

SAMPLE PAPER - 124

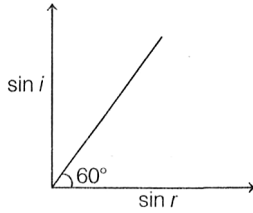
Time : 1 : 15 Hr.

Question : 60

PHYSICS

01. Rain is falling vertically with speed 30 m/s. A woman rides a bicycle with speed of 30 m/s in south to north direction. The direction in which she should hold her umbrella from vertical is
 (1) 45°- south (2) 180°- south
 (3) 45°- North (4) 18°- North
02. A block is projected over a rough surface with speed 9.8 m/s. If friction coefficient of surface-block interface is 0.5. Find distance after which block stops
 (1) 4.9 m (2) 9.8 m (3) 14.7 m (4) 19.6 m
03. For diatomic gas the relation between pressure of a gas and temperature T is $P \propto T^C$ where C is. (For adiabatic process) :
 (1) $\frac{7}{5}$ (2) $\frac{2}{7}$
 (3) $\frac{5}{7}$ (4) $\frac{7}{2}$
04. An ideal gas expands to double its initial volume by means of several processes. Which of the process results in the maximum work done by the gas ?
 (1) Isothermal (2) Adiabatic
 (3) Isobaric (4) Isochoric
05. Three identical rods, each of length L, are joined to form a rigid equilateral triangle. Its radius of gyration about an axis passing through center of mass of system and perpendicular to the plane of triangle is
 (1) $\frac{L}{\sqrt{6}}$ (2) $L\sqrt{\frac{3}{2}}$ (3) $\frac{L}{\sqrt{2}}$ (4) $\frac{L}{\sqrt{3}}$
06. The Earth is assumed to be a sphere of radius R. A platform is arranged at a height 4R from the surface of the earth. The escape velocity of a body from this platform is $f v_e$, where v_e is its escape velocity from the surface of the earth. The value of f is
 (1) $\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) $\sqrt{5}$ (4) $\frac{1}{\sqrt{5}}$
07. A simple harmonic oscillator has an amplitude a and time period T. The time required by it to travel from $x = a/2$ to $x = a$ then returning back to $x = a/2$ is:
 (1) T/6 (2) T/4 (3) T/3 (4) T/2.
08. The total energy of a particle executing S.H.M. is 80 J. What is the kinetic energy when the particle is at a distance of 3/4 of amplitude from the mean position?
 (1) 60 J (2) 80 J (3) 35 J (4) 45 J
09. A simple pendulum has a time period T in vacuum. Its time period when it is completely immersed in a liquid of density one-fourth of the density of material of the bob is
 (1) $\sqrt{\frac{3}{4}} T$ (2) $\sqrt{\frac{4}{3}} T$ (3) $\sqrt{\frac{5}{3}} T$ (4) $\sqrt{\frac{3}{5}} T$
10. A wind with speed 40 m/s blows parallel to the roof of a house. The area of the roof is 500 m². Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be: ($\rho_{\text{air}} = 1.2 \text{ kg/m}^3$)
 (1) $4.8 \times 10^5 \text{ N}$, upwards
 (2) $2.4 \times 10^5 \text{ N}$, upwards
 (3) $2.4 \times 10^5 \text{ N}$, down wards
 (4) $4.8 \times 10^5 \text{ N}$, down wards
11. As one moves from center to surface of a uniformly charged dielectric sphere the electric field strength E :
 (1) increases (2) decreases
 (3) remains the same as at the surface
 (4) is zero at all points.
12. A semicircular arc of radius a is charged uniformly with charge Q. The electric field at the centre is
 (1) $\frac{Q}{2\pi^2 \epsilon_0 a^2}$ (2) $\frac{Q}{2\pi^2 \epsilon_0 a^3}$
 (3) $\frac{Q}{4\pi^2 \epsilon_0 a^2}$ (4) $\frac{Q^2}{4\pi^3 \epsilon_0 a^3}$

13. A ray of light is incident on a medium with angle of incidence i and refracted into a second medium with angle of refraction r . The graph of $\sin i$ versus $\sin r$ is as shown in figure. Then, the velocity of light in the first medium is n times the velocity of light in the second medium. What should be the value of n ?



