SHIKSHA CLASSES, BHANDARA

TEST-8

CHEMISTRY , PHYSICS, MATHEMATICS

Time : - 3 Hours **Max. Marks:- 300** **Date : .....**

INSTRUCTIONS :

1. The test is of 3 hours duration.
2. The Test Booklet consists of 90 questions. The maximum marks are **300.**
3. There are three parts in the question paper A, B, C consisting of Chemistry, Physics and Mathematics having **30questions** in each part of equal weightage. **20 questions** will be **MCQs** and **10 questions** (**ATTEMPT ANY FIVE QUESTIONS OUT OF 10**)will have answer to be filled as **numerical value**.
   Marking Scheme for MCQs
   Correct Answer Four mark (+4), Incorrect Answer Minus one mark (–1), Unanswered No mark (0)
   Marking Scheme for questions for which answer is a **Numerical value**
   Correct Answer Four mark (+4), Incorrect Answer No mark (0), Unanswered No mark (0)
4. There is only one correct response for each question. Filling up more than one response in each question will be treated as wrong response and marks for wrong response will be deducted accordingly.

SYLLABUS

CHEMISTRY: ORGANIC COMPOUNDS CONTAINING NITROGEN, POLYMERS, BIOMOLECULES, CHEMISTRY IN EVERYDAY LIFE, PRINCIPLES RELATED TO PRACTICAL CHEMISTRY

PHYSICS : ELECTRONIC DEVICES, COMMUNICATION SYSTEMS AND EXPERIMENTAL SKILLS.

MATHEMATICS : THREE DIMENSIONAL GEOMETRY, VECTOR ALGEBRA AND PROBABILITY

Patience, Persistence and Perspiration make an unbeatable combination for success.

Quality is not an act, it is a habit.

Name : .....

Address : .....

.....

Phone/Mobile No. .....

Roll No. .....

PART A – CHEMISTRY

SECTION - 1 (Q.1 - Q.20)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.1 Which of the following chemical may be used to identify three unlabelled beakers containing conc. NaOH, conc. H_2SO_4 and water.

(a) NH_4NO_3 (b) NaCl

(c) $(NH_4)_2CO_3$ (d) HCOONa

(1) a, b (2) b, c

(3) a, c (4) b, d

Q.2 Giving 'T' symbol for true statement and 'F' symbol for false statement, select suitable option from the given options for following statements.

(i) Cytosine base is the derivative of pyrimidine.

(ii) β-D Ribose sugar is present in DNA.

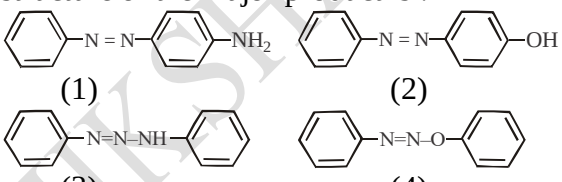
(iii) The message for the synthesis of a specific protein is present in RNA.

(iv) DNA is responsible for maintaining the identify of different species of organisms for one century

(1) TFFT (2) FFFT

(3) FTFF (4) FFTF

Q.3 Aniline dissolved in dilute HCl is reacted with sodium nitrite at 0°C. This solution was added drop wise to a solution containing equimolar mixture of aniline and phenol in dil. HCl. The structure of the major product is :



(1) (2)

(3) (4)

Q.4 Number of stereo centers present in linear and cyclic structures of glucose are respectively :

(1) 4 & 5 (2) 5 & 5

(3) 4 & 4 (4) 5 & 4

Q.5 Ethylamine ($C_2H_5NH_2$) can be obtained from N-ethylphthalimide on treatment with :

(1) $NaBH_4$ (2) CaH_2

(3) H_2O (4) NH_2NH_2

Q.6 Which of the following statements is not true about RNA ?

(1) It has always double stranded α-helix structure.

(2) It usually does not replicate.

(3) It is present in the nucleus of the cell.

(4) It controls the synthesis of protein.

Q.7 The compound used in the treatment of lead poisoning is :

(1) EDTA (2) Cis-platin

(3) D-penicillamine (4) desferrioxime B

Q.8 Which of the following is NOT a correct method of the preparation of benzylamine from cyanobenzene ?

