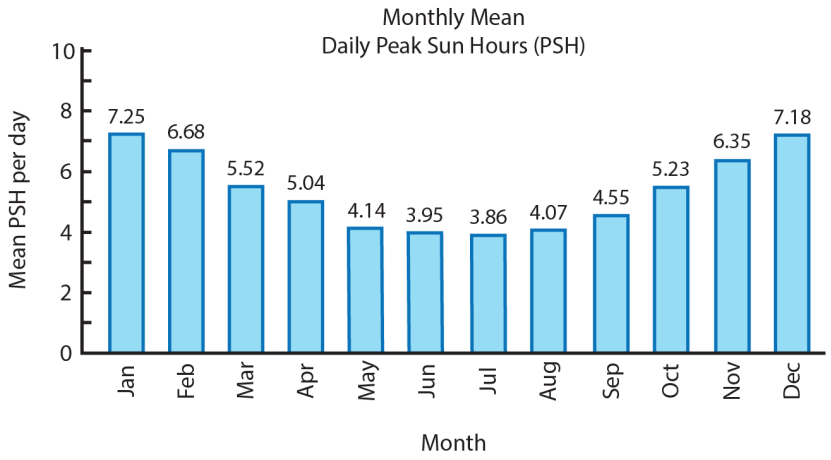
Started on	Tuesday, 25 March 2025, 5:32 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:32 PM
Time taken	10 secs
Grade	**0.00** out of 22.00 (**0**%)

Question 1

Not answered

Marked out of 1.00



Interpret the irradiation chart to identify the average yearly irradiation for that location.

Provide your answer in PSH, correctly rounded to three significant figures.

Answer: ✖ PSH

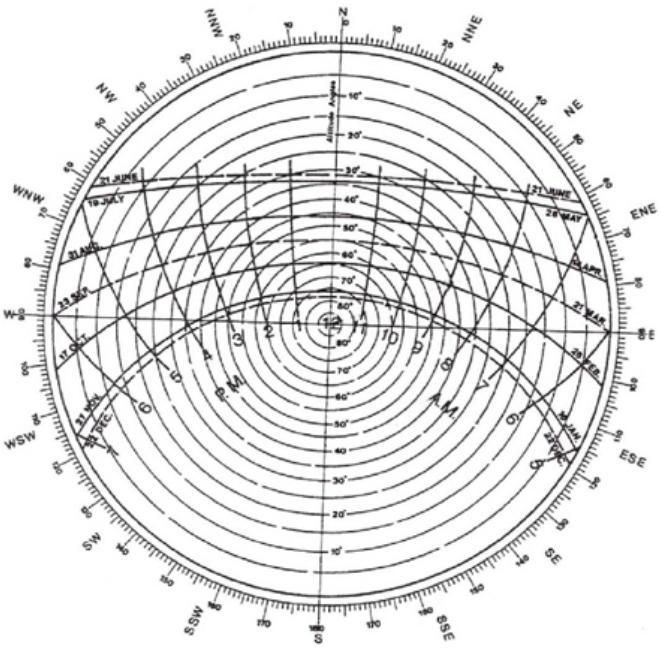
7.25 + 6.68 + 5.52 + 5.04 + 4.14 + 3.95 + 3.86 + 4.07 + 4.55 + 5.23 + 6.35 + 7.18 = 63.82

63.82/12 = 5.318 = 5.32 PSH

Question 2

Not answered

Marked out of 1.00



What type of solar data is pictured above?

- a. A sun path diagram
- b. None of these
- c. A solar contour map
- d. An irradiation chart

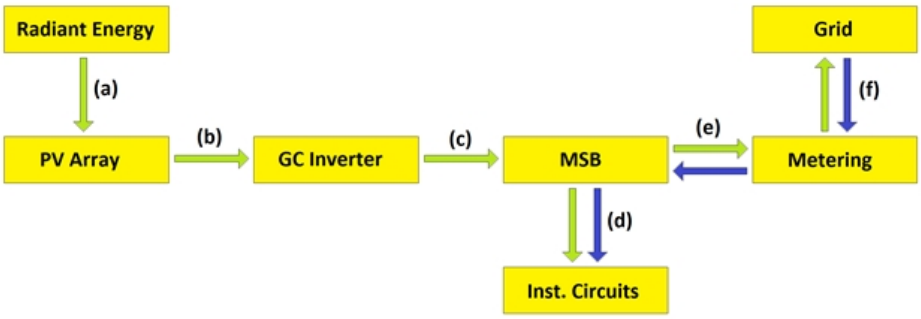
Refer to content page 1.2

The correct answer is: A sun path diagram

Question 3

Not answered

Marked out of 1.00



In the grid-connected PV system pictured above, direct current (d.c.) is flowing:

a. at point (a) only
b. at point (b) only
c. at points (c), (d), (e) and (f)
d. at points (a) and (b) only

Direct current will flow in the system between the PV array and the inverter. Refer to content page 1.1 for more information.

The correct answer is: at point (b) only

Question 4

Not answered

Marked out of 1.00

Which of the following factors will cause variations in the irradiance at the surface of a fixed PV array?

a. Cloud cover
b. All of these
c. Time of day
d. Shading

The irradiance arriving at the surface of a fixed PV array will not be affected by voltage drop or cell efficiency, but will vary due to seasonal changes.
Refer to content page 1.3 for further guidance.

The correct answer is: All of these

Question 5

Not answered

Marked out of 1.00

To achieve optimal irradiation in Australia, PV panels should be oriented to face true:

a. north
b. west
c. east
d. south

Refer to content page 1.3

The correct answer is: north

Question 6

Not answered

Marked out of 1.00

The daily irradiation of a fixed PV array can vary due to:

a. the time of year
b. voltage drop
c. the time of day
d. inverter efficiency

The irradiation of a fixed PV array will not be affected by voltage drop or inverter efficiency, but will vary based on the solar window.
Refer to content page 1.3 for further guidance.

The correct answer is: the time of year

Question 7

Not answered

Marked out of 1.00

The MPP tracking of a GC inverter maintains a PV array at maximum power for the given operating conditions by:

a. adjusting the input voltage
b. adjusting the load resistance
c. adjusting the output frequency
d. adjusting the output voltage

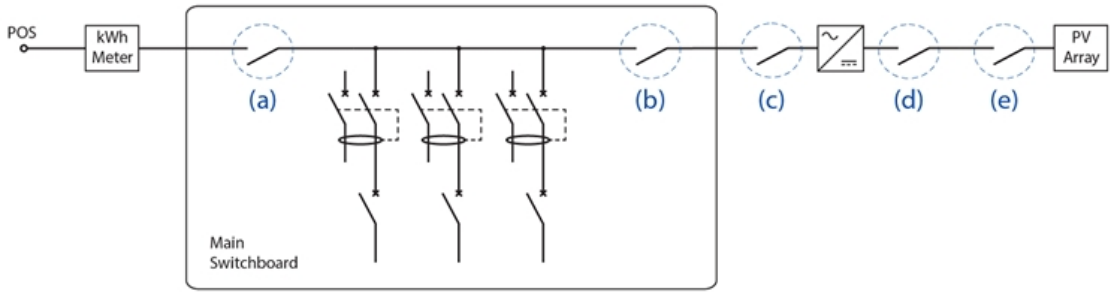
MPP tracking adjusts the load resistance placed on the PV system, to maintain maximum efficiency for a given irradiation and operating temperature.
Refer to content page 1.1 for more information.

The correct answer is: adjusting the load resistance

Question 8

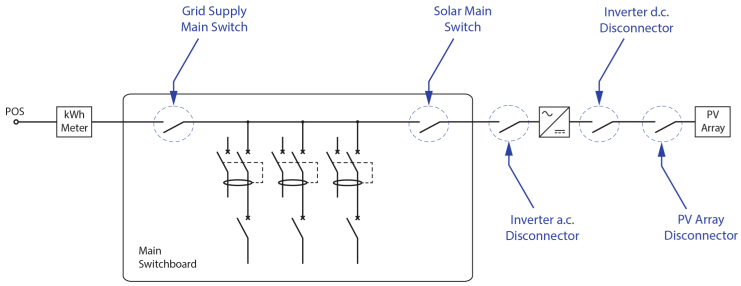
Not answered

Marked out of 1.00



In the PV system diagram above, (b) indicates:

a. the solar supply main switch
b. the grid supply main switch
c. the inverter d.c. disconnector
d. the PV array disconnector

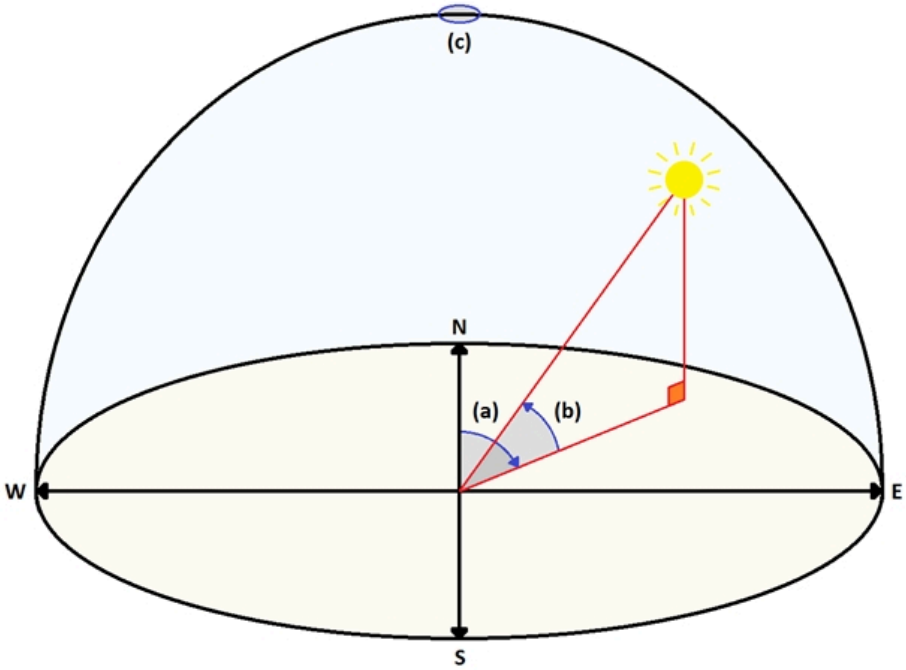


The correct answer is: the solar supply main switch

Question 9

Not answered

Marked out of 1.00



In relation to the diagram above, what does (b) represent?

a. The azimuth angle
b. The zenith
c. The tilt angle
d. The altitude angle

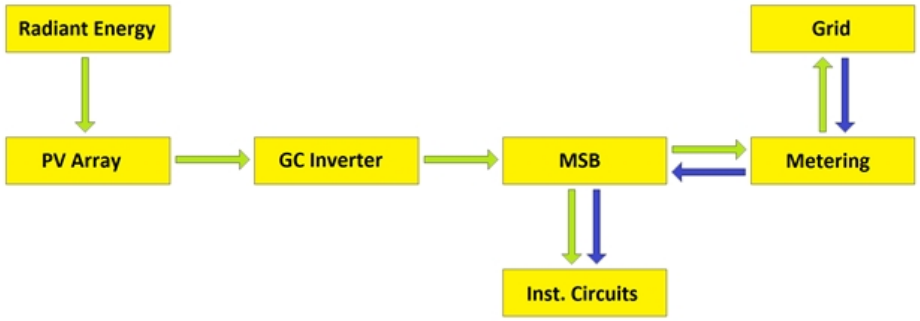
The altitude angle is the angle between the horizon and the sun. Refer to content page 1.2 for further guidance.

The correct answer is: The altitude angle

Question 10

Not answered

Marked out of 1.00



In the grid-connected PV system pictured above, the green arrows indicate the flow of:

a. direct current
b. renewable energy
c. solar radiation
d. electricity supplied from the grid

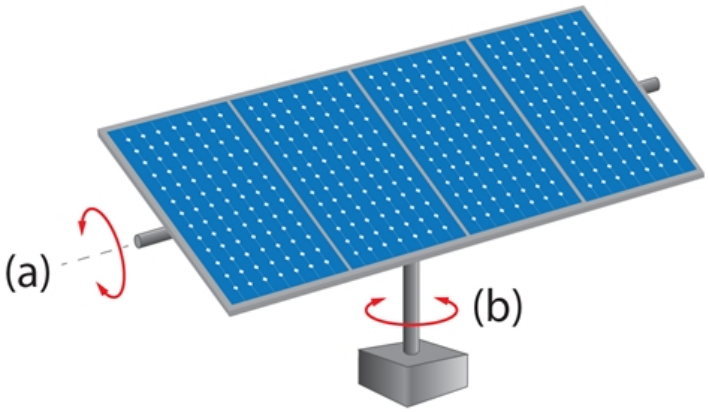
Refer to content page 1.1.

The correct answer is: renewable energy

Question 11

Not answered

Marked out of 1.00



For the solar tracking system illustrated above, what does (b) indicate?

a. Tilt angle adjustment
b. Orientation adjustment
c. Zenith adjustment
d. Latitude adjustment

Refer to content page 1.3

The correct answer is: Orientation adjustment

Question 12

Not answered

Marked out of 1.00

The type of protection that produces a voltage or frequency shift in the event that the grid becomes de-energised, to cause automatic disconnection of the GC inverter is:

a. MPP tracking
b. overvoltage protection
c. passive anti-islanding protection
d. active anti-islanding protection

An active anti-islanding protection device causes a voltage or frequency shift when it senses that the grid has become de-energised.
This shift acts to trip the passive anti-islanding protection, disconnecting the GC inverter from the grid.
The purpose of anti-islanding is to prevent the grid from being supplied from a PV system in the event that it has been shut down (e.g. for maintenance).
Refer to content page 1.1 for more information.

The correct answer is: active anti-islanding protection

Question 13

Not answered

Marked out of 1.00

In the event of a disruption to the grid supply, active anti-islanding protection shall operate within:

a. 5 seconds
b. 1 second
c. 2 seconds
d. 0.4 seconds

Refer to AS/NZS 4777.2:2020 Clause 4.4 and Table 4.1.

The correct answer is: 2 seconds

Question 14

Not answered

Marked out of 1.00

What is the advantage of using solar tracking systems in PV installations?

a. Less maintenance required
b. Increased energy production
c. Reduced installation costs
d. Increased durability

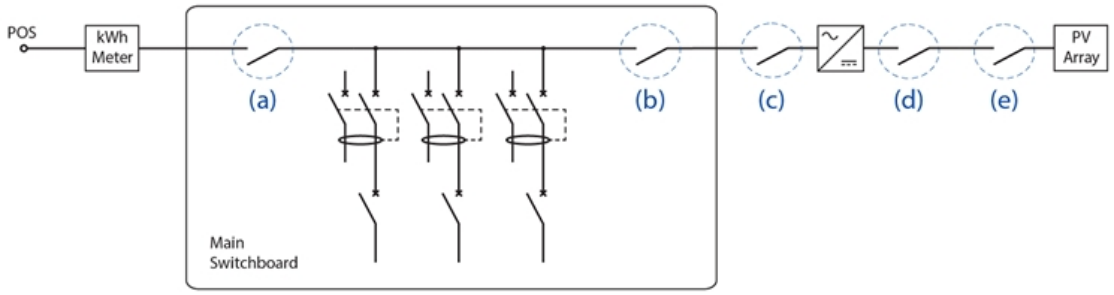
Refer to content page 1.3

The correct answer is: Increased energy production

Question 15

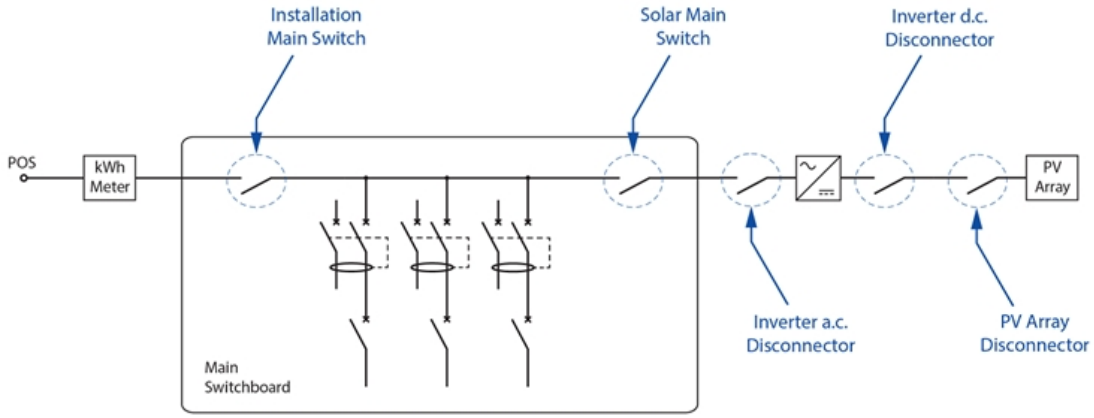
Not answered

Marked out of 1.00



In the PV system diagram above, (d) indicates:

a. the inverter d.c. disconnector
b. the inverter a.c. disconnector
c. a 30 mA RCD
d. the solar main switch



The correct answer is: the inverter d.c. disconnector

Question 16

Not answered

Marked out of 1.00

According to AS/NZS 4777.2:2020, what is the maximum passive protection disconnection time for an over-frequency of 52 Hz for Australian regions A and B?

a. 0.1 seconds
b. 2 seconds
c. 0.2 seconds
d. 1 second

Refer to AS/NZS 4777.2:2020 Clause 4.4 and Table 4.2.

