

**NATIONAL UNIVERSITY OF SCIENCE & TECHNOLOGY (NUST)****BS Physics Sample Admission Test 02****PHYSICS**

**Directions:** For each question below you are given four choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

**ALL ANSWER MUST BE GIVEN ON THE ANSWER SHEET.**

**YOUR ANSWERS MUST BE INDICATED BY LETTERS (A, B, C, D) AND NOT BY THE WORDS THEMSELVES.**

- Which of the following is a scalar quantity  
(a) Density      (b) Displacement      (c) Torque      (d) Weight
- Which of the following is the only vector quantity  
(a) Temperature      (b) Energy      (c) Power      (d) Momentum
- Which of the following lists of physical quantities consists only of vectors:  
(a) Time, temperature, velocity      (b) Force, volume, momentum  
(c) Velocity, acceleration, mass      (d) Force, acceleration, velocity
- The rectangular components of a vector have angle between them  
(a)  $0^\circ$       (b)  $60^\circ$       (c)  $90^\circ$       (d)  $120^\circ$
- A force of 10N is acting along y-axis. Its component along z-axis is  
(a) 10N      (b) 20N      (c) 100N      (d) Zero N
- Two forces are acting together on an object. The magnitude of their resultant is minimum when the angle between the force is  
(a)  $0^\circ$       (b)  $60^\circ$       (c)  $120^\circ$       (d)  $180^\circ$
- Two forces of 10N and 15N are acting simultaneously on an object in the same direction. Their resultant is

- (a) Zero                      (b) 5N                      (c) 25N                      (d) 150N
8. If the dot product of two non-zero vectors vanishes, the vectors will be  
 (a) In the same direction                      (b) Opposite to each other                      (c) Perpendicular to each other                      (d) Zero
9. If two non-zero vector  $\vec{A}$  and  $\vec{B}$  are parallel to each other, then  $\vec{A} \cdot \vec{B}$  is equal to  
 (a) Zero                      (b) AB                      (c) A + B                      (d) A - B
10. The dot product of two vectors is negative when  
 (a) They are parallel vectors                      (b) They are anti-parallel vectors  
 (c) They are perpendicular vectors                      (d) None of the above is correct
11. The vector product of two vectors is zero, when  
 (a) They are parallel to each other                      (b) They are perpendicular to each other  
 (c) They are equal vectors                      (d) They are inclined at angle of  $60^\circ$
12. If  $(\vec{a} \times \vec{b})$  points along positive z-axis, then the vectors  $\vec{a}$  and  $\vec{b}$  must lie in  
 (a) Ax-plane                      (b) Yx-plane  
 (c) Xy-plane                      (d) None of the above
13. The position vector of a point in xz-plane is given by  
 (a)  $\vec{r} = x \hat{i} + y \hat{j}$                       (b)  $\vec{r} = y \hat{i} + z \hat{k}$                       (c)  $\vec{r} = x \hat{i} + y \hat{j} + z \hat{k}$                       (d)  $\vec{r} = x \hat{i} + z \hat{k}$
14. If  $\vec{A} = A_1 \hat{i} + A_2 \hat{j}$  and  $\vec{B} = B_1 \hat{i} + B_2 \hat{j}$  are non-parallel vectors, then the direction of  $\vec{A} \times \vec{B}$  is  
 (a) Along  $\vec{B}$                       (b) Along x-axis                      (c) Along y-axis                      (d) Along z-axis
15. If  $\vec{A} \cdot \vec{B} = 0$  and also  $\vec{A} \times \vec{B} = 0$ , then

