

**K S ACADEMY, SALEM -Best Institute for TRB Physics**  
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## **UG TRB – PHYSICS -2024 QUESTION PAPER**

### **Answer Key**

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 CENTRE FOR PHYSICS**

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- For a complete understanding of the solution steps, watch our institute's solution video lecture.
- விடையின் ஒவ்வொரு படிநிலையையும் தெரிந்துகொள்ள, KS ACADEMY விரிவுரை வீடியோவை பார்க்கவும்

31) Match the following.

Column - A

Column - B

(a) Kepler's Second law

(i) Sun at one of its foci

(b) Gravitational Constant

(ii)  $T^2 \propto a^3$

(c) Law of Orbit

(iii) Areal velocity

(d) Harmonic law

(iv) Astronomical unit of force

(A) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

(B) (a)-(ii), (b)-(iv), (c)-(i), (d)-(ii)

(C) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

(D) (a)-(i), (b)-(iv), (c)-(ii), (d)-(i)

**Ans: B**

32) Mark the correct equation of the loss of kinetic energy due to direct impact.

A)  $\frac{1}{2} \cdot \frac{m_1 m_2}{m_1 + m_2} u_1$

B)  $\frac{1}{2} \cdot \frac{m_1 m_2}{m_1 + m_2} (u_1 - u_2)$

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C)  $\frac{1}{2} \cdot \frac{m_1 m_2}{m_1 + m_2} (u_1 + u_2)$

D)  $\frac{1}{2} \cdot \frac{m_1 m_2}{m_1 + m_2} (u_1 - u_2)^2$

**Ans: D**

33. If the coefficient of restitution of the body is given as  $0 < e < 1$  then the examples for extreme cases of 'e' respectively are:

- (A) Perfect elastic, plastic
- (B) Moderate elastic, plastic
- (C) Plastic, less elastic
- (D) Plastic, good elastic

**Ans: A**

34. The principle of shock absorbers used in two wheelers is to:

- (A) prolong the period of average force
- (B) increase the momentum transfer
- (C) avoid fall off from road
- (D) decrease the time of average force

**Ans: A**

35.  $f_S = \mu_S N, f_K = \mu_K N$

Statement I:  $f_S$  is a vector relation because  $f_S$ , and N are in the same direction.

Statement II :  $f_K$  is not a vector relation because  $f_K$  and N are not in same direction.

- (A) Statement I and II are true
- (B) Statement I and II are not true
- (C) Statement I is not true and Statement II is true
- (D) Statement I is true and Statement II is not true

**Ans: A**

36. Which of the following statement is correct one ?

- (A) There is no change of entropy during a reversible adiabatic process.
- (B) There is change of entropy during a reversible adiabatic process.
- (C) There is no change of entropy during the irreversible adiabatic process.
- (D) There is change of entropy during the irreversible adiabatic process.

**Ans: A & D****KS ACADEMY, SALEM. CONTACT: 9047767620, 8148891005 & 9042976707**

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37) Match the following and choose the correct option.

- |                        |                            |
|------------------------|----------------------------|
| (a) Isothermal process | (i) $Q=0$                  |
| (b) Adiabatic process  | (ii) $V=0$                 |
| (c) Isobaric process   | (iii) $T= \text{constant}$ |
| (d) Isochoric process  | (iv) $T=0$                 |
|                        | (v) $P = \text{constant}$  |

- (A) (a)-(i), (b)-(iv), (c)-(ii), (d)-(v)  
 (B) (a)-(i), (b)-(iii), (c)-(v), (d)-(ii)  
 (C) (a)-(iv), (b)-(i), (c)-(ii), (d)-(v)  
 (D) (a)-(iii), (b)-(i), (c)-(v), (d)-(ii)

**Ans: D**

38) Arrange the following process of conversion of ice at  $-10^{\circ}\text{C}$  into steam at  $100^{\circ}\text{C}$  and choose the correct option

- a) 273 Kelvin changes to water at 273 Kelvin B  
 b) WATER 373 Kelvin changes into steam at 373 Kelvin  
 c) water heated from 273 Kelvin to 373 Kelvin

- (A) (a), (b), (c)  
 (B) (a), (c), (b)  
 (C) (b), (c), (a)  
 (D) (c), (a), (b)

**Ans: B**

39. For an ideal monoatomic gas, the 'R' is 'n' times the molar heat capacity, ' $C_p$ '. Therefore the value of 'n' is

- (A) 0.4  
 (B) 0.67  
 (C) 1.4  
 (D) 1.67

**Ans: A**

40. The average kinetic energy of hydrogen molecule at  $27^{\circ}\text{C}$  is E. The average kinetic energy at  $327^{\circ}\text{C}$  is

- (A) E  
 (B)  $\sqrt{2}$  E  
 (C) 2E

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(D) 4E

Ans: C

41. Gyrostat means \_\_\_\_\_

- A) FLY wheel of large moment of inertia
- B) FLY wheel of SMALL moment of inertia
- C) it is a disc of small moment of inertia
- D) it is a disk rotating with small radius of gyration

Ans: A

42. Which of the following is an example for inelastic collision ?

- (A) Collision between carrom coins
- (B) Collision between glass balls
- (C) Collision between billiard balls
- (D) Collision between a bullet and its target

Ans: D

43. A ball of mass  $m$  moving at  $2 \text{ m/s}$  hits directly on another ball of mass  $2 \text{ kg}$  moving in the same direction at  $0.5 \text{ m/s}$ . If the coefficient of restitution is  $\frac{2}{3}$ , the velocities after the impact are \_\_\_\_\_ ,

- A)  $\frac{1}{3} \text{ m/s}$ ,  $\frac{4}{3} \text{ m/s}$
- B)  $\frac{2}{3} \text{ m/s}$ ,  $\frac{1}{3} \text{ m/s}$
- C)  $3 \text{ m/s}$ ,  $\frac{1}{3} \text{ m/s}$
- D)  $\frac{4}{3} \text{ m/s}$ ,  $\frac{1}{3} \text{ m/s}$

Ans: A\*

44. Example for unstable equilibrium is

- (A) Pendulum of a clock
- (B) A pin resting on its point
- (C) Tanjore head oscillating doll
- (D) A cone with its slant side on a horizontal plane

Ans: B

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45) The z coordinates of the center of gravity G of the body is expressed as \_\_\_\_\_

- A)  $\bar{z} = \frac{1}{M^2} \int z \, dm$   
B)  $\bar{z} = \frac{1}{M} \int z \, dm$   
C)  $\bar{z} = \frac{1}{M} \int z^2 \, dm$   
D)  $\bar{z} = \frac{1}{M^2} \int z^2 \, dm$

**Ans: B**

46) Find the nature of path for the condition given for velocity of a satellite  $v = v_e$  where  $v$ -velocity,  $v_e$ -escape velocity.

