

MHT CET SAMPLE PAPER 2024

MockTest

SUBJECT: Physics/ Chemistry

1 : A body of mass 0.05 kg is observed to fall with an acceleration of 9.5 ms^{-2} . The opposing force of air on the body is ($g = 9.8 \text{ ms}^{-2}$)

- (A) 0.015 N
- (B) 0.15 N
- (C) 0.030 N
- (D) zero

2 : The colloidal solution in which both the dispersed phase and dispersion medium are liquids are called

- (A) emulsions
- (B) gels
- (C) foams
- (D) liquid crystals

3 : In fog, photographs of the objects taken with infrared radiations are more clear than those obtained during visible light because

- (A) I-Radiation has lesser wavelength than visible radiation
- (B) scattering of I-R light is more than the object is less
- (C) the intensity of I-R light is more than the object is less
- (D) scattering of I-R light is less than visible light

4 : Three concurrent co-planar forces 1 N, 2 N and 3 N acting along different directions on a body

- (A) can keep the body in equilibrium if 1 N and 3 N act at right angle
- (B) can keep the body in equilibrium if 1 N and 2 N act at right angle
- (C) cannot keep the body in equilibrium
- (D) can keep the body in equilibrium if 1 N and 3 N act at an acute angle

5 : Sound waves transfer

- (A) only energy not momentum
- (B) energy
- (C) momentum
- (D) both (a) and (b)

6 : G.P. Thomson experimentally confirmed the existence of matter waves by the phenomena

- (A) diffraction
- (B) refraction
- (C) polarisation
- (D) scattering

7 : The resistance of a wire at 300 K is found to be 0.3Ω . If the temperature coefficient of resistance of wire is $1.5 \times 10^{-3} \text{ K}^{-1}$, the temperature at which the resistance becomes 0.6Ω is

- (A) 720 K
- (B) 345 K
- (C) 993 K
- (D) 690 K

8 : 5 moles of SO_2 and 5 moles of O_2 are allowed to react to form SO_3 in a closed vessel. At the equilibrium stage 60% of SO_2 is used up. The total number of moles of SO_2 , O_2 and SO_3 in the vessel now is:

- (A) 10.0
- (B) 8.5
- (C) 10.5
- (D) 3.9

9 : A base, as defined by Bronsted theory, is a substance which can

- (A) accept protons
- (B) donate protons
- (C) lose a pair of electrons
- (D) gain a pair of electrons

10 : In the case of small cuts bleeding is stopped by applying potash alum. Here alum acts as:

- (A) Fungicide
- (B) Disinfectant
- (C) Germicide
- (D) Coagulating agent

11 : "It is impossible to determine simultaneously the position and velocity of small particles such as electron". It is a statement of

- (A) Hund's rule
- (B) Aufbau's principle
- (C) Pauli's rule
- (D) Heisenberg's uncertainty principle

12 : The percentage of N₂ in urea is about:

- (A) 28
- (B) 18
- (C) 85
- (D) 46

13 : When salicylic acid is distilled with zinc dust, the product obtained is:

- (A) Zinc salicylate
- (B) Salicylaldehyde
- (C) Phenol
- (D) Benzoic acid

14 : On heating ethanol with excess of conc. H₂SO₄ at 1700 C, the product obtained is:

- (A) Ethene
- (B) Ethoxy ethane
- (C) Ethyne
- (D) Ethane

15 : To calculate the amount of work done in joules during reversible isothermal expansion of an ideal gas, the volume must be expressed in:

- (A) Dm³ only
- (B) M³ only
- (C) Any unit
- (D) Cm³ unit

16 : The quantity of electricity required to liberate 112 cm³ of hydrogen at STP from acidified water is:

- (A) 965 coulombs
- (B) 1 faraday
- (C) 0.1 faraday
- (D) 96500 coulombs

17 : Hydrogen ion concentration of an aqueous solution is 1×10^{-4} M. The solution is diluted with equal volume of water. Hydroxyl ion concentration of the resultant solution in terms of mol dm⁻³ is:

- (A) 1×10^{-8}
- (B) 2×10^{-8}
- (C) 1×10^{-9}
- (D) 2×10^{-9}

0.5 × 10⁻¹⁰

18 : The shape of cuprammonium ion is:

- (A) Trigonal
- (B) Tetrahedral
- (C) Octahedral
- (D) Square planar

19 : The enthalpy of combustion of $C_6H_6(l)$ is -3250 kJ. When 0.39 g of benzene is burnt in excess of oxygen in an open vessel, the amount of heat liberated is:

- (A) 16.25 J
- (B) 16.25 kJ
- (C) 32.5 J
- (D) 32.5 kJ

20 :