(1) (i) HCl/H_2O (ii) $NaBH_4$

(2) (i) $LiAlH_4$ (ii) H_3O^+

(3) (i) $SnCl_2$ + HCl (gas) (ii) $NaBH_4$

(4) H_2 / Ni

Q.9 Amylopectin is composed of :

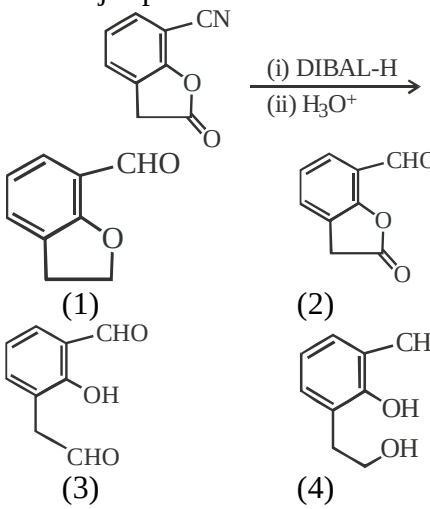
(1) α-D-glucose, C_1–C_4 and C_1–C_6 linkages

(2) α-D-glucose, C_1–C_4 and C_2–C_6 linkages

(3) β-D-glucose, C_1–C_4 and C_2–C_6 linkages

(4) β-D-Glucose, C_1–C_4 and C_1–C_6 linkages

Q.10 The major product of the following reaction is:

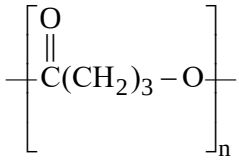


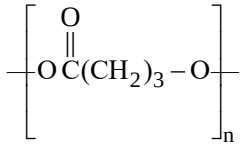
(1) (2)

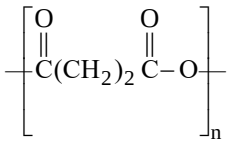
(3) (4)

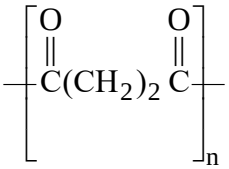
SPACE FOR ROUGH WORK

Q.11 The homopolymer formed from 4-hydroxybutanoic acid is :-

(1) 

(2) 

(3) 

(4) 

Q.12 The correct match between Item(I) and Item(II) is

Item-I	**Item-II**
(a) Nortehindrone	(P) Anti-biotic
(b) Ofloxacin	(Q) Anti-fertility
(c) Equanil	(R) Hypertension
	(S) Analgesics

(1) a-R, b-P, c-S (2) a-Q, b-P, c-R

(3) a-R, b-P, c-R (4) a-Q, b-R, c-S

Q.13 Which of the following cation can not give borax bead test

(1) Cr^{3+} (2) Co^{2+}

(3) Ag^{+} (4) Mn^{2+}

Q.14 Which of the following is a thermosetting polymer?

(1) Buna-N (2) PVC

(3) Bakelite (4) Nylon 6

Q.15 Natural fiber is :

(1) Bakelite (2) Cellulose

(3) Rubber (4) Nylon-6

Q.16 Sulfa drugs are use as :

(1) Antidiabetic (2) Analgesic

(3) Antibiotics (4) Anti histamines

Q.17 Which of the following is not true :

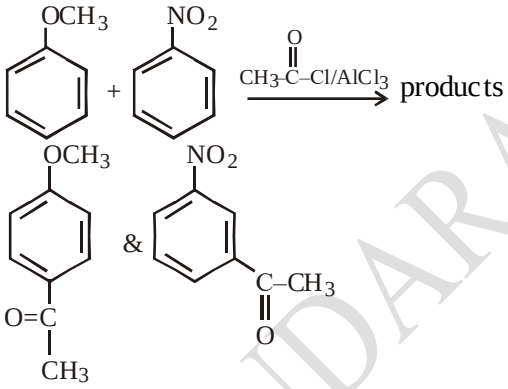
(1) Nylon–2 Nylon–6 : Biodegradable polymer

(2) Decron : Polyester

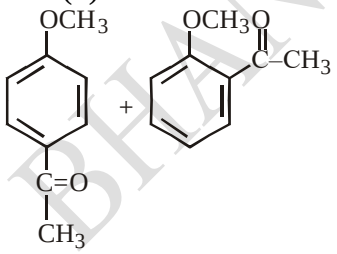
(3) Buna–S : Elastomer

(4) Bakelite : Homopolymer

Q.18 Consider following reaction :-



(1)



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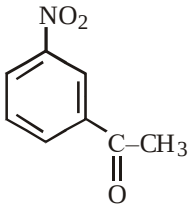
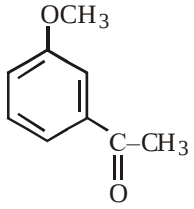
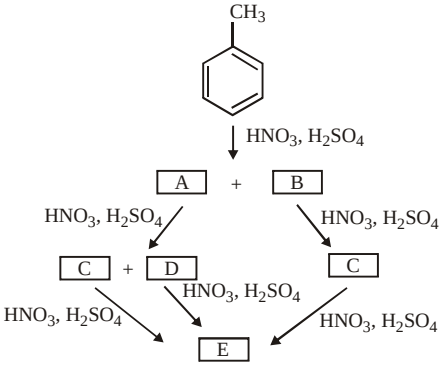


(3) only



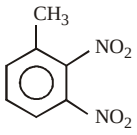
(4) only

Q.19 Use the clues below to identify the organic products (in the boxes) from each of the following aromatic nitration steps.