The correct answer is: 0.2 seconds

Question 17

Not answered

Marked out of 1.00

Select the statement below containing the correct abbreviation and unit measure for irradiation.

a. Irradiation (G) is measured in W/m^2
b. Irradiation (E) is measured in kWh
c. Irradiation (H) is measured in kWh/m^2
d. Irradiation (I) is measured in W/m

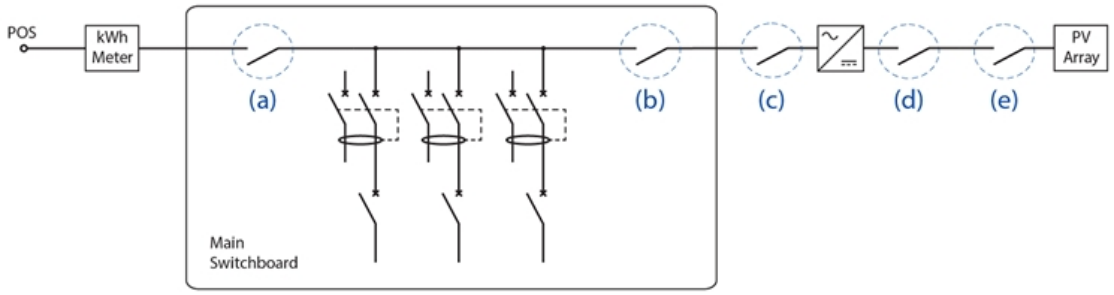
Irradiation is symbolised by the letter 'H', and is measured in kilowatt hours per square metre (kWh/m^2). Refer to content page 1.2 for further guidance.

The correct answer is: Irradiation (H) is measured in kWh/m^2

Question 18

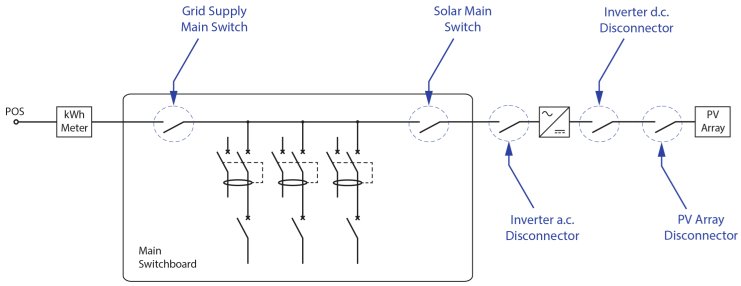
Not answered

Marked out of 1.00



In the PV system diagram above, (a) indicates:

- a. the solar supply main switch
- b. the PV array disconnector
- c. the grid supply main switch
- d. the inverter a.c. disconnector



The correct answer is: the grid supply main switch

Question 19

Not answered

Marked out of 1.00

According to AS/NZS 4777.2:2020, what is the passive protection undervoltage 1 limit in Australian regions A and B?

- a. 160 V
- b. 200 V
- c. 180 V
- d. 220 V

Refer to AS/NZS 4777.2:2020 Clause 4.4 and Table 4.1.

The correct answer is: 180 V

Question 20

Not answered

Marked out of 1.00

The main factor to consider when determining the optimal tilt angle for a fixed array is:

a. altitude angle
b. azimuth angle
c. longitude
d. latitude

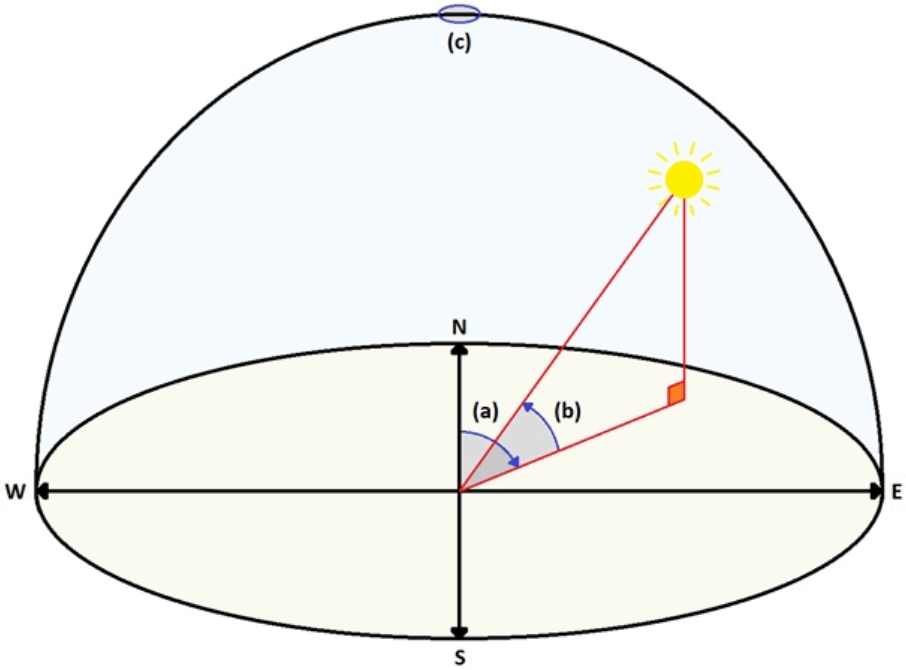
For a fixed array, the altitude and azimuth angles will vary throughout the year but the latitude remains constant. The longitude will not impact the required tilt.
Refer to content page 1.2 for further guidance.

The correct answer is: latitude

Question 21

Not answered

Marked out of 1.00



In relation to the diagram above, what does (a) represent?

a. The tilt angle
b. The azimuth angle
c. The zenith
d. The altitude angle

The azimuth angle is the angle between the sun and true north in a clockwise direction.

Refer to content page 1.2 for further guidance.

The correct answer is: The azimuth angle

Question 22

Not answered

Marked out of 1.00

What is the purpose of solar tracking systems in PV installations?

a. To maximise the irradiation of the array
b. To mitigate the effect of shading and cloud cover
c. To reduce the operating temperature of the array
d. To protect the array from harsh weather conditions

Refer to content page 1.3

The correct answer is: To maximise the irradiation of the array

Started on	Tuesday, 25 March 2025, 5:36 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:36 PM
Time taken	8 secs
Grade	**0.00** out of 26.00 (**0**%)

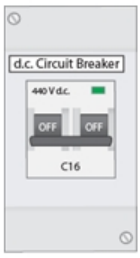
Question 1

Not answered

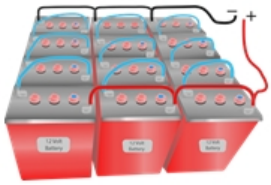
Marked out of 6.00

Identify each of the PV power system components pictured below.

Choose...

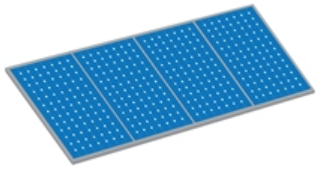


Choose...



Choose...

Choose...

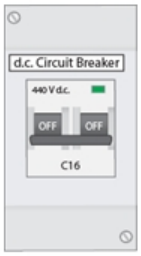


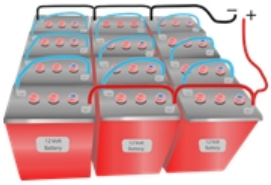
Choose...

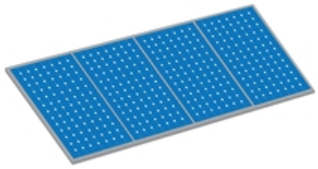
Choose...

Refer to content page 1.1

The correct answer is: 

→ Isolator, 

→ d.c. circuit breaker, 
→ Battery bank,

→ Energy meter, 
→ PV array, 
→ Inverter

Question 2

Not answered

Marked out of 4.00

Identify each of the PV system components from the description.

Converts radiant energy into electrical energy	Choose...
Converts direct current into alternating current	Choose...
Maintains the d.c. voltage within a set tolerance	Choose...
Stores electrical energy	Choose...

Refer to content page 1.1

The correct answer is: Converts radiant energy into electrical energy → PV array, Converts direct current into alternating current → Inverter, Maintains the d.c. voltage within a set tolerance → Regulator, Stores electrical energy → Batteries

Question 3

Not answered

Marked out of 5.00

Match each of the components to its function within a grid-connected PV power system.

Anti-islanding protection	Choose...
a.c. circuit breaker	Choose...
d.c. circuit breaker	Choose...
Energy meter	Choose...
Isolators	Choose...

Refer to content page 1.1

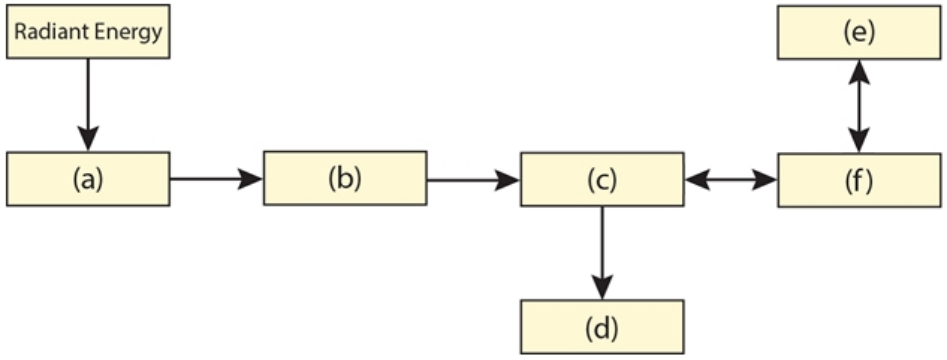
The correct answer is: Anti-islanding protection → Disconnects the PV system from the grid in the event of abnormal grid parameters, a.c. circuit breaker → Protects installation equipment against overcurrent, d.c. circuit breaker → Protects installation equipment against overcurrent, Energy meter → Measures the imported and exported electrical energy, Isolators → Provides points from which to shut down the PV power system

Question 4

Not answered

Marked out of 6.00

Identify the missing components, to produce a simple block diagram of a grid connected PV power system.



(a) Choose...

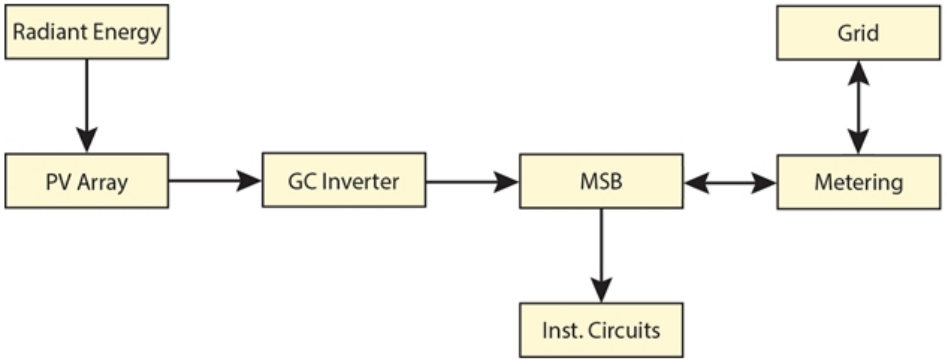
(b) Choose...

(c) Choose...

(d) Choose...

(e) Choose...

(f) Choose...



The correct answer is: (a) → PV Array, (b) → Grid Connect Inverter, (c) → Main Switchboard, (d) → Installation Circuits, (e) → Electricity Grid, (f) → Metering

Question 5

Not answered

Marked out of 1.00

According to AS/NZS 4777.2:2020 what are the passive anti-islanding voltage limits in Australian regions A and B for the following protective functions.

- Undervoltage 1 – less than ✖
- Undervoltage 2 – less than ✖
- Overvoltage 1 – more than ✖
- Overvoltage 2 – more than ✖

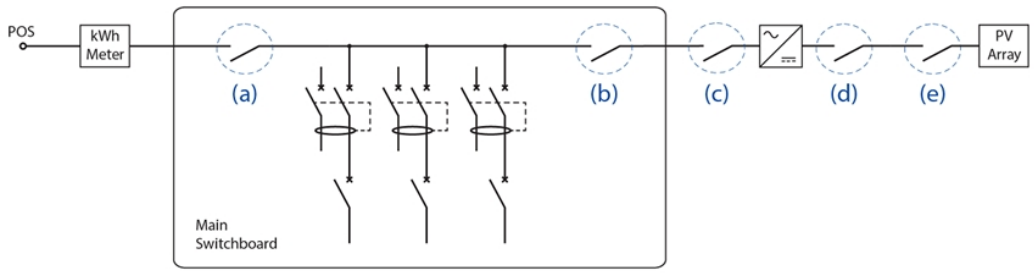
Refer to the relevant clauses in AS/NZS 4777.2:2020 Table 4.1

Question 6

Not answered

Marked out of 4.00

Identify each type of control/protection device used in a typical PV installation.



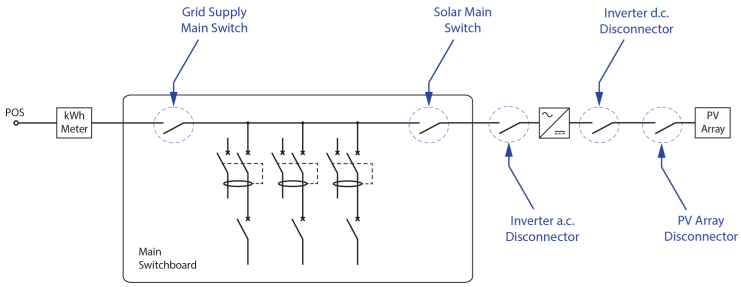
(a) Choose...

(b) Choose...

(c) Choose...

(d) Choose...

(e) Choose...



The correct answer is: (a) → Grid supply main switch, (b) → Solar main switch, (c) → Inverter a.c. disconnector, (d) → Inverter d.c. disconnector, (e) → PV array d.c. disconnector

Started on	Tuesday, 25 March 2025, 5:36 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:36 PM
Time taken	12 secs
Grade	**0.00** out of 22.00 (**0**%)

Question 1

Not answered

Marked out of 6.00

Match each of the technical solar terms to the correct definition.

A coordinate indicating the north-south position of a point on the earth	Choose...
The angle between the horizontal plane and the plane of a photovoltaic module	Choose...
A coordinate indicating the east-west position of a point on the earth	Choose...
The average hours of sunlight received at a location for a given time period	Choose...
The quantity of solar power available at a surface at a given instant in time	Choose...
The quantity of solar energy available at a surface over a given time period	Choose...

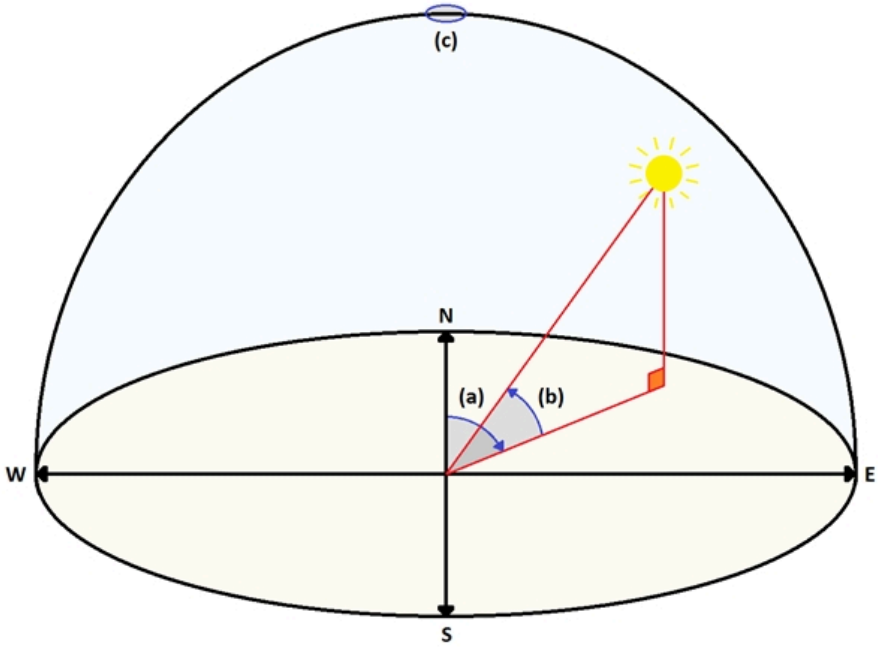
Refer to content page 1.2

The correct answer is: A coordinate indicating the north-south position of a point on the earth → Latitude, The angle between the horizontal plane and the plane of a photovoltaic module → Tilt angle, A coordinate indicating the east-west position of a point on the earth → Longitude, The average hours of sunlight received at a location for a given time period → Sunshine hours, The quantity of solar power available at a surface at a given instant in time → Irradiance, The quantity of solar energy available at a surface over a given time period → Irradiation

Question 2

Not answered

Marked out of 3.00



In the diagram above:

- (a) is the ✖ .
- (b) is the ✖ .
- (c) is the ✖ .

