SUBJECT CODE	SUBJECT	PAPER
A-16-03	PHYSICAL SCIENCES	III

HALL TICKET NUMBER									QUESTION BOOKLET NUMBER

OMR SHEET NUMBER					

DURATION	MAXIMUM MARKS	NUMBER OF PAGES	NUMBER OF QUESTIONS
2 HOUR 30 MINUTES	150	16	75

This is to certify that, the entries made in the above portion are correctly written and verified.

Candidates Signature **Name and Signature of Invigilator**

Instructions for the Candidates

1. Write your Hall Ticket Number in the space provided on the top of this page.
2. This paper consists of seventy five multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested **to open the booklet and compulsorily examine it as below** :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example: (A) (B) ● (D)
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Answer Sheet given to you**. If you mark at any place other than in the circle in the Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. **The candidate must handover the OMR Answer Sheet to the invigilators at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. The candidate is allowed to take away the carbon copy of OMR Sheet and used Question paper booklet at the end of the examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

అభ్యర్థులకు సూచనలు

1. ఈ పుట పై భాగంలో ఇవ్వబడిన స్థలంలో మీ హాల్ టికెట్ నంబరు రాయండి.
2. ఈ ప్రశ్న పత్రము డెభైనదు బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది. మొదటి ఐదు నిమిషములలో **ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా సరిచూసుకోండి.**
   (i) ఈ ప్రశ్న పత్రమును చూడడానికి కవర్‌పేజి అంచున ఉన్న కాగితపు సీలును చించండి. స్టిక్కర్ సీలులేని మరియు ఇదివరకే తెరిచి ఉన్న ప్రశ్నాపత్రమును మీరు అంగీకరించవద్దు.
   (ii) **కవరు పేజి పై ముద్రించిన సమాచారం ప్రకారం ఈ ప్రశ్నపత్రములోని పేజీల సంఖ్యను మరియు ప్రశ్నల సంఖ్యను సరిచూసుకోండి. పేజీల సంఖ్యకు సంబంధించి గానీ లేదా సూచించిన సంఖ్యలో ప్రశ్నలు లేకపోవుట లేదా నిజప్రతి కాకపోవుట లేదా ప్రశ్నలు క్రమపద్ధతిలో లేకపోవుట లేదా ఏవైనా తేడాలుండుట వంటి దోషపూరితమైన ప్రశ్న పత్రాన్ని వెంటనే మొదటి ఐదు నిమిషాల్లో పరీక్షా పర్యవేక్షకునికి తిరిగి ఇచ్చివేసి దానికి బదులుగా సరిగ్గా ఉన్న ప్రశ్నపత్రాన్ని తీసుకోండి. తదనంతరం ప్రశ్నపత్రము మార్చబడదు అదనపు సమయం ఇవ్వబడదు.**
   (iii) పై విధంగా సరిచూసుకొన్న తర్వాత ప్రశ్నాపత్రం సంఖ్యను OMR పత్రము పై అదేవిధంగా OMR పత్రము సంఖ్యను ఈ ప్రశ్నాపత్రము పై నిర్దిష్టస్థలంలో రాయవలెను.
4. ప్రతి ప్రశ్నకు నాలుగు ప్రత్యామ్నాయ ప్రతిస్పందనలు (A), (B), (C) మరియు (D) లుగా ఇవ్వబడ్డాయి. ప్రతిప్రశ్నకు సరైన ప్రతిస్పందనను ఎన్నుకొని కింద తెలిపిన విధంగా OMR పత్రములో ప్రతి ప్రశ్నా సంఖ్యకు ఇవ్వబడిన నాలుగు వృత్తాల్లో సరైన ప్రతిస్పందనను సూచించే వృత్తాన్ని బాల్ పాయింట్ పెన్‌తో కింద తెలిపిన విధంగా పూరించాలి.
   ఉదాహరణ : (A) (B) ● (D)
   (C) సరైన ప్రతిస్పందన అయితే
5. ప్రశ్నలకు ప్రతిస్పందనలను ఈ ప్రశ్నపత్రముతో ఇవ్వబడిన OMR పత్రము పైన ఇవ్వబడిన వృత్తాల్లోనే పూరించి గుర్తించాలి. అలాకాక సమాధాన పత్రంపై వేరొక చోట గుర్తిస్తే మీ ప్రతిస్పందన మూల్యాంకనం చేయబడదు.
6. ప్రశ్న పత్రము లోపల ఇచ్చిన సూచనలను జాగ్రత్తగా చదవండి.
7. చిత్తుపనిని ప్రశ్నపత్రము చివర ఇచ్చిన ఖాళీస్థలములో చేయాలి.
8. OMR పత్రము పై నిర్ణీత స్థలంలో సూచించబడిన వివరాలు తప్పించి ఇతర స్థలంలో మీ గుర్తింపును తెలిపే విధంగా మీ పేరు రాయడం గానీ లేదా ఇతర చిహ్నాలను పెట్టడం గానీ చేసినట్లయితే మీ అనర్హతకు మీరే బాధ్యులవుతారు.
9. **పరీక్ష పూర్తయిన తర్వాత మీ OMR పత్రాన్ని తప్పనిసరిగా పరీక్ష పర్యవేక్షకుడికి ఇవ్వాలి.** వాటిని పరీక్ష గది బయటకు తీసుకువెళ్లకూడదు. పరీక్ష పూర్తయిన తరువాత అభ్యర్థులు ప్రశ్న పత్రాన్ని, OMR పత్రం యొక్క కార్బన్ కాపీని తీసుకువెళ్లవచ్చు.
10. **నీలి/నల్ల రంగు బాల్ పాయింట్ పెన్ మాత్రమే ఉపయోగించాలి.**
11. **లాగరిథమ్ టేబుల్స్, కాలిక్యులేటర్‌లు, ఎలక్ట్రానిక్ పరికరాలు మొదలగునవి పరీక్షగదిలో ఉపయోగించడం నిషేధం.**
12. **తప్పు సమాధానాలకు మార్కుల తగ్గింపు లేదు.**