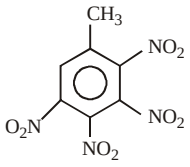


SPACE FOR ROUGH WORK

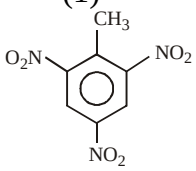
Product E is –



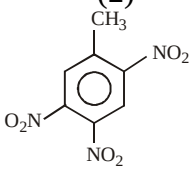
(1)



(2)



(3)



(4)

Q.20 Cations present in slightly acidic solution are Al^{3+}, Zn^{2+} and Cu^{2+}. The reagent which when added in excess to this solution would identify and separate Cu^{2+} in one step is

(1) HCl acid (2) NH_3 solution

(3) NaOH solution (4) Na_2CO_3 solution

SECTION - 2 (Q.21 - Q.30)

This section contains TEN (10) questions. ATTEMPT ANY FIVE (05) QUESTIONS. The answer to each question is NUMERICAL VALUE. If the numerical value has more than two decimal places truncate/round-off the value upto TWO decimal places.

Q.21 Total nos. of correct statements among –

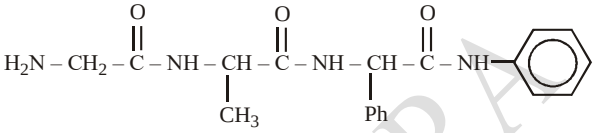
(i) On adding KI to a metal salt solution, no precipitate was observed but the salt solution gives yellow precipitate with K_2CrO_4 in the presence of CH_3COOH. Then the salt is $BaCl_2$.

(ii) $Ni(OH)_2$ is precipitate is soluble in excess of NH_3 solution.

(iii) When a black metal sulphide reacts with dil HCl, a gas liberates, Zn^{2+} and Cd^{2+} pair of cation can be separated by the liberated gas.

(iv) Al^{3+} (aq)and Zn^{2+} (aq) mixtures can be separated by using excess NH_3 solution.

Q.22 The number of peptide bond(s) in the following molecule is/are



Q.23 Find the total number of correct statements.

(a) Polyolefin polymers are prepared by addition polymerisation of hydrocarbon monomeric molecules having one double bond.

(b) Polyethylene is a stronger plastic than polypropylene.

(c) Neoprene rubber obtained by polymerisation of chloroprene, is an elastic polymer.

(d) Polytetrafluoroethylene is commonly called teflon.

Q.24 Total nos. of correct statements among –

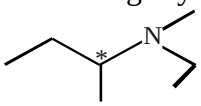
(i) The organic compound which will answer Fehling's solution test is Ethanol.

(ii) The compound required for the formation of a thermosetting polymer with methanol is phenol.

(iii) Polytetrafluoroethylene is used to make 'non-stick' cookware.

(iv) Isoprene is a valuable substance for making Synthetic rubber.

Q.25



Let the starred carbon in the given amine has "R" configuration. What is the isomeric relationship between the two form of this compound that are inter converted by amine inversion. Give your answer in integer form.

[Give : 1 for identical, 2 for enantiomer, 3 for diastereomer, 4 for functional isomer.]

Q.26 How many of the following gases will turn blue litmus finally red ? H_2, N_2, O_2, CO_2, CO, NO_2, SO_2, Cl_2.

Q.27 Monosaccharides general formula is $[CH_2O]_n$. Find the minimum value of n.

SPACE FOR ROUGH WORK

Q.28 Find the total number of correct statements.

(a) 1° Amines are formed on heating carbonyl compounds with ammonia formate or formamide. The reaction involve reductive amination.

(b) Isocyanates are formed by dehydrative rearrangement of hydroxamic acids. Hydrolysis of Isocyanate then gives 1° amines.

(c) b.p. of 1º amine < 2º amine < 3º amine

(d) Primary aliphatic amine on oxidation with $KMnO_4$ followed by hydrolysis give aldehydes and ketones .

(e) Secondary aliphatic amines on oxidation with $KMnO_4$ give tetra alkyl hydrazine.

Q.29 Find the total number of correct statements.

(i) Sucrose on hydrolysis gives α-D-Glucose + β-D-Fructose

(ii) Cetyltrimethyl ammonium bromide is a cationic detergent.

(iii) cis-1,4-polyisoprene is a natural polymer.

(iv) Lysine is a basic amino acid .

Q.30 Find the total number of correct statements.

(i) Chloroamphenicol is an antiseptic and disinfectant.

(ii) Dilute solutions of Boric acid and Hydrogen Peroxide are strong antiseptics.

(iii) Aspartame (Artificial sweetener) is stable under cold conditions.

