ASAL SEM-III-03

Department of Physics, C.M. Dubey Post Graduate College, Bilaspur (C.G.)

This is a Combined test of *Quantum Mechanics, Statistical Mechanics* and *Condensed Matter Physics-I* of the course which are taught in *M.Sc. III Semester.*

1. In adiabatic approximation, if the system is in nth state initially (H_n) then after time t, it will be found in ____ (1 point)

   ● n^{th} state of H_n' (new Hamiltonian)

   ○ n^{th} state of (H_n'-H_n)

   ○ n^{th} state of (H_n'+H_n)

   ○ n^{th} state of H_n

2. A thermodynamic system is one which may interact with its surrounding in at least two distinct ways and one of these necessarily is a transfer of heat (1 point)

   ○ False

   ● True

3. In Balmer series of hydrogen spectra, ω_{24} represents transitions _____ (1 point)

   ○ from 3rd excited state to 2nd excited state

   ○ from 4th excited state to 2nd excited state

   ● from 3rd excited state to 1st excited state

   ○ from 2nd excited state to 4th excited state

4. Total no. of transition due to constant perturbation is (1 point)

   ○ one

   ○ infinite

   ○ Dependent on energy gap between two states

   ● zero

5. A system is said to be in thermodynamic equilibrium if state does not change in the following ways (1 point)

   ○ Thermal

   ○ Chemical

   ○ Mechanical

   ● All of the above

6. How many Bravais lattice in two dimension? (1 point)

   ● 5

   ○ 7

○ 32

○ 14

7. Fermi golden rule represents   (1 point)

   ○ no transition

   ○ maximum no. of transition

   ○ transition only

   ● transition rate

8. In the first order time dependent perturbation, the transition probability is proportional to   (1 point)

   ○ $1/\omega$

   ○ $1/\omega^2$

   ● t

   ○ t^2

9. The interplanner spacing of (220) planes of a FCC structure is 1.7458 Å. Calculate the lattice constant.   (1 point)

   ○ 2.458 Å

   ○ 5.125 Å

   ● 4.983 Å

   ○ 0

10. The coordination number of HCP structure is   (1 point)

    ○ 6

    ● 12

    ○ 8

    ○ 16

11. The variation of transition probability with transition frequency is   (1 point)

    ○ a straight line

    ○ an exponentially increasing function

    ● an even function

    ○ an odd function

12. Match each statement with the correct option   (1 point)

    _2_ A path dependent workdone   **1.** Irreversible process

    _5_ Entropy   **2.** is not Perfect differential

    _1_ Isothermal expansion of a gas   **3.** Reversible process

    _4_ Internal energy   **4.** is a Perfect differential

                                         5. Macroscopic parameter

13. If the conditions for any of the three type of equilibrium are satisfied then the system is in non thermodynamic equilibrium   (1 point)

   ● True
   ○ False

14. NaCl is face centered cubic lattice structure. How many Na atoms are in a unit cell?   (1 point)

   ○ 1
   ○ 6
   ○ 3
   ● 4

15. The number of lattice points in a primitive cell is   (1 point)

   ○ 3
   ○ 2
   ○ 4
   ● 1

16. For a adiabatic process the first law of thermodynamics becomes **dU=-PdV**   (1 point)

   ○ False
   ● True

17. X-rays have larger wavelengths than which of the following ?   (1 point)

   ○ Visisble light
   ○ Beta rays
   ○ Microwave
   ● Gamma rays

18. If n distinguisible particle are distributed in two identical boxes then the propbability of (r,n-r) state is given by   (1 point)

   ○ $^nC_r \, 2^n$

   ○ $2^n / ^nC_r$

   ● $^nC_r / 2^n$

   ○ ^nC_r

19. In the thermodynamic limit that the properties that become directly proportional to the size of system are called   (1 point)

   ● Extensive properties
   ○ Microscopic properties
   ○ Intensive properties

○ Macroscopic properties

20. What in the relation between lattice constant (a) and lattice density p ?   (1 point)

● $(nM/Np)^{1/3}$

○ $(np/NM)^{1/3}$

○ $(nN/Mp)^{1/3}$

○ $(Mp/nN)^{1/3}$

21. The working of LASER is based on the phenomena of   (1 point)

○ stimulated absorption

● stimulated emission

○ spontaneous emission

22. Who is the founder of the Ensemble theory?   (1 point)

○ Boltzmann

○ Maxwell

● Gibbs

○ Einstein

23. Which of the following is an amorphous material?   (1 point)

○ Rubber

○ Lead

● Glass

○ Mica

24. A system of N particles has only two allowed states A and B.the probability foe A is P and for B is 1-P. (1 point)
    What is the probability for the system to be in the macrostate (r,N-r)

○ N!/r! (N-r)!