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PHYSICAL SCIENCES

Paper – III

1. If $L\{y(x)\}=f(x)$ for a $a \le x \le b$, where $L = \frac{d}{dx}\left(p\frac{d}{dx}\right) - q$ and for some t in [a, b], G(x,t) is Green's function for this differential equation, then

i) $L\{G(x,t)\} = 0$

ii) $G(x,t) = G(t,x)$

iii) $\left.\frac{dG(x,t)}{dx}\right|_{x=t^+} - \left.\frac{dG(x,t)}{dx}\right|_{x=t^-} = \frac{-1}{p(t)}$

(A) i) is true

(B) i) , ii) are true

(C) All are true

(D) ii), iii) are true

2. The Green's function for the differential equation $y''(x) - y(x) = 0$ with $y(0) = y(1) = 0$ is given by $\sinh 1.G(x,t) =$

(A) $\begin{cases}\sinh x \sinh(t-1) \text{ if } x<t \\ \sinh t.\sinh(x-1) \text{ if } x>t\end{cases}$

(B) $\begin{cases}\sinh x \cosh(t-1) \text{ if } x<t \\ \sinh t.\cosh(x-1) \text{ if } x>t\end{cases}$

(C) $\begin{cases}\cosh x \sinh(t-1) \text{ if } x<t \\ \cosh t.\sinh(x-1) \text{ if } x>t\end{cases}$

(D) $\begin{cases}\cosh x \cosh(t-1) \text{ if } x<t \\ \cosh t.\cosh(x-1) \text{ if } x>t\end{cases}$

3. The general solution of a Laplace equation for steady state temperature distribution $u(r,\theta)$ within a circular disc is given by $u(r,\theta) =$

(A) $\sum a_n r^{2n+1}\sin\theta$

(B) $\sum a_n r^{-n.}\sin n\theta$

(C) $\sum a_n r^{-2n}\sin\theta$

(D) $\sum a_n r^{n}\sin n\theta$

4. The general solution of wave equation for a vibrating string y(x,t) travelling with speed c is given by y(x,t)=

(A) $\sum a_n \sin nx.\sin nt$

(B) $\sum a_n \sin nx.e^{nt}$

(C) $\sum a_n e^{nx}.\sin nt$

(D) $\sum a_n e^{nx}.e^{nt}$

5. Match the following for interpolating polynomials (IP) y(x)

Column I	Column II
I. Newton's forward IP	1. Estimates value of y for p in between ¼ and ¾.
II. Lagrange's IP	2. Estimates value of y for x near to first point of the data
III. Stirling's IP	3. Estimates value of y unequally spaced data
IV. Bessel's IP	4. Estimates value of y for x near to mid point of the data

Choose correct matching among A, B, C, D for the row I, II, III, IV given below.

