MHT CET SAMPLE PAPER -2022

Mock Test

SUBJECT: Physics/Chemistry

1 : Choose the correct statement (a) for a cricket ball that is spinning clockwise through air S1 :
Statemlines of air are symmetric around the ball.
S2 : The velocity of air above the ball relative to it is larger than that below the ball.
S3 : The velocity of air above the ball relative to it is smaller than that below the ball.
S4 : There is a net upward force on the ball.

(A) S1,S2 and S4

(B) S2 and S4

(C) S4 only

(D) S3 only

2 : Ferromagnetic materials used in a transformer must have

(A) low permeability and high hysterisis loss

(B) high permeability and low hysterisis loss

(C) high permeability and high hysterisis loss

(D) low permeability and low hysterisis loss

3 : According to Newton's corpuscular theory, the speed of light is

(A) same in all the medium

(B) lesser in rarer medium

(C) lesser in denser medium

(D) independent of the medium

4 : For the constructive interference the path difference between the two interfering waves must be equal to

(A) (2ð•œ‹ + 1)?

(B) 2nð•œ‹

(C) n?

(D) n

5 : The accurate measurement of emf can be obtained using

(A) multimeter

(B) voltmeter

(C) voltameter

(D) potentiometer

6 : A person, with outstretched arms, is spinning on a rotating stool. He suddenly brings his arms down to his sides. Which the following is true about his kinetic energy K and angular momentum L?

(A) Both K and L increase

(B) Both K and L remain unchanged

(C) K remains constant, L increases

(D) K increases but L remains constant

7 : Which of the following is not a thermodynamic coordinate?

(A) Gas constant (R)

(B) Pressure (p)

(C) Volume (V)

(D) Temperature (T)

8 : The base present in DNA, but not in RNA is:

(A) Guanine

(B) Adenine

(C) Uracil

(D) Thymine

9 : The total number of lattice arrangements in different crystal system is:
(A) 7 **(B)** 3 **(C)** 8 **(D)** 14

10 : Alcoholic potash is used to bring about :
(A) Dehydrogenation
(B) Dehydration
(C) Dehydrohalogenation
(D) Dehalogenation

11 : Which of the following is the correct statement?
(A) Order of a reaction has always an integral value
(B) Mechanism of a reaction proposed is always final
(C) Zero order reactions are multi-step reactions
(D) Order of reaction can be predicted even without knowing the rate law

12 : The unit of quantity of electricity is:
(A) Ohm
(B) Ampere
(C) Coulomb
(D) Volt

13 : Which of the following organic compounds answers both iodoform test and fehling's test ?
(A) Methanal
(B) Ethanol
(C) Propane
(D) Ethanal

14 : 10 dm^3 of N_2 gas and 10 dm^3 of gas X at the same temperature and pressure contain the same number of molecules.
(A) NO
(B) H_2
(C) CO_2 or CO
(D) All of these

15 : When the electrons of hydrogen atoms return to L shell from shells of higher energy, we get a series of lines in the spectrum. This series is called
(A) Balmer series
(B) Lyman series
(C) Bracket series
(D) Paschen series

16 : The alcohol obtained by the hydrolysis of oils and fats is:
(A) Glycol
(B) Glycerol
(C) Propanol
(D) Pentanol

17 : Which of the following alloys is used for making magnets for hearing aids?
(A) Alnico
(B) German silver
(C) Invar
(D) Monel metal

18 : One dm3 of 2M ethanoic acid is mixed with one dm3 of 3M ethanol to form an easter CH_3COOH + C_2H_5OH ? $CH_3COOC_2H_5 + H_2O$
The decrease in the initial rate if each solution is diluted with an equal volume of water would be

(A) 2 times

(B) 4 times

(C) 0.25 times

(D) 0.5 times

19 : Which one of the following can be classified as a Bronstead base?

(A) NO_3^-

(B) H_3O^+

(C) CH_3COOH

(D) NH_4^+

20 : Gold sol is an electronegative sol. The amount of electrolyte required to coagulate a certain amount of gold sol is minimum in the case of :â€‹

(A) $CaCl_2$

(B) NaCl

(C) $AlCl_3$

(D) Na_2SO_4

21 : Aluminium displaces hydrogen from acids, but copper does not. A Galvanic cell prepared by combining Cu/Cu2+ and Al/Al3+ has an emf of 2.0 V at 298 K. If the potential of copper electrode is +0.34 V, that of aluminium electrode is:

(A) – 2.3 V

(B) + 2.34 V

(C) – 1.66 V

(D) + 1.66 V

22 : 1.5 moles of O_2 combine with Mg to form the oxide MgO. The mass of Mg that has combined is (Mg = 24):

(A) 72 g

(B) 36 g

(C) 48 g

(D) 24 g

23 : How much of NaOH is required to neutralize 1500 cm3 of 0.1 N HCl?(Na = 23):

(A) 60 g

(B) 6 g

(C) 4 g

(D) 40 g

24 : The boiling point of water is exceptionally high because:

(A) Water molecule is not linear

(B) Water molecule is linear

(C) There is covalent bond between H and O

(D) Water molecules associate due to hydrogen bonding

25 : P_4O_{10} is not used with to dry NH_3 gas because:

(A) P_4O_{10} is basic and NH_3 is acidic

(B) P_4O_{10} is acidic and NH_3 is basic

(C) P_4O_{10} is not a drying agent

(D) P_4O_{10} reacts with moisture in NH_3

26 : A radioactive isotope has a half-life of 10 years. What percentage of the original amount of it remain after 20 years:

(A) 1

(B) 12.5

(C) 8

(D) 25

27 : 75% of a first order reaction is completed in 30 minutes. What is the time required for 93.75% of the reaction (in minutes)?

(A) 45

(B) 120

(C) 90

(D) 60

28 : Potential is measured in

(A) joule/coulomb

(B) watt/coulomb

(C) newton–second

(D) None of these

29 : One Nanometer is equal to

(A) 10–9m

(B) 10–6m

(C) 10–10m

(D) 10–3m

30 : Maxwell is the unit of

(A) magnetic susceptibility

(B) intensity of Magnetisation

(C) magnetic Flux

(D) magnetic Permeability

31 : A particle experiences constant acceleration for 20 seconds after starting from rest. If it travels a distances s1 in the first 10 seconds and distances s2 in the next 10 seconds, then

(A) s2 = s1

(B) s2 = 2s1

(C) s2 = 3s1

(D) s2 = 4s1

32 : Motion of an object is the change in position with respect to a reference point known as

(A) Origin

(B) initial position

(C) final position

(D) distance

33 : Displacement is the

(A) shortest distance between initial and final position

(B) the actual distance between initial and final positions

(C) the distance travelled by the object

(D) distance traveled by the object in a unit time

34 : An object has traveled 10 km is 15 minutes, its displacement will be

(A) 10 km

(B) Can be zero

(C) More than 10 km

(D) All of the Above

35 : Momentum has the same units as that of.

(A) couple

(B) torque

(C) impulse

(D) force

36 : When a force of newton acts on a mass of 1 kg that is free to move, the object moves with a.

(A) speed of 1m/s

(B) speed of 1 km/s

(C) acceleration of 10 m/s^2

(D) acceleration of 1m/s^2

37 : If an object experience a net zero unbalanced force, then the body.

(A) can be acclerated

(B) moves with constant velocity

(C) cannot remain at rest

(D) None of these

38 : The energy of 4900 Joule was expanded in lifting a 50 kg mass. The mass was raised to a height of-

(A) 10 m

(B) 98 m

(C) 960 m

(D) 245000 m

39 : If a stone of mass m falls a vertical distance d, the decrease in gravitational potential energy is-

(A) mg/d

(B) $md^2/2$

(C) mgd

(D) md/g

40 : The centre of mass of two particle lies on the line

(A) joining the particles

(B) perpendicular to the line joining the particles

(C) at any angle to this line

(D) None of these

41 : A system consists of three particles, each of mass m and located at (1, 2) (2, 2) and (3,3). The co–ordinates of the centre of mass are

(A) (1, 1)

(B) (2, 2)

(C) (3, 3)

(D) (6, 6)

42 : A cylinder of water, is rotating about its own axis with uniform angular velocity ?. The shape of free surface of water will be

(A) parabola

(B) elliptical

(C) circular

(D) spherical

43 : All bodies whether large or small fall with the

(A) same force

(B) same acceleration

(C) same velocity

(D) same momentum

44 : Weightlessness experienced while orbiting the earth in a spaceship is the result of

(A) zero gravity

(B) inertia

(C) accleration

(D) centre of gravity

45 : When an object falls freely the earth, the force of the gravity is

(A) opposite to the direction of motion
(B) in the same direction as that of motion
(C) zero
(D) constant

46 : The weight of a body at the centre of the earth is
(A) zero
(B) infinite
(C) same as at other places
(D) slightly greater than that at poles

47 : Water rises in a capillary tube to a height h. It will rise to a height more than h
(A) on the surface of sun
(B) in a lift moving down with an acceleration
(C) at the poles
(D) in a lift moving up with an acceleration

48 : An object just foats in water. if common salt is added into the water
(A) the volume of the object immersed in the liquid decreases
(B) the object sinks
(C) the object first sinks and then floats up
(D) cannot be determined

49 : A substance float in water, but sinks in coconut oil. The density of the substance
(A) is less than the density of water
(B) is greater than the density of oil
(C) both (a) and (b)
(D) Cannot be decided from the given information

50 : Sound is transmitted through a medium. The medium can be
(A) Solid
(B) Liquid
(C) Gas
(D) Solid, liquid or gas

51 : The speed of sound of a wave of frequency 200 Hz in air is 340 m/s. The speed of sound of wave of frequency 400 Hz in same air is
(A) 340 m/s
(B) 680 m/s
(C) 170 m/s
(D) 3 × 108 m/s

52 : Ultrasonic waves have frequency
(A) below 20 Hz
(B) between 20 and 20,000 Hz
(C) only above 20,000 Hz
(D) only above 20,000 MHz

53 : When water is heated from 0°C to 10°C, its volume
(A) increases
(B) decreases
(C) does not change
(D) first decreases and then increases

54 : The temperature of an iron block is 140°F. Its temperature on the Celsius scale is
(A) 60°

(B) 160°
(C) 140°
(D) 132°

55 : For the construction of a thermometer, one of the essential requirements ia thermometric substance which
(A) remains liquid over the entire range of temperatures to be measured
(B) has property that varies linearly with temperature
(C) has a property that varies with temperature
(D) obey Boyle's law

56 : The temperature of the Sun is measure with
(A) platinum thermometer
(B) gas thermometer
(C) pyrometer
(D) vapour pressure thermometer

57 : A mountain climber finds that water boils at 80°C. The temperature of this boiling water is ..... Fahrenheit
(A) 50°
(B) 150°
(C) 176°
(D) 200°

58 : Potential difference is defined as
(A) the amount of work done is moving a unit charge in a unit time
(B) distance between two terminals
(C) length of the connecting wire
(D) the amount of work done in moving a unit charge

59 : A cooler of 1500W, 200 volt and a fan of 500W, 200 volt are to be used from a supply. The rating of fuse to be uses is
(A) 2.5 A
(B) 5.0 A
(C) 7.5 A
(D) 10 A

60 : A fuse wire repeatedly gets burnt when used with a good heater. It is advised to use a fuse wire of
(A) more length
(B) less radius
(C) less length
(D) more radius

61 : Rheostat is a device used to vary
(A) voltage
(B) current
(C) resistance
(D) power

62 : The length of a wire is doubled, but its cross–section remains the same, then its resistance will become
(A) 4times
(B) 2times
(C) $\frac{1}{2}$ *times*
(D) 8 times

63 : In case of a concave mirror, when the object is situated at the principal focus, the image formed is
(A) real and inverted

(B) of infinite size
(C) lies at infinity
(D) All of these

64 : An object placed at F of a concave mirror will produce an image
(A) atinfinity
(B) highly enlarged
(C) real and inverted
(D) All of these

65 : The relation between u, v and R for a spherical mirror is
(A) $R = \frac{2uv}{u+v}$
(B) $R = \frac{2}{u+v}$
(C) $R = \frac{2(u+v)}{(uv)}$
(D) None of these

66 : Which element contained in a fuel contributes to its high calorific value ?
(A) Carbon
(B) Hydrogen
(C) Oxygen
(D) Nitrogen

67 : It is a well known fact that energy can neither be created nor be destroyed, but still we say that there is an energy crisis because
(A) forms of energy keep changing
(B) total energy before and after remains constan, but some of it is used to carry other functions
(C) usable form of energy is dissipated to the surroundings in less usable forms
(D) All of these

68 : The specific charge for cathode rays is
(A) constant
(B) variable
(C) depend upon the material of the cathode
(D) depend upon the nature of gas in the discharge tube

69 : Cathode rays are made to pass between the poles of a magnet perpendicular to axis, the effect of the magnetic field is
(A) to increase the velocity of rays
(B) to deflect them towards the north pole
(C) to deflect them towards the south pole
(D) to deflect them upwards above the plane of paper

70 : A strong argument for the particle nature of cathode rays is that they
(A) produce fluroscence
(B) travel through vacuum
(C) get deflected by electric and magnetic fields
(D) cast shadow

71 : What is the reson for white cement to be white ?
(A) It does not contain carbon
(B) It does not contain silicon
(C) It does not contain iron
(D) It does not contain calcium

72 : Which fertilizer is assimilated directly by the plant ?

(A) Super phosphate

(B) Nitrolim

(C) Muriate of Potash

(D) Humus

73 : Which of the following processes is known as fusion ?

(A) change of liquid to solid

(B) Change of solid to liquid

(C) Change of liquid to vapour

(D) Change of gaseous state to solid state

74 : The one, in which interparticle forces are strongest, is.

(A) sodium chloride

(B) hydrogen

(C) ether

(D) carbon dioxide

75 : Which of the following is compound ?

(A) Stainless steel

(B) Brass

(C) Iron sulphide

(D) Diamond

76 : Which one of the following is non-crystalline or amorphous ?

(A) Diamond

(B) Graphite

(C) Glass

(D) Common Salt

77 : Which among the following is popularly called Hypo ?

(A) Silver bromide

(B) Silver nitrate

(C) Sodium thiosulphate

(D) Sodium phosphate

78 : The number of neutrons in $^{27}_{13}Al$ is.

(A) 40

(B) 27

(C) 14

(D) 13

79 : The nucleus of a singly ionized carbon atom contains.

(A) 6protons and 6 neutrons

(B) 5protons and 6 neutrons

(C) 6protons, 6 nuetrons and 6 electrons

(D) 12 proton, 6 nuetrons and 6 electrons

80 : Protons and neutrons are bound in a nucleus by the.

(A) short range 'weak interaction'

(B) short range 'strong interaction'

(C) long range 'electromagnetic interaction'

(D) long range 'gravitational interaction'

81 : According to Newland's law of octaves, which element in the repetiton of the first element in the periodic table ?

(A) Oxygen

(B) Nitrogen
(C) Chlorine
(D) Sulphur

82 : Which one of the following is a diagonally related pair ?
(A) H, Be
(B) Na, Mg
(C) B, Si
(D) K, Ca

83 : Which element is most electronegative among hologens ?
(A) Br
(B) Cl
(C) F
(D) I

84 : On moving horizontally across a period, the number of electrons in the outermost shell increases from ..... to .....
(A) 2, 8
(B) 2, 18
(C) 1, 8
(D) 1, 18

85 : An ionic compound when dissolved in water has produced m An–, n Bm– ions. What is the formula of the compound ?
(A) AmBn
(B) AnBm
(C) AmBm
(D) AnBn

86 : What are the types of bonds present in CuSO4.5H2O ?
(A) Electrovalent and covalent
(B) Elecrovalent and coordinate covalent
(C) Electrovalent, covalent, coordinate covalent and hydrogen bonds
(D) Covalent and coordinate covalent

87 : Consider the following equation for the formation of ammonia from nitrogen and hydrogen :

$$N_2 + 3H_2 \rightarrow 2NH_3$$

How many hydrogen molecules are required to react with 100 molecules of nitrogen ?
(A) 100 **(B)** 200 **(C)** 300 **(D)** 400

88 : As compared to covalent compounds, electrovalent compounds, generally have
(A) low melting point and low boiling point
(B) low melting point and high boiling point
(C) high melting point and low boiling point
(D) high melting point and high boiling point

89 : Human stomach produces acid 'X' which helps in digestion of food. Acid 'X' is
(A) acetic acid
(B) methanoic acid
(C) hydrochloric acid
(D) citic acid

90 : Bases turn red litmus blue and acids turn blue litmus red. A student tested a liquid with a red litmus paper and it stayed red with no change. This shows that the liquid .

(A) must be pure water

(B) must be an acid

(C) is not a base

(D) is neither a base nor an acid

91 : Which one among the following is the correct order of strength of acids ?

(A) H2SO4> H3PO3> CH3COOH

(B) H3PO3> H2SO4> CH3COOH

(C) CH3COOH > H3PO3> H2SO4

(D) CH3COOH>H2SO4>H3PO3

92 : The pH of fresh milk is 6. When it turns sour, the pH

(A) becomes < 6

(B) remains the same i.e., 6

(C) becomes > 6

(D) becomes neutral, i.e., 7

93 : The metals that reacts with cold water is–

(A) mercury

(B) sodium

(C) zinc

(D) tungsten

94 : The only metal that is liquid at room temperature is–

(A) mercury

(B) sodium

(C) zinc

(D) tungsten

95 : Metal reacts with oxygen to form

(A) neutral oxides

(B) basic oxides

(C) acidic oxides

(D) None of these

96 : The metal used to built bridges is

(A) gold

(B) silver

(C) platinum

(D) iron

97 : 'Drinking alcohol' is very harmful and it ruins the health. 'Drinking alcohol' stands for :

(A) drinking methyl alcohol

(B) drinking ethyl alcohol

(C) drinking propyl alochol

(D) drinking isopropyl alcohol

98 : Which of the following has shortest carbon bond length ?

(A) C2H2

(B) C2H4

(C) C2H6

(D) C6H6

99 : Which of the following can be used to distinguish between ethane and ethene ?

(A) Alighted splinter
(B) Aqueous bromine
(C) Litmus solution
(D) Lime water

100 : Gas welding used for welding broken pieces of iron, we normally use a mixture of :
(A) ehtane and oxygen
(B) ethene and oxygen
(C) ethyne and oxygen
(D) ethene and air

SUBJECT: Maths

101. The particular solution of the differential equation

$y(1 + \log x) = (\log x^x)\dfrac{dy}{dx}$, when $y(e) = e^2$ is

(a) $2ex \log x - y = e^2$ **(b)** $3ex \log yx - y = 2e^2$

(c) $ex \log x + y = 2e^2$ **(d)** $ex \log x - y = 0$

102. The general solution of $\sin^{-1}\left(\dfrac{dy}{dx}\right) = x + y$ is

(a) $\tan(x + y) - \sec(x + y) = x^2 + c$

(b) $\tan(x + y) + \sec(x + y) = x^2 + c$

(c) $\tan(x + y) + \sec(x + y) = x + c$

(d) $\tan(x + y) - \sec(x + y) = x + c$

103. $\int e^x\left(\dfrac{x - 1}{x^2}\right)dx =$

(a) $\dfrac{-e^x}{x^2} + c$ **(b)** $\dfrac{-e^x}{x} + c$

(c) $\dfrac{e^x}{x^2} + c$ **(d)** $\dfrac{e^x}{x} + c$

104. $\lim\limits_{x \to 0} \dfrac{\cos(mx) - \cos(nx)}{x^2} =$

(a) $\dfrac{m^2 - n^2}{2}$ **(b)** $m^2 - n^2$

(c) $\dfrac{n^2 - m^2}{2}$ **(d)** $n^2 - m^2$

105. A polygon has 44 diagonals. Then the number of sides of the polygon are

(a) 11 **(b)** 12

(c) 10 **(d)** 13

106. If $|\bar{u}| = 2$ and $\bar{u}$ makes angles of 60° and 120° with axes OX and OY in the origin, then $\bar{u} =$

(a) $\hat{i} + \hat{j} + \sqrt{2}\hat{k}$ **(b)** $2(\hat{i} + \hat{j} \pm \sqrt{2}\hat{k})$

(c) $2(\hat{i} - \hat{j} + \sqrt{2}\hat{k})$ **(d)** $2(\hat{i} - \hat{j} \pm \sqrt{2}\hat{k})$

107. If a plane meets the axes X, Y, Z in A, B, C respectively such that centroid of ΔABC is $(1, 2, 3)$, then the equation of the plane is

(a) $x + 2y + 3z = 1$ **(b)** $x + \dfrac{y}{2} + \dfrac{z}{3} = 3$

(c) $\dfrac{x}{3} + \dfrac{y}{6} + \dfrac{z}{9} = 1$ **(d)** $\dfrac{x}{4} + \dfrac{y}{8} + \dfrac{z}{12} = 1$

108. Area of the triangle formed by the lines $y^2 - 9xy + 18x^2 = 0$ and $y = 9$ is

(a) $\frac{27}{3}$ sq. units **(b)** $\frac{27}{2}$ sq. units

(c) $\frac{27}{4}$ sq. units **(d)** 27 sq. units

109. The domain of the function $f(x) = \sqrt{x-1} + \sqrt{6-x}$ is

(a) $[1, \infty)$ **(b)** $[1, 6]$

(c) $(-\infty, 6)$ **(d)** $(-\infty, 6]$

110. The equation of perpendicular bisector of the line segment joining $A(-2, 3)$ and $B(6, -5)$ is

(a) $x + y = 3$ **(b)** $x + y = 1$

(c) $x - y = -1$ **(d)** $x - y = 3$

111. If $x = 1 + 2i$, then the value of $x^3 + 7x^2 - x + 16$ is

(a) $-17 - 24i$ **(b)** $-17 + 24i$

(c) $17 - 24i$ **(d)** $17\ 24i$

112. If slope of one of the lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other, then $h^2 : ab$ is

(a) 8 : 7 **(b)** 7 : 8

(c) 9 : 8 **(d)** 8 : 9

113. If $A = \begin{bmatrix} k & 2 \\ -2 & -k \end{bmatrix}$, then A^{-1} does not exist if $k =$

(a) 3 **(b)** ± 2

(c) 0 **(d)** ± 1

114. If $x = \frac{1 - t^2}{1 + t^2}$ and $y = \frac{2at}{1 + t^2}$, then $\frac{dy}{dx} =$

(a) $\frac{a(t^2 + 1)}{2t}$ **(b)** $\frac{a(t^2 - 1)}{t}$

(c) $\frac{a(1 - t^2)}{2t}$ **(d)** $\frac{a(t^2 - 1)}{2t}$

115. If $y^2 = ax^2 + bx + c$, where a, b, c are constants, then $y^3 \frac{d^2y}{dx^2}$ is equal to

(a) function of y

(b) function of both x and y

(c) constant

(d) function of x

116. A rectangle of maximum area is inscribed in an ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$, then its dimensions are

(a) $4\sqrt{2}, 6\sqrt{2}$ **(b)** $\sqrt{2}, 5\sqrt{2}$

(c) $4\sqrt{2}, 5\sqrt{2}$ **(d)** $4\sqrt{2}, \sqrt{2}$

117. If in ΔABC, with usual notations, the angles are in A.P., then $\frac{a}{c}\sin 2C + \frac{c}{a}\sin 2A =$

(a) $\frac{1}{2}$ **(b)** $\sqrt{3}$

(c) $2\sqrt{3}$ **(d)** $\frac{\sqrt{3}}{2}$

118. The equation of a circle that passes through the origin and cut off intercepts -2 and 3 on the X-axis and Y-axis respectively is

(a) $x^2+y^2-2x+3y=0$ **(b)** $x^2+y^2+2x+3y=0$

(c) $x^2+y^2+2x-3y=0$ **(d)** $x^2+y^2-2x-3y=0$

119. $\int \sin^{-1}\left(\frac{2x}{1+x^2}\right) dx =$ (where $|x|<1$)

(a) $2\tan^{-1}x - \log|1+x^2| + c$

(b) $x\tan^{-1}x + \log|1+x^2| + c$

(c) $\tan^{-1}x + \log|1+x^2| + c$

(d) $2x\tan^{-1}x - \log|1+x^2| + c$

120. Let $f(x) = |x| + 3$, if $x \le -3$

$= -2x$, if $-3 < x < 3$

$= 6x + 2$, if $x \ge 3$, then

(a) $f(x)$ is discontinuous at both $x=-3$ as well as $x=3$

(b) $f(x)$ is continuous at $x=-3$ but discontinuous at $x=3$

(c) $f(x)$ is continuous at $x=-3$ as well as $x=3$

(d) $f(x)$ is discontinuous at $x=-3$ but $f(x)$ is continuous at $x=3$

121. For two events A and B, $P(A \cup B) = \frac{5}{6}$, $P(A) = \frac{1}{6}$, $P(B) = \frac{2}{3}$, then A and B are

(a) independent **(b)** mutually exhaustive

(c) mutually exclusive **(d)** complementary

122. Solution of the differential equation $y = \frac{(x^2+y^2)}{xy}$, where $y(1) = -2$ is given by

(a) $y^2 = 4x^2\log x^2 + x^2$ **(b)** $y^2 = x^2\log x - x^2$

(c) $y^2 = x\log x^2 + 4x^2$ **(d)** $y^2 = x^2\log x^2 + 4x^2$

123. If $\bar{a} + \bar{b} + \bar{c} = \bar{0}$ with $|\bar{a}| = 3$, $|\bar{b}| = 5$ and $|\bar{c}| = 7$, then angle between $\bar{a}$ and $\bar{b}$ is

(a) $\left(\frac{\pi}{3}\right)^c$ **(b)** $\left(\frac{4\pi}{3}\right)^c$

(c) $\left(\frac{2\pi}{3}\right)^c$ **(d)** π^c

124. A coin is tossed three times. If X denotes the absolute difference between the number of heads and the number of tails, then $P(X=1)=$

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

125. If statement p and q are true and r and s are false, then truth values of $\sim(p \to q) \leftrightarrow (r \wedge s)$ and $(\sim p \to q) \wedge (r \leftrightarrow s)$ are respectively

(a) F, F (b) T, T

(c) T, F (d) F, T

126. If $A=\begin{bmatrix}1 & 0 & 1\\ 0 & 2 & 3\\ 1 & 2 & 1\end{bmatrix}$, then the value of determinant of A^{-1} is

(a) -6 (b) $\frac{-1}{6}$

(c) $\frac{1}{36}$ (d) 36

127. Bismath has half life period of 5 days. A sample originally has a mass of 1000 mg, then the mass of Bismath after 30 days is

(a) 16.625 mg (b) 13.625 mg

(c) 14.625 mg (d) 15.625 mg

128. If $\bar{a}, \bar{b}, \bar{c}$ are mutually perpendicular vectors having magnitudes 1, 2, 3 respectively, then $[\bar{a}+\bar{b}+\bar{c}\ \ \bar{b}-\bar{a}\ \ \bar{c}]=$

(a) 12 (b) 18

(c) 0 (d) 6

129. The plane $\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=1$ cuts the X-axis at A, Y-axis at B and Z-axis at C, then the area of $\Delta ABC=$

(a) $\sqrt{71}$ sq. units (b) $\sqrt{29}$ sq. units

(c) $\sqrt{41}$ sq. units (d) $\sqrt{61}$ sq. units

130. In ΔABC, with usual notations, $2ab\sin\frac{1}{2}(A+B-C)=$

(a) $a^2-b^2-c^2$ (b) $a^2+b^2-c^2$

(c) $a^2+b^2+c^2$ (d) $a^2-b^2+c^2$

131. $\int_{-\pi}^{\pi}\frac{x\sin x}{1+\cos^2 x}dx=$

(a) $\frac{\pi^2}{2}$ (b) π^2

(c) $\frac{\pi^2}{4}$ (d) 3π

132. The expression $[(p \wedge \sim q) \vee q] \vee (\sim p \wedge q)$ is equivalent to

(a) $p \vee q$ **(b)** $p \wedge q$

(c) $p \rightarrow q$ **(d)** $p \leftrightarrow q$

133. $\tan 3A \cdot \tan 2A \cdot \tan A =$

(a) $\tan 3A + \tan 2A - \tan A$

(b) $\tan 3A - \tan 2A - \tan A$

(c) $\tan 3A + \tan 2A - \tan A$

(d) $\tan 3A - \tan 2A + \tan A$

134. The Cartesian equation of a line is $3x + 1 = 6y - 2 = 1 - z$, then its vector equation is

(a) $\vec{r} = \left(-\frac{1}{3}\hat{i} + \frac{1}{3}\hat{j} + \hat{k}\right) + \lambda(2\hat{i} + \hat{j} - 6\hat{k})$

(b) $\vec{r} = (-\hat{i} + 2\hat{j} - \hat{k}) + \lambda(3\hat{i} + 6\hat{j} - \hat{k})$

(c) $\vec{r} = \left(-\frac{1}{3}\hat{i} + \frac{1}{3}\hat{j} + \hat{k}\right) + \lambda(2\hat{i} - \hat{j} + 6\hat{k})$

(d) $\vec{r} = \left(-\frac{1}{3}\hat{i} + \frac{1}{3}\hat{j} + \hat{k}\right) + \lambda(2\hat{i} + \hat{j} - 6\hat{k})$

135. The maximum value of $z = 10x + 25y$ subject to $0 \le x \le 3,\ 0 \le y \le 3,\ x + y \le 5$ occurs at the point.

(a) (3, 2) **(b)** (2, 3)

(c) (4, 3) **(d)** (5, 4)

136. The shortest distance between lines

$\vec{r} = (2\hat{i} - \hat{j}) + \lambda(2\hat{i} + \hat{j} - 3\hat{k})$ and

$\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(2\hat{i} + \hat{j} - 5\hat{k})$ is

(a) $\frac{1}{\sqrt{5}}$ **(b)** 3 units

(c) $\sqrt{5}$ units **(d)** 2 units

137. The position vector of the point of intersection of the medians of a triangle, whose vertices are $A(1, 2, 3)$, $B(1, 0, 3)$ and $C(4, 1, -3)$ is

(a) $6\hat{i} + 3\hat{j} + 3\hat{k}$ **(b)** $2\hat{i} + \hat{j} + \hat{k}$

(c) $3\hat{i} + \hat{j} + \hat{k}$ **(d)** $\hat{i} + \hat{j} + \hat{k}$

138. The value of $\int_0^1 \tan^{-1}\left(\frac{2x - 1}{1 + x - x^2}\right) dx$ is

(a) 2 **(b)** -1

(c) 1 **(d)** 0

139. The point on the curve $y^2 = 2(x - 3)$ at which the normal is parallel to the line $y - 2x + 1 = 0$ is

(a) $\left(-\frac{1}{2}, -2\right)$ **(b)** $\left(\frac{3}{2}, 2\right)$

(c) (5, 2) **(d)** (5, –2)

140. A random variable $X \sim B(n, p)$, if values of mean and variance of X are 18 and 12 respectively, then $n =$

(a) 54 **(b)** 18

(c) 12 **(d)** 55

141. The area bounded between the curve $x^2 = y$ and the line $y = 4x$ is

(a) $\frac{32}{3}$ sq. units **(b)** $\frac{8}{3}$ sq. units

(c) $\frac{1}{3}$ sq. units **(d)** $\frac{16}{3}$ sq. units

142. The area of the parallelogram whose diagonals are represented by the vectors

$\bar{a} = 3\hat{i} - \hat{j} - 2\hat{k}$ and $\bar{b} = -\hat{i} + 3\hat{j} - 3\hat{k}$ is

(a) $\sqrt{266}$ sq. units **(b)** $\frac{1}{2}\sqrt{266}$ sq. units

(c) 266 sq. units **(d)** 122 sq. units

143.

$$\tan^{-1}\left(\tan\frac{5\pi}{6}\right) + \cos^{-1}\left(\cos\frac{13\pi}{6}\right) =$$

(a) 0 **(b)** 3π

(c) $-\frac{\pi}{6}$ **(d)** $\frac{\pi}{6}$

144. If the variance of the data 2, 4, 5, 6, 8, 17 is 23.33, then the variance of 4, 8, 10, 12, 16, 34 will be

(a) 93.32 **(b)** 25.33

(c) 23.23 **(d)** 48.66

145. A random variable X has the following distribution

$X = x$	1	2	3	4	5	6
$P(X = x)$	k	$3k$	$5k$	$7k$	$8k$	k

then $P(2 \le x < 5) =$

(a) $\frac{7}{25}$ **(b)** $\frac{3}{5}$

(c) $\frac{24}{25}$ **(d)** $\frac{23}{25}$

146. The sum of three numbers is 6. Thrice the third number when added to the first number gives 7. On adding three times first number to the sum of second and third number we get 12. The product of these numbers is

(a) 20 **(b)** 3

(c) $\frac{20}{3}$ **(d)** $\frac{5}{3}$

147. The differential equation of all family of lines $y = mx + \frac{4}{m}$ obtained by eliminating the arbitrary constant m is

(a) $y\left(\frac{dy}{dx}\right) = 4$

(b) $x\left(\frac{dy}{dx}\right)^2 + y\left(\frac{dy}{dx}\right) + 4 = 0$

(c) $y\left(\frac{dy}{dx}\right) + 4 = 0$

(d) $x\left(\frac{dy}{dx}\right)^2 - y\left(\frac{dy}{dx}\right) + 4 = 0$

148. If $y = \tan^{-1}\left(\sqrt{\frac{1 + \sin x}{1 - \sin x}}\right)$, $0 \le x < \frac{\pi}{2}$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{6}$ is

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

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

149. A sperical snow ball is forming so that its volume is increasing at the rate of 8 cm^3/sec. Find the rate of increase of radius when radius is 2 cm.

(a) π cm/sec. (b) $\frac{1}{8\pi}$ cm/sec.

(c) 2π cm/sec. (d) $\frac{1}{2\pi}$ cm/sec.

150. $\int \frac{\sec^8 x}{\operatorname{cosec} x} dx =$

(a) $\frac{\sec^8 x}{8} + c$ (b) $\frac{\sec^6 x}{6} + c$

(c) $\frac{\sec^7 x}{7} + c$ (d) $\frac{\sec^9 x}{9} + c$

ANSWER KEY

1 ::B

2 :B

3 ::B

4 : :C

5 : :D

6 : :D

7 : :A

8 : :D

9 : :D

10 : :C

11 : :D

12 : :C

13 : :D

14 : :D

15 : :A

16 : :B

17 : :A

18 ::B

19 : :A

20 : :C

21 : :C

22 : :A

23 : :B

24 : :D

25 : :B

26 : :D

27 : :D

28 : :A

29 : :A

30 : :C

31 : :C

32 : :A

33 : :A

34 : :D

35 : :C

36 : :D

37 : :B

38 : :A

39 : :C

40 : :A

41 : :B

42 : :A

43 : :B

44 : :A

45 : :B

46 : :A

47 : :B

48 : :A

49 : :C

50 : :D

51 : :A

52 : :C

53 : :D

54 : :A

55 : :C

56 : :C

57 : :C

58 : :D

59 : :D

60 : :D

61 : :B

62 : :B

63 ::D

64 : :D

65 : :A

66 : :B

67 : :D

68 : :A

69 : :D

70 : :C

71 : :C

72 : :D

73 : :B

74 : :A

75 : :C

76 : :C

77 : :C

78 : :C

79 : :A

80 : :B

81 : :A

82 : :C

83 : :C

84 : :C

85 : :A

86 : :C

87 : :C

88 : :D

89 : :C

90 : :C

91 : :A

92 : :A

93 : :B

94 : :A

95 : :B

96 : :D

97 : :B

98 : :A

99 : :B

100 : :C

101. D

102. D

103. D

104. C

105. A

106. D

107. C

108. C

109. B

110. D

111. B

112. C

113. B

114. D

115. D

116. C

117. B

118. C

119. D

120. B

121. C

122. D

123. A

124. D

125. B

126. B

127. D

128. A

129. D

130. B

131. A

132. A

133. B

134. D

135.D

136.A

137. B

138. D

139. D

140. A

141. A

142.B

143. A

144. A

145. B

146. C

147. D

148. D

149. D

150. C