pneumonia pathogen infects alveoli whereas the common cold affects nose and respiratory passage but not the lungs

(2) Pneumonia is a communicable disease whereas the common cold is a nutritional deficiency disease

(3) Pneumonia can be prevented by a live attenuated bacterial vaccine whereas the common cold has no effective vaccine

(4) Pneumonia is caused by a virus while the common cold is caused by the bacterium *Haemophilus influenzae*

Ans. [1]

53. Which one of the following in not a property of cancerous cells whereas the remaining three are ?

(1) They show contact inhibition

(2) They compete with normal cells for vital nutrients

(3) They do not remain confined in the area of formation

(4) They divide in an uncontrolled manner

Ans. [1]

54. How many plants in the list given below have composite fruits that develop from an inflorescence ? Walnut, poppy, radish, fig, pineapple, apple, tomato, mulberry.

(1) Three (2) Four (3) Five (4) Two

Ans. [1]

55. An organic substance that can withstand environmental extremes and cannot be degraded by any enzyme is

(1) Cellulose (2) Cuticle (3) Sporopollenin (4) Lignin

Ans. [3]

56. Both, autogamy and geitonogamy are prevented in

(1) Maize (2) Papaya (3) Cucumber (4) Castor

Ans. [2]

57. Which part of the human ear plays no role in hearing as such but is otherwise very much required ?

(1) Ear ossicles (2) Eustachian tube

(3) Organ of Corti (4) Vestibular apparatus

Ans. [4]

58. Water containing cavities in vascular bundles are found in

(1) *Pinus* (2) Sunflower (3) Maize (4) *Cycas*

Ans. [3]

59. Which one of the following is a case of wrong matching ?

(1) Callus - Unorganised mass of cells produced in tissue culture

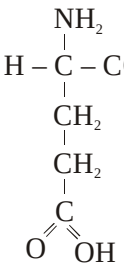
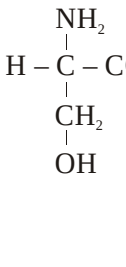
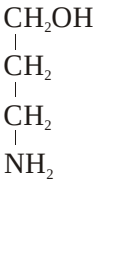
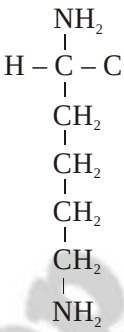
(2) Somatic hybridization - Fusion of two diverse cells

(3) Vector DNA - Site for t-RNA synthesis

(4) Micropropagation - In vitro production of plants in large numbers

Ans. [3]

60. Which one out of A – D given below correctly represents the structural formula of the basic amino acid?

A	B	C	D
			

Options :

(1) B (2) C (3) D (4) A

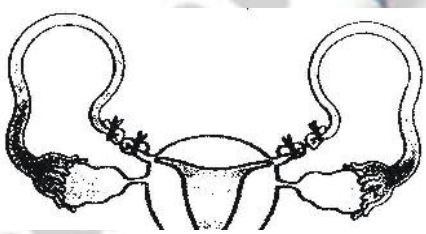
Ans. (3)

61. A patient brought to a hospital with myocardial infarction is normally immediately given

(1) Statins (2) Penicillin (3) Streptokinase (4) Cyclosporin–A

Ans. (3)

62. What is the figure given below showing in particular ?



(1) Vasectomy (2) Ovarian cancer (3) Uterine cancer (4) Tubectomy

Ans. [4]

63. Ribosomal RNA is actively synthesized in

(1) Ribosomes (2) Lysosomes (3) Nucleolus (4) Nucleoplasm

Ans. (3)

64. Which one of the following does not differ in *E.coli* and *Chlamydomonas* ?

(1) Cell membrane (2) Ribosomes

(3) Chromosomal Organization (4) Cell wall

Ans. [1]

65. Which one is the most abundant protein in the animal world ?

(1) Insulin (2) Trypsin (3) Haemoglobin (4) Collagen

Ans. [4]

66. Consumption of which one of the following foods can prevent the kind of blindness associated with vitamin 'A' deficiency ?

(1) Bt-Brinjal (2) 'Flaver Savr' tomato

(3) Canolla (4) Golden rice

Ans. [4]

67. Which one of the following options gives one correct example each of convergent evolution and divergent evolution ?

	Convergent evolution	**Divergent evolution**
(1)	Thorns of Bougainvillia and tendrils of *Cucurbita*	Eyes of Octopus and mammals
(2)	Eyes of octopus and mammals	Bones of forelimbs of vertebrates
(3)	Thorns of Bougainvillia and tendrils of *Cucurbita*	Wings of butterflies and birds
(4)	Bones of forelimbs of vertebrates	Wings of butterfly and birds

Ans. [2]

68. The gynoecium consists of many free pistils in flowers of
(1) *Michelia* (2) *Aloe* (3) Tomato (4) *Papaver*

Ans. [1]

69. Evolution of different species in a given area starting from a point and spreading to other geographical areas is known as
(1) Divergent evolution (2) Adaptive radiation (3) Natural selection (4) Migration

Ans. [2]

70. Which one of the following statements is false in respect of viability of mammalian sperm ?
(1) Sperms must be concentrated in a thick suspension
(2) Sperm is viable for only up to 24 hours
(3) Survival of sperm depends on the pH of the medium and is more active in alkaline medium
(4) Viability of sperm is determined by its motility

Ans. [2]

71. A single strand of nucleic acid tagged with a radioactive molecule is called
(1) Probe (2) Vector (3) Selectable marker (4) Plasmid

Ans. [1]

72. Measuring Biochemical Oxygen Demand (BOD) is a method used for
(1) Working out the efficiency of R.B.Cs. about their capacity to carry oxygen
(2) Estimating the amount of organic matter is sewage water
(3) Working out the efficiency of oil driven automobile engines
(4) Measuring the activity of *Sacccharomyces cerevisae* in producing curd on a commercial scale

Ans. [2]

73. Yeast is used in the production of
(1) Cheese and butter (2) Citric acid and lactic acid
(3) Lipase and pectinase (4) Bread and beer

Ans. [4]

74. In an area where DDT had been used extensively, the population of birds declined significantly because
(1) Many of the birds eggs laid, did not hatch (2) Birds stopped laying eggs
(3) Earthworms in the area got eradicated (4) Cobras were feeding exclusively on birds

Ans. [1]

75. *Pheretima* and its close relatives derive nourishment from
(1) Small pieces of fresh fallen leaves of maize, etc
(2) Sugarcane roots
(3) Decaying fallen leaves and soil organic matter
(4) Soil insects

Ans. (3)

76. People who have migrated from the planes to an area adjoining Rohtang Pass about six months back
(1) Have the usual RBC count but their haemoglobin has very high binding affinuty of O_2
(2) Have more RBCs and their haemoglobin has a lower binding affinity of O_2
(3) Are not physically fit to play games like football
(4) Suffer from altitude sickness with symptoms like nausea, fatigue, etc

Ans. [2]

77. Which one of the following is correctly matched ?
(1) Bakane of rice seedlings – F.Skoog (2) Passive transport of nutrients – ATP
(3) Apoplast – Plasmodesmata (4) Potassium – Readily immobilisation

Ans. [4]

78. Maximum nutritional diversity is found in the group
(1) Plantae (2) Fungi (3) Animalia (4) Monera

Ans. [4]

79. Which one of the following is common to multicellular fungi, filamentous algae and protonema of mosses ?
(1) Multiplication by fragmentation (2) Diplontic life cycle
(3) Members of kingdom Plantae (4) Mode of Nutrition

Ans. [1]

80. In which one of the following options the two examples are correctly matched with their particular type of immunity ?