○ $^{N}C_r /2^N$

● $^{N}Cr \, P^r \, (1-P)^{N-r}$

○ None of these

25. What is the atomic packing fraction of FCC, BCC and SC structure respectively?   (1 point)

○ 0.52, 0.68, 0.74

○ 0.68, 0.74, 0.52

● 0.74, 0.68, 0.52

○ 0.72, 0.54, 0.67

26. What is the lattice constant for FCC crystal having atomic radius 1.476 Å ?   (1 point)

○ 5.216 Å

○ 4.1748 Å

● 1.476 Å

○ 0

27. In stimulated emission of radiation, no. of photon(s) emitted is   (1 point)

○ zero

○ one

● two

○ three

28. Einstein's coefficients of stimulated emission and induced absorption are _____   (1 point)

○ of zero value

○ dependent on room temperature

● equal

○ not equal

29. How many bravais lattice are there in three dimension?   (1 point)

● 14

○ 32

○ 5

○ 239

30. The crystal structure of Al is _____ .   (1 point)

○ closed packed structure

○ simple cube

● face centred

○ Body centred

31. Effective no. of lattice points in unit cell of SC, BCC and FCC structures are   (1 point)

○ 2, 4, 4

○ 1, 2, 2

○ 2, 3, 4

● 1 , 2, 4

32. To describe the initial state of a system, the order of perturbation required is   (1 point)

○ third

● zero

○ second

○ first

33. Time dependent perturbation theory was developed by   (1 point)

○ Einstein

○ Maxwell

● Dirac

○ Schrodinger

34. Minimum interplanar spacing required for Bragg's diffraction is_____   (1 point)

○ λ

○ 2λ

● $\lambda/2$

○ $\lambda/4$

35. The parameter of the order of atomic level is called ....   (1 point)
    microscopic
    _____

36. Degree of Freedom of diatomic molecules at high temperature is   (1 point)

○ 3

○ 5

● 6

○ None of these

37. Einstein's coefficients of spontaneous emission is related to light velocity as proportional to _____ (1 point)

● $1/c^3$

○ c^3

○ $1/c$

○ $1/c^2$

38. For a isochoric process the first law of thermodynamics becomes **dQ=dU**   (1 point)

○ False

● True

39. For a cyclic process the first law of thermodynamics becomes **dQ=dW**   (1 point)

● True

○ false

40. In harmonic perturbation, emission of photon is represented by   (1 point)

○ $e^{-i\omega t}-e^{i\omega t}$

○ $e^{-i\omega t}$

● $e^{i\omega t}$

○ $2(e^{-i\omega t}-e^{i\omega t})$

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Ishwar Prasad dansena	58% (23.25/40)	2022-07-27 1:01 PM	2022-07-27 1:50 PM	0:48:52	✔	✘	✔	✘
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Ayushi Kulmitra	43% (17.25/40)	2022-07-27 1:01 PM	2022-07-27 1:32 PM	0:24:09	✘	✘	✔	✘
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DEVASHISH	43% (17.25/40)	2022-07-27 1:01 PM	2022-07-27 1:49 PM	0:47:50	✘	✘	✔	✘
Yash kumar yadav	42% (17/40)	2022-07-27 1:02 PM	2022-07-27 1:43 PM	0:41:24	✘	✘	✔	✘
Afsin Bano	42% (17/40)	2022-07-27 1:01 PM	2022-07-27 1:47 PM	0:46:12	✘	✘	✔	✘
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YAMINI KASHYAP	39% (15.50/40)	2022-07-27 1:03 PM	2022-07-27 1:49 PM	0:42:27	✔	✘	✘	✘
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Chinmay Tiwari	26% (10.25/40)	2022-07-27 1:05 PM	2022-07-27 1:39 PM	0:31:54	✔	✘	✘	✘
ASHISH BHARATDUWAJ	25% (10/40)	2022-07-27 1:01 PM	2022-07-27 1:53 PM	0:51:36	✘	✔	✘	✘
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ASAL SEM-III-03

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ASAL SEM-III-03

Ishwar Prasad dansena
July 27, 2022, 1:50 p.m.

Thank you for appearing in the test. We hope to see you soon in the **next test**

Your score: 58%   23.25 / 40
Duration: 0:48:52

Congratulations!

You have successfully passed the test.