- (1) $\sqrt{3}$ (2) $1/\sqrt{3}$ (3) $\sqrt{3}/2$ (4) $2/\sqrt{3}$

14. The interference pattern is obtained with two coherent light sources of intensity ratio n . In the interference pattern, the ratio

$$\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}} \text{ will be}$$

- (1) $\frac{2\sqrt{n}}{(n+1)^2}$ (2) $\frac{\sqrt{n}}{n+1}$
 (3) $\frac{2\sqrt{n}}{n+1}$ (4) $\frac{\sqrt{n}}{(n+1)^2}$

15. A ball is dropped from top of a building 45 m high; and at the same instant another ball is thrown upward with speed 30 ms^{-1} from the bottom. The two ball will meet after time

- (1) 1.0 s (2) 1.5 s
 (3) 2.0 s (4) none of these

CHEMISTRY

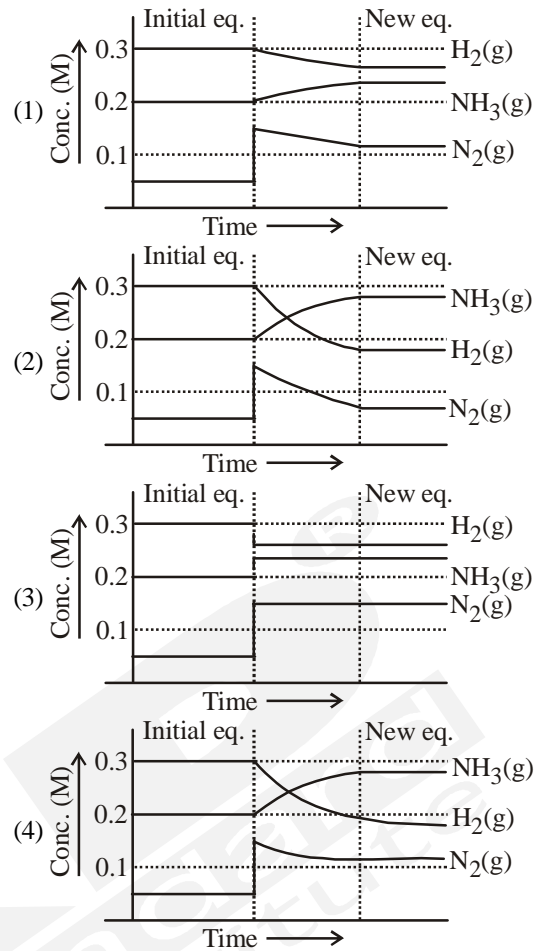
16. At a certain temperature, the following reactions have the equilibrium constants as shown below:



What is the equilibrium constant K_c for the reaction at the same temperature?

- $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$
 (1) 2.5×10^{76} (2) 4×10^{23}
 (3) 4×10^{-77} (4) None of these

17. An equilibrium mixture at 700 K of 0.05 M $\text{N}_2(\text{g})$, 0.3 M $\text{H}_2(\text{g})$ and 0.2 M $\text{NH}_3(\text{g})$ is present in a container. Now if this equilibrium is disturbed by adding $\text{N}_2(\text{g})$ so that its concentration becomes 0.15 M just after addition then which of the following graphs represents the above situation more appropriately?



18. The most stable oxides of nitrogen will be:



$$K = 6.7 \times 10^{16} \text{ mol L}^{-1}$$



$$K = 1.2 \times 10^{24} \text{ mol}^5 \text{ L}^{-5}$$



$$K = 2.2 \times 10^{30}$$



$$K = 3.5 \times 10^{33} \text{ mol L}^{-1}$$

19. At 25°C , K_{sp} for PbBr_2 is equal to 8×10^{-5} . If the salt is 80% dissociated, what is the solubility of PbBr_2 in mol/litre?

(1) $\left[\frac{10^{-4}}{1.6 \times 1.6} \right]^{1/3}$ (2) $\left[\frac{10^{-5}}{1.6 \times 1.6} \right]^{1/3}$

(3) $\left[\frac{10^{-4}}{1.8 \times 1.8} \right]^{1/3}$ (4) $\left[\frac{10^{-5}}{1.6 \times 1.6} \right]^{1/2}$

20. Formation of a solution from two components can be considered as:

- (i) Pure solvent \rightarrow separated solvent molecules, ΔH_1
 (ii) Pure solute \rightarrow separated solute molecules, ΔH_2
 (iii) separated solvent and solute molecules \rightarrow solution, ΔH_3

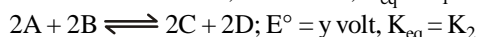
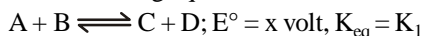
Solution so formed will be ideal if:

- (1) $\Delta H_{\text{soln}} = \Delta H_1 + \Delta H_2 + \Delta H_3$
 (2) $\Delta H_{\text{soln}} = \Delta H_1 + \Delta H_2 - \Delta H_3$
 (3) $\Delta H_{\text{soln}} = \Delta H_1 - \Delta H_2 - \Delta H_3$
 (4) $\Delta H_{\text{soln}} = \Delta H_3 - \Delta H_1 - \Delta H_2$

21. Which solution has the highest vapour pressure?

- (1) 0.02 M NaCl at 50°C
 (2) 0.03 M sucrose at 15°C
 (3) 0.005 M CaCl₂ at 50°C
 (4) 0.005 M CaCl₂ at 25°C

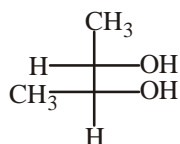
22. Consider the following equations for a cell reaction



then:

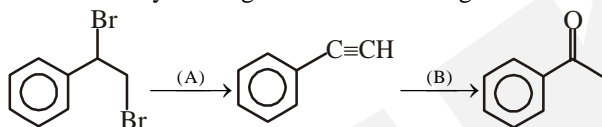
- (1) $x = y, K_1 = K_2$
 (2) $x = 2y, K_1 = 2K_2$
 (3) $x = y, K_1^2 = K_2$
 (4) $x^2 = y, K_1^2 = K_2$

23. Correct configuration of the following is



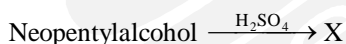
- (1) 1S, 2S
 (2) 1S, 2R
 (3) 1R, 2S
 (4) 1R, 2R

24. Identify the reagents in the following transformations:



- (1) NaNH₂ and KMnO₄/H⁺
 (2) NaNH₂ and H₂O, HgSO₄, H₂SO₄
 (3) Alc. KOH and H₂O, HgSO₄, H₂SO₄
 (4) Alc. KOH and KMnO₄/H⁺

25. In the reaction given below, X is:



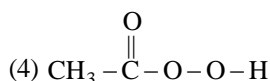
- (1) 2-methylpentane
 (2) Neo-pentane
 (3) 2-methylpent-2-ene
 (4) 2-methylbut-2-ene

26. Ethylacetate reacts with excess of CH₃MgBr to form:

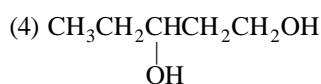
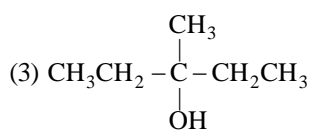
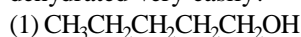
- (1) $\begin{array}{c} \text{H}_5\text{C}_2 \quad \text{C}_2\text{H}_5 \\ \diagdown \quad \diagup \\ \text{C} \\ \diagup \quad \diagdown \\ \text{H}_5\text{C}_2 \quad \text{OH} \end{array}$ (2) $\begin{array}{c} \text{H}_3\text{C} \quad \text{CH}_3 \\ \diagdown \quad \diagup \\ \text{C} \\ \diagup \quad \diagdown \\ \text{H}_3\text{C} \quad \text{OH} \end{array}$
 (3) $\begin{array}{c} \text{H}_3\text{C} \quad \text{C}_2\text{H}_5 \\ \diagdown \quad \diagup \\ \text{C} \\ \diagup \quad \diagdown \\ \text{H}_5\text{C}_2 \quad \text{OH} \end{array}$ (4) $\begin{array}{c} \text{H}_5\text{C}_2 \quad \text{C}_2\text{H}_5 \\ \diagdown \quad \diagup \\ \text{C} \\ \diagup \quad \diagdown \\ \text{H}_7\text{C}_3 \quad \text{OH} \end{array}$

27. Propan-1-ol may be prepared by the reaction of propene with:

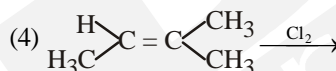
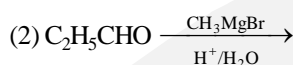
- (1) H₃BO₃
 (2) B₂H₆/NaOH - H₂O₂
 (3) H₂SO₄/H₂O



28. Among the following compounds which can be dehydrated very easily?



29. Which will give chiral molecule?



30. The strongest acid is:

- (1) HC≡CH
 (2) C₆H₆
 (3) C₂H₆
 (4) CH₃OH

BOTANY

31. Well developed pith is found in

- (1) Monocot root and monocot stem
 (2) Monocot stem and dicot root
 (3) Monocot root and dicot stem
 (4) Dicot root and dicot stem

32. Moss plant is

- (1) Gametophyte
 (2) Sporophyte
 (3) Sometimes gametophyte and sometimes sporophyte
 (4) Predominantly gametophyte with sporophyte attached to it

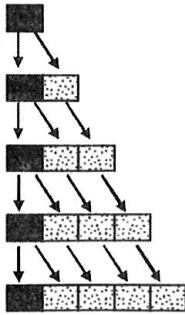
33. In a Mendelian dihybrid cross, the probability of getting seeds with genotype Rryy, RrYy, rrYy and RrYY in F₂ generation is respectively

- (1) $\frac{2}{16} : \frac{4}{16} : \frac{1}{8} : \frac{1}{8}$ (2) $\frac{2}{16} : \frac{2}{16} : \frac{2}{16} : \frac{2}{16}$
 (3) $\frac{4}{16} : \frac{4}{16} : \frac{2}{16} : \frac{2}{16}$ (4) $\frac{1}{8} : \frac{1}{4} : \frac{2}{8} : \frac{1}{16}$

34. Which of the following is incorrect for glycolysis

- (1) It produces ATP
 (2) It uses ATP
 (3) End products are CO₂ and H₂O
 (4) None of the above

35. Select correct representation of



- (1) Logistic growth
 (2) Arithmetic growth
 (3) Geometric growth
 (4) Both arithmetic and geometric

36. Which of the following is correct if a system performs all the functions of any ecosystem and of the biosphere as a whole?

- (i) Conversion of inorganic into organic material with the help of the radiant energy of the sun by the autotrophs
 (ii) Consumption of the autotrophs by heterotrophs
 (iii) Decomposition and mineralisation of the dead matter to release them back for reuse by the autotrophs
 (iv) There is bidirectional movement of energy towards the higher trophic levels and its dissipation and loss as heat to the environment

- (1) (i) and (ii) (2) (i), (ii) and (iii)
 (3) (iii), (ii) and (iv) (4) (ii), (iii) and (iv)

37. Annual net productivity of the whole lithosphere is:

- (1) 80 billion tons (2) 170 billion tons
 (3) 55 billion tons (4) 115 billion tons

38. Of the total incident solar radiation the proportion of PAR is:

- (1) about 70% (2) about 60%
 (3) less than 50% (4) more than 80%

39. Major biomes of India includes:

- (i) Tropical rainforest (ii) Alpine region
 (iii) Deciduous forest (iv) Desert
 (v) Himalayan region
 (vi) Sea coast

Choose the correct combination for given question:

- (1) (i), (ii), (iv) and (v) (2) (i), (ii), (iii) and (iv)
 (3) (ii), (iii), (iv) and (vi) (4) (i), (iii), (iv) and (vi)

40. In an inflorescence, two types of small, sessile flowers were observed. They are arranged in centripetal manner and have reduced hair-like sepals. Which pair of the following characters are not associated with such flowers?