	Examples	**Type of immunity**
(1)	Mucus coating of epithelium lining the urinogenital tract and the HCl in stomach	Physiological barriers
(2)	Polymorpho-nuclear leukocytes and monocytes	Cellular barriers
(3)	Anti-tetanus and anti-snake bite injections	Active immunity
(4)	Saliva in mouth and Tears in eyes	Physical barriers

Ans. [2]

81. Which one of the following pairs of hormones are the examples of those that can easily pass through the cell membrane of the target cell and bind to a receptor inside it (mostly in the nucleus)
(1) Cortisol, testosterone (2) Insulin, glucagon
(3) Thyroxin, Insulin (4) Somatostatin, oxytocin

Ans. [1]

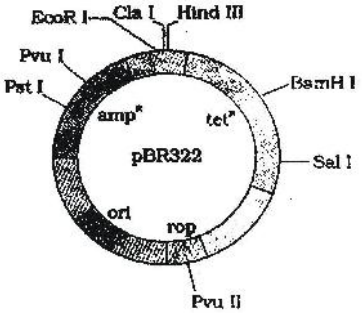
82. Closed vascular bundles lack
(1) Pith (2) Ground tissue (3) Conjunctive tissue (4) Cambium

Ans. [4]

83. Which one of the following is **wrong** statement ?
(1) *Nitrosomonas* and *Nitrobacter* are chemoautotrophs
(2) *Anabaena* and *Nostoc* are capable of fixing nitrogen in free-living state also
(3) Root nodule forming nitrogen fixers live as aerobes under free-living conditions
(4) Phosphorus is a constituent of cell membranes, certain nucleic acids and all proteins

Ans. [4]

84. The figure below is the diagrammatic representation of the *E.Coli* vector pRB 322. Which one of the given options correctly identifies its certain component (s) ?



(1) amp^R, tet^R- antibiotic resistance genes (2) ori-original restriction enzyme
(3) rop-reduced osmotic pressure (4) Hind III, EcoRI-selectable markers

Ans. [1]

85. Which one of the following is a correct statement ?
(1) Origin of seed habit can be traced in pteridophytes
(2) Pteridophyte gametophyte has a protonemal and leafy stage
(3) In gymnosperms female gametophyte is free-living
(4) Antheridiophores and archegoniophores are present in pteridophytes

Ans. [1]

86. Widal Test is carred out to test
(1) Typhoid fever (2) Malaria (3) Diabetes mellitus (4) HIV/AIDS

Ans. [1]

87. The maximum amount of electrolytes and water (70 – 80 percent) from the glomerular filtrate is reabsorbed in which part of the nephron ?
(1) Descending limb of loop of Henle (2) Ascending limb of loop of Henle
(3) Distal convoluted tubule (4) Proximal convoluted tubule

Ans. [4]

88. The Test-tube Baby Programme employs which one of the following techniques ?
(1) Zygote intra fallopian transfer (ZIFT) (2) Intra cytoplasmic sperm injection (ICSI)
(3) Intra uterine insemination (IUI) (4) Gamete intra fallopian transfer (GIFT)

Ans. [1]

89. Which one of the following is a wrong statement ?
(1) Eutrophication is a natural phenomenon in freshwater bodies
(2) Most of the forests have been lost in tropical areas
(3) Ozone in upper part of atmosphere is harmful to animals
(4) Greenhouse effect is a natural phenomenon

Ans. (3)

90. Identify the possible line "A" in the following food chain : Plant → insect → frog → "A" → Eagle
(1) Parrot (2) Rabbit (3) Wolf (4) Cobra

Ans. [4]

91. The human hind brain comprises three parts, one of which is
(1) Hypothalamus (2) Spinal cord (3) Corpus callosum (4) Cerebellum

Ans. [4]

92. PCR and Restriction Fragment Length Polymorphism are the methods for
(1) Genetic Fingerprinting (2) Study of enzymes
(3) Genetic transformation (4) DNA sequencing

Ans. [1]

93. Which one of the following areas in India, is a hotspot of biodiversity ?
(1) Western Ghats (2) Eastern Ghats (3) Gangetic Plain (4) Sunderbans

Ans. [1]

94. Phyllode is present in
(1) *Opuntia* (2) *Asparagus* (3) *Euphorbia* (4) Australian Acacia
Ans. [4]

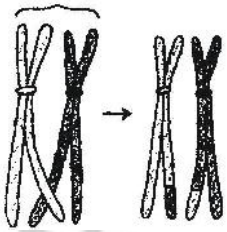
95. The highest number of species in the world is represented by
(1) Lichens (2) Fungi (3) Mosses (4) Algae
Ans. [2]

96. Motile zygote of *Plasmodium* occurs in
(1) Human liver (2) Gut of female *Anopheles*
(3) Salivary glands of *Anopheles* (4) Human RBCs
Ans. [2]

97. Select the correct statement regarding the specific disorder of muscular or skeletal system
(1) *Gout*-inflammation of joints due to extra deposition of calcium
(2) *Muscular dystrophy*-age related shortening of muscles
(3) *Osteoporosis*-decrease in bone mass and higher chances of fractures with advancing age
(4) *Myasthenia gravis*-Auto immune disorder which inhibits sliding of myosin filaments
Ans. [3]

98. Vexillary aestivation is characteristic of the family
(1) Brassicaceae (2) Fabaceae (3) Asteraceae (4) Solanaceae
Ans. [2]

99. Give below is the representation of a certain event at a particular stage of a type of cell division. Which is this stage ?



(1) Both prophase and metaphases of mitosis (2) Prophase I during meiosis
(3) Prophase II during meiosis (4) Prophase of Mitosis
Ans. [2]

100. Which statement is wrong for viruses ?
(1) Antibiotics have no effect on them
(2) All are parasites
(3) All of them have helical symmetry
(4) They have ability to synthesize nucleic acids and proteins
Ans. [3]

101. The correct sequence of cell organelles during photorespiration is
(1) Chloroplast, -vacuole, -peroxisome
(2) Chloroplast,-Golgibodies,-mitochondria
(3) Chloroplast,-Rough Endoplasmic reticulum,-Dictyosomes
(4) Chloroplast,-mitochondria,-peroxisome
Ans. [4]

102. Which one of the following is an example of carrying out biological control of pests/diseases using microbes ?
(1) Lady bird beetle against aphids in mustard
(2) *Trichoderma* sp. against certain plant pathgens
(3) Nucleopolyhedrovirus against white rust in *Brassica*
(4) Bt-cotton to increase cotton yield
Ans. [2]

103. The extinct human who lived 1,00,000 to 40,000 years ago, in Europe, Asia and parts of Africa, with short stature, heavy eye brows, retreating for heads, large jaws with heavy teeth, stocky bodies, a lumbering gait and stooped posture was

(1) *Ramapithecus* (2) *Homo habilis*
(3) Neanderthal human (4) Cro-magnan humans

Ans. [3]

104. A normal-visioned man whose father was colour-blind, marries a woman whose father was also colour-blind. They have their first child as a daughter. What are the chances that this child would be colour-blind ?

