Question Booklet Series:

C

Entrance Test for B.Sc. Nursing/ B.Sc. Paramedical Courses – 2021

QUESTION BOOKLET

Question Booklet Number:

753308

INSTRUCTIONS

Maximum Time Allowed : 3 Hours
Negative Marking : 0.25 Marks

No. of Questions: 180
Maximum Marks: 180

Roll Number: _____ Answer Sheet Number: _____

Please read the following instructions carefully:

1) **Check the booklet thoroughly**: In case of any defect – Misprint, missing question(s) or duplication of question(s) / Page(s), get the booklet changed with the booklet of the same series from the Room Invigilator. No complaint shall be entertained after the entrance test is over.

2) Write your Roll Number and the OMR Answer Sheet Number on the question booklet.

3) Mark carefully your Roll Number, Question Booklet Number, Paper Code, Question Booklets series and Course on the OMR Answer sheet and sign at the appropriate place. Candidates shall be personally responsible for any mistake committed in making these entries in the OMR Answer Sheet. Board shall under no circumstances be responsible for any such mistake.

4) Strictly follow the instructions given by the Centre Supervisor / Room Invigilator and those given on the Question Booklet.

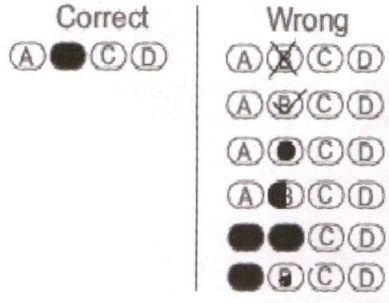
5) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of such unauthorized material, indulging in copying or impersonation or adopting unfair means / reporting late / without Admit Card will be debarred from the written test.

6) Please mark the right responses on the OMR Sheet with ONLY a Blue/Black ball point pen. Use of eraser, whitener (fluid) and cutting on the OMR Answer Sheet is NOT allowed.

7) The test is of objective type containing multiple choice questions (MCQs). Each objective question is followed by four responses. Your task is to choose the correct/best response and mark your response on the OMR Answer Sheet and NOT on the Question Booklet.

8) There will be **negative marking of 0.25 marks** for every wrong answer.

9) For marking response to a question, completely darken the CIRCLE so that the alphabet inside the CIRCLE is not visible. Darken only ONE circle for each question. If you darken more than one circle, it will be treated as wrong answer. The CORRECT and the WRONG methods of darkening the CIRCLE on the OMR Answer Sheet are shown below.



10) Please be careful while marking the response to questions. The response once marked cannot be changed and if done shall be treated as wrong answer.

11) In view of the tight time span, do NOT waste your time on a question which you find to be difficult.

12) DO NOT make any stray marks anywhere in or around the oval on the OMR Answer Sheet. It will be read as double shading and will make answer invalid. DO NOT fold or wrinkle the OMR Answer Sheet.

13) Rough work MUST NOT be done on the OMR Answer Sheet. Use your test booklet for this purpose.

14) Candidates are provided carbonless OMR Answer Sheet having original copy and candidate's copy. After completing the examination, candidates are directed to fold at perforation on the top of the sheet, tear it to separate original copy and candidate's copy and then hand over the original copy of OMR Answer Sheet to the Room Invigilator and take candidate's copy with them.

DO NOT OPEN THE SEAL OF THIS BOOKLET UNTIL TOLD TO DO SO

Section 1 – Physics

1) If the ratio of the mass number of two nuclei is 125:64, then what will be the ratio of their radii?

A) 4:5
B) 5:4
C) 1:4
D) 4:1

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2) Which of the following is CORRECT about total energy (T.E) of a particle executing simple hormonic oscillation?

A) T.E is independent of both time and displacement.
B) T.E is dependent of both time and displacement.
C) T.E depends upon time only.
D) T.E depends upon displacement only.

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3) Which of the following relation is CORRECT between electric field (E) and current density (J)? (Here σ is electrical conductivity)

A) $J=\sigma E$
B) $J=\sigma/E$
C) $J=E/\sigma$
D) $J=\sigma^2 E$

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4) If a spring of spring constant 100N/m extended 2cm from its equilibrium, then how much energy will be stored in spring in the process of extension?

A) 100J
B) 2J
C) 0.2J
D) 0.02J

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5) If the amount of charge passed in time t through a cross-section of a wire is $q(t) = t^3+3t^2+2t+20$, then what will be current at t=6s?

A) 120A
B) 136A
C) 146A
D) 150A

6) If a particle of momentum p behaves like a wave, then which of the following is wavelength associated with that wave? (h is planck's constant)

A) h/p
B) p/h
C) ph
D) ph^2

---

7) If two long, straight wires, each carrying an electric current of 3.0 A, are kept parallel to each other at a separation of 2.0 cm, then what will be magnetic force experienced by 1 m of the wire?

A) 1×10^{-5} N
B) 3×10^{-5} N
C) 6×10^{-5} N
D) 9×10^{-5} N

---

8) Which of the following is the Poission's equation? (V, G and ρ are gravitation potential, universal gravitational constant and volume density respectively)

A) $\nabla^2 V=4\pi/G\rho$
B) $\nabla^2 V=4\pi G\rho$
C) $\nabla^2 V=4\pi G/\rho$
D) $\nabla^2 V=4\pi\rho/G$

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9) A Van der Waal's gas expands from high pressure to low pressure. Which of the following relation is CORRECT for cooling effect? (Here a and b are Van der Waal's constants while R and T are gas constant and Temperature respectively)

A) 2a/RT>b
B) 2a/RT
C) 2a/RT=b
D) 2a/RT=2b

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10) Which of the following is the dimension of current density (J)? (Symbols have their usual meaning)

A) $[IL^2]$
B) $[IL^{-2}]$
C) [I]
D) [IL]

11) Which of the following statement is CORRECT about fringes formed from wedge-shaped thin films?

A) Fringe at apex is bright.
B) Fringes are straight and parallel.
C) Fringes are not equidistant.
D) Fringes are not localized.

12) Which of the following is Poisson's equation? (Symbols have their usual meanings)

A) $\nabla V = \rho/\varepsilon_0$
B) $\nabla V = -\rho/\varepsilon_0$
C) $\nabla^2 V = \rho/\varepsilon_0$
D) $\nabla^2 V = -\rho/\varepsilon_0$

13) Which of the following expression could be a solution of wave equation? (Here k, v, t, and, x are wave number, wave velocity, time and, displacement respectively.)

A) sin{k(t+x)}
B) sin{k(vt+x)}
C) tan{k(vt-x)}
D) tan{k(vt+x)}

14) If $R_1 = R_2 = R_3 = R = 10\ k\Omega$ and $C_1 = C_2 = C_3 = C = 0.001\mu F$ of a phase shift oscillator, then what will be the frequency of oscillation?

A) 5.5 kHz
B) 6.5 kHz
C) 7.5 kHz
D) 8.5 kHz

15) The slit source is at a distance of 2mm from the plane of the mirror in Lloyd's single mirror interference experiment. If the screen is kept at a distance of 3.0 m from the source and wavelength of light used is 5890Å, then what will be fringe width?

A) 0.11mm
B) 0.22mm
C) 0.33mm
D) 0.44mm

16) If the radius of curvature of the lens in a newton's ring experiment is 2cm and wavelength of light falling normally on it is 100Å, then what will be the radius of 8th dark fringe?

A) 0.04mm
B) 0.04cm
C) 0.04m
D) 0.08mm

17) Three forces of equal magnitude (10N) are applied on a body of mass 15kg. If forces are applied symmetrically with equal angles to each other, then what will be the acceleration of body?

A) 0 m/s^2
B) 1 m/s^2
C) 2 m/s^2
D) 3 m/s^2

18) Which of the following statement is CORRECT about a common emitter transistor?

A) $I_e < I_c$
B) $I_e < I_b$
C) $I_c < I_b$
D) $I_e > I_b$

19) If a message signal of frequency 20kHz is used to modulate a carrier signal of frequency 1MHz, then which one of the following is the side band produced?

A) 1000kHz
B) 1010kHz
C) 1020kHz
D) 1030kHz

20) A uniform wire of resistance 50 Ω is cut into 5 equal parts and then each of the parts are connected in parallel. Which of the following is the equivalent resistance of the combination?

A) 1Ω
B) 2Ω
C) 5Ω
D) 10Ω

21) If the electric field in an electromagnetic wave is given by $E=100NC^{-1}\sin\{\omega(t-x/c)\}$, then which of the following will be energy contained in a cylinder of cross-section $10cm^2$ and length 50 cm along the x-axis? (Symbols have their usual meaning)

A) 2.2×10^{-8} J
B) 2.2×10^{-9} J
C) 2.2×10^{-10} J
D) 2.2×10^{-11} J

22) A helicopter is flying horizontally with 600m/s, at a height of 500m from the earth. A ball has been dropped from helicopter so that it reaches to a boy who is standing on the earth. Which of the following will be horizontal distance between boy and helicopter when ball just dropped from helicopter?

A) 2km
B) 6km
C) 10km
D) 12km

23) If mass and radius of a solid sphere are M and R respectively, then which of the following is the moment of inertia about its diameter?

A) $^2/_5MR^2$
B) $^1/_5MR^2$
C) MR^2
D) $^5/_2MR^2$

24) The length of the wire is increased by 2% by applying a load of 2.5 kg-wt. What is the linear strain produced in the wire?

A) 0.1
B) 0.01
C) 0.2
D) 0.02

25) If the maximum electric field in a plane electromagnetic wave is 300 NC^{-1}, then what will be maximum magnetic field in the wave? (use $c=3.0\times10^8$ m/s)

A) 1.0×10^{10} T
B) 1.0×10^{6} T
C) 1.0×10^{-6} T
D) 1.0×10^{-10} T

26) Which of the following is the velocity of sound in a gas in which the waves of wavelength 45cm and 45.5cm produces 8 beats per second?

A) 127 m/s
B) 227 m/s
C) 327 m/s
D) 427 m/s

27) If a current I is flowing in a circular wire of radius r, then what will be the magnetic field at the center of circle? (Other symbols have their usual meanings)

A) $\mu_0 I/2\pi r$
B) $\mu_0 I/2r$
C) $\mu_0 I/4r$
D) $\mu_0 I/4\pi r$

28) Two cylinders of same material, mass and length, but one is hollow and other is solid. If twisting couple per unit twist for hollow cylinder is C' and for solid is C, then which of the following relation is CORRECT?

A) C'<C
B) C'=C
C) C'>C
D) C'/C=0.5

29) If inductance and capacitance of an LCR circuit is 2mH and 80μF, then what will be the resonant frequency (in Hertz) of that circuit?

A) 1250/π
B) 2500/π
C) 5000/π
D) 10000/π

30) A light rope is fixed at one end of the ceiling. A monkey start climbing up the rope with $2m/s^2$ acceleration from the lower end. If mass of the monkey is 40kg, then what will be the tension in the rope? (Here $g=10m/s^2$)

A) 80N
B) 320N
C) 400N
D) 480N

31) If a change of 8.0 mA in the emitter current causes a change of 7.9 mA in the collector current, then what will be the value of β? (Here β is transister parameter)

A) 49
B) 79
C) 99
D) 0.99

32) A long solenoid is formed by winding 40 turns/cm. If magnetic field at its axis is 1mT, then what is the current inside the solenoid?

A) 0.1 A
B) 0.2 A
C) 0.3 A
D) 0.4 A

33) Which of the following is the CORRECT relation between electric field (E) and potential (V)?

A) $E = -\nabla V$
B) $E = \nabla V$
C) $E = \nabla \cdot V$
D) $E = \nabla \times V$

34) If a body is projected vertically upwards with a speed of 10m/s, then what will be the maximum height reached by the body? (Here $g=10m/s^2$)

A) 10m
B) 5m
C) 2m
D) 1m

35) If v_d is drift velocity in a conductor, then the relation between current (I) and drift velocity (v_d) is

A) $I \propto 1/v_d$
B) $I \propto 1/v_d^2$
C) $I \propto v_d^2$
D) $I \propto v_d$

36) A p-channel JFET has I_{DSS} =25 mA and $V_{GS(off)}$ = 15V. If V_{GS} is 5V, then what will be I_D? (Here I_{DSS} - Drain to source current with gate shorted, V_{GS} - gate to source voltage and I_D - drain current)

A) 8.1 mA
B) 9.1 mA
C) 10.1 mA
D) 11.1 mA

37) If the light from a star is found to have a maximum intensity near the wavelength of 500 nm, then what will be the temperature of the surface of the star. (Assuming that the surface of the star emits as a blackbody and Wien constant b=0.288 cmK)

A) 6000K
B) 5960K
C) 5810K
D) 5760K

38) Which of the following is time constant of a LR circuit? (Here L and R are self inductance and Resistance)

A) LR
B) R/L
C) L/R
D) LR^2

39) Which of the following is the velocity of escape from the earth surface? (Here R and g are radius of earth and acceleration due to gravity respectively)

A) $\sqrt{gR/2}$

B) $\sqrt{gR}$

C) $\sqrt{2gR}$

D) $2\sqrt{gR}$

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40) Which of the following relation is CORRECT about root mean square velocity (v_{rms})? (Symbols have their usual meanings)

A) $v_{rms} \propto \sqrt{P}$

B) $v_{rms} \propto \sqrt{T}$

C) $v_{rms} \propto \sqrt{V}$

D) $v_{rms} \propto \sqrt{G}$

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41) Which of the following shows CORRECT dependency of potential (V) on distance (r) of an octopole?

A) $V \propto 1/r$

B) $V \propto 1/r^2$

C) $V \propto 1/r^3$

D) $V \propto 1/r^4$

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42) Which of the following statement is CORRECT about purely capacitive circuit?

A) Current and emf both have same phase

B) Current lags behind the emf by π

C) Current lags behind the emf by $\pi/2$

D) Current leads the emf by $\pi/2$

43) A charged particle of mass 2kg and charge 6C enters in to a magnetic field of 1T normally to magnetic field lines. Which of the following is cyclotron angular frequency of the charged particle?

A) 3 rad/s

B) 2 rad/s

C) 1 rad/s

D) 0 rad/s

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44) If ratio of molar heat capacities C_p and C_v of a gas is 1.33, then what will be its degree of freedom?

A) 3

B) 4

C) 5

D) 6

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45) Two buses A and B are approaching each other with the speeds of 15 m/s and 20 m/s respectively. If the distance between the buses is 105 m, then how much time will bus A take to cross bus B?

A) 15s

B) 20s

C) 7s

D) 3s

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46) Inductance of an inductor is 100mH. If a current of 2A passed through it, then what will be the energy stored in it?

A) 0.1J

B) 0.2J

C) 0.3J

D) 0.4J

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47) If an infinite plane sheet carries a uniform surface charge (σ), then which of the following is electric field near the plane? (Symbols have their usual meanings)

A) σ/ε_o

B) $\sigma/2\varepsilon_o$

C) $2\sigma/\varepsilon_o$

D) $4\sigma/\varepsilon_o$

48) Which of the following is CORRECT about magnetic field (B)?

A) $\nabla \cdot B = 0$

B) $\nabla \times B = 0$

C) $\nabla B = 0$

D) $\nabla \times \nabla \times B = 0$

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49) If ratio of maximum and minimum intensity of light in a double slit experiment is 16:9, then what will be the ratio between amplitudes of waves used in experiment?

A) 6:1

B) 7:1

C) 8:1

D) 9:1

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50) If a double refracting plate capable of producing a path difference of $\lambda/2$ between ordinary and extraordinary waves, then what will be the thickness of the plate? (Here λ=5890Å, μ_e=1.54 and μ_0=1.53)

A) 14.7μm

B) 29.4μm

C) 44.1μm

D) 58.8μm

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51) If a zone plate is behaving like a convex lens of focal length 50cm for light of wavelength 5000Å, then what will be the radius of the first half period of zone?

A) 0.3mm

B) 0.4mm

C) 0.5mm

D) 0.6mm

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52) Which of the following is the possible spin angular momentum of electron?

(Note: Here $\hbar = h/2\pi$ and h is planck's constant)

A) $\pm \hbar/2$

B) $\pm \hbar$

C) $\pm 2\hbar$

D) $\pm 3\hbar$

53) Which of the following wavelength of the radiation emitted when the electron in a hydrogen atom jumps from n = ∞ to n = 4? (Given ground state energy of hydrogen atom is -13.6eV)

A) $-13.6eV$

B) $-3.4eV$

C) $-1.5eV$

D) $-0.85eV$

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54) A body of radius R, radius of gyration K and mass M is rolling without slipping along a plane surface. If the linear velocity of the centre of mass of body is v, then what will be its kinetic energy?

A) $^1/_2 Mv^2[R^2/K^2+1]$

B) $^1/_2 Mv^2[K^2/R^2+1]$

C) $Mv^2[K^2/R^2+1]$

D) $^1/_2 Mv^2[K^2/R^2]$

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55) If a particle of mass m lies in a potential $U = 2x^2+100$ Joules/kg, then which of the following will be its angular frequency (ω) of oscillation?

A) 16 rad/s

B) 8 rad/s

C) 4 rad/s

D) 2 rad/s

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56) Which of the following is Clausius-Clapeyron's latent heat equation? (Symbols have their usual meaning)

A) $dp/dt = T/(L(V_2 - V_1))$

B) $dp/dt = T/(L(V_2 + V_1))$

C) $dp/dt = L/(T(V_2 - V_1))$

D) $dp/dt = L/(T(V_2 + V_1))$

57) If 400 fringes cross the field of view when the movable mirror is moved through 0.0589mm in a Michelson interferometer, then what will be the wavelength of light used in the experiment?

A) 1945Å
B) 2940Å
C) 2945Å
D) 5890Å

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58) The least count of a stop watch is 0.2 s. The time period of oscillations of a pendulum is measured to be 25.0 s. What is the percentage error in this measurement?

A) 0.8%
B) 8%
C) 80%
D) 0.08%

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59) Height of a tower is 10m. A lifting machine use to put bricks of mass 3kg at tower from earth surface. If lifting machine can put 100 bricks in 10s, then what will be the power of lifting machine?

A) 100W
B) 300W
C) 3000W
D) 30000W

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60) If a message signal with peak voltage of 20V is used to modulate a carrier of peak voltage of 40V, then what will be the modulation index?

A) 0.5
B) 1
C) 1.5
D) 2

Section 2 – Chemistry

61) Which of the following statements is INCORRECT regarding atomic orbitals?

A) 4s orbital has 3 radial nodes
B) 5f orbital has 2 radial nodes
C) s-orbital has no angular dependence
D) angular wave function determines the shape of electron cloud

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62) Calculate pH of a solution which is placed between hydrogen electrode and calomel electrode? Electromotive force of the electrochemical cell thus obtained was found to be +0.972V at 298K. (standard potential of the saturated KCl calomel electrode was found to be +0.242V.)

A) 10.52
B) 5.6
C) 15.62
D) 12.33

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63) What is the CORRECT expression between Reaction quotient (Q) and Equilibrium constant (K) for a reaction said to be in equilibrium?

A) Q>K
B) Q<K
C) Q=K
D) Cannot be determined

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64) One of the following property which is NOT attributed for the formation of complexes in d-block elements is:

A) Large size
B) High charge density
C) Availability of vacant d-orbitals
D) Exhibition of variable oxidation states

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65) In the formation of Ammonia from Nitrogen and Hydrogen, $N_2 + 3H_2 \rightleftharpoons 2\,NH_3$, Partial pressures of N_2 is 4×10^4 Pa, H_2 is 2×10^4 Pa and NH_3 is 5×10^4 Pa. Calculate its equilibrium constant, Kp?

A) 1.56×10^{-8}/Pa
B) 0.78×10^{-8}/Pa
C) 4.16×10^{-8}/Pa
D) 2.08×10^{-8}/Pa

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66) Which among the following statements is the CORRECT statement with respect to Chemical Kinetics?

A) A positive order in a product concentration means that the rate of a reaction is increased by Autocatalysis
B) A negative order in a concentration means that the species acts as a Promoter
C) Dissociation of hydrogen iodide is an example for trimolecular reaction
D) Half-life for a second order concentration is independent of initial concentration

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67) This reaction is known as

$$RCOOAg + Cl_2 \xrightarrow{\Delta} R\text{-}Cl + CO_2 + AgCl.$$

A) Hell Volhard Zelinsky reaction
B) Sabatier-Senderens' Reaction
C) Koch reaction
D) Hunsdiecker reaction

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68) Identify the amino acid which contains sulphur in its structure?

A) Leucine
B) Methionine
C) Valine
D) Proline

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69) The plot between temperature and pressure for a fixed amount of adsorption is called as

A) Adsorption isostere
B) Adsorption isobar
C) Adsorption isotherm
D) Adsorption isochore

70) Calculate molecular weight of a compound when 0.5g in vapor state occupies 100 mL at a pressure of 2 atm and at a temperature of 350 K? (Assume the vapor state of the compound behaves as an ideal gas)

A) 98.62 g/mol
B) 143.75 g/mol
C) 56.25 g/mol
D) 71.75 g/mol

71) Identify the product and the state of the product formed when secondary amine is treated with Hofmann's reagent?

A) Dialkyloxamide, Solid
B) Dialkyloxamide, Liquid
C) Dialkyloxamic ester, Solid
D) Dialkyloxamic ester, Liquid

72) Among the following Co-ordination compounds, identify the compound whose Effective Atomic number (EAN) is NOT equal to 36?

A) $[Ni(CO)_4]$
B) $[Co(NH_3)_6]^{3+}$
C) $[Ag(NH_3)_4]^{+}$
D) $[Fe(CO)_5]$

73) Calculate E^0_{cell} for an electrochemical cell consisting of silver electrode and lead electrode when both the half-cells have activity of 1.00? (The standard potential of silver is +0.796V and lead is -0.124V)

A) 0.672 volt
B) 2.672 volt
C) 0.920 volt
D) 2.920 volt

74) Among the following compounds, identify the compound which is an example for Tetradentate ligand?

A) porphyrin ring
B) diethylenetriamine
C) 8-hydroxyquinoline
D) 1,10-phenanthroline

75) Which of the following metal is most frequently used as inert electrodes?

A) Platinum
B) Copper
C) Zinc
D) Lead

76) A compound 'X' undergoes free-radical vinyl polymerization to give the product Orlon. Identify the compound 'X'?

A) Methyl methacrylate
B) Styrene
C) Vinyl chloride
D) Acrylonitrile

77) Read the following statements and choose the CORRECT option:

(i) The best method for the separation of naphthalene and benzoic acid from their mixture is sublimation

(ii) The best-suited method for the separation of para and ortho-nitrophenols from 1:1 mixture is steam distillation

A) (i) is FALSE and (ii) is TRUE
B) (i) is TRUE and (ii) is FALSE
C) (i) and (ii) are FALSE
D) (i) and (ii) are TRUE

78) Which of the following pair of elements show diagonal relationship?

A) Lithium, Calcium
B) Sodium, Calcium
C) Beryllium, Aluminium
D) Bromine, Iodine

79) In XeF_2 molecule, the total number of electron pairs, bond pairs, lone pairs respectively are;

A) 6, 4, 2
B) 6,3, 3
C) 8, 3, 2
D) 5, 2, 3

80) According to Le Chatelier's principle increase in the concentration of one or more reactants shifts the equilibrium in which direction?

A) Towards lesser number of gaseous molecules
B) Backward direction
C) Forward direction
D) Towards larger number of gaseous molecules

81) In which group of periodic table, chalcogens are present?

A) Group 14
B) Group 15
C) Group 16
D) Group 17

82) The functional isomer of Propanal is

A) 2-Propanol
B) Propanone
C) 1-Propanol
D) Methoxy ethane

83) The category of Chloropicrin is

A) Dye
B) Insecticide
C) Detergent
D) Antiseptic

84) Which of the following property is NOT a colligative property?

A) Relative lowering of vapour pressure of the solvent
B) Lowering of dielectric constant of the solvent
C) Depression of freezing point of the solvent
D) Elevation of boiling point of the solvent

85) What is the electronic configuration of the element which has second highest electronegativity value in the periodic table?

A) $1s^2\ 2s^2\ 2p^4$
B) $1s^2\ 2s^2\ 2p^5$
C) $1s^2\ 2s^2\ 2p^3$
D) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

86) A gas is allowed to expand from 20 mL to V2 mL when temperature is increased from 300 K to 320 K and pressure initially is 760 mm Hg and final pressure noted was 740 mm Hg. Calculate V2?

A) 35.6 mL
B) 15.2 mL
C) 21.9 mL
D) 9.8 mL

87) Which of the following statements is INCORRECT regarding Alcohols?

A) In Schotten-Baumann reaction the product formed is 3,5-dinitro benzoyl chloride
B) When Lucas reagent is added to secondary alcohols, the reaction mixture gets cloudy in 5-10 minutes
C) When vapours of secondary alcohols is passed over heated copper at 573K, ketones are obtained
D) Corey's reagent is Pyridinium Chlorochromate complex

88) Which of the following is an example of Ideal solution?

A) Solution of benzene and toluene
B) Mixture of ethanol and acetone
C) Solution of methanol and water
D) Mixture of acetone and aniline

89) Calculate the amount of heat liberated when a compound was subjected to combustion in a calorimeter at constant volume having heat capacity of 5.2 kJ/K. The temperature of the calorimeter was increased from 298 K to 303.5K.

A) 0.945 kJ
B) 0.3 kJ
C) 14.8 kJ
D) 28.6 kJ

90) If one hydrogen in diphenylmethane is replaced by chlorine the number of structural isomers are possible is

A) 4
B) 7
C) 6
D) 5

91) The formula of the co-ordination compound, Prussian blue is

A) $Fe_2[Fe_3(CN)_6]_4$
B) $Fe_3[Fe_2(CN)_4]_3$
C) $Fe_3[Fe(CN)_6]_4$
D) $Fe_4[Fe(CN)_6]_3$

92) What is the IUPAC name of the acid that is present in ants?

A) Acetic acid
B) Caproic acid
C) Methanoic acid
D) Ethanoic acid

93) Read the following statements regarding coordination or complex compounds and choose the INCORRECT option:

A) Transition elements form co-ordination compounds due to the presence of empty d-orbitals in the metal atom
B) Co-ordination compound is formed from the union of Lewis acid and Lewis base
C) Dimethylglyoxime is an example for positive monodentate ligand
D) Oxalate ion is an example for bidentate ligand

94) What is the isoelectric pH of valine if one region of buffering action is centered on 2.52 and the other is on 10.08?

A) 6.3
B) 5.8
C) 4
D) 5.4

95) Aqueous solution of HCl is the best conductor of electric current because HCl is

A) strong base
B) weak base
C) weak acid
D) strong acid

96) What is the electronegativity value of the halogen in Pauling scale which exhibits only "-1" oxidation state in the halogens group?

A) 4
B) 1.2
C) 2.7
D) 2

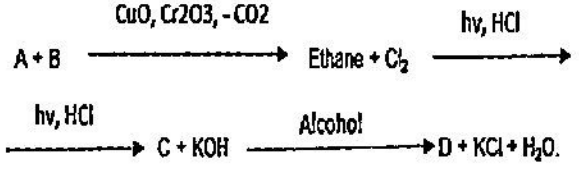
97) Read the following statements and choose the CORRECT option regarding characteristics of catalyst in chemical kinetics:

A) In the presence of a catalyst, the heat evolved or absorbed during the reaction decreases
B) In the presence of a catalyst, the heat evolved or absorbed during the reaction increases
C) In the presence of a catalyst, the heat evolved or absorbed during the reaction remains unchanged
D) In the presence of a catalyst, there is change in Gibbs free energy and equilibrium of reaction

98) When 1000 J of heat is supplied to the thermodynamic system, there was a decrease in internal energy by 200 J. What is the work done?

A) 1200 J, work is done on the system by the surroundings.
B) -1200 J, work is done by the system on the surroundings.
C) -800 J, work is done by the system on the surroundings.
D) 800 J, work is done on the system by the surroundings.

99) What are A, B, C, D respectively in the reaction?



A) Propene, Grignard's reagent, Ethylchloride, Ethene
B) Propanol, Grignard's reagent, Ethylchloride, Ethene
C) Propanal, Sodium, Ethylchloride, Ethylene
D) Propanoic acid, Pyridine, Ethylchloride, Ethylene

100) Among the following group of compounds, Identify the group of compounds which are formed by ionic bond only?

A) NaCl, CaO, KF, H_2O
B) $MgCl_2$, CaF_2, KCl, NO_2
C) CsCl, $MgBr_2$, NaF, KCl
D) $CaCl_2$, MgF_2, HCl, AgCl

---

101) Which of the following statement is TRUE regarding the alkanes preparation by Kolbe's electrolysis method?

A) Alkane and carbon dioxide are collected at cathode and hydrogen and KOH are collected at anode
B) Alkane and carbon dioxide are liberated at Anode and hydrogen and KOH are collected at cathode
C) Alkane and hydrogen are liberated at Anode and carbon dioxide and KOH are collected at cathode
D) Alkane and hydrogen are liberated at cathode and carbon dioxide and KOH are collected at anode

---

102) Identify the spontaneous reaction which is an endothermic type of reaction?

A) Burning wood
B) Combustion of methane
C) Acid-base neutralization
D) Dissolution of ammonium nitrate in water

---

103) What are A and B in the reaction respectively?

$$CH_2{=}CH_2 + CO + H_2O \xrightarrow{H_3PO_4,\,673\,K} A \xrightarrow{Cu,\,Quinoline} B.$$

A) Ethanoic acid, Ethyne
B) Propanoic acid, Ethane
C) Propanol, Propene
D) Propanone, Propyne

---

104) Among the following, identify the INCORRECT statement regarding coordination number and crystal geometry?

A) Coordination number in CsCl is 8 and the crystal structure is Cubic
B) Coordination number in NaCl is 5 and the crystal structure is Pyramidal
C) Coordination number in ZnS is 4 and the crystal structure is Tetrahedral
D) Coordination number in BN is 3 and the crystal structure is Triangular

---

105) Among the following statements, identify the CORRECT statement regarding amino acids?

A) The α-carbon atom in glycine is bonded to 4 different substituent groups
B) Proline is an iminoacid as it contains tertiary amine group. This offers rigidity to the peptide chain in proteins
C) Serine, Lysine, Histidine amino acids contain polar uncharged 'R' groups
D) Tryptophan contains indole group and tyrosine contains phenolic group as their 'R' groups

---

106) 0.2 moles of Helium gas behaving as an ideal gas is allowed to expand its volume from 2 dm^3 to 4 dm^3 at 300 K. What is the maximum work that can be done by the system? (Log 2=0.3010)

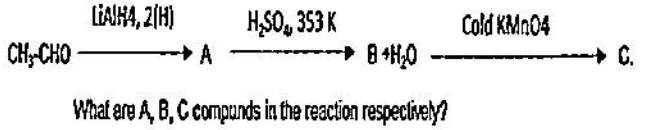
A) -345.79 J, Work is done by the system on the surroundings.
B) 345.79 J, Work is done by the system on the surroundings.
C) -82.35 J, Work is done by the system on the surroundings.
D) 82.35 J, Work is done by the system on the surroundings.

---

107) Which of the following statements is TRUE regarding Octane number?

A) When hydrocarbon chain is branched, octane number decreases
B) Octane number of 100 means is considered as a bad fuel
C) When hydrocarbon chain length is increased, octane number decreases
D) Acyclic alkanes have higher octane number than cycloalkanes

108)



What are A, B, C compounds in the reaction respectively?

A) Ethylene, Ethanol, Acetone
B) Ethylene, Ethanol, Acetic acid
C) Ethanol, Ethylene, Ethylene Glycol
D) Ethylene, Ethanol, Propanone

---

109) Which of the following is an example of synthetic polymer?

A) Starch
B) Cellulose
C) Nylon
D) Rubber

---

110) Among the following electronic configurations, which electronic configuration corresponds to atoms with high electronegativity?

A) ns^2np^1
B) ns^2np^2
C) ns^2np^4
D) ns^2np^5

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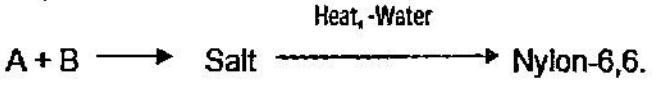
111)



What are A and B in the reaction respectively?

A) Methyl terephthalate and Ethylene glycol
B) Adipic acid and Hexamethylenediamine
C) Phthalic anhydride and Glycerol
D) Phthalic anhydride and Phenol

---

112) Which among the following equations represents de Broglie equation?

A) $\lambda = E/hc$
B) $E = mc^2$
C) $\lambda = h/mv$
D) $E = hc/\lambda$

113) Electronic configuration of the element Technetium with the atomic number 43 is

A) $[Kr]4d^{10}5s^1$
B) $[Kr]4d^{10}5s^2$
C) $[Kr]4d^{1}5s^2$
D) $[Kr]4d^{5}5s^2$

---

114) Which of the following statements is INCORRECT regarding Aliphatic amines?

A) N-H------N hydrogen bond is weaker than O-H-----O hydrogen bond
B) Tertiary amines do not show up a peak in infrared spectroscopy
C) Primary and secondary amines are more soluble in water compared to hydrocarbons of similar molecular weight
D) Primary, secondary and tertiary amines form intermolecular hydrogen bonds

---

115) Calculate Degrees of Freedom for a gas-liquid-solid system containing single component?

A) 0
B) 1
C) 2
D) 3

---

116) Which of the following statements is INCORRECT about Adsorption?

A) It is a spontaneous process
B) The molecular species or substance, which concentrates or accumulates at the surface is adsorbent
C) The free energy change of the system is negative for adsorption process
D) It is an exothermic process

---

117) Calculate the % ionic character according to Pauling in HCl if electronegativities of Hydrogen and Chlorine are 2.1 and 4.5 respectively?

A) 81.33%
B) 56.58%
C) 70.58%
D) 68.23%

118) Among the following statements, identify the statement which is INCORRECT?

A) Salol and camphor is an example for eutectic mixture
B) As per kinetic molecular theory, the average kinetic energy of gas molecules is inversely proportional to absolute temperature
C) Kinetic molecular theory states that the gas particles are in constant motion and exhibit perfectly elastic collisions
D) For a single component system containing 2 phases, Degrees of Freedom is 1

---

119) The method that is used for the separation of lanthanides which is based on the differences in partition coefficient of lighter and heavier lanthanides between water and tri-butyl phosphate is

A) Fractional crystallization method
B) Fractional precipitation method
C) Solvent extraction method
D) Valency change method

---

120) The example of molecule having sp hybridisation is

A) C_2H_6
B) CH_4
C) BCl_3
D) $BeCl_2$

Section 3 – Biology

121) Match the following microbes given in List - I with their uses in industrial production of Organic acids given in List – II

List - I (Microbes)	List - II (Organic acids)
A) Aspergillus niger	1) acetic acid
B) Acetobacter aceti	2) butyric acid
C) Clostridium butylicum	3) citric acid
D) Lactobacillus	4) lactic acid

A) A - 2, B - 4, C - 1, D - 3
B) A - 4, B - 3, C - 1, D - 2
C) A - 1, B - 2, C - 3, D - 4
D) A - 3, B - 1, C - 2, D - 4

122) Match the following diseases given in List I with the deficient nutrient causing it given in List II

List I (Disease name)	List II (Nutrient Deficiency)
P) Khaira disease	1) Copper
Q) Exanthema	2) Boron
R) Brown Heart disease	3) Calcium
S) Bitter pit	4) Zinc

A) P-3, Q-1, R-2, S-4
B) P-4, Q-2, R-1, S-3
C) P-2, Q-1, R-3, S-4
D) P-4, Q-1, R-2, S-3

123) In cDNA cloning of ripening-related genes in tomato fruit, what is the role of pTOM6 clone in ripening process?

A) Red coloration
B) Fruit softening
C) Ripening trigger
D) Stop ripening

124) In a single flower with many stamens, when development of stamen maturation starts at the outside and then gradually towards the center, what is the term used to describe for such an androecium?

A) Basifixed
B) Centrifugal
C) Centripetal
D) Connective

125) Which of the following steps is involved in closure of stomata during night time?

A) Increase in turgor pressure of the guard cells
B) Hydrolysis of starch into sugars due to increase in pH
C) Formation of starch from soluble sugars due to decrease in pH
D) Increase in osmotic concentration

126) Read the following statements regarding function of radial spokes the axoneme component of cilia and flagella and choose the CORRECT option:

A) It is the principal components of microtubules
B) It holds adjacent microtubule doublets together
C) It extend from each of the nine outer doublets inward to the central pair
D) It projects from microtubule doublets and interact with adjacent doublets and produce bending

127) Which of the following is INCORRECT about hypophosphatemia?

A) Decreased intake or absorption of Pi
B) Renal phosphate loss
C) Non-heritable
D) Transcellular shifts of Pi from extracellular to intracellular space

128) Convergent evolution is

A) when different organisms independently evolve similar traits
B) when different organisms independently evolve different traits
C) change in the frequency of alleles in populations of organisms from generation to generation
D) movement of genes into or through a population by interbreeding

129) Flowers having two long and two short stamens are known as

A) Diadelphous
B) Didynamous
C) Monadelphous
D) Synandrous

130) Which of the following structural features about human oviducts is INCORRECT?

A) They are paired tubes extending from near each ovary to the top of the uterus
B) Nearest to ovary, the oviduct has a funnel-shaped portion known as oviductal infundibulum
C) The point at which the oviduct empties into the uterine cavity is termed as oviductal ampulla
D) Middle layer of oviducts consists of smooth muscles which helps in transport of ovum towards the uterus

131) Which of the following type of Tap root system modification is found in Radish?

A) Tuberous
B) Conical
C) Fusiform
D) Napiform

132) Inbreeding is the production of offspring from the mating or breeding of individuals or organisms that are closely related genetically. Which of the following is reduced through Inbreeding?

A) Mutations
B) Homozygosity
C) Genetic diversity
D) Congenital defects

133) Which of the following statements is CORRECT regarding Apoplast pathway of movement of water in plants?

A) The movement of water is aided by cytoplasmic streaming
B) The neighbouring cells are connected through cytoplasmic strands that extend through plasmodesmata
C) The movement of water occurs exclusively through the intercellular spaces and the walls of the cells
D) The water has to enter the cells through the cell membrane, hence the movement is relatively slower

134) Which of the following is an example of autosomal dominant disorder?

A) Cystic fibrosis
B) Huntington's disease
C) Sickle cell anemia
D) Tay Sachs disease

135) Absorption of water by seeds and dry wood are examples of

A) Guttation
B) Plasmolysis
C) Transpiration
D) Imbibition

136) In which state, photochemical reaction by excited form of chlorophyll-a takes part?

A) ground state
B) first singlet state
C) second singlet state
D) metastable triplet state

137) When insufficient hemopoiesis results from inability of the stomach to produce intrinsic factor which is needed for absorption of vitamin B12 in small intestine, it is a condition of

A) aplastic anaemia
B) haemolytic anaemia
C) pernicious anaemia
D) thalassemia

138) The J-shaped growth curve describes growth to be density-independent since regulation of growth rate is not tied to the population density until the final crash. Which of the following exponential equation is represented by J-shaped growth curve?

A) dt/dN = rN
B) dt = dN/rN
C) rN = dN/dt
D) dN = rN/dt

139) In Biolistic method, there is a step wise process for preparation of microcarriers. Choose the CORRECT step-wise order?

A) Suspensions of the microcarriers are then stored as aliquots, either at 4°C (gold) or at -20°C (tungsten)

B) Pretreated by washing the microcarriers in ethanol and sterile distilled water

C) Microcarriers are mixed, washed with ethanol and then re-suspended in ethanol

D) The microcarriers are then applied to macrocarrier membrane as an ethanol suspension and dried on the macrocarrier

E) Plasmid DNA are attached to the gold microcarriers by mixing both in 2.5 mol l^{-1} $CaCl_2$ and 0.1 mol l^{-1} spermidine

A) B>A>E>C>D
B) A>B>C>D>E
C) B>C>A>E>D
D) B>C>E>A>D

140) In succulent (CAM) plants, which of the following is the reason that causes opening of stomata during night time?

A) Accumulated organic acids break down rapidly releasing excess amount of carbon dioxide
B) Incomplete oxidation of carbohydrate in respiration and accumulation of organic acids
C) Low chlorophyll content
D) Low water content

141) Which of the following law states that a "certain organism's survival and existence depend upon the multifaceted set of conditions wherein each individual has definite minimum, maximum and optimum ecological factors to establish success"?

A) Lindeman's Law
B) Liebig's Law of limiting factor
C) Shelfords Law of tolerance
D) Blackman's Law of limiting factor

142) The stems of maize and sugarcane have supporting roots coming out of the lower nodes of the stem. These are called

A) climbing roots
B) prop roots
C) stilt roots
D) parasitic roots

143) The upper respiratory tract includes which of the following?

A) Trachea, primary bronchi, lungs
B) Nasal passages, lungs, larynx
C) Pharynx, trachea, lungs
D) Nasal passages, pharynx, larynx

144) Paired pouch-like glands, lie at the base of the urinary bladder. Secretes an alkaline, viscous fluid rich in sugar fructose an important nutrient for sperm. Identify the organ.

A) Prostate gland
B) Seminal Vesicles
C) Bulbourethral glands
D) Epididymis

145) The 'Montreal Protocol' is an international treaty designed to fulfil the objective of

A) Ozone layer protection
B) Wild life protection
C) Forest conservation
D) Water conservation

146) In humans, which layer of uterine fundus plays a major role in creating strong contractions during labor?

A) Perimetrium
B) Myometrium
C) Endometrium
D) Exometrium

147) Which of the following is a condition of Arteriosclerosis?

A) improper beating of the heart, whether irregular, too fast or too slow
B) continuous or sustained rise in the arterial blood pressure
C) blood clot forms in a vein located deep inside your body
D) calcification of plaques making wall of the arteries rigid and stiff

148) Which one of the following is more in number in the middle piece of human sperm?

A) Mitochondria
B) Acrosome
C) Nucleus
D) Centriole

149) Thallophytes lack a well-differentiated body structure and the plant body is thallus like. The common examples are

A) Marchantia
B) Funaria
C) Volvox
D) Selaginella

150) Which of the following is TRUE about Cricoid cartilage?

A) acts as lid if the larynx is likened to a box
B) leaf-shaped cartilage attached to posterior wall of larynx
C) shaped like a signet ring, completely encircling the larynx
D) has two pyramid shaped cartilages situated on top broad part of thyroid cartilage

151) Choose the CORRECT option of ecological groups that shows such adaptations:
I) Plants with moderate amount of water available to the roots
II) Plants adapted to long period of extreme dryness

A) I) Xerophytes II) Epiphytes
B) I) Mesophytes II) Hydrophytes
C) I) Epiphytes II) Mesophytes
D) I) Mesophytes II) Xerophytes

152) Ciliary zonules are a ring of fibrous structures anchoring the ciliary body with the lens of the

A) eye
B) ear
C) nose
D) teeth

153) At which stage of meiosis, orientation of chromosome occurs leading to independent assortment of genes?

A) interphase
B) metaphase I
C) telophase I
D) cytokinesis

154) Who among the following stated the principle that within sufficiently large populations, the allele frequencies remain constant from one generation to the next unless the equilibrium is disturbed by migration, genetic mutation, or selection?

A) Gregor Mendel
B) William Bateson
C) Thomas Hunt Morgan
D) Hardy–Weinberg

155) Which of the following is a proteinaceous interdoublet linkage that function like a rubber bands to resist the sliding between adjacent double microtubules?

A) dynein
B) nexin
C) tubulin
D) myelin

156) Which of the following assumptions is CORRECT regarding Lotka-Volterra predator-prey model a mathematical model?