- I. Nectar glands at the base of the corolla
 II. Axile placentation
 III. Superior ovary
 IV. Scaly bracts

- (1) II and III (2) III and IV
 (3) I and II (4) I and IV

41. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F_1 plants were selfed the resulting genotypes were in the ratio of
 (1) 1 : 2 : 1 :: Tall heterozygous : Tall homozygous : Dwarf
 (2) 3 : 1 :: Tall : Dwarf
 (3) 3 : 1 :: Dwarf : Tall
 (4) 1 : 2 : 1 :: Tall homozygous : Tall heterozygous : Dwarf homozygous

42. Fill in the blanks :

1. All living organisms need ...A... for carrying out daily life activities, to be it absorption, transport, movement, reproduction or even breathing.
 2. All the energy required for life processes is obtained by ...B... some macromolecules that we call food.
 3. Animals are heterotrophic, i.e. they obtain food from plant directly (...C...) or indirectly (...D...).

4. ...E... like fungi are dependent on dead and decaying matter
 (1) A-food, B-oxidation, C-carnivores, D-herbivores, E-parasites
 (2) A-energy, B-reduction, C-herbivores, D-Carnivores, E-Saprophytes
 (3) A-energy, B-oxidation, C-herbivores, D-Carnivores, E-Saprophytes
 (4) A-oxygen, B-reduction, C-carnivores, D-herbivores, E-Saprophytes

43. Consider the following statements concerning food chains:

- a. Removal of 80% tigers from an area resulted in greatly increased growth of vegetation
 b. Removal of most of the carnivores resulted in an increased population of deers
 c. The length of food chains is generally limited to 3-4 trophic levels due to energy loss
 d. The length of food chains may vary from 2 to 8 trophic levels

Which two of the above statements are correct?

- (1) a, b (2) b, c
 (3) c, d (4) a, d

44. How many statements are correct?

- (i) Ecology is a subject which studies the interactions among organisms and between the organism and its physical (abiotic) environment.
 (ii) Temperature, water, light and soil are the key elements that lead to so much variation in the physical and chemical conditions of different habitats.
 (iii) Abiotic factor along with biotic components like pathogens, parasites, predators and competitors also affect habitat of the organism.
 (iv) Mango trees can grow in temperate countries like Canada and Germany.
 (v) Tuna fish normally caught beyond tropical latitudes in the ocean.
 (vi) Majority organisms is eurythermal and few are stenothermal.

(vii) The levels of thermal tolerance of different species determine to a large extent their geographical distribution.

- (1) 4 (2) 5
(3) 6 (4) All of these

45. Which of the following statement(s) is/are not correct about meiosis?

- I. Meiosis involves pairing of homologous chromosomes and recombination between them
II. Two diploid cells are formed at the end of meiosis-II
III. Meiosis involves two sequential cycles of nuclear and cell division called meiosis-I and meiosis-II, but only a single cycle of DNA replication
IV. Meiosis-I is initiated after the parental chromosome replication which produce identical sister chromatids at the S-phase

The correct option is

- (1) I and III (2) II only
(3) II and III (4) I, II, III and IV

ZOOLOGY

46. Hypersensitivity towards any foreign material or particle is known as:

- (1) Hypergenital disease
(2) Congenital disease
(3) Cancer
(4) Allergy

47. Which statement is correct for cancer?

- (1) The common approaches for treatment of cancer are surgery, radiation therapy, immunotherapy and chemotherapy
(2) Most cancers are treated by combination of surgery, radiotherapy and chemotherapy
(3) Majority of anti-cancerous drugs have side effects like hair loss, anaemia, etc
(4) All are correct

48. As AIDS has no cure, prevention is the best option, WHO has started a number of programmes to prevent the spreading of HIV infection. Which of the following steps taken up in HIV susceptible populations for prevention of AIDS?

- (i) Taking blood (from blood banks) safe from HIV.
(ii) Ensuring the use of only disposable needles and syringes in public and private hospitals and clinics.
(iii) Free distribution of condoms
(iv) Controlling drug abuse
(v) Advocating safe sex and promoting regular check-ups
(1) Only (i), (iii) and (v) are correct
(2) Only (ii), (iii) and (iv) are correct
(3) Only (i), (ii), (iii), (iv) and (v) are correct
(4) All are correct

49. Which of the following statement is/are correct in relation with epithelial tissue?

- I. It helps in protection and diffusion.
II. It helps in excretion and reproduction.
III. It helps in absorption and secretion.
IV. It helps in locomotion.