- (A) Elliptical path-return to Earth  
**(B) Parabolic path-escape from the Earth**  
(C) Circular path around the Earth  
(D) Elliptical path around the Earth

**Ans: B**

47) The intensity of gravitational field at the centre of the sphere :

- (A)  $\infty$   
(B) 0  
(C)  $-\infty$   
(D) 1

**Ans: B**

48) Calculate the limiting velocity required by an artificial satellite for orbiting round the earth, if radius of the earth is  $6.4 \times 10^6 m$  and  $g$  is  $9.8 m/s^2$ .

- (A) 8000 m/s  
(B) 6400 m/s  
(C) 8400 m/ s  
(D) 4800 m/ s

**Ans: A**

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49) What is the ratio of gravitational potential at the centre of solid sphere to its surface ?

- (A) 3:2
- (B) 2:3
- (C) 1:3
- (D) 3:1

**Ans: B**

50) If the equal masses of two particles remains same but distance between them is doubled then the force of attraction between them would become \_\_\_\_\_N.

- A) 2F
- B) F/2
- C) F/4
- D) 4F

**Ans: C**

51) 500 g of water is heated from 30°C to 60°C. The change in internal energy of the water, after ignoring the slight expansion of water is \_\_\_\_\_ (Given that specific heat of water is 4184 J/kg/K)

- (A) 62.76 J
- (B) 62.76 ergs
- (C) 62.76 kJ
- (D) 627 J

**Ans: A**

52) Nitrogen gas is compressed adiabatically from a pressure of one atmosphere to a pressure of 2 atmosphere. The fractional change in the rms velocity of nitrogen molecule is \_\_\_\_\_ (Given  $\gamma=1.4$ )

- A) 2/5
- B) 1/3
- C) 1/2
- D) 1/10

**Ans: A**

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53) Calculate the efficiency of an **auto(otto)** engine having adiabatic compression ratio  $\rho = 9$ . Given ratio of specific heat capacities = 1.5.

- (A) 50%
- (B) 48%
- (C) 67%
- (D) 53%

**Ans: C**

spelling mistake in original TRB question paper

54. What does happen when a rubber band quickly stretched ?

- (A) it warms up
- (B) it cools down
- (C) it neither warms up nor cools down
- (D) Sometimes it warms up

**Ans: A**

55. Degree of freedom of mosquito flying in air is:

- (A) 3
- (B) 5
- (C) 1
- (D) 2

**Ans: A**

56. Match the following.

- |                    |                               |
|--------------------|-------------------------------|
| (a) Monoatomic gas | (i) Carbon monoxide           |
| (b) Diatomic gas   | (ii) Real gas at low pressure |
| (c) Triatomic gas  | (iii) Helium                  |
| (d) Ideal gas      | (iv) Sulphur dioxide          |
- (A) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
  - (B) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
  - (C) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)
  - (D) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

**Ans: A**

57. Calculate the power radiated from a  $1 \text{ mm}^2$  surface at a temperature of  $3000^\circ\text{C}$ .

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- (A) 65 W
- (B) 6.5 W
- (C) 0.65 W
- (D) 0.065 W

**Ans: B**

58. The heat capacity is negligible for all diatomic molecules only if the temperature is below

- (A) 5000 °K
- (B) 4000 °K
- (C) 3000 °K
- (D) 2000 °K

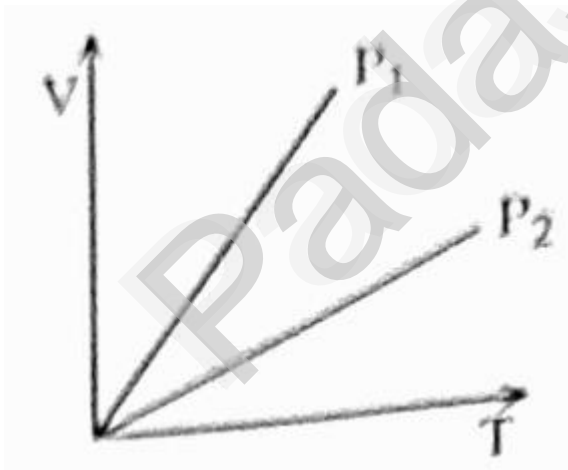
**Ans: D**

59) The Clausius Clapeyron equation is associated with \_\_\_\_\_

- A) enthalpy vaporization
- B) enthalpy of sublimation
- C) chemical potential
- D) Both A and B

**Ans: D**

60.



The V-T graph represents isobaric process at two different pressure.  $P_1$  has larger slope than  $P_2$  because :

- (A)  $P = \left(\frac{\mu R}{T}\right) V$
- (B)  $\frac{P}{V} = \mu R T$

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$$(C) V = \left(\frac{\mu R}{T}\right) P$$

$$(D) V = \left(\frac{\mu R}{P}\right) T$$

**Ans: D**

61. If the frequency of the magnetic field applied between the Ds (dees) of a cyclotron to accelerate a proton is 53.4 MHz, then the value of applied magnetic field is

(A) 4.5 Wb / m<sup>2</sup>

(B) 3.5Wb / m<sup>2</sup>

(C) 2.5Wb / m<sup>2</sup>

(D) 1.5Wb / m<sup>2</sup>

**Ans: b**

62. Number of neutrons generated by a single neutron in  ${}_{92}\text{U}^{235}$  during nuclear fission is :

(A) 3

(B) 5

(C) 9

(D) 20

**Ans: a**

63. If the Bohr's radius of the hydrogen atom is 0.529 Å, then the radius of 3<sup>rd</sup> orbit is:

(A) 4.76 Å

(B) 1.71 Å

(C) 3.17 Å

(D) 2.21 Å

**Ans: A**

64. The difference between shortest wavelength of Balmer and Lyman series is :

(A) 2/R

(B) 3/R

(C) 4/R

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(D) 5/R

**Ans: B**

65. If A be the mass number, M be the atomic mass, then packing fraction (f) of the nucleus is:

(A)  $f = \frac{A - M}{A}$

(B)  $f = \frac{M - A}{M}$

(C)  $f = \frac{M - A}{A}$

(D)  $f = \frac{A - M}{M}$

**Ans: C**

66. Which of the following numbers are not representing the magic numbers ?

(A) 2, 8, 20

(B) 8, 20, 82

(C) 20, 50, 126

(D) 18, 26, 58

**Ans: D**

67. Zeeman effect is which of the following phenomenon ?

(A) Magneto-optical

(B) Electro-optical

(C) Thermo-electric

(D) Photo-electric

**Ans: A**

68. According to Bohr Atom Model, the energy level of an atom with atomic number z can be obtained by the formula.

(A)  $E_n = -\frac{13.6}{n} z eV$

(B)  $E_n = \frac{13.6}{n} z eV$

(C)  $E_n = -\frac{13.6}{n^2} z^2 eV$

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(D)  $E_n = \frac{13.6}{n^2} z^2 eV$