1.   A system is said to be in thermodynamic equilibrium if state does not change in the following ways   **1 / 1 point**

Your Answer: ✔️ **Correct**
○ Thermal
○ Chemical
○ Mechanical
✔️ 🔵 All of the above

2.   If the conditions for any of the three type of equilibrium are satisfied then the system is in non thermodynamic   **0 / 1 point**
equilibrium

Your Answer: ✖️ **Incorrect**
✔️ ○ True
✖️ 🔵 False

3.   A thermodynamic system is one which may interact with its surrounding in at least two distinct ways and one of   **1 / 1 point**
these necessarily is a transfer of heat

Your Answer: ✔️ **Correct**
○ False
✔️ 🔵 True

4.   The parameter of the order of atomic level is called ....   **0 / 1 point**

Your Answer: ✖️ **Incorrect**

Bita parameters

Correct Answer:

microscopic

5.   Who is the founder of the Ensemble theory?   **1 / 1 point**

Your Answer: ✔️ **Correct**
○ Maxwell
○ Boltzmann
○ Einstein
✔️ 🔵 Gibbs

6.   Match each statement with the correct option   **0.25 / 1 point**

Your Answer: ✔️ **Partially correct**
✖️ [4 ▾] → **3** A path dependent workdone   **1.** is a Perfect differential
✔️ [5 ▾]   Isothermal expansion of a gas   **2.** Macroscopic parameter

❌ [2 ▾] → **1** Internal energy   **3.** is not Perfect differential

❌ [1 ▾] → **2** Entropy   **4.** Reversible process

                                                 5. Irreversible process

7. Degree of Freedom of diatomic molecules at high temperature is   1 / 1 point

Your Answer: ✔ **Correct**

○ 3

○ 5

✔ ◉ 6

○ None of these

8. If n distinguisible particle are distributed in two identical boxes then the propbability of (r,n-r) state is given by   1 / 1 point

Your Answer: ✔ **Correct**

○ $^{n}C_{r}$

○ $_{n}C_{r}\, 2^{n}$

○ $2^{n}/nC_{r}$

✔ ◉

    $^{n}C_{r}/2^{n}$

9. For a cyclic process the first law of thermodynamics becomes **dQ=dW**   1 / 1 point

Your Answer: ✔ **Correct**

✔ ◉ True

○ false

10. For a isochoric process the first law of thermodynamics becomes **dQ=dU**   1 / 1 point

Your Answer: ✔ **Correct**

○ False

✔ ◉ True

11. For a adiabatic process the first law of thermodynamics becomes **dU=-PdV**   1 / 1 point

Your Answer: ✔ **Correct**

○ False

✔ ◉ True

12. In the thermodynamic limit that the properties that become directly proportional to the size of system are called   1 / 1 point

Your Answer: ✔ **Correct**

○ Intensive properties

✔ ◉ Extensive properties

○ Microscopic properties

○ Macroscopic properties

13. A system of N particles has only two allowed states A and B.the probability foe A is P and for B is 1-P. What is the probability for the system to be in the macrostate (r,N-r)   0 / 1 point

Your Answer: ❌ **Incorrect**

○ N!/r! (N-r)!

❌ ◉ $^NC_r/2^N$

✔ ○ $^NCr\, P^r\, (1-P)^{N-r}$

○ None of these

14.　How many Bravais lattice in two dimension?   1 / 1 point

Your Answer: ✔ **Correct**

○ 14

✔ ◉ 5

○ 32

○ 7

15.　How many bravais lattice are there in three dimension?   1 / 1 point

Your Answer: ✔ **Correct**

○ 5

○ 32

○ 239

✔ ◉ 14

16.　The number of lattice points in a primitive cell is   0 / 1 point

Your Answer: ❌ **Incorrect**

○ 2

○ 3

✔ ○ 1

❌ ◉ 4

17.　NaCl is face centered cubic lattice structure. How many Na atoms are in a unit cell?   0 / 1 point

Your Answer: ❌ **Incorrect**

○ 1

○ 3

✔ ○ 4

❌ ◉ 6

18.　The interplanner spacing of (220) planes of a FCC structure is 1.7458 Å. Calculate the lattice constant.   0 / 1 point