(1) 50% (2) 100% (3) Zero percent (4) 25%

Ans. [3]

105. Best defined function of Manganese in green plants is

(1) Water absorption (2) Photolysis of water (3) Calving cycle (4) Nitrogen fixation

Ans. [2]

106. Even in absence of pollinating agents seed-setting is assured in

(1) Fig (2) *Commellina* (3) *Zostera* (4) *Salvia*

Ans. [2]

107. What was the most significant trend in the evolution of modern man (*Homo sapiens*) from his ancestors?

(1) Upright posture (2) Shortening of jaws
(3) Binocular vision (4) Increasing cranial capacity

Ans. [4]

108. The most abundant prokaryotes helpful to humans in marking curd from milk and in production of antibiotics are the ones categorised as

(1) Heterotrophic bacteria (2) Cyanobacteria
(3) Archaebacteria (4) Chemosynthetic autotrophs

Ans. [1]

109. A person entering an empty room suddenly finds a snake right in front on opening the door. Which one of the following is likely to happen in his neuro-hormonal control system ?

(1) Sympathetic nervous system is activated releasing epinephrin and norepinephrin from adrenal cortex
(2) Sympathetic nervous system is activated releasing epinephrin and norepinephrin from adrenal medulla
(3) Neurotransmitters diffuse rapidly across the cleft and transmit a nerve impulse
(4) Hypothalamus activates the parasympathetic division of brain

Ans. [2]

110. Which one single organisms or the pair of organisms is correctly assigned to its or their named taxonomic group ?

(1) *Nostoc* and *Anabaena* are examples of protista
(2) *Paramecium* and *Plasmodium* belong to the same kingdom as that of *Penicillium*
(3) Lichen is a composite organism formed from the symbiotic association of an algae and a protozoan
(4) Yeast used in making bread and beer is a fungus

Ans. [4]

111. In a normal pregnant woman, the amount of total gonadotropin activity was assessed. The result expected was

(1) High level of circulating HCG to stimulate estrogen and progesterone synthesis

(2) High level of circulating FSH and LH in the uterus to stimulate implantation of the embryo

(3) High level of circulating HCG to stimulate endometrial thickening

(4) High levels of FSH and LH in uterus to stimulate endometrial thickening

Ans. [1]

112. Which part would be most suitable for raising virus-free plants for micropropagation ?

(1) Node (2) Bark (3) Vascular tissue (4) Meristem

Ans. [4]

113. The Leydig cells as found in the human body are the secretory source of

(1) Androgens (2) Progesterone (3) Intestinal mucus (4) Glucagon

Ans. [1]

114. Which one of the following is not a part of a transcription unit in DNA ?

(1) The structural gene (2) The inducer (3) A terminator (4) A promoter

Ans. [2]

115. Gymnosperms are also called soft wood spermatophytes because they lack

(1) Xylem fibres (2) Cambium

(3) Phloem fibres (4) Thick-walled tracheids

Ans. [4]

116. *Cycas* and *Adiantum* resemble each other in having

(1) Vessels (2) Seeds (3) Motile Sperms (4) Cambium

Ans. [3]

117. A certain road accident patient with unknown blood group needs immediate blood transfusion. His one doctor friend at once offers his blood. What was the blood group of the donor ?

(1) Blood group A (2) Blood group B (3) Blood group AB (4) Blood group O

Ans. [4]

118. Compared to those of humans, the erythrocytes in frog are

(1) Nucleated and without haemoglobin (2) Without nucleus but with haemoglobin

(3) Nucleated and with haemoglobin (4) Very much smaller and fewer

Ans. [3]

119. A nitrogen-fixing microbe associated with *Azolla* in rice fields is

(1) *Tolypothrix* (2) *Spirulina* (3) *Anabaena* (4) *Frankia*

Ans. [3]

120. What is correct to say about the hormone action in humans ?

(1) FSH stimulates the secretion of estrogen and progesterone

(2) Glucagon is secreted by β-cells of Islets of Langerhans and stimulates glycogenolysis

(3) Secretion of thymosins is stimulated with aging

(4) If females, FSH first binds with specific receptors on ovarian cell membrane

Ans. [4]

121. Cymose inflorescence is present in

(1) *Brassica* (2) *Solanum* (3) *Sesbania* (4) *Trifolium*

Ans. [2]

122. Which one of the following is correctly matched ?

(1) Yeast – Zoospores (2) Onion – Bulb

(3) Ginger – Sucker (4) *Chlamydomonas* – Conidia

Ans. [2]

123. What is true about ribosomes ?

(1) These are self - splicing introns of some RNAs

(2) The prokaryotic ribosomes are 80S, where "S" stands for sedimentation coefficient

(3) These are composed of ribonucleic acid and proteins

(4) These are found only in eukaryotic cells

Ans. [3]

124. A process that makes important difference between C_3 and C_4 plants is

(1) Photorespiration (2) Transpiration (3) Glycolysis (4) Photosynthesis

Ans. [1]

125. Placentation in tomato and lemon is

(1) Axile (2) Parietal (3) Free central (4) Marginal

Ans. [1]

126. If one strand of DNA has the nitrogenous base sequence as ATCTC, what would be the complementary RNA strand sequence ?

(1) ATCGU (2) TTAGU (3) UAGAC (4) AACTG

Ans. [3]

127. Select the correct statement from the following regarding cell membrane

(1) Fluid mosaic model of cell membrane was proposed by Singer and Nicolson

(2) Na^+ and K^+ ions move across cell membrane by passive transport

(3) Proteins make up 60 to 70% of the cell membrane

(4) Lipids are arranged in a bilayer with polar heads towards the inner part

Ans. [1]

128. For transfomation, micro-particles coated with DNA to be bombarded with gene gun are made up of

(1) Gold or Tungsten (2) Silver or Platinum (3) Platinum or Zinc (4) Silicon or Platinum

Ans. [1]

129. Which one is a true statement regarding DNA polymerase used in PCR ?

(1) It remains active at hight temperature

(2) It is used to ligate introduced DNA in recipient cells

(3) It serves as a selectable marker

(4) It is isolated from a virus

Ans. [1]

130. The upright pyramid of number is absent in

(1) Grassland (2) Pond (3) Forest (4) Lake

Ans. [3]

131. Signals for parturition originate from

(1) Fully developed foetus only

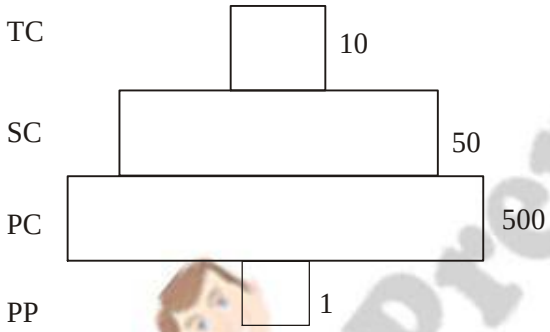
(2) Both placenta as well as fully developed foetus

(3) Oxytocin released from maternal pituitary

(4) Placenta only

Ans. [2]

132. Given below is an imaginary pyramid of numbers. What could be one of the possibilities about certain organisms at some of the different levels ?



