

COMEDK UGET 2021 Question Paper PDF (September 14, 2021) (Shift 1)

Instructions

- There are 180 questions in all. The number of questions in each section is as given below.

Sections	No. of Questions
Section I : Physics	1-60
Section II : Chemistry	61-120
Section III : Mathematics	121-180

- All the questions are Multiple Choice Questions having four options out of which **ONLY ONE** is correct.
- Candidates will be awarded 1 mark for each correct answer. There will be no negative marking for incorrect answer.
- Time allotted to complete this paper is 3 hrs.

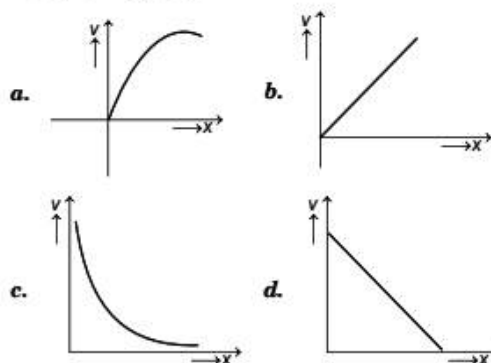
PHYSICS

- The Lyman series of a hydrogen atom belongs in which category
 a. ultraviolet region b. infrared region
 c. visible region d. None of these
- Insulators can be charged by which of the following process?
 a. Induction b. Diverging
 c. Friction d. Heating
- In an adiabatic process with the ratio of two specific heat, $\gamma = \frac{3}{2}$, pressure is increased by $\frac{2}{3}\%$, then decrease in the volume will be
 a. $\frac{4}{9}\%$ b. $\frac{2}{3}\%$ c. 4% d. $\frac{9}{4}\%$
- Two converging lenses of focal length 20 cm and 40 cm are placed in contact. The effective power of the combination is
 a. 5.25 D b. 7.25 D c. 2.75 D d. 7.5 D

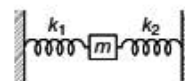
- The formula of capacitive reactance is

- a. $2\pi fC$ b. $\frac{fC}{2\pi}$
 c. $\frac{C}{2\pi f}$ d. $\frac{1}{2\pi fC}$

- Which graph shows the correct $v - x$ graph of a freely falling body ?



7. The displacement x of a particle varies with time t , $x = ae^{-pt} + be^{qt}$, where a , b , p and q are positive constant. The velocity of the particle will
- go on increasing forever
 - be independent of p and q
 - drop to zero when $p = q$
 - go on decreasing with time
8. Which of the following quantity represents the dimensions of momentum?
- Impulse
 - Pressure
 - Viscosity
 - Power
9. The angle of projection with the horizontal in terms of maximum height attained and horizontal range is given by
- $\tan^{-1}\left(\frac{2H}{3R}\right)$
 - $\tan^{-1}\left(\frac{4R}{3H}\right)$
 - $\tan^{-1}\left(\frac{4H}{R}\right)$
 - $\tan^{-1}\left(\frac{R}{H}\right)$
10. For the same resonant frequency, if L is changed from L to $\frac{L}{3}$, then capacitance should change from C to
- $\frac{C}{3}$
 - $3C$
 - $\frac{2}{3}C$
 - $2C$
11. The velocity of the proton is one-fourth the velocity of the electron. What is the ratio of the de-Broglie wavelength of an electron to that of a proton?
- 1
 - $\frac{1}{2}$
 - $\frac{1}{3}$
 - $\frac{1}{4}$
12. For an ideal gas, coefficient of volume expansion is given by
- $\frac{1}{p}$
 - $\frac{1}{pV}$
 - $\frac{1}{R}$
 - $\frac{1}{T}$
13. Which of the following is not a green house gas?
- CH_4
 - CO_2
 - O_3
 - H_2O
14. Two particles of masses $m_1 = m$, $m_2 = 2m$ and charges $q_1 = q$, $q_2 = 2q$ entered into uniform magnetic field. Find F_1/F_2 (force ratio).
- $\frac{1}{2}$
 - 1
 - $\frac{1}{3}$
 - 2
15. Work done in moving a charge of 25C is 50 J. Calculate potential difference, between two points.
- 0.5 V
 - 1 V
 - 2 V
 - 2.5 V
16. The correct arrangement in increasing order of wavelength of X-rays, UV rays, microwave is
- microwave, X-rays, UV rays
 - UV rays, X-rays, microwave
 - X-rays, UV rays, microwave
 - microwave, UV rays, X-rays
17. What is the electric field near infinite plane sheet of charge density σ ?
- $\frac{\sigma}{2\epsilon_0}$
 - $\frac{\sigma A}{2\epsilon_0}$
 - $\frac{\sigma}{2\epsilon_0 A}$
 - $\frac{\sigma}{\epsilon_0}$
18. Which of the following waves are used to treatment of muscles ache?
- Ultraviolet
 - Infrared
 - Microwave
 - X-rays
19. Find the logic gate, when both the inputs are high but the output is low and *vice-versa*.
- AND
 - OR
 - NAND
 - NOR
20. What is the minimum band-gap of the LED diode?
- 1.5 eV
 - 1.7 eV
 - 1.8 eV
 - 0.8 eV
21. The displacement of a wave is given by
- $$y = 20 \cos(\omega t + 4z)$$
- The amplitude of the given wave is
- 10
 - 20
 - $20\sqrt{2}$
 - $10\sqrt{2}$
22. If frequencies are $(v - 1)$ and $(v + 2)$, then find the value of beats.
- 2
 - 1
 - 3
 - 4
23. The function $y = \log \omega t$ can represent
- a periodic function
 - non-periodic function
 - oscillatory function
 - circulatory motion
24. Two spring of force constant k_1 and k_2 are configured as the figure given below



The angular frequency of this configuration is

- a. $\frac{k_1 + k_2}{m}$ b. $\sqrt{\frac{k_1 + k_2}{m}}$
 c. $\sqrt{\frac{k_1}{k_2 m}}$ d. $\frac{k_2 m}{k_1}$

