

Question Booklet Series:

C

**Entrance Test for B.Sc. Nursing/
B.Sc. Paramedical Courses – 2020
QUESTION BOOKLET**

Question Booklet Number:

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.

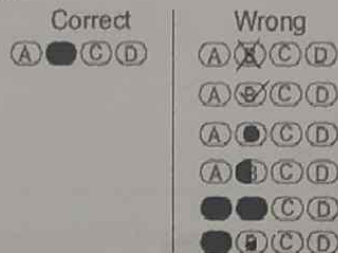
5) Candidates are not allowed to carry any papers, notes, books, calculators, cellular phones, scanning devices, pagers etc. to the Examination Hall. Any candidate found using, or in possession of such unauthorized material, indulging in copying or impersonation or adopting unfair means / reporting late / 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

13-17 11.25

Section 1 – Physics

1) What is the length of a simple pendulum which ticks seconds?

- A) 1.50 m
- B) 0.88 m
- C) 2.05 m
- D) 0.99 m

2) Moving charge produces

- A) Neither electric nor magnetic field
- B) Magnetic field
- C) Electric field
- D) Both magnetic and electric field

3) What happens to the electric potential energy if a positive charge is shifted from a low potential region to a high potential region?

- A) decreases
- B) increases
- C) remains same
- D) becomes zero

4) The most effective method of inducing nuclear fission is by using

- A) Fast Proton
- B) Fast Neutron
- C) Slow Neutron
- D) Slow Proton

5) A, B and C are three vectors such that $A = B + C$ and $B = C + A$. Which of the following statements is correct?

- A) $C = A + B$
- B) $B = C - A$
- C) C is a unit vector
- D) C is a null vector

Handwritten derivation for question 5:

$$A = B + C$$

$$B = C + A$$

$$A = C + A + C$$

$$0 = 2C$$

$$C = 0$$

6) To obtain p type extrinsic semiconductor, the impurity element to be added to germanium should be of valency

- A) 5
- B) 4
- C) 3
- D) 2

7) The wave which is used for satellite communication is

- A) Sky
- B) Ground
- C) Sound
- D) Space

8) A body is launched up from north pole with a vertical velocity v . Find the height to which the body will rise.

Given, R = radius of the earth and g = acceleration due to gravity at the surface of the earth.

- A) $v^2 / 2g$
- B) $v^2 R / 2g$
- C) $v^2 R / (2gR - v^2)$
- D) $v^2 / (2gR - v^2)$

9) An air bubble of radius r rises with a uniform velocity of v through a liquid of density ρ . Neglecting the density of air, what is the coefficient of viscosity of the liquid?

- A) $2r^2 \rho g / v$
- B) $r^2 \rho g / 3v$
- C) $2r^2 \rho g / 9v$
- D) $r^2 \rho g / 7v$

10) In a diatomic molecule, the rotational energy at a given temperature

- A) is inversely proportional to the translational kinetic energy
- B) has the same values for all molecules
- C) equals the translational kinetic energy for each molecule
- D) obeys Maxwell distribution

11) A TV tower has a height of 144m. What is the maximum distance up to which the TV transmission can be received? (radius $R = 8 \times 10^6 m$)

- A) 48km
- B) 24km
- C) 36km
- D) 12km

12) The rays of different colours fail to converge at a point after going through a converging lens. The name of the defect is called as

- A) chromatic aberration
- B) distortion
- C) spherical aberration
- D) coma

13) When placed in a non uniform magnetic field, Diamagnetic substances tend to

- A) move from weaker to stronger magnetic field
- B) move from stronger to weaker magnetic field
- C) create their own magnetic field
- D) attract other metals

14) The photocurrent in an experiment on photoelectric effect, increases if

- A) the exposure time is increased
- B) there is increase in the intensity of the source
- C) the exposure time is decreased
- D) there is decrease in the intensity of the source

15) The unit of capacitive reactance is

- A) Mho
- B) Coulomb
- C) Coulomb per sec
- D) Ohms

16) A fuse wire with radius of 0.02 mm blows with a current of 5A. What is the current required to blow another fuse wire of the same material which has a radius of 0.04 mm?

- A) 5.5 A
- B) 14.1 A
- C) 22.3 A
- D) 37.8 A

17) To produce a pure spectrum, the incident light is made to pass through a narrow slit placed in the focal plane of an achromatic lens because a narrow slit

- A) increases intensity
- B) allows only one colour at a time
- C) allows a more parallel beam when it passes through the lens
- D) produces less diffraction

18) After how much interval from $t=0$ will its displacement be half of its amplitude if the periodic time of an executing simple harmonic motion is 2 seconds?

