JT (Phy) L-1
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Indian Institute of Information Technology
Design and manufacturing, Kancheepuram

Question paper for the post of Junior Technician in Physics (Level 1)
Screening test

The question paper consists of 100 Multiple Choice Questions. Each question carries 1 mark and any wrong answer will have a negative mark of 0.25 each.

1) If A and B are perpendicular vectors, A= 5i + 7j-3k, B= 2i +2j-ak. Then the value of a is

   A) -2

   B) 8

   C) -7

   D) -8

2) Which of the following is not correct?

   A) $j \times i = -k$

   B) $k \times j = -i$

   C) $i \times k = j$

   D) $k \times i = -j$

3) Two adjacent sides of a parallelogram are represented by 2 vectors i+2j+3k and 3i-2j+k. What is the area of the parallelogram?

   A) 8

   B) $8\sqrt{3}$

   C) $3\sqrt{8}$

   D) 192

4) The sum of the 2 vectors having magnitude 50 and 100 can never be?

   A) 120

   B) 50

   C) 40

   D) 80

5) A body is at rest under the action of 3 forces and 2 of which are, F1=4i, F2=6i. The third force is?

A) 4i+6j
B) 4i-6j
C) -4i+6j
D) -4i-6j

6) Which of the following is correct?

A) A.B ≠B.A
B) A.(B+C) = A.B+A.C
C) A.(B+C) ≠ A.B+A.C
D) A×B = B×A

7) The dimensional formula for angular momentum is

A) MLT^{-1}
B) $ML^{-1}T^{-1}$
C) $ML^{2}T^{-1}$
D) None of these

8) A particle moved from position r_1=3i+2j-6k to position r_2 = 4i+j+3kn. What is the work done?

A) 1J
B) 0.01J
C) 10J
D) 100J

9) In simple harmonic motion, the acceleration is?

A) Directly proportional to displacement from central position
B) Constant
C) Inversely proportional to displacement from central position
D) Inversely proportional to square of the displacement from central position

10) For a particle executing SHM, determine the ratio of average acceleration of the particle between extreme position and equilibrium position with respect to the maximum acceleration

A) 4/π
B) 2/π
C) 1/4π
D) 1/2π

11) A particle executes a SHM of period 10 seconds and amplitude of 1.5 metres. The maximum velocity is?

A) 0.142 m/s
B) 0.9442 m/s
C) 0.466 m/s
D) 942 m/s

12) A mass of 0.5kgs hangs from a spring. If the mass is pulled downward and let go it executes SHM. The time period of the same spring is stretched 16cms by 0.4kg mass is

A) 28 sec
B) 2.8 sec
C) 0.28 sec
D) 18 sec

13) A particle is vibrating in SHM with an amplitude of 4cms. At what displacement from the equilibrium position is its energy half potential and half kinetic?

A) 1cm

B) $\sqrt{2}$ cms

C) 2 cms

D) $2\sqrt{2}$ cms

14) Dispersion is maximum for

A) Violet colour
B) Red colour
C) Yellow colour
D) Blue colour

15) If the critical angle for total internal reflection from medium to vacuum is 30^0.The velocity of light in medium is?

A) 3×10^8 m/sec

B) 1.5×10^8 m/sec

C) 6×10^8 m/sec

D) 0.3×10^8 m/sec

16) In order that a thin film of oil floating on the surface of water should show colours due to interference, the thickness of the oil film should be the order of?

A) 1cm

B) 10 A^0

C) 1000 A^0

D) 10000 A^0

17) In young's experiment, with one source of light and 2 slits is performed in water instead of in air.

A) The fringes will be broader

B) The fringes will be smaller in number

C) The fringes will be narrower

D) No fringes will be obtained.

18) Two coherent waves with same amplitude 'a' interfere, then the maximum intensity expected is as?

A) $2a^2$

B) a^2

C) $4a^2$

D) 2a

19) In the interference pattern, energy is

A) Conserved but is redistributed

B) Created at the maximum

C) Destroyed at the minima

D) Converted into matter

20) The air film in Newton's ring experiment is replaced by an oil film. The radius of the rings

A) Remains same

B) Decreases

C) Increases

D) Overlap the rings

21) A smaller circular disc is placed in the path of monochromatic light. The centre of the geometrical shadow of the object always

A) Bright

B) Dark

C) Coloured

D) Half bright and half dark

22) Two waves having amplitudes in the ratio 5:1 produces interference. The ratio of the maximum to minimum intensity is?

A) 25:1

B) 6:4

C) 4:9

D) 9:4

23) The convex lens in Newton's ring experiment is replaced by an ordinary glass plate, then

A) No interference occurs

B) Circular rings are still obtained

C) Interference takes place but the shape of the fringes is irregular

D) Straight line fringes are obtained

24) The condition for observing fraunhoffer diffraction from single slit is that the light wave front incident on the slit should be

A) Cylindrical

B) Spherical

C) Planar

D) All the above wave fronts

25) When viewed in white light, soap bubbles show colour because

A) Diffraction

b) Interference

C) Scattering

D) Dispersion

26) A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by blue light?

A) No change

B) Diffraction bands become narrower and crowded together

C) Bands become broader and further apart

D) Bands disappear

27) When white light is incident on diffraction grating, the light that will be deviated from central image will be?

A) Yellow

B) Violet

C) Indigo

D) Red

28) Maximum number of orders available with a grating is

A) Independent of grating elements

B) Directly proportional to grating elements

C) Inversely proportional to grating elements

D) Directly proportional to wavelength

29) When a beam of unpolarised light passes through a Nicol prism, then O-ray is?

A) Transmitted onwards

B) Totally reflected sideways

C) Partially reflected sideways

D) Absorbed by prism.

30) Polarisation of light proves the

A) Corpuscular nature of light

B) Transverse nature of light

C) Quantum nature of light

D) Longitudinal nature of light

31) Polaroid sun glasses decrease glare on a sunny day because they

A) Block a portion of light

B) Have a special colour

C) Completely absorb the light

D) Refract the light

32) The substances that rotate the plain polarised light are said to be

A) Optically inactive

B) Optically active

C) Opaque

D) Polaroids

33) Nicol prism is based on the action of

A) Refraction

B) Scattering

C) Double refraction

D) None of the above

34) When a quartz half wave plate is placed between 2 crossed polaroids such that the half wave plate is oriented 45^0 to the axis of polaroids, the combination will transmit intensity

A) No light

B) One fourth of the intensity of the incident unpolarised light

C) Half of the intensity of the incident unpolarised light

D) None of the above

35) In He-Ne lasers, the ratio of He-Ne mixture is

A) 10:1

B) 1:10

C) 3:4

D) 1:2

36) Among the following laser sources, which source will give visible light radiation?

A) Nd YAG laser

B) Nd glass laser

C) CO_2 laser

D) He-Ne laser

37) Among the following lasers, which laser is widely used in ophthalmology?

A) Ruby laser

B) Nd YAG laser

C) Argon ion laser

D) CO_2 laser

38) Coherence in lasers is coming from

A) Spontaneous emission
B) Stimulated emission
C) Population inversion
D) Non thermal equilibrium

39) In a dielectric, the polarisation is

A) Linear function of applied field

B) Square function of applied field

C) Exponential function of applied field

D) Logarithmic function of applied field

40) For a given dielectric, the dielectric polarisability

A) Increases with temperature

B) Not affected by temperature

C) Decreases with temperature

D) May increase or decrease with temperature

41) In a dielectric, the power loss is proportional to

A) W

B) W^2

C) 1/W

D) 1/ W^2

42) Dielectric loss in ferrites is?

A) Very high

B) Very low

C) Zero

D) None of these

43) In a ferro electric material, as the applied electric field is gradually reduced to zero, the polarisation still left is known as?

A) Coercive polarisation

B) Remnant polarisation

C) Electronic polarisation

D) Ionic polarisation

44) Piezo electric effect is the production of electricity by

A) Chemical energy

B) Varying field

C) Temperature

D) Pressure

45) Dielectric strength of a material is

A) The capacity to take 2 or more stresses

B) The capacity to withstand higher voltages

C) The capacity to withstand electrical and mechanical shocks

D) None of the above

46) Piezo electric materials serve as a source of

A) Ultrasonic waves

B) Micro waves

C) Musical waves

D) Resonant waves

47) Ferrites are sub group of?