(1) Level PC is "rats" and level SC is "cats"

(2) Level PC is "insects" and level SC is "small insectivorous birds"

(3) Level PP is "phytoplanktons" in sea and "Whale" on top level TC

(4) Level one PP is "pipal trees" and the level SC is "sheep

Ans. [2]

133. The common bottle cork is a product of

(1) Vascular Cambium (2) Dermatogen (3) Phellogen (4) Xylem

Ans. [3]

134. Nuclear membrane is absent in

(1) *Nostoc* (2) *Penicillium* (3) *Agaricus* (4) *Volvox*

Ans. [1]

135. The cyanobacteria are also referred to as

(1) Blue green algae (2) Protists (3) Golden algae (4) Slime moulds

Ans. [1]

136. Which one of the following microbes forms symbiotic association with plants and helps them in their nutrition ?

(1) *Trichoderma* (2) *Azotobacter* (3) *Aspergillus* (4) *Glomus*

Ans. [4]

137. Which one of the following is not a functional unit of an exosystem ?

(1) Stratification (2) Energy flow (3) Decomposition (4) Productivity

Ans. [1]

138. During gamete formation, the enzyme recombinase participates during

(1) Prophase-II (2) Metaphase-I (3) Anaphase-II (4) Prophase-I

Ans. [4]

139. Anxiety and eating spicy food together in an otherwise normal human, may lead to

(1) Vomiting (2) Indigestion (3) Jaundice (4) Diarrhoea

Ans. [2]

140. Removal of RNA polymerase III from nucleoplasm will affect the synthesis of

(1) rRNA (2) tRNA (3) hnRNA (4) mRNA

Ans. [2]

141. In which one of the following, the genus name, its two characters and its phylum are not correctly matched, whereas the remaining three are correct ?

	Genus Name	**Two Characters**		**Phylum**
(1)	*Periplaneta*	(a)	Jointed appendages	Arthropoda
		(b)	Chitinous exoskeleton	
(2)	*Pila*	(a)	Body segmented	Mollusca
		(b)	Mouth with radula	
(3)	*Asterias*	(a)	Spiny Skinned	Echinodermata
		(b)	Water vascular system	
(4)	*Sycon*	(a)	Pore bearing	Porifera
		(b)	Canal system	

Ans. [2]

142. F_2 generation in a Mendelian cross showed that both genotypic and phenotypic ratios are same as 1 : 2 : 1. It represents a case of

(1) Monohybrid cross with incomplete dominance

(2) Co-dominance

(3) Dihybrid cross

(4) Monohybrid cross with complete dominance

Ans. [1]

143. Select the correct statement from the ones given below with respect to *Periplaneta americana*

(1) Grinding of food is carried out *only* by the mouth parts

(2) Nervous system located dorsally, consists of segmentally arranged ganglia joined by a pair of longitudinal connectives

(3) Males bear a pair of short thread like anal styles

(4) There are 16 very long Malpighian tubules present at the junctions of midgut and hindgut

Ans. [3]

144. Cirrhosis of liver is caused by the chronic intake of

(1) Cocaine (2) Opium

(3) Alcohol (4) Tobacco (Chewing)

Ans. [3]

145. *Monascus purpureus* is a yeast used commercially in the production of

(1) Blood cholesterol lowering statins

(2) Ethanol

(3) Streptokinase for removing clots from the blood vessels

(4) Citric acid

Ans. [1]

146. The coconut water and the edible part of coconut are equivalent to

(1) Embryo (2) Endosperm (3) Endocarp (4) Mesocarp

Ans. [2]

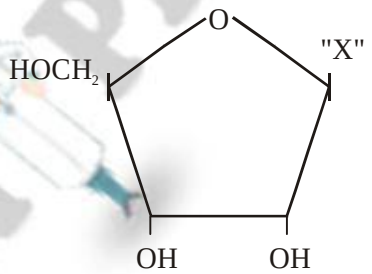
147. Companion cells are closely associated with

(1) Guard cells (2) Sieve elements (3) Vessel elements (4) Trichomes

Ans. [2]

148. Given below is the diagrammatic representation of one of the categories of small molecular weight organic compounds in the living tissues. Identify the category shown and the *one blank* component "X" in it

	Category	**Component**
(1)	Nucleoside	Uracil
(2)	Cholesterol	Guanin
(3)	Amino acid	NH_2
(4)	Nucleotide	Adenine



Ans. [1]

149. Which one of the following is not a gaseous biogeochemical cycle in ecosystem ?

(1) Carbon cycle (2) Sulphur cycle (3) Phosphorus cycle (4) Nitrogen cycle

Ans. [3]

150. Which one of the following is the correct statement for respiration in humans ?

(1) About 90% of carbon dioxide (CO_2) is carried by haemoglobin as carbamino-haemoglobin

(2) Cigarette smoking may lead to inflammation of bronchi

(3) Neural signals from pneumotoxic centre in pons region of brain can increase the duration of inspiration

(4) Workers in grinding and stone-breaking industries may suffer, from lung fibrosis.

Ans. [4]

151. In a CE transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 2V. If the base resistance is 1 kΩ and the current amplification of the transistor is 100, the input signal voltage is

(1) 10 mV (2) 0.1 V (3) 1.0 V (4) 1 mV

Sol: [1] $\frac{2}{V_i} = 100 \times \frac{2 \times 10^3}{10^3}$

$\Rightarrow V_i = 10$ mV

152. A coil of resistance 400 Ω is placed in a magnetic field. If the magnetic flux ϕ (wb) linked with the coil varies with time t (sec) as $\phi = 50\,t^2 + 4$, the current in the coil at $t = 2$ sec is

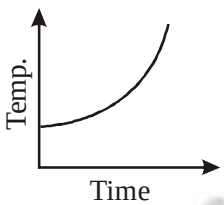
(1) 1 A (2) 0.5 A (3) 0.1 A (4) 2 A

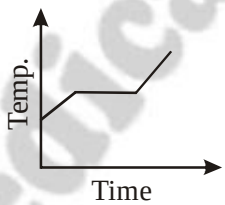
Sol: [2] $|emf| = \frac{d\phi}{dt} = 100t$

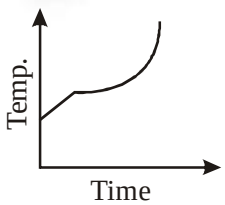
at $t = 2$, $emf = 200$ V

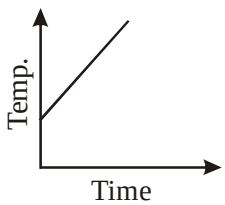
$\Rightarrow i = \frac{200}{400} = 0.5$ A

153. Liquid oxygen at 50 K is heated to 300 K at constant pressure of 1 atm. The rate of heating is constant. Which one of the following graphs represents the variation of temperature with time?

