PGIMER B.SC PARAMEDICAL SAMPLE PAPER 07

A) Time Allowed: 1 Hour 30 Minutes.
B) Maximum Marks: 100
C) Total Questions: 100

General Instructions:

- This paper consists of five sections: Mathematics (25), Chemistry (25), Physics (25), English (10), and General Knowledge (15).
- Each question has four options (A, B, C, D), with only one correct answer.
- +1 mark is awarded for each correct answer and 0.25 marks are deducted for each incorrect answer.
- The question paper is available in English language only.

SECTION 1 : PHYSICS

Q1. A particle's velocity vector is

$$\vec{v} = (3t^2)\hat{i} + (4t)\hat{j}.$$

The angle between acceleration and velocity at $t = 1\ s$ is:
A) $\cos^{-1}\left(\frac{10}{13\sqrt{5}}\right)$
B) $0°$
C) $90°$
D) $45°$

Q2. A block of mass m slides down an incline of angle θ with coefficient of friction μ. The acceleration is:
A) $g(\sin\theta - \mu\cos\theta)$
B) $g(\sin\theta + \mu\cos\theta)$
C) $g\mu\cos\theta$
D) $g\sin\theta$

Q3. The radius of gyration of a hollow sphere of mass M and radius R about a tangent is:
A) $\sqrt{\frac{7}{3}}R$
B) $\sqrt{\frac{5}{3}}R$
C) R
D) $\sqrt{\frac{2}{3}}R$

Q4. A particle in SHM has amplitude A. At what displacement is the kinetic energy equal to potential energy?
A) $A/\sqrt{2}$
B) $A/2$
C) $A/\sqrt{3}$
D) A

Q5. For a gas,

$$\gamma = 1.4.$$

The ratio of adiabatic bulk modulus to isothermal bulk modulus is:
A) 1.4
B) 0.7
C) 1.0
D) 1.96

Q6. The work done in blowing a soap bubble of radius R to $2R$ is proportional to:
A) R^2
B) R^3
C) R
D) $1/R^2$

Q7. The magnetic field at the center of a circular loop of radius R carrying current I is B_0. At a point on the axis at distance R:
A) $B_0/2\sqrt{2}$
B) $B_0/2$

C) $B_0/\sqrt{2}$
D) B_0

Q8. The displacement current density is given by:
A) $\epsilon_0 \left(\frac{\partial E}{\partial t}\right)$
B) $\epsilon_0 \left(\frac{\partial B}{\partial t}\right)$
C) $\mu_0 \left(\frac{\partial E}{\partial t}\right)$
D) $\left(\frac{\partial E}{\partial t}\right)$

Q9. A convex lens (refractive index 1.5) in water (1.33) behaves as:
A) Convex lens
B) Concave lens
C) Plane glass plate
D) Mirror

Q10. In photoelectric effect, the slope of stopping potential versus frequency graph is:
A) h/e
B) e/h
C) h
D) e

Q11. The half-life of a substance is 20 min. The time taken to decay 87.5% is:
A) 60 min
B) 40 min
C) 80 min
D) 30 min

Q12. The logic gate equivalent to two NOT gates in series is:
A) BUFFER
B) AND
C) OR
D) NAND

Q13. The escape velocity from a planet with double the mass and half the radius of Earth is:
A) $2v_e$
B) $4v_e$
C) $v_e/\sqrt{2}$
D) $\sqrt{2}v_e$

Q14. The magnetic susceptibility of a paramagnetic material at temperature T is:
A) C/T
B) CT
C) C/T^2
D) Constant

Q15. A wire of resistance R is stretched to twice its length. The new resistance is:
A) $4R$
B) $2R$
C) $R/2$
D) $R/4$

Q16. The power factor of a purely capacitive circuit is:
A) 0
B) 1
C) 0.5
D) ∞

Q17. The velocity of sound in a gas is proportional to:
A) $\sqrt{T}$
B) T
C) $1/T$
D) T^2

Q18. The electric flux through a surface enclosing a dipole is:
A) 0
B) q/ϵ_0
C) $2q/\epsilon_0$
D) Infinite