The oxidation number and the electronic configuration of sulphur in H_2SO_4 is:

- (A) $+4$; $1s^2 2s^2 2p^6 3s^2$
- (B) $+2$; $+6$; $1s^2 2s^2 2p^6 3s^2 3p^2$
- (C) $+3$; $1s^2 2s^2 2p^6 3s^2 3p^1$
- (D) $+6$; $1s^2 2s^2 2p^6$

21 : The solubility product of a binary weak electrolyte is 4×10^{-10} at 298 K. Its solubility in mol dm^{-3} at the same temperature is:

- (A) 4×10^{-5}
- (B) 2×10^{-5}
- (C) 8×10^{-10}
- (D) 16×10^{-20}

22 : Propane is the product obtained by dehydrogenation of:

- (A) 2 *v*- propanol
- (B) 1 – propanol
- (C) Propanol
- (D) *N* – propyl alcohol

23 : To get DDT chlorobenzene has to react with the following compound in the presence of concentrated sulphuric acid:

- (A) Trichloro ethane
- (B) Dichloro acetone
- (C) Dichloro acetaldehyde
- (D) Trichloro acetaldehyde

24 : Glacial acetic acid is obtained by:

- (A) Chemically separating acetic acid
- (B) Treating vinegar with dehydrating agents
- (C) Crystallising, separating and melting acetic acid
- (D) Distilling vinegar

25 : Hypothyroidism is caused by the deficiency of :

- (A) Thyroxine
- (B) Glucocorticoid
- (C) Vitamin B-12
- (D) Adrenalin

26 : A food additive that also acts as an anti-oxidant is :

- (A) Sugar syrup
- (B) Salt
- (C) BHA
- (D) Saccharin

27 : Which of the following monomers can undergo condensation polymerisation ?

- (A) Isoprene
- (B) Propene
- (C) Styrene
- (D) Glycine

28 : The dimensions of Rydberg's constant are

- (A) $[M^0L^{-1}T]$
- (B) $[MLT^{-1}]$
- (C) $[M^0L^{-1}T^0]$
- (D) $[ML^0T^2]$

29 : 'Farad' is the unit of

- (A) resistance
- (B) conductance
- (C) capacitance
- (D) inductance

30 : S.I. unit of surface tension is

- (A) degree/cm
- (B) N/m
- (C) N/m^2
- (D) Nm

31 : In velocity – time graphs.

- (A) Velocity is taken along the Y-axis and Time is taken along the X-axis
- (B) Straight line indicates uniform acceleration
- (C) Straight line parallel to x-axis indicates uniform motion
- (D) All of the above

32 : The equation (s) of motion can be represented as.

(A) $v = u + at$

(B) $s = ut + \frac{1}{2}at^2$

(C) $2as = v^2 - u^2$

- (D) All of these

33 : A train travels 40 km at a uniform speed of 30 km h⁻¹. Its average speed after traveling another 40 km is 45 km h⁻¹ for the whole journey. Its speed in the second half of the journey is.

- (A) 45 km h⁻¹
- (B) 90 km h⁻¹
- (C) 60 km h⁻¹
- (D) None of these

34 : Aman walks on a straight road from his home to market 2.5km. away with a speed of 5 km/h. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 km/h. The average speed of the man over the interval of time 0 to 40 min. is equal to –

- (A) 5 km/h
- (B) $25/4$ km/h
- (C) $30/4$ km/h
- (D) 45/km/h

35 : A book of weight 10 N is placed on a table. The force exerted by the surface of the table on the book will be.

- (A) Zero
- (B) 10 N
- (C) 20 N

(D) None of these

36 : When a body is stationary-

- (A) There is no force acting on it
- (B) The force acting on it not in contact with it
- (C) The combination of force acting on it balances each other
- (D) The body is in vacuum

37 : A rider on horse falls back when horse starts running, all of a sudden because.

- (A) rider is taken back
- (B) rider is suddenly afraid of falling
- (C) inertia of rest keeps the upper part of body at rest while lower part of the body moves forward with the horse
- (D) None of the above

38 : The proper care and maintenance of machines require.

- (A) to make them good looking
- (B) for preserving them for future
- (C) for their efficient and longer use
- (D) None of these

39 : Solar cookers are used.

- (A) to cook our food
- (B) in artificial satellites
- (C) converting into electrical energy
- (D) in drying clothes and other materials

40 : A ball tied to a string is swung in a vertical circle. Which of the following remains constant ?

- (A) tension in the string
- (B) speed of the ball
- (C) centripetal force
- (D) earth's pull on the ball

41 : Statement 1 ; When you lean behind over the hind legs of the chair, the chair falls back after a certain angle. Statement 2 : Centre of mass lying outside the system makes the system unstable .