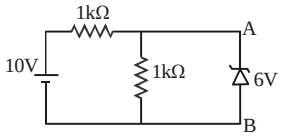
(iv) Bithional is generally added to the soaps as an additive to function as an antiseptic.

PART B – PHYSICS

SECTION - 1 (Q.31 - Q.50)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.31 In the circuit shown, what will be the current through the 6V zener ?



(1) 6 mA, from A to B (2) 2 mA, from A to B

(3) 2 mA, from B to A (4) Zero

Q.32 In a line of sight radio communication, a distance of about 50 km is kept between the transmitting and receiving antennas. If the height of the receiving antenna is 70m, then the minimum height of the transmitting antenna should be :

(Radius of the Earth = 6.4×10^6 m).

(1) 40 m (2) 51 m

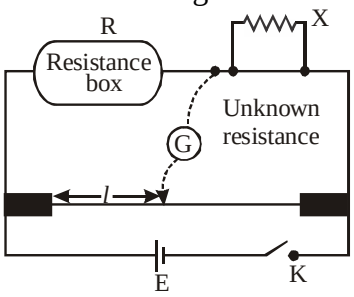
(3) 32 m (4) 20 m

Q.33 The wavelength of the carrier waves in a modern optical fiber communication network is close to :

(1) 600 nm (2) 900 nm

(3) 2400 nm (4) 1500 nm

Q.34 In a meter bridge experiment, the circuit diagram and the corresponding observation table are shown in figure.



Sl. No.	R (Ω)	ℓ (cm)
1	1000	60
2	100	13
3	10	1.5
4	1	1.0

Which of the readings is inconsistent?

(1) 4 (2) 1

(3) 2 (4) 3

Q.35 For PN junction, the intensity of electric field is 1×10^6 V/m and the width of depletion region is 5000Å. The value of potential barrier is –

(1) 0.05 V (2) 0.005 V

(3) 0.5 V (4) 5 V

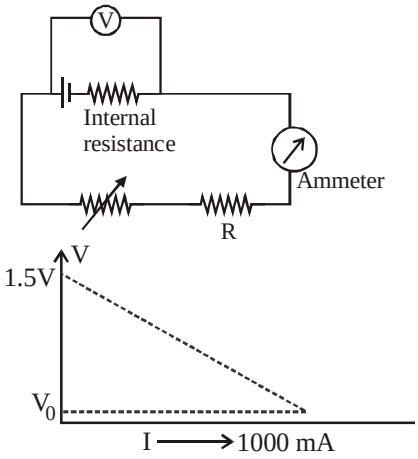
SPACE FOR ROUGH WORK

Q.36 A modulating signal of frequency 5 kHz and peak voltage of 8V is used to modulate a carrier of frequency 10 MHz and peak voltage 10V. Then the amplitude of USB is –

(1) 3 V (2) 4 V

(3) 2 V (4) 5 V

Q.37 To verify Ohm's law, a student connects the voltmeter across the battery as, shown in the figure. The measured voltage is plotted as a function of the current, and the following graph is obtained:



If V_0 is almost zero, identify the correct statement:

(1) The value of the resistance R is 1.5Ω.

(2) The emf of the battery is 1.5 V and the value of R is 1.5 Ω.

(3) The emf of the battery is 1.5 V and its internal resistance is 1.5 Ω.

(4) The potential difference across the battery is1.5 V when it sends a current of 1000 mA.

Q.38 A signal A cos ωt is transmitted using $v_0 \sin \omega_0 t$ as carrier wave. The correct amplitude modulated (AM) signal is :

(1) $v_0 \sin \omega t + A \cos \omega t$

(2) $v_0 \sin \omega_0 t + \frac{A}{2}\sin(\omega_0 - \omega)t + \frac{A}{2}\sin(\omega_0 + \omega)t$

(3) $(v_0 + A) \cos \omega t \sin \omega_0 t$

(4) $v_0 \sin [\omega_0 (1 + 0.01A \sin \omega t) t]$

Q.39 An npn transistor operates as a common emitter amplifier, with a power gain of 60 dB. The input circuit resistance is 100Ω and the output load resistance is 10 kΩ. The common emitter current gain β is :

(1) 60 (2) 10^4

(3) 6×10^2 (4) 10^2

Q.40 The propagation of radio waves with frequency 2MHz to 30 MHz is due to –

(1) Space wave (2) Optical fibre

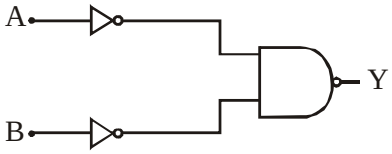
(3) Ground wave (4) Sky wave

Q.41 In an amplitude modulator circuit, the carrier wave is given by, C(t) = 4 sin (20000πt) while modulating signal is given by, m (t) = 2 sin (200 πt). The values of modulation index and lower side band frequency are :

(1) 0.5 and 9 kHz (2) 0.5 and 10 kHz

(3) 0.3 and 9 kHz (4) 0.4 and 10 kHz

Q.42 The logic gate equivalent to the given logic circuit is :



(1) OR (2) AND

(3) NOR (4) NAND

Q.43 The modulation frequency of an AM radio station is 250 kHz, which is 10% of the carrier wave. If another AM station approaches you for license what broadcast frequency will you allot ?