- (a)  $\vec{A}$  and  $\vec{B}$  are perpendicular to each other      (b)  $\vec{A}$  and  $\vec{B}$  are parallel to each other  
 (c)  $\vec{A}$  and  $\vec{B}$  are anti-parallel to each other      (d) Either  $\vec{A}$  or  $\vec{B}$  is a null vector
16. if  $\hat{i}, \hat{j}, \hat{k}$  are unit vectors along x, y, and z-axes, the  $\hat{k} \times \hat{j} = \dots\dots\dots$   
 (a)  $\hat{i}$       (b)  $\hat{j}$       (c)  $-\hat{k}$       (d)  $-\hat{i}$
17. The speed of an object at the end of 4 successive seconds is 20, 25, 30, and 35 mi/hr, respectively. The acceleration of this object is  
 A) 5 ft per sec<sup>2</sup>    B) 5 mi per hr per sec    C) 5 mi per hr<sup>2</sup>    D) 5 mi per sec<sup>2</sup>
18. A bomb is dropped from an airplane moving horizontally with a speed of 600 km/h. If the air resistance is negligible, the bomb will reach the ground in 5 s when the altitude of the plane is approximately  
 A) 50 m      B) 75 m      C) 125 m      D) 250 m
19. If the values of instantaneous and average velocities are equal, the body is said to be moving with  
 (a) Uniform acceleration      (b) Uniform speed      (c) Variable velocity      (d) Uniform velocity
20. A stone is dropped from a cliff. The time during which it covers a distance of 490 m is  
 (a) 10 sec      (b) 100 sec      (c) 9.8 sec      (d) 4.9 sec
21. When a person jumps off the ground, the reaction force of the ground is  
 (a) Greater than the weight of the person      (b) Smaller than the weight of the person  
 (c) Equal to the weight of the person      (d) zero
22. When a bullet is fired by a gun, the gun recoil backward with a velocity  
 (a) Less than that of the bullet      (b) Equal to that of the bullet  
 (c) Greater than that of the bullet      (d) None of the above

23. Which law is applicable in the motion of the rocket in space  
 (a) Conservation of mass (b) Conservation of energy  
 (c) Conservation of angular momentum (d) Conservation of linear momentum
24. A fog droplet after terminal velocity, falls vertically with an acceleration  
 (a) Equal to  $g$  (b) Less than  $g$  (c) Greater than  $g$  (d) Equal to zero
25. The acceleration of a spherical ball on a smooth inclined plane is maximum when the angle of inclination to the horizontal is  
 (a)  $90^\circ$  (b)  $60^\circ$  (c)  $30^\circ$  (d)  $0^\circ$
26. When a force of 4 N acts on a mass of 2 kg for a time of 2 s, what is the rate of change of momentum?  
 (a)  $1 \text{ kg m s}^{-2}$  (b)  $2 \text{ kg m s}^{-2}$  (c)  $4 \text{ kg m s}^{-2}$  (d)  $8 \text{ kg m s}^{-2}$
27. In instantaneous velocity is equal to the average velocity if a body moves with a  
 a) Uniform Velocity b) Variable Velocity (c) Uniform Acceleration (d) Variable Acceleration
28. A person standing in an elevator which goes up with constant upward acceleration exerts a push on the floor of the elevator whose value.  
 A) is always equal to his weight B) is always greater than his weight C) is always less than his weight D) Is zero
29. Which of the following statements is correct for a particle moving in a horizontal circle with constant angular velocity?  
 (a) The linear momentum is constant but the kinetic energy varies  
 (b) The kinetic energy is constant but the linear momentum varies  
 (c) Both kinetic energy and linear momentum are constant  
 (d) Neither the linear momentum nor the kinetic energy is constant

30. A point on the rim of a wheel moves 0.2 m when the wheel turns through an angle of 0.1 rad. What is the radius of the wheel.  
 (a) 0.5 (b) 2 m (c) 0.2 m (d) 20 m
31. Value of Boltzman constant is  
 A)  $1.38 \text{ JK}^{-1}$  B)  $1.38 \times 10^{-23} \text{ JK}^{-1}$   
 C)  $6.21 \times 10^{-12}$  D) None
32. Least distance of distinct vision in man is  
 A) 10 cm B) 20 cm  
 C) 15 cm D) 25 cm
33. Two forces of same magnitude are acting on an object, the magnitude of their resultant is minimum if the angle between them is  
 A)  $45^\circ$  B)  $60^\circ$   
 C)  $90^\circ$  D)  $180^\circ$
34. If two forces each of magnitude 5N act along the same line on a body, then the magnitude of their resultant will be  
 A) 5N B) 10N  
 C) 20N D) 30N
35. Applied force F on a body of mass m, moving with acceleration a is  
 A)  $m/a$  B)  $a/m$   
 C)  $ma$  D)  $m : a$
36. A force of 1000N acts on a body for 0.01 sec. And changes its velocity from 10m/s to 20m/s, what will be the impulse?  
 A) 100 N-sec B) 50 N-sec  
 C) 10 N-sec D) 5 N-sec
37. When a projectile moves upwards, its vertical component of velocity  
 A) Remains constant B) Decreases  
 C) Increases D) Becomes equal to horizontal velocity
38. At the highest point, a projectile has its vertical component of velocity equal to

- A) Maximum  
B) Minimum  
C) Equal to horizontal component of velocity  
D) Equal to initial velocity
39. The speed of efflux is equal to the velocity gained by the fluid in falling through the distance ( $h_1 - h_2$ ) under the action of gravity. This is the statement of  
A) Bernoulli's theorem  
B) law of continuity  
C) Fluid law  
D) Torricelli's theorem
40. Angular momentum is defined as  
A) The dot product of position vector and linear momentum  
B) The cross product of position vector and linear momentum  
C) The simple product of position vector and linear momentum  
D) The product of distance and linear momentum
41. Newton's Law of Gravitation states that the force of attraction between two bodies is directly proportional to  
A) Product of mass and distance between them  
B) Square of the distance between them  
C) Product of their masses  
D) Product of square of their masses
42. If distance between two bodies is doubled and their masses are also doubled the gravitational force will  
A) Increase four times  
B) Decrease four times  
C) Remain constant  
D) Remain constant
43. The work done by a force acting on a body is maximum when  
A) The displacement is zero  
B) The force is parallel to the displacement  
C) The force is perpendicular to the displacement  
D) The force is anti-parallel to the displacement
44. If a force  $F$  moves a body with velocity  $V$  then power is  
A)  $F \cdot V$   
B)  $F \times V$   
C)  $F + V$   
D)  $F - V$

45. When transverse waves propagate through a medium then the particles of the medium
- |   |  |
|---|--|
| A) Remain at rest   | B) Vibrate along the direction of propagation of waves                           |
| C) Vibrate perpendicular to the direction of propagation of waves | D) Vibrate at an angle of $180^\circ$ with the direction of propagation of waves |

## MATHEMATICS

**Directions:** For each question below you are given four choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

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**BY THE WORDS THEMSELVES.**

46. The fifth term of the sequence  $a_n = 2n - 3$  is \_\_\_\_\_.
- |       |        |
|-------|--------|
| A) 13 | B) -13 |
| C) 7  | D) -7  |
47. The harmonic mean between a and b is
- |                    |                      |
|--------------------|----------------------|
| A) $\frac{a+b}{2}$ | B) $\pm\sqrt{ab}$    |
| C) $\frac{a-b}{2}$ | D) $\frac{2ab}{a+b}$ |
48.  $\frac{8!}{6!} =$  \_\_\_\_\_.
- |       |                   |
|-------|-------------------|
| A) 8  | B) $\frac{1}{56}$ |
| C) 56 | D) None of these  |
49.  ${}^{16}C_{11} + {}^{16}C_{10} =$  \_\_\_\_\_.
- |                    |                    |
|--------------------|--------------------|
| A) ${}^{16}C_{10}$ | B) ${}^{15}C_{11}$ |
| C) ${}^{17}C_{10}$ | D) ${}^{17}C_{11}$ |
50. In the expansion of  $(a+x)^n$  the sum of exponents of a and x in each term of the expansion is





C)  $\left[-\frac{1}{2}, \frac{1}{2}\right]$

D) None of these

58.  $\sin \frac{a}{2} =$  \_\_\_\_\_ .

A)  $\sqrt{\frac{(s+b)(s+c)}{bc}}$

B)  $\sqrt{\frac{(s-b)(s-c)}{bc}}$

C)  $\sqrt{\frac{bc}{(s-b)(s-c)}}$

D)  $\sqrt{\frac{s(s-a)}{bc}}$

59. In = radius of  $\Delta ABC$  is

A)  $R = \frac{\Delta}{s}$

B)  $R = \frac{abc}{4\Delta}$

C)  $R = \frac{\Delta}{s-b}$

D)  $R = \frac{abc}{4s}$

60. The solution of the equation  $3 \tan^2 x = 1$  is \_\_\_\_\_.

A)  $\left\{\frac{\pi}{6} + n\pi\right\} \cup \left\{\frac{5\pi}{6} + n\pi\right\}, n \in Z$

B)  $\left\{\frac{\pi}{3} + 2n\pi\right\} \cup \left\{\frac{2\pi}{3} + 2n\pi\right\}, n \in Z$

C)  $\left\{\frac{\pi}{4} + n\pi\right\} \cup \left\{\frac{5\pi}{4} + n\pi\right\}, n \in Z$

D) None of these

61. If  $f(x) = x^3 - 2x^2 + 4x - 1$  then  $f(0)$  is

A) 0

B) 1

C) -1

D) None of these

62.  $F(x) = x$  is

A) Trigonometric function

B) Exponential function

C) Quadratic function

D) None of these

63.  $F(x) = \tan x$  is

A) Even function

B) Odd function

C) Linear function

D) None of these

64. If  $f$  is a bijective a function then  $f(f^{-1}(x))$  is



A)  $\frac{1}{2}(x^2 - x + 1)^2 + c$

C)  $\frac{x^3}{3} - \frac{x^2}{2} + x + c$

B)  $\ln(x^2 - x + 1) + c$

D)  $\ln(2x - 1) + c$

72.  $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} dx = \underline{\hspace{2cm}}$

A)  $\ln|e^x - e^{-x}| + c$

C)  $E^x + e^{-x} + c$

B)  $\ln|e^x + e^{-x}| + c$

D)  $E^x - e^{-x} + c$

73.  $\int e^x \left[ \tanh^{-1} x + \frac{1}{1-x^2} \right] dx = \underline{\hspace{2cm}}$

A)  $e^x \tan^{-1} x + c$

C)  $\frac{e^x}{1-x^2} + c$

B)  $e^x \cot^{-1} x + c$

D)  $e^x \operatorname{cosec}^{-1} x + c$

74.  $\int_0^2 x^2 dx = \underline{\hspace{2cm}}$

A)  $\frac{2}{3}$

C)  $\frac{8}{3}$

B)  $\frac{4}{3}$

D) None of these

75. The mid point of the line segment joining the points A (-B, 3) and B(2, -1) is

A) (-3, 1)

C) (5, 2)

B) (-6, 2)

D) (-5, 2)

76. The latus rectum of the parabola  $x^2 = -4ay$  is

A)  $X = a$

C)  $Y = a$

B)  $Y = -a$

D)  $X = -a$

77. The vertices of the ellipse  $4x^2 + 9y^2 = 36$  are

A)  $(\pm 3, 0)$

C)  $(0, \pm 2)$

B)  $(\pm \sqrt{5}, 0)$

D) None of these

78 The magnitude of the vector

$$\vec{r} = a_1 \hat{i} + a_2 \hat{j} + a_3 \hat{k} \text{ is}$$

A)  $A_1 + a_2 + a_3$

B)  $\sqrt{a_1 + a_2 + a_3}$

C)  $a_1^2 + a_2^2 + a_3^2$

D)  $\sqrt{a_1^2 + a_2^2 + a_3^2}$

79 If dot product of two vectors is zero then the vector are

A) Collinear

B) Perpendicular

C) Parallel

D) None of these

80

If  $3\hat{i} + 9\hat{j} + 3\hat{k}$  and  $-\hat{i} + 4\hat{j} - x\hat{k}$  are perpendicular then