Ans: C

69. The Space Quantization and Spinning of electron can be explained by :

- (A) Sommerfield Atom Model
- (B) Rutherford Atom Model
- (C) Vector Atom Model
- (D) Bohr Atom Model

Ans: C

70. Which one of the following is explained using Stern-Gerlach experiments ?

- (A) Existence of Electron Spin
- (B) Existence of Line Spectra
- (C) Existence of spatial Quantization
- (D) Existence of Orbital Motion

Ans: A

spelling mistake in original TRB question paper

71. Neptunium is formed when  ${}_{92}\text{U}^{238}$  is bombarded with:

- (A) high energy neutrons
- (B)  $\gamma$ -radiation
- (C) slow energy neutrons
- (D) high energy protons

Ans: C

72. If the value of Rydberg constant is  $1.097 \times 10^7 \text{ m}^{-1}$  then the wavelength of the first Paschen series is:

- (A)  $18750\text{\AA}$ ,
- (B)  $16750\text{\AA}$
- (C)  $17750\text{\AA}$

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(D)  $15750\text{\AA}$

**Ans: A**

73. When there is a transition from infinite state to ground state in a hydrogen atom the wavelength of spectral line is: ( $R_H \rightarrow$  Rydberg's constant)

(A)  $\frac{3}{4R_H}$

(B)  $\frac{1}{R_H}$

(C)  $\frac{1}{4R_H}$

(D)  $\frac{3}{2R_H}$

**Ans: B**

74. An atom whose  $Z$  or  $N$  is equal to the magic numbers, the value of binding energy in the B.E. curve is:

- (A) high and continuous
- (B) low and discontinuous
- (C) high and discontinuous
- (D) low and continuous

**Ans: C**

75. Which one of the following is a new family of leptons?

- (A) Tauons

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- (B) Pions
- (C) Kaons
- (D) n-meson

**Ans: A**

76. The time interval measured by a clock at rest relative to the observer is called

- (A) Proper time interval .
- (B) Improper time interval
- (C) Maximum time interval
- (D) Minimum time interval

**Ans: A**

77. The normalized wave function should satisfy which of the following relation?

- (A)  $\iiint |\Psi|^2 dx dy dz = 1,$
- (B)  $\iint |\Psi|^2 dx dy dz = 1$
- (C)  $\int |\psi'|^2 dx dy dz = 1$
- (D)  $|\Psi|^2 dx dy dz = 1$

**Ans: A**

78. The conservation of probability density of a quantum particle is given by:

- (A)  $\frac{\partial}{\partial t}(\Psi) + \nabla \cdot J = 0$
- (B)  $\frac{\partial}{\partial t}(\psi * \psi) + \nabla \cdot J = 0$

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(C)  $\frac{\partial}{\partial t}(\Psi) - \nabla \cdot J = 0$

(D)  $\frac{\partial}{\partial t}(\psi * \Psi) - \nabla \cdot J = 0$

**Ans: B**

79. What is the de-Broglie wavelength of an electron having kinetic energy 1000eV ?

(A)  $3.9 \times 10^{-10}$  m

(B)  $3.9 \times 10^{-9}$  m

(C)  $0.39 \times 10^{-10}$  m

(D)  $0.39 \times 10^{-9}$  m

**Ans: C**

80. The probability of penetration through finite potential barrier ' $V_0$ ', of a particle with kinetic energy ' $E$ ', increases with

(A) decreasing ( $V_0 - E$ )

(B) increasing ( $V_0 - E$ )

(C) increasing  $V_0$

(D) decreasing  $V_0$

**Ans: A**

81. The angle of contact between a glass capillary tube of length 10 cm and a liquid is  $90^\circ$ . If the capillary tube is dipped vertically in the liquid, then the liquid:

(A) will rise in the tube

(B) will get depressed by the tube

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- (C) will rise upto 10 cm in the tube and will overflow  
 (D) will neither rise nor fall

**Ans: D**

82. In the following equation which one is related to phase of Resonance?

- (A)  $\tan \alpha = \frac{\mu P}{K - Mp^2}$   
 (B)  $\tan \alpha = \frac{\mu P}{Mp^2 - K}$   
 (C)  $\tan \alpha = \frac{K - Mp^2}{\mu P}$   
 (D)  $\tan \alpha = \frac{Mp^2 - K}{\mu P}$

**Ans: A**

83. When source is moving away from the observer, what is the change of frequency of sound?

- (A)  $f' = \frac{v_s}{v}$   
 (B)  $f' = \left( \frac{v_s}{v + v_s} \right) f$   
 (C)  $f' = \frac{v}{v_s}$   
 (D)  $f' = \left( \frac{v}{v + v_s} \right) f$

**Ans: D**

84. In a damped harmonic oscillator the amplitude is:

- (A) infinity  
 (B) increasing

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(C) decreasing

(D) constant

**Ans: C**

85. The Resultant Force of vibrating body is:

(A) Periodic driving Force, the elastic Restoring Force and Friction Force

(B) Damping force, the elastic Restoring Force and Friction Force

(C) Damping Force, the Elastic Restoring Force

(D) Elastic Restoring Force and Friction Force

**Ans: A**

86. Loudness and intensity are related to each other by the relation

(A)  $I \propto \log L$

(B)  $I \propto \log L^2$

(C)  $L \propto \log I$

(D)  $L \propto \log I^2$

**Ans: C**

87. What are the necessary condition to get beats?

(A) When two notes of nearly same frequency and amplitude

(B) When two notes of nearly different frequency and amplitude

(C) When two notes of nearly same frequency and different amplitude

(D) When two notes of nearly different frequency and same amplitude

**Ans: A**

88. A uniform spring of force constant ' K ' is cut into two pieces of equal length. What is the force constant of each piece?

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- (A) 2 K
- (B)  $\frac{K}{2}$
- (C) K + 1
- (D) K<sup>2</sup>

**Ans: A**

89. Calculate the pressure inside an air bubble below the water surface.

[Surface tension of water =  $72 \times 10^{-3}$  N/m

Atmospheric pressure =  $1.012 \times 10^{-5}$  N/m<sup>2</sup>

Radius of the bubble =  $10^{-4}$  m ]

- (A)  $1.0264 \times 10^5$  N/m<sup>2</sup>
- (B)  $1.0264 \times 10^6$  N/m<sup>2</sup>
- (C)  $1.0264 \times 10^6$  N/m
- (D)  $1.0264 \times 10^5$  N/m

**Ans: A**

90. A quartz crystal of thickness 0.001 m radiates ultrasonic wave into water of frequency C 20 kilo-Hertz and Intensity  $5 \times 10^4$  Watts /m<sup>2</sup>.

Calculate maximum acceleration.

- (A)  $a = 1.45 \times 10^5$  m/s<sup>2</sup>
- (B)  $a = 1.4 \times 10^5$  m/s<sup>2</sup>
- (C)  $a = 1.5 \times 10^5$  m/s<sup>2</sup>
- (D)  $a = 1.55 \times 10^5$  m/s<sup>2</sup>

**Ans: A**

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91. For glass, the Young's modulus and Poisson's ratio have the values

$7.2 \times \frac{10^{10} \text{ N}}{\text{m}^2}$  and 0.25 respectively. Calculate the modulus of rigidity of glass.

(A)  $28.8 \times \frac{10^9 \text{ N}}{\text{m}^2}$

(B)  $2.88 \times \frac{10^9 \text{ N}}{\text{m}^2}$

(C)  $288 \times \frac{10^9 \text{ N}}{\text{m}^2}$

(D)  $2.88 \times \frac{10^9 \text{ N}}{\text{m}}$

**Ans: A**

92. A soap bubble of radius 0.01 m is expanded to the radius of 0.1 m. Calculate the work done on it. [Surface tension of a soap bubble =  $26 \times 10^{-3} \text{ N/m}$ ]

(A)  $8.47 \times 10^{-3} \text{ J}$

(B)  $6.47 \times 10^{-3} \text{ J}$

(C)  $64.7 \times 10^{-3} \text{ J}$

(D)  $64.7 \times 10^{-6} \text{ J}$

**Ans: B**

93. In an experiment to obtain Lissajou's figures, one tuning fork is of frequency 250 Hz and a circular figure occurs after every five seconds. What will be the frequency of the other tuning fork?

(A) 250.5 Hz or 258 Hz

(B) 250.2 Hz or 249.8 Hz

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(C) 250 Hz or 255 Hz

(D) 250 Hz or 252 Hz

**Ans: B**

94. In streamline motion, the velocity of flow at any given point in the space of flow remains:

(A) unchanged with time and area

(B) changed with time and area

(C) changed with time only

(D) unchanged with time only

(D) unchanged with time only

**Ans: D**

95. If one liter of glycerin gets reduced in volume by  $0.21 \text{ cm}^3$  under a pressure of  $10 \text{ kg/cm}^2$ , calculate the bulk modulus of glycerin.

(A)  $46.7 \times 10^{11} \text{ dyne /cm}^2$

(B)  $4.67 \times 10^{11} \text{ dyne /cm}$

(C)  $4.67 \times 10^{11} \text{ dyne /cm}^2$

(D)  $467 \times 10^{11} \text{ dyne /cm}^2$

**Ans: NONE Correct answer is  $4.67 \times 10^{10} \text{ dyne /cm}$**

96. When the number of turns in the primary and secondary coil is increased three times each, the natural inductance increased:

(A) 6 times

(B) 9 times

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- (C) 12 times
- (D) remains constant

**Ans: B**

97. Which of the following is dimensions of self inductance?

- (A)  $I^2ML^2 T^{-2}$
- (B)  $I^{-2}ML^2 T^{-2}$
- (C)  $I^{-2}ML^2 T^2$
- (D)  $I^{-2}ML^{-2} T^2$

**Ans: B**

98. An absolute electrometer is used to measure

- (A) Inductance
- (B) Capacitance
- (C) Resistance
- (D) Potential difference

**Ans: D**

99. In Thomson effect, if the Thomson co-efficient of the metal expressed in joules/coulomb/ °C is numerically equal to the emf in volt, then the temperature difference between the two points is

- (A) 0°K
- (B) -1°K
- (C) 1°C
- (D) 0°C

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**Ans: C**

100.  $\oint \vec{B} \cdot d\vec{s} = 0$  shows that:

- (A) There is no isolated magnetic dipole
- (B) There is no isolated magnetic monopole
- (C) There is no isolated electric dipole
- (D) There is no isolated electric monopole

**Ans: B**

101. Bravais Lattice corresponds to the basic vector  $a = b = c$ ;  $\alpha = \beta = \gamma = 90^\circ$  is:

- (A) Cubic
- (B) Monoclinic
- (C) Triclinic
- (D) Trigonal

**Ans: A**

102. Cell having more than one lattice Point in an unit cell is known as

- (A) Primitive cell
- (B) Non-primitive cell
- (C) Non - primitive unit cell
- (D) Primitive unit cell

**Ans: C**

103. The lattices reciprocal to each other:

- (A) Body centred cubic and Simple cubic
- (B) Body centred cubic and Face centred cubic
- (C) Face centred cubic and Simple cubic
- (D) Face centred cubic and monoclinic

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**Ans: B**

104. The mass of the unit cell with lattice constant 'a' is

- a)  $\rho a^3$
- b)  $m a^3$
- c)  $\mu m a^3$
- d)  $\lambda m a^3$

**Ans: A**

105. The path difference between rays reflected from the adjacent planes which are 'd' distance apart is [Where  $\theta$  is the angle of diffraction]

- (A)  $2d \sin \theta$
- (B)  $2 \sin \theta$
- (c)  $d \sin \theta$
- (D)  $\frac{d}{2} \sin \theta$

**Ans: A**

106. The difference between the crystalline and amorphous structure is:

- a) both have regular internal atomic structure
- (B) both have no regular internal atomic structure
- (C) Crystalline have regular internal atomic structure but amorphous do not have regular internal atomic structure
- (D) Crystalline have no regular internal atomic structure but amorphous have regular internal atomic structure

**Ans: C**

107. What is the number of atoms per  $(mm)^2$  area in (100) plane which has fcc structure? [Radius of the atom is 0.174 nm]

- (A)  $0.82 \times 10^{12}$
- (B)  $8.2 \times 10^{12}$
- (C)  $8.02 \times 10^{12}$
- (D)  $0.082 \times 10^{12}$

**Ans: B**

108. Which one is not correct for hexagonal crystal system?

- (A)  $\gamma = 120^\circ$

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- (B)  $a_1 = a_2 \neq a_3$
- (c)  $\alpha = \beta = 90^\circ$
- (D) Number of lattice is 2

**Ans: D**

109. Stacking sequence in a primitive cube structure is

- (A) ABCABCABC
- (B) ABABAB
- (C) CACACAB
- (D) AAA

**Ans: D**

110. The bond due to electrostatic attraction between permanent dipoles:

- (A) Metallic bond
- (B) Covalent bond
- (C) Ionic bond
- (D) Vander Waals bond

**Ans: D**

111. Name the crystal systems which have all the three lattice constants equal.

- (A) Cubic and Triclinic
- (B) Cubic and Trigonal
- (C) Triclinic and Trigonal
- (D) Triclinic and Tetragonal

**Ans: B**

112. Which two operations constitute a glide symmetry?

- (A) Rotation and inversion operations
- (B) Reflection and inversion operations
- (C) Rotation and translation operations
- (D) Reflection and translation operations

**Ans: D**

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113. In the Vander Waals bonding the attractive interaction energy between two dipole depend on \_\_\_\_\_(C - constant)

(A)  $\frac{C}{r^3}$

(B)  $-\frac{C}{r^3}$

(C)  $\frac{C}{r^6}$

(D)  $-\frac{C}{r^6}$

**Ans: B**

114. The bond energy in the hydrogen bond is in the order of

(A) 0.01 eV

(B) 0. 1eV

(c) 1 eV

(D) 1 ev

**Ans: B****115. Assertion (A)**

Ionic solid have high melting point and boiling point.

**Reason (R)**

Because more energy is needed to make ion mobile and to overcome the strong electrostatic force of attraction.

(A) (A) is true but (R) is false

(B) Both (A) and (R) are fake

(C) Both (A) and (R) are true

(D) (A) is false but (R) is true

**Ans: C**

116. The combination of prism, the condition for dispersion without deviation

(A)  $\delta_V - \delta_R = (\omega - \omega')(\mu - 1)A$

(B)  $\delta_V - \delta_R = (\omega - \omega')(\mu + 1)A$

(c)  $\delta_V - \delta_R = (\omega + \omega')(\mu - 1)A$

(D)  $\delta_V - \delta_R = (\omega + \omega')(\mu + 1)A$

**Ans: A****KS ACADEMY, SALEM. CONTACT: 9047767620, 8148891005 & 9042976707**



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117. Two glasses have dispersive powers in the ratio 2: 3. These glasses are to be used in the manufacture of an achromatic objective of focal length 20 cm. The focal length of the lenses

- (A)  $f_1 = 5.8 \text{ cm}, f_2 = -6 \text{ cm}$   
 (B)  $f_1 = -8.0 \text{ cm}, f_2 = 5 \text{ cm}$   
 (C)  $f_1 = 6.67 \text{ cm}, f_2 = -10 \text{ cm}$   
 (D)  $f_1 = -6.67 \text{ cm}, f_2 = 8 \text{ cm}$

**Ans: C**

118. Einstein's co-efficient for stimulated emission is

- (A)  $\frac{A_{21}}{B_{21}} = \frac{8\pi h \nu^3}{c^3}$   
 (B)  $\frac{A_{12}}{B_{21}} = \frac{8\pi h \nu^3}{c^3}$   
 (C)  $\frac{A_{21}}{B_{12}} = \frac{8\pi h \nu^3}{c^3}$   
 (D)  $\frac{A_{12}}{B_{21}} = \frac{8\pi h \nu^3}{c}$

**Ans: A**

119. If ' $F$ ' is the restoring force and ' $\mu$ ' is reduced mass of the molecule, then the frequency of vibration of the diatomic molecule in Raman effect is

- (A)  $\nu = \frac{1}{2\pi} \sqrt{\frac{F}{\mu}}$   
 (B)  $\nu = \frac{1}{2\pi} \sqrt{\frac{f}{\mu}}$   
 (C)  $\nu = \frac{1}{2\pi^2} \sqrt{\frac{F}{\mu}}$   
 (D)  $\nu = \frac{1}{2\pi^4} \sqrt{\frac{F}{\mu}}$

**Ans: A**

120. In a Newton's ring experiment the diameter of 10<sup>th</sup> ring changes from 1.40 cm to 1.27 cm when a drop of liquid is introduced between the lens and the glass plate then the refractive index is

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121. An electric dipole is placed at an alignment angle of  $30^\circ$  with an electric field of  $2 \times 10^5 \text{NC}^{-1}$ . It experiences a torque equal to 8 N-m. Calculate the charge on the dipole, if the dipole length is 1 cm.

(A)  $4\text{mC}$ (B)  $8 \text{mC}$ (c)  $5\text{mC}$ (D)  $7\text{mC}$ **Ans: B**

122. For a diamagnetic material, which of the following statement is correct?

(A) Magnetic susceptibility  $< 0$ (B) Magnetic susceptibility  $> 0$ (C) Magnetic susceptibility  $= 0$ (D) Magnetic susceptibility  $= 1$ **Ans: A**

123. Material for making transformer core must have

(A) High magnetic induction and low hysteresis loss

(B) Low magnetic induction and high hysteresis loss

(C) Low magnetic induction and low hysteresis loss

(D) High Magnetic induction and high hysteresis loss

**Ans: A**

124. The force of repulsion between two like charges is 3.5 N. What will be the force if the distance between the charges is increased to five times its original value?

(A) 0. 26N

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(B) 0. 14N

(C) 0.24 N

(D) 0. 34N

**Ans: B**

125. When a material attained uniform polarization its net charge density is

(A) 0

(B) 1

(C) -1

(D)  $\infty$ **Ans: A**

126. The sensitivities of the bridge will be higher if the resistance in series with the unknown resistance is greater than the resistance connected in parallel to it. This rule is:

(A) Mance rule

(B) Kelvin's rule

(C) Kirchhoff' s rule

(D) Calendar rules

**Ans: D**

127. Choose the correct thermoelectric series in which current flows from hot junction to cold junction

(A) *Bi*, Pt, Cn, Ni, Pb

(B) Bi, Ni, Pb, Pt, Cu

(C) Bi, Ni, Pt, *Cu*, Pb

(D) Ni, Bi, Pi, Cu, Pb

**Ans: C**

Question sentence structure is not correct -Current in hot junction and cold junction

128. A sample of HCl gas is placed in an uniform electric field of magnitude  $3 \times 10^4 \text{ NC}^{-1}$ . The dipole moment of each HCl molecule is  $3.4 \times 10^{-30} \text{ Cm}$ . Calculate the maximum torque experienced by each HCl molecule.