- (A) Statement – 1 is false, Statement – 2 is true
- (B) Statement – 1 is true, Statement – 2 is true; Statement – 2 is a correct explanation for statement – 1
- (C) Statement – 1 is true, Statement – 2 is true; Statement – 2 is not a correct explanation for Statement – 1
- (D) Statement – 1 is true, Statement – 2 is false

42 : Centre of mass of the earth and the moon system lies

- (A) closer to the earth
- (B) closer to the moon
- (C) at the mid–point of line joining the earth and the moon
- (D) cannot be predicted

43 : Kepler's laws governing the motion of planets are :

- (A) The orbit of a planet is an ellipse with the Sun at one of the foci
- (B) The line joining the planet and the Sun sweep equal areas in equal intervals of time
- (C) The cube of the mean distance of a planet (r) from the Sun is proportional to the square of its orbital period (T)
- (D) All of these

44 : According to Kepler, force acting on an orbiting planet is given by

- (A) $F = mg$
- (B) $F < \frac{v^2}{r}$
- (C) $F = mgh$
- (D) None of these

- 45 : Pick up the correct relationship
- (A) gravitational constant $G = Fd^2 / M \times m$
 - (B) $G = g M / R^2$
 - (C) $G = g$
 - (D) All of these

- 46 : The gravitational force between two objects is F . If masses of both objects are halved without changing distance between them, then the gravitational force would become
- (A) $F/4$
 - (B) $F/2$
 - (C) F
 - (D) $2 F$

- 47 : Two liquids drops coalesce to form a large drop. Now,
- (A) energy is liberated
 - (B) energy is neither liberated nor absorbed
 - (C) some mass gets converted into energy
 - (D) energy is absorbed

- 48 : Hooke's law states that
- (A) energy is liberated
 - (B) energy is neither liberated nor absorbed
 - (C) some mass gets converted into energy
 - (D) energy is absorbed

- 49 : Hooke's law essentially defines
- (A) stress
 - (B) strain
 - (C) yield point
 - (D) elastic limit

- 50 : An underwater explosion is caused near the sea-shore. There are two observers, X under water and Y on land, each at a distance of 1 km from the point of explosion
- (A) X will hear the sound earlier
 - (B) Y will hear the sound earlier
 - (C) Both will hear the sound at the same time.
 - (D) Y will not hear the sound at all

- 51 : In a long spring which of the moves forward, it pushes and compresses the air in front of it creating a region of high pressure called
- (A) longitudinal only
 - (B) transverse only
 - (C) both longitudinal and transverse
 - (D) electromagnetic only

- 52 : When a vibrating object moves forward, it pushed and compresses the air in front of it creating a region of high pressure called
- (A) rarefaction
 - (B) compression
 - (C) depression
 - (D) hypertension

- 53 : To keep correct time modern watches are fitted with balance wheel made of
- (A) steel
 - (B) platinum
 - (C) invar
 - (D) tangstan

54 : By increasing the temperature of liquid, its

- (A) volume and density decreases
- (B) volume and density increases
- (C) volume increases and density decreases
- (D) volume decreases and density increases

55 : Two spheres of same size are made of the same metal but one is hollow and the other is solid. They are heated to same temperature, then

- (A) both spheres will expand equally
- (B) hollow sphere will expand more than the solid one
- (C) solid sphere will expand more than the hollow one
- (D) None of these

56 : As the temperature is increased, the time period of a pendulum

- (A) increases proportionately with temperature
- (B) increases
- (C) decreases
- (D) remains constant

57 : A solid ball of metal has spherical cavity inside it. The ball is heated. The volume of cavity will

- (A) decrease
- (B) increase
- (C) remain unchanged
- (D) have its shape changed

58 : The two forms of energy released by a tungsten filament used in a bulb are

- (A) electrical and light
- (B) light and heat
- (C) heat and electrical
- (D) electrical only

59 : The combined resistance of any number of resistances connect in series is equal to

- (A) The sum of individual resistances
- (B) The sum of reciprocals of individual resistance
- (C) Product of individual resistances
- (D) Highest individual resistance

60 : An air conditioner of 2000 W, a fan of 500 W, a bulb of 40 W and a computer offering 30 W are used in a house hold using 220V. The power rating of the fuse to be used in this case is

- (A) 10A
- (B) 15A
- (C) < 20A
- (D) < 5A

61 : Appliances : Parallel Fuse :

- (A) Series
- (B) Parallel
- (C) Series in appliances always
- (D) Parallel in fuse always

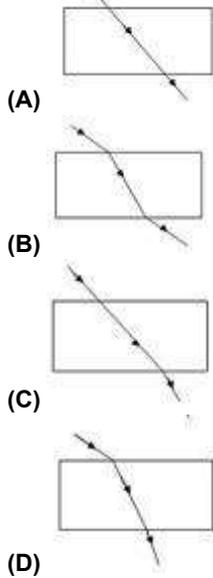
62 : The magnitude of the force experienced by a current carrying conductor when placed in a magnetic field will be

- (A) maximum if the directions of current and magnetic field are perpendicular to each other
- (B) minimum if the directions of current and magnetic field are perpendicular to each other
- (C) maximum if the directions of current and magnetic field are opposite to each other
- (D) maximum if the directions of current and magnetic field are same

63: When a ray of light passes from an optically denser medium to a rarer medium, it

- (A) goes undeviated
- (B) bends away from the normal
- (C) bends towards the normal
- (D) None of these

64: The path of ray of light coming from passing through a rectangular glass slab traced by four students are shown as 1, 2, 3 and 4 in the figure. Which one of them is correct?



65: In torches, search lights and headlights of vehicles the bulb is placed

- (A) between the pole and the focus of the reflector
- (B) very near to the focus of the reflector
- (C) between the focus and centre of curvature of the reflector
- (D) at the centre of curvature of the reflector

66: In solar water heater, a copper pipe with its outer surface painted in black is fixed in the form of a coil in a box.

- (A) The only purpose of bending copper pipe is to increase the capacity of water storage
- (B) Bending copper pipe as a coil helps to increase the surface area for heating
- (C) Both (a) and (b) are true
- (D) Both (a) and (b) are false

67: Different forms of energy can be

- (A) mechanical energy
- (B) heat energy
- (C) muscular energy
- (D) chemical energy, electrical energy & other in addition to those mentioned above

68: In which of the following, emission of electrons does not take place?

- (A) Thermionic emission
- (B) X-rays emission
- (C) Photoelectric emission
- (D) Secondary emission

69: A photon is a/an

- (A) quantum of light
- (B) quantum of matter
- (C) positively charged particle
- (D) instrument for measuring light intensity

70: Of the following properties, the photon does not possess

- (A) rest mass
- (B) momentum
- (C) energy
- (D) frequenc

71 : Which one of the following chemicals is used in beauty parlours for hair – setting ?

- (A) Sulphur based
- (B) Phosphorus based
- (C) Silicon based
- (D) Iron based

72 : Which one of the following is used as a mordant in dyeing and tanning industry ?

- (A) Magnesium oxide
- (B) Magnesium carbonate
- (C) Magnesium chloride
- (D) Magnesium sulphate

73 : A mixture of sulphur and carbon disulphide is.

- (A) heterogeneous and shows Tyndall effect
- (B) homogeneous and shows Tyndall effect
- (C) heterogeneous and does not show Tyndall effect
- (D) homogeneous and does not show Tyndall effect

74 : A student, carefully observed the colloidal of starch in water, human blood and cow milk. On the basis of observations, he made certain conclusions given below. Choose the wrong conclusion about colloidal solution.

- (A) Translucent
- (B) Components can be separated by ordinary filtration
- (C) Heterogenous and stable
- (D) show tyndal effect

75 : Choose the incorrect statement about true solution.

- (A) Its components can not be separated by filtration
- (B) It is opaque and unstable
- (C) Its particles can not be seen through naked eye
- (D) It does not show tyndal effect

76 : Barium sulphate (BaSO_4) dispersed in water used diagnostic X-rays is a.

- (A) Colloid
- (B) Solution
- (C) Suspension
- (D) Foam

77 : Heavy water implies.

- (A) water which is used in heavy industires such as thermal power plants
- (B) water which contains SO_4^{2-} and Cl^- of calcium and magnesium
- (C) deuterated water
- (D) water which has maximum density

78 : Which one of the following is not needed in a nuclear fission reactor ?

- (A) Moderator
- (B) Coolant
- (C) Accelerator
- (D) Control device

79 : An α -particle consists of which of the following ?

- (A) 2 protons and 2 neutrons

- (B) 1 proton and 1 electron
- (C) 2 protons and 4 neutrons
- (D) 1 proton and 1 neutron

80 : In which one of the following is the valence electronic configuration, ns^2np^3 found ?

- (A) Carbon
- (B) Oxygen
- (C) Nitrogen
- (D) Argon

81 : Which element forms the highest number of compounds in the periodic table ?

- (A) Carbon
- (B) Oxygen
- (C) Silicon
- (D) Sulphur

82 : Which one of the following elements is a metalloid ?

- (A) P
- (B) Al
- (C) As
- (D) Po

83 : Periodic classification of elements is used to examine the

- (A) periodic trends in physical properties of elements
- (B) periodic trends in chemical properties of elements
- (C) Both (a) and (b)
- (D) None of the above

84 : The most significant contribution towards the development of periodic table was made by

- (A) Mendeleev
- (B) Avogadro
- (C) Dalton
- (D) Cavendish

85 : Which one of the following reducing agents can also act as an oxidising agent ?

- (A) H_2
- (B) H_2S
- (C) SO_2
- (D) HI

86 : A woman desires to clean the surface of her gold ornaments by a chemical approach. For this she requires to use

- (A) aqua-regia
- (B) concentrated H_2SO_4
- (C) concentrated NaOH
- (D) sodium thiosulphate solution

87 : Among the elements Zn, Ga, Ge and As, the one with the lowest first ionization energy is

- (A) As
- (B) Zn
- (C) Ga
- (D) Ge

88 : The valency of an element depends upon the

- (A) total number of proton in an atom
- (B) mass number of an atom
- (C) total number of neutron in an atom

(D) total number of electrons in the outer most shell of an atom

89 : In paper manufacturing, degumming of the raw material is done using

- (A) sulphuric acid
- (B) bleaching powder
- (C) caustic soda
- (D) nitric acid

90 : Dolomite powder is applied in some agricultural lands. The purpose of applying it is to

- (A) increase the pH of the soil
- (B) lower the pH of the soil
- (C) increase the phosphorus content of the soil
- (D) increase the nitrogen content of the soil

91 : The pH value of a sample of multiple – distilled water is

- (A) zero
- (B) 14
- (C) very near to zero
- (D) very near to seven

92 : In the reaction between hydrogen sulphate ion and water, the water acts as

- (A) an acid
- (B) a base
- (C) a salt
- (D) an inert medium

93 : Metals can be obtained economically from

- (A) minerals
- (B) ores
- (C) earth's crust
- (D) none

94 : Brass contains

- (A) Copper and Zinc
- (B) Copper and Tin
- (C) Copper and Silver
- (D) Copper and Nickel

95 : Which is the purest commercial form of iron ?

- (A) Pig iron
- (B) Steel
- (C) Stainless steel
- (D) Wrought iron

96 : In galvanization, iron is coated with

- (A) Copper
- (B) Zinc
- (C) Tin
- (D) Nicked

97 : Methoxyethane and propanol are the examples of isomerism of the type

- (A) structural
- (B) position
- (C) functional
- (D) tautomerism

98 : Isomers of propionic acid are

- (A) HCOOC_2H_5 and $\text{CH}_3\text{COOCH}_3$
- (B) $\text{CH}_3\text{COOCH}_3$ and $\text{C}_3\text{H}_7\text{OH}$
- (C) $\text{CH}_3\text{COOCH}_3$ and $\text{C}_3\text{H}_7\text{OH}$
- (D) $\text{C}_3\text{H}_7\text{OH}$ and CH_3COCH_3

99 : $\text{C}_6\text{H}_5\text{C} \equiv \text{N}$ and $\text{C}_6\text{H}_5\text{N}$

are which type of isomers ?

- (A) Position
- (B) Functional
- (C) Tautomerism
- (D) Linkage

100 : Which organic structure among the following is not an isome of the compound $\text{CH}_3\text{-CO-CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$?

- (A) $\text{CH}_3\text{CH}_2\text{OCH}=\text{CHCH}_2\text{CH}_3$
- (B) $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CHO}$
- (C) CH_3
- (D) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_2\text{CH}_3$



VIDYA
SCIENCE ACADEMY

SUBJECT : Maths

101. $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} \frac{dx}{1 + \cos x}$ is equal to

- (a) $-2\sqrt{2}$ (b) 2
(c) $-2 - 2\sqrt{2}$ (d) -2

102. If $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2} \tan^{-1}x$, then x has the value

- (a) 3 (b) 1
(c) $\frac{1}{\sqrt{3}}$ (d) $\sqrt{3}$

103. If $p: \forall n \in \mathbb{N}, n^2 + n$ is an even number
 $q: \forall n \in \mathbb{N}, n^2 - n$ is an odd number,
then the truth values of $p \wedge q, p \vee q$ and $p \rightarrow q$ are respectively

- (a) F, T, F (b) F, F, T
(c) T, T, F (d) F, T, T

104. If the function $f(x) = x^3 - 3(a-2)x^2 + 3ax + 7$, for some $a \in \mathbb{R}$ is increasing in $(0, 1]$ and decreasing in $[1, 5)$,

then a root of the equation $\frac{f(x) - 14}{(x-1)^2} = 0$ ($x \neq 1$) is

- (a) 14 (b) 7
(c) -14 (d) -7

105. If $\vec{a} = \hat{i} - \hat{k}, \vec{b} = x\hat{i} + \hat{j} + (1-x)\hat{k}$ and
 $\vec{c} = y\hat{i} + x\hat{j} + (1+x-y)\hat{k}$, then $[\vec{a} \vec{b} \vec{c}]$

- depends on
(a) only y (b) neither x nor y
(c) both x and y (d) only x

117. The incidence of occupational disease in an industry is such that the workmen have a 10% chance of suffering from it. The probability that out of 5 workmen, 3 or more will contract the disease is

- (a) 0.000856 (b) 0.856
(c) 0.0000856 (d) 0.00856

118. If $y = \log \sqrt{\frac{1 + \sin x}{1 - \sin x}}$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{3}$ is

- (a) $\frac{1}{2}$ (b) $-\frac{1}{2}$
(c) 2 (d) $\frac{1}{4}$

119. The variance and mean of 15 observations are respectively 6 and 10. If each observation is increased by 8 then the new variance and new mean of resulting observations are respectively

- (a) 6, 18 (b) 6, 10
(c) 14, 10 (d) 14, 18

120. If $y = \sin \left(2 \tan^{-1} \sqrt{\frac{1+x}{1-x}} \right)$, then $\frac{dy}{dx}$ is equal to

- (a) $\frac{-x}{\sqrt{1-x^2}}$ (b) $\frac{-2x}{\sqrt{1-x^2}}$
(c) $\frac{-1}{\sqrt{1-x^2}}$ (d) $\frac{1}{\sqrt{1-x^2}}$

121. The magnitude of the projection of the vector $2\hat{i} + 3\hat{j} + \hat{k}$ on the vector perpendicular to the plane containing the vectors $\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} + 3\hat{k}$ is

- (a) $3\sqrt{6}$ units (b) $\frac{\sqrt{3}}{2}$ units
(c) $\frac{3}{\sqrt{2}}$ units (d) $\sqrt{\frac{3}{2}}$ units

122. If $f(x) = ax^2 + bx + 1$, if $|2x - 3| \geq 2$
 $= 3x + 2$, if $\frac{1}{2} < x < \frac{5}{2}$

is continuous on its domain, then $a + b$ has the value

- (a) $\frac{13}{5}$ (b) $\frac{31}{5}$
 (c) $\frac{23}{5}$ (d) $\frac{1}{5}$

123.

If $\vec{a} = i + j + k$, $b = i - j + k$ and $\vec{c} = i - j - k$ are three vectors then vector \vec{r} in the plane of \vec{a} and \vec{b} , whose projection on \vec{c} is $\frac{1}{\sqrt{3}}$, is given by

- (a) $(2t + 1)\vec{i} - \vec{j} + (2t + 1)\vec{k}$, $\forall t \in \mathbb{R}$
 (b) $(2t + 1)\vec{i} - \vec{j} + (2t - 1)\vec{k}$, $\forall t \in \mathbb{R}$
 (c) $(2t - 1)\vec{i} - \vec{j} + (2t - 1)\vec{k}$, $\forall t \in \mathbb{R}$
 (d) $(2t - 1)\vec{i} - \vec{j} + (2t + 1)\vec{k}$, $\forall t \in \mathbb{R}$

124.

A tetrahedron has vertices $P(1, 2, 1)$, $Q(2, 1, 3)$, $R(-1, 1, 2)$ and $O(0, 0, 0)$. Then the angle between the faces OPQ and PQR is

- (a) $\cos^{-1}\left(\frac{17}{35}\right)$ (b) $\cos^{-1}\left(\frac{17}{31}\right)$
 (c) $\cos^{-1}\left(\frac{19}{35}\right)$ (d) $\cos^{-1}\left(\frac{19}{31}\right)$

125.

The principal value of $\sin^{-1}\left(\sin\left(\frac{2\pi}{3}\right)\right)$ is

- (a) $\left(\frac{\pi}{3}\right)$ (b) $\left(\frac{2\pi}{3}\right)$
 (c) $-\left(\frac{2\pi}{3}\right)$ (d) $\left(\frac{5\pi}{3}\right)$

126.

The differential equation $\frac{dy}{dx} = \frac{\sqrt{1 - y^2}}{y}$ determines

a family of circles with

- (a) fixed radius of 1 unit and variable centres along the X-axis
 (b) fixed radius of 1 unit and variable centres along the Y-axis
 (c) variable radii and a fixed centre at $(0, 1)$
 (d) variable radii and a fixed centre at $(0, -1)$

127. The value of the integral $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx$ is

- (a) $\left(\frac{\pi}{2}\right) + 1$ (b) $\left(\frac{\pi}{2}\right) - 1$
(c) 1 (d) -1

128. If a question paper consists of 11 questions divided into two sections I and II. Section I consists of 6 questions and section II consists of 5 questions, then the number of different ways can student select 6 questions, taking at least 2 questions from each section, is

- (a) 425 (b) 275
(c) 350 (d) 225

129. The area (in sq. units) of the region described by

$$A = \{(x, y) / x^2 + y^2 \leq 1 \text{ and } y^2 \leq 1 - x\}$$

- (a) $\left(\frac{\pi}{2} + \frac{2}{3}\right)$ (b) $\left(\frac{\pi}{2} + \frac{4}{3}\right)$
(c) $\left(\frac{\pi}{2} - \frac{4}{3}\right)$ (d) $\left(\frac{\pi}{2} - \frac{2}{3}\right)$

130. A firm is manufacturing 2000 items. It is estimated that the rate of change of production P with respect to additional number of workers x is given by

$$\frac{dP}{dx} = 100 - 12\sqrt{x}. \text{ If the firm employs 25 more workers, then the new level of production of items is}$$

- (a) 4500 (b) 3000
(c) 2500 (d) 3500

131. $\int \frac{3x - 2}{(x + 1)(x - 2)^2} dx =$

(where C is a constant of integration)

- (a) $\frac{-5}{9} \log(x + 1) + \frac{5}{9} \log(x - 2) - \frac{4}{3} \times \frac{1}{(x - 2)} + C$
(b) $\frac{-5}{9} \log(x + 1) + \frac{5}{9} \log(x - 2) - \frac{1}{x - 2} + C$
(c) $\frac{1}{9} \log(x + 1) + \frac{5}{9} \log(x - 2) - \frac{4}{3} \times \frac{1}{(x - 2)} + C$
(d) $\frac{-5}{9} \log(x + 1) + \frac{1}{9} \log(x - 2) - \frac{1}{x - 2} + C$

138. Let z be a complex number such that $|z| + z = 3 + i$,
 $i = \sqrt{-1}$, then $|z|$ is equal to

- (a) $\frac{5}{4}$ (b) $\frac{5}{3}$
 (c) $\frac{\sqrt{34}}{3}$ (d) $\frac{\sqrt{41}}{4}$

139. Given $A = \begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$, if $xyz = 60$ and

$8x + 4y + 3z = 20$, then A

- (a) $\begin{bmatrix} 60 & 0 & 0 \\ 0 & 60 & 0 \\ 0 & 0 & 60 \end{bmatrix}$ (b) $\begin{bmatrix} 108 & 0 & 0 \\ 0 & 108 & 0 \\ 0 & 0 & 108 \end{bmatrix}$
 (c) $\begin{bmatrix} 20 & 0 & 0 \\ 0 & 20 & 0 \\ 0 & 0 & 20 \end{bmatrix}$ (d) $\begin{bmatrix} 68 & 0 & 0 \\ 0 & 68 & 0 \\ 0 & 0 & 68 \end{bmatrix}$

140. If $y^{\frac{1}{m}} + y^{\frac{-1}{m}} = 2x$, $x \neq 1$, then $(x^2 - 1) \left(\frac{dy}{dx} \right)^2$ is equal

to

- (a) my^2 (b) m^2y
 (c) m^2y^2 (d) $\frac{my^2}{2}$

141. $\int_0^2 [x] dx + \int_0^2 |x - 1| dx =$

(where $[x]$ denotes the greatest integer function.)

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

142. The equations of the lines passing through the point
 (3, 2) and making an acute angle of 45° with the line
 $x - 2y - 3 = 0$ are

- (a) $3x + y - 11 = 0$, $x + 3y + 9 = 0$
 (b) $3x - y - 7 = 0$, $x + 3y - 9 = 0$
 (c) $3x + y - 11 = 0$, $x + 3y - 9 = 0$
 (d) $x + 2y - 7 = 0$, $2x - y - 4 = 0$

143. If $[x]$ is greatest integer function and $2[2x - 5] - 1 = 7$, then x lies in

(a) $\left(\frac{9}{2}, 5\right)$ (b) $\left[\frac{9}{2}, 5\right]$
(c) $\left[\frac{9}{2}, 5\right)$ (d) $\left(\frac{9}{2}, 5\right]$

144. The Cartesian equation of a line passing through $(1, 2, 3)$ and parallel to $x - y + 2z = 5$ and $3x + y + z = 6$ is

(a) $\frac{x - 1}{-3} = \frac{y - 2}{5} = \frac{z - 3}{4}$
(b) $\frac{x - 1}{3} = \frac{y - 2}{1} = \frac{z - 3}{1}$
(c) $\frac{x - 1}{1} = \frac{y - 2}{-1} = \frac{z - 3}{1}$
(d) $\frac{x - 1}{-3} = \frac{y - 2}{-5} = \frac{z - 3}{4}$