Q19. The magnifying power of a telescope with objective focal length f_o and eyepiece focal length f_e is:
A) f_o/f_e
B) f_e/f_o
C) $f_o f_e$
D) $f_o + f_e$

Q20. The de-Broglie wavelength of an electron accelerated by potential V is:
A) $\sqrt{\frac{150}{V}}$ Å
B) $\sqrt{\frac{V}{150}}$ Å
C) $\frac{150}{V}$ Å
D) $\frac{V}{150}$ Å

Q21. In a Carnot engine, the efficiency is $1/6$. If sink temperature is reduced by 62 K, efficiency becomes $1/3$. Source temperature is:
A) 372 K
B) 310 K
C) 273 K
D) 400 K

Q22. The torque on a current loop in a magnetic field is:

$$\tau = NIAB\sin\theta.$$

For maximum torque:
A) $\theta = 90°$
B) $\theta = 0°$
C) $\theta = 45°$
D) $\theta = 180°$

Q23. The bulk modulus of an incompressible fluid is:
A) ∞

B) 0
C) 1
D) Negligible

Q24. The force on a charge q moving with velocity v in magnetic field B is:
A) $q(v \times B)$
B) $q(v \cdot B)$
C) $q(B \times v)$
D) Both A and C

Q25. The emission of an alpha particle reduces the atomic number by:
A) 2
B) 1
C) 4
D) 0

SECTION 2 : CHEMISTRY

Q26. Which orbital has the lowest energy in a multi-electron atom?
A) 4s
B) 3d
C) 4p
D) 4d

Q27. The bond order of

$$O_2^{2-}$$

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

Q28. The oxidation state of S in

$$H_2S_2O_7$$

is:
A) +6
B) +4
C) +2
D) +7

Q29. Which molecule is non-polar?
A) BF_3
B) NH_3
C) H_2O
D) HCl

Q30. The number of atoms in a BCC unit cell is:
A) 2
B) 1
C) 4
D) 8

Q31. The unit of rate constant for a zero-order reaction is:
A) mol L^{-1} s^{-1}
B) s^{-1}
C) L mol^{-1} s^{-1}
D) Dimensionless

Q32. The Gold Number is a measure of:
A) Protective power
B) Purity
C) Concentration
D) Color

Q33. Which is a Lewis Acid?
A) $AlCl_3$
B) NH_3
C) H_2O
D) OH^-

Q34. The hybridization of carbon in CH_4 is:
A) sp^3
B) sp^2
C) sp
D) dsp^2

Q35. Bakelite is formed by the reaction of phenol and:
A) Formaldehyde
B) Acetone
C) Acetaldehyde
D) Benzaldehyde

Q36. The reagent used in Clemmensen reduction is:
A) Zn-Hg/HCl
B) $LiAlH_4$
C) H_2/Ni
D) $NaBH_4$

Q37. Which isomerism is shown by

$$[Co(NH_3)_5Br]SO_4$$

and

$$[Co(NH_3)_5SO_4]Br?$$

A) Ionization isomerism
B) Linkage isomerism
C) Hydrate isomerism
D) Coordination isomerism

Q38. The pH of 0.01 M HCl is:
A) 2
B) 1
C) 12
D) 10

Q39. Which metal is extracted by electrolysis of fused salts?
A) Na
B) Fe
C) Cu
D) Ag

Q40. Ozone is an allotrope of:
A) Oxygen
B) Sulfur
C) Carbon
D) Phosphorus

Q41. The van der Waals equation is:
A) $\left(P + \frac{a}{V^2}\right)(V - b) = RT$
B) $PV = nRT$
C) $PV = constant$
D) None of these

Q42. The maximum number of electrons in a subshell is:
A) $2(2l + 1)$
B) $2n^2$
C) $2l + 1$
D) n^2

Q43. Which is the weakest acid?
A) CH_3COOH
B) HCOOH
C) $ClCH_2COOH$
D) CCl_3COOH

Q44. Dumas method is used for estimation of:
A) Nitrogen
B) Carbon
C) Sulfur
D) Halogens

Q45. Tyndall effect is shown by:
A) Colloids
B) True solutions
C) Suspensions
D) Precipitates