25. The resistance of a wire is R ohm. If it is melted and stretched to n times its original length, its new resistance will be

- a. nR b. $\frac{R}{n}$
 c. $n^2 R$ d. $\frac{R}{n^2}$

26. An unpolarised beam of intensity I_0 is incident on a pair of nicols making an angle of 60° with each other. The intensity of light emerging from the pair is

- a. I_0 b. $\frac{I_0}{4}$
 c. $\frac{I_0}{2}$ d. $\frac{I_0}{8}$

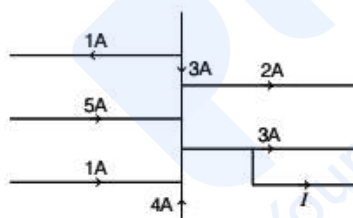
27. The collision of the molecules of an ideal gas is taken as

- a. elastic b. inelastic
 c. partially elastic d. partially inelastic

28. The average energy associated with a monoatomic molecule is

- a. $K_B T$ b. $\frac{1}{2} K_B T$
 c. $\frac{3}{2} K_B T$ d. $2 K_B T$

29. For the given electrical arrangement, what is the value of current I ?



- a. 6A b. 5A c. 7A d. 8A

30. If an electron in hydrogen atom jumps from an orbit of level $n = 3$ to an orbit at level $n = 2$, emitted radiation has a frequency of ($R = \text{Rydberg's constant}$ and $c = \text{velocity of light}$)

- a. $\frac{3Rc}{27}$ b. $\frac{Rc}{25}$
 c. $\frac{8Rc}{9}$ d. $\frac{5Rc}{36}$

31. Within the elastic limit, the corresponding stress is known as

- a. tensile strength b. yield strength
 c. elastic fatigue d. yield point

32. A wire is stretched to double of its length. The strain is

- a. 1 b. 2
 c. 3 d. 4

33. Kepler's second law of planetary motion corresponds to

- a. conservation of energy
 b. conservation of angular momentum
 c. conservation of linear momentum
 d. conservation of mass

34. A constant potential energy of a satellite is given as

$$PE = r(KE)$$

where, PE = potential energy
 and KE = kinetic energy.

The value of r will be

- a. -1 b. -2
 c. $-\frac{1}{2}$ d. $-\frac{3}{2}$

35. A long solenoid has 20 turns cm^{-1} . The current necessary to produce a magnetic field of 20 mT inside the solenoid is approximately

- a. 1A b. 2A
 c. 4A d. 8A

36. A constant current flows from A to B as shown in the figure. What is the direction of current in the circle?



- a. Clockwise
 b. Anti-clockwise
 c. Straight line
 d. None of the above

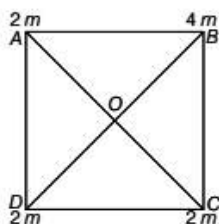
37. According to Pascal's law, pressure in a fluid at rest is the same at all points, if

- a. they are at the same plane
 b. they are at the same height
 c. they are along same line
 d. Both (a) and (b)

38. The surface tension of a liquid at its boiling point

- a. becomes zero
 b. becomes infinity
 c. is equal to the value at room temperature
 d. is half of the value at room temperature

39. Centre of mass of the given system of particles will be at



a. OA b. OB c. OC d. OD

40. Newton's second law of rotational motion of a system particles having angular momentum L is given by

a. $\frac{dp}{dt} = \tau_{\text{ext}}$ b. $\frac{dL}{dt} = \tau_{\text{int}}$
 c. $\frac{dL}{dt} = \tau_{\text{ext}}$ d. $\frac{dL}{dt} = \tau_{\text{int}} + \tau_{\text{ext}}$

41. The motion of a particle of mass m is described by $y = ut + gt^2$. The force acting on the particle will be

a. zero b. $4mg$ c. $3mg$ d. $2mg$

42. When a car of mass m is moving with speed v along a circle of radius r on a level road, the centripetal force is provided by f , where f denotes

($\mu_s \rightarrow$ coefficient of friction, $N \rightarrow$ normal reaction)

a. $\frac{mv^2}{r} = f \leq \mu_s N$ b. $f < \mu_s = \frac{mv^2}{r}$
 c. $f = \mu_s N = \frac{mv^2}{r}$ d. $f = \mu_k N = \frac{mv^2}{r}$

43. Ba-122 has half-life of 2 min. Experiment has to be done using Ba-122 and it takes 10 min to set up the experiment. It initially 80 g at Ba-122 was taken, how much Ba was left when experiment was started?

a. 2.5 g b. 5 g c. 10 g d. 20 g

44. When the speed of light becomes $\frac{2}{3}$ of its present value, then the energy released in a given atomic explosion would

a. decrease by a factor $\frac{2}{3}$
 b. decrease by a factor $\frac{4}{9}$
 c. decrease by a factor $\frac{5}{9}$
 d. decrease by a factor $\frac{\sqrt{5}}{9}$

45. What should be the value of self-inductance of an inductor that should be connected to 220 V 50 Hz supply, so that a maximum current of 0.9 A flows through it?

a. 11 H b. 2 H
 c. 1.1 H d. 5 H

46. 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

a. 10 cm, 10 cm b. 15 cm, 5 cm
 c. 18 cm, 2 cm d. 11 cm, 9 cm

47. Two masses of 1g and 9g are moving with equal kinetic energy. The ratio of magnitude of their momentum is

a. 3 : 1 b. 1 : 3
 c. 1 : 2 d. 2 : 1

48. When two bodies collide with each other such that their kinetic energy remains constant. Their collision is said to be

a. elastic
 b. inelastic
 c. Both (a) and (b)
 d. None of the above

49. In detector, output circuit consists of $R = 10 \text{ k}\Omega$ and $C = 100 \text{ pF}$. The frequency of carrier signal which it can detect is

a. $\gg 1 \text{ MHz}$ b. 0.1 kHz
 c. $\gg 1 \text{ GHz}$ d. 10^3 Hz

50. For motion under central forces, which quantity will be conserved?

a. Kinetic energy
 b. Mechanical energy
 c. Potential energy
 d. None of the above

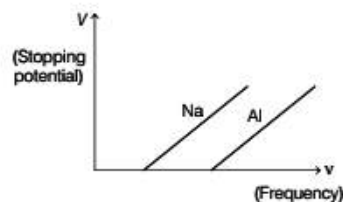
51. Which of the following statement is incorrect?

a. Classical Physics deals with macroscopic phenomena and includes subject like mechanics, electrodynamics, optics and thermodynamics.
 b. All Physics and also mathematics is based on assumptions each of which is variously called hypothesis or axiom or postulate etc.
 c. A hypothesis is a supposition with assuming that is true.
 d. An axiom is a self-evident truth, while a model is a theory proposed to explain observed phenomena.