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(A)  $\tau_{\max} = 10.2 \times 10^{-22} \text{ Nm}$

(B)  $\tau_{\max} = 10.2 \times 10^{-24} \text{ Nm}$

(C)  $\tau_{\max} = 10.2 \times 10^{-26} \text{ Nm}$

(D)  $\tau_{\max} = 10.2 \times 10^{-28} \text{ Nm}$

**Ans: C**

129. In an inductor, if there is no self-induction and self-induced emf then it

(A) Blocks AC and allows DC

(B) Blocks DC and allows AC

(C) Blocks AC and DC

(D) Allows both AC and DC

**Ans: D**

130. In an electrical circuit R, L, and AC voltage source are all connected in series. When 'L' is removed from the circuit, the phase difference between the voltage and current in the circuit is  $\pi/3$ . Instead if 'C' is removed from the circuit, the phase difference again is  $\pi/3$ . The power factor of the circuit is:

a)  $\frac{1}{2}$

b)  $\frac{1}{\sqrt{2}}$

c) 1

d)  $\frac{\sqrt{3}}{2}$

**Ans: C**

131. Which one of the following metal does not cause photoelectric emission under the action of visible light?

(A) Sodium

(B) Cadmium

(C) Cesium

(D) Potassium

**Ans: B****KS ACADEMY, SALEM. CONTACT: 9047767620, 8148891005 & 9042976707****Kindly Send Me Your Study Materials To Us Email ID: padasalai.net@gmail.com**

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132. The probability of finding the particle within an interval of  $1 \text{ \AA}$  at the centre of a box of length 'L', when it is in least energy state is

- (A) Zero
- (B) L
- (c) L/2
- (D) 2/L

**Ans: D**

133. For a particle encountering potential barrier, the sum of the reflection and transmission coefficients is always

- (A) 0
- (B) Infinite
- (C) 1
- (D) 0.5

**Ans: C**

134. When the particle mass ( $M_0$ ) approaches 'C', the value of observed mass approaches

- (A) Zero
- (B)  $\infty$
- (C)  $-\infty$
- (D) Less than  $M_0$

**Ans: B**

135. For a linear motion of the particle, the Hamiltonian  $H$  is given by:

- (A)  $H = \frac{-\hbar^2}{2m} \frac{d^2}{dx^2} + V$
- b)  $H = \frac{\hbar^2}{2m} \frac{d^2}{dx^2} + V$
- (c)  $H = \frac{\hbar^2}{2m} \frac{d^2}{dx^2} - V$
- (D)  $H = \frac{-\hbar^2}{2m} \frac{d^2}{dx^2} - V$

**Ans: None** correct answer is  $H = \frac{-\hbar^2}{2m} \frac{d^2}{dx^2} + V$

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136. If lifetime of an excited state of an atom is  $10^{-8}$ s the minimum uncertainty in the determination of energy of the excited state is

- (A)  $4 \times 10^{-26} J$
- (B)  $3 \times 10^{-26} J$
- (c)  $2 \times 10^{-26} J$
- (D)  $1 \times 10^{-26} J$

**Ans: D**

137. The relativistic relation between momentum and energy is

- (A)  $E^2 = c^2 p^2 + m_0^2 c^4$
- (B)  $E^2 = c^2 P^2$
- (C)  $E = mc$
- (D)  $E = mc^2$

**Ans: A**

138. In Compton Scattering experiment, greater is the scattering angle when:

- (A) greater is the Compton shift
- (B) lesser is the Compton shift
- c) no change in Compton shift
- (D) very less in the Compton shift

**Ans: A**

139. The length of the spur in the graph reaches maximum value in Davisson and Germer experiment, when the accelerating voltage of electron is

- (A) 68 V
- (B) 60 V
- (c) 54V
- (D) 48 V

**Ans: C**

140. If  $\int_a^b \Psi_2^* (x)\Psi_1(x)dx = 0$  then the wave function  $\Psi_1(x)$  and  $\Psi_2(x)$  are said to be

- (A) Orthogonal wave functions

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- (B) Normalized wave functions  
 (c) Orthonormal wave functions  
 (D) Linear wave functions

**Ans: A**

141. The focal length of the zone plate  $f_n$  is given by

- (A)  $f_n = \frac{r\lambda}{r_n}$   
 (B)  $f_n = \frac{r_n^2}{n\lambda}$   
 (c)  $f_n = \frac{n\lambda}{r_n^2}$   
 (D)  $f_n = \frac{r_n}{n\lambda}$

**Ans: B**

142. In a wedge-shaped thin film the fringe width is

- (A)  $\beta = \frac{\lambda}{12\mu \tan \theta}$   
 (B)  $\beta = \frac{\lambda}{6\mu \tan \theta}$   
 (C)  $\beta = \frac{\lambda^2}{2\mu \tan \theta}$   
 (D)  $\beta = \frac{\lambda}{2\mu \tan \theta}$

**Ans: D**

143. Match the following

- |                                  |  |
|----------------------------------|--|
| (a) Flint                        | (i) Path difference $\frac{\lambda}{4}$ or phase difference $90^\circ$ |
| (b) Quarter wave plate           | (ii) $\frac{\theta}{l \times c}$                                       |
| (c) Specific rotation            | (iii) Glass  |
| (d) Elliptically polarised light | (iv) Circularly polarised light  |
- (A) (a)-(iv) (b)-(i) (c)-(iii), (d)-(ii)  
 (B) (a)-(ii) (b)-(iv) (c)-(i) (d)-(iii)

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(C) (a)-(i) (b)-(ii) (c)-(iii), (d)-(iv)

(D) (a)-(iii), (b)-(iv) (c)-(ii) (d)-(i)

**Ans: D**

144. In fibre optics the numerical aperture is defined as

(A) Sine of the acceptance angle

(B) Cosine of the acceptance angle

(C) Sine of the critical angle

(D) Cosine of the critical angle

**Ans: A**

145. For an optical fibre with refractive indices of core and cladding are 1.5 and 1.49 respectively. Then the fractional refractive index is

a) 0.0417

b) 0.0027

c) 0.0017

d) 0.0067

**Ans: D**

146. The correct match is:

a) Interference - iii) Principle of superposition

b) Diffraction - i) Bending of light

c) Polarization - iv) Transverse wave

d) Laser - ii) Scattering of light

(A) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

(B) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

(C) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(D) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

**Ans: B**



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147. If the relation between the refractive index of extraordinary ray and ordinary ray is  $n_e < n_o$  then the crystal is a

- (A) positive crystal
- (B) negative crystal
- (C) neutral crystal
- (D) quartz crystal

**Ans: B**

148. Interference of two beams of light, the maximum and minimum intensity values are found to be  $9 I_0$  and  $4 I_0$ , respectively. If  $I_0$  is a constant then the ratio of intensities of the two interfering beam of light is:

- (A) 9:4
- (B) 81:1
- (C) 16:1
- (D) 25:1

**Ans: D**

149. Which of the following statement is correct?

Statement 1: A half wave plate introduces a phase difference between extraordinary wave and ordinary wave is  $\pi$ .

Statement 2: A quarter wave plate introduces a phase difference between extraordinary wave and ordinary wave is  $\frac{\pi}{2}$

- (A) Both Statement 1 and Statement 2 are correct.
- (B) Statement 1 is correct; Statement 2 is wrong
- (C) Statement 1 is wrong; Statement 2 is correct
- (D) Both Statement 1 and Statement 2 are wrong

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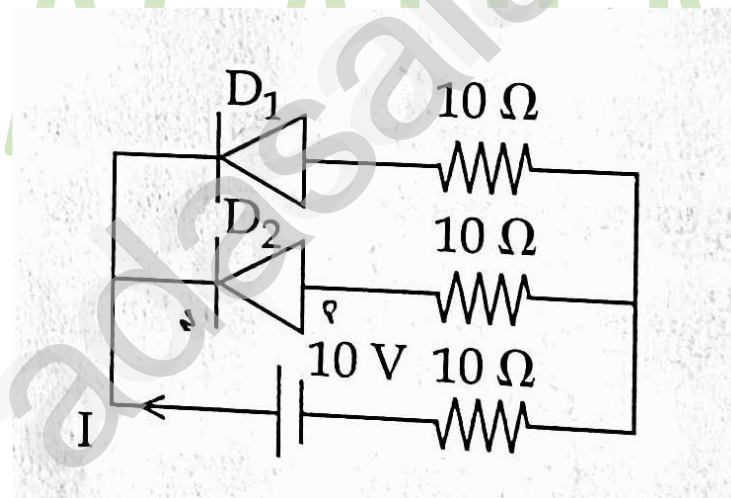
Ans: A

150. If unpolarized light of intensity  $4I_0$  is incident on a polarizer, then the intensity of light transmitted through the polarizer is

- (A)  $2I_0$
- (B)  $I_0$
- (C)  $\frac{I_0}{2}$
- (D)  $4I_0$

Ans: A

151. For the given circuit, if ' $D_1$ ' and ' $D_2$ ' are ideal PN Junction diodes,



then the current ' $I$ ' flowing in the circuit is \_\_\_\_\_

- (A) 1 A
- (B) 2 A
- (C) 0.4 A
- (D) Zero

Ans: D

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152. Simplified expression for the following Karnaugh map.

	$C'D'$	$C'D$	$CD$	$CD'$
$A'B'$	1	0	0	1
$A'B$	1	0	0	1
$AB$	1	0	0	1
$AB'$	1	0	0	1

A)  $y = D'$

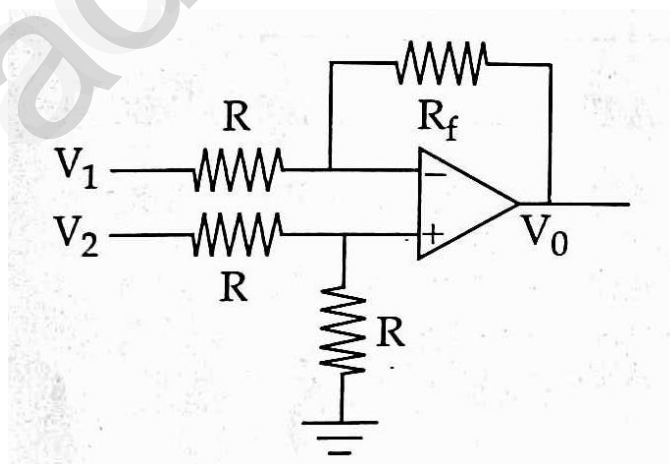
B)  $y = C'D'$

C)  $y = A'B' + C'D' + A'B'CD + AB'CD$

D)  $y = C'$

Ans: A

153. Identify the circuit, given  $V_2 = 2V_1$



A) Inverting Amplifier

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- B) Non-inverting Amplifier
- C) Zero crossing Amplifier
- D) Oscillator

**Ans: B**

154. To generate square wave and rectangle wave the oscillator used is

- (A) Colpitt's oscillator
- (B) Hartley oscillator
- (C) Phase shift oscillator
- (D) Astable multivibrator

**Ans: D**

155. Boolean expression for the following truth table is

A	B	C	Y
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

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- (A)  $A'B'C + A'BC + AB'C' + ABC'$
- (B)  $A'B'C' + A'BC + AB'C + ABC$
- (C)  $AB'C' + ABC' + A'BC' + A'BC$
- (D)  $A'BC + AB'C + ABC + AB'C$

**Ans: B**

156. The oscillator is nothing but an amplifier with

- (A) Large gain
- (B) No feedback
- (C) Positive feedback
- (D) Negative feedback

**Ans: C**

157. When will be the output of the NOR gate high ?

- (A) Only when all the inputs are high
- (B) Only when all the inputs are low
- (C) Only when at least one input is high
- (D) Only when at least one input is low

**Ans: B**

158.  $Y = \bar{A} + \bar{B}$  represents

- (A) NOR gate
- (B) X-OR gate
- (C) NAND gate
- (D) OR gate

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Ans: C

159. The ratio between the reactance of the coil at resonance and resistance of the circuit is called

- (A) Q Factor
- (B) R Factor
- (C) S Factor
- (D) L Factor

Ans: A

160. Which one of the following statement is false for Ballistic Galvanometer (B.G.)?

- A) The condition of B.G. Damping should be large
- B) Measured the absolute capacitance
- C) Charge sensitiveness measured
- D) Measured the comparison of two emfs

Ans: A

161. 10 l of water at  $80^{\circ}C$  is mixed with 20 l of same water at  $50^{\circ}C$ . What is the final temperature of the mixture?