The azimuth angle is the angle on the horizontal plane between the sun and true north.
The altitude angle is the angle between the horizon and the sun.
The zenith is the point directly overhead.
Refer to content page 1.2 for further guidance.

Question 3

Not answered

Marked out of 2.00

Solar irradiation is measured in ✖ .

Solar irradiance is measured in ✖ .

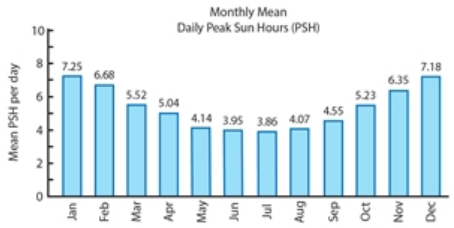
Refer to content page 1.2

Question 4

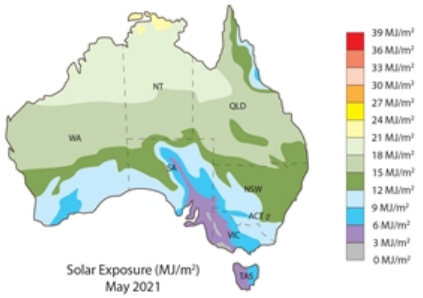
Not answered

Marked out of 3.00

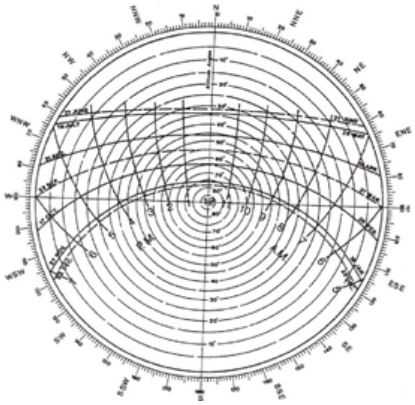
Identify each of the following types of solar radiation data.



Choose...

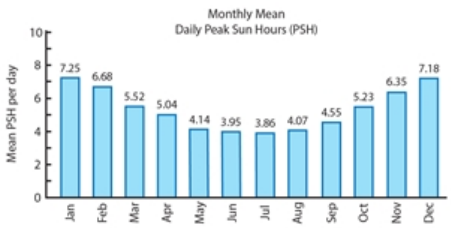


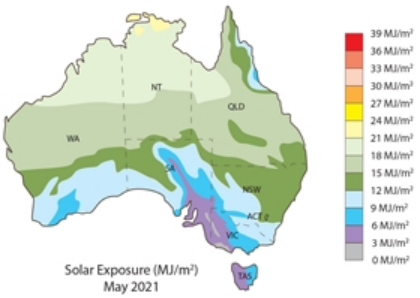
Choose...

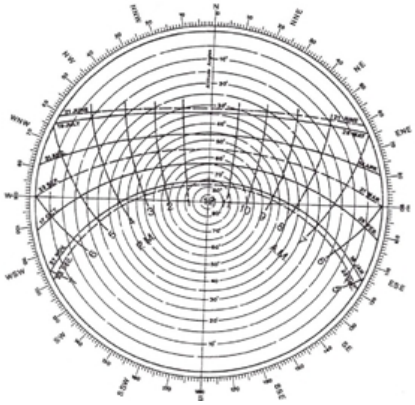


Choose...

Refer to content page 1.2

The correct answer is: 

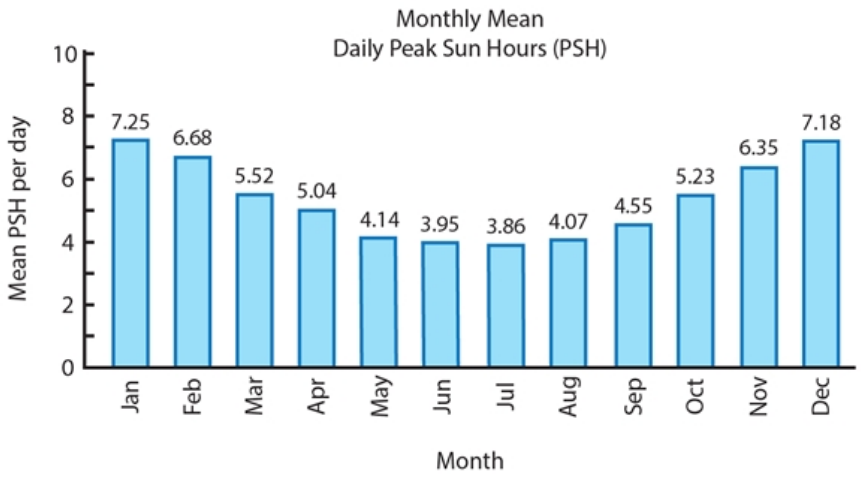
→ Irradiation chart, 

→ Solar contour map,  → Sun path diagram

Question 5

Not answered

Marked out of 4.00



Interpret the irradiation chart to identify the average irradiation at that location for:

a) The summer months (December, January and February).

b) The winter months (June, July and August).

Provide each answer in PSH, correctly rounded to three significant figures.

Summer Average Irradiation: ✖ PSH

Winter Average Irradiation: ✖ PSH

Working for (a)

7.18 + 7.25 + 6.68 = 21.11

21.11/3 = 7.036 = 7.04 PSH

Working for (b)

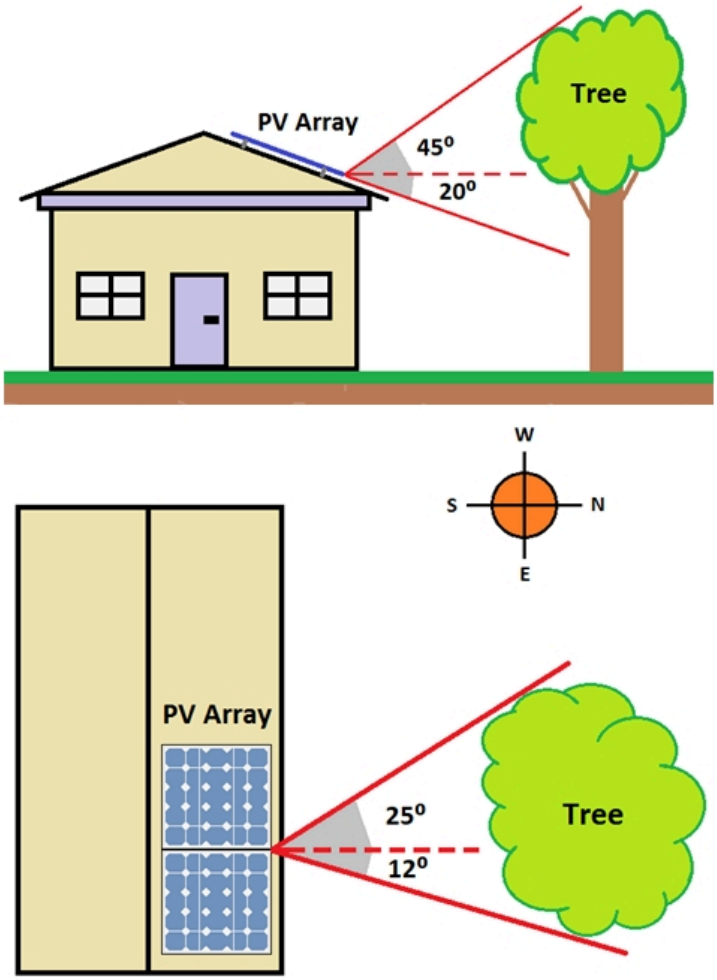
3.95 + 3.86 + 4.07 = 11.88

11.88/3 = 3.96 PSH

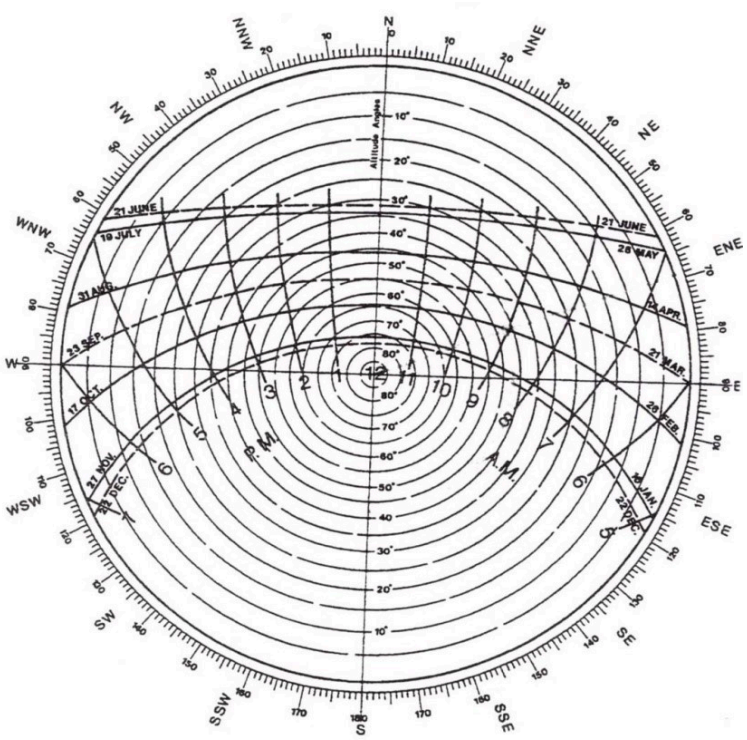
Question 6

Not answered

Marked out of 4.00



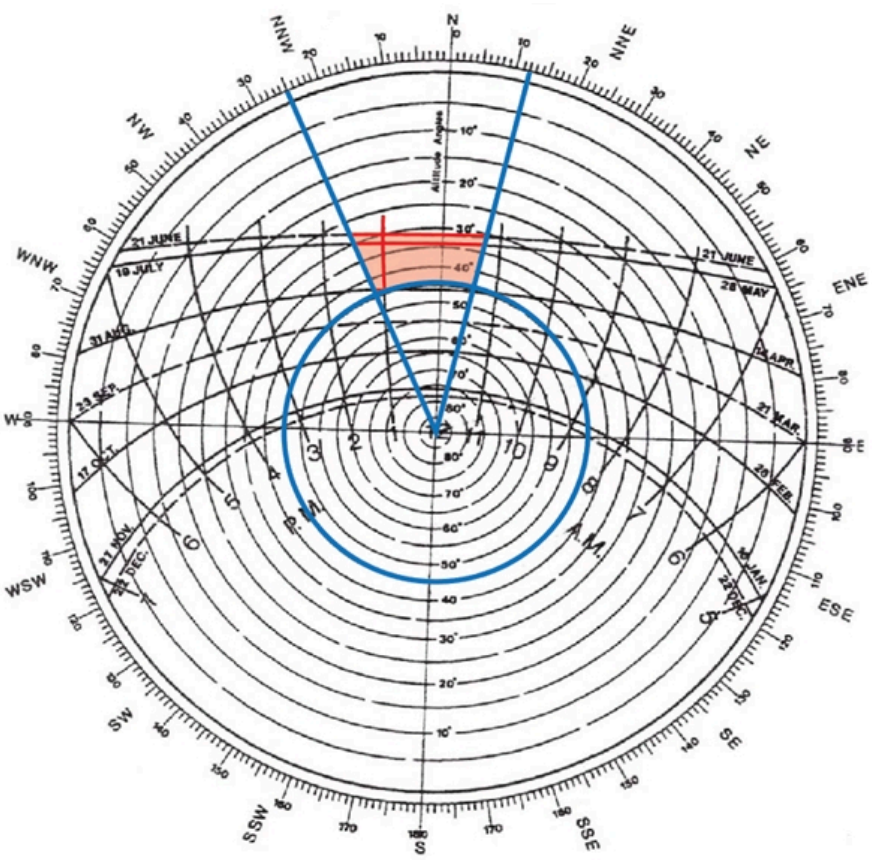
The array pictured above is installed at latitude 35^0. The customer regularly maintains the tree, keeping it at its current size.



Latitude 35° south

Use the sun path diagram to determine whether the following statements are true or false.

The array will be shaded by the tree from 12 p.m. till 1 p.m. on the 1st of June.	✖
The array will be shaded by the tree at 11 a.m. on the 8th of April.	✖
The array will be shaded by the tree from 12:30 p.m. till 1:30 p.m. on the 11th of September.	✖
The array will be shaded at 1 p.m. on the 27th of July.	✖



Refer to content page 1.2 for further guidance.

Started on	Tuesday, 25 March 2025, 5:36 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:36 PM
Time taken	8 secs
Grade	**0.00** out of 19.00 (**0**%)

Question 1

Not answered

Marked out of 1.00

The ideal orientation for a PV array in Australia, is to be facing ✖ .

Refer to content page 1.3

Question 2

Not answered

Marked out of 4.00

Which of the following factors will directly affect the energy output of a fixed PV array?

- a. Shading
- b. Cloud cover
- c. Orientation
- d. Tilt angle
- e. Aesthetics

The orientation and tilt angle will affect the irradiance of the modules due to the solar window at the given latitude.
Shading and cloud cover will reduce the amount of direct incident radiation reaching the panels.
The aesthetic appearance of the panels will not affect the energy output.
Refer to content page 1.3 for more information.

The correct answers are: Orientation, Tilt angle, Cloud cover, Shading

Question 3

Not answered

Marked out of 5.00

The solar radiation arriving at the surface of a particular fixed PV panel can vary throughout the year as a result of:

- a. Latitudinal variations
- b. Voltage drop in the d.c. cabling
- c. Soiling
- d. Shading
- e. Seasonal change
- f. Cloud cover
- g. The PV panel power rating
- h. The time of day

Seasonal changes will result in variations in the angle of incident solar radiation on the panel.
Shading and soiling will act as a barrier to solar radiation arriving at the surface of the panel.
Cloud cover will reduce the amount of direct solar radiation arriving at the panel.
The quantity and angle of incidence of solar radiation will vary throughout each day as the sun moves through the solar window.
Refer to content page 1.3 for more information.

The correct answers are: Seasonal change, Shading, Soiling, Cloud cover, The time of day

Question 4

Not answered

Marked out of 2.00

In relation to solar tracking systems:

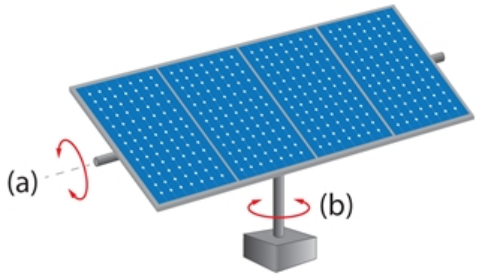
- Single-axis systems adjust [ ] ✖ to follow the sun's path across the sky.
- Dual-axis systems adjust [ ] ✖ to track the sun's movement throughout the day and throughout the year.

Refer to content page 1.3

Question 5

Not answered

Marked out of 2.00



For the dual-axis tracking system pictured above:

- (a) indicates [ ] ✖ adjustment.
- (b) indicates [ ] ✖ adjustment.

Refer to content page 1.3

Question 6

Not answered

Marked out of 5.00

Solar tracking [ ] ✖ array performance, thereby [ ] ✖ energy production. However solar tracking systems also:

- Cost [ ] ✖ than fixed systems.
- Require [ ] ✖ maintenance.
- Consumes [ ] ✖ to operate.

Refer to content page 1.3

Started on	Tuesday, 25 March 2025, 5:33 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:33 PM
Time taken	10 secs
Grade	**0.00** out of 18.00 (**0**%)

Question 1

Not answered

Marked out of 1.00

Performance	
Rated Power	165 W
Tolerance	±4%
Electrical Charateristics	***STC (1000 W/m²)***
P_{max}	165 W
V_{mp}	34.3 V
I_{mp}	4.8 A
V_{oc}	43.7 V
I_{sc}	5.4 A
$t_{coeff\text{-}Pmax}$	-(0.5±0.05)%/°C
$t_{coeff\text{-}Voc}$	-(0.36±0.05)%/°C
$t_{coeff\text{-}Isc}$	(0.06±0.02)%/°C
NOCT	47±2°C
Physical Charateristics	
Solar Cells	72 monocrystalline (125mm x 125mm) connected in series
Dimensions	1596 x 793 x 51 mm
Weight	15.7 kg

The job specifications for a particular PV job require that the open circuit voltage of the array does not exceed 120 V. What is the maximum number of modules, specified above, that can be connected into each string of the array?

- a. 4
- b. 1
- c. 2
- d. 3

Your answer is incorrect.

120 / 43.7 = 2.75
Therefore 2 is the maximum number of modules per string to avoid exceeding an open circuit array voltage of 120 V.
Refer to content pages 2.1 and 2.2 for further guidance.

The correct answer is: 2

Question 2

Not answered

Marked out of 1.00

A 220 W PV module has a temperature coefficient of -0.4 W/^{0}C.
What is the rated maximum power output of the module at a cell operating temperature of 50^{0}C?
Provide your answer as a whole number in the units indicated.

Answer: ✖ W

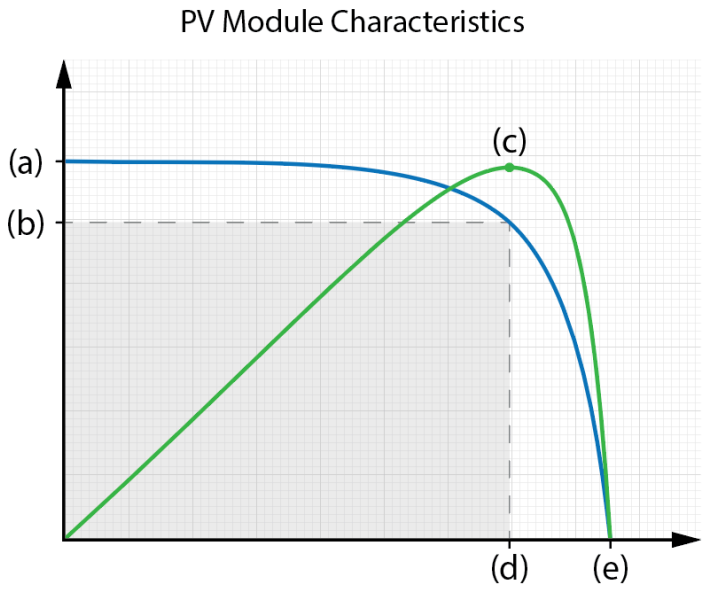
180 x 8 = 1,440 W

220 – [(50 – 25) x 0.4] = 210 W

Question 3

Not answered

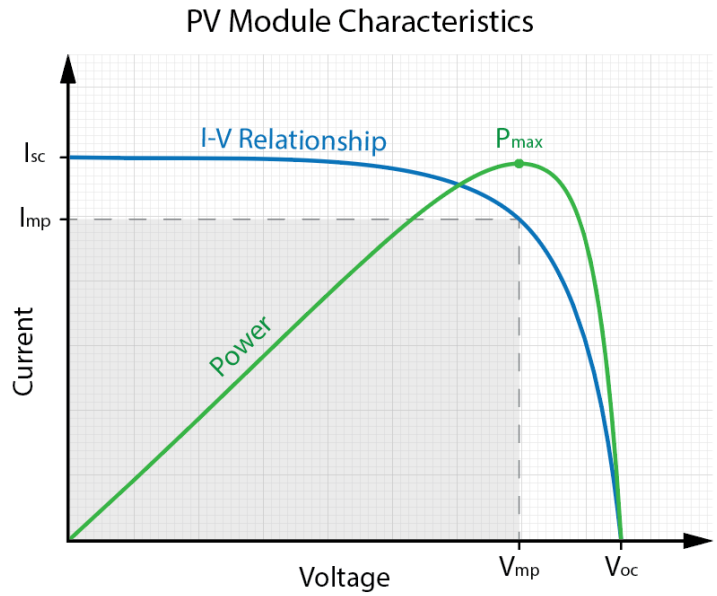
Marked out of 1.00



In relation to the PV module characteristic curves pictured above, point (d) indicates:

- a. the short circuit current
- b. the MPP voltage
- c. the open circuit voltage
- d. the MPP current

Your answer is incorrect.



Refer to content page 2.2 for further guidance.

The correct answer is: the MPP voltage

Question 4

Not answered

Marked out of 1.00

When compared to bulk silicon technologies, thin-film PV modules:

a. are more efficient
b. have a similar spectral response
c. are less efficient
d. are more expensive to produce

Your answer is incorrect.

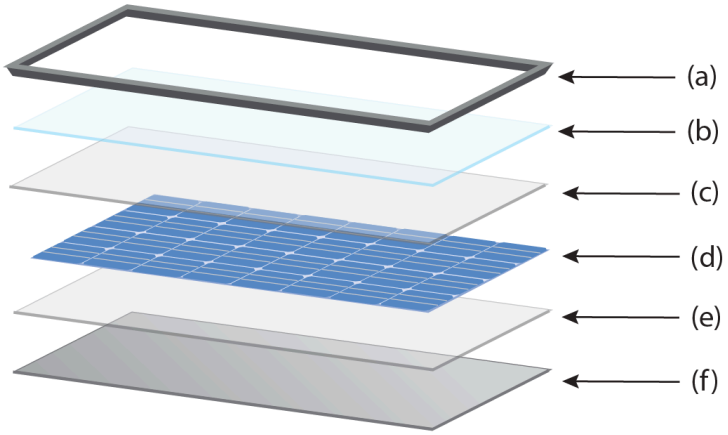
Amorphous PV cells are cheaper to produce than crystalline cells, are typically around 7% to 10% efficient, and are most sensitive to the blue-end of the spectrum.
Refer to content page 2.1 for further guidance.

The correct answer is: are less efficient

Question 5

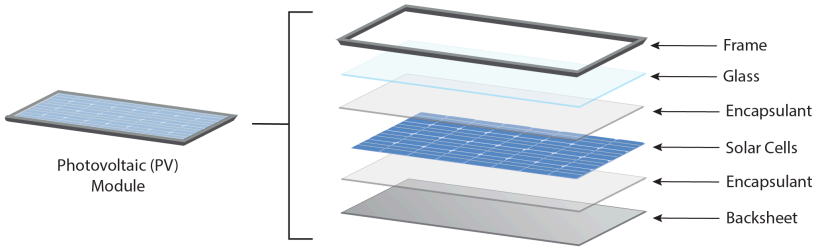
Not answered

Marked out of 1.00



Match the columns to correctly label the PV module structure pictured above.

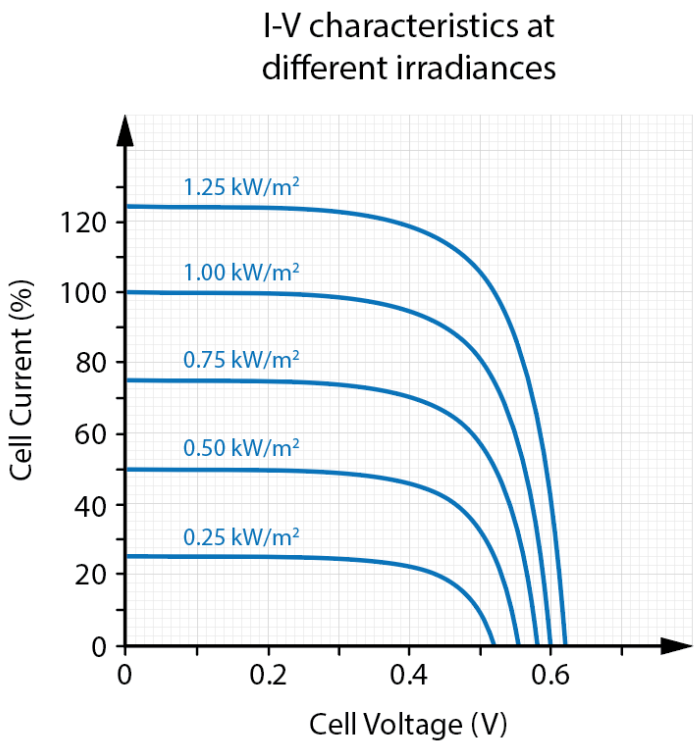
(d)	✖
(e)	✖
(f)	✖



Question 6

Not answered

Marked out of 1.00



The graph pictured above shows the I-V curves for a PV module. The graph indicates that a decrease in irradiance will cause:

- ✖ in cell voltage.
- ✖ in cell current.
- ✖ in output power.

Refer to content page 2.2

Question 7

Not answered

Marked out of 1.00

What type of photovoltaic technology is pictured above?

- a. Polycrystalline
- b. Monocrystalline
- c. Amorphous
- d. None of these

Your answer is incorrect.

A polycrystalline PV cell is made from a thin slice of a cast silicon ingot that consists of many crystals, giving them their characteristic speckled appearance.
Refer to content page 2.1 for further guidance.

The correct answer is: Polycrystalline

Question 8

Not answered

Marked out of 1.00

It can be reasonably expected that during the normal service of a PV installation, the modules will be exposed to:

- a. any of these
- b. lightning strikes
- c. high temperatures
- d. fire

Your answer is incorrect.

PV modules can reasonably be expected to be exposed to high ambient temperatures, rain and/or hail, and high winds.

The correct answer is: high temperatures

Question 9

Not answered

Marked out of 1.00

When compared to polycrystalline cells, monocrystalline cells:

a. are less efficient
b. are less expensive to produce
c. are more expensive to produce
d. have a much longer life

Your answer is incorrect.

Monocrystalline cells are more expensive to produce than polycrystalline and amorphous cells.

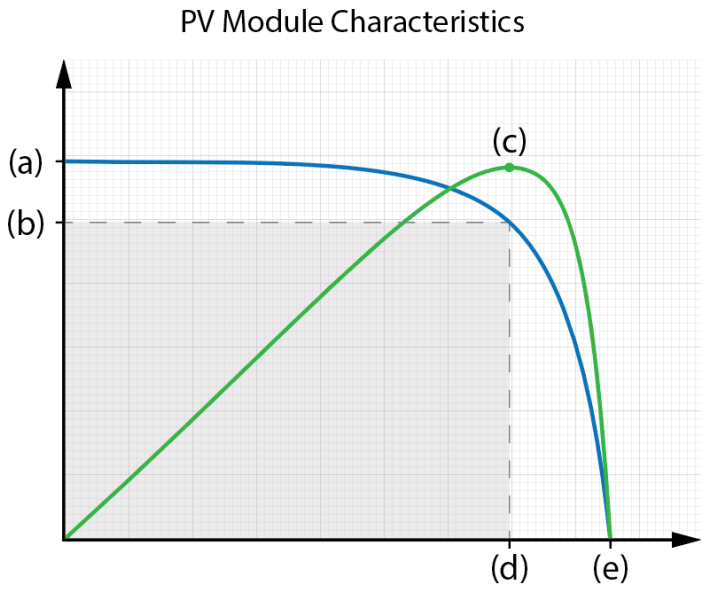
Refer to content page 2.1 for further guidance.

The correct answer is: are more expensive to produce

Question 10

Not answered

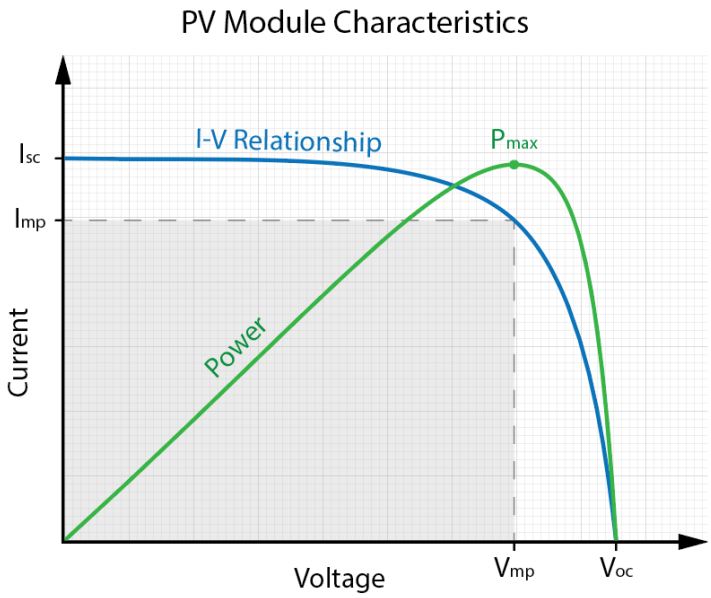
Marked out of 1.00



In relation to the PV module characteristic curves pictured above, which letter indicates the maximum power output of the module?

- (b)
- (e)
- (a)
- (c)
- (d)

Your answer is incorrect.



Refer to content page 2.2 for further guidance.

The correct answer is:
(c)

Question 11

Not answered

Marked out of 1.00

Performance	
Rated Power	165 W
Tolerance	±4%
Electrical Charateristics	***STC (1000 W/m²)***
P_{max}	165 W
V_{mp}	34.3 V
I_{mp}	4.8 A
V_{oc}	43.7 V
I_{sc}	5.4 A
$t_{coeff\text{-}Pmax}$	-(0.5±0.05)%/°C
$t_{coeff\text{-}Voc}$	-(0.36±0.05)%/°C
$t_{coeff\text{-}Isc}$	(0.06±0.02)%/°C
NOCT	47±2°C
Physical Charateristics	
Solar Cells	72 monocrystalline (125mm x 125mm) connected in series
Dimensions	1596 x 793 x 51 mm
Weight	15.7 kg

How many of the modules specified above would be required to produce a 3.3 kW array?

a. 10 modules
b. 40 modules
c. 20 modules
d. 30 modules

Your answer is incorrect.

3300 / 165 = 20 modules Refer to content pages 2.1 and 2.2 for further guidance.

The correct answer is: 20 modules

Question 12

Not answered

Marked out of 1.00

What is the output power of a 220 W module operating at a temperature of 32 ^{0}C, if the module temperature coefficient is -0.42W/^{0}C?

a. 211.2 W
b. 220 W
c. 206.6 W
d. 217.1 W

Your answer is incorrect.

220 – [(32 – 25) x 0.42] = 217.1 W

The correct answer is: 217.1 W

Question 13

Not answered

Marked out of 1.00

Performance	
Rated Power	165 W
Tolerance	±4%
Electrical Charateristics	***STC (1000 W/m²)***
P_{max}	165 W
V_{mp}	34.3 V
I_{mp}	4.8 A
V_{oc}	43.7 V
I_{sc}	5.4 A
$t_{coeff\text{-}Pmax}$	-(0.5±0.05)%/°C
$t_{coeff\text{-}Voc}$	-(0.36±0.05)%/°C
$t_{coeff\text{-}Isc}$	(0.06±0.02)%/°C
NOCT	47±2°C
Physical Charateristics	
Solar Cells	72 monocrystalline (125mm x 125mm) connected in series
Dimensions	1596 x 793 x 51 mm
Weight	15.7 kg

Based on the PV module specifications pictured above, what is the open circuit voltage of each individual PV cell at STC?

a. 0.4 V
b. 0.6 V
c. 0.8 V
d. 1.0 V

Your answer is incorrect.

Refer to content pages 2.1 and 2.2 for further guidance.

The correct answer is: 0.6 V

Question 14

Not answered

Marked out of 1.00

Thin-film PV modules are:

a. all of these are correct
b. commonly incorporated directly into building materials
c. most responsive to the blue-end of the visual spectrum
d. typically around 7 to 10% efficient

Your answer is incorrect.

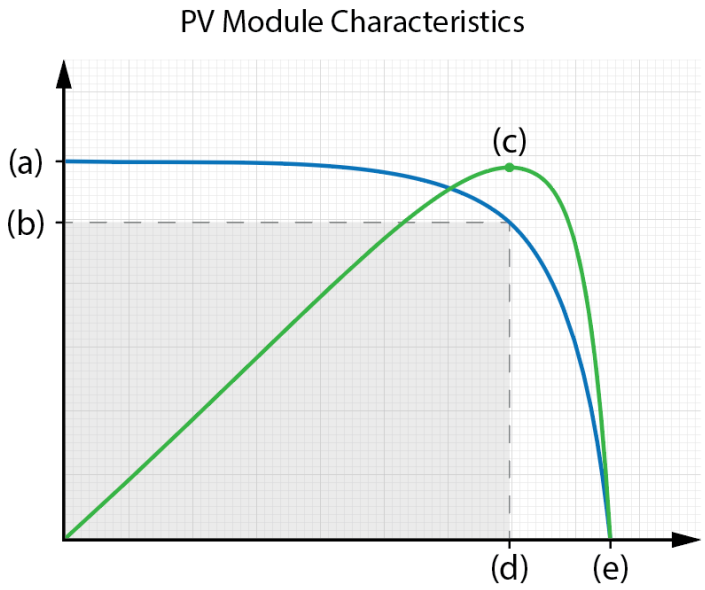
Amorphous PV cells are cheaper to produce than crystalline cells, are typically around 7 to 10% efficient, are most sensitive to the blue-end of the spectrum, can be manufactured to be flexible, can be easily integrated into building materials.
Refer to content page 2.1 for further guidance.