145. If the lines $3x - 4y - 7 = 0$ and $2x - 3y - 5 = 0$ pass through diameters of a circle of area 49π square units, then the equation of the circle is

(a) $x^2 + y^2 - 2x + 2y - 47 = 0$
(b) $x^2 + y^2 - 2x + 2y + 51 = 0$
(c) $x^2 + y^2 + 2x - 2y - 51 = 0$
(d) $x^2 + y^2 + 2x + 2y + 47 = 0$

146. A spherical iron ball of 10 cm radius is coated with a layer of ice of uniform thickness that melts at the rate of $50 \text{ cm}^3/\text{min}$. If the thickness of ice is 5 cm, then the rate at which the thickness of ice decreases is

(a) $\frac{-1}{18\pi} \text{ cm/min}$ (b) $\frac{2}{9\pi} \text{ cm/min}$
(c) $\frac{1}{18\pi} \text{ cm/min}$ (d) $\frac{1}{3\pi} \text{ cm/min}$

147. $\int \frac{\sin \frac{5x}{2}}{\sin \frac{x}{2}} dx =$

(where C is a constant of integration.)

- (a) $x + \sin x + \sin 2x + C$
(b) $x + \sin x + \sin 2x - C$
(c) $x + 2 \sin x + 2 \sin 2x + C$
(d) None of these

148. The equation of the plane passing through the points (2, 3, 1), (4, -5, 3) and parallel to X -axis is
- (a) $3y + 4z = 13$ (b) $y - 4z = -1$
(c) $2y + 4z = 19$ (d) $y + 4z = 7$

149. If $\int e^{x^2} \cdot x^3 dx = e^{x^2} \cdot [f(x) + C]$
(where C is a constant of integration.)
and $f(1) = 0$, then value of $f(2)$ will be

- (a) $\frac{-3}{2}$ (b) $\frac{-1}{2}$
(c) $\frac{3}{2}$ (d) $\frac{1}{2}$

150. The negation of the statement, "The payment will be made if and only if the work is finished in time" is

- (a) The work is finished in time and the payment is not made or the payment is made and the work is finished in time.
(b) The work is finished in time and the payment is not made.
(c) The payment is made and the work is not finished in time.
(d) Either the work is finished in time and the payment is not made or the payment is made and the work is not finished in time.

ANSWER KEY

- 1 : A
- 2 : A
- 3 : D
- 4 : C
- 5 : D
- 6 : A
- 7 : C
- 8 : B
- 9 : A
- 10 : D
- 11 : D
- 12 : D
- 13 : D
- 14 : A
- 15 : C
- 16 : A
- 17 : C
- 18 : D
- 19 : B
- 20 : D
- 21 : B
- 22 : A
- 23 : D
- 24 : D
- 25 : A
- 26 : C
- 27 : D
- 28 : C
- 29 : C
- 30 : B



31 : D
32 : B
33 : B
34 : D
35 : B
36 : C
37 : C
38 : C
39 : A
40 : D
41 : D
42 : A
43 : D
44 : A
45 : A
46 : A
47 : A
48 : A
49 : D
50 : A
51 : C
52 : B
53 : C
54 : C
55 : A
56 : B
57 : B
58 : B
59 : A
60 : C
61 : A
62 : A
63 : B



VIDYA
SCIENCE ACADEMY

64 : B
65 : B
66 : B
67 : D
68 : B
69 : A
70 : A
71 : C
72 : A
73 : D
74 : B
75 : B
76 : C
77 : C
78 : C
79 : A
80 : C
81 : A
82 : C
83 : C
84 : A
85 : C
86 : A
87 : C
88 : D
89 : B
90 : A
91 : D
92 : B
93 : B
94 : A
95 : D
96 : B



VIDYA
SCIENCE ACADEMY

97 : C
98 : A
99 : B
100 : B
101. b
102 c
103. a
104. b
105. b
106. a
107. b
108. a
109. c
110. b
111. c
112. a
113. a
114. a
115. b
116. c
117. d
118. c
119. d
120. a
121. d
122. a
123. a
124. a
125. b
126. a
127. b
128. b
129. a



VIDYA
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- 130. d
- 131. a
- 132. d
- 133. a
- 134. b
- 135. a
- 136. d
- 137. b
- 138. c
- 139. c
- 140. c
- 141. d
- 142. b
- 143. c
- 144. d
- 145. a
- 146. c
- 147. d
- 148. d
- 149. c
- 150. d



VIDYA
SCIENCE ACADEMY