- A) 1/2 sec
- B) 2/3 sec
- C) 1/9 sec
- D) 1/6 sec

19) The magnetic flux through a surface of area A placed in a uniform magnetic field B is given by

- A) $\Phi = - B A$
- B) $\Phi = B A \cos \theta$
- C) $\Phi = - B A \cos \theta$
- D) $\Phi = B/A \cos \theta$

20) The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is

- A) Infinite
- B) Five
- C) Three
- D) Zero

Handwritten notes and calculations:

- Top left: $58728_1C 484$
- Top right: 484 , 49 , 49 , 49 , 49
- Left margin: $144 \times 12 = 1728$, $1728 \div 1936 = 0.89$
- Right margin: $49 \div 1936 = 0.025$, $490 \div 1936 = 0.25$
- Bottom left: $v = IR$, $v = IR$, $176 \div 7W = 25.14$, $0.02 \times 0.02 = 0.0004$
- Bottom center: $R \propto \frac{1}{A}$, $R \propto \frac{1}{A}$, 0.04
- Bottom right: $2\pi r h$, $2 \times \frac{12}{7} \times 2 \times h = 2 \times \frac{24}{7} \times h = 6.857 \times h$

21) Kinetic energy of oxygen molecule at 0°C is 9.4×10^{-21} J. What will be the Avogadro's number, when $R = 8.31 \text{ J mole}^{-1} \text{ K}^{-1}$?

- A) 6.033×10^{23}
- B) 6.033×10^{20}
- C) 6.033×10^{21}
- D) 6.033×10^{24}

22) A drop of petroleum when spreads on the water surface displays colourful patterns during day light due to

- A) interference of light
- B) dispersion of light
- C) polarization of light
- D) reflection of light

23) In a potentiometer experiment the balancing with a cell is at a length of 240 cm. On shunting the cell with a resistance of 2 ohms, the balancing length becomes 120 cm. What is the internal resistance of the cell?

- A) 1 ohm
- B) 4 ohm
- C) 0.5 ohm
- D) 2 ohm

24) A particle of mass m is moving in a horizontal circle of radius r . The centripetal force acting on the particle is $-B/r^2$, where B is a constant. The total energy of the particle is

- A) B/r
- B) $-B/r$
- C) $B/2r$
- D) $-B/2r$

25) The equation, $p = E/c$ is valid

- A) for an electron but not for a photon
- B) for an electron as well as for a photon
- C) neither for an electron nor for a photon
- D) for photon but not for an electron

26) In most AC generators in USA

- A) the coils rotate in the magnetic field at a frequency of 50 Hz
- B) the coils are stationary but magnets are rotated at 50 Hz
- C) the coils rotate in the magnetic field at a frequency of 60 Hz
- D) the coils are stationary but magnets are rotated at 60 Hz

27) In a p-n junction photodiode, the value of the photo electromotive force produced by monochromatic light is proportional to

- A) the voltage applied at the p-n junction
- B) the intensity of light falling on the cell
- C) the frequency of light falling on the cell
- D) the barrier voltage at p-n junction

28) Which of the following quantity has the dimensional formula $\text{ML}^2\text{T}^{-3}\text{I}^{-2}$?

- A) Electric field
- B) Electric potential
- C) Resistance
- D) Inductance

29) In a process of negative β decay

- A) an atomic electron is ejected
- B) an electron which is already present within nucleus is ejected
- C) a neutron is converted to a proton, while releasing an electron and an antineutrino
- D) a proton in the nucleus decays emitting an electron

30) Meissner effect is seen in

- A) Insulators
- B) Paramagnetic substances
- C) Ferromagnetic substances
- D) Non magnetic substances

wave nature of matter.

$m v = \frac{h \nu}{c}$
 $\lambda = \frac{h}{m v}$
 de Broglie

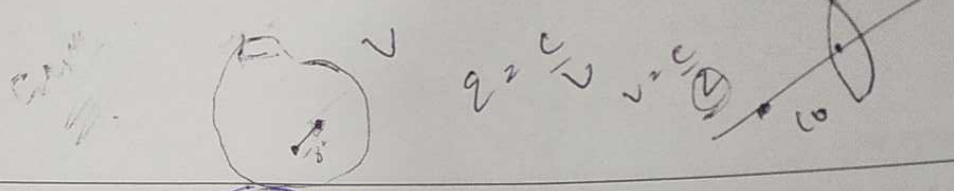
$\frac{M V}{2} + \frac{M V}{2}$

$\frac{M V}{2} + \frac{M V}{2}$

$R = \frac{V}{I}$
 $V = I R$

$V = I R$

$\frac{1}{2} M V^2$



11) 31) The separation between the plates of a charged parallel plate capacitor is increased. Which of the following quantities will change?

A) charge on capacitor
 B) potential difference across the capacitor
 C) the dielectric constant
 D) energy density between the plates

36) An object is placed on the principal axis of a concave mirror of focal length 10 cm at a distance of 8.0 cm from the pole. What is the image distance from the pole?

A) 20 cm
 B) 30 cm
 C) 40 cm
 D) 50 cm

17) 32) Consider a thin spherical shell of mass M and radius R . The gravitational field at a distance r ($r < R$) from the centre of the shell is

A) Zero
 B) inversely proportional to r^2
 C) directly proportional to r^2
 D) directly proportional to r

37) A wire of resistance R is cut into n equal parts. These parts are then connected in parallel. What is the equivalent resistance of the combination?

A) nR
 B) R/n
 C) n/R
 D) R/n^2

33) Two bodies of masses m_1 and m_2 , respectively, where $m_2 > m_1$, possess same momentum. What is the ratio of their respective kinetic energies (K_1 / K_2)?

A) m_1 / m_2
 B) m_2 / m_1
 C) $m_1 / (m_1 + m_2)$
 D) $m_2 / (m_1 + m_2)$

38) Find the ratio between the velocities of two bodies A and B, if their displacement - time curves make 30° and 60° angles with the time axis respectively.