	I	II	III	IV
(A)	2	1	4	3
(B)	3	2	4	1
(C)	2	3	4	1
(D)	3	4	1	2

6. Assertion A: Euler's formula for estimating y at $x = x_{n+1}$ from the differential equation $y'(x) = f(x,y)$ with $y(x_0) = y_0$ is given by $y_{n+1} = y_n + h\, f(x_n, y_n)$

Reason R: Since this formula has no second order terms, it is a very crude estimation.

(A) Both A and R correct

(B) A is correct but R is not correct explanation

(C) A is wrong, R is correct

(D) Both A and R are wrong

7. Choose the correct statement.

Simpson's 1/3rd formula

i) is derived from Newton codes quadrature formula for n = 2

ii) estimates area of a curve by parabolas

iii) divides the given interval into odd number of equi-spaced intervals.

(A) All are true

(B) i), ii) are true

(C) ii), iii) are true

(D) i), iii) are true

8. If A is a vector with covariant components A_i, curl(A_i) =

(A) $A_i\, g^{ij} - A_j\, g^{ij}$

(B) $\frac{1}{2}(A_i - A_j)\, g^{ij}$

(C) $A_{i,j} - A_{j,i}$

(D) $A_{i,j}\, g^{ij} - A_{j,i}\, g^{ij}$

9. SU(2) is defined as a vector space with elements :

(A) $\left\{\begin{bmatrix} a & \bar{b} \\ b & \bar{a} \end{bmatrix} : a,b \varepsilon C, a^2+b^2 \neq 1\right\}$

(B) $\left\{\begin{bmatrix} a & \bar{b} \\ b & -\bar{a} \end{bmatrix} : a,b \varepsilon C, a^2+b^2 = 0\right\}$

(C) $\left\{\begin{bmatrix} a & b \\ b & -\bar{a} \end{bmatrix} : a,b \varepsilon C, a^2+b^2 = 1\right\}$

(D) $\left\{\begin{bmatrix} a & -\bar{b} \\ b & \bar{a} \end{bmatrix} : a,b \varepsilon C, a^2+b^2 = 1\right\}$

10. If f(x,y) is to be transformed to F(u,y), then the necessary relations for Lagrangian transformations from (x,y) to (u,v) are:

(A) $x = -\frac{\partial F}{\partial u}, v = \frac{\partial F}{\partial y}$

(B) $v = -\frac{\partial F}{\partial u}, x = \frac{\partial F}{\partial y}$

(C) $x = -\frac{\partial F}{\partial y}, v = \frac{\partial F}{\partial u}$

(D) $x = \frac{\partial F}{\partial y}, v = \frac{\partial F}{\partial u}$

11. The canonical transformation obtained from the generating function $f = \sum q_i\ p_i$ is ———— transform.

(A) Dual

(B) Identity

(C) Skew-symmetric

(D) Equivalent

12. If the transformation from (q_k, p_k) to (Q_k, P_k) is canonical, then the bilinear form $\sum(\delta p_k dq_k - \delta q_k dp_k)$ is

(A) Exact (B) =1

(C) invariant (D) = 0

13. If F and G are functions of q_k, p_k , then Poisson's bracket of F, G is defined as [F,G] =

(A) $\sum(\frac{\partial F}{\partial q_k}\frac{\partial F}{\partial p_k} - \frac{\partial G}{\partial q_k}\frac{\partial G}{\partial p_k})$

(B) $\sum(\frac{\partial F}{\partial q_k}\frac{\partial G}{\partial p_k} - \frac{\partial F}{\partial p_k}\frac{\partial G}{\partial q_k})$

(C) $\sum(\frac{\partial F}{\partial q_k}\frac{\partial G}{\partial q_k} - \frac{\partial F}{\partial p_k}\frac{\partial G}{\partial p_k})$