52. If impedance is $\sqrt{3}$ times of resistance, then find phase difference.

a. Zero b. 30°
 c. 60° d. Data is incomplete

53. A bar magnet is oscillating in the earth's magnetic field with a period T . What happens to its period and motion, if its mass is quadrupled?
- Motion remains simple harmonic with time period $4T$.
 - Motion remains simple harmonic with time period nearly constant.
 - Motion remains simple harmonic and time period becomes $T/2$.
 - Motion remains simple harmonic with time period $2T$.
54. The relative permeability of iron is 6000. Its magnetic susceptibility is
- 5999
 - 6001
 - 6000×10^{-7}
 - 6000×10^7
55. Which of the following technique is not used for measuring small time intervals?
- Electronic oscillator
 - Decay of elementary particles
 - Atomic clock
 - Spring oscillator
56. The relative errors in the measurement of two lengths $1.02 \text{ cm} \pm 0.01 \text{ cm}$ and $9.89 \text{ cm} \pm 0.01 \text{ cm}$ is
- $\pm 1\%$ and $\pm 0.1\%$
 - $\pm 1\%$ and $\pm 0.2\%$
 - $\pm 1\%$ and $\pm 1\%$
 - 0.1% and $\pm 1\%$
57. In Young's double slit experiment with sodium vapour lamp of wavelength 589 nm and slit 0.589 mm apart, the half angular width of the central maxima is
- $\sin^{-1}(0.01)$
 - $\sin^{-1}(0.0001)$
 - $\sin^{-1}(0.001)$
 - $\sin^{-1}(0.1)$
58. From the figure describing photoelectric effect, we may infer correctly that

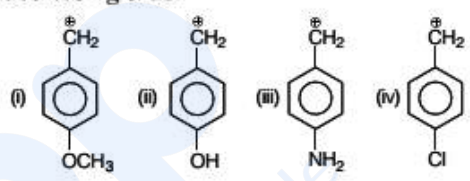


- Na and Al both have the same threshold frequency
 - Maximum kinetic energy for both the metals depends linearly on the frequency
 - the stopping potential are different for Na and Al for the same change in frequency
 - Al is better photosensitive material than Na
59. Carnot cycle of an engine is given below
-
- The P-V diagram shows a Carnot cycle with four states: P (p_1, V_1, T_1), Q (p_2, V_2, T_2), R (p_3, V_3, T_3), and S (p_4, V_4, T_4). The processes are: P to Q (isothermal expansion), Q to R (adiabatic expansion), R to S (isothermal compression), and S to P (adiabatic compression).
- Total work done by the gas in one cycle is
- $\mu RT_2 \log \frac{V_2}{V_1} - \mu RT_1 \log \frac{V_3}{V_4}$
 - $\mu RT_1 \log \frac{V_2}{V_1} - \mu RT_2 \log \frac{V_3}{V_4}$
 - $\mu RT_1 \log \frac{V_2}{V_1} + \mu RT_2 \log \frac{V_3}{V_4}$
 - Zero
60. An optical fibre communication system works on a wavelength of $1.3 \mu\text{m}$. The number of subscribers it can feed, if a channel requires 20 kHz are
- 2.3×10^{10}
 - 1.15×10^{10}
 - 1×10^5
 - None of these

CHEMISTRY

61. When the expansion of a gas occurs in vacuum and at constant volume, then
- $\Delta U = qV$
 - $\Delta U = qp$
 - $\Delta H = qV$
 - $\Delta H = qp$
62. Carbon monoxide is poisonous to human beings because
- it binds 300 times more strongly to haemoglobin than oxygen.
 - it doesn't bind to haemoglobin
 - it forms cyanide in body.
 - it leads to coagulation of blood.
63. Which one of the following sets of monosaccharides forms sucrose?
- α -D-galactopyranose and α -D-glucopyranose
 - α -D-glucopyranose and β -D-fructofuranose
 - β -D-glucopyranose and α -D-fructofuranose
 - α -D-glucopyranose and β -D-fructopyranose
64. Under which of the following condition, the gases does not follow Henry's law?
- When gases are placed under high temperature.
 - When the molecules of the system are in equilibrium state.

- c. When gases are placed under extremely high pressure.
d. All of the above
65. An aqueous solution of X on addition of hydrogen peroxide in ice cold conditions gives blue colour to the ethereal layer. Then, X can be
a. acidified potassium chromate
b. alkaline potassium dichromate
c. acidified potassium manganate
d. acidified potassium permanganate
66. Determine the specific rate constant of the reaction. If the half-life period of a first order reaction is 1402 s.
a. $4.94 \times 10^{-3} \text{ s}^{-1}$
b. $0.49 \times 10^{-3} \text{ s}^{-1}$
c. $0.49 \times 10^{-4} \text{ s}^{-1}$
d. $4.94 \times 10^{-5} \text{ s}^{-1}$
67. Sodium metal crystallises in a body centred cubic lattice with a unit cell edge of $4.29 \text{ \AA}$. The radius of sodium atom is
a. $1.86 \text{ \AA}$
b. $3.22 \text{ \AA}$
c. $5.72 \text{ \AA}$
d. $0.93 \text{ \AA}$
68. Which of the following amino acid ($\text{NH}_2\text{CH(R)COOH}$) contains polar R group?
a. Alanine
b. Valine
c. Glycine
d. Glutamine
69. Find the correct order of C—O bond length among CO , CO_3^{2-} , CO_2 .
a. $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$
b. $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$
c. $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$
d. $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
70. The total number of nodes are given by
a. $(n+1)$
b. $(n-l-1)$
c. $(n-1)$
d. $(n-l+1)$
71. In the equilibrium, $\text{AB} \rightleftharpoons \text{A} + \text{B}$, if the equilibrium concentration of A is double, then equilibrium concentration of B will be
a. half
b. twice
c. $\frac{1}{4}$ th
d. $\frac{1}{8}$ th
72. Which of the following is used as a drug to reduce fever?
a. Antibiotic
b. Antipyretic
c. Analgesic
d. Tranquiliser
73. The reaction
$$\text{ArN}_2^+\text{Cl}^- \xrightarrow{\text{Cu/HCl}} \text{ArCl} + \text{N}_2 + \text{CuCl}$$
 is called as
a. Sandmeyer reaction
b. Gattermann reaction
c. Claisen reaction
d. Carbylamine reaction
74. In $3d$ -transition series, which one has the least melting point?
a. V
b. Zn
c. Mn
d. Cu
75. Among the following enzymes, which one is involved in the given below catalytic reaction?
$$\text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) \longrightarrow 2\text{C}_2\text{H}_5\text{OH}(\text{aq}) + 2\text{CO}_2(\text{g})$$

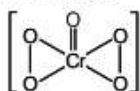
a. Maltase
b. Urease
c. Zymase
d. Invertase
76. Which of the following is correct mixture of azeotrope?
a. Chlorobenzene + bromobenzene
b. $\text{C}_2\text{H}_5\text{Br} + \text{C}_2\text{H}_5\text{Cl}$
c. $\text{C}_6\text{H}_{14} + \text{C}_7\text{H}_{16}$
d. $\text{CCl}_4 + \text{CHCl}_3$
77. Rate constant (K) of a reaction has least value at
a. high T and high E_a
b. high T and low E_a
c. low T and low E_a
d. low T and high E_a
78. Arrange stability of the given carbon cation in decreasing order

a. (iii) > (ii) > (i) > (iv)
b. (i) > (ii) > (iii) > (iv)
c. (iii) > (i) > (ii) > (iv)
d. (ii) > (iii) > (i) > (iv)
79. Which of the following pairs of ions in iso-electronic and iso-structural?
a. CO_3^{2-} , NO_3^-
b. SO_3^{2-} , NO_3^-
c. ClO_3^- , CO_3^{2-}
d. SO_3^{2-} , CO_3^{2-}
80. How much part of any corner atom actually belongs to a particular unit cell?
a. $\frac{1}{4}$ th
b. $\frac{1}{6}$ th
c. $\frac{1}{8}$ th
d. $\frac{1}{10}$ th
81. For the equilibrium,
$$2\text{NOCl}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Cl}_2(\text{g})$$

the value of the equilibrium constant, K_C is 3.75×10^{-6} at 1069 K. The value of K_p for the reaction at this temperature will be
a. 0.133
b. 1.242
c. 0.033
d. 0.00033
82. Arrange the following artificial Sweetening agents in order of increasing sweetness.
Aspartame, Saccharin, Sucralose, Alitame
a. Alitame > Saccharin > Sucralose > Aspartame
b. Aspartame > Alitame > Saccharin > Sucralose
c. Alitame > Sucralose > Saccharin > Aspartame
d. Sucralose > Aspartame > Alitame > Saccharin

83. Coupling reaction is an example of

- nucleophilic addition reaction.
- nucleophilic substitution reaction.
- electrophilic substitution reaction.
- electrophilic addition reaction.

84. The oxidation number of Cr in CrO_5 which has the following structure, is



- +4
- +5
- +3
- +6

85. Identify the pair of gases that have equal rates of diffusion

- CO, NO
- N_2O , CO
- N_2O , CO_2
- CO_2 , NO_2

86. The reducing agent which is used to reduce iron oxide in blast furnace is

- CO
- coke
- silica
- lime

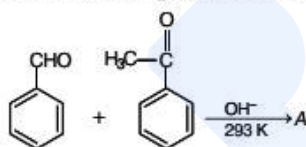
87. Given that molar conductances for Ba(OH)_2 , BaCl_2 and NH_4Cl are 523.28, 280.0 and $129.8 \Omega^{-1}\text{cm}^2\text{mol}^{-1}$ respectively. What is the molar conductivity ($\Omega^{-1}\text{cm}^2\text{mol}^{-1}$) of NH_4OH ?

- 502.88
- 251.44
- 1005.76
- 209.42

88. Xerophthalmia disease causes by which deficiency of vitamin?

- Vitamin-A
- Vitamin-C
- Vitamin-B
- Vitamin-B₆

89. Find the final product for the reaction



-
-
-
-

90. The melting of ice

- is the phase transformation
- takes place at constant pressure and temperature
- takes place at 373 K
- Both (a) and (b)

91. Which of the following options represent the correct composition of dettol?

- Chloroxylenol and terpineol
- Chloroxylenol and furacine
- Terpineol and iodine
- Iodine and furacine

92. The chemical formula of Hinsberg's reagent is

- HNO_2
- $\text{NaOH} + \text{CaO}$
- $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$
- CH_3CONH_2

93. The increasing order of atomic radii of the following group 13 elements is

- $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$
- $\text{Ga} < \text{Al} < \text{In} < \text{Tl}$
- $\text{Al} < \text{In} < \text{Tl} < \text{Ga}$
- $\text{Al} < \text{Ga} < \text{Tl} < \text{In}$

94. Which of the following colloids resemble to the true solutions?

- Macromolecular colloids
- Micelles
- Micromolecular colloids
- Lyophobic colloids