A) Number of prey decreases if the number of predators falls below a threshold
B) The interaction involves only one predator and one prey species
C) The interaction between prey and predators was developed to account as well for organisms (such as bacteria) taking up nutrients
D) Serves as one of the important building blocks in studies of complex biochemical reactions in ecology

157) It is a saprophytic fungus, commonly known as "common pinmould" grows on animal dung, wet shoes, rotten fruit, decaying matter. Identify the fungal type?

A) albugo
B) mucor
C) phytophthora
D) saprolegnia

158) Mimoseae is a sub-family of Leguminoseae which is the second biggest family of dicotyledons. Identify the characteristic way in which it distinguishes from other sub-families of Leguminoseae?

A) Flowers are papilionaceous and racemose inflorescence
B) Flowers are zygomorphic and racemose inflorescence
C) Flowers are regular, small and spherical head inflorescence
D) Flowers are regular, small and racemose inflorescence

159) In which era did the first flowering plants evolve?

A) coenozoic
B) mesozoic
C) palaeozoic
D) proterozoic

160) The dough, which is used for making foods such as dosa and idli is also fermented by bacteria. The puffed-up appearance of dough is due to the production of

A) Oxygen
B) Nitrogen
C) Hydrogen
D) Carbon dioxide

161) The hypopigmentation disorder, albinism in humans is controlled by a recessive gene (a). If, one of the parents is an albino (aa) and the other is a carrier (Aa), What is the chance that any pregnancy would result in an albino child?

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

162) Obligate parasites are fully dependent on the host for a specific stage of their life-cycle or the entire length of their lives. The examples of obligate parasite are

A) Plasmodium falciparum
B) Naegleria fowleri
C) Hymenolepis diminuta
D) Strongyloides stercoralis

163) A Nephron can be divided into three major regions - Proximal nephron, Loop of Henle and Distal nephron. Which of the following is TRUE about "Loop of Henle"?

A) The first fourth-fifth of the descending limb constitutes the thick segment and has the same diameter as that of the proximal tubule
B) The first fourth-fifth of the descending limb constitutes the thin segment and has the same diameter as that of the proximal tubule
C) The distal part of the descending limb is the thick segment and is lined by flat epithelial cells
D) The distal part of the ascending limb has no thin segment

164) Which of the following refers to the phenomenon that progeny of diverse varieties of a species or crosses between species exhibit greater biomass, speed of development, and fertility than both parents?

A) Micropropagation
B) Out breeding
C) Out crossing
D) Heterosis

165) When stomata is distributed on both the surfaces of leaves but more on the lower side and less on the upper side. What are such leaves known as?

A) Hypostomatic
B) Amphistomatic
C) Astomatic
D) Epistomatic

166) The scientific name of mango is written as Mangifera indica. In this name Mangifera represents the genus while indica is a particular

A) kingdom
B) class
C) family
D) species

167) Which of the following genetic disorders is caused by the deletion of genetic material on the 'p' arm of chromosome 5?

A) Cri du chat syndrome
B) Klinefelter syndrome
C) Turner syndrome
D) Down syndrome

168) In Myelinated neurons, between the layers of Schwann cell plasma membrane there is a small amount of fatty substance called

A) synaptic cleft
B) myelin
C) neurilemma
D) axolemma

169) Some carrier or transport proteins allow diffusion only if two types of molecules move together. When a molecule moves across a membrane independent of other molecules, the process is called

A) antiport
B) symport
C) aquaporin
D) uniport

170) Found in those syncarpous ovaries, where the carpels are fused laterally and ovary becomes one-chambered. The placentae develop on the ovary wall and the number of placentae is equal to the number of carpels. Identify the type of placentation?

A) Basal
B) Axile
C) Superficial
D) Parietal

171) How many carpels are found in Hibiscus?

A) Three carpels
B) One carpel
C) Five carpels
D) Two carpels

172) Cyclosporin A is a drug derived from Trichoderma polysporum. It is used as a

A) immunostimulant
B) anticoagulant
C) immunosuppressant
D) antacid

173) Pure-line selection is a method for breeding self-pollinated species and has been proven successful, but it did have few disadvantages. Which of the following is a disadvantage of this method?

A) Attains the maximum possible improvement of over the original variety
B) Upper limit on improvement is set by the genetic variation present in the orignal population
C) Extremely uniform since all the plants in the variety has the same genotype
D) Variety is easily identified in seed certification programmes due to its extreme uniformity

174) The roots which arise from petiole or veins of leaf due to some injury is

A) Napiform roots
B) Fusiform roots
C) Fibrous roots
D) Foliar roots

175) The Akap4 gene encodes an AKAP and is only expressed in

A) breast cells
B) spermatogenic cells
C) hepatic cells
D) pancreatic cells

176) When the perianth and androecium are inserted around the base of the gynoecium and in some flowers the stamens may be adnate to the base of the petals, such flowers are usually

A) hypogynous
B) perigynous
C) epigynous
D) gamosepalous

177) The behaviour of the plant cells with regard to water movement depends on the surrounding solution. If the external solution balances the osmotic pressure of the cytoplasm, it is said to be

A) isotonic
B) hypotonic
C) hypertonic
D) plasmolysis

178) Which of the following is INCORRECT about Androgen in male reproductive system?

A) Stimulates the growth and the maintenance of male tissues
B) Testosterone,5α-dihydrotestosterone, androstenedione and dihydroepiandrosterone are the androgens found in blood of human males
C) 5α-dihydrotestosterone is found to have the highest percentage in blood plasma
D) Testosterone and DHT are potent androgens as they stimulate androgen-dependent structures in very low dosages

179) Which of the following options is INCORRECT about Orchidaceae family?

A) The androecium is represented by one or two sterile anthers
B) The gynoecium is monocarpellary syncarpous with axile placentation
C) The pollen grains are either granular or agglutinated into waxy pollinia
D) The presence of 2 to 8 pollinia per anther and they are free or more or less loosely united

180) Synthetic variety is produced by crossing in all combinations a number of inbreds that combine well with each others. Choose the CORRECT option of steps involved in development of synthetic variety?

A) Evaluation of inbred lines for GCA

B) Isolation of inbred lines

C) Mixing of seed of all F1 crosses in equal quantity

D) Intermating of good general combining inbreds in all possible combinations

A) BADC
B) DACB
C) BCAD
D) CDAB