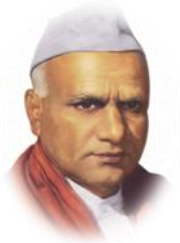

"ज्ञान, विज्ञान आणि सुसंस्कार यासाठी शिक्षण प्रसार"

शिक्षणमहर्षी- डॉ बापूजी साळुंखे .

Shri Swami Vivekanand Shikshan Sanstha's

Dattajirao Kadam Arts, Science & Commerce College, Ichalkaranji

DEPARTMENT OF PHYSICS

QUESTION BANK

B.Sc. Part-III, Semester-VI, PHYSICS Paper-XVI

DSE-F4 Energy Studies and Materials Science

❖Multiple Choice Questions

Unit-I: Chapter-1: Energy and Wind Energy

Question	Option a	Option b	Option c	Option d
The capacity to do work is……..	Motion	Power	**Energy**	Force
…….is non-conventional source of energy	Coal	Oil	Natural gas	Wind energy
Which of the following is secondary source of energy ?	Sun	electrical	Wind	Coal
Which of the following is not a unit of energy ?	Watt	Joule	Watt-sec	KWh
…… is the proper energy chain	Primary-intermediate-secondary	Primary-secondary-intermediate	Secondary-primary-intermediate	Intermediate-secondary-primary
Wind energy is a manifestation of…….	Heat energy	Geothermal energy	Solar energy	Mechanical
Wind farm is…….	Farm where wind flows heavily	Wind is used for agricultural work	Grinding mills operate on wind power	A large number of wind turbine electrical generator units are installed
India's potential for electrical power from wind power……..	Negligible	50 MW	2000 MW	100 kW
S. I. Unit of wind……	J/m^2	W/m^2	W/cm^2	Kw/m^2
If V_i, V_r and V_w are respectively the wind	$V_i > V_r > V_w$	$V_w > V_r > V_i$	$V_r > V_w > V_i$	$V_w > V_i > V_r$

velocities at the inlet, at the rotor and exit sides of a horizontal axis type wind-turbine then……				
If V_i is the incoming wind velocity for a horizontal axis type wind-turbine then maximum power output of the turbine is ……..	$P_{max} \alpha V_i^2$	$P_{max} \alpha V_i^3$	$P_{max} \alpha V_i$	$P_{max} \alpha \sqrt{V_i}$
For VAWT the rotating shaft axis is…….	Vertical	Tilted	Horizontal	Inclined at 45 with vertical
The axial induction factor of wind turbine lies between	1 and ∞	0 and 1	0 and ∞	1 and -1
What is unit of Energy?	BTU	Calorie	Joule	All Above
Which of the following is not a renewable energy?	Wind	Biogas	Nuclear	All above
If A the area swept by blades of wind turbine and Pw is the wind power density then the incident wind power is given by P = --------	Pw.A	Pw/A	(8/27) (PwA)	8/27). (Pw./A)
--- is used to adjust the plane of blades normal to incoming wind when the wind direction changes.	yaw control	pitch control	speed control	gear control system
In a HAWT generator unit, the gearbox, generator, electronic control unit and yaw mechanism are kept……	close to the ground inside the tower	in the nacelle	close to the ground outside the tower	anywhere as per site requirement
Area under Po-H curve represents ---------- of wind turbine in 24 hours.	Incident energy	energy output	wasted energy	all above
---------- resource has largest contribution to electricity production.	Coal	Oil	Nuclear	Solar
The winds resulting due to unequal heating and cooling of ground surface and water surface during the day and night is called ----------	planetary winds	local winds	easterly winds	Polar winds
The theoretical efficiency of the wind mill is ……%	100	limited by Carnot's theorem	75	59.3

The maximum power density of a wind turbine is ……W/m^2. Given wind speed: 10 m/s and air density: 1 kg/m^3	296.3	350.88	344.88	363.3
S.I. unit of energy is…	J	erg	W	HP
The power of wind turbine is proportional to…… where V is speed of incoming wind and A is area swept by blades of wind turbine.	V and A	V^2 and A^2	V^3 and A	inversely proportional to V and A
Wind speed is measured in....	Knots	m/s	km/hr	All above
Wind farm is ----------	Site where wind flows heavily	site used for agricultural work	site where wind turbines are used to run grinding mills	site where number of wind turbine generator units are installed in large area
Find the maximum power density of a wind turbine. Given wind speed: 10 m/s and air density: 1 kg/m^3.	296.3	350.88	344.88	363.3
Which of the following is a vertical axis wind turbine (VAWT)?	space frame rotor design	wind mill type design	bicycle wheel design	Darrius wind turbine

Unit-1: chapter 2: Solar Energy

Question	Option a	Option b	Option c	Option d
The solar radiation with wavelengths below 300 nm are absorbed by ------- in the earth's atmosphere	water	Carbon dioxide	ozone	All above
The solar spectrum comprises of … parts of the electromagnetic spectrum.	all	Only visible	Only UV	UV, Visible and IR
The amount of solar radiation (energy) received on a flat horizontal surface at a given place over a specified time is called—	Solar constant	solar insolation	clarity index	solar energy density
The clarity index varies between --- .	0.1 and 0.7	0.1 and 5	1 and 2	1 and 1

Which of the following device is based on the photovoltaic principle?	Solar cell	solar water heater	LED	solar cooker
A solar PV panel has 100 modules and 50 cells in each module. If power of each solar cell is 0.2 W then power of the panel is -------	10 W	100 W	1 K W	2.5 KW
The major disadvantage of solar energy is….	It is a dilute source of energy	Available everywhere on the earth	available free of the cost	Emits polluting gases
…… energy is a clean and renewable source of energy	Solar	Thermal	Chemical	Electrical
The direct route of utilizing solar energy is…….	Biomass	Wind	Heating water	Tides
Clarity index has unit……	W/m^2	W/m	No unit	J/m^2
Solar cell converts……..	Light energy into electrical energy	Chemical energy into electrical energy	Light energy into magnetic energy	Light energy into heat energy
Solar PV system panel consists of……	PV cells	Strings of PV cells	Series arrangement of modules	Series and parallel arrangement of modules
In solar PV panel there are n solar cell in module, m number of modules in a panel and Pc power of single cell, then power of the PV panel is…..	nmP_c	nm/P_c	P_c/nm	$(n+m)P_c$
Solar energy is the ……. source of energy.	Conventional	renewable	non-renewable	Commercial
Most of the solar energy in solar spectrum at sea level is present in……region	MW	IR	Visible	UV
Which of the following is the solar thermal device?	Solar Dryer	Solar hot water systems	Solar Cooker	All above
---- is not affected by the atmospheric conditions.	solar insolation	Solar constant	clarity index	Air mass ratio
The conversion of solar radiation in electricity in solar cells is known as…..... effect.	Photoelectric	Raman	Compton effect	photovoltaic

The solar energy received per unit area per unit time normal to the direction of the sunrays at mean distance between earth and sun is ------	Solar constant	solar insolation	Clarity index	Energy quantum
A solar PV panel has m modules and n cells in each module. If power of each solar cell is P then power of the panel is -------	m*n*P	(m+n)/P	(m*n)/P	m+n+P
In satellite station solar energy plant, the solar energy from satellite is send to the ground station in the form of……	MW	IR	Visible	UV
The value of solar constant is ---------- W/m^2.	1367	1167	1253	1377
The absorption bands in the solar spectrum at sea level are due to absorption of solar radiations by ……	carbon dioxide	water vapours	ozone	All above
The solar constant is measured ----------	Anywhere on the earth's surface	at sea level	outside the earth's atmosphere at mean distance between earth and sun	in the earth's atmosphere
The clarity index depends upon ….	The place	time	conditions of the atmosphere	All above

Chapter-3: Biomass Energy

Question	Option a	Option b	Option c	Option d
Which one of the following is a biomass resource?	Green plants	Algae	Industry waste	All above
The process of anaerobic digestion is carried out in ….	Gasifier	Biogas plant	Fermenter	in open atmosphere
Which of the following techniques is used to produce alcohol?	Pyrolysis	Incineration	Fermentation	Gasification
What is the product of the anaerobic digestion?	Methane	carbon	butane	None of above

Which of the following biomass energy conversion process is biochemical?	Pyrolysis	Incineration	Fermentation	Gasification
The concept of harnessing biomass from from cultivated crops is known as ……...	wind farm	energy farms	social plantation	all above
Which of the following is renewable energy source?	Nuclear	Biogas	Coal	Oil
……..is the cause of origin of biomass energy	Photosynthesis	Fermentation	Oxidation	Deoxidation
Photosynthesis takes place…….	Only in green plants	In any plant	Even in dry wood	In any living organism
Algae is a kind of……	Tree	Pack of small plants	Microorganism	Chemical
Algae in the presence of sunlight and organic waste forms……	Methane	carbon dioxide	Biomass	Ethanol
Biogas is……gas	Methane	Propane	Butane	Ethane
……..not included in the category of biomass	Vegetables	Forest waste	Agricultural waste	Fossil fuels
Which of the following is biochemical conversion process of biomass conversion?	Pyrolysis	Incineration	Fermentation	Gasification
Which of the following is not part of Biogas plants?	Digester	Gas holder	Pyrolysis reactor	Distribution line
A process of decomposition of organic matter by microorganisms is called as……..	Pyrolysis	Fermentation	Anaerobic digestion	incineration

Unit-2 Chapter-1: Superconductivity

Question	Option a	Option b	Option c	Option d
Soft Superconductor observes…….	Meissner effect	Silsbee's Rule	Both a & b	None Of these
Hard superconductor observes….....	Breakdown of silsbee's rule	Incomplete Meissner Effect	High critical field and transition temperature	All of these
The temperature at which a conductor becomes superconductor is called…..	Superconducting temperature	Curie Temperature	Onne's Temperature	Transition Temperature
The critical temperature of	233 oK	4.2 oK	34 oK	90 oK

mercury is…….				
The type-I superconductors are completely…….	Diamagnetic	Ferromagnetic	Paramagnetic	Antiferromagnetic
The superconducting material when placed in magnetic field will ……	Attract the magnetic field towards its centre	Repel all the magnetic lines of force passing through it	Attract the magnetic field but transfer it into a concentrated zone	Not influence the magnetic field
Superconductor is also called as a…….	Perfect Conductor	Bad conductor	Phonon	Semiconductor
The normal conductor becomes superconductor when….....	Its electrical conductivity becomes equal to zero	Its thermal conductivity becomes equal to zero	Its electrical resistance becomes equal to zero	it melt
As temperature decreases, the vibration of ions in a crystal….....	decreases	Increases	remains same	None Of these
Resistivity of the metal decreases as collision time 't'….....	increases	Decreases	remains same	None Of these
Resistivity of the metal decreases as temperature….....	increases	Decreases	remains same	None of these
According to Onnes, the superconducting transition is….....	Reversible	Irreversible	Both a & b	None Of these
Critical magnetic field is found to be a function of…...	Collision time	Temperature	Resistance	None of these
For type-I superconductor the magnitude of Hc is always ….....for useful technical application in coils for superconducting magnets	Too Low	High	Too high	None Of these
The magnetisation in type-II superconductor…..... gradually with increase of applied magnetic field.	increases	Decreases	Both a & b	remains same
Superconductivity result basically due to…	zero atomic vibration of crystal structute	infinite atomic vibration of crystal structure	all electrons having possessed fermi energy	all electrons interacting in the, superconducting state
Superconductors are	Perfect	Perfect	Perfect	Perfect

……..	ferromagnets	paramagnets	diamagnets	ferrimagnets
The essential properties of superconducting materials are……	Only zero resistivity	Only perfect diamagnetism	Zero resistivity and perfect diamagnetism	None of the above
The critical temperature of a superconductor varies with its isotopic mass M as…….	Tc α M-1/2	Tc α M1/2	Tc α M-1/4	Tc α M1/4
The magnetic lines of force cannot penetrate the body of a superconductor, this phenomenon is known as……	Isotopic effect	London's effect	Meissner effect	BCS Theory
The phenomenon of superconductor was first discovered by……..	London	Kamerlingh Onnes	Bardeen	Cooper
At critical temperature T_c, the critical magnetic field becomes……	Infinite	Twice the field	Zero	Negative
The magnetic field at which superconductivity vanishes is called as……..	Critical magnetic field	Superconductin g field	Surface field	Induced field
The susceptibility of superconductor is χ =……	0	1	-1	354

Unit-2 chapter-2 nanotechnology

Question	Option a	Option b	Option c	Option d
The prefix "nano" comes from a …	French word meaning billion	Greek word meaning dwarf	Spanish word meaning particle	Latin word meaning invisible
Who first used the term nanotechnology and when?	Richard Feynman, 1959	Norio Taniguchi, 1974	Eric Drexler, 1986	Sumio Iijima, 1991
Richard Feynman is often credited with predicting the potential of nanotechnology. What was the title of his famous speech given on December 29, 1959?	There is a tiny room at the bottom	hings get nanoscopic at the bottom	Bottom? What bottom?	There is plenty of room at the bottom
10 nm = ……m.	10^(-7)	10^(-8)	10^(-9)	10^(-10)
Nanowires are an example of ……. nanostructures.	3 D	2 D	1 D	0 D
The nucleation and growth of	LaMer diagram	Ostwald	Larmor	None of above