95. The hydrocarbon that cannot be prepared effectively by Wurtz reaction

-
-
-
-

96. Reaction find the product B.

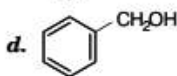
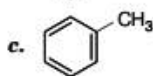
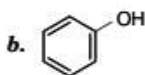
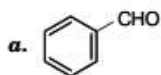
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- 97.** Why, ketones and carboxylic acids have higher boiling point as compared to aldehydes?
 a. Due to —CHO group
 b. Due to Fajan's rule
 c. Due to inter molecular hydrogen bonding
 d. Due to intramolecular hydrogen bonding
- 98.** The vacant space in bcc lattice cell is
 a. 26%
 b. 48%
 c. 23%
 d. 32%
- 99.** In the chemical reaction,
 $N_2 + 3H_2 \rightleftharpoons 2NH_3$ at equilibrium point.
 a. equal volumes of N_2 and H_2 are reacting.
 b. equal moles of N_2 and H_2 are reacting.
 c. the reaction has stopped.
 d. the same amount of ammonia is formed, as it is decomposed into N_2 and H_2 .
- 100.** The change in the energy of system if 500 cal of heat energy are added to a system and system does 350 cal of work on the surroundings will be
 a. -150 cal
 b. +150 cal
 c. +850 cal
 d. -850 cal
- 101.** Which of the following is not an antacid?
 a. Aluminium hydroxide
 b. Cimetidine
 c. Phenelzine
 d. Ranitidine
- 102.** Which of the following is most stable?
 a. $CH_3N_2^+X^-$
 b. $C_6H_5N_2^+X^-$
 c. $CH_3CH_2N_2^+X^-$
 d. $C_6H_5CH_2N_2^+X^-$
- 103.** Which type of ligand is EDTA?
 a. Monodentate
 b. Hexadentate
 c. Bidentate
 d. Tridentate
- 104.** The density of a gas A is thrice that of a gas B at the same temperature. The molecular weight of gas B is twice that of A. What will be the ratio of pressure acting on B and A?
 a. $\frac{1}{4}$
 b. $\frac{7}{8}$
 c. $\frac{2}{5}$
 d. $\frac{1}{6}$
- 105.** Which of the following is correct order of their increasing boiling points?
 a. 10^{-4} M NaCl > 10^{-3} M $MgCl_2$ > 10^{-2} M NaCl > 10^{-4} M urea.
 b. 10^{-2} M NaCl > 10^{-3} M $MgCl_2$ > 10^{-4} M NaCl > 10^{-4} M urea.
 c. 10^{-4} M urea > 10^{-4} M NaCl > 10^{-3} M $MgCl_2$ > 10^{-2} M NaCl.
 d. 10^{-2} M NaCl > 10^{-3} M $MgCl_2$ > 10^{-4} M NaCl > 10^{-4} M urea.
- 106.** The specific conductivity of a solution containing 1.0 g of anhydrous $BaCl_2$ in 200 cm^3 of the solution has been found to be 0.0058 S cm^{-1} . The molar and equivalent conductivity of the solution respectively are
 a. $120.83\text{ S cm}^2\text{ eq}^{-1}$ and $241.67\text{ S cm}^2\text{ eq}^{-1}$
 b. $150.5\text{ S cm}^2\text{ eq}^{-1}$ and $289.7\text{ S cm}^2\text{ eq}^{-1}$
 c. $241.6\text{ S cm}^2\text{ mol}^{-1}$ and $120.83\text{ S cm}^2\text{ eq}^{-1}$
 d. $248.6\text{ S cm}^2\text{ mol}^{-1}$ and $180.3\text{ S cm}^2\text{ eq}^{-1}$
- 107.** For the reaction $2N_2O_5 \longrightarrow 4NO_2 + O_2$, rate constant k is $4.48 \times 10^{-5}\text{ s}^{-1}$ and the initial pressure is 600 atm. After 10 min, determine the final pressure of N_2O_5 .
 a. 590 atm
 b. 490 atm
 c. 588 atm
 d. 580 atm
- 108.** Calculate the difference between C_p and C_v for 10 moles of an ideal gas
 a. 83.14 J/K
 b. 8.314 J/K
 c. 831.4 J/K
 d. 0.831 J/K
- 109.** Which of the following particulate matter is emitted from vehicles?
 a. Co
 b. Pb
 c. Sn
 d. Se
- 110.** Arrange the hydrides of group 15 in correct decreasing order of reducing nature.
 a. $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$
 b. $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
 c. $PH_3 < AsH_3 < SbH_3 < BiH_3 < NH_3$
 d. $BiH_3 > SbH_3 > AsH_3 > PH_3 > NH_3$
- 111.** What would be the molarity of one litre solution of 22.2 g of $CaCl_2$?
 a. 0.2 M
 b. 0.4 M
 c. 0.6 M
 d. 0.8 M
- 112.** For decolourisation of 1 mole of $KMnO_4$, the moles of H_2O_2 required is
 a. $\frac{1}{2}$
 b. $\frac{3}{2}$
 c. $\frac{5}{2}$
 d. $\frac{7}{2}$
- 113.** What is the IUPAC name of following compound?

$$HC \equiv C - \text{CH} = \text{CH} - C \equiv CH$$

 a. 3, 3-diethynylpenta-1, 4-diene
 b. 3, 3-diethynylpenta-1, 4-diyne
 c. 3, 3-diethynyl-3, 3-diethynyl-methane
 d. 3-ethyl-3-ethylpent-1-en-4-yne
- 114.** Find the compound which have both polar and non-polar covalent bonds.
 a. HCN
 b. H_2O_2
 c. NH_4Cl
 d. CH_4

