

# OJEE Basic BSc Nursing Sample Paper 01

**A) Mode and Time:** The exam is a Computer Based Test (CBT) lasting 120 minutes.

**B) Total Questions:** The exam contains 100 questions.

**C) Marking Scheme & Rules:**

- Each question carry 1 mark and there is no negative marking for wrong answer.

**Q1.** A uniform solid cylinder of mass  $M$  and radius  $R$  rests on a rough horizontal board. The board is suddenly given a constant horizontal acceleration  $a$ . If the cylinder rolls without slipping, what is the magnitude of the friction force acting on it?

A.  $Ma\frac{2}{3}$

B.  $Ma\frac{3}{2}$

C.  $2Ma\frac{3}{2}$

D.  $Ma$

**Q2.** Two particles, each of mass  $m$  and charge  $q$ , are attached to the two ends of a light rigid rod of length  $L$ . The rod is rotated at a constant angular speed  $\omega$  about a perpendicular axis passing through its center. The ratio of the magnitudes of the magnetic dipole moment to the angular momentum of the system is:

A.  $q\frac{L}{2m}$

B.  $q\frac{L}{m}$

C.  $2q\frac{L}{m}$

D.  $q\frac{L}{4m}$

**Q3.** In a Young's Double Slit Experiment, the slits are separated by a distance  $d$  and illuminated by light of wavelength  $\lambda$ . A thin transparent plastic sheet of thickness  $t$  and refractive index  $\mu$  is placed over one of the slits. If the central maximum shifts to the position of the original 3rd bright fringe, the thickness  $t$  is:

A.  $3\lambda\frac{1}{\mu-1}$

B.  $3\lambda\frac{1}{\mu}$

C.  $\lambda\frac{1}{3(\mu-1)}$

D.  $3\lambda d\frac{1}{\mu-1}$

**Q4.** An ideal monoatomic gas is taken through a cycle ABCA. Process AB is an isothermal expansion at temperature  $T_0$  to twice the initial volume. BC is an isochoric process, and CA is an adiabatic compression back to the initial state. The total work done by the gas per mole is:

A.  $R T_0(\ln 2 - \frac{3}{2}(2^{2/3} - 1))$

B.  $R T_0(\ln 2 - \frac{5}{2}(2^{2/3} - 1))$

C.  $R T_0(\ln 2 + \frac{3}{2}(1 - 2^{-2/3}))$

D.  $R T_0(\ln 2 - \frac{3}{2}(2^{5/3} - 1))$

**Q5.** A point object is placed at a distance of 30 cm from a convex lens of focal length 20 cm. A convex mirror of focal length 10 cm is placed 40 cm behind the lens. The final image formed by the system is at:

A. Infinity

B. The pole of the mirror

C. The optical center of the lens

D. 20 cm behind the mirror

**Q6.** A satellite of mass  $m$  is in a circular orbit of radius  $r$  around the Earth (mass  $M$ ). If it is transferred to a higher circular orbit of radius  $2r$ , the change in its kinetic energy is  $\Delta K$  and the change in its potential energy is  $\Delta U$ . The ratio  $\Delta K/\Delta U$  is:

A.  $-1/2$ B.  $1/2$ C.  $-1$ D.  $2$ 

**Q7.** A uniform wire of resistance  $R$  is bent to form a circle. A cell of EMF  $E$  and internal resistance  $r$  is connected across two points on the wire such that they subtend an angle  $\theta$  at the center. The power dissipated in the wire is maximum when  $\theta$  is:

A.  $\pi$ B.  $\pi/2$ C.  $2\pi/3$ D. Independent of  $\theta$ 

**Q8.** The stopping potential in a photoelectric experiment is  $V_0$  when the incident wavelength is  $\lambda$ . If the wavelength is changed to  $2\lambda$ , the stopping potential becomes  $V_0/3$ . The threshold wavelength for the metal is:

A.  $3\lambda$ B.  $4\lambda$ C.  $5\lambda$ D.  $6\lambda$ 

**Q9.** An RC circuit has a capacitor  $C$  and a resistor  $R$  connected in series to a DC voltage source  $V$ . The time required for the energy stored in the capacitor to reach 75% of its maximum value is:

A.  $RC \ln 2$ B.  $RC \ln(4/3)$ C.  $RC \ln(2/\sqrt{3})$ D.  $RC \ln(2/(2 - \sqrt{3}))$ 

**Q10.** A particle undergoes simple harmonic motion with amplitude  $A$ . What is the magnitude of the displacement from the mean position when its kinetic energy is thrice its potential energy?

A.  $A/2$ B.  $A/\sqrt{2}$ C.  $A/3$ D.  $\sqrt{3}A/2$ 

**Q11.** A conducting square loop of side  $L$  and resistance  $R$  moves in its plane with a uniform velocity  $v$  perpendicular to one of its sides. A uniform magnetic field  $B$ , constant in time and space, points perpendicular to the plane of the loop. The induced current in the loop is:

A.  $BLv/R$ B.  $2BLv/R$ 

C. Zero

D.  $B L^2 v / 2R$ 

**Q12.** Two soap bubbles of radii  $r_1$  and  $r_2$  coalesce to form a single bubble under isothermal conditions. If the external atmospheric pressure is  $P_0$  and the surface tension is  $S$ , the radius  $R$  of the new bubble satisfies:

A.  $P_0 R^3 + 4SR^2 = P_0(r_1^3 + r_2^3) + 4S(r_1^2 + r_2^2)$

B.  $R^2 = r_1^2 + r_2^2$

C.  $R^3 = r_1^3 + r_2^3$

D.  $P_0 R^2 + 4SR = P_0(r_1^2 + r_2^2) + 4S(r_1 + r_2)$

**Q13.** A source of sound emitting a frequency  $f$  moves away from a stationary observer towards a stationary wall with velocity  $v$ . If the speed of sound is  $c$ , the beat frequency heard by the observer is:

A.  $2fv \frac{c}{c-v}$

B.  $2fvc \frac{c}{c^2-v^2}$

C.  $2fv \frac{c}{c+v}$

D.  $fv \frac{c}{c-v}$

**Q14.** In an LC circuit, the maximum charge on the capacitor is  $Q_0$ . When the energy is shared equally between the electric and magnetic fields, the charge on the capacitor is:

A.  $Q_0/2$

B.  $Q_0/\sqrt{2}$

C.  $Q_0/4$

D.  $\sqrt{3}Q_0/2$

**Q15.** The de Broglie wavelength of an electron accelerated through a potential difference of  $V$  volts is  $\lambda$ . If the accelerating voltage is increased to  $4V$ , the new de Broglie wavelength is:

A.  $\lambda/4$

B.  $\lambda/2$

C.  $2\lambda$

D.  $4\lambda$

**Q16.** A block of mass  $m$  is placed on a rough wedge of mass  $M$  and angle  $\theta$ . The whole system is accelerated horizontally so that the block does not slip on the wedge. If the coefficient of static friction is  $\mu$ , the minimum acceleration required is:

A.  $g \sin \theta - \mu \cos \theta \frac{1}{\cos \theta + \mu \sin \theta}$

B.  $g \sin \theta + \mu \cos \theta \frac{1}{\cos \theta - \mu \sin \theta}$

C.  $g \tan \theta$

D.  $g(\sin \theta - \mu \cos \theta)$

**Q17.** The half-life of a radioactive substance is  $T$ . The time taken for the activity to drop from 90% to 10% of its initial value is approximately:

A. 2.1  $T$

B. 3.16  $T$

C. 4.5  $T$

D. 6.3  $T$

**Q18.** A capillary tube of radius  $r$  is dipped vertically in a liquid of density  $\rho$  and surface tension  $T$ . The liquid rises to a height  $h$ . The work done by surface tension during this rise is:

A.  $\pi r^2 h \rho g$

B.  $2\pi r^2 h \rho g$

C.  $\frac{1}{2\pi r^2 h \rho g}$

D.  $4\pi r^2 h \rho g$

**Q19.** An AC voltage  $V = V_0 \sin(\omega t)$  is applied across a series LCR circuit. At resonance, the voltage across the inductor is:

A. Zero

B. Equal to  $V_0$

C.  $QV_0$  (where  $Q$  is the quality factor)

D.  $V_0/\sqrt{2}$

**Q20.** A uniform rod of length  $L$  and mass  $M$  is pivoted at its center. Two bullets, each of mass  $m$  and moving with velocity  $v$  in opposite directions, strike the ends of the rod simultaneously and get embedded. The angular velocity of the system just after the collision is:

- A.  $6mv \sqrt{(M+6m)L}$
- B.  $12mv \sqrt{(M+6m)L}$
- C.  $6mv \sqrt{(M+3m)L}$
- D.  $12mv \sqrt{(M+12m)L}$

**Q21.** The rate constant of a reaction increases by a factor of 4 when the temperature is raised from 300 K to 320 K. Assuming the pre-exponential factor is temperature-independent, the activation energy of the reaction is approximately:

- A. 53.6 kJ/mol
- B. 26.8 kJ/mol
- C. 107.2 kJ/mol
- D. 13.4 kJ/mol

**Q22.** Which of the following sets of quantum numbers represents the highest energy electron in a ground-state Chromium (Cr) atom?

- A.  $n = 4, l = 0, m_l = 0, m_s = +1/2$
- B.  $n = 3, l = 2, m_l = +2, m_s = +1/2$
- C.  $n = 3, l = 1, m_l = -1, m_s = -1/2$
- D.  $n = 4, l = 1, m_l = 0, m_s = +1/2$

**Q23.** In the extraction of copper from copper pyrites, the matte contains mostly:

- A.  $Cu_2S$  and  $FeS$
- B.  $Cu_2O$  and  $FeO$
- C.  $CuSiO_3$  and  $FeSiO_3$
- D. Pure  $Cu$  and  $FeS$

**Q24.** Identify the major product formed when 1-methylcyclohexene reacts with  $B_2H_6$ /THF followed by  $H_2O_2/OH^-$ .

- A. 1-Methylcyclohexanol
- B. 2-Methylcyclohexanol (cis)
- C. 2-Methylcyclohexanol (trans)
- D. 1-Methylcyclohexane-1,2-diol

**Q25.** Which of the following complex ions is expected to have the largest ligand field splitting energy ( $\Delta_0$ )?

- A.  $[Co(H_2O)_6]^{2+}$
- B.  $[Co(H_2O)_6]^{3+}$
- C.  $[Co(NH_3)_6]^{3+}$
- D.  $[Co(CN)_6]^{3-}$

**Q26.** An ideal solution is formed by mixing two volatile liquids *A* and *B*. If the vapor pressure of pure *A* is 100 torr and pure *B* is 200 torr, and the mole fraction of *A* in the liquid phase is 0.4, what is the mole fraction of *A* in the vapor phase?

- A. 0.20
- B. 0.25
- C. 0.33
- D. 0.50

**Q27.** Which of the following reactions does NOT yield a primary amine?

- A. Reduction of an alkyl azide with  $LiAlH_4$
- B. Gabriel phthalimide synthesis
- C. Hofmann bromamide degradation of an amide
- D. Reaction of an alkyl halide with excess ammonia followed by alkaline hydrolysis

**Q28.** The standard reduction potentials for  $Fe^{3+}/Fe^{2+}$  and  $Fe^{2+}/Fe$  are +0.77 V and -0.44 V, respectively. What is the standard reduction potential for  $Fe^{3+}/Fe$ ?

- A. +0.33 V
- B. -0.037 V
- C. +0.11 V
- D. -0.11 V

**Q29.** Which of the following species has a square planar molecular geometry?

- A.  $SF_4$
- B.  $XeF_4$
- C.  $CF_4$
- D.  $NH_4^+$

**Q30.** For the reaction  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ , the equilibrium constant is  $K_c$ . If the volume of the reaction vessel is suddenly halved at equilibrium, what will be the effect on the reaction quotient  $Q_c$ ?

- A.  $Q_c = K_c/2$
- B.  $Q_c = K_c/4$
- C.  $Q_c = 4K_c$
- D.  $Q_c = 2K_c$

**Q31.** The most stable conformation of ethylene glycol ( $HO - CH_2 - CH_2 - OH$ ) is:

- A. Anti conformation due to minimal steric hindrance
- B. Gauche conformation due to intramolecular hydrogen bonding
- C. Eclipsed conformation due to dipole stabilization
- D. Fully eclipsed conformation due to hydrogen bonding

**Q32.** A solid has a structure in which  $W$  atoms are located at the corners of a cubic lattice,  $O$  atoms at the center of the edges, and  $Na$  atoms at the center of the cube. The formula of the compound is:

- A.  $NaWO_2$
- B.  $NaWO_3$
- C.  $Na_2WO_3$
- D.  $NaWO_4$

**Q33.** Which of the following statements regarding the stability of carbocations is correct according to hyperconjugation?

- A. A tertiary butyl carbocation has 6 hyperconjugative structures.
- B. An isopropyl carbocation has 9 hyperconjugative structures.
- C. A tertiary butyl carbocation has 9 hyperconjugative structures.
- D. An ethyl carbocation has 4 hyperconjugative structures.

**Q34.** Among the following oxoacids of phosphorus, the one with the strongest reducing property is:

- A.  $H_3PO_4$
- B.  $H_3PO_3$
- C.  $H_3PO_2$



D.  $H_4P_2O_7$

**Q35.** When phenol is treated with  $CHCl_3$  and aqueous  $NaOH$  at 340 K, followed by hydrolysis, the major product is:

- A. Salicylic acid
- B. Salicylaldehyde
- C. Picric acid
- D. *p*-Hydroxybenzoic acid

**Q36.** The work done during the reversible isothermal expansion of 1 mole of an ideal gas from 10 L to 100 L at 300 K is approximately:

- A.  $-5.74$  kJ
- B.  $-2.30$  kJ
- C.  $+5.74$  kJ
- D.  $-11.48$  kJ

**Q37.** In qualitative analysis, Group III cations ( $Fe^{3+}$ ,  $Al^{3+}$ ,  $Cr^{3+}$ ) are precipitated as hydroxides by adding  $NH_4OH$  in the presence of  $NH_4Cl$ . The role of  $NH_4Cl$  is to:

- A. Increase the concentration of  $OH^-$  ions.
- B. Form complex ions with the metals.
- C. Decrease the concentration of  $OH^-$  ions through the common ion effect.
- D. Prevent the precipitation of Group IV carbonates.

**Q38.** Which carbohydrate yields exactly equal amounts of D-glucose and D-fructose upon hydrolysis?

- A. Maltose
- B. Sucrose
- C. Lactose
- D. Cellulose

**Q39.** Identify the monomer of natural rubber.

- A. Chloroprene
- B. Isoprene
- C. Neoprene

D. Styrene

**Q40.** According to the Hardy-Schulze rule, the coagulating power of an ion depends on:

- A. Only its charge magnitude.
- B. Only its sign of charge.
- C. Both magnitude and sign of charge.
- D. The size of the ion only.

**Q41.** If a double-stranded DNA molecule contains 20% adenine, what is the percentage of cytosine?

- A. 20%
- B. 30%
- C. 40%
- D. 60%

**Q42.** In C<sub>4</sub> plants, the primary carboxylation reaction occurs in the:

- A. Bundle sheath cells via RuBisCO
- B. Mesophyll cells via PEP carboxylase
- C. Mesophyll cells via RuBisCO
- D. Bundle sheath cells via PEP carboxylase

**Q43.** During the human menstrual cycle, the surge of Luteinizing Hormone (LH) directly triggers:

- A. Menstruation
- B. Development of the corpus luteum only
- C. Ovulation
- D. Thickening of the endometrium

**Q44.** The restriction endonuclease EcoRI cleaves DNA at the specific palindromic sequence:

- A. 5'-GGATCC-3'
- B. 5'-GAATTC-3'
- C. 5'-AAGCTT-3'

D. 5'-CTGCAG-3'

**Q45.** In the lac operon, what happens when lactose is present and glucose is absent?

- A. The repressor binds to the operator, blocking transcription.
- B. cAMP levels fall, preventing CAP binding, blocking transcription.
- C. Allolactose binds the repressor, cAMP-CAP binds the promoter, enabling high transcription.
- D. RNA polymerase is competitively inhibited by lactose.

**Q46.** A cross between a heterozygous tall pea plant with round seeds (*TtRr*) and a dwarf plant with wrinkled seeds (*ttrr*) produces progeny in a 1:1:1:1 ratio. This specific cross is known as a:

- A. Back cross
- B. Test cross
- C. Reciprocal cross
- D. Dihybrid self-cross

**Q47.** Which of the following hormones is not secreted by the human placenta?

- A. Human Chorionic Gonadotropin (hCG)
- B. Estrogen
- C. Progesterone
- D. Luteinizing Hormone (LH)

**Q48.** In cellular respiration, the final electron acceptor in the electron transport chain is:

- A.  $NAD^+$
- B.  $FAD$
- C. Oxygen
- D. Cytochrome c

**Q49.** Which of the following is true regarding the 'fluid mosaic model' of the plasma membrane?

- A. Phospholipids form a rigid lattice.
- B. Transmembrane proteins can exhibit lateral movement within the lipid bilayer.

- C. Cholesterol decreases membrane fluidity at low temperatures.
- D. Glycoproteins are attached to the intracellular side of the membrane.

**Q50.** The binding of oxygen to hemoglobin is represented by a sigmoid curve. Which factor causes a rightward shift of the oxygen dissociation curve, facilitating  $O_2$  release in tissues?

- A. Decreased  $pCO_2$
- B. Increased  $pH$
- C. Decreased temperature
- D. Increased  $H^+$  concentration

**Q51.** In an ecosystem, which of the following ecological pyramids is always upright?

- A. Pyramid of Numbers
- B. Pyramid of Biomass
- C. Pyramid of Energy
- D. None of the above

**Q52.** Down's syndrome is caused by:

- A. Monosomy of chromosome X
- B. Trisomy of chromosome 21
- C. Trisomy of chromosome 18
- D. Deletion of a segment of chromosome 5

**Q53.** Plasmodium falciparum, which causes malignant malaria, primarily infects:

- A. Hepatocytes and Erythrocytes
- B. Leukocytes and Platelets
- C. Alveolar macrophages
- D. Splenic lymphocytes

**Q54.** Which of the following techniques is utilized to amplify a specific segment of DNA *in vitro*?

- A. Southern Blotting
- B. Polymerase Chain Reaction (PCR)

- C. Gel Electrophoresis
- D. Microinjection

**Q55.** During meiosis I, the homologous chromosomes separate during:

- A. Prophase I
- B. Metaphase I
- C. Anaphase I
- D. Telophase I

**Q56.** The hormone responsible for the contraction of the gallbladder to release bile is:

- A. Gastrin
- B. Secretin
- C. Cholecystokinin (CCK)
- D. Enterokinase

**Q57.** The phenomenon where a single gene exhibits multiple phenotypic expressions is called:

- A. Polygenic inheritance
- B. Pleiotropy
- C. Multiple allelism
- D. Co-dominance

**Q58.** The primary site for the maturation of T-lymphocytes in humans is the:

- A. Bone marrow
- B. Spleen
- C. Thymus
- D. Lymph nodes

**Q59.** Mycorrhiza represents a symbiotic association between:

- A. Fungi and the roots of higher plants
- B. Algae and Fungi
- C. Bacteria and Leguminous roots
- D. Cyanobacteria and Ferns

**Q60.** In the human eye, the fovea centralis contains:

- A. Only rods
- B. Only cones
- C. Both rods and cones in equal number
- D. Blood vessels and optic nerve fibers

**Q61.** Choose the correct word to complete the sentence: “Despite the overwhelming evidence against him, he remained \_\_\_\_\_ in his claim of innocence.”

- A. transient
- B. obdurate
- C. docile
- D. reticent

**Q62.** Identify the part with a grammatical error: (A) Neither the head nurse (B) nor the assisting doctors (C) has completed their (D) mandatory safety training.

- A. Neither the head nurse
- B. nor the assisting doctors
- C. has completed their
- D. mandatory safety training

**Q63.** Select the most appropriate synonym for “EMPATHY”:

- A. Pity
- B. Sympathy
- C. Compassion
- D. Apathy

**Q64.** Choose the correct passive voice form: “The surgeon is performing a complex operation.”

- A. A complex operation is being performed by the surgeon.
- B. A complex operation was being performed by the surgeon.
- C. A complex operation has been performed by the surgeon.
- D. A complex operation is performed by the surgeon.

**Q65.** Fill in the blank with the appropriate preposition: “The patient was completely cured \_\_\_\_\_ the rare tropical disease.”

- A. from
- B. of
- C. with
- D. by

**Q66.** Rearrange the jumbled words into a meaningful sentence: 1. immediate / 2. the / 3. patient’s / 4. requires / 5. condition / 6. intervention

- A. 2 3 5 4 1 6
- B. 3 5 4 1 2 6
- C. 2 5 3 4 1 6
- D. 1 6 4 2 3 5

**Q67.** Select the exact meaning of the idiom: “To nip in the bud.”

- A. To plant a new idea
- B. To destroy a problem in its early stages
- C. To bloom early
- D. To ignore a growing issue

**Q68.** Identify the correctly spelled word:

- A. Pnuemonia
- B. Pneumonia
- C. Pnuemonya
- D. Neumonia

**Q69.** Choose the option that improves the underlined phrase: “She has been sleeping since three hours.”

- A. is sleeping
- B. has slept
- C. had been sleeping
- D. has been sleeping for

**Q70.** What is the antonym of “MITIGATE”?

- A. Alleviate
- B. Aggravate
- C. Assuage
- D. Placate

**Q71.** Fill in the blanks: “The doctor prescribed a broad-spectrum \_\_\_\_\_ to treat the bacterial \_\_\_\_\_.”

- A. analgesic, infection
- B. antibiotic, infection
- C. antiviral, disease
- D. antihistamine, allergy

**Q72.** Read the following and answer: “The triage nurse assessed the casualties and immediately directed the red-tagged patients to surgery.” A ‘red-tagged’ patient likely implies:

- A. Minor injuries
- B. Deceased
- C. Immediate, life-threatening injuries
- D. Infectious disease

**Q73.** Replace with a single word: “A person who is recovering from an illness.”

- A. Hypochondriac
- B. Convalescent
- C. Invalid
- D. Septic

**Q74.** Identify the sentence with the correct punctuation:

- A. The diagnosis is clear; the patient needs rest, fluids, and medication.
- B. The diagnosis is clear, the patient needs rest fluids and medication.
- C. The diagnosis is clear: the patient needs; rest, fluids and medication.
- D. The diagnosis is clear the patient needs, rest, fluids, and medication.



**Q75.** “To burn the midnight oil” means:

- A. To work late into the night
- B. To light a lamp
- C. To waste resources
- D. To start a fire in the dark

**Q76.** Fill in the blank: “He is \_\_\_\_\_ the best cardiologist in the city.”

- A. by far
- B. most
- C. much
- D. far

**Q77.** Change to reported speech: The nurse said to the patient, “Please take your medicine after lunch.”

- A. The nurse asked the patient please take your medicine after lunch.
- B. The nurse requested the patient to take his medicine after lunch.
- C. The nurse ordered the patient to take the medicine after lunch.
- D. The nurse told the patient take your medicine after lunch.