(1) 

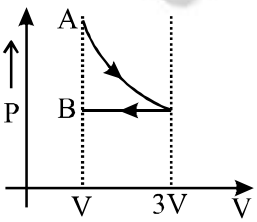
(2) 

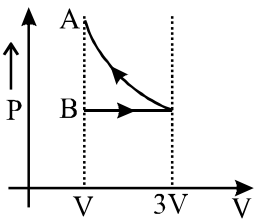
(3) 

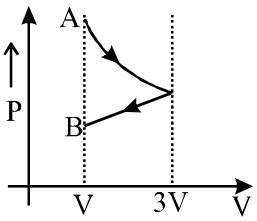
(4) 

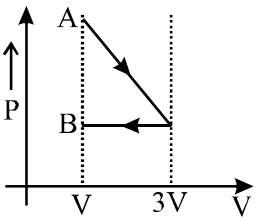
Sol: [2] Factual

154. One mole of an ideal gas goes form an initial state A to final state B via two processes: It first undergoes isothermal expansion from volume V to 3V and then its volume is reduced from 3V to V at constant pressure. The correct P-V diagram representing the two processes is:

(1) 

(2) 

(3) 

(4) 

Sol: [1] Factual

155. A solid cylinder of mass 3 kg is rolling on a horizontal surface with velocity 4 ms^{-1}. It collides with a horizontal spring of force constant 200 Nm^{-1}. The maximum compression produced in the spring will be

(1) 0.2 m (2) 0.5 m (3) 0.6 m (4) 0.7 m

Sol: [3] $\frac{1}{2}\times 3(4)^2+\frac{1}{2}\times\frac{(3\times R^2)}{2}\times\left(\frac{4}{R}\right)^2=\frac{1}{2}\ Kx^2$

$\Rightarrow x = 0.6$ m

156. An electric dipole of moment '*p*' is placed in an electric field of intensity 'E'. The dipole acquires a position such that the axis of the dipole makes an angle θ with the direction of the field. Assuming that the potential energy of the dipole to be zero when θ = 90°, the torque and the potential energy of the dipole will respectively be

(1) pE cosθ, – pE sinθ (2) pE sinθ, – pE cosθ (3) pE sinθ, – 2pE cosθ (4) pEsinθ, 2pEcosθ

Sol: [2] Potential energy = $-\vec{P}.\vec{E}$

157. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is

(1) $\theta = 45°$ (2) $\theta=\tan^{-1}\left(\frac{1}{4}\right)$ (3) $\theta=\tan^{-1}(4)$ (4) $\theta=\tan^{-1}(2)$

Sol: [3] $\frac{u^2\sin^2\theta}{2g}=\frac{2u^2\sin\theta\cos\theta}{g}$

$\Rightarrow \tan\theta = 4 \Rightarrow \theta = \tan^{-1}(4)$

158. If the nuclear radius of ^{27}Al is 3.6 Fermi, the approximate nuclear radius of ^{64}Cu in Fermi is:

(1) 3.6 (2) 2.4 (3) 1.2 (4) 4.8

Sol: [4] $R \propto A^{1/3}$

$\Rightarrow \left(\frac{3.6}{R}\right)=\left(\frac{27}{64}\right)^{1/3}=\frac{3}{4} \Rightarrow R = 4.8$ F

159. Two similar coils of radius R are lying concentrically with their planes at right angles to each other. The currents flowing in them are I and 2I, respectively. The resultant magnetic field induction at the centre will be

(1) $\frac{\mu_0 I}{R}$ (2) $\frac{\sqrt{5}\mu_0 I}{2R}$ (3) $\frac{3\mu_0 I}{2R}$ (4) $\frac{\mu_0 I}{2R}$

Sol: [2] $B=\sqrt{\left(\frac{\mu_0 I}{2R}\right)+\left(\frac{\mu_0\times 2I}{2R}\right)^2}=\frac{\sqrt{5}\mu_0 I}{2R}$

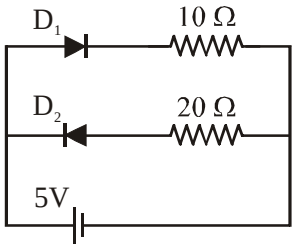
160. When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as a plane sheet of glass. This implies that the liquid must have refractive index

(1) less than that of glass (2) equal to that of glass

(3) less than one (4) greater than that of glass

Sol: [2] $\frac{1}{f}=\left(\frac{\mu_2}{\mu_1}-1\right)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

161. Two ideal diodes are connected to a battery as shown in the circuit. The current supplied by the battery is



(1) 0.5 A (2) 0.75 A

(3) zero (4) 0.25 A

Sol: [1] D_1 is forward bias while D_2 is reverse bias

$\Rightarrow i = \frac{5}{10} = 0.5$ A

162. Two spheres A and B of masses m_1 and m_2 respectively collide. A is at rest initially and B is moving with velocity v along x-axis. After collision B has a velocity $\frac{v}{2}$ in a direction perpendicular to the original direction. The mass A moves after collision in the direction

(1) $\theta = \tan^{-1}(-½)$ to the x-axis (2) same as that of B

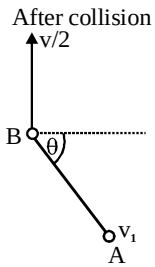
(3) opposite to that of B (4) $\theta = \tan^{-1}(½)$ to the x-axis

Sol: [4] $m_1v_1 \cos\theta = m_2v$ ....(i)

$m_1v_1 \sin\theta = m_2v/2$ ....(ii)

Divide : (ii) by (i) $\tan\theta = \frac{1}{2} \Rightarrow \theta = \tan^{-1}\frac{1}{2}$

Before collision



163. A particle has initial velocity $(2\vec{i}+3\vec{j})$ and acceleration $(0.3\vec{i}+0.2\vec{j})$. The magnitude of velocity after 10 seconds will be

(1) 9 units (2) $9\sqrt{2}$ units (3) $5\sqrt{2}$ units (4) 5 units

Sol: [3] $\vec{v} = \vec{u} \perp \vec{a}t$

$= (2\hat{i}+3\hat{j})+(0.3\hat{i}+0.2\hat{j})\times 10$

$= (5\hat{i}+5\hat{j})$

$\Rightarrow |\vec{v}| = 5\sqrt{2}$ units

164. The height which the weight of a body becomes 1/16th, its weight on the surface of earth (radius R) is

(1) 4 R (2) 5 R (3) 15 R (4) 3 R

Sol: [4] $\frac{g}{16} = \frac{g}{\left(1+\frac{h}{R}\right)^2}$

$\Rightarrow \left(1+\frac{h}{R}\right) = 4$ (h = 3R)

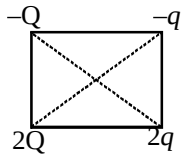
165. Four point charges $-Q$, $-q$, $2q$ and $2Q$ are placed, one at each corner of the square. The relation between Q and q for which the potential at the centre of the square is zero is

(1) $Q = \frac{1}{q}$ (2) $Q = -q$ (3) $Q = -\frac{1}{q}$ (4) $Q = q$

Sol: [2] $O = \frac{k(-Q)}{x} + \frac{k(-q)}{x} + \frac{k(2q)}{x} + \frac{k(2Q)}{x}$

$\Rightarrow Q + q = 0$

$\Rightarrow Q = -q$



166. When a string is divided into three segments of length l_1, l_2 and l_3, the fundamental frequencies of these three segments are v_1, v_2 and v_3 respectively. The original fundamental frequency (v) of the string is

(1) $\frac{1}{\sqrt{v}} = \frac{1}{\sqrt{v_1}} + \frac{1}{\sqrt{v_2}} + \frac{1}{\sqrt{v_3}}$

(2) $\sqrt{v} = \sqrt{v_1} + \sqrt{v_2} + \sqrt{v_3}$

(3) $v = v_1 + v_2 + v_3$

(4) $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

Sol: [4] $v = \frac{v}{2l}$

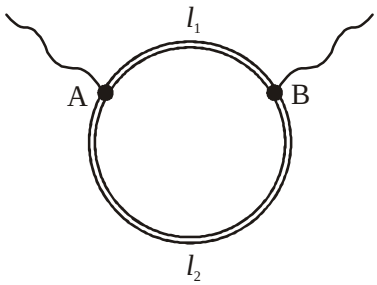
$v_1 = \frac{v}{2l_1}$

$v_2 = \frac{v}{2l_2}$

$v_3 = \frac{v}{2l_3}$

$\Rightarrow \frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

167. A ring is made of a wire having a resistance $R_0 = 12\ \Omega$. Find the points A and B, as shown in the figure, at which a current carrying conductor should be connected so that the resistance R of the sub circuit between these points is equal to $\frac{8}{3}\Omega$



(1) $\frac{l_1}{l_2} = \frac{1}{2}$

(2) $\frac{l_1}{l_2} = \frac{5}{8}$

(3) $\frac{l_1}{l_2} = \frac{1}{3}$

(4) $\frac{l_1}{l_2} = \frac{3}{8}$

Sol: [1] $\left(\frac{A}{\rho l_1} + \frac{A}{\rho l_2}\right) = \frac{3}{8}$ ....(i)

$\frac{\rho(l_1 + l_2)}{A} = 12$ .... (ii)

Solving $\frac{l_1}{l_2} = \frac{1}{2}$

168. A geostationary satellite is orbiting the earth at a height of 5R above the surface of the earth, R being the radius of the earth. The time period of another satellite in hours at a height of 2R from the surface of the earth is

(1) $\frac{6}{\sqrt{2}}$ (2) 5 (3) 10 (4) $6\sqrt{2}$

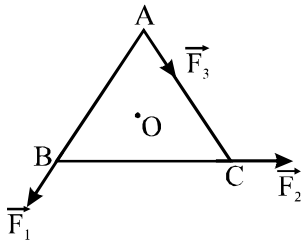
Sol: [4] $\because$ $T^2 \propto r^3$

$$\Rightarrow \left(\frac{24}{T}\right) = \left(\frac{6R}{3R}\right)^{3/2}$$

$$\frac{24}{T} = 2\sqrt{2}$$

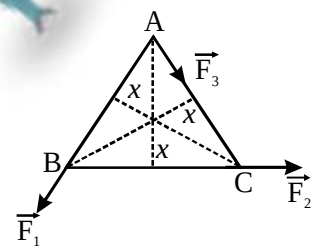
$$T = 6\sqrt{2}$$

169. ABC is an equilateral triangle with O as its centre. $\vec{F}_1, \vec{F}_2$ and $\vec{F}_3$ represent three forces acting along the sides AB, BC and AC respectively. If the total torque about O is zero then the magnitude of $\vec{F}_3$ is



(1) $2(F_1 + F_2)$ (2) $F_1 + F_2$

(3) $F_1 - F_2$ (4) $\frac{F_1 + F_2}{2}$



Sol: [2] $F_2 \times x - F_3 \times x + F_1 \times x = 0$

$F_3 = F_1 + F_2$

170. If the radius of a star is R and it acts as a black body, what would be the temperature of the star, in which the rate of energy production is Q?

(1) $\left(\frac{Q}{4\pi R^2\sigma}\right)^{1/4}$ (2) $\frac{Q}{4\pi R^2\sigma}$ (3) $\left(\frac{Q}{4\pi R^2\sigma}\right)^{-1/2}$ (4) $\left(4\pi R^2 Q/\sigma\right)^{1/4}$

(σ stands for Stefan's constant)

Sol: [1] $Q = 4\pi R^2\sigma T^4$

$$\Rightarrow T = \left(\frac{Q}{4\pi R^2\sigma}\right)^{1/4}$$

171. When a mass is rotating in a plane about a fixed point, its angular momentum is directed along:

(1) the tangent to the orbit

(2) a line perpendicular to the plane of rotation

(3) the line making an angle of 45° to the plane of rotation

(4) the radius

Sol: [2] Factual

172. Two sources of sound placed close to each other, are emitting progressive waves given by

$y_1 = 4 \sin 600\,\pi t$ and $y_2 = 5 \sin 608\,\pi t$. An observer located near these two sources of sound will hear:

(1) 4 beats per second with intensity ratio 81 : 1 between waxing and waning

(2) 4 beats per second with intensity ratio 25 : 16 between waxing and waning

(3) 8 beats per second with intensity ratio 25 : 16 between waxing and waning

(4) 8 beats per second with intensity ratio 81 : 1 between waxing and waning

Sol: [1] $\frac{I_1}{I_2} = \frac{(A_1 + A_2)^2}{(A_1 - A_2)^2} = \frac{81}{1}$

Beat frequency = 304 – 300 = 4 Hz.

173. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is

(1) 10 ms^{-1} (2) 20 ms^{-1} (3) 30 ms^{-1} (4) 5 ms^{-1}

Sol: [3] $\tan\theta = \frac{v^2}{rg} \Rightarrow v = \sqrt{90 \times 10 \times \tan 45^\circ} = 30 \text{ m/sec}$

174. The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is 20 cm. The focal length of lenses are

(1) 11 cm, 9 cm (2) 10 cm, 10 cm (3) 15 cm, 5 cm (4) 18 cm, 2 cm

Sol: [4] $f_0 + f_e = 20$ ... (i)

$\left|\frac{f_0}{f_e}\right| = a$ ... (ii)

Solving, $f_0 = 18$ cm

$f_e = 2$ cm

175. What is the flux through a cube of side 'a' if a point charge of q is at one of its corner?

(1) $\frac{q}{2\epsilon_0}6a^2$ (2) $\frac{2q}{\epsilon_0}$ (3) $\frac{q}{8\epsilon_0}$ (4) $\frac{q}{\epsilon_0}$

Sol: [3] Application of Gauss's theorem

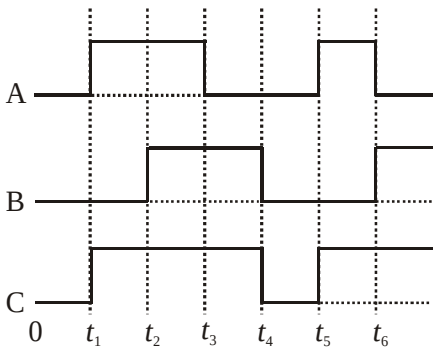
176. An α-particle moves in a circular path of radius 0.83 cm in the presence of a magnetic field of 0.25 Wb/m^2. The de Broglie wavelength associated with the particle will be