115. What is the product formed when benzene react with CO and HCl in presence of anhydrous AlCl_3 ?



116. Which of the following series of transitions in the spectrum of hydrogen atom fall in visible region?

a. Balmer series

b. Paschen series

c. Brackett series

d. Lyman series

117. The value of ΔG° for the phosphorylation of glucose in glycolysis is 13.8 kJ/mol. The value of K_C at 298 K is

a. 7.72×10^{-4}

b. 5.62×10^{-4}

c. 4.81×10^{-3}

d. 3.81×10^{-3}

118. The Lyman series of hydrogen spectrum lies in which region

a. Infrared region
b. Visible region
c. Ultraviolet region
d. X-ray region

119. The correct IUPAC name of the coordination compound $\text{K}_3[\text{Fe}(\text{CN})_5\text{NO}]$ is

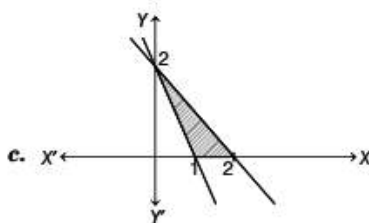
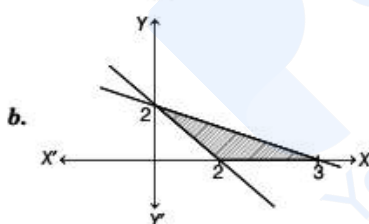
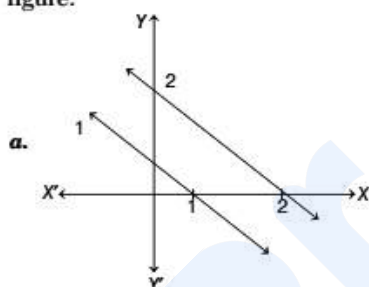
a. potassium pentacyanonitrosylferrate (II)
b. potassium pentacyanonitro-N-ferrate (III)
c. potassium nitritopentacyanoferrate (IV)
d. potassium nitritopentacyanoiron (II)

120. Which of the following conditions are favourable for chemisorption?

a. Low temperature and high pressure
b. High temperature and low pressure
c. High temperature and high pressure
d. Low temperature and low pressure

MATHEMATICS

121. Shade the feasible region for the inequations $x + y \geq 2$, $2x + 3y \leq 6$, $x \geq 0$, $y \geq 0$ in a rough figure.



(d) None of the above

122. The maximum value of $x + y$ subject to $2x + 3y \leq 6$, $x \geq 0$, $y \geq 0$ is

a. 5 b. 4 c. 6 d. 3

123. Write the solution of the following LPP
Maximise $Z = x + y$

Subject to $3x + 4y \leq 12$, $x \geq 0$, $y \geq 0$.

Which point the value of Z is maximum?

a. (0, 4) b. (4, 0) c. (6, 0) d. (0, 6)

124. The vector that must be added to $\hat{i} - 3\hat{j} + 2\hat{k}$ and $3\hat{i} + 6\hat{j} - 7\hat{k}$ so resultant vector is a unit vector along the X -axis is

a. $4\hat{i} + 2\hat{j} + 5\hat{k}$ b. $-4\hat{i} + 2\hat{j} + 5\hat{k}$
c. $3\hat{i} + 4\hat{j} + 5\hat{k}$ d. Null vector

125. If $|a| = 8$, $|b| = 3$ and $|a \times b| = 12$, then find the angle between a and b .

a. $\frac{\pi}{3}$ b. $\frac{\pi}{6}$
c. $\frac{\pi}{4}$ d. None of these

126. If for $a = 2\hat{i} + 3\hat{j} + \hat{k}$, $b = \hat{i} - 2\hat{j} + \hat{k}$ and $c = -3\hat{i} + \hat{j} + 2\hat{k}$, then find $[a \ b \ c]$.

a. -15 b. -10 c. -30 d. -5

127. If for any 2×2 square matrix A ,

$$A(\text{adj } A) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}, \text{ then the value of } \det(A).$$

a. 6 b. 5 c. 7 d. 8

- 128.** If matrix $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$ and $A^2 = pA$, then the value of p is
 a. 6 b. -4 c. 4 d. 8
- 129.** If $A(\text{adj } A) = \begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$, then $|\text{adj } A|$ equals
 a. -2 b. -4 c. 4 d. 8
- 130.** The coefficients a, b and c of the quadratic equation, $ax^2 + bx + c = 0$ are obtained by throwing a dice three times. The probability that this equation has equal roots is
 a. $\frac{1}{72}$ b. $\frac{5}{216}$
 c. $\frac{1}{36}$ d. $\frac{1}{54}$
- 131.** $8^{3\log_8 5}$ is equal to
 a. $\log_8 25$ b. 120
 c. 125 d. $\log_8 15$
- 132.** The equation of normal to the curve $y = (1+x)^y + \sin^{-1}(\sin^2 x)$ at $x = 0$ is
 a. $x + y = 1$ b. $x - y = 1$
 c. $x + y = -1$ d. $x - y = -1$
- 133.** If $L = \lim_{x \rightarrow 0} \frac{a - \sqrt{a^2 - x^2} - \frac{x^2}{4}}{x^4}$, $a > 0$. If L is finite, then
 a. $a = 2$ b. $a = 1$
 c. $a = \frac{1}{3}$ d. None of these
- 134.** What will be the equation of circle whose centre is (1, 2) and touches X -axis?
 a. $x^2 + y^2 - 2x - 4y + 1 = 0$
 b. $x^2 - y^2 + 2x + 4y + 1 = 0$
 c. $x^2 + y^2 + 2x - 4y - 1 = 0$
 d. $x^2 + y^2 + 2x + 4y - 1 = 0$
- 135.** The approximate value of $f(5.001)$, where $f(x) = x^3 - 7x^2 + 15$ is
 a. -34.995 b. -33.995 c. -33.335 d. -35.995
- 136.** Find the centre and radius of the circle given by the equation $2x^2 + 2y^2 + 3x + 4y + \frac{9}{8} = 0$.
 a. 1 b. -1 c. 2 d. -2
- 137.** Find the maximum value of $f(x) = \frac{1}{4x^2 + 2x + 1}$.
 a. $\frac{3}{4}$ b. $\frac{4}{3}$
 c. $\frac{1}{3}$ d. None of these
- 138.** If $f(x) = \begin{cases} ax + 3, & x \leq 2 \\ a^2x - 1, & x > 2 \end{cases}$, then the values of a for which f is continuous for all x are
 a. 1 and -2 b. 1 and 2
 c. -1 and 2 d. -1 and -2
- 139.** The value of $\lim_{x \rightarrow 0} \left(\frac{a^x + b^x + c^x}{3} \right)^{2/x}$, $(a, b, c > 0)$ is
 a. $(abc)^3$ b. abc
 c. $(abc)^{1/3}$ d. None of these
- 140.** What will be the equation of the circle whose centre is (1, 2) and which passes through the point (4, 6)?
 a. $x^2 + y^2 - 2x - 4y - 20 = 0$
 b. $x^2 + y^2 + 2x + 4y - 20 = 0$
 c. $x^2 - y^2 - 2x - 4y + 20 = 0$
 d. $x^2 - y^2 + 2x - 4y - 20 = 0$
- 141.** The line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ is parallel to the plane
 a. $3x + 4y + 5z = 7$ b. $2x + 3y + 4z = 0$
 c. $x + y - z = 2$ d. $2x + y - 2z = 0$
- 142.** The equation of a plane passing through the line of intersection of the planes $x + 2y + 3z = 2$, $x - y + z = 3$ and at a distance $\frac{2}{\sqrt{3}}$ from the point (3, 1, -1) is
 a. $5x - 11y + z = 17$ b. $\sqrt{2}x + y = 3\sqrt{2} - 1$
 c. $x + y + z = \sqrt{3}$ d. $x - \sqrt{2}y = 1 - \sqrt{2}$
- 143.** The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is
 a. 30° b. 45°
 c. 90° d. 0°
- 144.** The point of intersection of the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ is
 a. (0, 0, 0) b. (1, 1, 1)
 c. (-1, -1, -1) d. (1, 2, 3)