The correct answer is: all of these are correct

Question 15

Not answered

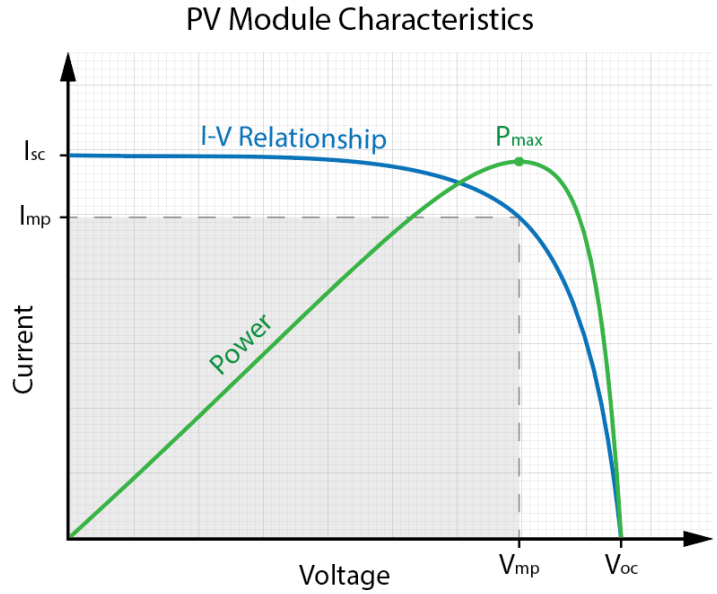
Marked out of 1.00



In relation to the PV module characteristic curves pictured above, point (c) indicates:

a. None of these are correct
b. the maximum power point
c. the short-circuit current
d. the open-circuit voltage

Your answer is incorrect.



Refer to content page 2.2 for further guidance.

The correct answer is: the maximum power point

Question 16

Not answered

Marked out of 1.00

A PV array consists of eight 180 W modules, each with a temperature coefficient of -0.41 W/^{0}C.
What is the rated maximum power output of the array at a cell operating temperature of 48^{0}C?

a. 1,471 W
b. 1,479 W
c. 1,449 W
d. 1,431 W

Your answer is incorrect.

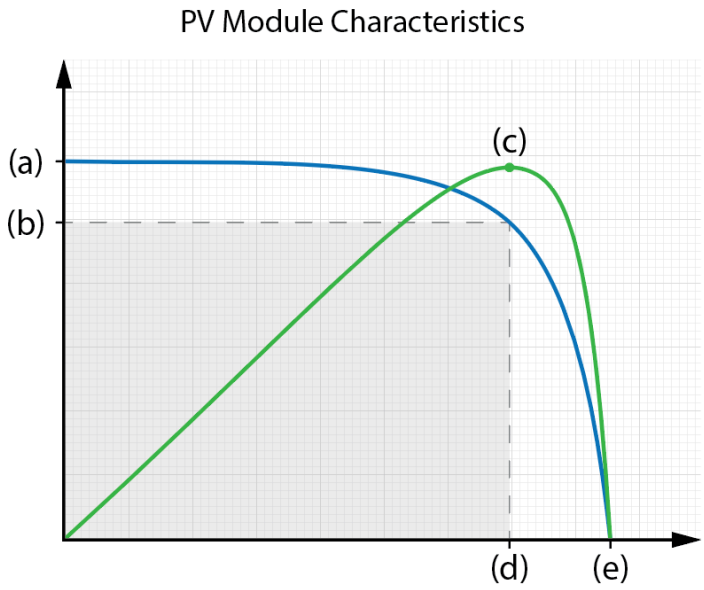
180 x 8 = 1,440 W
1,440 – [(48 – 25) x 0.41] = 1430.57 W

The correct answer is: 1,431 W

Question 17

Not answered

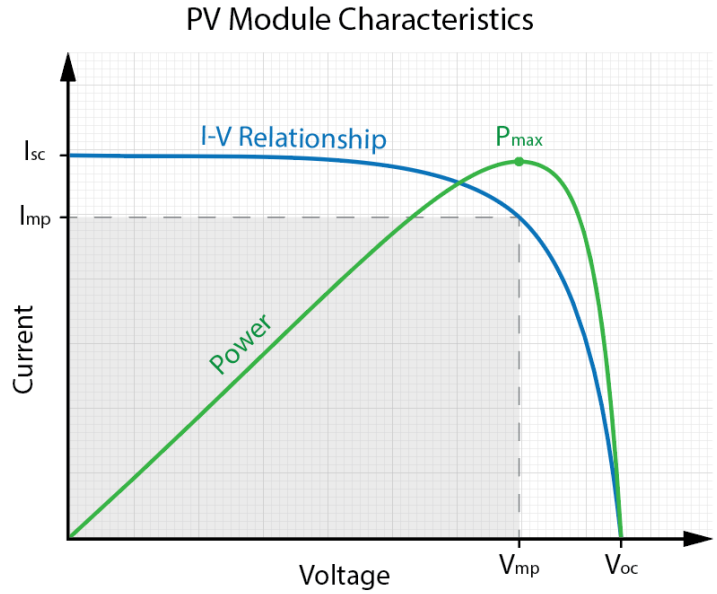
Marked out of 1.00



In relation to the PV module characteristic curves pictured above, point (b) indicates:

- a. the short circuit current
- b. the MPP voltage
- c. the MPP current
- d. the open circuit voltage

Your answer is incorrect.



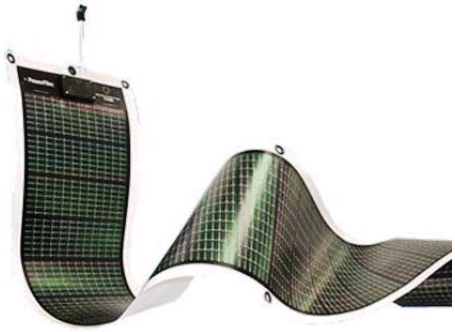
Refer to content page 2.2 for further guidance.

The correct answer is: the MPP current

Question 18

Not answered

Marked out of 1.00



What type of photovoltaic technology is pictured above?

a. None of these
b. Polycrystalline
c. Amorphous
d. Monocrystalline

Your answer is incorrect.

An amorphous (thin-film) PV cell is made from a non-crystalline form of silicon where layers of doped silicon are applied to a substrate. Refer to content page 2.1 for further guidance.

The correct answer is: Amorphous

Started on	Tuesday, 25 March 2025, 5:37 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:37 PM
Time taken	9 secs
Grade	**0.00** out of 18.00 (**0**%)

Question 1

Not answered

Marked out of 3.00

Identify each of the following solar panel terms and definitions.

A single photovoltaic unit Choose...

A number of series connected cells Choose...

A number of interconnected modules Choose...

Your answer is incorrect.

A cell is a single PV unit, typically producing a nominal output voltage of 0.5 V.

A module is a number of PV cells (typically 30, 36, or 72) connected in a series 'string', and packed into a robust protective housing.

An array is a number of interconnected modules. The nominal output voltage and current ratings of the array will depend on the series-parallel arrangement of the modules.

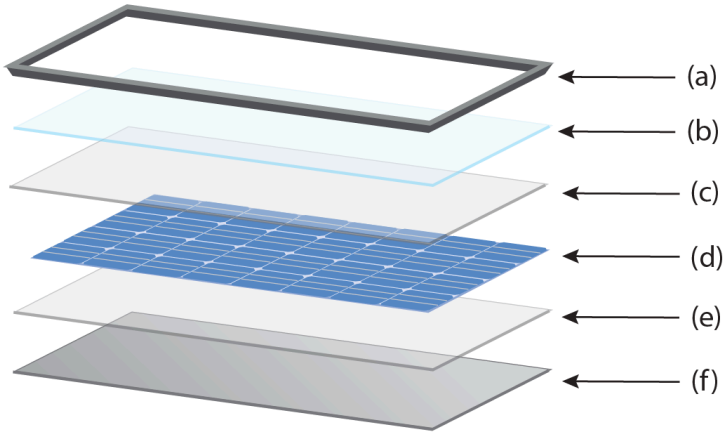
Refer to content page 2.1 for further guidance.

The correct answer is: A single photovoltaic unit → Cell, A number of series connected cells → Module, A number of interconnected modules → Array

Question 2

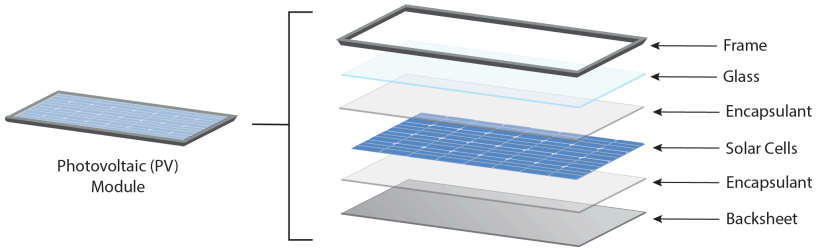
Not answered

Marked out of 6.00



Match the columns to correctly label the PV module structure pictured above.

(a)	
(b)	
(c)	
(d)	
(e)	
(f)	



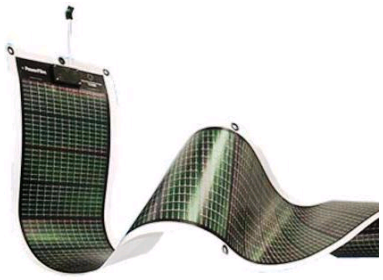
Question 3

Not answered

Marked out of 3.00

Identify each type of PV module technology pictured below.

Choose...



Choose...

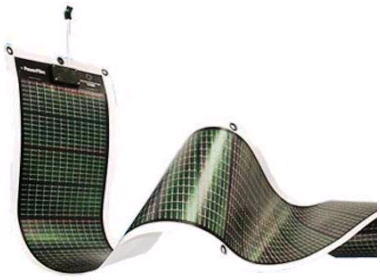
Choose...

Your answer is incorrect.

Refer to content page 2.1

The correct answer is:

→ Monocrystalline,



→ Amorphous (thin-film),

→ Polycrystalline

Question 4

Not answered

Marked out of 3.00

Identify the typical efficiency range for each of the PV cell types.

Polycrystalline Choose...

Amorphous Choose...

Monocrystalline Choose...

Your answer is incorrect.

Refer to content page 2.1

The correct answer is: Polycrystalline → 13% to 19%, Amorphous → 7% to 10%, Monocrystalline → 15% to 22%

Question 5

Not answered

Marked out of 3.00

Which of the following factors need to be considered in the design of PV modules?

- a. Corrosion
- b. Vandalism
- c. High temperatures
- d. Rain
- e. Soiling
- f. Dirt and dust
- g. Shading
- h. Hail

Your answer is incorrect.

Refer to content page 2.1

The correct answers are: High temperatures, Rain, Vandalism, Dirt and dust, Corrosion, Hail, Soiling, Shading

Started on	Tuesday, 25 March 2025, 5:37 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:37 PM
Time taken	9 secs
Grade	**0.00** out of 35.00 (**0**%)

Question 1

Not answered

Marked out of 7.00

Match each of the PV terms to the correct definitions.

A graphical representation of the voltage/current characteristic for a given PV cell.	Choose...
A factor by which the output current of a PV module will be affected by variations in operating temperature.	Choose...
A factor by which the MPP of a PV module will be reduced by increases in operating temperature.	Choose...
The point on the I-V curve at which maximum output power is achieved.	Choose...
The point on the I-V curve at which optimal performance is achieved.	Choose...
A factor by which the output voltage of a PV module will be affected by variations in operating temperature.	Choose...

Your answer is incorrect.

Refer to content page 2.2

The correct answer is: A graphical representation of the voltage/current characteristic for a given PV cell. → I-V curve, A factor by which the output current of a PV module will be affected by variations in operating temperature. → Current coefficient, A factor by which the MPP of a PV module will be reduced by increases in operating temperature. → Cell temperature coefficient, The point on the I-V curve at which maximum output power is achieved. → Maximum power point, The point on the I-V curve at which optimal performance is achieved. → Operating point, A factor by which the output voltage of a PV module will be affected by variations in operating temperature. → Voltage coefficient

Question 2

Not answered

Marked out of 3.00

List the Standard Test Conditions (STC) for PV modules:

Irradiance: ✖ kW/m2

Ambient Temperature: ✖ ^{0}C

Air Mass: ✖

The performance of PV modules is tested in a laboratory under Standard Test Conditions (STC) of an irradiance of 1 kW/m^2, ambient temperature of 25 ^{0}C, and air mass of 1.5.

Refer to content page 2.2 for further guidance.

Question 3

Not answered

Marked out of 3.00

List the test conditions used to determine the Nominal Operating Cell Temperature (NOCT):

Irradiance: ✖ W/m2

Ambient Temperature: ✖ ^{0}C

Wind Velocity: ✖ m/s

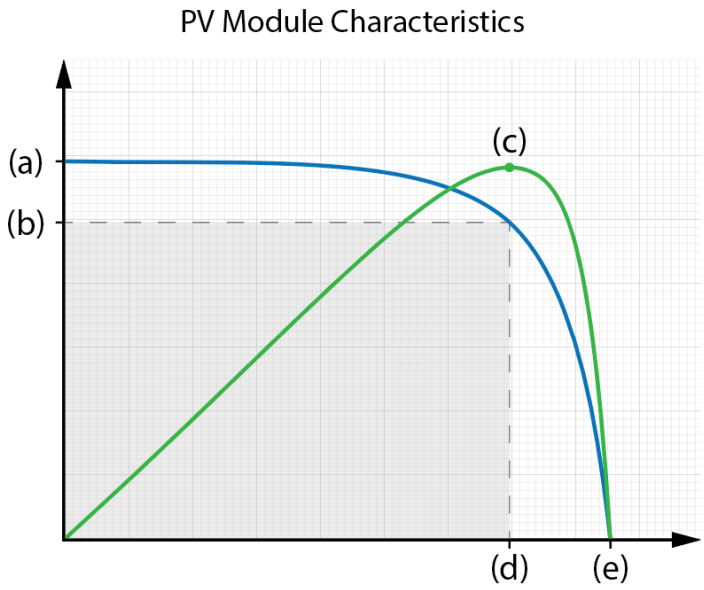
The Nominal Operating Cell Temperature (NOCT) is the temperature reached by a PV cell under an irradiance of 800 W/m^2, an ambient temperature of 20^{0}C and with a wind velocity of 1 m/s.

Refer to content page 2.2 for further guidance.

Question 4

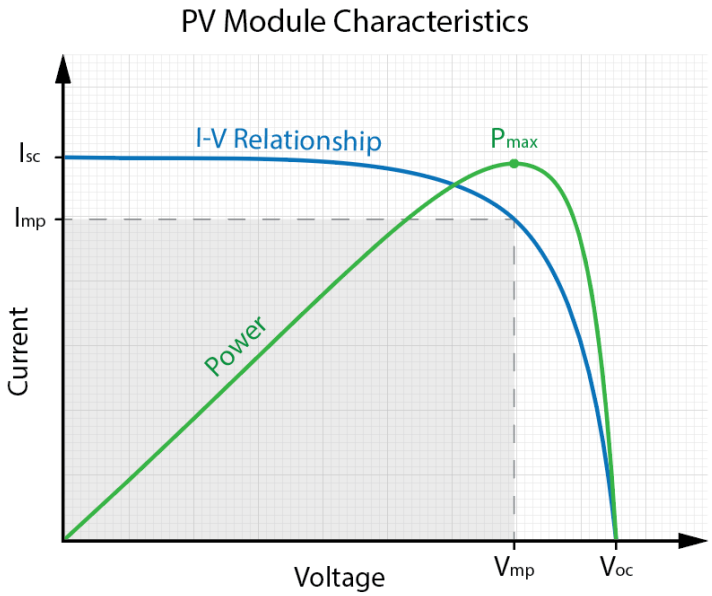
Not answered

Marked out of 6.00



Identify the various parts of the PV cell characteristic curves pictured above.

- (a) indicates the ✖ .
- (b) indicates the ✖ .
- (c) indicates the ✖ .
- (d) indicates the ✖ .
- (e) indicates the ✖ .
- The area of the graph coloured in grey represents the ✖ .

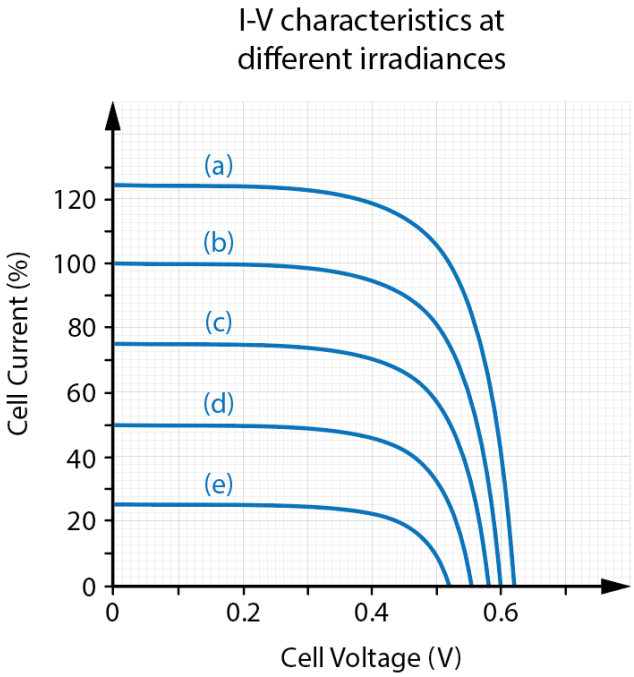


Refer to content page 2.2 for further guidance.