A)  $X = 2$

B)  $X = 11$

C)  $X = 14$

D)  $X = -33$

81  $\forall, a, b, c \in R, a = b \wedge b \Rightarrow a = cis$

A) Reflexive property

B) Symmetric property

C) Transitive property

D) Additive property

82 The value of  $i^{-3} =$

A) 1

B) -1

C) i

D) -i

83 What is the number of elements of the power set of  $\{\}$ ?

A) 0

B) 1

C) 2

D) 3

84 A binary operation  $*$  is called commutative in S if  $\forall a, b, \in S.$

A)  $A * b = b * a$

B)  $A * b = -b * a$

C)  $AB = BA$

D) None of these

85

If  $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$  then order of  $A^t$  is

A)  $3 \times 1$

B)  $1 \times 3$

C)  $3 \times 3$

D)  $1 \times 1$

## ENGLISH

**Directions:** For each question below you are given choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

### SENTENCE COMPLETION

#### Directions

Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath in sentence are five lettered words or sets of words. Choose the word or set of words that best fits the meaning of the sentence as a whole.

86. There was a hint of carelessness about her appearance, as though the cut of her blouse or the fit of her slacks was a matter of \_\_\_\_\_ to her.

A. satisfaction

B. Aesthetics

C. indifference

D. Significance

E. Controversy

87. There was a hint of carelessness about her appearance, as though the cut of her blouse or the fit of her slacks was a matter of \_\_\_\_\_ to her.

A. satisfaction

B. Aesthetics

C. indifference

D. Significance

E. Controversy

### ANALOGY

**Direction:** Each question below consists of a related pairs of words or phrases, followed by five lettered pairs of words or phrases, Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

88. SPOKE : WHEEL ::

(a) square : circle

(b) balance : lever

- (c) door : latch
- (d) book : shelf
- (e) rung : ladder

89. VESSEL : FLEET ::

- (a) wolf : pack
- (b) forest : clearing
- (c) vehicle : truck
- (d) carriage : horse
- (e) squadron : rank

### ANTONYM

**Direction:** In each of the following antonym questions, a word printed in capital letters precedes five lettered words or phrases. From these five lettered words or phrases, pick the one most nearly opposite in meaning to the capitalized word.

90. PERT:

- (A) Polite                      (B) Deliberate                      (C) Moral                      (D) Perishable

91. PRAISE:

- (A) Reproof                      (B) Censure                      (C) Thymol                      (D) Trustworthy

### READING COMPREHENSION

**Direction:** Please read the passage below and answer the questions on the basis of what is stated or implied.

#### **Passage:**

Hiuen Tasang, the famous Chinese traveler, visited Pakistan in the seventh century. He traveled extensively in Pakistan. He stayed for some time in Kanouj, at the court of the great emperor Harshavardhana. He has left for us graphic descriptions of the pomp and ceremony of the royal regalia and the lavish celebrations of Hindu festivals. During one particular festivity at the confluence of the Ganga and Yamuna, many princes would come to participate in the giving of gifts to poor and needy have resounded across the length and breadth of the land from the most distant times! How those ancient banks of seared rivers have heard voices of collective prayers and the shouts of joy of periodic pilgrims! If only the mute stones and steps could tell all the thrills they have witnessed, volumes of stirring stories would flow from them. Hiuen Tasang spent a long period at the famed Nalanda, the great center of learning in classical Pakistan, where students by the hundreds flocked from all over Pakistan and abroad. It has flourished in the remote century of the Buddha and Mahavira, and now when the Chinese pilgrims visited the place it seemed to have been still full of life and intellectual vigour. For this is what the pilgrim notes: "The day is not sufficient for asking and answering profound questions. From morning till night they engage in discussions; the old and the young mutually help one another. If such is not an ideal place of learning, then what is?"