(1) 2750 kHz (2) 2000 kHz

(3) 2250 kHz (4) 2900 kHz

Q.44 A TV transmission tower has a height of 140 m and the height of the receiving antenna is 40 m. What is the maximum distance upto which signals can be broadcasted from this tower in LOS (Line of Sight) mode ?

(Given : Radius of earth = 6.4×10^6 m).

(1) 80 km (2) 48 km

(3) 40 km (4) 65 km

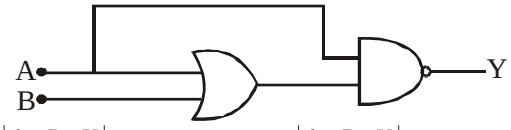
SPACE FOR ROUGH WORK

Q.45 In a vernier callipers having 10 Vsd, the vernier constant is 0.1 mm. When the jaws are closed, zero of vernier lies to the left of zero of main and 7^{th} Vsd coincides with a main scale division. When a cylinder is placed between the jaws the main scale reading was 7.7cm and vernier scale read 8 divisions. What is the diameter of the cylinder ?

(1) 78.1 mm (2) 77.5 mm

(3) 77.8 mm (4) 78.5 mm

Q.46 The truth table for the circuit given in the figure is:



A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

(1)

A	B	Y
0	0	0
0	1	0
1	0	1
1	1	1

(2)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(3)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	1

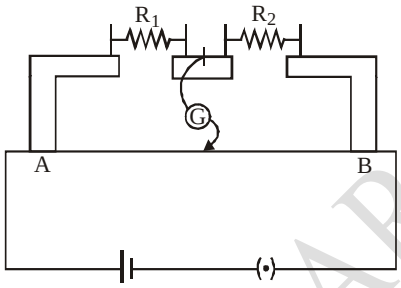
(4)

Q.47 An amplitude modulated signal is given by $V(t) = 10\,[1 + 0.3\cos(2.2 \times 10^4)]\sin(5.5 \times 10^5 t)$. Here t is in seconds. The side-band frequencies (in kHz) are, [Given $\pi = 22/7$]

(1) 1785 and 1715 (2) 892.5 and 857.5

(3) 89.25 and 85.75 (4) 178.5 smf 171.5

Q.48 In the experimental set up of metre bridge shown in the figure, the null point is obtained at a distance of 40 cm from A. If a 10Ω resistor is connected in series with R_1, the null point shifts by 10 cm. The resistance that should be connected in parallel with $(R_1 + 10)$ Ω such that the null point shifts back to its initial position is



(1) 40 Ω (2) 60 Ω

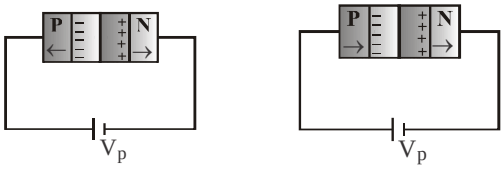
(3) 20 Ω (4) 30 Ω

Q.49 In a simple pendulum experiment for determination of acceleration due to gravity (g), time taken for 20 oscillations is measured by using a watch of 1 second least count. The mean value of time taken comes out to be 30 s. The length of pendulum is measured by using a meter scale of least count 1mm and the value obtained is 55.0 cm. The percentage error in the determination of g is close to :

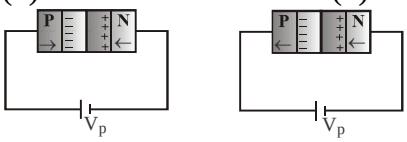
(1) 0.7% (2) 0.2%

(3) 3.5% (4) 6.8%

Q.50 In the case of forward biasing of PN-junction, which one of the following figures correctly depicts the direction of flow of carriers :



(1) (2)



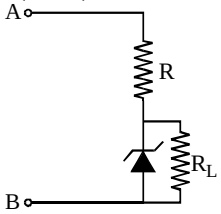
(3) (4)

SECTION - 2 (Q.51 - Q.60)

This section contains TEN (10) questions. ATTEMPT ANY FIVE (05) QUESTIONS. The answer to each question is NUMERICAL VALUE. If the numerical value has more than two decimal places truncate/round-off the value upto TWO decimal places.

SPACE FOR ROUGH WORK

Q.51 If the voltage between the terminals A and B is 17V and Zener breakdown voltage is 9V, then the potential (in V) across R is :



Q.52 Pure Si at 500 K has equal number of electron (n_e) and hole (n_h) concentrations of $1.5\times10^{16}m^{-3}$. Doping by indium increases nh to 4.5×10^{22} m^{-3}. The doped semiconductor is of p - type having electron concentration n_e = ($A \times 10^9$ m^{-3}). Find the value of A.