Question 5

Not answered

Marked out of 5.00



Match the irradiances provided to the curves on the graph above to correctly indicate the relationship between irradiance and cell performance.

Curve (c) Choose...

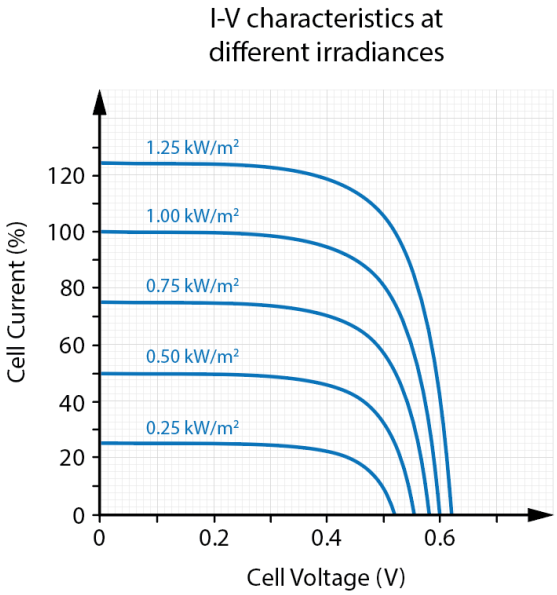
Curve (b) Choose...

Curve (d) Choose...

Curve (a) Choose...

Curve (e) Choose...

Your answer is incorrect.



A decrease in the irradiance arriving at a PV module will result in a decrease in output current, and vice versa.

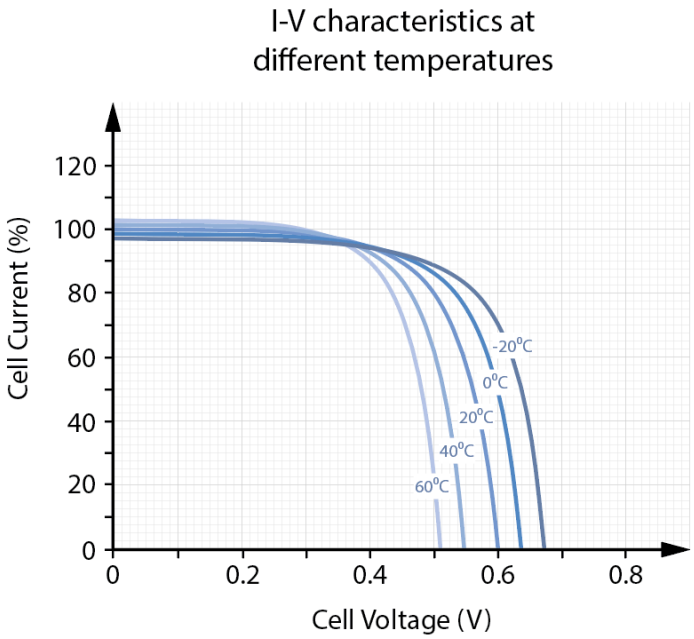
Refer to content page 2.2 for further guidance.

The correct answer is: Curve (c) → 0.75 kW/m2, Curve (b) → 1.00 kW/m2, Curve (d) → 0.50 kW/m2, Curve (a) → 1.25 kW/m2, Curve (e) → 0.25 kW/m2

Question 6

Not answered

Marked out of 1.00



The curve pictured above show that as the temperature of a PV cell increases, the power output of the cell ✖ .

Refer to content page 2.2

Question 7

Not answered

Marked out of 7.00

Identify each of the following ratings from the descriptions provided.

Indicates the voltage under open circuit conditions.	Choose...
Indicates the physical size of the panel.	Choose...
Indicates the maximum power output of the module.	Choose...
Indicates the current under short circuit conditions.	Choose...
Indicates how heavy the panel is.	Choose...
Indicates the module voltage at optimal performance.	Choose...
Indicates the module current at optimal performance.	Choose...

Your answer is incorrect.

Refer to content page 2.2

The correct answer is: Indicates the voltage under open circuit conditions. → Voc, Indicates the physical size of the panel. → Dimensions, Indicates the maximum power output of the module. → Pmax, Indicates the current under short circuit conditions. → Isc, Indicates how heavy the panel is. → Weight, Indicates the module voltage at optimal performance. → Vmp, Indicates the module current at optimal performance. → Imp

Question 8

Not answered

Marked out of 3.00

Consider that a PV module has the following ratings:

P_{max}	180 W
V_{mp}	32 V
I_{mp}	5.7 A
Temp. coefficient of P_{max}	-0.45%/^{0}C

Based on the temperature coefficient provided (i.e. neglecting all other factors), determine the power output of the PV module when operating at:

- 25^{0}C
- 40^{0}C
- 60^{0}C

Provide your answers in the units indicated, correct to three significant figures.

Power Output at 25^{0}C: ✖ W

Power Output at 40^{0}C: ✖ W

Power Output at 60^{0}C: ✖ W

Power Output at 25^{0}C

25 – 25 = 0^{0}C

Operating at STC temperature so no change in power output

Power Output at 40^{0}C

40 – 25 = 15^{0}C above STC

15 x -0.45 = -6.75%

-0.0675 x 180 = 12.15 W

180 – 12.15 = 167.85 = 168 W

Power Output at 60^{0}C

60 – 25 = 35^{0}C above STC

35 x -0.45 = -15.75%

-0.1575 x 180 = 28.35 W

180 – 28.35 = 151.65 = 152 W

Refer to content page 2.2 for further guidance.

Started on	Tuesday, 25 March 2025, 5:33 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:33 PM
Time taken	8 secs
Grade	**0.00** out of 16.00 (**0**%)

Question 1

Not answered

Marked out of 1.00

Which of the following types of building elements are commonly available as BIPV products?

a. Roof tiles
b. Skylights
c. All of these
d. Windows

Your answer is incorrect.

Refer to content page 3.3

The correct answer is: All of these

Question 2

Not answered

Marked out of 1.00

Which of the following control measures will reduce the risk of occupational overuse syndrome (OOS) associated with computer usage?

a. Having a safety observer
b. Wearing safety glasses and a hi-vis vest
c. Wearing gloves
d. Taking breaks and stretching regularly

Refer to content page 3.3.

The correct answer is: Taking breaks and stretching regularly

Question 3

Not answered

Marked out of 1.00

According to AS/NZS 5033:2021, the d.c. cables used for low voltage PV array cabling should:

a. have flexible conductors with a minimum c.s.a of 4 mm^2
b. be V90 TPS with a minimum c.s.a of 10 mm^2
c. be solid-core X-90 SDI with a minimum c.s.a of 6 mm^2
d. be fixed in position using PVC cable ties where the cables are accessible

Refer to AS/NZS 5033:2021 Clauses 4.4.2.1 (d) and 4.4.2.3

The correct answer is: have flexible conductors with a minimum c.s.a of 4 mm^2

Question 4

Not answered

Marked out of 1.00

Which of the following types of building elements are commonly available as BIPV products?

a. Footings
b. Roofing material
c. All of these
d. Plasterboard

Your answer is incorrect.

Refer to content page 3.3

The correct answer is: Roofing material

Question 5

Not answered

Marked out of 1.00

Module Specifications			
P_{MPP}	175 W		
V_{MPP}	35.4 V	V_{oc}	44.5 V
I_{MPP}	4.9 A	I_{sc}	5.5 A

A customer has specified the use of the modules detailed above to produce a 4.9 kW PV array at their domestic residence, with a maximum d.c. voltage of less than 600 V.

Which of the following arrangements complies with customer and regulatory requirements?

a. 2 strings, each consisting of 13 modules
b. 2 strings, each consisting of 14 modules
c. 4 strings, each consisting of 7 modules
d. 4 strings, each consisting of 5 modules

Your answer is incorrect.

4900 / 175 = 28 modules required for the array.

Only the arrangement of 4 x 7 module strings provides the required array power, and results in a maximum array voltage of less than 600 V.

Refer to content page 3.1 for further guidance.

The correct answer is: 4 strings, each consisting of 7 modules

Question 6

Not answered

Marked out of 1.00

Which of the following is the most suitable method of preventing shading and soiling of PV arrays caused by vegetation?

a. Regular pruning
b. Relocation of the array
c. Installation of a barrier
d. Use of netting

Regular control of vegetation by pruning will reduce shading and soiling of an array.
Placing netting around vegetation may prevent some soiling but will not reduce shading.
Installation of a barrier may increase shading rather than reduce it.
Relocation of an array is not typically practical.
Refer to content page 3.2 for more information.

The correct answer is: Regular pruning

Question 7

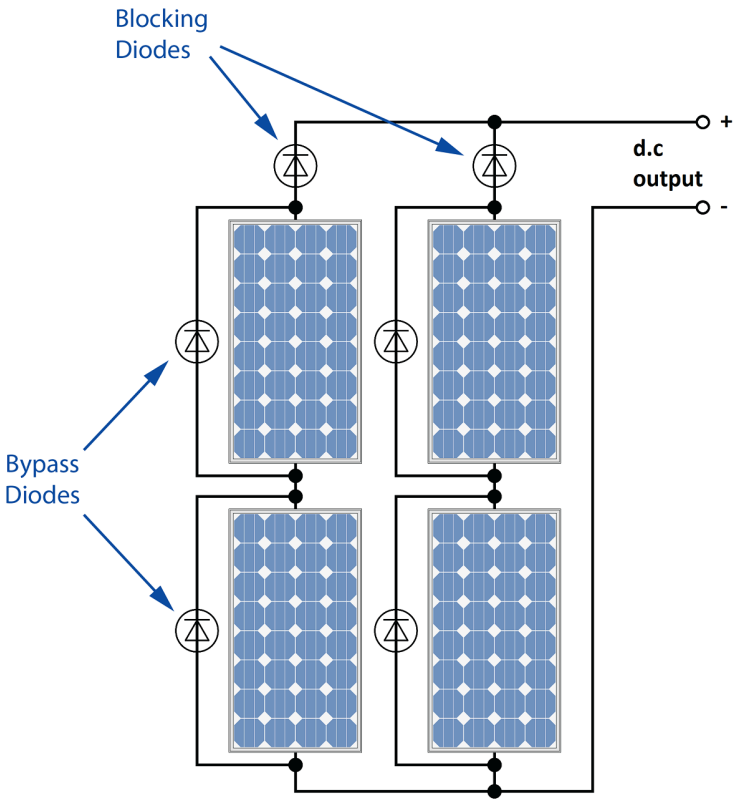
Not answered

Marked out of 1.00

How are bypass diodes connected in a PV array?

a. In series with series connected modules
b. In series with parallel connected strings
c. In parallel with parallel connected strings
d. In parallel with series connected modules

Your answer is incorrect.



Refer to content page 3.1 for further guidance.

The correct answer is: In parallel with series connected modules

Question 8

Not answered

Marked out of 1.00

Having a poor posture whilst using a computer increases the risk of:

a. respiratory damage
b. muscle strains
c. cuts and other flesh wounds
d. trips and falls

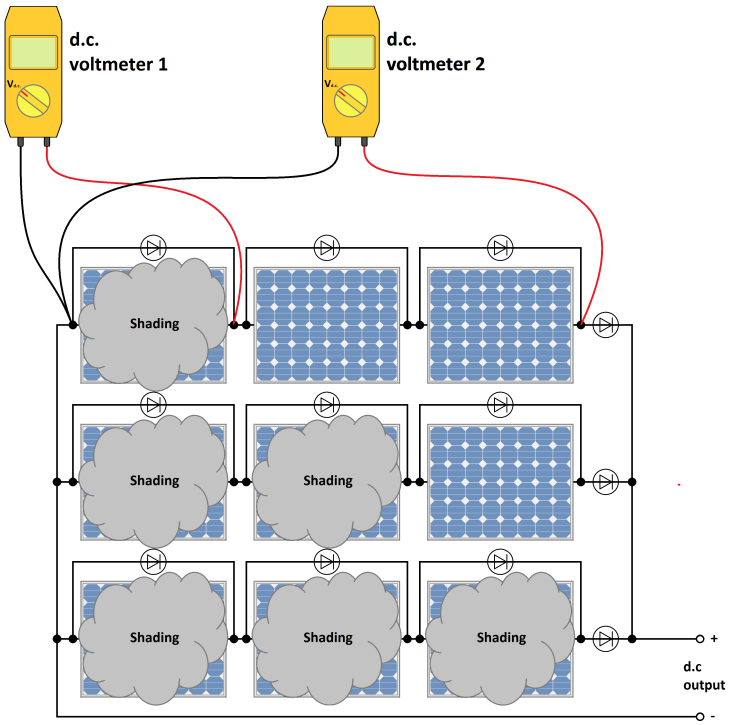
Refer to content page 3.3.

The correct answer is: muscle strains

Question 9

Not answered

Marked out of 1.00



The PV array pictured above has a nominal array voltage of 72 V d.c. and a maximum output power of 1.9 kW. As a result of the shading indicated, the d.c. voltmeters 1 and 2 will read:

a. 0 V and 16 V respectively
b. 24 V and 72 V respectively
c. 0 V and 24 V respectively
d. 0 V and 48 V respectively

Your answer is incorrect.

The shaded module will be bypassed and no voltage will be measured across it.
If the array voltage is 72 V, this means that the voltage of each module is 24 V.
Due to one module being bypassed, the string voltage is reduced to two modules in series. 24 V + 24 V = 48 V.
Refer to content page 3.1 for further guidance.

The correct answer is: 0 V and 48 V respectively

Question 10

Not answered

Marked out of 1.00

According to AS/NZS 5033:2021, where the d.c. cabling running from the PV array to the GC inverter is installed in a ceiling cavity, the cabling shall:

a. All of these are correct
b. be securely fastened to the building structure using PVC cable ties
c. be enclosed in a metal or heavy-duty insulating conduit
d. have a temperature rating of no less than 110^{o}C

Refer to AS/NZS 5033:2021 Clause 4.4.5.2.2

The correct answer is: be enclosed in a metal or heavy-duty insulating conduit

Question 11

Not answered

Marked out of 1.00

Module Specifications			
$\mathbf{V_{MPP}}$	34.3 V	$\mathbf{V_{oc}}$	43.7 V
$\mathbf{I_{MPP}}$	4.8 A	$\mathbf{I_{sc}}$	5.4 A

A customer has specified the use of the modules detailed above to produce a 3.3 kW PV array with a nominal operating voltage of approximately 170 V.

What is the minimum number of modules required to create the array?

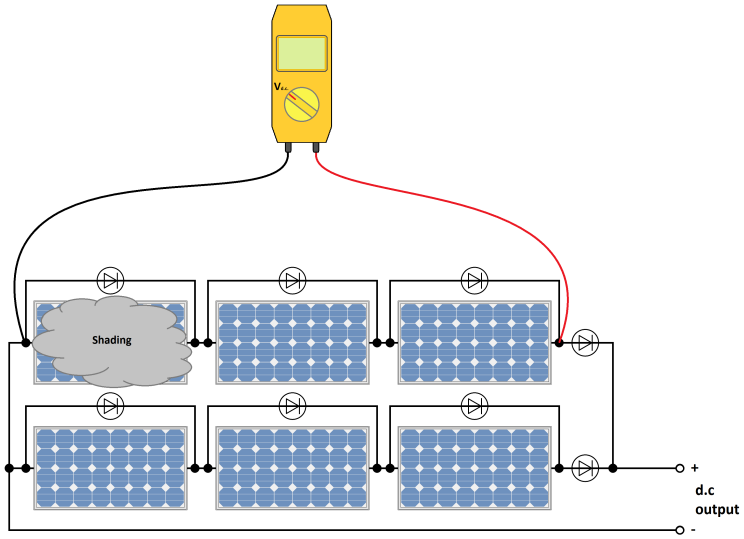
Answer: ✖ Modules

170 / 34.3 = 4.96 Therefore five modules are required in each series string. 3300 / 170 = 19.4 A 19.4 / 4.8 = 4
Therefore four strings are required to produce the required power at an array voltage of 170 V. 5 x 4 = 20
Therefore twenty modules are required in total.
Refer to content page 3.1 for further guidance.

Question 12

Not answered

Marked out of 1.00



The PV array pictured above has a nominal array voltage of 48 V d.c. Due to the shading indicated, the d.c. voltmeter will read:

a. 32 V d.c.
b. 24 V d.c.
c. 48 V d.c.
d. 16 V d.c.

Your answer is incorrect.

(48/3) x 2 = 32 V
Refer to content page 3.1 for further guidance.

The correct answer is: 32 V d.c.