**Q78.** Antonym of “STERILE” in a medical context:

- A. Clean
- B. Contaminated
- C. Barren
- D. Aseptic

**Q79.** Complete the analogy: Scalpel is to Surgeon as \_\_\_\_\_ is to Nurse.

- A. Prescription
- B. Stethoscope
- C. Courtroom
- D. Lesson

**Q80.** The word “PROGNOSIS” refers to:

- A. The identification of a disease
- B. The likely course of a disease
- C. The cause of a disease
- D. The medication for a disease

**Q81.** You discover an unconscious patient without a pulse. As a trained nurse, your immediate first action according to BLS guidelines should be:

- A. Administer rescue breaths
- B. Begin high-quality chest compressions
- C. Check the patient's medical records
- D. Administer Epinephrine intravenously

**Q82.** When prioritizing care among four patients, which patient should the nurse assess first?

- A. A patient requesting pain medication for a chronic backache (3/10 on pain scale).
- B. A post-operative patient who just started vomiting and has a decreased level of consciousness.
- C. A patient scheduled for an X-ray in 15 minutes.
- D. A diabetic patient with a fasting blood glucose of 110 mg/dL.

**Q83.** The ethical principle of Autonomy in nursing practice specifically refers to:

- A. The nurse's right to refuse an unsafe assignment.
- B. Doing no harm to the patient.
- C. The patient's right to make their own healthcare decisions.
- D. Treating all patients equally regardless of background.

**Q84.** A doctor prescribes a medication dosage that you know is dangerously high for a patient of this weight. What is your most appropriate action?

- A. Administer the drug but document your concern in the chart.
- B. Reduce the dosage to the safe limit and administer it.
- C. Refuse to administer the medication and immediately contact the prescribing doctor to verify.
- D. Ask another nurse to administer it.

**Q85.** Proper hand hygiene, according to WHO, requires scrubbing hands with soap and water for at least:

- A. 10 seconds
- B. 20 seconds
- C. 2 minutes
- D. 5 minutes

**Q86.** When inserting a peripheral IV catheter, a nurse should strictly adhere to:

- A. Clean technique
- B. Aseptic technique
- C. Surgical sterile technique
- D. Isolation precautions

**Q87.** A patient refuses to sign a consent form for a life-saving blood transfusion due to religious beliefs. The nurse should:

- A. Sneak the blood into another IV fluid to save the patient's life.
- B. Respect the patient's decision, document the refusal, and inform the physician.
- C. Argue with the patient about the necessity of the procedure.
- D. Forcibly restrain the patient and administer the blood.

**Q88.** The term "Nosocomial infection" refers to an infection:

- A. Acquired by a fetus in utero.
- B. Acquired in a hospital or healthcare facility.
- C. Caused by an unknown pathogen.
- D. Acquired from animal bites.

**Q89.** While taking a blood pressure reading, the systolic pressure represents:

- A. The pressure in the arteries when the heart rests between beats.
- B. The pressure in the arteries when the heart muscle contracts.
- C. The volume of blood pumped per minute.
- D. The resistance of the capillary beds.

**Q90.** If a patient is diagnosed with active pulmonary tuberculosis (TB), which type of isolation precaution must be implemented?

- A. Contact Precautions
- B. Droplet Precautions
- C. Airborne Precautions
- D. Standard Precautions only

**Q91.** What is the normal range for adult resting heart rate?

- A. 40-60 bpm
- B. 60-100 bpm
- C. 100-140 bpm
- D. 120-160 bpm

**Q92.** A patient is crying due to a terminal diagnosis. The best nursing action is to:

- A. Tell the patient everything happens for a reason.
- B. Leave the room to give the patient complete privacy.
- C. Sit with the patient, offer a tissue, and listen empathetically.
- D. Distract the patient by turning on the television.

**Q93.** To prevent pressure ulcers (bedsores) in a bedridden patient, the nurse should reposition the patient at least every:

- A. 30 minutes
- B. 2 hours
- C. 8 hours
- D. 24 hours

**Q94.** The primary purpose of a triage nurse in an emergency department is to:

- A. Diagnose the patients' conditions.
- B. Prescribe initial medications.
- C. Determine the severity of conditions and prioritize care.
- D. Handle hospital billing and registration.

**Q95.** A patient complains of dyspnea. This medical term means:

- A. Difficulty swallowing
- B. Difficulty breathing

- C. Difficulty urinating
- D. Difficulty sleeping

**Q96.** In calculation of BMI (Body Mass Index), the formula used is:

- A. Weight (kg) / Height (cm)
- B. Weight (kg) / [Height (m)]<sup>2</sup>
- C. Weight (lbs) / Height (inches)
- D. [Weight (kg)]<sup>2</sup>/Height(m)

**Q97.** When a patient signs a “DNR” (Do Not Resuscitate) order, it means:

- A. The nurse should not provide any medical care at all.
- B. CPR and advanced cardiac life support should not be initiated if breathing or heartbeat stops.
- C. The patient cannot receive pain medication.
- D. The patient must be transferred to hospice immediately.

**Q98.** A nurse notices smoke coming from a patient’s bathroom. The very first step according to the RACE protocol for fire safety is:

- A. Rescue/Remove anyone in immediate danger.
- B. Alarm - pull the fire alarm.
- C. Contain the fire by closing doors.
- D. Extinguish the fire with an extinguisher.

**Q99.** Hypoglycemia refers to:

- A. High blood pressure
- B. Low blood pressure
- C. High blood sugar
- D. Low blood sugar

**Q100.** Effective communication in nursing requires all of the following EXCEPT:

- A. Active listening
- B. Using complex medical jargon with the patient to sound professional
- C. Validating patient concerns
- D. Maintaining appropriate eye contact

## Solutions

1. B

**Explanation:** For a solid cylinder rolling without slipping under an accelerating board, considering pseudo forces and torque about the center of mass yields a static friction magnitude of  $Ma/3$ .

2. A

**Explanation:** The gyromagnetic ratio (ratio of magnetic dipole moment to angular momentum) for any system where charge and mass are distributed proportionally is always  $q/2m$ .

3. A

**Explanation:** The path difference introduced by the sheet is  $(\mu - 1)t$ . Equating this to the path difference of the 3rd maximum ( $3\lambda$ ) gives  $t = 3\lambda/(\mu - 1)$ .

4. A

**Explanation:** Total work is the sum of isothermal work  $RT_0 \ln(2)$  and adiabatic work. For monoatomic gas  $\gamma = 5/3$ , leading to the exact expression  $RT_0(\ln 2 - \frac{3}{2}(2^{2/3} - 1))$ .

5. C

**Explanation:** Applying the lens formula and then the mirror formula shows the rays retrace their path after reflection, placing the final image exactly at the optical center of the lens.

6. A

**Explanation:** For a circular orbit,  $K = -E$  and  $U = 2E$ . As radius doubles, energy changes lead to  $\Delta K/\Delta U = -1/2$ , consistent with the virial theorem.

7. A

**Explanation:** The equivalent resistance of the two parallel arc segments is maximized when they are equal in length, which occurs when the connection points are diametrically opposite ( $\theta = \pi$ ).

8. B

**Explanation:** Using Einstein's photoelectric equation for both wavelengths and eliminating the work function yields the threshold wavelength  $\lambda_0 = 4\lambda$ .

9. B

**Explanation:** The energy stored is  $U = q^2/2C$ . Setting this to 75% of maximum energy allows us to solve for time using the standard RC charging exponential equation.

10. A

**Explanation:** Kinetic energy is 3 times potential energy:  $\frac{1}{2}k(A^2 - x^2) = 3(\frac{1}{2}kx^2)$ . Solving for  $x$  gives  $A^2 = 4x^2 \Rightarrow x = A/2$ .

11. C

**Explanation:** Since the magnetic field is uniform in space and time, the magnetic flux through the loop remains constant as it moves. Hence, induced EMF and current are zero.

12. A

**Explanation:** Under isothermal conditions, the total number of moles of air inside

the bubbles is conserved ( $n_1 + n_2 = n_{new}$ ). Using  $P = P_0 + 4S/r$  and  $PV = nRT$  yields the equation.

**13. A**

**Explanation:** The observer hears direct sound (frequency  $f_1 = f \frac{c}{c+v}$ ) and reflected sound (frequency  $f_2 = f \frac{c}{c-v}$ ). The beat frequency is the difference between these two.

**14. B**

**Explanation:** Total energy is  $Q_0^2/2C$ . When energy is shared equally, electrical energy is half of the total:  $Q^2/2C = \frac{1}{2}(Q_0^2/2C)$ , resulting in  $Q = Q_0/\sqrt{2}$ .

**15. B**

**Explanation:** The de Broglie wavelength is inversely proportional to the momentum, and thus inversely proportional to  $\sqrt{V}$ . Quadrupling the voltage halves the wavelength.

**16. B**

**Explanation:** To prevent slipping, the pseudoforce must balance the components of gravity and static friction. Resolving forces along the incline provides the minimum required horizontal acceleration.

**17. B**

**Explanation:** Activity follows  $A = A_0 e^{-\lambda t}$ . Solving for  $t$  when  $A = 0.9A_0$  and  $A = 0.1A_0$ , the time difference is  $\Delta t = (\ln 9)/\lambda \approx 3.16T$ .

**18. A**

**Explanation:** The liquid rises until weight balances the surface tension force. The total work done by surface tension is  $F \cdot h = (2\pi r T \cos \theta)h$ , which equates to  $\pi r^2 h \rho g$ .

**19. C**

**Explanation:** At resonance, the voltages across the inductor and capacitor cancel each other out, but their individual magnitudes are  $Q$  times the applied voltage  $V_0$ .

**20. A**

**Explanation:** Conserving angular momentum about the pivot:  $L_i = 2 \times mv(L/2)$ . The final moment of inertia is  $I_f = ML^2/12 + 2m(L/2)^2$ . Using  $L_i = I_f \omega$  gives the result.

**21. A**

**Explanation:** Using the Arrhenius equation:  $\ln(k_2/k_1) = \frac{E_a}{R}(\frac{1}{T_1} - \frac{1}{T_2})$ . Substituting  $k_2/k_1 = 4$ ,  $T_1 = 300$ ,  $T_2 = 320$  yields approximately 53.6 kJ/mol.

**22. B**

**Explanation:** Chromium has an anomalous electron configuration:  $[Ar]4s^1 3d^5$ . The highest energy electrons reside in the 3d subshell, which corresponds to  $n = 3$  and  $l = 2$ .

**23. A**

**Explanation:** During the smelting of copper pyrites, the resulting molten matte is primarily a mixture of copper(I) sulfide ( $Cu_2S$ ) and iron(II) sulfide ( $FeS$ ).

**24. C**

**Explanation:** Hydroboration-oxidation of substituted alkenes proceeds via anti-Markovnikov addition with syn-stereoselectivity, resulting in trans-2-methylcyclohexanol

from 1-methylcyclohexene.

**25. D**

**Explanation:** Cyanide ( $CN^-$ ) is a strong-field ligand according to the spectrochemical series, inducing the maximum splitting of d-orbitals ( $\Delta_0$ ) among the given options.

**26. B**

**Explanation:** By Raoult's law,  $P_{total} = P_A^0 x_A + P_B^0 x_B = 100(0.4) + 200(0.6) = 160$  torr. Mole fraction in vapor  $y_A = P_A/P_{total} = 40/160 = 0.25$ .

**27. D**

**Explanation:** Reacting an alkyl halide with excess ammonia primarily leads to a mixture of primary, secondary, tertiary amines, and quaternary ammonium salts, not exclusively primary amines.

**28. B**

**Explanation:** Using  $\Delta G^0 = -nFE^0$ , summing the free energies of the two half-reactions ( $Fe^{3+} \rightarrow Fe^{2+}$  and  $Fe^{2+} \rightarrow Fe$ ) yields an overall standard potential of  $-0.037$  V.

**29. B**

**Explanation:** Xenon tetrafluoride ( $XeF_4$ ) has  $sp^3d^2$  hybridization with two lone pairs on the central atom. The lone pairs occupy axial positions, leaving a square planar geometry.

**30. C**

**Explanation:** Halving the volume alters the concentration of all reacting species, shifting the reaction quotient  $Q_c$  relative to the equilibrium constant based on their respective stoichiometric coefficients.

**31. B**

**Explanation:** The gauche conformation of ethylene glycol is exceptionally stabilized by intramolecular hydrogen bonding between the two adjacent hydroxyl groups, making it the most stable form.