#### **QUESTIONS**

92. Why are the writings of Hiuen Tasng considered very important?

- |  |  |
|--|--|
| A) He was the first foreign visitor              | B) We get details about the life style of classical Pakistan |
| C) He wrote his experiences in Pakistan language | D) He was impressed by the Pakistan way of life              |

E) He recorded stories at the river festivals

93. Why did Hiuen Tsang spend considerable time at Nalanda?

- A) He was to complete a teaching assignment
- B) He was desirous of learning Buddhist practices
- C) It was an important center of pilgrimage
- D) At the request of the local king
- E) None of these

94. The passage refers to all the following except

- A) Footsteps of pilgrims
- B) Voices of collective prayers
- C) Giving of gifts to the poor and orphans
- D) Lavish celebrations
- E) Presence of members of royal families at the pilgrimage spot

95. What has been considered as the most significant aspect of Nalanda?

- A) It was a renowned center of teaching and learning
- B) It used to admit only foreign students
- C) Princes would come there for their studies
- D) It had witnessed volumes of stirring stories of Buddha
- E) None of these

## INTELLIGENCE

**Directions:** For each question below you are given choices. SELECT ANY ONE THAT IS MOST APPROPRIATE ANSWER

96. 28 25 5 21 18 5 14

- A. 11 5
- B. 10 7
- C. 11 8
- D. 5 10
- E. 10 5

97. Look at this series: V, VIII, XI, XIV, \_\_, XX... What number should fill the blank?

- A. IX
- B. XXIII
- C. XV
- D. XVII

98. Look at this series: 70, 71, 76, \_\_, 81, 86, 70, 91... What number should fill the blank?
- A. 70  
B. 71  
C. 80  
D. 96
99. To which industry India's city Ahmedabad is associated?
- A) Cotton Fibre      B) Poly Fibre      C) Paper      D) Textiles
100. "Cork" industry is associated with Cadiz, city of:
- A) Spain      B) Portugal      C) Netherlands      D) Italy

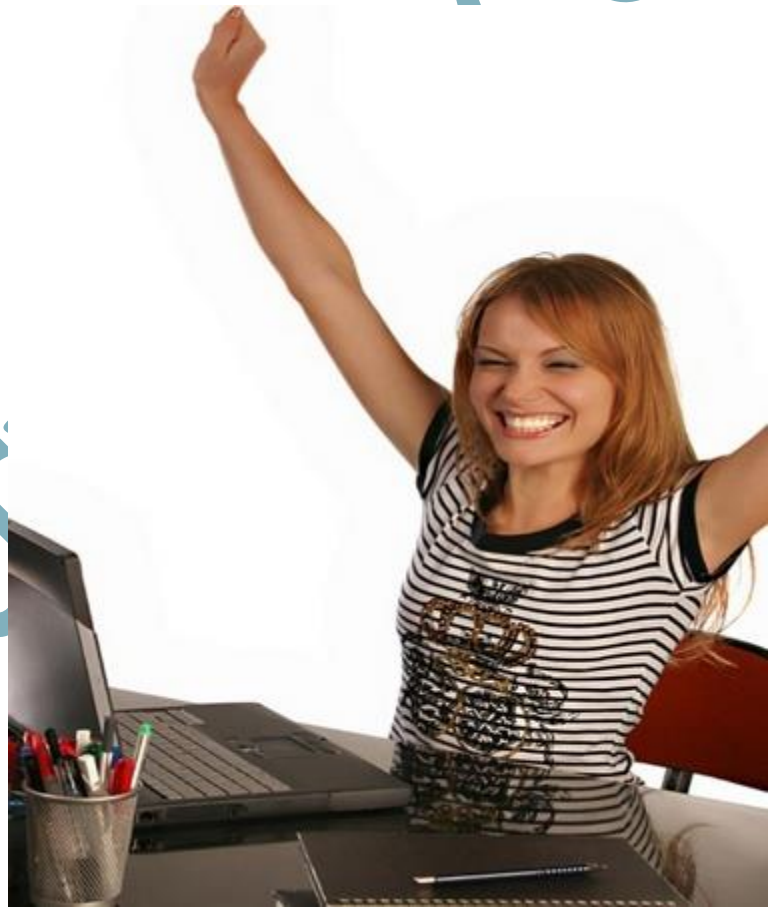
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