(D) $\sum(\frac{\partial F}{\partial q_k}\frac{\partial G}{\partial p_k} + \frac{\partial F}{\partial p_k}\frac{\partial G}{\partial q_k})$

14. Match the following:

Column I	**Column II**
I. [F,G]	1. 0
II. $[F, q_i]$	2. – [G, F]
III. $[q_k, p_k]$	3. $-\frac{\partial F}{\partial p_i}$
IV. $[q_i, q_k]$	4. 1

Choose correct matching among A, B, C, D for the row I, II, III, IV given below :

	I	**II**	**III**	**IV**
(A)	4	3	2	1
(B)	3	4	1	2
(C)	2	3	4	1
(D)	2	4	1	3

15. If $J = J_1 i + J_2 j + J_3 k$ is angular momentum vector and $P = p_1 i + p_2 j + p_3 k$ is momentum vector then $[J_1, p_2] =$

(A) J_3 (B) p_3

(C) 0 (D) $J_1 p_2$

16. **Assertion A:** In Galilean transformation acceleration of a particle observed by an observer in two different frames is same.

Reason R: Newton's laws of motion are valid in Galilean transformation.

(A) A and R are true

(B) A is true, R is false

(C) A is false, R is true

(D) A and R are false

17. The number of fundamental postulates in the special theory of relativity are

(A) 2 (B) 3

(C) 4 (D) 5

18. Galilean transformation does not satisfy the law

(A) Newton's laws

(B) Distance between two points is constant

(C) Propagation of electro magnetic waves

(D) Existence of universal time

19. **Assertion A:** Interference and cross talk are the result of undesired signal coupling between circuits.

Reason R: The parameter of interest is the ratio of voltage generated in one circuit to the rate of change of current in another.

(A) A and R are true and R is the correct explanation

(B) A and R are true and R is not the correct explanation

(C) A is true but R is not the correct explanation

(D) Both A and R are false

20. The product of impedance of a line when it is open circuited and when it is short circuited equal to

(A) characteristic impedance Z_0 of the line

(B) square of characteristic impedance Z_0 of the line

(C) square root of characteristic impedance Z_0 of the line

(D) inverse of characteristic impedance Z_0 of the line

21. In the case of transmission line which is perfectly matched to the load, the reflection co-efficient and VSWR are respectively

(A) $< 0, 1$ (B) $0, < 1$

(C) 0, 1 (D) $> 0, < 1$

22. When a plane electromagnetic wave is incident normally on the boundary between two media with intrinsic impedances Z_1 and Z_2, then the reflection and transmission co-efficients are respectively

(A) $\frac{2Z_2}{Z_1+Z_2}, \frac{Z_2-Z_1}{Z_2+Z_1}$

(B) $\frac{Z_2-Z_1}{Z_2+Z_1}, \frac{Z_2}{Z_1+Z_2}$

(C) $\frac{Z_2-Z_1}{Z_2+Z_1}, \frac{2Z_2}{Z_1+Z_2}$

(D) $\frac{2Z_2}{Z_1-Z_2}, \frac{Z_1+Z_2}{Z_1-Z_2}$

23. **Assertion A :** The most common co-axial cable impedances employed are 50 Ω and 75 Ω.

Reason R: The theoretical impedance for maximum attenuation is close to 30 Ω and the best impedance for maximum power handling capacity is close to 77 Ω and their average is 53.5 Ω, rounded off to 50 Ω.

(A) A and R are true and R is the correct explanation

(B) A and R are true and R is not the correct explanation

(C) A is true but R is not the correct explanation

(D) Both A and R are false

24. For the same VSWR, comparing single and double $\lambda/4$ transformers

(A) The single $\lambda/4$ transformer has greater bandwidth

(B) The double $\lambda/4$ transformer has greater bandwidth

(C) Both possess the same bandwidth

(D) None of the above

25. **Assertion A :** Even though Dielectrics are good insulators for dc, there can be an appreciable ac current in phase with applied field because of dielectric hysteresis.

Reason R: Dielectric heating makes the moulding of plastics and heating of food in microwave ovens possible.

(A) A and R are true and R is the correct application

(B) A and R are true and R the incorrect application

(C) A only is true but R is incorrect application

(D) Both A and R are false

26. The cut off wavelength for a circular wave guide of diameter d is given by

(A) πd (B) $\pi\sqrt{d}$

(C) $d\sqrt{\pi}$ (D) $\sqrt{(\pi d)}$

27. Thermodynamic I order phase transitions take place at

(A) Constant temperature and variable pressure

(B) Constant pressure and variable temperature

(C) Constant temperature and pressure

(D) Variable pressure and temperature

28. Choose the wrong statement.

A given block of ferromagnetic materials has

(A) Single domain

(B) Maintains ferromagnetic property if the temperature is less than T_c

(C) Iron has ferromagnetic property

(D) Second order phase transition when it is converted in to paramagnetic phase at curie temperature

29. During II order phase transitions

(A) There is transference of heat

(B) There is change of volume

(C) There is change of entropy

(D) There is no change of entropy

30. Select the wrong statement connected with diamagnetic material

(A) These materials have relative magnetic permeability less than 1

(B) These are repelled by the magnet

(C) Since it is a weak property, its effects are not observable in every day life

(D) Bismuth is a weak diamagnetic material than superconductor

31. Choose the wrong statement.

The paramagnetic materials

(A) Are feebly attracted by the magnets

(B) Have relative permeability greater than one

(C) Paramagnetic properties are due to the presence of paired electrons

(D) In the presence of external magnetic field, there is only a small induced magnetization

32. During Gibb's function I order phase transition

(A) Derivative with respect to temperature is continuous at transition point

(B) Derivative with respect to pressure continuous

(C) Derivative with respect to temperature and pressure is discontinuous

(D) Is not constant in both the phases

33. Choose the wrong statement.
Ising model of ferromagnetism

(A) Is a mathematical model of ferromagnetism in statistical mechanics

(B) The model consists of discrete variables that represent magnetic dipole moments

(C) The atomic spins will be either in +1 or -1 state

(D) This model is not able to predict phase transition

34. According to Brownian motion, in a colloidal solution

(A) The motion of each particle is irregular and random

(B) The motion is independent of nature of the suspended particles

(C) The motion of the particles decreases with increase of temperature

(D) The Brownian motion cannot be observed with particles of large size

35. Choose the wrong statement.
Bose-Einstein condensation

(A) Is connected with dilute gas of Bosons

(B) It mainly works near about 0 K

(C) In this state, a large fraction of bosons occupy lowest quantum state

(D) Here quantum effects are negligible

36. The Open loop gain of 741 OP Amp rolls off from _____ KHz with a slope of _____ dB /decade.

(A) 10, 40

(B) 0.1, – 20

(C) 0.01, – 20

(D) 0.1, – 40

37. If ω and τ are input frequency and time constant, a low pass RC filter acts as a pure _____ when $\omega\tau$ is _____

(A) Differentiator, << 1

(B) Integrator, >> 1

(C) Integrator, << 1

(D) Differentiator, >> 1

38. The slew rate of an OP- Amp with saturation voltages of $\pm$ 15V is 20 v/ms. The maximum switching time from one saturation state to other is

(A) 0.75 μ s

(B) 1.5 μ s

(C) 1 μ s

(D) 0.66 μ s

39. A seismic vibration transducer can be used to measure displacements at frequencies substantially

(A) Higher than its natural frequency

(B) Lower than its natural frequency

(C) Equal to its natural frequency

(D) None of the above

40. A circular diaphragm type pressure transducer produces a deflection of 0.2 mm at the centre for a pressure of 256 KN/m^2 . What pressure would produce the same deflection if the diameter is made twice and thickness halved ?

(A) 128 KN/m^2

(B) 64 KN/m^2

(C) 2 KN/m^2

(D) 0.5 KN/m^2

41. A thermo couple produces a voltage of 60 mv. Its internal impedance is 50 Ω . The resistance of the leads is 10 Ω . Its output is read by a PMMC meter having an internal resistance of 120 Ω . The output indicated by the instrument is

(A) 33.3 mv

(B) 25 mv

(C) 10 mv

(D) 40 mv

42. A piezoelectric transducer having a capacitance of 250 pF has an output voltage of 3v at no load conditions. Find the output voltage at high frequencies when it is connected to a load capacitance of 125 pF