Q46. Trans-esterification is used in the synthesis of:
A) Polyester
B) Nylon
C) Bakelite
D) PVC

Q47. The geometry of SF_6 is:
A) Octahedral
B) Tetrahedral
C) Trigonal bipyramidal
D) Square planar

Q48. Lanthanoid contraction is due to:
A) Poor shielding of 4f electrons
B) Shielding of 5d electrons
C) Increase in mass
D) Expansion of orbitals

Q49. Alum is a double salt of:
A) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
B) Na_2SO_4

C) $CuSO_4$
D) $FeSO_4$

Q50. Bauxite is the chief ore of:
A) Aluminum
B) Iron
C) Copper
D) Zinc

SECTION 3 : MATHEMATICS

Q51. If

$$f(x) = x^3,$$

then $f'(2)$ is:
A) 12
B) 8
C) 6
D) 4

Q52. The derivative of

$$\sin^2 x$$

is:
A) $\sin 2x$
B) $2 \sin x$
C) $\cos 2x$
D) $\cos x$

Q53. The integral

$$\int \frac{1}{x}\, dx$$

is:
A) $\ln |x| + C$
B) $x^2/2 + C$
C) $x + C$
D) $1/x^2 + C$

Q54. The sum of the roots of

$$ax^2 + bx + c = 0$$

is:
A) $-\frac{b}{a}$
B) $\frac{b}{a}$
C) $\frac{c}{a}$
D) $-\frac{c}{a}$

Q55. The value of

$$e^0$$

is:
A) 1
B) 0
C) ∞
D) e

Q56. The angle between vectors

$$\vec{a} = (1, 1, 0)$$

and

$$\vec{b} = (0, 1, 1)$$

is:
A) 60°
B) 90°
C) 45°
D) 30°

Q57. If

$$\log x = 2,$$

then x is:
A) 100
B) 10
C) 1
D) 20

Q58. The inverse of matrix

$$(1)001$$

is:
A) Identity matrix
B) Zero matrix
C) Inverse does not exist
D)

$$(-)100-1$$

Q59. The probability of an impossible event is:
A) 0
B) 1
C) 0.5
D) Undefined

Q60. The number of tangents that can be drawn from a point outside a circle is:
A) 2
B) 1
C) 0
D) Infinite

Q61.

$$\cos(90^\circ - \theta)$$

is equal to:
A) $\sin\theta$
B) $-\sin\theta$
C) $\cos\theta$
D) $-\cos\theta$

Q62. The determinant of a 3×3 identity matrix is:
A) 1
B) 0
C) 3
D) -1

Q63. The slope of the line

$$2x + 3y + 5 = 0$$

is:
A) $-\frac{2}{3}$
B) $\frac{2}{3}$
C) $-\frac{3}{2}$
D) $\frac{3}{2}$

Q64. The focus of the parabola

$$y^2 = 4ax$$

is:
A) $(a, 0)$
B) $(0, a)$
C) $(-a, 0)$
D) $(0, -a)$

Q65. The value of

$$\lim_{x \to \infty} \frac{1}{x}$$

is:
A) 0
B) 1
C) ∞
D) -1

Q66. The derivative of

$$\tan x$$

is:
A) $\sec^2 x$
B) $\cot x$
C) $\sec x \tan x$
D) $-\csc^2 x$

Q67. The value of

$$\int_0^1 x \, dx$$

is:
A) 0.5
B) 1
C) 0
D) 0.25

Q68. The complex number

$$i^3$$

equals:
A) $-i$
B) i
C) 1
D) -1

Q69. The sum of the first n natural numbers is:
A) $\frac{n(n+1)}{2}$
B) n^2
C) $n(n+1)$
D) $\frac{n}{2}$

Q70. The area of a circle with radius r is:
A) πr^2
B) $2\pi r$
C) πr
D) $4\pi r^2$

Q71. The scalar product

$$\vec{a} \cdot \vec{b}$$

is:
A) $|\vec{a}||\vec{b}| \cos\theta$
B) $|\vec{a}||\vec{b}| \sin\theta$
C) 0
D) $\vec{a} \times \vec{b}$