145. $\int \frac{2^x}{\sqrt{1-4^x}} dx$ is equal to

- a. $(\log 2) \sin^{-1} 2^x + C$ b. $\frac{1}{2} \sin^{-1} 2^x + C$
 c. $\frac{1}{\log 2} \sin^{-1} 2^x + C$ d. $2 \log 2 \sin^{-1} 2^x + C$

146. $\int_{-\pi/2}^{\pi/2} \sin x dx$

- a. 2 b. 3 c. 0 d. 5

147. Integral of $\int \frac{dx}{x^2[1+x^4]^{3/4}}$.

- a. $-4(x^{1/4} + 1)^{1/4} + C$ b. $4(x^{1/4} + 1)^{1/4} + C$
 c. $4(x^4 + 1)^{1/4} + C$ d. None of these

148. Three of the six vertices of a regular hexagon are chosen at random. The probability that the triangle with three vertices is equilateral equals

- a. $\frac{1}{2}$ b. $\frac{1}{5}$ c. $\frac{1}{10}$ d. $\frac{1}{20}$

149. Five persons A, B, C, D and E are in queue of a shop. The probability that A and E are always together, is

- a. $\frac{1}{4}$ b. $\frac{2}{3}$ c. $\frac{2}{5}$ d. $\frac{3}{5}$

150. If A, B and C are mutually exclusive and exhaustive events of a random experiment such that $P(B) = \frac{3}{2} P(A)$ and $P(C) = \frac{1}{2} P(B)$, then

$P(A \cup C)$ equals

- a. $\frac{10}{13}$ b. $\frac{3}{13}$
 c. $\frac{6}{13}$ d. $\frac{7}{13}$

151. A student answers a multiple choice question with 5 alternatives, of which exactly one is correct. The probability that he knows the correct answer is p , $0 < p < 1$. If he does not know the correct answer, he randomly ticks one answer. Given that he has answered the question correctly, the probability that he did not tick the answer randomly, is

- a. $\frac{3p}{4p+3}$ b. $\frac{5p}{3p+2}$
 c. $\frac{5p}{4p+1}$ d. $\frac{4p}{3p+1}$

152. If x and y are acute angles, such that $\cos x + \cos y = \frac{3}{2}$ and $\sin x + \sin y = \frac{3}{4}$, then $\sin(x+y)$ equals

- a. $\frac{2}{5}$ b. $\frac{3}{4}$
 c. $\frac{3}{5}$ d. $\frac{4}{5}$

153. The expression $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A}$ can be

written as

- a. $\sin A \cos A + 1$
 b. $\sec A \operatorname{cosec} A + 1$
 c. $\tan A + \cot A$
 d. $\sec A + \operatorname{cosec} A$

154. If $\sin 2x = 4 \cos x$, then x is equal to

- a. $\frac{n\pi}{2} \pm \frac{\pi}{4}, n \in \mathbb{Z}$ b. no value
 c. $n\pi + (-1)^n \frac{\pi}{4}, n \in \mathbb{Z}$ d. $2n\pi \pm \frac{\pi}{2}, n \in \mathbb{Z}$

155. If $f(x)$ satisfies the relation $2f(x) + f(1-x) = x^2$ for all real x , then $f(x)$ is

- a. $\frac{x^2 + 2x - 1}{6}$ b. $\frac{x^2 + 2x - 1}{3}$
 c. $\frac{x^2 + 4x - 1}{3}$ d. $\frac{x^2 + 4x - 1}{6}$

156. If $A = \{1, 2, 5, 6\}$ and $B = \{1, 2, 3\}$, then $(A \times B) \cap (B \times A)$ is equal to

- a. $\{(1, 1), (2, 1), (6, 1), (3, 2)\}$
 b. $\{(1, 1), (1, 2), (2, 1), (2, 2)\}$
 c. $\{(1, 1), (2, 2)\}$
 d. $\{(1, 1), (1, 2), (2, 5), (2, 6)\}$