(A) 3v

(B) 1v

(C) 2v

(D) Data insufficient

43. Find the odd man out from the following

(A) Thermocouple

(B) Thermistor

(C) RTD

(D) Pirani gauge

44. An ac signal conditioning is used normally for

(A) Resistance transducers like strain gauges

(B) Inductive and capacitive transducers

(C) Piezoelectric transducers

(D) All the above

45. Integral control

(A) increase the steady state error

(B) decrease the steady state error

(C) increases the noise and stability

(D) decreases the damping co-efficient

46. Which of the following systems provide excellent transient and steady state response ?

(A) Proportional action

(B) Proportional + integral action

(C) Proportional + derivative action

(D) Proportional + integral + derivative action

47. PID controller overshoot has increased. Derivative time constant has to be _____ to reduce overshoot.

(A) increased (B) reduced

(C) made zero (D) none

48. Generally, grounding is provided

(A) only for the safety of the equipment

(B) only for the safety of the operating personnel

(C) Both (A) & (B)

(D) None

49. Choose the wrong statement.

Careful examination of alkali spectra reveals that

(A) Each members of principal series consists of simple doublets

(B) The wave numbers differences of sharp series doublet remain constant

(C) Splitting of the lines is due to spin orbit interaction

(D) The relativistic effects which are important for hydrogen atom is equally important for the valence electron of the alkali atoms

50. In the Zeeman effect

(A) In the absence of magnetic field, the vector L and S precess separately around their resultant J

(B) When the magnetic field is applied "L" and S couple with it and in the absence of coupling between L and S, the latter precess independently around "B"

(C) In weak magnetic field energy corresponding to coupling of L and S with B is larger than spin orbit interaction energy

(D) Under small magnetic field, it is able to perturb the coupling between L and S. So L and S are not able to precess about their resultant J

51. Choose the wrong statement.

Nuclear magnetic resonance is a spectroscopic method.

(A) It is more important to organic chemist than infrared spectroscopy

(B) It can be used to identify different nuclei in the sample

(C) It cannot give information about magnetically distinct type of atoms in the sample

(D) In combination with IR is often sufficient to work out complete structures of unknown molecule

52. In NMR experiment the frequency needed to satisfy the resonance for N^{14} in a magnetic field of 2.34 T is (g nitrogen = 0.4036, $Bn = 5.05082 \times 10^{-27} JT^{-1}$, $h = 6.626 \times 10^{-34}$ J.S)

(A) 7.22 MHz

(B) 4.25 MHz

(C) 9.21 MHz

(D) 12.36 MHz

53. In the near infrared spectrum HCL has a single intense band at 2885.9 cm^{-1}.

If this represents a vibration spectrum, the vibration frequency is

(A) 2.15×10^{12} Hz

(B) 4×10^{10} Hz

(C) 8.65×10^{13} Hz

(D) 16×10^{13} Hz

54. Choose the wrong statement.

The Raman and infrared spectrum are complementary because

(A) The reason lies in the different nature of the processes involved in the two effects

(B) Raman process is scattering effect involving permanent diploes

(C) Raman process is connected with change of molecular polarizability during vibration

(D) Infrared spectroscopy is an absorption process caused by the change in the permanent molecular dipole

55. The quality factor of a laser cavity depends on

(A) reflectivities of the two mirrors of the cavity

(B) separation between the mirrors

(C) loss coefficient of the cavity due to mechanisms other than the finite reflectivity of the mirror

(D) All of the above

56. For a plane parallel configuration of a laser cavity, the value of g_1g_2 is

(A) 1.0

(B) 0.75

(C) 0.5

(D) 0

57. Metals have the property of

(A) Moderate to strong binding

(B) Malleability and ductility

(C) Close packed structures

(D) Transparent to electromagnetic radiation

58. According to the Debye's theory of specific heat of solids

(A) Solid is assumed to be continuous

(B) In case of solid with "N" atoms total number of modes of vibrations is taken as "3N"

(C) The maximum frequency of the waves upto which they can propagate through the solid is Debye cut off frequency

