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Unit 2 - Week 1

Course outline

How to access the portal ?

Week 1

- Overview to Micro/Nanoscale energy transport part 1
- Overview to Micro/Nanoscale energy transport part 2
- Some applications of Micro/Nanoscale energy transport
- Continuum heat transfer and its limitation
- Quiz : Week 1 Assignment 1
- Feedback for week 1

Week 2

Week 3

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Week 10

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Week 1 Assignment 1

The due date for submitting this assignment has passed. **Due on 2017-08-07, 23:55 IST.**

Submitted assignment

Answer the following questions, More than one option can be correct.

1) What is the length scale for nano-tubes and nano-wires? ***1 point***

- 100nm-1μm
- 1nm-100nm
- 1μm-1mm
- 1m-1km

No, the answer is incorrect.
Score: 0

Accepted Answers:
1nm-100nm

2) Knudsen No. is ratio of ***1 point***

- Mean free path/Characteristic length scale.
- Wave Length/(Characteristic length scale).
- Mean free path*Characteristic length scale.
- Mean free path/(Characteristic length scale) 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mean free path/Characteristic length scale.

3) Very high Knudsen can be encountered at ***1 point***

- Outer Space
- Very small Scale Devices
- Living room
- Under sea

No, the answer is incorrect.
Score: 0

Accepted Answers:
Outer Space
Very small Scale Devices

4) All continuum assumptions are valid (ideally) if Knudsen No. approaches ***1 point***

- ∞
- 0
- 10

Week 12

- 100

No, the answer is incorrect.
Score: 0

Accepted Answers:
0

5) Till what no. can we use continuum theory with correction at walls for slip **1 point**

- .1
- .01
- 10
- 50

No, the answer is incorrect.
Score: 0

Accepted Answers:
.1

6) Methods/Equations used in sub-continuum range is/are **1 point**

- Boltzmann Transport Equation
- Navier Stokes Equation
- Molecular Dynamics
- Equation of continuity

No, the answer is incorrect.
Score: 0

Accepted Answers:
Boltzmann Transport Equation
Molecular Dynamics

7) Can we encounter sub continuum regime in micro scale devices. **1 point**

- Yes
- No

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yes

8) What is Moore's Law? **1 point**

- Every second year transistor density keeps doubling.
- Every third year transistor density keeps doubling.
- Every second year transistor density remains unchanged.
- Don't know.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Every second year transistor density keeps doubling.

9) Viscous Dissipation becomes _____ in small length scales. **1 point**

- Significant
- Insignificant

No, the answer is incorrect.
Score: 0

Accepted Answers:
Significant

10)Very small time scales(10-9-10-15 sec) can be encountered in **1 point**

- [ ] Lasers
- [ ] Robotics
- [ ] Opto electronics
- [ ] Nano Photonics

No, the answer is incorrect.
Score: 0

Accepted Answers:
Lasers
Opto electronics
Nano Photonics

11) Which of the following technique is used for characterization of micro-nano structures? ***1 point***

- [ ] TEM (Transmission Electron Microscope)
- [ ] SEM (Scanning Electron Microscope)
- [ ] STM (Scanning Tunneling Electron Microscope)
- [ ] AFM (Atomic Force Microscope)

No, the answer is incorrect.
Score: 0

Accepted Answers:
TEM (Transmission Electron Microscope)
SEM (Scanning Electron Microscope)
STM (Scanning Tunneling Electron Microscope)
AFM (Atomic Force Microscope)

12) Power Factor is defined as ***1 point***

- S* σ
- $S^* \sigma^2$
- $S^{2*} \sigma$
- Don't know.

No, the answer is incorrect.
Score: 0

Accepted Answers:
$S^{2*} \sigma$

13) Figure of Merit is defined as ***1 point***

- a) $ZT=\frac{Power\ Factor}{K} T$
- b) $ZT=\frac{Power\ Factor}{K*\sigma} T$
- c) $ZT=\frac{Power\ Factor}{K*\sigma} T^2$
- Don't know

No, the answer is incorrect.
Score: 0

Accepted Answers:
a) $ZT=\frac{Power\ Factor}{K} T$

14) Macroscopic laws break down when ***1 point***

- [ ] Length of the system is comparable to the mean free path of the carrier.
- [ ] Length of the system is very large than mean free path of the carrier.

- [ ] The time scale of the physical system is smaller than the relaxation time of the heat carrier.
- [ ] The time scale of the physical system is greater than the relaxation time of the heat carrier.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Length of the system is comparable to the mean free path of the carrier.
The time scale of the physical system is smaller than the relaxation time of the heat carrier.

15) BTE alone is sufficient to explain all the phenomenon at sub continuum regime if ratio of device dimension and thermal wavelength of carrier is comparable. ***1 point***

- [ ] True
- [ ] False

No, the answer is incorrect.
Score: 0

Accepted Answers:
False

16) Which Equation has to be solved along with BTE when device dimensions become comparable to thermal wave length of particle? ***1 point***

- [ ] Schrodinger Wave Equation
- [ ] Continuity Equation
- [ ] Navier Stokes Equation
- [ ] Einstein's Energy mass balance.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Schrodinger Wave Equation

17) The constitutive law for radiation is ***1 point***

- [ ] Fourier Law
- [ ] Newton's Law of cooling
- [ ] Stefan Boltzmann Law
- [ ] Ohm's Law

No, the answer is incorrect.
Score: 0

Accepted Answers:
Stefan Boltzmann Law

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