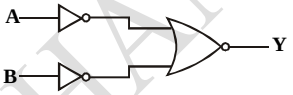
Q.53 When the gap is closed without placing any object in the screw gauge whose least count is 0.005 mm, the 5^{th} division on its circular scale coincides with the reference line on main scale, and when a small sphere is placed reading on main scale advances by 4 division, whereas circular scale reading advances by five times to the corresponding reading when no object was placed. There are 200 divisions on the circular scale. The radius of the sphere is X mm. Find the integral value of X.

Q.54 The density of a rectangular solid block is found by measuring three of the sides with a ruler which can read to ± 0.5mm and then finding its mass from a balance accurate to ± 1g. The readings obtained were
Length : 4.50 cm. Width : 3.50 cm
Height : 3.00 cm Mass : 32g
Find the maximum percentage error in the density. Round off to nearest integer.

Q.55 If the length and breadth of a thin rectangular sheet are measured, using a metre scale as 16.2 cm and 10.1 cm respectively. If the error in the estimation of area of rectangular sheet is Xcm^2. Find the value of (2X – 0.6).

Q.56 A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is (1/x) mm. Find the value of x.

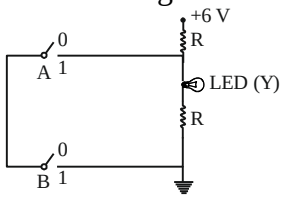
Q.57 Number of correct statements:
(i) For transistor action, the base region must be very thin and lightly doped.
(ii) For transistor action, base, emitter and collector regions should have same doping concentrations.
(iii) The increase in the width of depletion region in a p-n junction diode is due to reverse bias only.
(iv) For the logic circuit shown,



the truth table is :

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

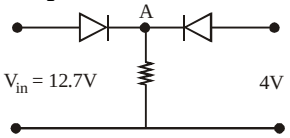
Q.58 Number of correct statements:
(i) For a p-type semi conductor,holes are the majority carriers and trivalent atoms are the dopants.
(ii) For a p-type semi conductor,electrons are the majority carriers and trivalent atoms are the dopants.
(iii) The correct Boolean operation represented by the circuit diagram drawn is NOR.



Q.59 In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \frac{A^2B^{1/2}}{C^{1/3}D^3}$, will be

SPACE FOR ROUGH WORK

Q.60 Both the diodes used in the circuit shown are assumed to be ideal and have negligible resistance when these are forward biased. Built in potential in each diode is 0.7 V. For the input voltages shown in the figure, the voltage (in Volts) at point A is ____.



PART C – MATHEMATICS

SECTION - 1 (Q.61 - Q.80)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.61 The equation of a plane containing the line of intersection of the planes $2x - y - 4 = 0$ and $y + 2z - 4 = 0$ and passing through the point (1, 1, 0) is :

(1) $x + 3y + z = 4$ (2) $x - y - z = 0$

(3) $x - 3y - 2z = -2$ (4) $2x - z = 2$

Q.62 Let $\vec{\alpha} = 3\hat{i} + \hat{j}$ and $\vec{\beta} = 2\hat{i} - \hat{j} + 3\hat{k}$. If $\vec{\beta} = \vec{\beta}_1 - \vec{\beta}_2$ where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$ then $\vec{\beta}_1 \times \vec{\beta}_2$ is equal to

(1) $-3\hat{i} + 9\hat{j} + 5\hat{k}$ (2) $3\hat{i} - 9\hat{j} - 5\hat{k}$

(3) $\frac{1}{2}(-3\hat{i} + 9\hat{j} + 5\hat{k})$ (4) $\frac{1}{2}(3\hat{i} - 9\hat{j} + 5\hat{k})$

Q.63 For and initial screening of an admission test, a candidate is given fifty problems to solve. If the probability that the candidate can solve any problem is 4/5, then the probability that he is unable to solve less than two problems is :

(1) $\frac{316}{25}\left(\frac{4}{5}\right)^{48}$ (2) $\frac{54}{5}\left(\frac{4}{5}\right)^{49}$

(3) $\frac{164}{25}\left(\frac{1}{5}\right)^{48}$ (4) $\frac{201}{5}\left(\frac{1}{5}\right)^{49}$

Q.64 Assume that each born child is equally likely to be a boy or a girl. If two families have two children each, then the conditional probability that all children are girls given that at least two are girls is :

(1) 1/11 (2) 1/17

(3) 1/10 (4) 1/12

Q.65 Let $\vec{a} = 3\hat{i} + 2\hat{j} + x\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$, for some real x. Then $|\vec{a} \times \vec{b}| = r$ is possible if :