A) Ferro magnetic materials

B) Ferri magnetic materials

C) Diamagnetic materials

D) Paramagnetic materials

48) Above the curie temperature, magnetic material becomes

A) Ferro magnetic

B) Para magnetic

C) Diamagnetic

D) None of the above

49) Magnetic recording tape is most commonly made from

A) Small particles of iron

B) Iron silicon

C) Ferric oxide

D) Silver nitrate

50) The following material is used for making permanent magnets

A) Platinum Cobalt

B) Alnico V

C) Carbon Steel

D) All the three

51) The permeability of a para and ferro magnetic materials are

A) Less than unity

B) Equal to unity

C) Negative

D) Greater than unity

52) Materials which lack permanent magnetic dipoles are called

A) Diamagnetic

B) Ferromagnetic

C) Semi magnetic

D) None of the above

53) Ferrox cube is most commonly made from

A) Ferric oxide

B) Magnesium manganese ferrite

C) Iron dust

D) None of the above

54) In case of ferrimagnetic materials the spin moment of 2 sets of atoms are aligned

A) Parallel to each other

B) Anti parallel to each other

C) Anti parallel but unequal magnitude

D) Random

55) Which of the following sets gives the ferromagnetic curie temperature in ascending order

A) Ni, Fe, Co

B) Co, Ni, Fe

C) Ni, Co, Fe

D) Fe, Co, Ni

56) Which of the following is not permanent magnetic material

A) Chromium steel

B) Silicon iron

C) Cobalt steel

D) AlNiCo

57) An electric iron is marked 220 volts, 500 watts. The units consumed by it in using for 24 hours will be

A) 12

B) 24

C) 5

D) 1100

58) There is a voltage drop of 100 volts across a resistance of 100 ohms. How much power will be consumed?

A) 1000W

B) 100W

C) 10W

D) 0.1W

59) A 250W, a 400W and a 1000W lamps are connected in series across the main. The one which will light brightest is?

A) 250W

B) 400W

C) 1000W

D) All will equally bright

60) If an EMF of 10 volts is applied to a circuit having resistance of 10 ohms and inductance of 0.5 henry, the time constant will be?

A) 20 seconds

B) 1/20 seconds

C) 1/10 seconds

D) 10 seconds

61) In a CR circuit, the growth of charge on the condenser is?

A) More rapid if smaller is the product CR

B) More rapid if bigger is the product CR

C) Independent of product CR

D) None of the above

62) If the number of turns in primary and also in secondary coils increases two times, the mutual inductance will be?

A) Remain constant

B) Increase 2 times

C) Increase 4 times

D) Reduce 4 times

63) The induced emf in a conductor is

A) Inversely proportional to the rate of change of flux

B) Directly proportional to the rate of change of flux

C) Directly proportional to the total flux associated with the conductor

D) None of the above

64) The average value of current (I) in AC circuit is given by

A) $0.637\ I_{max}$

B) $0.707\ I_{max}$

C) $2\ I_{max}$

D) $\sqrt{2}\ I_{max}$

65) In LCR circuit, the discharge will be oscillatory if?

A) $R^2 = 4L/C$

B) $R^2 > 4L/C$

C) $R^2 < 4L/C$

D) $R^2 < L/4C$

66) Determine the energy stored in the surface of a soap bubble of radius 2.1cms, if its surface tension is 4.5×10^{-2} N/m

A) 8mJ

B) 4.93×10^4J

C) 2.46 mJ

D) None of the above

67) When an elastic material with young's modulus E is subjected to a stretching stress S, the elastic energy stored per unit volume of the material is?

A) $S^2/2E$

B) ES/2

C) $S^2E/2$

D) S/2E

68) The effect of temperature on the value of modulus of elasticity for various substances in general is?

A) It increases with increase in temperature

B) Remains constant

C) Decreases with increase in temperature

D) None of the above

69) A spiral spring is stretched by a weight attached to it. The strain will be?

A) Elastic

B) Bulk

C) Shear

D) Tensile

70) A simple shear Θ is equivalent to an extension strain and compression strain at right angles to each other of value

A) 2Θ

B) Θ

C) $\Theta/2$

D) $3\Theta/2$

71) The ratio of lateral contraction to longitudinal strain, when a body undergoes linear tensile strain is known as

A) Modulus of elasticity

B) Young's modulus

C) Bulk modulus

D) Poisson's ratio

72) A needle floats on the surface of water because of

A) Lighter weight

B) Adhesive force

C) Viscosity

D) Surface tension

73) A value of surface tension of 70 dynes/cm is equal to

A) 70 N/m

B) 70×10^{-3} N/m

C) 7×10^2 N/m

D) 7×10^3 N/m

74) The rate of flow of liquid through a hole of particular size in a tank is?