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

13) 34) In the propagation of polarised light waves, what is the angle between the plane of vibration and the plane of polarisation?

A) 45°
 B) 90°
 C) 60°
 D) 30°

39) What is the magnitude of the capacitive reactance (in ohms) in a circuit if a 2 mF capacitor is connected to a 110 V, 60 Hz source?

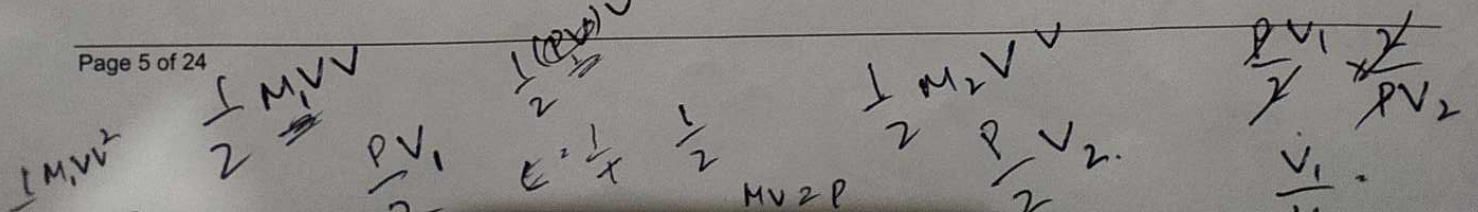
A) 1.33
 B) 0.75
 C) 0.13
 D) 7.5

35) A 1 degree rise in temperature is observed in a conductor by passing some current. When the current is doubled, the rise in temperature will be equal to

A) 1°C
 B) 2°C
 C) 2.5°C
 D) 4°C

40) If E and B are the electric and magnetic field vectors of electromagnetic waves, then the direction of propagation of electromagnetic waves is along the direction of

A) B
 B) E
 C) $B \times E$
 D) $E \times B$



41) What happens when a dielectric slab is introduced between the plates of a capacitor connected to a battery?

- A) charge on capacitor increases
- B) potential difference across the capacitor increases
- C) energy stored decreases
- D) capacity remains the same

42) The moment of inertia of a thin spherical shell of mass M and radius R about a tangent in its plane is

- A) $MR^2/2$
- B) $MR^2/3$
- C) $2MR^2/3$
- D) $5MR^2/3$

43) The work done by the system is equal to the decrease in its internal energy in a system which undergoes a change. What kind of change the system has undergone?

- A) Isothermal change
- B) Isochoric change
- C) Isobaric change
- D) Adiabatic change

44) The energy gap between valence band and conduction band is 10eV . The given material is said to be a/an

- A) semiconductor
- B) insulator
- C) metal
- D) superconductor

45) As the mass number A increases, the binding energy per nucleon in a nucleus

- A) decreases
- B) increases
- C) remains the same
- D) varies, which depends on the actual value of A

46) When a glass prism is dipped in water, its dispersive power

- A) does not change
- B) increases
- C) decreases
- D) increases or decreases depending on whether the angle of the prism is less than or greater than 45°

47) When a person in a lift accelerates in downward direction, the ratio of his apparent weight to his actual weight will be

- A) 1
- B) more than 1
- C) less than 1
- D) 0

48) If upon tilting, the centre of gravity remains at the same height, then the body is said to be in

- A) stable equilibrium
- B) unstable equilibrium
- C) neutral equilibrium
- D) no equilibrium

49) The Dees in the cyclotron are made of metal to shield from

- A) Magnetic field
- B) Electric field
- C) Protons
- D) Electrons

50) If θ is the angle between two vectors A and B , then the tangent of the angle which their resultant makes with A is

- A) $B \sin \theta / (A + B \cos \theta)$
- B) $B \sin \theta / (A - B \cos \theta)$
- C) $\cos \theta / (A + B \sin \theta)$
- D) $B \cos \theta / (A - B \sin \theta)$

51) How would the period of spring mass system change, when it is made to oscillate horizontally and then vertically?

- A) The period remains same in both the cases
 B) Time period will increase when it is oscillated horizontally
 C) Time period will increase when it is oscillated vertically
 D) Time period reduces and becomes zero when it is oscillated vertically

52) Which of the following materials is diamagnetic at 300 Kelvin?

- A) Aluminium
 B) Chromium
 C) Magnesium
 D) Lead

53) A block of mass M rests on a horizontal floor. What is the magnitude of the minimum force (F) required to initiate the movement of the block?

[Given, m = coefficient of static friction between the floor and the block surface]

- A) $mg/\sqrt{1+m^2}$
 B) $2mg/\sqrt{1+m^2}$
 C) $1/\sqrt{1+m^2}$
 D) $mMg/\sqrt{1+m^2}$

54) When a diode is reverse biased, a positive potential is applied to the n-side and negative potential to p-side. Which among the given fact is CORRECT?

- A) potential barrier increases.
 B) reverse current is due to the flow of minority charge carriers.
 C) width of depletion layer decreases.
 D) p-n junction provides high resistance.

55) A simple harmonic motion of amplitude A has a time period T . The acceleration of the oscillator when its displacement is half the amplitude is

- A) $(2\pi^2A)/T$
 B) $(-2\pi A)/T^2$
 C) $(4\pi^2A)/T^2$
 D) $(-2\pi^2A)/T^2$

56) Two capillaries of lengths l and $2l$ are connected in series. Their radii are r and $r/2$, respectively. If streamline flow is maintained and the pressure across the first capillary is P , the pressure across the second is

- A) $32P$
 B) $16P$
 C) $8P$
 D) $4P$

57) Which of the following can be used to produce a propagating electromagnetic wave?

- A) A charged particle
 B) An accelerating charge
 C) A charge moving at constant velocity
 D) A stationary charge

58) What will happen when 2 capacitors are connected in series?

- A) They will have equal charges
 B) They will have same potential
 C) They will have equal charges and equal potential across them
 D) They will neither have equal charges nor have same potential

59) 1 attometer is equal to

- A) $10^{-9}m$
 B) $10^{-12}m$
 C) $10^{-15}m$
 D) $10^{-18}m$

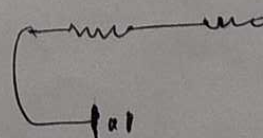
60) A work of 146kJ is performed in order to compress 1 kilo mole of a gas adiabatically and in this process the temperature of the gas increases by $7^\circ C$.

Which gas will it be? ($R=8.3J \text{ mol}^{-1}K^{-1}$)

- A) Triatomic
 B) Monoatomic
 C) Diatomic
 D) Mixture of monoatomic and diatomic

$$\frac{1}{C} + T$$

P-diffe.
 Ex.



all
 P-Same
 one d

Section 2 – Chemistry

61) Ice is an example of

- A) molecular solid
 B) ionic solid
 C) metallic solid
 D) covalent solid

62) Which of the following compounds show isomerism with ethers?

- A) Aldehydes
 B) Ketones
 C) Alcohols
 D) Acids

63) Hybridisation of Co in $[\text{Co}(\text{NH}_3)_6]^{3+}$

- A) sp^3d
 B) sp^3
 C) sp^3d^2
 D) d^2sp^3

64) Read the following statements and identify the CORRECT option.

(i) Avogadro number is the number of atoms present in one gram atom of the element.

(ii) The units may be electrons, atoms, ions, or molecules, depending on the nature of the substance and the character of the reaction.

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

65) Which of the following options is TRUE for zwitterions?

- A) Ions containing positive charges
 B) Ions containing negative charges
 C) Ions containing equal positive and negative charges
 D) Ions having more positive charge than negative charge

66) The geometry around phosphorus atoms in oxoacids of phosphorus is

- A) Octahedral
 B) Tetrahedral
 C) Linear
 D) Trigonal bipyramidal

67) What is the molecular electronic configuration of O_2 ?

- A) $(\sigma_{2s})^2(\sigma_{2s}^*)^2(\sigma_{2p})^2(\pi_{2p})^4(\pi_{2p}^*)^4$
 B) $(\sigma_{2s})^2(\sigma_{2s}^*)^2(\sigma_{2p})^2(\pi_{2p})^4(\pi_{2p}^*)^2$
 C) $(\sigma_{2s})^2(\sigma_{2s}^*)^2(\sigma_{2p})^2(\pi_{2p})^2(\pi_{2p}^*)^2$
 D) $(\sigma_{2s})^2(\sigma_{2s}^*)^4(\sigma_{2p})^2(\pi_{2p})^2(\pi_{2p}^*)^2$

68) Proteins are made of which of the following biomolecules?

- A) Amino acids
 B) Fatty acids
 C) Sterols
 D) Carbohydrates

69) Blood is isotonic with

- A) 0.16 M NaCl
 B) concentrated NaCl
 C) 50% of NaCl
 D) 30% of NaCl

70) In a triple bond connecting two atoms, the number of sharing electrons is

- A) 2
 B) 3
 C) 6
 D) 8

71) Which of the following pairs of species are isoelectronic?

- A) N_2 and CO
 B) N_2 and NO
 C) O_2 and NO
 D) O_2^{2-} and NO^+

72) Which of the following options is NOT an example of condensation polymer?

- A) Bakelite
 B) Terylene
 C) Nylon-66
 D) Buna-S

73) Which product is obtained in the reaction of 2-bromobutane with alcoholic KOH?

- A) $\text{CH}_3\text{-CH}_2\text{-CH=CH}_2$
 B) $\text{CH}_3\text{-CH=CH-CH}_3$
 C) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$
 D) CH_3COOH

74) The branch of chemistry which deals with the reaction rates and reaction mechanism is called

- A) Thermochemistry
 B) Photochemistry
 C) Analytical chemistry
 D) Chemical kinetics

75) The reaction $\text{SO}_2(\text{g}) + 1/2\text{O}_2 \rightarrow \text{SO}_3(\text{g})$ is

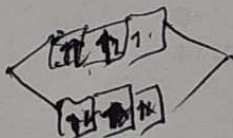
- A) Endothermic
 B) Enthalpic
 C) Exothermic
 D) Unpredictable

76) What will be the solubility product of CaF_2 if its solubility is 4×10^{-4} moles per liter?

- A) 2.56×10^{-10}
 B) 2.56×10^{-12}
 C) 4.56×10^{-12}
 D) 4.56×10^{-10}

77) The 5th period in the periodic table contains

- A) 8 elements
 B) 18 elements
 C) 24 elements
 D) 32 elements



78) In Daniell cell, for any concentration of Cu^{2+} and Zn^{2+} , the electrode potential of anode is

- A) $E_{(\text{Cu}^{2+}/\text{Cu})} = E_{(\text{Cu}^{2+}/\text{Cu})}^0 - \frac{RT}{2F} \ln \frac{[\text{Cu}]}{[\text{Cu}^{2+}]}$
 B) $E_{(\text{Cu}^{2+}/\text{Cu})} = E_{(\text{Cu}^{2+}/\text{Cu})}^0 + \frac{RT}{2F} \ln \frac{[\text{Cu}]}{[\text{Cu}^{2+}]}$
 C) $E_{(\text{Zn}^{2+}/\text{Zn})} = E_{(\text{Zn}^{2+}/\text{Zn})}^0 - \frac{RT}{2F} \ln \frac{[\text{Zn}]}{[\text{Zn}^{2+}]}$
 D) $E_{(\text{Zn}^{2+}/\text{Zn})} = E_{(\text{Zn}^{2+}/\text{Zn})}^0 + \frac{RT}{2F} \ln \frac{[\text{Zn}]}{[\text{Zn}^{2+}]}$

79) Law of thermodynamics deals with:

- A) Energy change in macroscopic system
 B) Energy change in microscopic system
 C) Energy change in adiabatic system
 D) Energy change in open system

80) Which of the following mixtures will lead to the formation of Buna-S?

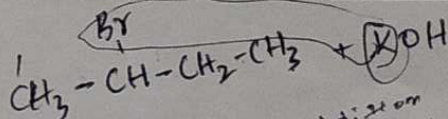
- A) 1,3-Butadiene + Styrene
 B) Adipic acid + Hexamine
 C) Urea + formaldehyde
 D) Chloroprene

81) The bond order of N_2 molecule is

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

82) In which of the following reactions is hydrazoic acid used?

- A) Schmidt reaction
 B) Alcohol synthesis
 C) Gattermann reaction
 D) Sandmeyer reaction



83) A buffer $\text{NH}_4\text{Cl}/\text{NH}_4\text{OH}$ is used to precipitate hydroxides of which group?

- A) Group 0
- B) Group I
- C) Group II
- D) Group III

84) In Dichromate ion, each chromium atom is bonded to how many oxygen atoms?

- A) Two oxygen atoms
- B) Three oxygen atoms
- C) Seven oxygen atoms
- D) Four oxygen atoms

85) For which of the following the units of rate constant and rate of the reaction are same?

- A) First order reaction
- B) Second order reaction
- C) Third order reaction
- D) Zero order reaction

86) For a spontaneous process,

- A) $\Delta S_{\text{total}} = \Delta S_{\text{sys}} + \Delta S_{\text{sur}} > 0$
- B) $\Delta S_{\text{total}} = \Delta S_{\text{sys}} + \Delta S_{\text{sur}} < 0$
- C) $\Delta S_{\text{total}} = \Delta S_{\text{sys}} + \Delta S_{\text{sur}} = 0$
- D) $\Delta S_{\text{total}} = \Delta S_{\text{sys}} + \Delta S_{\text{sur}} \leq 0$

87) Number of unpaired electrons in $\text{K}_4[\text{Mn}(\text{CN})_6]$ is

- A) 1
- B) 2
- C) 5
- D) 3

88) Which of the following dimensions is TRUE for an Orthorhombic crystal?

- A) $a = b = c$ and $\alpha = \beta = \gamma = 90^\circ$
- B) $a = b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$
- C) $a = b = c$ and $\alpha = \beta = \gamma \neq 90^\circ$
- D) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$

89) How many molecules are present in one gram of hydrogen?

- A) 6.02×10^{23}
- B) 3.01×10^{23}
- C) 2.5×10^{23}
- D) 1.5×10^{23}

90) What is the product obtained in when alkyl halide is treated with alcoholic KOH?

- A) Alkane
- B) Aldehyde
- C) Alkene
- D) Alkyne

91) Diastereomers of the compound $\text{CHCl}=\text{CHBr}$ are named as

- A) (Z)-1-chloro-2-bromoethene and (E)-1-chloro-2-bromoethene
- B) (Z)-1-bromo-2-chloroethane and (E)-1-bromo-2-chloroethane
- C) (Z)-1-bromo-2-chloroethene and (E)-1-bromo-2-chloroethene
- D) 1-bromo-2-chloroethene and 1-bromo-2-chloroethene

92) According to R and S system of nomenclature of isomers, D-Glyceraldehyde is named as

- A) (S)-Glyceraldehyde
- B) (R)-Glyceraldehyde
- C) (E)-Glyceraldehyde
- D) (Z)-Glyceraldehyde

93) Highest oxidation state that chromium can exhibit in its compounds is

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

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16
94) Which of the following options is TRUE for a Daniell cell?

- A) Cu is used as anode and Zn is as cathode
- B) Zn is used as anode and Cu is as cathode
- C) Cu-Zn alloy is used as cathode and Pt electrode is as anode
- D) Pt electrode is used as cathode and Cu-Zn alloy is as anode

95) Transport of oxygen by Hb in blood can be explained by

- A) Le-Chatelier's Principle
- B) Bronsted - Lowry Theory
- C) Lewis Concept
- D) Henry's Law

96) Which of the following intermolecular forces are present in Nylon-66?

- A) Van der Waals
- B) Hydrogen Bonding
- C) Dipole-Dipole interaction
- D) Covalent bond

97) A buffer solution is:

- A) A strong base and its conjugate acid
- B) A weak base and its conjugate base
- C) A strong acid and its conjugate base
- D) A weak acid and its conjugate base

17
98) Which of the following is the primary sugar in cow's milk?

- A) Sucrose
- B) Lactose
- C) Maltose
- D) Xylose

99) Change in Internal energy of a system when no heat is absorbed by the system from surroundings, but work is done on the system is

- A) $\Delta U = w$
- B) $\Delta U = 0$
- C) $\Delta U = q$
- D) $\Delta U = T$

100) Maximum covalency that nitrogen can exhibit is

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

18
101) The first acceptable structure of Benzene was proposed by

- A) Kekule
- B) Dewar
- C) Baeyer
- D) Boyle

102) Which is the product of Curtius reaction?

- A) Amide
- B) Amine
- C) Alcohol
- D) Alkene

103) When activated carbon is added to a Rhodamine B solution, the color intensity of the solution

- A) increases
- B) decreases
- C) remains same
- D) initially increases and then sharply decreases

104) Which of the following compound is used as an anti-cancer drug?

- A) Diamminedichloroplatinum(II)
- B) Dichlorotriammineplatinum(III)
- C) Diamminedichloroplatinum(IV)
- D) Dichlorodiammineplatinum(IV)

99) Which electronic configuration amongst the following correctly represents "Sulphur" atom?

- A) $1s^2 2s^2 2p^6 3s^2 3p^2 3d^2$
- B) $1s^2 2s^2 2p^6 3s^2 3p^2 4s^2$
- C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 4p^3$
- D) $1s^2 2s^2 2p^6 3s^2 3p^4$

106) Identify the element having atomic number 118.

- A) Nihonium
- B) Oganesson
- C) Moscovium
- D) Tennessine

107) Preparation of alkanes by the reaction alkyl halides with sodium in dry ether goes through the formation of

- A) Carbocation intermediate
- B) Free radical intermediate
- C) Carbanion intermediate
- D) Carbene intermediate

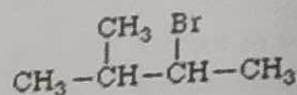
108) Which of the following has high boiling point?

- A) $C_2H_5NH_2$
- B) C_2H_6
- C) C_2H_5OH
- D) CH_3COOH

109) To convert propanoic acid into propanol which of the following reagent is used?

- A) BH_3/THF AND H_2O
- B) $NABH_4$
- C) Na/Ethanol
- D) H_2 /Catalyst

110) The IUPAC name of the compound below is



- A) 3-Methylbutan-2-one
- B) 2-Methylbutane
- C) 2-bromo-3-methylbutane
- D) 2-bromo-3-methylpropane

111) Read the following statements and identify the CORRECT option with respect to Faraday's law.

(i) The amount of substance consumed or produced at one of the electrodes in an electrolytic cell is inversely proportional to the amount of electricity that passes through the cell.

(ii) One coulomb (C) of charge is transferred when a one-ampere (amp) current flows for one second (s).

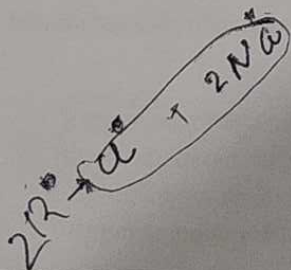
- A) (i) is TRUE and (ii) is TRUE
- B) (i) is FALSE and (ii) is TRUE
- C) (i) is FALSE and (ii) is FALSE
- D) (i) is TRUE and (ii) is FALSE

112) Which of the following products is formed finally when acetaldehyde reacts with HCN followed by hydrolysis?

- A) Lactic acid
- B) Glycolic acid
- C) Malic acid
- D) Formic acid

113) Reaction of hexane with concentrated nitric acid to form nitrohexane is an example of

- A) Elimination reaction
- B) Condensation reaction
- C) Substitution reaction
- D) Rearrangement reaction



114) Number of P=O bonds present in orthophosphoric acid is

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

115) Which of the following conditions favours the existence of a substance in the solid state?

- A) High thermal energy
- B) High temperature
- C) Low temperature
- D) Weak cohesive forces

116) The plant cell shrinks when placed in a

- A) Solution isotonic with the cell sap
- B) Water
- C) Hypertonic solution
- D) Hypotonic solution

117) Atomicity of phosphorus is

- A) 2
- B) 3
- C) 4
- D) 5

118) The spin only magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM. The number of unpaired electrons present in this complex is

- A) 3
- B) 6
- C) 5
- D) 7

119) The Rhombohedral crystal system is described by three primitive vectors and their angles. Choose the CORRECT option which depicts this.

- A) $a = b = c$ and $\alpha = \beta = \gamma = 90^\circ$
- B) $a = b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$
- C) $a = b = c$ and $\alpha = \beta = \gamma \neq 90^\circ$
- D) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$

120) During adsorption, what effect is caused on surface energy?

- A) increase in surface energy
- B) decrease in surface energy
- C) no change in surface energy
- D) both increase and decrease in surface energy

14, 25, 26, 27, 28, 29, 30, 31

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26

Handwritten notes: $R = \frac{c}{A}$, $I \propto R \frac{dI}{A}$, $R \propto \frac{1}{A}$

Handwritten calculations: $\frac{22}{7} \times (0.02)^2$, $\frac{0.02 \times 0.02}{7}$, 0.0004 , 0.0004

Mm

Handwritten diagram showing a rectangular area with dimensions 0.00008 and 0.00016 . Includes the text "Page 13 of 24" and a large number "7".