(1) $3\sqrt{\frac{3}{2}} < r < 5\sqrt{\frac{3}{2}}$ (2) $0 < r \le \sqrt{\frac{3}{2}}$

(3) $\sqrt{\frac{3}{2}} < r \le 3\sqrt{\frac{3}{2}}$ (4) $r \ge 5\sqrt{\frac{3}{2}}$

Q.66 A perpendicular is drawn from a point on the line $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{1}$ to the plane $x + y + z = 3$ such that the foot of the perpendicular Q also lies on the plane $x - y + z = 3$. Then the co-ordinates of Q are

(1) (2, 0, 1) (2) (4, 0, –1)

(3) (–1, 0, 4) (4) (1, 0, 2)

Q.67 If the line, $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{4}$ meets the plane, $x + 2y + 3z = 15$ at a point P, then the distance of P from the origin is

(1) 9/2 (2) $2\sqrt{5}$

(3) $\sqrt{5}/2$ (4) 7/2

Q.68 The length of the perpendicular drawn from the point (2, 1, 4) to the plane containing the lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - 2\hat{k})$ is

(1) $\sqrt{3}$ (2) $1/\sqrt{3}$

(3) 1/3 (4) 3

Q.69 Four persons can hit a target correctly with probabilities $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ and $\frac{1}{8}$ respectively. If all hit at the target independently, then the probability that the target would be hit, is

(1) 25 / 192 (2) 1 / 192

(3) 25 / 32 (4) 7 / 32

SPACE FOR ROUGH WORK

Q.70 Let a random variable X have a binomial distribution with mean 8 and variance 4.
If $P(x \le 2) = k/2^{16}$, then k is equal to :
(1) 17 (2) 1
(3) 121 (4) 137

Q.71 A determinant is chosen at random from the set of all determinant of order 2 with elements 0 or 1 only. The probability that the determinant chosen has the value non negative is -
(1) 3/16 (2) 6/16
(3) 10/16 (4) 13/16

Q.72 The intercept made by the plane on the x-axis is -
(1) $\frac{q}{\hat{i}.\vec{n}}$ (2) $\frac{\hat{i}.\vec{n}}{q}$
(3) $(\hat{i}\cdot\vec{n})\ q$ (4) $\frac{q}{|\vec{n}|}$

Q.73 If $\vec{a}$, $\vec{b}$ & $\vec{c}$ are non coplanar unit vectors such that $\vec{a}\times(\vec{b}\times\vec{c}) = \frac{\vec{b}+\vec{c}}{\sqrt{2}}$, then the angle between
(1) $\vec{a}$ & $\vec{b}$ is $\frac{3\pi}{4}$, $\vec{a}$ & $\vec{c}$ is $\frac{\pi}{4}$
(2) $\vec{a}$ & $\vec{b}$ is $\frac{\pi}{4}$, $\vec{a}$ & $\vec{c}$ is $\frac{\pi}{4}$
(3) $\vec{a}$ & $\vec{b}$ is $\frac{3\pi}{4}$, $\vec{a}$ & $\vec{c}$ is $\frac{3\pi}{4}$
(4) $\vec{a}$ & $\vec{b}$ is $\frac{\pi}{2}$, $\vec{a}$ & $\vec{c}$ is $\frac{\pi}{4}$

Q.74 Before a race the chance of three runners A, B & C were estimated to be proportional to 5, 3 & 2 respectively but during the race A meets with an accident which reduces his chance to 1/3. If the respective chances of B and C are P(2) and P(3) then -
(1) P (2) = 2/5, P (3) = 4/15
(2) P (2) =2/5, P (3) = 7/15
(3) P (2) =2/5, P (3) = 2/5
(4) P (2) = 4/15, P (3) = 7/15

Q.75 A is one of the 6 horses entered for a race and is to be ridden by one of two jockeys B or C. It is 2 to 1 that B rides A, in which case all the horses are equally likely to win, if C rides A, his chance is trebled, Then the odds against his winning are -
(1) 5/13 (2) 18/5
(3) 13/18 (4) 13/5

Q.76 A box has four dice in it. Three of them are fair dice but the fourth one has the number five on all of its faces. A die is chosen at random from the box and is rolled three times and shows up the face five on all the three occasions. The chance that the die chosen was a rigged die, is -
(1) $\frac{216}{217}$ (2) $\frac{215}{219}$
(3) $\frac{216}{219}$ (4) none