Your Answer: ❌ **Incorrect**

✔ ○ 4.983 Å

❌ ◉ 2.458 Å

○ 0

○ 5.125 Å

19.　What is the lattice constant for FCC crystal having atomic radius 1.476 Å ?   1 / 1 point

Your Answer: ✔ **Correct**

✔ ⦿ 1.476 Å

○ 4.1748 Å

○ 5.216 Å

○ 0

20. What is the atomic packing fraction of FCC, BCC and SC structure respectively?   0 / 1 point

Your Answer: ✖ **Incorrect**
○ 0.68, 0.74, 0.52

✖ ⦿ 0.52, 0.68, 0.74

✔ ○ 0.74, 0.68, 0.52

○ 0.72, 0.54, 0.67

21. The coordination number of HCP structure is   1 / 1 point

Your Answer: ✔ **Correct**
○ 6

○ 8

○ 16

✔ ⦿ 12

22. Which of the following is an amorphous material?   1 / 1 point

Your Answer: ✔ **Correct**
○ Mica

○ Lead

○ Rubber

✔ ⦿ Glass

23. The crystal structure of Al is _____ .   1 / 1 point

Your Answer: ✔ **Correct**
○ Body centred

✔ ⦿ face centred

○ closed packed structure

○ simple cube

24. Effective no. of lattice points in unit cell of SC, BCC and FCC structures are   1 / 1 point

Your Answer: ✔ **Correct**
○ 1, 2, 2

✔ ⦿ 1 , 2, 4

○ 2, 3, 4

○ 2, 4, 4

25. Einstein's coefficients of stimulated emission and induced absorption are _____   0 / 1 point

Your Answer: ✖ **Incorrect**
✔ ○ equal

✘ 🔘 not equal

○ dependent on room temperature

○ of zero value

26. The variation of transition probability with transition frequency is   0 / 1 point

Your Answer: ✘ **Incorrect**

✔ ○ an even function

○ an odd function

○ a straight line

✘ 🔘 an exponentially increasing function

27. Einstein's coefficients of spontaneous emission is related to light velocity as proportional to _____   1 / 1 point

Your Answer: ✔ **Correct**

○ $1/c$

○ $1/c^2$

○ c^3

✔ 🔘 $1/c^3$

28. In Balmer series of hydrogen spectra, ω_{24} represents transitions _____   1 / 1 point

Your Answer: ✔ **Correct**

○ from 4th excited state to 2nd excited state

○ from 3rd excited state to 2nd excited state

✔ 🔘 from 3rd excited state to 1st excited state

○ from 2nd excited state to 4th excited state

29. Time dependent perturbation theory was developed by   0 / 1 point

Your Answer: ✘ **Incorrect**

○ Maxwell

✔ ○ Dirac

✘ 🔘 Schrodinger

○ Einstein

30. Fermi golden rule represents   1 / 1 point

Your Answer: ✔ **Correct**

○ transition only

○ maximum no. of transition

✔ 🔘 transition rate

○ no transition

31. Total no. of transition due to constant perturbation is   0 / 1 point

Your Answer: ✘ **Incorrect**

✔ ○ zero

✘ 🔘 Dependent on energy gap between two states

○ one

○ infinite

32.   In the first order time dependent perturbation, the transition probability is proportional to   0 / 1 point

Your Answer: ✖ **Incorrect**

✔ ○ t

✖ ◉ t^2

○ $1/\omega$

○ $1/\omega^2$

33.   To describe the initial state of a system, the order of perturbation required is   0 / 1 point

Your Answer: ✖ **Incorrect**

✖ ◉ first

○ second

✔ ○ zero

○ third

34.   In stimulated emission of radiation, no. of photon(s) emitted is   1 / 1 point

Your Answer: ✔ **Correct**

○ zero

○ one

✔ ◉ two

○ three

35.   The working of LASER is based on the phenomena of   1 / 1 point

Your Answer: ✔ **Correct**

✔ ◉ stimulated emission

○ stimulated absorption

○ spontaneous emission

36.   In harmonic perturbation, emission of photon is represented by   0 / 1 point

Your Answer: ✖ **Incorrect**

○ $e^{-i\omega t}$

✔ ○ $e^{i\omega t}$

✖ ◉ $2(e^{-i\omega t} - e^{i\omega t})$

○ $e^{-i\omega t} - e^{i\omega t}$

37.   In adiabatic approximation, if the system is in nth state initially (H_n) then after time t, it will be found in _____   1 / 1 point

Your Answer: ✔ **Correct**

✔ ◉ n^{th} state of H_n' (new Hamiltonian)

○ n^{th} state of H_n

○ n^{th} state of ($H_n'-H_n$)

○ n^{th} state of ($H_n'+H_n$)

38.   What in the relation between lattice constant (a) and lattice density p ?   0 / 1 point

   Your Answer: ✘ **Incorrect**

   ✔ ○ $(nM/Np)^{1/3}$

   ✘ ⦿ $(np/NM)^{1/3}$

   ○ $(nN/Mp)^{1/3}$

   ○ $(Mp/nN)^{1/3}$

39.   X-rays have larger wavelengths than which of the following ?   0 / 1 point

   Your Answer: ✘ **Incorrect**

   ✔ ○ Gamma rays

   ○ Beta rays

   ○ Microwave

   ✘ ⦿ Visisble light

40.   Minimum interplanar spacing required for Bragg's diffraction is_____   1 / 1 point

   Your Answer: ✔ **Correct**

   ○ $\lambda/4$

   ✔ ⦿ $\lambda/2$

   ○ λ

   ○ 2λ