Handwritten calculations: 22×0.00004 , $R = \frac{3e}{A}$, $A = \sqrt{5 \times \frac{22}{7}}$

Section 3 – Biology

121) Which of the following is a physical barrier method of contraception?

- A) Vaginal pills
- B) Diaphragms
- C) Tubectomy
- D) Vasectomy

122) The convoluted outer layer of the gray matter covering the cerebral hemispheres is

- A) Cerebral cortex
- B) Medulla oblongata
- C) Thalamus
- D) Meninges

123) Which of the following means that, neither allele can mask the expression of the other allele?

- A) Phenotype
- B) Genotype
- C) Pleiotropy
- D) Codominance

124) Which of the following microbes is used as biocontrol agent in order to control butterfly caterpillars?

- A) Anabaena
- B) *Bacillus thuringiensis*
- C) Rhizobium
- D) Nostoc

125) Which of the following option regarding dicotyledonous stem is INCORRECT?

- A) Cambium is present between phloem and xylem
- B) Cambium possesses the ability to form secondary xylem and phloem tissues
- C) Vascular bundles are closed
- D) Vascular bundles are open

126) The rate of production of organic matter during photosynthesis of an ecosystem is

- A) Tertiary productivity
- B) Secondary productivity
- C) Net primary productivity
- D) Gross primary productivity

127) A symbiotic association between fungi and roots of higher plants is

- A) Rhizobium
- B) Mycorrhiza
- C) Azospirillum
- D) Azotobacter

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

(i) Homologous organs are those that have same internal structures, but their function differs

(ii) Analogous organs are those that basically have same function but not the same underlying structure

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

129) Bidder's canal found in the kidney of the frog carries which of the following from testis?

- A) Eggs
- B) Sperms
- C) Ammonia
- D) Oxygenated blood

130) Large holes in Swiss cheese is due to production of which of the following gas by bacterium?

- A) Carbon monoxide
- B) Oxygen
- C) Nitrogen
- D) Carbon dioxide

UM

9 131) The Klenow fragment is a large fragment produced when DNA Pol I from E.coli is enzymatically cleaved by the protease

- A) Ligase
- B) Subtilisin
- C) Helicase
- D) Reverse Transcriptase

136) Which of the following cell organelle in plant cell is bounded by a single membrane?

- A) Mitochondria
- B) Vacuole
- C) Chloroplast
- D) Nucleus

10 132) The molecular structure of chlorophyll consists of four nitrogen atoms surrounded by a central

- A) magnesium atom
- B) iron atom
- C) cobalt atom
- D) zinc atom

137) In many plants tap root becomes swollen and assumes various form due to storage of food. The form of tap root found in Radish is

- A) tuberous
- B) nodulated
- C) napiform
- D) fusiform

11 133) Sickle cell anemia is a disease in which the body produces abnormally shaped red blood cells that have a crescent or sickle shape. The disease is inherited in

- A) allosomal recessive pattern
- B) autosomal dominant pattern
- C) autosomal recessive pattern
- D) allosomal dominant pattern

138) According to light reaction stage of photosynthesis, in Photosystem I (PSI) the reaction centre "chlorophyll a" has an absorption peak at

- A) 700 nm
- B) 680 nm
- C) 560 nm
- D) 490 nm

12 134) Lysosomes are also known as "suicidal bags" because they

- A) oxidise the digested food in our body to produce energy
- B) play an important role in cell division and protein synthesis
- C) help in digestion of foreign bodies and worn out cell parts
- D) help in transport of proteins in and out of the cell

139) Which of the following types of plants are classified into Phanerogams?

- A) Bryophytes
- B) Pteridophytes
- C) Gymnosperms
- D) Thallophytes

13 135) The smallest taxon of classification which contains only one type of organism is

- A) Kingdom
- B) Family
- C) Order
- D) Species

140) Which of the following plant hormones mainly promotes seed dormancy?

- A) Zeatin
- B) Gibberellins
- C) Cytokinin
- D) Absciscic acid

141) Which of the following microorganism is used in the production of butyric acid?

- A) Propionibacterium shermanii
- B) Saccharomyces cerevisiae
- C) Clostridium butyricum**
- D) Corynebacterium diphtheriae

142) A typical leaf consists of three parts which includes all of the following EXCEPT

- A) Leaf base
- B) Petiole
- C) Tendril**
- D) Lamina

143) Which of the following cell organelle in plant cell is also called dictyosomes?

- A) Nucleus
- B) Lysosome
- C) Mitochondria
- D) Golgi apparatus**

144) The process of formation of seeds without fertilization in flowering plants is known as

- A) Budding
- B) Somatic hybridization
- C) Apomixis**
- D) Sporulation

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

- i) A group of closely related classes having certain common characters is termed as Phylum
- ii) A group of closely related species having certain common characters is termed as Genus

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

146) Choose the CORRECT sequence of Taxonomic categories showing hierarchial arrangement in ascending order:

- A) Family - Order - Species - Phylum - Kingdom - Genus - Class
- B) Phylum - Family - Order - Species - Genus - Class - Kingdom
- C) Kingdom - Phylum - Family - Order - Species - Genus - Class
- D) Kingdom - Phylum - Class - Order - Family - Genus - Species**

147) Which of the following Mendel's law of inheritance states that hybrid offsprings will only inherit the dominant trait in the phenotype?