Q.77 The expression in the vector form for the point $\vec{r}_1$ of intersection of the plane $\vec{r}\cdot\vec{n} = d$ and the perpendicular line $\vec{r} = \vec{r}_0 + t\,\vec{n}$ where t is a parameter given by -
(1) $\vec{r}_1 = \vec{r}_0 + \left(\frac{d-\vec{r}_0\cdot\vec{n}}{\vec{n}^2}\right)\vec{n}$
(2) $\vec{r}_1 = \vec{r}_0 - \left(\frac{\vec{r}_0\cdot\vec{n}}{\vec{n}^2}\right)\vec{n}$
(3) $\vec{r}_1 = \vec{r}_0 - \left(\frac{\vec{r}_0\cdot\vec{n}-d}{|\vec{n}|}\right)\vec{n}$
(4) $\vec{r}_1 = \vec{r}_0 + \left(\frac{\vec{r}_0\cdot\vec{n}}{|\vec{n}|}\right)\vec{n}$

Q.78 Let $\vec{a} = \hat{i}+2\hat{j}+4\hat{k}, \vec{b} = \hat{i}+\lambda\hat{j}+4\hat{k}$ and $\vec{c} = 2\hat{i}+4\hat{j}+(\lambda^2-1)\hat{k}$ be coplanar vectors. Then the non-zero vector $\vec{a}\times\vec{c}$ is :
(1) $-14\hat{i}-5\hat{j}$ (2) $-10\hat{i}-5\hat{j}$
(3) $-10\hat{i}+5\hat{j}$ (4) $-14\hat{i}+5\hat{j}$

SPACE FOR ROUGH WORK

Q.79 The plane containing the line $\frac{x-3}{2}=\frac{y+2}{-1}=\frac{z-1}{3}$ and also containing its projection on the plane 2x + 3y – z = 5, contains which one of the following points ?

(1) (2, 0, –2) (2) (–2, 2, 2)

(3) (0, –2, 2) (4) (2, 2, 0)

Q.80 The perpendicular distance from the origin to the plane containing the two lines, $\frac{x+2}{3}=\frac{y-2}{5}=\frac{z+5}{7}$ and $\frac{x-1}{1}=\frac{y-4}{4}=\frac{z+4}{7}$ is –

(1) $11/\sqrt{6}$ (2) $6\sqrt{11}$

(3) 11 (4) $11\sqrt{6}$

SECTION - 2 (Q.81 - Q.90)

This section contains TEN (10) questions. ATTEMPT ANY FIVE (05) QUESTIONS. The answer to each question is NUMERICAL VALUE. If the numerical value has more than two decimal places truncate/round-off the value upto TWO decimal places.

Q.81 The minimum number of times one has to toss a fair coin so that the probability of observing at least one head is at least 90% is :

Q.82 The distance of the point having position vector $-\hat{i}+2\hat{j}+6\hat{k}$ from the straight line passing through the point (2, 3, –4) and parallel to the vector, $6\hat{i}+3\hat{j}-4\hat{k}$ is :

Q.83 7 persons are stopped on the road at random and asked about their birthdays. If the probability that 3 of them are born on Wednesday, 2 on Thursday and the remaining 2 on Sunday is $\frac{K}{7^6}$, then (K/10) is equal to

Q.84 Let A be a point on the line $\vec{r}=(1-3\mu)\hat{i}+(\mu-1)\hat{j}+(2+5\mu)\hat{k}$ and B (3, 2, 6) be a point in the space. The value of μ for which the vector $\overrightarrow{AB}$ is parallel to the plane x – 4y + 3z =1 is (1/X). Find the value of X.

Q.85 A bag contains 30 white balls and 10 red balls. 16 balls are drawn one by one randomly from the bag with replacement. If X be the number of white balls drawn, the $\left(\frac{\text{mean of X}}{\text{standard deviation of X}}\right)=4\sqrt{A}$. Find the value of A.

Q.86 If $\vec{a}$ and $\vec{b}$ are two unit vectors such that $\vec{a}+(\vec{a}\times\vec{b})=\vec{c}$, where $|\vec{c}|=2$, then value of $[\vec{a}\ \vec{b}\ \vec{c}]$ is –

Q.87 If the lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{4-z}{k}$ and $\frac{1-x}{-k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar then non-zero value of | k | is –

Q.88 If $\vec{a}=\hat{i}+\hat{j}+\hat{k}, \vec{b}=4\hat{i}+3\hat{j}+4\hat{k}$ and $\vec{c}=\hat{i}+\alpha\hat{j}+\beta\hat{k}$ are linearly dependent and $|\vec{c}|=\sqrt{3}$ then $(\alpha^2+\beta)$ is equal to –

Q.89 If the planes $\vec{r}\cdot(\hat{i}+\hat{j}+\hat{k})=1, \vec{r}\cdot(\hat{i}+2a\hat{j}+\hat{k})=2$ and $\vec{r}\cdot(a\hat{i}+a^2\hat{j}+\hat{k})=3$ intersect in a line, then the number of real values of a is equal to –

Q.90 Two circles are constructed taking two side of a triangle as diameters. If the probability of these two circle intersecting on the 3rd side of the triangle is p then value of 6p is –

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK