INSTRUMENTATION (Final)

1. Which of the following is the characteristic of ideal operational amplifier?

   A. Input impedance zero
   B. Output impedance zero
   C. Bandwidth zero
   D. Gain zero

2. The polarity of voltage applied to the collector of a NPN transistor in the common-emitter configuration is

   A. positive
   B. negative
   C. 'zero' voltage
   D. any polarity

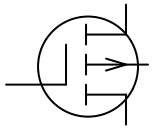
3. Four 20 μ fd capacitors are connected in series. Its effective value is

   A. 10 μ fd
   B. 80 μ fd
   C. 40 μ fd
   D. 5 μ fd

4. A device that converts electric energy into mechanical energy is

   A. dynamo
   B. motor
   C. transformer
   D. none of the above

5. The following symbol refers to



   A. FET
   B. n-channel MOSFET
   C. p-channel MOSFET
   D. None of the above

6. Efficiency of bridge rectifier is

A. 20.3%
B. 40.6%,
C. 60.9%
D. 81.2%

7. Which method is suitable for flaw detection?

A. Photography
B. Radio frequency
C. Laser
D. Ultrasonic

8. Anti-aliasing filter is

A. high-pass filter
B. low-pass filter
C. band-pass filter
D. notch filter

9. Which of the following types of ADCs is used in noisy environment?

A. Integrating type
B. Successive approximation type
C. Flash
D. None of the above

10. Sampling theorem states that, if f_s is the sampling frequency and f_H is the highest frequency in the signal, then

A. $f_s > 2f_H$
B. $f_s < 2f_H$
C. $2f_s > f_H$
D. $2f_s < 2f_H$

11. Which of the following types of ADCs requires Sample and Hold device?

A. Integrating type
B. Successive approximation type
C. Flash
D. None of the above

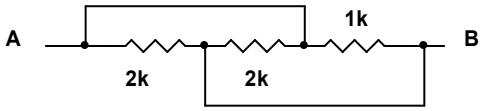
12. What is the resolution of 8-bit ADC operating in 10 V range?

A. 39.06 mV
B. 2.44 mV
C. 0.625 V
D. None of the above

13. Which antennas are used in microwave communication?

A. Long wave antennas
B. Rhombic antennas
C. Parabolical antennas
D. Any of the above

14. What is the equivalent resistance between points A and B in the network shown below?

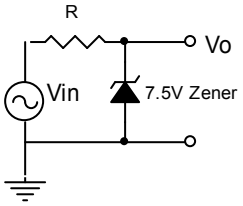


A. (2/3) k
B. 1.5 k
C. 0.5 k
D. 2k

15. A MOSFET differs from a JFET in the sense that it has no

A. Channel
B. Gate
C. P-N junction between gate and channel
D. Substrate

16. The output voltage Vo in the following circuit (assume ideal Zener diode)



A. can vary between 0V and +7.5V
B. can vary between 0V and –7.5V
C. can vary between +7.5V and –7.5V
D. always zero

17. The switching speed of Schottky diode

A. is lower than that of p-n junction diode
B. is the same as that of p-n junction diode
C. is higher than that of p-n junction diode
D. may be lower or higher than that of a p-n junction diode

18. If the input of the differentiator is square wave, the output will be a ……. waveform

A. triangular
B. spike
C. saw tooth
D. cosine

19. For narrow band pass filter, the Q value should be

A. Q < = 10
B. Q > 10
C. Q < 10
D. Q > = 10

20. In Wien bridge oscillator, what is the phase shift when the bridge is in balance condition?

A. 180^o
B. 60^o
C. 0^o
D. 360^o

21. A RC Phase shift oscillator is used to generate …… waveform.

A. sine
B. square
C. triangular
D. saw-tooth

22. Which one of the following logic gates is similar to the function of two switches in series?

A. OR
B. Exclusive OR
C. NOR
D. AND

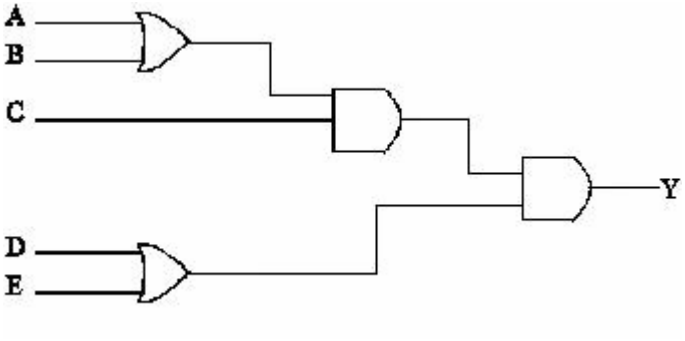
23. Compared with CMOS devices, the TTL devices have

A. high power consumption
B. low power consumption
C. low speed operation
D. None of the above

24. Two 4-bit binary numbers '1000' and '0100' are multiplied. What is the decimal value of the result?

A. 1000
B. 100
C. 32
D. None of the above

25. Consider the logic circuit diagram given below.



The output 'Y' is given as

A. $(A.B + C).D.E$
B. $(A + B).C.(D + E)$
C. $(A + B).C.\overline{(D + E)}$
D. $(A.B + C) + D.E$

26. If an input of a TTL OR gate is left unconnected, what would be the output?

A. High
B. Low
C. May be high or low
D. High impedance state

27. Which of the following logic gates simulates the operation of staircase switches?

A. AND
B. OR
C. NOR

D. XOR

28. Which of the following Boolean expressions is equal to (A + BC)?

A. $(\overline{A} + B).(\overline{A} + C)$
B. $(A + B).(A + C)$
C. $(A + B).(\overline{A} + C)$
D. None of the above

29. Separation of AF from RF in radio communication is known as

A. modulation
B. mixing
C. demodulation
D. Rectification

30. A charge coupled device is

A. a magnetic device
B. a bipolar semiconductor device
C. a MOS device
D. none of the above

31. A 555 timer can be used as

A. an astable multivibrator only
B. a monostable multivibrator only
C. a frequency divider only
D. any of the above

32. The minimum number of resistors required in a 4-bit digital to analog converter network of weighted-resistor type is

A. 4
B. 8
C. 15
D. 16

33. The width of data bus of 8086 microprocessor is

A. 8
B. 16
C. 32
D. 64

34. Two's complement of the binary number '00001' is

A. 11111
B. 11110
C. 00010
D. none of the above

35. NPN transistors are preferred over PNP transistors for digital circuits because

A. they require positive voltage
B. they consume less power
C. of the requirements of positive logic system
D. the mobility of electrons is higher than the mobility of holes

36. A PLA is

A. mask programmable
B. field programmable
C. can be programmed by a user
D. can be erased and programmed

37. Which of the following operations is commutative but not associative?

A. AND
B. OR
C. EX-OR
D. NAND

38. A CMOS inverter consists of

A. a n-channel MOSFET and a resistor
B. a p-channel MOSFET and a resistor
C. a n-channel and a p-channel MOSFETs
D. n-channel and p-channel MOSFETs and resistors

39. Which one of the following parameters of op amp indicates how fast the output can vary for the input variations?

A. Slew rate
B. Unity gain bandwidth
C. Open loop gain
D. Offset voltage

40. How do you increase the bandwidth of an op amp amplifier circuit?

A. By increasing the gain
B. By decreasing the gain
C. By changing the supply voltage
D. None of the above

41. Which one of the following types of filters is used to eliminate 50 Hz noise?

A. Low-pass filter
B. High-pass filter
C. Band-pass filter
D. Notch filter

42. The phase change at cutoff frequency for a –20 dB low-pass filter is

A. 0^o
B. -45^o
C. $+45^o$
D. -90^o

43. Which of the following bridge configurations offers linear response and more sensitivity?

A. Wuarter-bridge
B. Half-bridge
C. Full-bridge
D. None of the above

44. Electric field induced noise is reduced by shielding. Which of the following coupling is generally prevented by shielding a cable?

A. Resistive coupling
B. Inductive coupling
C. Magnetic coupling
D. Capacitive coupling

45. Which of the following circuits is used for detecting change in resistance?

A. Bridge
B. Amplifier
C. Oscillator
D. Filter

46. RF interference in electronic circuits is generally minimised by proper

A. grounding
B. filtering
C. shielding
D. None of the above

47. The $\left|\frac{V_o}{V_{in}}\right|$ of 10 kHz cutoff –20 dB/decade low-pass filter for the 10 kHz input signal is

A. 0
B. 0.5
C. 0.707
D. 1

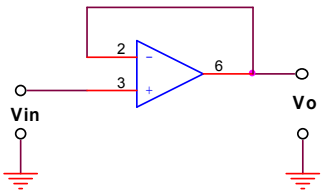
48. Which of the following op amp amplifier configurations has gain above or equal to unity?

A. Inverting amplifier
B. Logarithmic amplifier
C. Differential amplifier
D. Non-inverting amplifier

49. What is the gain magnitude of 10 kHz, 60 dB/decade high-pass Butterworth filter for the 1 kHz signal?

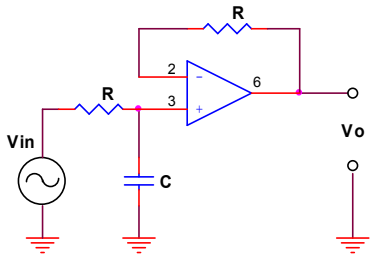
A. –80 dB
B. –60 dB
C. –40 dB
D. –20 dB

50. What is the gain of the amplifier shown in the following figure?



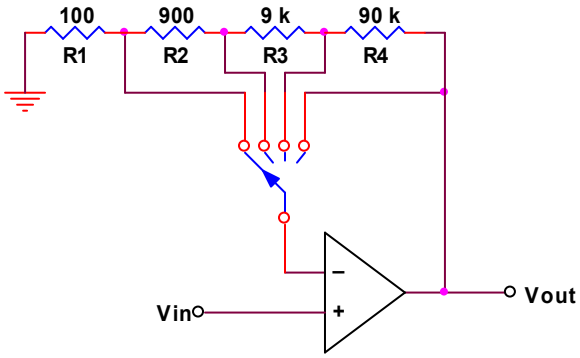
A. 0
B. 1
C. Infinity
D. None of the above

51. Identify the circuit shown in the following figure.



A. non-inverting amplifier
B. high-pass filter
C. low-pass filter
D. None of the above

52. Find the gain of the non-inverting amplifier with the switch set as shown in the figure.



A. 1
B. 10
C. 100
D. 1000

53. The phase shift provided by each RC network in a phase shift oscillator is

A. 0^o
B. 30^o
C. 60^o
D. 90^o

54. When a 50Hz sinusoidal voltage is applied to the input of a full-wave rectifier the output frequency is

A. 0Hz
B. 50Hz
C. 100Hz

D. 200Hz

55. A diode that has a negative resistance characteristics is the

A. Schottky diode
B. tunnel diode
C. laser diode
D. hot-carrier diode

56. Which one of the following memory devices looses its contents when power to the device is disconnected?

A. EPROM
B. RAM
C. ROM
D. Flash memory

57. Which one of the following header files is to be included in a ‘C’ programme to use the ‘C’ function ‘cos (x)’?

A. Stdio.h
B. Graphics.h
C. dos.h
D. math.h

58. At what temperature the density of water is maximum?

A. 0^oC
B. 4^oC
C. 100^oC
D. None of the above

59. A body is executing a simple harmonic motion. If 'a' is the amplitude, then its potential energy is maximum when the displacement is

A. +a/2
B. +a or –a
C. –a/2
D. zero

60. As an object is moved towards a plane mirror, its image

A. becomes large
B. becomes smaller
C. is the same as the object
D. undetermined

61. Two convex lens of focal length of 10 cm are put in contact. What is the focal length of the combination?

A. 10 cm
B. 20 cm
C. 2.5 cm
D. 5 cm

62. The resolving power of a grating depends on

A. the number of rulings per unit length
B. the thickness of ruling
C. the physical size of the grating
D. none of the above

63. When ether is poured on the hand, the hand feels cold because

A. the temperature of ether is low
B. hand absorbs heat from ether
C. ether absorbs heat from hand and evaporates
D. none of the above

64. The distance between two charges is doubled. Then the force between them becomes

A. double
B. same
C. half
D. one fourth

65. The number of turns in the primary of a step-up transformer will be …… the number of turns in the secondary.

A. more than
B. less than
C. equal to
D. in any ratio to

66. Which one of the following spectroscopic techniques can be employed for measurement of concentration of trace components?

A. UV-VIS Spectroscopy
B. IR Spectroscopy
C. NMR Spectroscopy
D. Raman spectroscopy

67. Which one of the following is a vector quantity?

A. Potential energy
B. Force
C. Mass
D. Temperature

68. Modulus of elasticity is

A. stress / strain
B. strain / stress
C. stress × strain
D. stress + strain

69. β particles consist of

A. Protons
B. Electrons
C. Hydrogen nuclei
D. Helium nuclei

70. The instrument used to measure the wavelengths of X-ray is

A. Spherometer
B. Monochromator
C. Bragg spectrometer
D. Spectrophotometer

71. Unit for the magnetic intensity in SI system of units is

A. ampere / metre
B. ampere metre
C. ampere metre^2
D. henry / metre

72. RTD is a

A. temperature sensor
B. light sensor
C. flow sensor
D. strain sensor

73. In a tuned LC circuit, if 'L' is decreased what would happen to the resonant frequency?

A. increases
B. decreases
C. remains same
D. cannot be determined

74. Which one of the following is a particle accelerator?

A. Nuclear reactor
B. Geiger-Miller counter
C. Cyclotron
D. None of the above

75. In Young's double slit experiment, the two slits act as coherent sources of equal amplitude A and of wavelength λ. In another experiment with the same set up, the two slits are sources of equal amplitude A and wavelength λ but are incoherent. The ratio of the intensity of light at the midpoint of the screen in the first case of that in the second case is

A. 1 : 1
B. 1 : 2
C. 2 : 1
D. $\sqrt{2}$: 1

76. Impulse is equal to change of

A. velocity
B. acceleration
C. momentum
D. energy

77. The dimensional formula for density is

A. ML^{-1}
B. ML^{-2}
C. ML^{-3}
D. None of the above

78. Ejection of electron in the innermost orbital leads to the emission of

A. UV radiation
B. IR radiation
C. X-ray
D. Visible radiation

79. A voltmeter reads 3V at full-scale deflection and is graded as 6000 ohm/V. What resistance should be connected in series with it so that it reads 12V at full-scale deflection?

A. 1.8×10^4 ohm
B. 3.6×10^4 ohm
C. 5.4×10^4 ohm
D. 7.2×10^4 ohm

80. Which of the following motors work on digital inputs?

A. ac induction motor
B. Stepper motor
C. dc motor
D. Servo motor

81. The primary colours are

A. Red, Green and Blue
B. Yellow, Magenta and Orange
C. Black and White
D. Red, Green and Violet

82. Velocity of light in vacuum is

A. 3×10^8 m/s
B. 331 m/s
C. 3×10^8 cm/s
D. 331 cm/s

83. 0^oC is equal to

A. 0^oF
B. 32^oF
C. 180^oF
D. 212^oF

84. Volume of a gas depends on

A. pressure alone
B. temperature alone
C. both pressure and volume
D. none of the above

85. An electric bulb is evacuated to prevent

A. bursting of the bulb
B. excess weight
C. oxidation of the filament
D. None of the above

86. The maximum memory locations addressed by 8085 microprocessor is

A. 32KB
B. 64KB
C. 1MB
D. 4MB

87. The number of bytes in the 8085 microprocessor CALL instruction is

A. one
B. two
C. three
D. five

88. The transfer function is defined as the Laplace Transform of the response for a

A. step input
B. impulse input
C. ramp input
D. parabolic input

89. In signal flow graph, a node which has only outgoing branches is called a

A. input node
B. output node
C. mixed node
D. general node

90. The Laplace Transform of impulse function is

A. zero
B. one
C. 1/s
D. None of the above

91. The average age of 24 boys and the teacher is 15 years. When the teacher's age is excluded, the average decreases by 1. What is the age of the teacher?

A. 38 years
B. 39 years
C. 40 years
D. 41 years

92. Let vectors $\mathbf{a} = 2\,\mathbf{i} + \mathbf{j} - \mathbf{k}$, and $\mathbf{b} = \mathbf{i} + 2\,\mathbf{j} + \mathbf{k}$, the angle between the vectors **a** and **b** is

A. $\pi/2$

B. $\pi/3$,

C. $2\pi/3$

D. $\pi/8$

93. Two pipes A and B can fill a tank in 6 hours and 4 hours respectively. If they are opened on alternate hours and if pipe A is opened first, in how many hours, the tank shall be full?

A. 4

B. 5

C. 4½

D. 5½

94. $\left(\cos\frac{\pi}{8} + i\sin\frac{\pi}{8}\right)^2$ is equal to

A. i

B. $\frac{1}{2} + i\frac{1}{2}$

C. $\frac{1}{\sqrt{2}} + i\frac{1}{\sqrt{2}}$

D. $\frac{1}{\sqrt{2}} - i\frac{1}{\sqrt{2}}$

95. If **A**, **B**, **C**, and **D** are vectors such that, $\mathbf{C} = \mathbf{A} \times \mathbf{B}$, and $\mathbf{D} = \mathbf{B} \times \mathbf{A}$, then the angle between the vectors **C** and **D** is

A. 0^o
B. 90^o
C. 180^o

D. 270^{o}

96. At which value of x, the function $f(x) = 2x^3 - 3x^2 - 36x + 10$ has maxima

A. –2
B. 3
C. 6
D. None of the above

97. If $\begin{bmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{bmatrix} = (a-b)\,(b-c)\,(c-a)$, then $\begin{bmatrix} 1 & 2 & 4 \\ 1 & 4 & 16 \\ 1 & 8 & 64 \end{bmatrix} =$

A. 46
B. 48
C. 84
D. 64

98. If 'i' is $\sqrt{-1}$, then i^i is

A. a pure imaginary number
B. a complex number
C. a real number
D. an integer

99. If A and B are real symmetric matrices of size $n \times n$. Then which one of the following is true?

A. $AA^t = 1$

B. $A = A^{-1}$

C. $AB = BA$

D. $(AB)^t = BA$

100. When θ is represented in radians, the expression $\theta + \frac{1}{3}\theta^3 + \frac{2}{5}\theta^5 \ldots\ldots$ up to ∞ is equal to

A. $\sin\theta$
B. $\cos\theta$
C. $\tan\theta$
D. None of the above

101. What piece of laboratory equipment is best-suited for accurately measuring the volume of a liquid?

A. Graduated cylinder
B. Beaker
C. Thermos flask
D. Spherometer

102. Accuracy is defined as

A. A measure of how often an experimental value can be repeated.
B. The closeness of a measured value to the real value.
C. The number of significant figures used in a measurement.
D. None of these

103. How many kilograms are there in 4.21 pounds? There are 2.2 pounds in 1 kilogram.

A. 9.26 kg
B. 1.91 kg
C. 0.523 kg
D. 2.2

104. "Exothermic" processes

A. Absorb energy
B. Give off energy
C. Have no energy change
D. It is impossible to predict the energy change of an exothermic process

105. Bohr's model of the atom was able to accurately explain

A. origin of spectral lines
B. the spin of an electron
C. the emission of alpha particles
D. the velocity of light in free space

106. The colours of light given off when a sample is heated corresponds to

A. The energy difference between the ground state and excited state of an element.
B. The amount of energy added to the sample.
C. The heat of the element.
D. total number of electrons in an atom

107. Which of the following is not an allowed value for the angular momentum quantum number of an atom?

A. –1
B. 0
C. +1
D. +2

108. Which of the following elements has three valence electrons?

A. Lithium
B. Boron
C. Nitrogen
D. Sodium

109. Cations have

A. Positive charge
B. Negative charge
C. No charge
D. Always +2 units of charge

110. Hydrates are defined as

A. compounds with water molecules attached to them.
B. compounds that have had their water molecules removed
C. compounds that have been heated to high temperatures
D. compounds with carbon

111. The decibel is a measure of

A. Current
B. Voltage
C. Power level
D. Electric Charge

112. In an amplifier, the coupling capacitors are employed for

A. Limiting the bandwidth
B. Matching the impedance
C. Preventing of DC mixing with input or output
D. Controlling the output

113. The negative feedback in an amplifier

A. Reduces voltage gain
B. Increases the voltage gain
C. Increases the gain band width product
D. Reduces the input impedances

114. The shorter wave length of the electron permits the detailed examination of tiny objects due to reduction of …….. effects

A. Reflection
B. Diffraction
C. Refraction
D. Polarization

115. Wire-wound resistors are used only when

A. Precision is essential
B. Low values are required
C. High power rating is necessary
D. Costly equipments are manufactured

116. Which of the following materials are piezoelectric?

A. Mica and quartz
B. Mica, barium titanate and quartz
C. Mica and diamond
D. Barium titanate and quartz

117. An LED made using GaAs emits radiation in

A. Visible region
B. UV region
C. Infrared region
D. Microwave region

118. A resistance thermometer has a temperature coefficient of resistance 10^{-3} per degree and to resistance at 0°C is 10Ω. At what temperature is its resistance 1.1Ω?

A. 10°C
B. 100°C
C. 120°C
D. –10°C

119. Which one of the following statements is correct? Ionics crystals are

A. Hard and brittle
B. Soft and elastic
C. Hard and corrosive
D. Soft and inflammable

120. The material which has the property of becoming electrically polarized is in response to an applied mechanical stress is termed as

A. Ferroelectric
B. Piezoelectric
C. Optoelectronic
D. Superconducting

121. The speed of response of a first order system is judged by

A. Time constant
B. Transient response
C. Steady state value
D. Rise time

122. What represents the departure of the observed reading from the arithmetic mean of the group readings?

A. Dispersion
B. Deviation
C. Variance
D. Median

123. Copper is

A. Diamagnetic
B. Paramagnetic
C. Ferrimagnetic
D. Ferromagnetic

124. In a linear circuit the superposition principle can be applied to calculate the

A. Voltage and power
B. Voltage and current
C. Current and power
D. Voltage, current and power

125. The inverse Fourier transformation of $\delta(t)$ is

A. U(t)
B. 1
C. $\delta(t)$
D. e^{j2pt}

126. The wavelength of He-Ne laser light is

A. 5893 Å
B. 6328 Å
C. 6382 Å
D. 6943 Å

127. Specify the photoelectric device which converts the light information to resistance information

A. Photo-emissive cell
B. Photo-conductive cell
C. Photo-voltaic cell
D. All of the above

128. High vacuum pressure is most commonly expressed as

A. cm of water
B. pascal
C. torr
D. micron

129. Doppler effect principle is used in the measurement of

A. Temperature
B. Frequency
C. Speed
D. Pressure

130. Measurement of viscosity involves measuring

A. Fictional force
B. Coriolis force
C. Centrifugal force
D. Buoyant force

131. The Gunn diode is made from

A. Silicon
B. Germanium
C. Gallium Arsenide
D. Selenium

132. The junction capacitance of a pn junction depends on

A. Doping concentration
B. Applied voltage
C. Both doping concentration and applied voltage
D. Barrier potential only

133. The nature of crystal bonding in germanium is

A. Ionic
B. Metallic
C. Covalent
D. Vanderwaals type

134. Which one of the following power amplifier has the maximum efficiency?

A. Class A
B. Class B
C. Class AB
D. Class C

135. A differential amplifier is invariably used in input stage of all OPAMPs. This is done basically to prove the OPAMPs with a very high

A. CMRR
B. Bandwidth
C. Slew rate
D. Open loop gain

136. The Fourier transform of a Guassian time pulse is

A. Uniform
B. A pair of impulse
C. Gaussian
D. Rayleigh

137. The spectral density of white noise is constant

A. Exponential
B. Uniform
C. Poisson
D. Gaussian

138. The number of flip-flops required in a decade counter is

A. 2
B. 3
C. 4
D.10

139. The switching time of LEDs is of the order of

A. 1s
B. 1ms
C. 1μs
D. 1 ns

140. The position vector locating the point P(5,12) relative to the origin is

A. $12\vec{i} + 5\vec{j}$
B. $-5\vec{i} - 12\vec{j}$
C. $5\vec{i} + 12\vec{j}$
D. $13\vec{i} + 13\vec{j}$

141. Superconductors are

A. Diamagnetic
B. Paramagnetic
C. Ferromagnetic
D. Antiferromagnetic

142. The quantum of magnetic flux is given by

A. h/2e
B. h/3e
C. 2h/e
D. 3h/e

143. The tunnelling of cooper pairs through an insulator layer between two superconductors is known as

A. Esaki effect
B. DC Josephson effect
C. AC Josephson effect
D. Raman Effect

144. If you double the speed of an object, its kinetic energy is

A. the same
B. doubled
C. tripled
D. Quadrupled

145. Light propagates through an optical fiber by means of

A. reflection
B. total internal reflection
C. polarization
D. interference

146. In conductors, if the temperature is increased, resistivity

A. decreases
B. increases
C. remains constant
D. fluctuates

147. Light falling on the surface of a metal such as caesium can liberate electrons from the metal. The kinetic energy of electrons emitted from a metal can be increased by

A. using light of higher frequency.
B. using light of lower frequency.
C. increasing the intensity of the incident light.
D. using a metal with a greater work function.

148. In the spectrum of white light which one of the following colours corresponds to the lowest temperature?

A. Yellow
B. Blue
C. Red
D. Green

149. The wavelength of a light beam is doubled. Which one of the following is correct for the momentum of photons for that light beam

A. It is halved
B. It stays the same
C. It is doubled
D. It is reduced by one-fourth

150. Protons are being accelerated in a particle accelerator. When the energy of the protons is doubled, their de Broglie wavelength will

A. increase by a factor of 4
B. increase by a factor of 2
C. decrease by a factor of 2
D. decrease by a factor of $\sqrt{2}$

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