(D) The specific heat of solids is proportional to T

59. Given a square piece of X-ray film 10 cm side, radiation of $\lambda = 0.0152$ nm and powdered NaCl with a lattice parameter 0.563 nm, devise a diffraction experiment in such a way that at what distance "x" from the sample the rays from (111) planes will produce a circle of diameter 0.01 metre on the film.(Given that if Sin θ = 0.234, $\theta = 13.5°$, Tan 27° = 0.509)

(A) 0.098 m

(B) 0.15 m

(C) 0.285 m

(D) 4.0 m

60. Mobilities of electrons and holes in a sample of intrinsic Germanium at 300 K are 0.36 $m^2V^{-1}S^{-1}$ and .017 $m^2V^{-1}S^{-1}$ respectively. If the conductivity of the specimen is 2.12 $\Omega^{-1}m^{-1}$, the density of charge carriers

(A) $5 \times 10^{20}/m^3$

(B) $25 \times 10^{28}/m^3$

(C) $6 \times 10^{8}/m^3$

(D) $2.5 \times 10^{19}/m^3$

61. The magnitude of quantum unit of magnetic flux in superconductor is in the order of

(A) 4×10^{-20} webers

(B) 8×10^{-8} webers

(C) 16.15×10^{-16} webers

(D) 2.07×10^{-15} webers

62. Choose the wrong statement.
Volume defects arises due to

(A) Cracks which are generated because of small electrostatic dissimilarity between the stacking sequences of close packed planes

(B) When clusters of atoms are missing volume defects or voids are not formed

(C) Foreign particle inclusions also produce volume defects

(D) At the time of preparation because of sudden locking of air bubbles inside cause volume defects

63. Choose the wrong statement.
Liquid crystal cells

(A) are active optical display devices which convert electrical energy into light energy

(B) are used to fabricate display pannels in low power portable systems

(C) retain some of the optical properties of their solid form even in the semi liquid state

(D) are not semiconductors but complex organic compounds

64. Choose the wrong statement.
Hall effect is

(A) Rarely used techniques for studying conduction mechanisms in solids

(B) For single carrier case, one can get carrier concentration and mobilities information

(C) This can supply information on the predominant charge carrier scattering mechanisms and on activation

(D) Hall effect is a I order phenomenon

65. The β - decay interaction has

(A) a long range

(B) short range

(C) extremely short range

(D) none

66. The theory of α-decay does not connect

(A) the kinetic energy of α particle

(B) the nuclear change

(C) the Q-value of the equation

(D) the disintegration constant

67. The existence of centrifugal barrier is associated with

(A) The nature of motion of the particle

(B) The charge of the particle

(C) The particle of zero angular momentums

(D) All the above

68. Light emission in organic scintillators is caused by transitions between

(A) Levels of delocalized electrons

(B) Vibrations levels

(C) Rotational levels

(D) All the above

69. Which of the following is incorrect about Cerenkov radiation ?

(A) It is observed when changed particle moves with a velocity exceeding the velocity of light in that medium

(B) It is a sharply directional glow

(C) This glow is due to coherent radiation of oriented dipoles created along the changed particle trajectory under the action of electric field

(D) None of the above

70. Which of the following is incorrect as regards to the decay constant λ ?

(A) It is independent of physical character and chemical condition

(B) Independent of the age of the nuclide

(C) It is an important character of each radioactive nuclide

(D) None of the above

71. Which one of the following is not used for absorbing excess of neutron in a nuclear reactor ?

(A) Cd (B) Graphite

(C) Heavy water (D) None

72. The velocity distribution of thermal neutrons follow

(A) Maxwell distribution

(B) Fermi Dirac distribution

(C) Bose - Einstein distribution

(D) None

73. Iso spin numbers are associated with

(A) Hardons only

(B) Leptons only

(C) Both hardons and leptons

(D) Neither hardons nor leptons

74. Choose the correct statement.

i) The change is conserved in all processes.

ii) Net lepton number in any process remains conserved.

iii) Hyper change does not conserve in weak interactions.

(A) i & ii only are correct

(B) ii & iii only are correct

(C) iii & i only are correct

(D) All are correct

75. Typical values of input offset voltage and offset current of 741 OP Amp are respectively

(A) 12 mv, 10 nA

(B) 12 mv, 10 mA

(C) 2 mv, 10 nA

(D) 0 V, 0A

Space for Rough Work

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