**32. B**

**Explanation:**  $W$  atoms at corners  $= 8 \times 1/8 = 1$ .  $O$  atoms at edge centers  $= 12 \times 1/4 = 3$ .  $Na$  atom at body center  $= 1$ . Thus, the empirical formula is  $NaWO_3$ .

**33. C**

**Explanation:** A tertiary butyl carbocation ( $C(CH_3)_3^+$ ) has nine alpha-hydrogens adjacent to the positively charged carbon, providing 9 hyperconjugative stabilization structures.

**34. C**

**Explanation:** Hypophosphorous acid ( $H_3PO_2$ ) has two direct P-H bonds. These direct P-H bonds impart strong reducing properties to the acid molecule.

**35. B**

**Explanation:** This is the Reimer-Tiemann reaction. Phenol reacts with chloroform and a base to introduce an aldehyde group at the ortho position, yielding salicylaldehyde.



**36. A**

**Explanation:** Work done in a reversible isothermal expansion is  $W = -nRT \ln(V_2/V_1) = -1 \times 8.314 \times 300 \times \ln(10) \approx -5740 \text{ J}$  or  $-5.74 \text{ kJ}$ .

**37. C**

**Explanation:** Ammonium chloride provides a common  $NH_4^+$  ion, which suppresses the ionization of  $NH_4OH$ , lowering the  $OH^-$  concentration to precipitate only Group III hydroxides.

**38. B**

**Explanation:** Sucrose is a disaccharide composed of an  $\alpha$ -D-glucose unit and a  $\beta$ -D-fructose unit. Upon hydrolysis (inversion), it yields equimolar amounts of both.

**39. B**

**Explanation:** Natural rubber is a linear polymer of isoprene (2-methyl-1,3-butadiene), specifically forming a cis-1,4-polyisoprene structure.

**40. C**

**Explanation:** The Hardy-Schulze rule states that the coagulating power of an ion depends on both the sign of its charge (must be opposite to the colloid) and the magnitude of the charge.

**41. B**

**Explanation:** According to Chargaff's rules, Adenine pairs with Thymine ( $A = T = 20\%$ ). The remaining 60% consists of Guanine and Cytosine, which pair equally ( $G = C = 30\%$ ).

**42. B**

**Explanation:** In C4 plants, the initial fixation of  $CO_2$  occurs in the mesophyll cells, where PEP carboxylase catalyzes the reaction between phosphoenolpyruvate and  $CO_2$ .

**43. C**

**Explanation:** The rapid release (surge) of Luteinizing Hormone (LH) midway through the menstrual cycle induces the rupture of the Graafian follicle, leading to ovulation.

**44. B**

**Explanation:** EcoRI recognizes and cuts the specific palindromic sequence 5'-GAATTC-3', producing sticky ends essential for recombinant DNA technology.

**45. C**

**Explanation:** Lactose (as allolactose) inactivates the repressor. The absence of glucose elevates cAMP levels, which bind CAP to the promoter, heavily initiating transcription.

**46. B**

**Explanation:** A test cross involves mating an organism expressing dominant traits with a homozygous recessive individual ( $ttrr$ ) to determine its exact genotype via the 1:1:1:1 progeny ratio.

**47. D**

**Explanation:** The placenta secretes hCG, estrogen, progesterone, and human placental lactogen. Luteinizing Hormone (LH) is secreted by the anterior pituitary gland, not the placenta.

**48. C**

**Explanation:** Oxygen sits at the end of the electron transport chain in the mitochondria, acting as the ultimate electron acceptor and combining with protons to form water.

**49. B**

**Explanation:** The fluid mosaic model describes the membrane as a dynamic structure where lipids and integral transmembrane proteins can freely move laterally within the lipid bilayer.

**50. D**

**Explanation:** A rightward shift of the dissociation curve (Bohr effect) is caused by increased  $CO_2$ , increased temperature, and increased  $H^+$  concentration (decreased pH), promoting oxygen release.

**51. C**

**Explanation:** The pyramid of energy is always upright because energy is lost as heat at each trophic level (10% rule), meaning energy always decreases from producers to apex predators.

**52. B**

**Explanation:** Down's syndrome is an aneuploidy disorder caused by the presence of an extra copy of chromosome 21 (Trisomy 21), resulting from nondisjunction during meiosis.

**53. A**

**Explanation:** Plasmodium sporozoites initially travel to and infect liver cells (hepatocytes) to multiply, then rupture and invade red blood cells (erythrocytes) causing cyclic fevers.

**54. B**

**Explanation:** The Polymerase Chain Reaction (PCR) is a molecular biology technique used to exponentially amplify a specific target DNA segment *in vitro* using thermal cycling.

**55. C**

**Explanation:** During Anaphase I of meiosis, the chiasmata separate and intact homologous chromosomes are pulled to opposite poles of the cell, halving the chromosome number.

**56. C**

**Explanation:** Cholecystikinin (CCK), secreted by the duodenum in response to fats, stimulates the gallbladder to contract and release bile into the small intestine.

**57. B**

**Explanation:** Pleiotropy occurs when a single gene influences multiple, seemingly unrelated phenotypic traits, such as the gene responsible for phenylketonuria (PKU).

**58. C**

**Explanation:** T-lymphocytes originate in the bone marrow but migrate to the thymus gland, where they mature, differentiate, and become immunocompetent.

**59. A**

**Explanation:** Mycorrhiza is a mutually beneficial symbiotic relationship between

specialized soil fungi and the root systems of higher plants, aiding in nutrient and water absorption.

**60. B**

**Explanation:** The fovea centralis is a small depression in the retina packed exclusively with cone cells, providing the highest visual acuity and color vision in the eye.

**61. B**

**Explanation:** Öbdurate means stubbornly refusing to change one's opinion or course of action, which perfectly describes remaining firm in a claim of innocence despite evidence.

**62. C**

**Explanation:** When subjects are joined by neither/nor, the verb agrees with the closer subject (assisting doctors, plural). Thus, has should grammatically be have." [0.2cm]

**63. C**

**Explanation:** Empathy is the ability to understand and share the feelings of another. Compassion is the closest synonym, reflecting a deep awareness and shared emotional response.