(1) 0.01 Å (2) 1 Å (3) 0.1 Å (4) 10 Å

Sol: [1] $0.83 \times 10^2 = \left(\frac{P}{2eB}\right)$ ... (i)

$$\lambda = \frac{h}{p} = \left(\frac{6.6 \times 10^{-34}}{0.83 \times 10^{-2} \times 2 \times 1.6 \times 10^{-19} \times 0.25}\right) = 9.94 \times 10^{-13} m \approx 0.01 \text{ Å}$$

177. The figure shows a logic circuit with two inputs A and B and the output C. The voltage wave forms across A, B and C are as given. The logic circuit gate is



(1) NAND gate (2) OR gate (3) NOR gate (4) AND gate

Sol: [2]

A	B	C
0	0	0
1	0	1
0	1	1
1	1	1

or Gate

178. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It:

(1) will stay in east-west direction only (2) will become rigid showing no movement

(3) will stay in any position (4) will stay in north-south direction only

Sol: [2] Magnetic field is vertical at poles.

179. A spherical planet has a mass M_p and diameter D_p. A particle of mass m falling freely near the surface of this planet will experience an acceleration due to gravity, equal to

(1) $4\,GM_p\,m / D_p^2$ (2) $4GM_p / D_p^2$ (3) $GM_p\,m/D_p^2$ (4) GM_p / D_p^2

Sol: [2] $g = \frac{GM_P}{R^2} = \frac{GM_P}{(D_{P/2})^2} = \frac{4GM_P}{D_P^2}$

180. A 200 W sodium street lamp emits yellow light of wavelength 0.6 μm. Assuming it to be 25% efficient in converting electrical energy to light, the number of photons of yellow light it emits per second is

(1) 3×10^{19} (2) 1.5×10^{20} (3) 6×10^{18} (4) 62×10^{20}

Sol: [2] Energy emitted = $200 \times \frac{25}{100} = 50\text{ W} = 50\text{ J/sec.}$

No. of photons = $\frac{50 \times 0.6 \times 10^{-6}}{6.6 \times 10^{-34} \times 3 \times 10^{8}} = 1.5 \times 10^{20}$

181. The potential energy of a particle in a force field is: $U = \frac{A}{r^2} - \frac{B}{r}$, where A and B are positive constants and r is the distance of particle from the centre of the field. For stable equilibrium the distance of the particle is

(1) B/A (2) B/2A (3) 2A/B (4) A/B

Sol: [3] $F = -\left(\frac{dV}{dr}\right) = -\left(\frac{-2A}{r^3} + \mathrm{B}\right) r^2 = c$

$\Rightarrow \quad r = \frac{2A}{B}$

182. An electrons of a stationary hydrogen atom passes from the fifth energy level to the ground level. The velocity that the atom acquired as a result of photon emission will be

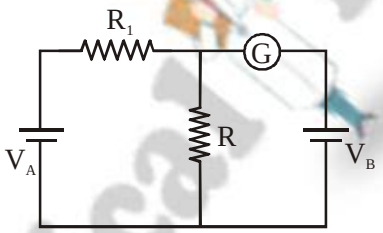
(1) $\frac{24m}{25hR}$ (2) $\frac{24hR}{25m}$ (3) $\frac{25hR}{24m}$ (4) $\frac{25m}{24hR}$

(m is the mass of the electron, R, Rydberg constant and h, Planck's constant)

Sol: [2] Momentum of atom, $P = \left(\frac{\Delta E}{C}\right)$

Velocity of H_2 atom = $\left(\frac{P}{m}\right) = \frac{\Delta E}{mc} = \frac{hcR}{mc}\left(1 - \frac{1}{25}\right) = \frac{h \times R}{m}\left(\frac{24}{25}\right) = \left(\frac{24h \times R}{25\,m}\right)$

183. In the circuit shown the cells A and B have negligible resistances. For V_A = 12V, R_1 = 500 Ω and R = 100 Ω the galvanometer (G) shows no deflection. The value of V_B is



(1) 6 V (2) 4 V (3) 2 V (4) 12 V

Sol: [3] $i = \frac{12}{600} = \frac{1}{50} A$

P.D. across, R = 100 Ω = $100 \times \frac{1}{50} = 2$ volt

184. Monochromatic radiation emitted when electron on hydrogen atom jumps from first excited to the ground state irradiates a photosensitive material. The stopping potential is measured to be 3.57 V. The threshold frequency of the material is

(1) 2.5×10^{15} Hz (2) 4×10^{15} Hz (3) 5×10^{15} Hz (4) 1.6×10^{15} Hz

Sol: [4] $1.6 \times 10^{-19} \times 3.75 = 13.6 \times 1.6 \times 10^{-19}\left(1 - \frac{1}{4}\right) - 6.6 \times 10^{-34} \nu_{Th}$

Solving, $\nu_{Th} = 1.6 \times 10^{15}$ Hz

185. A mixture consists of two radioactive materials A_1 and A_2 with half lives of 20 s and 10 s respectively. Initially the mixture has 40 g of A_1 and 160 g of A_2. The amount of the two in the mixture will become equal after

(1) 40 s (2) 60 s (3) 80 s (4) 20 s

Sol: [1] $40 \longrightarrow 20 \longrightarrow 10$

$160 \longrightarrow 80 \longrightarrow 40 \longrightarrow 10$

t = 40 sec.

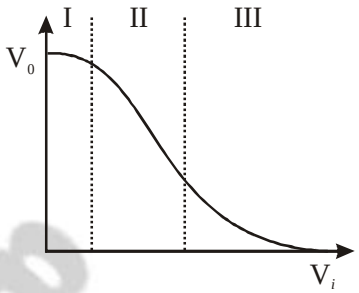
186. If voltage across a bulb rated 220 Volt-100 Watt drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is

(1) 10% (2) 20% (3) 2.5% (4) 5%

Sol: [4] $P = \frac{V^2}{R}$

$$100 \times \frac{\Delta P}{P} = 2\frac{\Delta V}{V} \times 100 = 2 \times 2.5 = 5\%$$

187. Transfer characteristics [output voltage(V_0) vs input voltage (V_i)] for a base biased transistor in CE configuration is as shown in the figure. For using transistor as a switch, it is used



(1) in region I (2) in region III

(3) both in region (I) and (III) (4) in region II

Sol: [3] Factual

188. C and Si both have same lattice structure, having 4 bonding electrons in each. However, C is insulator where as Si is intrinsic semiconductor. This is because

(1) The four bonding electrons in the case of C lie in the third orbit, whereas for Si they lie in the fourth orbit

(2) In case of C the valance band is not completely filled at absolute zero temperature

(3) In case of C the conduction band is partly filled even at absolute zero temperature

(4) The four bonding electrons in the case of C lie in the second orbit, whereas in the case of Si they lie in the third

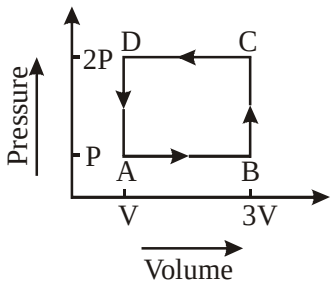
Sol: [4] Factual

189. Two persons of masses 55 kg and 65 kg respectively, are at the opposite ends of a boat. The length of the boat is 3.0 m and weighs 100 kg. The 55 kg man walks up to the 65 kg man and sits with him. If the boat is in still water the centre of mass of the system shifts by

(1) 0.75 m (2) 3.0 m (3) 2.3 m (4) zero

Sol: [4] There is no external force.