the nanoparticles can be depicted by..		diagram	diagram	
Spintronics is the study of …	only charge of electron	only intrinsic spin of the elctron	intrinsic spin in addition to charge of electron	None of above
A quantum dot …..	is a 0D nanostructure	is confined in all three dimensions	exhibits discrete quantized energy levels	All above
Following is an example of top-down approach for the synthesis of nanostructured materials. …….	photolithography	sputtering	nucleation and growth	sol-gel
"There is a plenty of room at the bottom" was a lecture given by …… in 1959	Enrico Fermi	Albert Einstein	Richard Feynman	Wolfgang Pauli
1 nm = …… m.	10^{-10} m	10^{-9} m	10^{-7} m	10^{-6} m
Quantum dots is example of ……. nanostructures.	0 D	1 D	2 D	3 D
If the size of nanoparticles is decreased, its surface to volume ratio --------	increases	decreases	remains same	None of above
Which of the following is two-dimensional nanostructure ?	Nanotube	quantum dots	thin films	nanoshell
Which of the following statement is true for spintronics?	It utilizes the spin properties of the electron	GMR is a widely used spintronics devices	Spintronics devices are influenced by the presence of the magnetic field	All above
A decrease in size of quantum dots results in…	decrease in band gap energy	increase in band gap energy	emission of longer wavelengths	no change in either band gap or emissions
The quantum confinement effect is observed …..	in all nanoparticles irrespective of their sizes	if the particle size is above 20 nm	when the size of the particle is too high than the de-Broglie wavelength	when the size of the particle is too small to be comparable to the de-Broglie wavelength of the electron

			of the electron	
The idea and concept of Nano was put forth by -----	Enrico Fermi	Albert Einstein	Richard Feynman	Wolfgang Pauli
The nanoscience deals with the materials with at least one dimension measuring less than …… nm.	1	10	100	1000
1 nm = …… Å.	1	10	100	1000
Thin films are an example of ……. nanostructures.	0 D	1 D	2 D	3 D
Following is an example of bottom-up approach for the synthesis of nanostructured materials. …….	mechanical milling	nucleation and growth	e-beam lithography	ball milling
Which ratio is important in dictating properties of nanomaterials?	weight/volume	volume/weight	surface area/volume	volume/surface area
Which of the following in 1D nanostructure?	nanaowire	nanorod	nanotube	All above
When the size of the particle decreases to nanometer range…….	Chemical reactivity is improved	Mechanical strength is improved	dielectric constant may change	All above
Nanomaterials are the materials with at least one dimension measuring less than…….	1 nm	10 nm	100 nm	1000 nm
Surface to volume ration of sphere of radius r is……	3/r	2/r	$3/r^2$	$2/r^2$
The melting point of particles in nano form……..	Increases	Decreases	Remains same	Increases then decreases
The first talk of nanotechnology was given by……	Albert Einstein	Newton	Gordon E. Moore	Richard Feynman
Following is an example of top-down approach for the synthesis of nanostructured materials. …….	Ball milling	Nucleation and growth	Molecular beam epitaxy	Gas phase agglomeration
Quantum confinement is observed at dimensions below……	10 nm	2 nm	100 nm	1000 nm

❖ Long answer questions

1. Write a note on man and environment.
2. Write a note on energy chains.
3. Write a note on wind energy quantum.
4. Describe in short brief types of wind-turbine generator unit.
5. Write a note on classification of energy resources.
6. Write a note on merits and limitations of solar photo voltaic systems
7. Discuss power of a solar cell and solar PV panel.
8. Explain utilization of solar energy by thermal route.
9. Explain utilization of solar energy by photo voltaic route.
10. Discuss in brief biomass energy resources: a) biomass from cultivated crops, b) biomass from waste organic matter.
11. Discuss in brief superconductivity and critical temperature.
12. Write a note on London equation and penetration depth.
13. What is Isotope effect?
14. Write a note on critical current.
15. Write a note on quantum confinement?
16. Discuss in brief top-down and bottom approach.
17. Explain in brief applications of nanotechnology in various fields.
18. Discuss in brief ball milling method to synthesize nanostructured material.
19. What are applications of nanotechnology in spintronics?

❖ Short answer type questions

1. Describe in short efficiency factor of wind turbine unit.
2. Describe in short renewable source of energy.
3. Discuss in short solar constant, clarity index and solar insolation.
4. What are prospects of solar PV systems?
5. Write a short note on biomass conversion process.
6. Explain in short Meissner effect.
7. Discuss in short Type-I and Type-II superconductors.
8. Discuss in short magnetic levitation.
9. Write a short note on Applications on nanotechnology.
10. Write a note on quantum dots and state its applications.
11. Discuss 0D, 1D, 2D and 3D nanostructures with suitable examples.