**64. A**

**Explanation:** In the present continuous passive voice, the object (a complex operation) becomes the subject, followed by is being and the past participle (performed).

**65. B**

**Explanation:** The correct idiomatic preposition to use with the verb cured in this context is of (e.g., cured of a disease).

**66. A**

**Explanation:** Rearranging logically: The patient's condition requires immediate intervention. This follows the standard Subject-Verb-Object structural flow.

**67. B**

**Explanation:** The idiom to nip in the bud means to stop or destroy something at an early stage before it can develop into a larger problem.

**68. B**

**Explanation:** Pneumonia is the correct spelling for the inflammatory condition of the lung, originating from the Greek root pneumon meaning lung.

**69. D**

**Explanation:** For is used to indicate a duration of time (three hours), whereas since is used to indicate a specific starting point in time. Has been sleeping for is correct.

**70. B**

**Explanation:** To mitigate means to make something less severe or painful. The antonym aggravate means to make a problem or condition worse or more serious.

**71. B**

**Explanation:** A broad-spectrum antibiotic is specifically prescribed by doctors to target and eliminate a wide variety of bacterial infections."

[0.2cm] **72. C**

**Explanation:** In emergency medical triage, a red tag indicates a patient with imme-

diate, life-threatening injuries who requires highly prioritized critical intervention.

**73. B**

**Explanation:** A convalescent is a person who is spending time resting and recovering their health and strength after an illness or medical treatment.

**74. A**

**Explanation:** A semicolon correctly joins two closely related independent clauses without a coordinating conjunction, while commas correctly separate items in the list.

**75. A**

**Explanation:** The idiom to burn the midnight oil implies reading, working, or studying late into the night, historically by the light of an oil lamp.

**76. A**

**Explanation:** The phrase by far is an intensifying idiom used with superlatives (the best) to emphasize that something is significantly superior to all others.

**77. B**

**Explanation:** When converting a polite request (Please) into reported speech, the reporting verb changes to requested, followed by the infinitive form of the verb (to take).

**78. B**

**Explanation:** In a medical context, sterile means completely free from bacteria or other living microorganisms. The direct antonym is contaminated.

[0.2cm] **79. B**

**Explanation:** A scalpel is the primary iconic instrument used by a surgeon, just as a stethoscope is the primary iconic diagnostic instrument utilized by a nurse.

**80. B**

**Explanation:** Prognosis is a medical term referring to the forecast or predicted likely outcome and course of a disease or ailment based on medical knowledge.

**81. B**

**Explanation:** According to the AHA Basic Life Support (BLS) guidelines, if an adult patient is unresponsive and lacks a pulse, chest compressions (C-A-B) must be initiated immediately.

**82. B**

**Explanation:** A post-operative patient experiencing decreased consciousness and vomiting is at immediate risk of airway compromise (aspiration), making them the highest clinical priority.

**83. C**

**Explanation:** The ethical principle of autonomy affirms the patient's fundamental right to self-determination, including the right to accept or refuse medical treatments.

**84. C**

**Explanation:** Nurses have a legal and ethical duty to ensure patient safety. Administering a dangerously high dose is malpractice; the nurse must withhold it and directly verify with the prescriber.

**85. B**

**Explanation:** The World Health Organization (WHO) and CDC strictly recommend scrubbing hands with soap and water for a minimum of 20 seconds to effectively remove pathogens.

**86. B**

**Explanation:** Peripheral IV insertion is an invasive procedure that breaches the skin barrier. It strictly requires aseptic technique to prevent the introduction of pathogens into the bloodstream.

**87. B**

**Explanation:** Respecting patient autonomy means a competent adult has the legal right to refuse life-saving treatment based on religious beliefs. The nurse must respect, document, and report this refusal.

**88. B**

**Explanation:** A nosocomial infection (or Healthcare-Associated Infection, HAI) is an infection that a patient acquires during the course of receiving treatment within a hospital or healthcare setting.

**89. B**

**Explanation:** Systolic blood pressure is the maximum pressure exerted on the arterial walls when the heart's ventricles forcefully contract to pump blood into the systemic circulation.

**90. C**

**Explanation:** Pulmonary tuberculosis is transmitted via tiny droplet nuclei that remain suspended in the air. Therefore, strict Airborne Precautions are required.

**91. B**

**Explanation:** For a healthy, resting adult, the normal physiological heart rate parameters range strictly between 60 and 100 beats per minute (bpm).

**92. C**

**Explanation:** Active listening and empathetic presence are core therapeutic communication skills. Sitting with the patient validates their emotional distress without offering false reassurances.

**93. B**

**Explanation:** To maintain skin integrity and prevent the ischemia that leads to decubitus ulcers, bedridden patients must have their physical position changed at least every 2 hours.

**94. C**

**Explanation:** The triage nurse's primary function is to rapidly assess incoming patients, determine the clinical severity of their condition, and prioritize the order of medical care based on urgency.

**95. B**

**Explanation:** Dyspnea is the clinical medical term for subjective difficulty or distress in breathing, commonly referred to as shortness of breath.

**96. B**

**Explanation:** The Body Mass Index (BMI) is a widely used anthropometric indicator calculated by dividing a person's body weight in kilograms by the square of

their height in meters.

**97. B**

**Explanation:** A Do Not Resuscitate (DNR) order specifically instructs health-care providers not to initiate CPR or advanced cardiac life support if the patient's breathing or heartbeat stops.

**98. A**

**Explanation:** The RACE acronym outlines the sequence for responding to a fire: Rescue/Remove individuals in immediate danger, Alarm, Confine/Contain the fire, and Extinguish/Evacuate.

**99. D**

**Explanation:** The prefix hypo- means low, and glycemia refers to glucose in the blood. Therefore, hypoglycemia is the medical condition of abnormally low blood sugar levels.

**100. B**

**Explanation:** Effective therapeutic communication involves using clear, easily understandable language. Utilizing overly complex medical jargon acts as a barrier to patient comprehension and partnership.