Q72. The range of

$$\sin x$$

is:
A) $[-1, 1]$
B) $[0, 1]$
C) $(-\infty, \infty)$
D) $[0, \infty)$

Q73. The derivative of

$$e^x$$

is:
A) e^x
B) xe^{x-1}
C) $\ln x$
D) $\frac{1}{x}$

Q74. The point $(1, 1)$ lies on:
A) $y = x$
B) $y = x^2 + 1$
C) $x + y = 0$
D) $y = 2x$

Q75. The median of

$$\{1, 5, 2, 8, 3\}$$

is:
A) 3
B) 2
C) 5
D) 8

SECTION 4 : ENGLISH

Q76. Synonym of “Ambivalent”:
A) Uncertain
B) Sure
C) Clear
D) Brave

Q77. He is addicted _____ gambling.
A) to
B) in
C) at
D) for

Q78. Choose the correct spelling:
A) Necessary
B) Necesary
C) Neccessary
D) Nessecary

Q79. “Fast” in “He fasts on Mondays” is a:
A) Verb
B) Noun
C) Adjective
D) Adverb

Q80. Antonym of “Prodigal”:
A) Thrifty
B) Wasteful
C) Generous
D) Rich

Q81. If she _____ me, she would tell me.
A) trusted
B) trusts
C) has trusted
D) will trust

Q82. Passive voice of “They built a house” is:
A) A house was built.
B) A house is built.
C) A house has been built.
D) A house builds.

Q83. The plural of “Criterion” is:
A) Criteria
B) Criterions
C) Criterion
D) Criterium

Q84. Antonym of “Garrulous”:
A) Taciturn
B) Talkative
C) Loud
D) Quiet

Q85. The idiom “Beat around the bush” means:
A) Avoid the topic
B) Fight
C) Look for a tree
D) Run away

Q86. “Scarcely” is paired with:
A) When
B) Then
C) Than
D) Before

Q87. Synonym of “Abstain”:
A) Refrain
B) Indulge
C) Eat
D) Take

Q88. Choose the correct sentence:
A) Each of the girls is happy.
B) Each of the girls are happy.
C) Each of the girl is happy.
D) Each of the girl are happy.

Q89. Prefer tea _____ coffee.
A) to
B) than
C) over
D) with

Q90. Meaning of “Ad hoc”:
A) For a specific purpose
B) Forever
C) By accident
D) Before time

SECTION 5 : GENERAL KNOWLEDGE

Q91. Longest river in the world:
A) Nile
B) Amazon
C) Ganga
D) Yangtze

Q92. Father of the Indian Constitution:
A) B.R. Ambedkar
B) Jawaharlal Nehru
C) Mahatma Gandhi
D) Sardar Patel

Q93. World Ozone Day is observed on:
A) September 16
B) October 16
C) August 16
D) December 16

Q94. Parliament of the USA is called:
A) Congress
B) Diet
C) Duma
D) Knesset

Q95. The first Nobel Prize in Chemistry was awarded to:
A) Jacobus Henricus van 't Hoff
B) Marie Curie
C) Albert Einstein
D) Niels Bohr

Q96. The Kiel Canal connects the:
A) North Sea and Baltic Sea
B) Mediterranean Sea and Red Sea
C) Pacific Ocean and Atlantic Ocean
D) Pacific Ocean and Indian Ocean

Q97. The Constitution of India came into effect on:
A) 26 January 1950
B) 26 November 1949
C) 15 August 1947
D) 26 January 1949

Q98. The strongest muscle in the human body is generally considered to be the:
A) Masseter
B) Femur
C) Heart
D) Biceps

Q99. The first woman President of India was:
A) Pratibha Patil
B) Indira Gandhi
C) Margaret Thatcher
D) Golda Meir

Q100. The Red Cross has won the Nobel Peace Prize:
A) 3 times
B) 1 time
C) 2 times
D) Never