157. Total number of elements in the power set of A containing 15 elements is

- a. 2^{15} b. 15^2
 c. 2^{15-1} d. $2^{15} - 1$

158. What is the argument of the complex number

$$\frac{(1+i)(2+i)}{3-i}, \text{ where } i = \sqrt{-1}?$$

- a. 0 b. $\frac{\pi}{4}$ c. $-\frac{\pi}{4}$ d. $\frac{\pi}{2}$

159. Evaluate $\left[i^{18} + \left(\frac{1}{i} \right)^{25} \right]^3$.

- a. $2(1-i)$ b. $7(i-1)$
 c. $2-7i$ d. $8i+4$

160. If $(\sqrt{3} + i)^{100} = 2^{99} (a + ib)$, then $a^2 + b^2$ is equal to

- a. $\sqrt{2}$ b. 4
 c. $\sqrt{3}$ d. None of these

- 161.** Using mathematical induction, the numbers a_n 's are defined by $a_0 = 1$, $a_{n+1} = 3n^2 + n + a_n$, ($n \geq 0$). Then, a_n is equal to
 a. $n^3 + n^2 + 1$ b. $n^3 - n^2 + 1$
 c. $n^3 - n^2$ d. $n^3 + n^2$
- 162.** If $49^n + 16n + P$ is divisible by 64 for all $n \in N$, then the least negative integral value of P is
 a. -2 b. -3
 c. -4 d. -1
- 163.** $2^{3n} - 7n - 1$ is divisible by
 a. 64 b. 36 c. 49 d. 25
- 164.** The solution of the differential equation $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$ is
 a. $\tan y \cdot \tan x = C$ b. $\frac{\tan y}{\tan x} = C$
 c. $\frac{\tan^2 x}{\tan y} = C$ d. None of these
- 165.** The solution of the differential equation $y \frac{dy}{dx} = x \left[\frac{y^2}{x^2} + \frac{\phi\left(\frac{y^2}{x^2}\right)}{\phi'\left(\frac{y^2}{x^2}\right)} \right]$ is (where, C is a constant)
 a. $\phi\left(\frac{y^2}{x^2}\right) = Cx$ b. $x\phi\left(\frac{y^2}{x^2}\right) = C$
 c. $\phi\left(\frac{y^2}{x^2}\right) = Cx^2$ d. $x^2\phi\left(\frac{y^2}{x^2}\right) = C$
- 166.** The solution of the differential equation $(1 + y^2) + (x - e^{\tan^{-1} y}) \frac{dy}{dx} = 0$ is
 a. $2xe^{\tan^{-1} y} = e^{2\tan^{-1} y} + C$
 b. $xe^{\tan^{-1} y} = \tan^{-1} y + C$
 c. $xe^{2\tan^{-1} y} = e^{\tan^{-1} y} + C$
 d. $(x - 2) = Ce^{-\tan^{-1} y}$
- 167.** The value of $1 \cdot 1! + 2 \cdot 2! + 3 \cdot 3! + \dots + n \cdot n!$ is
 a. $(n+1)!$ b. $(n+1)! + 1$
 c. $(n+1)! - 1$ d. None of these
- 168.** The sum of the series $(1+2) + (1+2+2^2) + (1+2+2^2+2^3) + \dots$ upto n terms is
 a. $2^{n+2} - n - 4$ b. $2(2^n - 1) - n$
 c. $2^{n+1} - n$ d. $2^{n+1} - 1$
- 169.** If a, b, c are in AP, $b - a, c - b$ and a are in GP, then $a : b : c$ is
 a. $1 : 2 : 3$ b. $1 : 3 : 5$
 c. $2 : 3 : 4$ d. $1 : 2 : 4$
- 170.** The number of triangles which can be formed by using the vertices of a regular polygon of $(n+3)$ sides is 220. Then, n is equal to
 a. 8 b. 9
 c. 10 d. 11
- 171.** Out of 8 given points, 3 are collinear. How many different straight lines can be drawn by joining any two points from those 8 points?
 a. 26 b. 28
 c. 27 d. 25
- 172.** How many numbers greater than 40000 can be formed from the digits 2, 4, 5, 5, 7?
 a. 12 b. 24
 c. 36 d. 48
- 173.** If a polygon of n sides has 275 diagonals, then n is equal to
 a. 25 b. 35
 c. 20 d. 15
- 174.** If two pairs of lines $x^2 - 2mxy - y^2 = 0$ and $x^2 - 2nxy - y^2 = 0$ are such that one of them represents the bisector of the angles between the other, then
 a. $mn = 1$ b. $m + n = mn$
 c. $mn = -1$ d. $m - n = mn$
- 175.** The distance of the point (1, 2) from the line $x + y + 5 = 0$ measured along the line parallel to $3x - y = 7$ is equal to
 a. $4\sqrt{10}$ b. 40
 c. $\sqrt{40}$ d. $10\sqrt{2}$
- 176.** The slopes of the lines, which make an angle 45° with the line $3x - y = -5$, are
 a. 1, -1 b. $\frac{1}{2}, -1$
 c. 1, $\frac{1}{2}$ d. $-2, \frac{1}{2}$
- 177.** If 3 and 4 are intercepts of a line $L \equiv 0$, then the distance of $L \equiv 0$ from the origin is
 a. 5 units b. 12 units
 c. $\frac{5}{12}$ unit d. $\frac{12}{5}$ units
- 178.** Number of terms in the binomial expansion of $(x+a)^{53} + (x-a)^{53}$ is
 a. 25 b. 26
 c. 27 d. 26.5

179. The coefficient of x^{10} in the expansion of $1 + (1+x) + \dots + (1+x)^{20}$ is

a. ${}^{19}C_9$

b. ${}^{20}C_{10}$

c. ${}^{21}C_{11}$

d. ${}^{22}C_{12}$

180. Middle term in the expansion of $\left(x^2 + \frac{1}{x^2} + 2\right)^n$ is

a. $\frac{n!}{(n!)^2}$

b. $\frac{(2n)!}{(n!)^2}$

c. $\frac{(2n-1)!}{(n!)^2}$

d. $\frac{(2n)!}{(n!)^2}$