Question 13

Not answered

Marked out of 1.00

Trees growing in close proximity to PV arrays can cause:

a. all of these
b. reduced energy yield
c. soiling
d. shading

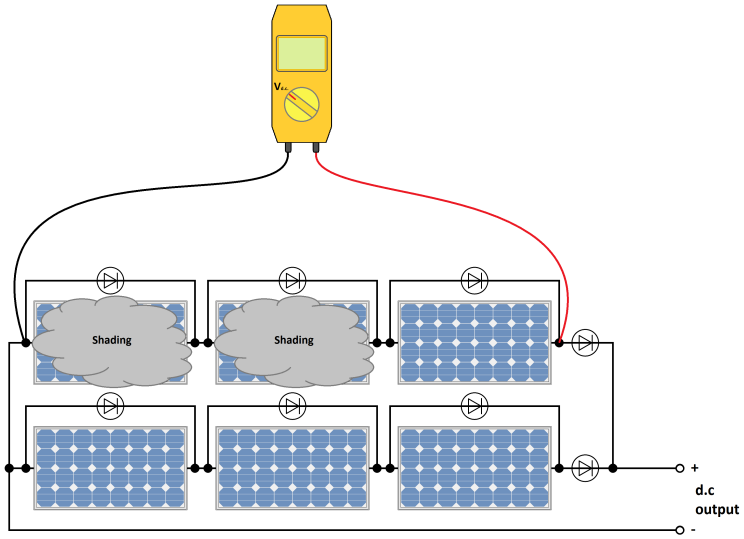
Refer to content page 3.2

The correct answer is: all of these

Question 14

Not answered

Marked out of 1.00



The PV array pictured above has a nominal array voltage of 48 V d.c. Due to the shading indicated, the d.c. voltmeter will read:

a. 24 V d.c.
b. 16 V d.c.
c. 48 V d.c.
d. 32 V d.c.

Your answer is incorrect.

(48/3) x 1 = 16 V Refer to content page 3.1 for further guidance.

The correct answer is: 16 V d.c.

Question 15

Not answered

Marked out of 1.00

A low voltage PV array consisting of two parallel strings:

a. must not be installed within 1.5 m of the PCE
b. must not have a maximum d.c. voltage exceeding 250 V
c. requires a roof-top load break disconnector
d. does not require a roof-top load break disconnector

Refer to AS/NZS 5033:2021 Figure 4.2

The correct answer is: does not require a roof-top load break disconnector

Question 16

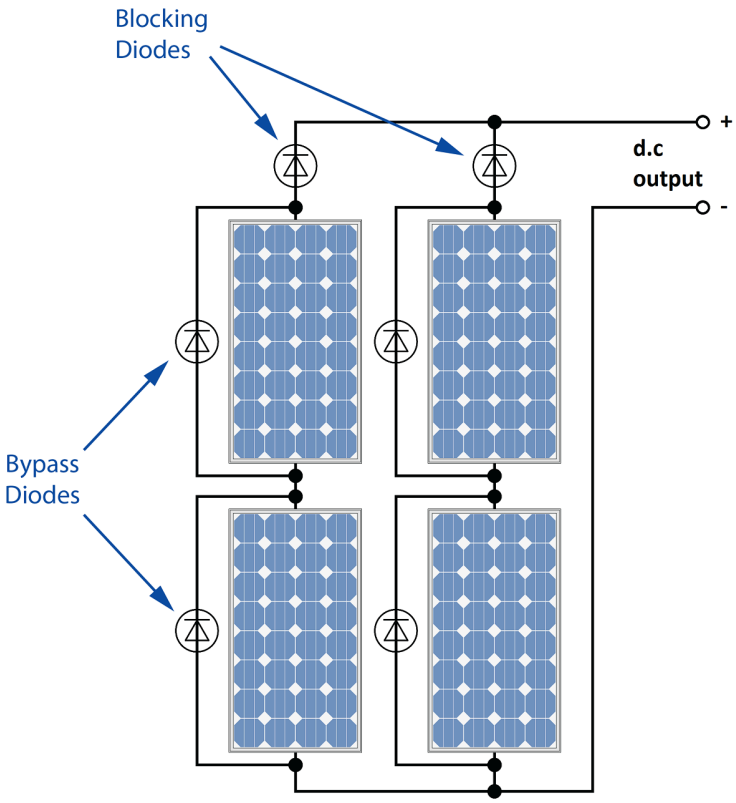
Not answered

Marked out of 1.00

How are blocking diodes connected in a PV array?

a. None of these
b. In parallel with series connected modules
c. In parallel with parallel connected strings
d. In series with parallel connected strings

Your answer is incorrect.



Refer to content page 3.1 for further guidance.

The correct answer is: In series with parallel connected strings

Started on	Tuesday, 25 March 2025, 5:38 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:38 PM
Time taken	9 secs
Grade	**0.00** out of 24.00 (**0**%)

Question 1

Not answered

Marked out of 4.00

Connecting PV modules in series increases the output ✖ , whilst the output ✖ remains the same.

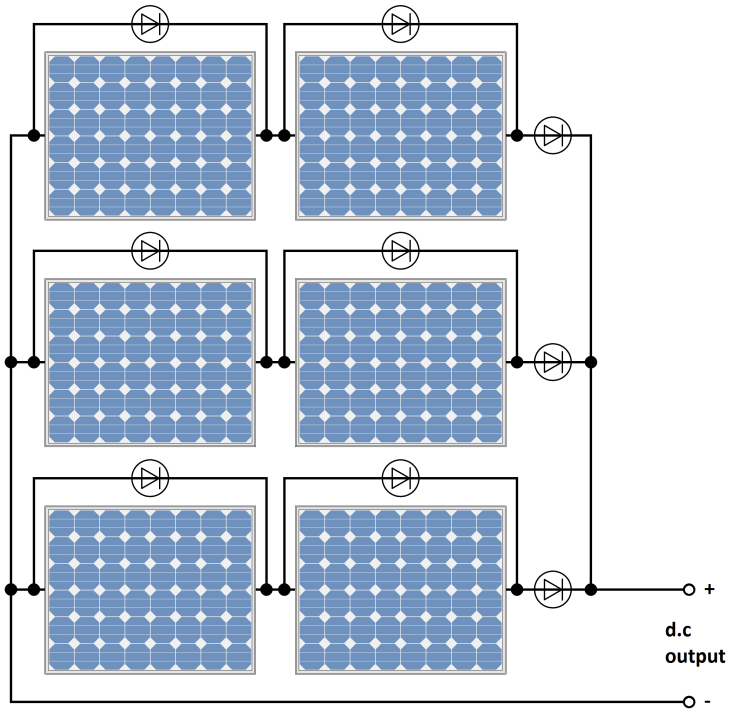
Connecting PV modules in parallel increases the output ✖ , whilst the output ✖ remains the same.

Refer to content page 3.1

Question 2

Not answered

Marked out of 6.00



The PV array pictured above has [ ] strings, each consisting of [ ] modules.

A bypass diode is connected in [ ] with each [ ] , and a blocking diode is connected in [ ] with each [ ] .

Refer to content page 3.1

Question 3

Not answered

Marked out of 3.00

Module Specifications			
P_{MPP}	175 W		
V_{MPP}	36.5 V	V_{oc}	44.3 V
I_{MPP}	4.8 A	I_{sc}	5.6 A

A commercial customer has specified the use of the modules detailed above to produce a 7 kW PV array.

The maximum array voltage must not exceed 400 V, and the maximum current must not exceed 30 A.

Identify the minimum number of modules, and the arrangement required to produce the array.

Number of Modules: ✖

Number of Strings: ✖

Modules in each String: ✖

7000 / 175 = 40 modules

400 / 44.3 = 9 max modules per string

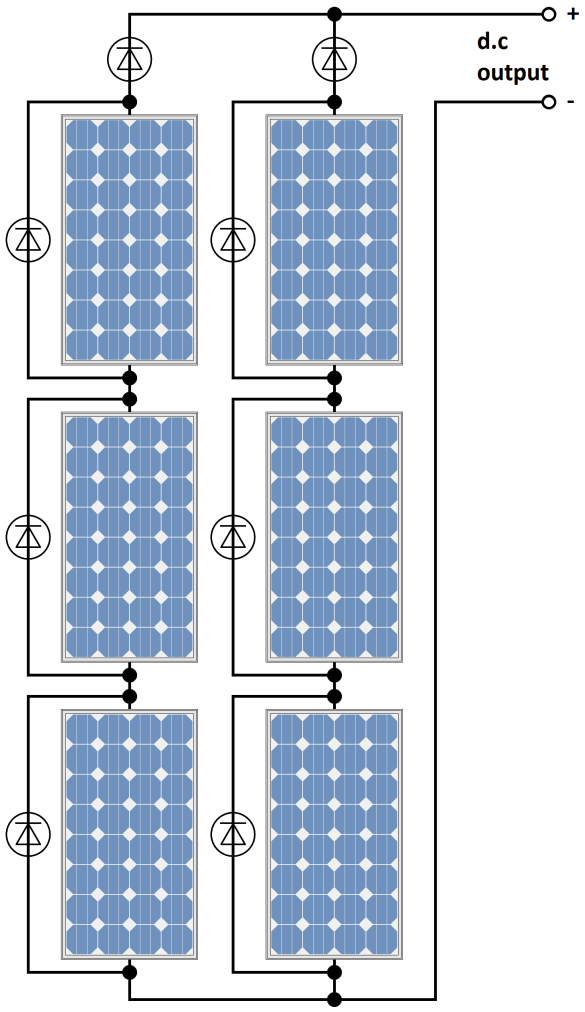
30 / 5.6 = 5.4 max number of strings

Therefore the only acceptable arrangement is to have 5 strings, each consisting of 8 modules.
Refer to content page 3.1 for further guidance.

Question 4

Not answered

Marked out of 4.00



Each module in array pictured above has the following ratings:

V_{MPP}	24 V
I_{MPP}	5 A
V_{oc}	29.1 V
I_{sc}	5.8 A

Operating Parameters

What are the rated MPP voltage, current and power values for the array (neglecting de-rating)?

- Array MPP Output Voltage: ✖ V
- Array MPP Output Current: ✖ A
- Array MPP Output Power: ✖ W

If one module becomes shaded, the output voltage of the associated string will drop to ✖ volts.

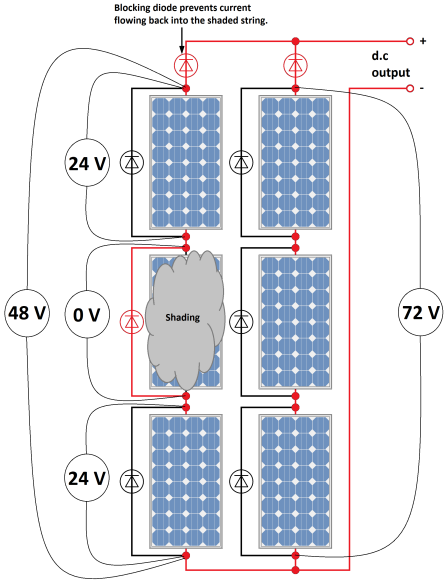
Three modules per string:

24 x 3 = 72 V

Two strings connected in parallel:

5 x 2 = 10 A

Maximum power = V_{MP} x I_{MP}

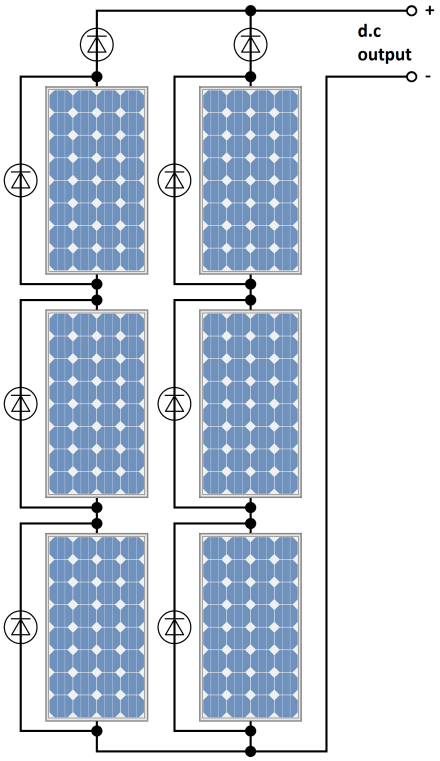


Refer to content page 3.1 for further guidance.

Question 5

Not answered

Marked out of 4.00



Each module in the array pictured above has the following ratings:

- Power: 192 W
- Voltage: 32 V d.c.
- Current: 6 A d.c.

Determine the following PV array operating parameters, correct to three significant figures:

- Total Power: ✖ kW
- Total Voltage: ✖ V
- Total Current: ✖ A

If one module becomes shaded, the output voltage of the associated string will drop to ✖ volts.

Three modules per string:

32 x 3 = 96 V

Two strings connected in parallel:

6 x 2 = 12 A

P = VI

96 x 12 = 1152 W = 1.15 kW

Or

Total power equals the sum of the power ratings of each module:

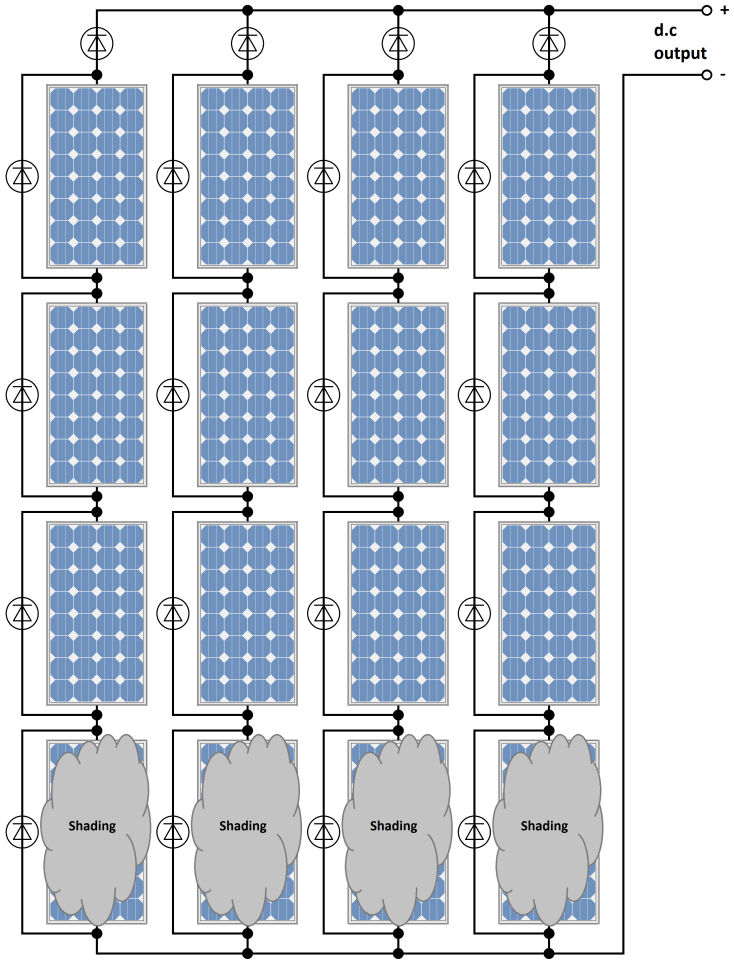
192 + 192 + 192 + 192 + 192 + 192 = 1152 W = 1.15 kW

Refer to content page 3.1 for further guidance.

Question 6

Not answered

Marked out of 3.00



Each module in the array pictured above has the following ratings:

V_{MPP}	16.1 V
I_{MPP}	5.2 A
V_{oc}	19.7 V
I_{sc}	5.9 A

Determine the output values of the array when it becomes shaded as indicated above.

Provide your answers to three significant figures.

- MPP Output Voltage: ✖ V
- MPP Output Current: ✖ A
- MPP Output Power: ✖ W

Shading results in each of the shaded modules being bypassed.

V_{MPP} = 16.1 x 3 = 48.3 V

I_{MPP} = 5.2 x 4 = 20.8 A

P_{MPP} = 48.3 x 20.8 = 1004.6 W

Started on	Tuesday, 25 March 2025, 5:38 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:38 PM
Time taken	7 secs
Marks	0.00/13.00
Grade	**0.00** out of 19.00 (**0**%)

Question 1

Not answered

Marked out of 3.00

Which of the following factors will directly affect the energy output of a fixed PV array?

- a. Aesthetics
- b. Tilt angle
- c. Shading
- d. Cloud cover
- e. Orientation

The orientation and tilt angle will affect the irradiance of the modules due to the solar window at the given latitude.
Shading and cloud cover will reduce the amount of direct incident radiation reaching the panels.
The aesthetic appearance of the panels will not affect the energy output.
Refer to content page 3.2 for more information.

The correct answers are: Orientation, Tilt angle, Cloud cover, Shading

Question 2

Not answered

Marked out of 7.00

Trees growing near PV arrays can cause ✖ of the array, resulting in ✖ energy yield.

Where vegetation exists near a PV array, ✖ may be required.

This can be achieved from the ground using ✖ or from elevated work platforms (EWPs) such as ✖ .

Refer to content page 3.2.

Question 3

Not answered

Marked out of 3.00

Grid-connect inverters should be installed ✖ .

The route length of d.c. cabling between the array and the inverter should be kept as ✖ as possible, as this will reduce ✖

Refer to content page 3.2

Started on	Tuesday, 25 March 2025, 5:38 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:38 PM
Time taken	8 secs
Grade	**0.00** out of 19.00 (**0**%)

Question 1

Not answered

Marked out of 3.00

Which of the following factors will affect the size of a PV array for a given installation?