- A)  $65^{\circ}C$
- B)  $60^{\circ}C$
- C)  $80^{\circ}C$
- D)  $70^{\circ}C$

Ans: B

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162. A physical measurement is given by the relation  $V = \frac{\pi Pr^4}{8\eta l}$ . The percentage errors in measuring  $P, r, \eta$  and  $l$  are 2%, 1%, 2% and 1% respectively. The percentage error in  $V$  is:

- A) 9%
- B) 0 %
- C) 3%
- D) 6%

**Ans: A**

163. Which of the following physical quantities have same dimensions?

- (A) Energy, Angular Momentum
- (B) Torque, Energy
- (C) Torque Angular Momentum
- (D) Workdone, Power

**Ans: B**

164. The dimensions of two sides of an equation are equal. Then it is called as

- (A) Principle of dimensions
- (B) Principle of homogeneity of dimensions
- (C) Principle of heterogeneity of dimensions
- (D) Equal dimension

**Ans: B**

165. A moving coil galvanometer in which the coil is wound on a metallic conducting frame is called as

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- (A) Ballistic galvanometer
- (B) Dead beat galvanometer
- (C) Oscillating galvanometer
- (D) Sensitive galvanometer

**Ans: B**

166. Parallel rays are falling on a concave lens. The nature of image and distance at which it is observed, respectively, will be

- (A) Real,  $f$
- (B) Virtual,  $f$
- (C) Real,  $2f$
- (D) Virtual,  $2f$

**Ans: B**

167. A current of 1 A flows through a tangent galvanometer shows a deflection of  $30^\circ$ . What will be the deflection if the current is  $\sqrt{3}$  A ?

- (A)  $90^\circ$
- (B)  $60^\circ$
- (C)  $45^\circ$
- (D)  $30^\circ$

**Ans: C**

168. A synchronous counter is the one in which:

- (A) no clock pulse given

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- (B) clock pulse given for only one flip-flop
- (C) clock pulse given simultaneously to all the flip-flops
- (D) output of one flip-flop is used as a clock for the next flip-flop

**Ans: C**

169. Which of the following physical quantities cannot be measured directly by a multimeter ?

- (A) Resistance
- (B) Capacitance
- (C) Frequency
- (D) Inductance

**Ans: C**

170. The resistance of an ideal ammeter and an ideal voltmeter are respectively

- (A) Zero, Infinite
- (B) Infinite, Zero
- (C) Zero, Zero
- (D) Infinite, Infinite

**Ans: A**

171. The Feedback path in an op-amp integrator is

- (A) A resistor
- (B) An inductance

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- (C) Resistor and inductance in series
- (D) A capacitor

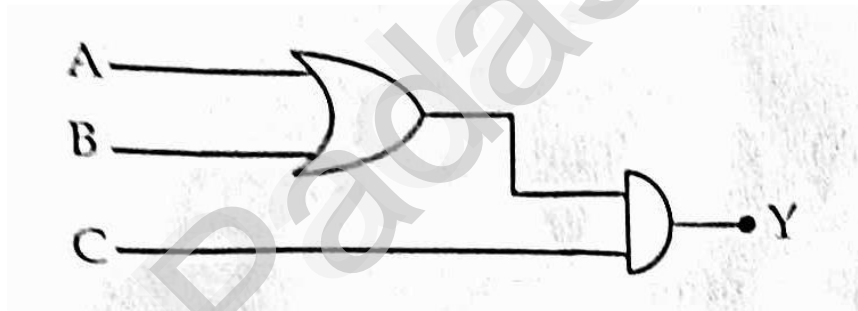
**Ans: D**

172. A Differentiator has  $R_1 = 10\text{k}\Omega$  and  $C_1 = 0.01\mu\text{F}$ . Determine its cut off frequency.

- (A) 189 Hz
- (B) 159 Hz
- (C) 160 Hz
- (D) 175 Hz

**Ans: None** - correct option 1590Hz

173. The output of the following circuit is 1, when the input  $ABC$  must be



- (A) 010
- (B) 100
- (C) 101
- (D) 110

**Ans: c**

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174. When an arsenic element is added to a pure semiconductor, it becomes

- (A) an insulator
- (B) a pure semiconductor
- (C) p-type semiconductor
- (D) n-type semiconductor

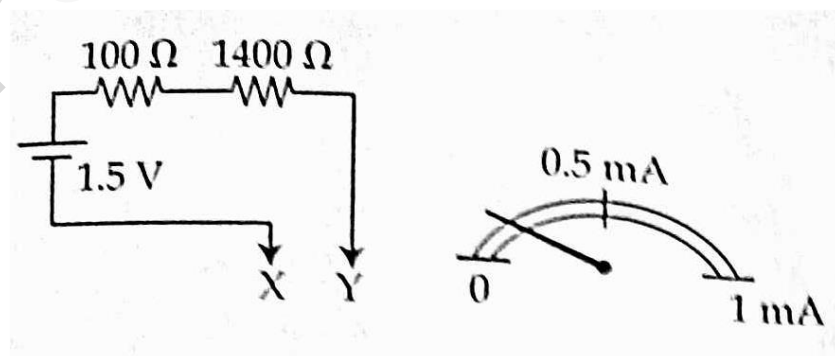
Ans: d

175. The circuit which converts a.c. voltage into pulsating d.c. voltage.

- (A) Rectifier
- (B) Filter
- (C) Voltage regulator
- (D) Feedback circuit

Ans: A

176. In the case of ohm meter with maximum deflection of 1 mA, when the terminals X and Y are connected, then the deflection in the galvanometer will be



- (A) Zero

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- (B) Half scale deflection
- (C) Full scale deflection
- (D) Terminated

**Ans: C**

177. Match the dimensional formula of the following

- |                        |                      |
|------------------------|----------------------|
| (i) Angular velocity   | (a) $ML^2Q^{-2}$     |
| (ii) Impulse           | (b) $ML^2 T^{-1}$    |
| (iii) Inductance       | (c) $M^0 L^0 T^{-1}$ |
| (iv) Planck's constant | (d) $MLT^{-1}$       |

(i), (ii), (iii), (iv)

(A) (a), (b), (c), (d)

(B) (c), (d), (a), (b)

(C) (b), (c), (d), (a)

(D) (d), (c), (b), (a)

**Ans: B**

178. The least count of the vernier microscope is found to be

- (A) 0.001 mm
- (B) 0.001 cm
- (C) 0.01 mm
- (D) 0.01 cm

**Ans: C**

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179. Focal length of two concave lenses are 50 cm and 100 cm respectively. The power of the combination is

- (A)  $-3D$
- (B)  $-0.33D$
- (C)  $-33.3D$
- (D)  $+3D$

**Ans: D**

180. The displacement of a particle at time interval  $t = [10 \pm 0.3]s$  is given by  $s = [50 \pm 0.2]m$ . The velocity of the particle is

- (A)  $[5 \pm 0.66]ms^{-1}$
- (B)  $[5 \pm 0.5]ms^{-1}$
- (C)  $[5 \pm 0.4]ms^{-1}$
- (D)  $[5 \pm 0.17]ms^{-1}$

**Ans: D**

Cut Off mark

**OC** - above 85

**BC** - above 81

**MBC** - above 80

**BCM** - above 76

**SC/SCA** - above 76

**ST** - above 70

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