- A) Law of Purity of gametes
- B) Law of Independent Assortment
- C) Law of Segregation
- D) Law of Dominance**

148) Amniocentesis is a procedure mainly performed in humans to detect the

- A) blood glucose level of women during pregnancy
- B) pulse rate of the fetus during prenatal development
- C) position of the fetus during prenatal development
- D) genetic problems during prenatal development**

149) The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water, is called

- A) Biological Oxygen Demand
- B) Biochemical Oxygen Demand**
- C) Biocontrol Oxygen Demand
- D) Eutrophication

150) In humans, which of the following portion or region of the stomach opens into the first part of the small intestine?

- A) Cardiac portion
- B) Fundus portion
- C) Pyloric portion**
- D) Body portion

20) 151) The diagram used by biologists to determine the probability of an offspring having a particular genotype is

- A) Punnett square
- B) Morgan square
- C) Haldane square
- D) William square

26) 152) The transfer of genetic material from one population to another is termed as

- A) genetic drift
- B) gene pool
- C) gene flow
- D) mutation

27) 153) Which of the following is a type of automatic self-pollination of certain plants that can propagate by using non-opening, self-pollinating flowers?

- A) Cleistogamy
- B) Anemophily
- C) Malcophily
- D) Hypohydrogamy

28) 154) Plasmolysis is the shrinkage of plasma membrane or protoplast from the cell wall due to

- A) Absorption
- B) Imbibition
- C) Endosmosis
- D) Exosmosis

29) 155) The vacuole is bounded by a membrane known as

- A) Aleuroplast
- B) Tonoplast
- C) Elaioplast
- D) Amyloplast

30) 156) The plant hormone Gibberellins was first isolated from and named after a fungus called

- A) Gibberella fujikuroi
- B) Gibberella gaditjirrii
- C) Gibberella acuminata
- D) Gibberella africana

31) 157) Which of the following techniques is used in genetic engineering to make multiple copies of DNA?

- A) Mass spectrometry
- B) Centrifugation
- C) Agarose gel electrophoresis
- D) Polymerase chain reaction

32) 158) Which of the following principle states that "in a large random-mating population the gene pool tends to remain constant from generation to generation unless outside forces act to change it"?

- A) Charles Darwin principle
- B) Hardy-Weinberg principle
- C) Watson-Crick principle
- D) J.B.S Haldane principle

33) 159) Musca domestica is the biological name of housefly which belongs to the phylum

- A) Chordata
- B) Echinodermata
- C) Arthropoda
- D) Nematoda

34) 160) Which of the following is an abiotic component of an ecosystem?

- A) Water
- B) Plants
- C) Animals
- D) Bacteria

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

- (i) Epistasis is a phenomenon in which one gene influences the expression of another gene
- (ii) The gene that makes its expression is said to be epistatic and the gene which is masked is said to be hypostatic

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

33) 162) The non-essential parts of a flower are

- A) androecium and gynoecium
- B) androecium and petals
- C) **sepals and petals**
- D) sepals and gynoecium

36) 163) Read the following statements regarding the reproduction in flowering plants and choose the CORRECT option:

- (i) Flowers which contain either the androecium or the gynoecium are called unisexual flowers
- (ii) Flowers which contain both androecium and gynoecium are called bisexual flowers

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

37) 164) The formula to calculate Net Primary Productivity (NPP) of an ecosystem is

- A) **$NPP = GPP - R$**
- B) $NPP = GPP + R$
- C) $NPP = GPP * R$
- D) $NPP = GPP / R$

38) 165) Which of the following microbes is used in the production of statins which are used as blood-cholesterol lowering agents?

- A) Escherichia coli
- B) **Monascus purpureus**
- C) Trichoderma polysporum
- D) Corynebacterium diphtheriae

39) 166) In Plant cell, Krebs cycle takes place in

- A) vacuole
- B) **mitochondria**
- C) nucleus
- D) chloroplast

40) 167) The human excretory system includes the kidneys and their functional unit is

- A) **Nephrons**
- B) Red blood cells
- C) Villi
- D) Pancreas

41) 168) Which one of the following is the largest part of the brain in humans?

- A) Pons
- B) Medulla
- C) **Cerebrum**
- D) Cerebellum

169) Where are the parotid glands located in humans?

- A) Below and in front of the abdomen
- B) Below and in front of the nose
- C) **Below and in front of the ears**
- D) Below and in front of the eyes

42) 170) The arrangement of ovules within the ovary is known as

- A) endocarp
- B) monoadelphous
- C) **placentation**
- D) endosperm

43) 171) The loss of water in the form of the water vapour from the surface of aerial parts of the plant is called

- A) Osmosis
- B) **Transpiration**
- C) Pollination
- D) Photosynthesis

44) 172) Choose the CORRECT sequence of stages of food processing in humans:

- A) absorption - digestion - elimination - ingestion
- B) **ingestion - digestion - absorption - elimination**
- C) digestion - ingestion - elimination - absorption
- D) elimination - ingestion - absorption - digestion