190. A thermodynamic system is taken through the cycle ABCD as shown in figure. Heat rejected by the gas during the cycle is



(1) PV (2) 2 PV

(3) 4 PV (4) ½ PV

Sol: [2] $W = -2PV$

$\because \quad Q = W + \Delta E$

$\Rightarrow \quad Q = -2PV$

191. The motion of a particle along a straight line is described by equation:

$x = 8 + 12t - t^3$ where x is in metre and t in second. The retardation of the particle when its velocity becomes zero, is

(1) 12 ms^{-2} (2) 24 ms^{-2} (3) zero (4) 6 ms^{-2}

Sol: [1] $v = \frac{dv}{dt} = 12 - 3t^2 = 0 \Rightarrow t = 2\,\text{sec}.$

$$a = \frac{d^2x}{dt^2} = -6t = -12\ \text{ms}^{-2}$$

192. A concave mirror of focal length f_1 is placed at a distance of d from a convex lens of focal length f_2. A beam of light coming from infinity and falling on this convex lens-concave mirror combination returns to infinity. The distance 'd' must equal

(1) $-2f_1 + f_2$ (2) $f_1 + f_2$ (3) $-f_1 + f_2$ (4) $2f_1 + f_2$

Sol: [4] $d = (f_2 + 2f_1)$

193. A milli voltmeter of 25 milli volt range is to be converted into an ammeter of 25 ampere range. The value (in ohm) of necessary shunt will be

(1) 0.05 (2) 0.001 (3) 0.01 (4) 1

Sol: [2] $i_g = \left(\frac{25\times10^{-3}}{R_g}\right)$

$$R = \frac{i_g R_g}{i - i_g} = \frac{25\times10^{-3}}{25} = 10^{-3}\Omega$$

194. The damping force on an oscillator is directly proportional to the velocity. The units of the constant of proportionality are

(1) kgs (2) $kgms^{-1}$ (3) $kgms^{-2}$ (4) kgs^{-1}

Sol: [4] $F = -kv$

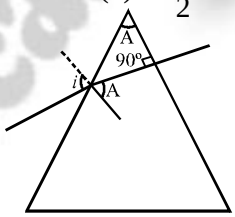
195. A ray of light is incident at an angle of incidence, i on one face of a prism of angle A (assumed to be small) and emerges normally from the opposite face. If the refractive index of the prism is μ, the angle of incidence i, is nearly equal to

(1) $\frac{A}{2\mu}$ (2) μA (3) $\frac{\mu A}{2}$ (4) $\frac{A}{\mu}$

Sol: [2] $\sin i = \mu.\sin A$

$\sin i \simeq \mu A$

or $i \approx \mu A$



196. Electron in hydrogen atom first jumps from third excited state to second excited state and then from second excited to the first excited state. The ratio of the wavelengths $\lambda_1 : \lambda_2$ emitted in the two cases is

(1) $\frac{20}{7}$ (2) $\frac{7}{5}$ (3) $\frac{27}{20}$ (4) $\frac{27}{5}$

Sol: [1] $\frac{1}{\lambda_1} = R\left(\frac{1}{9} - \frac{1}{10}\right) = \frac{7R}{9\times16}$

$$\frac{1}{\lambda_2} = R\left(\frac{1}{4} - \frac{1}{9}\right) = \frac{5R}{36}$$

$$\Rightarrow \quad \frac{\lambda_1}{\lambda_2} = \frac{20}{7}$$

197. The electric field associated with an e.m. wave in vacuum is given by $\vec{E} = \hat{i}40\cos(kz - 6\times10^{-8}t)$, where E, z and t are in volt/m, meter and seconds respectively. The value of wave vector k is

(1) 3 m^{-1} (2) 2 m^{-1} (3) 0.5 m^{-1} (4) 6 m^{-1}

Sol: [2] Wave velocity, $3\times10^8 = \frac{6\times10^8}{k} \Rightarrow$ k = 2 m/sec

198. An alternating electric field, of frequency *v*, is applied across the dees (radius = R) of a cyclotron that is being used to accelerate protons (mass = m). The operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by

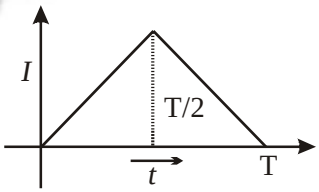
(1) $B = \frac{mv}{e}$ and $K = m^2 \pi v R^2$ (2) $B = \frac{mv}{e}$ and $K = 2m\pi^2 v^2 R^2$

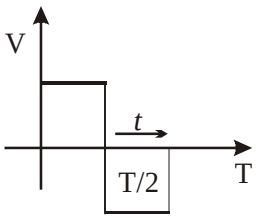
(3) $B = \frac{2\pi mv}{e}$ and $K = m^2 \pi v R^2$ (4) $B = \frac{2\pi mv}{e}$ and $K = 2m\pi^2 v^2 R^2$

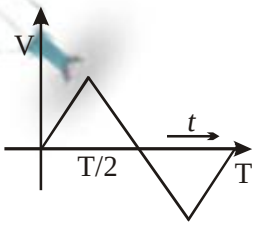
Sol: [4] $v = \left(\frac{eB}{2\pi m}\right)$ ... (i)

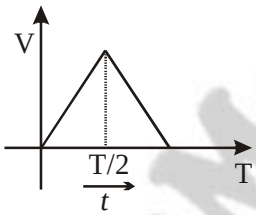
$$\frac{\sqrt{2mk}}{eB} = R \Rightarrow k = \left(\frac{R^2 e^2 B^2}{2m}\right) = 2m\pi^2 v^2 R^2$$

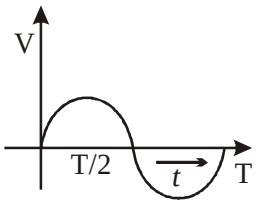
199. The current (I) in the inductance is varying with time according to the plot shown in figure. Which one of the following is the correct variation of voltage with time in the coil?



(1)


(2)


(3)


(4)


Sol: Ans [1] $emf = -L\frac{di}{dt}$

in inductor $\Rightarrow v_s = L\frac{di}{dt}$

200. In an electrical circuit R, L, C and an a.c voltage source are all connected in series. When L is removed from the circuit, the phase difference between the voltage and the current in the circuit is π/3. If instead, C is removed from the circuit, the phase difference is again π/3. The power factor of the circuit is

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

Sol: Ans [4] Circuit is at resonance

$\because x_L = x_C$

$\Rightarrow \cos\phi = 1$