SOLUTIONS

Q1. **Answer: A**

$$f(x) = x^3$$
$$f'(x) = 3x^2$$
$$f'(2) = 3(2)^2 = 12$$

Q2. **Answer: A**

$$y = \sin^2 x$$
$$\frac{dy}{dx} = 2\sin x \cos x$$
$$= \sin 2x$$

Q3. **Answer: A**

$$\int \frac{1}{x}\, dx = \ln|x| + C$$

Q4. **Answer: A**

For

$$ax^2 + bx + c = 0$$

Sum of roots:

$$-\frac{b}{a}$$

Q5. **Answer: A**

$$e^0 = 1$$

Q6. **Answer: A**

$$\vec{a} \cdot \vec{b} = (1)(0) + (1)(1) + (0)(1) = 1$$
$$|\vec{a}| = \sqrt{2}, \quad |\vec{b}| = \sqrt{2}$$
$$\cos\theta = \frac{1}{2}$$
$$\theta = 60^\circ$$

Q7. **Answer: A**

$$\log x = 2$$

(Base 10)

$$x = 10^2 = 100$$

Q8. **Answer: A**

The inverse of identity matrix is identity itself:

$$I^{-1} = I$$

Q9. **Answer: A**
Probability of an impossible event:

$$P = 0$$

Q10. **Answer: A**
Exactly two tangents can be drawn from a point outside a circle.

Q11. **Answer: A**

$$\cos(90^\circ - \theta) = \sin\theta$$

Q12. **Answer: A**
For identity matrix:

$$|I| = 1$$

Q13. **Answer: A**

$$2x + 3y + 5 = 0$$

$$y = -\frac{2}{3}x - \frac{5}{3}$$

Slope:

$$m = -\frac{2}{3}$$

Q14. **Answer: A**
For

$$y^2 = 4ax$$

Focus:

$$(a, 0)$$

Q15. **Answer: A**

$$\lim_{x\to\infty} \frac{1}{x} = 0$$

Q16. **Answer: A**

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

Q17. **Answer: A**

$$\int_0^1 x\,dx = \left[\frac{x^2}{2}\right]_0^1 = \frac{1}{2}$$

Q18. **Answer: A**

$$i^3 = i^2(i) = (-1)i = -i$$

Q19. **Answer: A**

$$1 + 2 + \cdots + n = \frac{n(n+1)}{2}$$

Q20. **Answer: A**
Area of circle:

$$A = \pi r^2$$

Q21. **Answer: A**

$$\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}| \cos\theta$$

Q22. **Answer: A**
Range of sine function:

$$[-1, 1]$$

Q23. **Answer: A**

$$\frac{d}{dx}(e^x) = e^x$$

Q24. **Answer: A**
Point $(1, 1)$ satisfies:

$$y = x$$

Q25. **Answer: A**
Arrange:

$$1, 2, 3, 5, 8$$

Median:

$$3$$

Q26. **Answer: A**
"Ambivalent" means having mixed feelings or being uncertain.

Q27. **Answer: A**
Correct expression:

$$addictedtogambling$$

Q28. **Answer: A**
Correct spelling:

$$Necessary$$

Q29. **Answer: A**
In this sentence "fast" means to abstain from food, hence it is a verb.

Q30. **Answer: A**
"Prodigal" means wasteful. Its antonym is "thrifty."

Q31. **Answer: A**
Subjunctive form:

$$If shetrustedme, shewouldtellme.$$

Q32. **Answer: A**
Passive voice:

$$Ahousewasbuilt.$$

Q33. **Answer: A**
Plural of criterion:

$$Criteria$$

Q34. **Answer: A**
"Taciturn" means reserved or not talkative.

Q35. **Answer: A**
The idiom means avoiding the main topic.

Q36. **Answer: A**
Standard usage:

$$Scarcely...when$$

Q37. **Answer: A**
"Abstain" means to refrain from doing something.

Q38. **Answer: A**
"Each" is singular:

$$Eachofthegirlsishappy.$$

Q39. **Answer: A**
Correct usage:

$$Preferteatocoffee.$$

Q40. **Answer: A**
"Ad hoc" means for a specific purpose.

Q41. **Answer: A**
The Nile is traditionally considered the longest river in the world.

Q42. **Answer: A**
Dr. B.R. Ambedkar is known as the Father of the Indian Constitution.

Q43. **Answer: A**
World Ozone Day:

$$16\ September$$

Q44. **Answer: A**
The legislature of the USA is called Congress.