A) More if situated near the bottom

B) More if situated near its top

C) Independent of its height from its bottom

D) More at midway between the top and bottom

75) The velocity of flow at a distance 'x' from the axis of tube

A) Increases as 'x' increases

B) Decreases as 'x' increases

C) Remains constant

D) Depends on the length of the tube

76) If the radius of the tube is increased two times keeping other quantities constant, the rate of flow of liquid through a capillary tube

A) Increases by 16 times

B) Decreases by 16 times

C) Increases by 4 times

D) remains constant

77) Which of the following examples can be explained as a result of surface tension?

A) A child sips milk through a straw

B) Spilled mercury forms into small drops

C) Table salt is in the form of cubic crystals

D) The smell of frying fish coming out of the house

78) The viscosity of a gas is directly proportional to

A) Temperature

B) Square root of temperature

C) Characteristic constant

D) Density of gas

79) For polyatomic gases such as hydrogen and ozone, the corresponding degree of freedom will be

A) 2,3

B) 5,6

C) 3,4

D) 3,9

80) At room temperature, the rms speed of molecules of a certain diatomic gas is found to be 1930 m/s. The gas is?

A) Hydrogen

B) Flourine

C) Oxygen

D) Chlorine

81) The law of equipartition of energy was postulated by?

A) Maxwell

B) Boltzmann

C) Stephen

D) Weins

82) The Boltzmann constant K is given as, if R is the gas constant for molecule of a gas and N is Avogadro number

A) RN

B) R/N

C) N/R

D) R^2N

83) In the carnot engine, when the heat is taken from the source, its temperature

A) Remains constant

B) Does not remain constant

C) Increases

D) Decreases

84) The efficiency of an otto cycle increases as

A) Compression ratio decreases

B) Compression ratio increases

C) Does not depend on compression ratio

D) None of the above

85) The net gain in entropy of the working substance in a carnot cycle is?

A) Zero

B) Positive

C) Negative

D) May be positive or negative

86) The fuel cut off for increasing efficiency in a diesel engine should be

A) Delayed

B) Should be advanced

C) May be delayed or advanced

D) None of the above

87) For the efficiency of carnot cycle to be maximum

A) Temperature of the source should be infinity

B) Temperature of the sink should be infinity

C) Temperature of the source should be zero

D) None of these

88) Under steady state, the temperature of a body

A) Increases with time

B) Decreases with time

C) Does not change with time and remains same at all the points of a body

D) Does not change with time but different at different points of a body

89) A body absorbing all the radiation incident over it is called

A) Good absorber

B) Poor absorber

C) Good emitter

D) None of the above

90) At what temperatures the numerical values on the Fahrenheit and Celsius scale is same

A) Zero degrees

B) 32 degrees

C) 180 degrees

D) 40 degrees

91) When we heat gas keeping volume constant, its pressure changes by

A) 1/273

B) 273

C) 1/2

D) Zero

92) Pirometers are used for measuring

A) Surface tension

B) Pressure

C) Temperature

D) None of the above

93) According to the Maxwell's law of distribution of molecular velocity in gas

A) The number of molecules with most probable velocity is finite

B) The number of molecules with most probable velocity is small

C) The number of molecules with most probable velocity is constant

D) None of the above

94) The dielectric constant of the commonly used ceramic varies between

A) 1 and 3

B) 4 and 10

C) 11 and 16

D) 16 and 25

95) Hysteresis in polarisation- electric field relation exhibited by

A) Piezoelectric materials

B) Ferroelectric materials

C) Pyroelectric materials

D) Electro optic materials

96) The polarisations which are dependent on temperature are

A) Orientation and space charge

B) Electronic and ionic

C) Orientation and ionic

D) Electronic and space charge

97) Magnetic ceramics are

A) Diamagnetic materials

B) Para magnetic materials

C) Ferromagnetic materials

D) Ferrimagnetic materials

98) In super conducting state

A) Entropy alone changes

B) Electronic specific heat changes

C) Both entropy and electronic specific heat changes

D) None of the above

99) In superconducting state, the energy gap

A) Is large compared to semiconductors and insulators

B) Is zero

C) Is very small compared to semiconductors and insulators

D) Does not change

100) The magnetic susceptibility of a superconductor is

A) -1

B) Zero

C) 1

D) Infinity