- (1) Only IV (2) Only II
(3) All except IV (4) All except III

50. Which of the following statement(s) is/are correct regarding phylum Aschelminthes?

- A. The body is circular in cross-section hence the name roundworms.
B. Alimentary canal is complete with a well-developed muscular pharynx.
C. Sexes are separate (dioecious), i.e., males and females are distinct.
D. Nephridia help in osmoregulation and excretion.
(1) A and B (2) C and D
(3) A, B and C (4) All of these

51. Select the option with correct locations of receptors of given hormones:

- (1) Steroidal Hormones–Membrane-bound; Iodothyronine Hormones–Membrane-bound
(2) Steroidal Hormones–Membrane-bound; Iodothyronine Hormones–Intracellular
(3) Steroidal Hormones–Intracellular; Iodothyronine Hormones–Intracellular
(4) Steroidal Hormones–Intracellular; Iodothyronine Hormones–Membrane-bound

52. Fibrinogen \xrightarrow{A} Fibrin. A is

- (1) Ca^{2+}
(2) Thrombin
(3) Thrombokinase
(4) Prothrombin

53. Which of the following are ureotelic ?

- (1) Aquatic insects
(2) Bony fishes and aquatic amphibians
(3) Mammals and cartilagenous fishes
(4) Terrestrial amphibians and aquatic insects

54. Match the columns:

Column-I		Column-II	
A.	Collecting duct	(i)	Carries blood into kidney
B.	Proximal convoluted tubule	(ii)	Carries urine to renal pelvis
C.	Renal artery	(iii)	Blood filtration
D.	Glomerulus	(iv)	Receives filtrate from Bowman's capsule

- (1) A = (ii), B = (iv), C = (i), D = (iii)
(2) A = (iv), B = (i), C = (iii), D = (ii)
(3) A = (ii), B = (iii), C = (iv), D = (i)
(4) A = (i), B = (ii), C = (iii), D = (iv)

55. Which of the following key factors, makes plasmid, the vector in genetic engineering?

- (1) It is resistant to antibiotics
- (2) It is resistant to restriction enzymes
- (3) Its ability to carry a foreign gene
- (4) Its ability to cause infection in the host

56. Match the following columns.

Column-I		Column-II	
A.	Perimetrium	1.	Inner glandular layer of uterus
B.	Endometrium	2.	External thin membrane of uterus
C.	Myometrium	3.	Middle thick layer of uterus

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

57. Length and width of testis is

- (1) 4-5 cm and 2-3
- (2) 5-6 cm and 3-4 cm
- (3) 6-7 cm and 4-5 cm
- (4) 7-8 cm and 8-9 cm

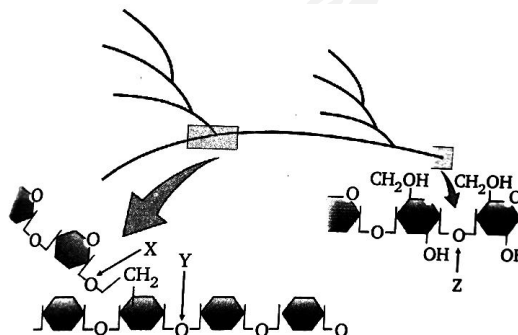
58. Identify correct statement regarding to a particular type of immunity:

- (1) Cellular barriers – Polymorphonuclear leukocytes and monocytes
- (2) Active immunity – Anti-tetanus and anti-snake bite injections
- (3) Physical barriers – Saliva in mouth and tears in eyes
- (4) Physiological barriers - Mucus coating of epithelium lining the urinogential tract and the HCl in stomach

59. Sympathetic nerves can

- (1) Decrease the rate of heart beat
- (2) Increase the strength of ventricular contraction
- (3) Increase the cardiac output
- (4) Both (2) and (3)

60. Identify the linkages X, Y and Z in the diagram:



- (1) X = α -1, 6 ; Y = α -1, 4 ; Z = α -1, 4
- (2) X = β -1, 6 ; Y = β -1, 4 ; Z = β -1, 4
- (3) X = α -1, 6 ; Y = β -1, 4 ; Z = α -1, 4
- (4) X = β -1, 6 ; Y = α -1, 4 ; Z = β -1, 4