Q45. **Answer: A**
The first Nobel Prize in Chemistry (1901) was awarded to:

$$J.H.van'tHoff$$

Q46. **Answer: A**
The Kiel Canal connects:

$$NorthSeaandBalticSea$$

Q47. **Answer: A**
The Constitution of India came into force on:

$$26\ January\ 1950$$

Q48. **Answer: A**
The masseter muscle is regarded as the strongest muscle based on force generated.

Q49. **Answer: A**
Pratibha Patil became India's first woman President in 2007.

Q50. **Answer: A**
The International Red Cross Movement has received the Nobel Peace Prize three times:

$$1917,\ 1944,\ 1963$$

Q51. **Answer: A**
Mitochondria produce ATP through cellular respiration and are therefore called the powerhouse of the cell.

Q52. **Answer: A**
DNA replication follows the semi-conservative model in which each daughter DNA molecule contains one parental strand and one newly synthesized strand.

Q53. **Answer: A**
Crossing over takes place during the pachytene stage of Prophase-I of meiosis.

Q54. **Answer: A**
The Fluid Mosaic Model of plasma membrane was proposed by Singer and Nicolson.

Q55. **Answer: A**
Accumulation of potassium ions (K^+) in guard cells causes stomatal opening.

Q56. **Answer: A**
Glycolysis occurs in the cytoplasm of cells.

Q57. **Answer: A**
Bile salts emulsify fats into small droplets to aid digestion.

Q58. **Answer: A**
The SA node acts as the natural pacemaker of the heart.

Q59. **Answer: A**
Neurotransmitters are stored in synaptic vesicles present in nerve endings.

Q60. **Answer: A**
Antibodies are produced by B-lymphocytes which differentiate into plasma cells.

Q61. **Answer: A**
Gout is caused by deposition of uric acid crystals in joints.

Q62. **Answer: A**
T-tubules are specialized structures present in muscle fibers.

Q63. **Answer: A**
Epinephrine (adrenaline) is secreted by the adrenal medulla.

Q64. **Answer: A**
Calcitonin decreases blood calcium concentration by promoting calcium deposition in bones.

Q65. **Answer: A**
The Cori cycle involves lactate transport between muscles and the liver.

Q66. **Answer: A**
Okazaki fragments are short DNA segments synthesized on the lagging strand.

Q67. **Answer: A**
The Z-disc forms the boundary of a sarcomere.

Q68. **Answer: C**
The placenta is responsible for exchange of nutrients and gases and also secretes hormones.

Q69. **Answer: A**
Auxin promotes elongation of plant cells.

Q70. **Answer: A**
PCR employs Taq polymerase, a heat-stable DNA polymerase.

Q71. **Answer: A**
Restriction enzymes recognize specific palindromic DNA sequences.

Q72. **Answer: A**
Rh incompatibility may cause erythroblastosis fetalis in newborns.

Q73. **Answer: A**
The hypothalamus regulates homeostasis including temperature, hunger and thirst.

Q74. **Answer: A**
Dystrophin deficiency causes Duchenne muscular dystrophy.

Q75. **Answer: A**
Amniotic fluid protects the developing fetus from mechanical shocks.

Q76. **Answer: A**
"Ambivalent" means having mixed feelings or uncertainty.

Q77. **Answer: A**
The correct phrase is:

$$addictedtogambling$$

Q78. **Answer: A**
The correct spelling is:

$$Necessary$$

Q79. **Answer: A**
In the sentence, "fast" means to abstain from food and functions as a verb.

Q80. **Answer: A**
"Prodigal" means wasteful; its antonym is "thrifty."

Q81. **Answer: A**
Correct conditional form:

$$If she trusted me, she would tell me.$$

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Passive voice:

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Plural of criterion:

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"Taciturn" means reserved or not talkative.

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The idiom means avoiding the main issue or topic.

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The accepted construction is:

$$Scarcely ... when$$

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"Abstain" means to refrain from doing something.

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"Each" is singular:

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Q99. **Answer: A**
Pratibha Patil became the first woman President of India in 2007.

Q100. **Answer: A**
The International Red Cross Movement has received the Nobel Peace Prize three times:

$$1917,\ 1944,\ 1963$$