- a. The initial cost and payback period
- b. The desired energy yield
- c. The latitude of the installation
- d. The type of mounting system
- e. The available roof space

Your answer is incorrect.

Refer to content page 3.2

The correct answers are: The desired energy yield, The available roof space, The initial cost and payback period

Question 2

Not answered

Marked out of 7.00

Which of the following types of building elements are currently available as BIPV products?

- a. Roof tiles and shingles
- b. Windows and skylights
- c. Facades
- d. Spandrel glass
- e. Curtain walls
- f. Awnings
- g. Flooring tiles
- h. Strip footings

Your answer is incorrect.

Refer to content page 3.2

The correct answers are: Roof tiles and shingles, Awnings, Windows and skylights, Spandrel glass, Facades, Curtain walls, Flooring tiles

Question 3

Not answered

Marked out of 3.00

In relation to computer-related health and safety hazards:

- Bad posture can result in ✖ .
- Poor lighting can result in ✖ .
- Repetitive movements can result in ✖ .

Refer to content page 3.2

Question 4

Not answered

Marked out of 1.00

(a) (b) (c) (d)

Which worker, pictured above, has the most suitable posture for using a computer?

- (c)
- (d)
- (a)
- (b)

Your answer is incorrect.

Refer to content page 3.2

The correct answer is:
(a)

Question 5

Not answered

Marked out of 5.00

When using a computer, your chair, desk and computer should be arranged so that when you are working:

- You [ ] ✖ twist your body in order to use the computer.
- Your elbows are bent at roughly [ ] ✖ .
- Your forearms are parallel with the [ ] ✖ .
- Your wrists are [ ] ✖ .
- Your shoulders are [ ] ✖ .

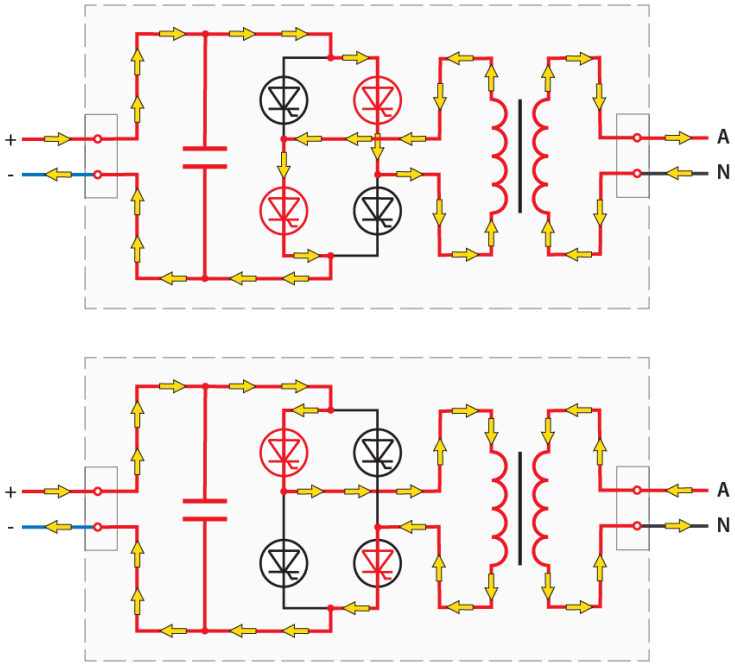
Refer to content page 3.2

Started on	Tuesday, 25 March 2025, 5:34 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:34 PM
Time taken	7 secs
Grade	**0.00** out of 8.00 (**0**%)

Question 1

Not answered

Marked out of 1.00



The diagrams above show the switching of current in:

a. an analogue inverter
b. a full-bridge inverter
c. a half-bridge inverter
d. none of these

Your answer is incorrect.

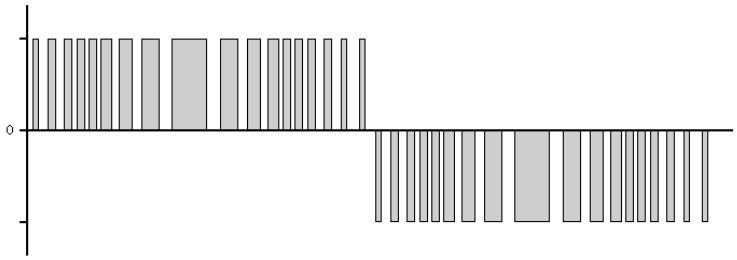
Refer to content page 4.2

The correct answer is: a full-bridge inverter

Question 2

Not answered

Marked out of 1.00



The waveform pictured above is produced by:

a. varying the amplitude of the inverter bridge triggering pulses
b. connecting an autotransformer in series parallel across the inverter output
c. connecting an L-C resonant branch across the inverter output
d. varying the durations of the inverter bridge triggering pulses

Your answer is incorrect.

Refer to content page 4.2

The correct answer is: varying the durations of the inverter bridge triggering pulses

Question 3

Not answered

Marked out of 1.00

Two types of inverters that are suitable for use in grid-connected applications are:

a. string inverters and standalone inverters
b. power inverters and standalone inverters
c. micro-inverters and power inverters
d. string inverters and micro-inverters

Your answer is incorrect.

Inverters used in grid-connected applications must comply with AS/NZS 4777.2.
Refer to content page 4.1 for more information.

The correct answer is: string inverters and micro-inverters

Question 4

Not answered

Marked out of 1.00

A field effect transistor (FET) is a type of:

a. voltage-controlled transistor
b. current controlled transistor
c. silicon-controlled rectifier
d. Triac

Your answer is incorrect.

Refer to content page 4.2

The correct answer is: voltage-controlled transistor

Question 5

Not answered

Marked out of 1.00

The type of inverter that is typically mounted on or adjacent to a PV module is a:

a. micro-inverter
b. string inverter
c. standalone inverter
d. power inverter

Your answer is incorrect.

Refer to content page 4.1

The correct answer is: micro-inverter

Question 6

Not answered

Marked out of 1.00

When compared to a central inverter system, an advantage of a micro-inverter system is:

a. low cost
b. reduced maintenance
c. increased reliability
d. all of these

Your answer is incorrect.

Micro-inverter systems are initially more expensive than central string inverter systems, and result in increased and more difficult maintenance due to multiple units and roof mounting.
The benefit of having multiple units is increased reliability, and individual MPPT for each module/pair of modules.
Refer to content page 4.1 for more information.

The correct answer is: increased reliability

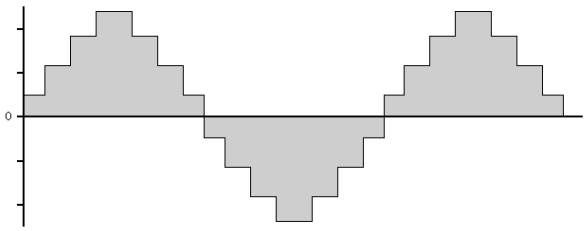
Question 7

Not answered

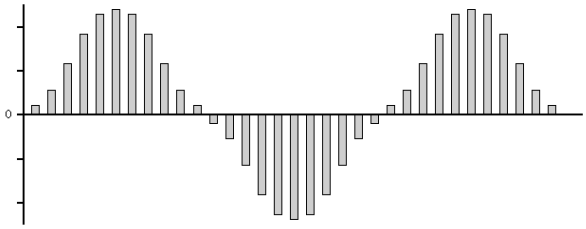
Marked out of 1.00

Which of the following is a PWM output waveform?

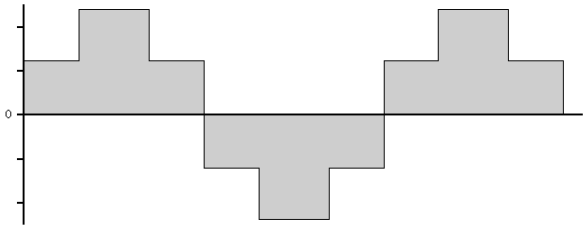
a.



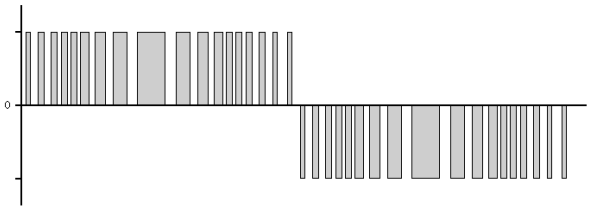
b.



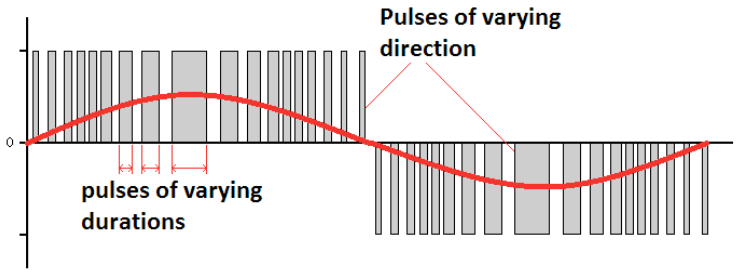
c.



d.

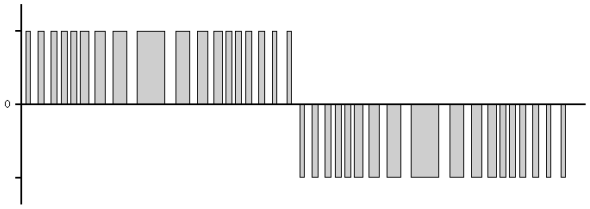


Your answer is incorrect.



In pulse width modulation, a pattern of triggering pulses that are varied in duration and direction, are sent to the SCRs, to produce a resultant true sine waveform. Refer to content page 4.2 for more information.

The correct answer is:



Question 8

Not answered

Marked out of 1.00

When compared to a central inverter system, an advantage of a micro-inverter system is:

a. increased efficiency
b. All of these
c. module level MPPT
d. reduced d.c. cabling

Your answer is incorrect.

Advantages of a micro-inverter systems include reduced d.c. cabling, increased efficiency, increased reliability, the effects of partial shading or soiling are limited to the affected module, module level MPPT and monitoring, and modules with in-built micro-inverters reduce installation time. Refer to content page 4.1 for more information.

The correct answer is: All of these

Started on	Tuesday, 25 March 2025, 5:39 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:39 PM
Time taken	9 secs
Grade	**0.00** out of 12.00 (**0**%)

Question 1

Not answered

Marked out of 2.00

An inverter is a device that converts ____ ✖ input into ____ ✖ output.

Refer to content page 4.1

Question 2

Not answered

Marked out of 1.00

Any inverter is suitable for connection to the supply network, provided the inverter output is rated at a minimum of 230/400 V. ____ ✖

Inverters used in grid-connected applications must comply with AS/NZS 4777.2:2020. Refer to content page 4.1 for more information.

Question 3

Not answered

Marked out of 3.00

Match the type of inverter to the description given in the right hand column.

An ELV inverter that is limited to the connection of a maximum of two modules, and is mounted directly adjacent to the array.	Choose...
The most commonly used inverter in domestic grid-connected PV installations, capable of being connected to several modules/strings.	Choose...
An inverter having a fixed output voltage and frequency, which is therefore not suitable for grid-connected applications.	Choose...

Your answer is incorrect.

Refer to content page 4.1

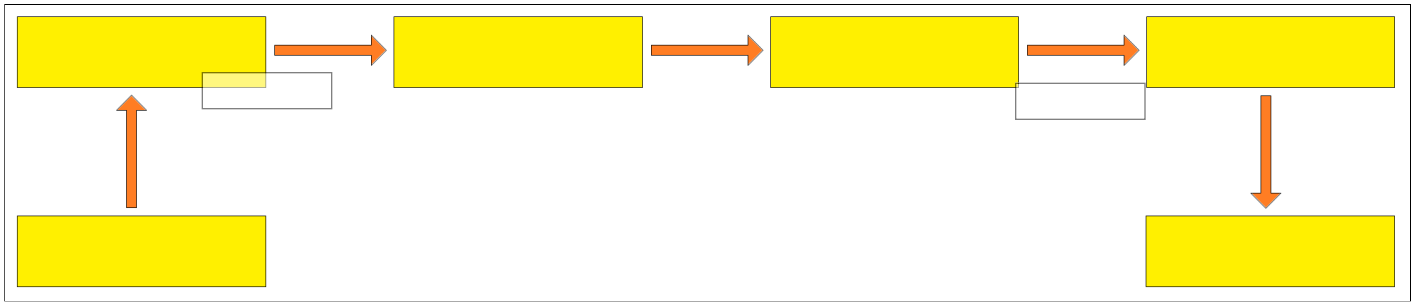
The correct answer is: An ELV inverter that is limited to the connection of a maximum of two modules, and is mounted directly adjacent to the array. → Micro-inverter, The most commonly used inverter in domestic grid-connected PV installations, capable of being connected to several modules/strings. → String inverter, An inverter having a fixed output voltage and frequency, which is therefore not suitable for grid-connected applications. → Standalone inverter

Question 4

Not answered

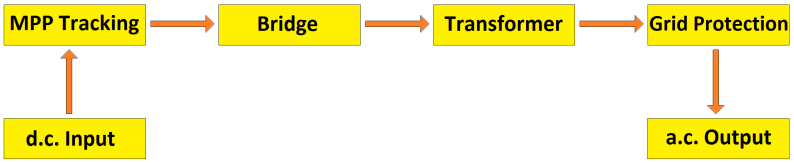
Marked out of 6.00

Drag and drop the inverter components to produce a block diagram of a GC inverter.



MPP Tracking | Grid Protection | Bridge | d.c. Input | Transformer | a.c. Output

Your answer is incorrect.



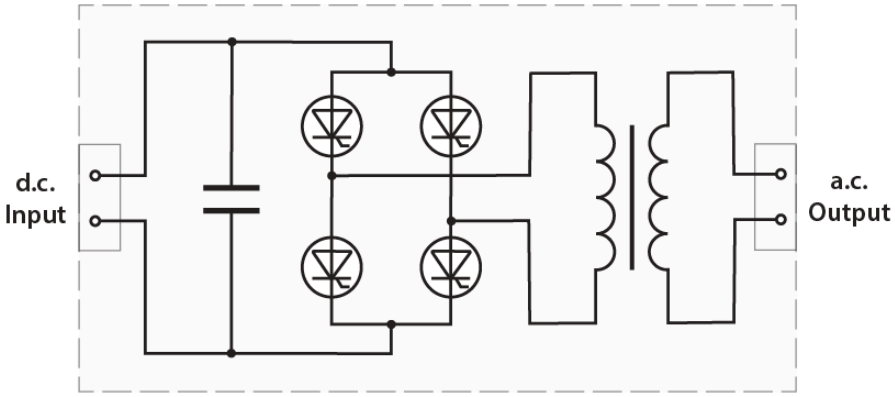
Refer to content page 4.1 for further guidance.

Started on	Tuesday, 25 March 2025, 5:39 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:39 PM
Time taken	8 secs
Grade	**0.00** out of 7.00 (**0**%)

Question 1

Not answered

Marked out of 3.00



The diagram above illustrates a simple inverter [ ] ✖ .

The inverter has two pairs of [ ] ✖ that are switched alternately, producing a [ ] ✖ at the transformer primary winding.

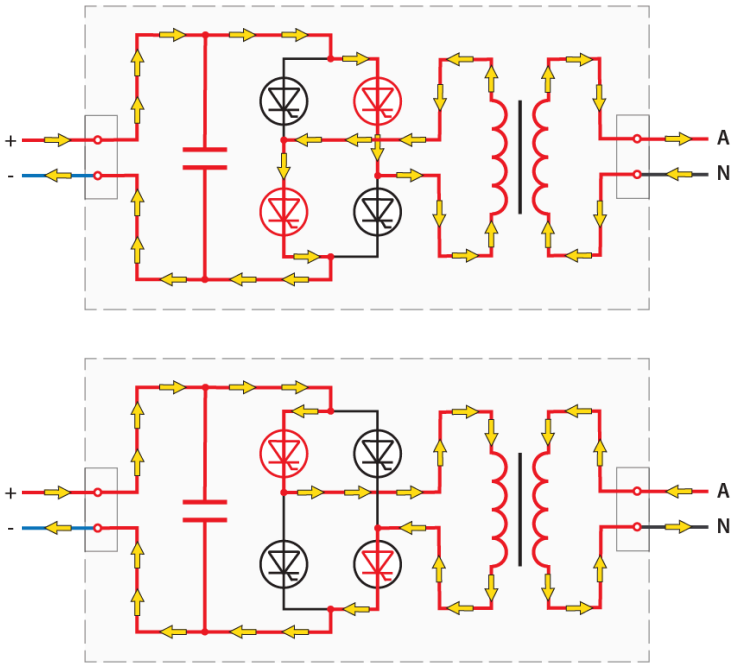
The alternating flux established in the transformer produces a [ ] ✖ at the inverter output.

Refer to content page 4.2

Question 2

Not answered

Marked out of 2.00



The diagrams above show the flow of current during inverter bridge switching.

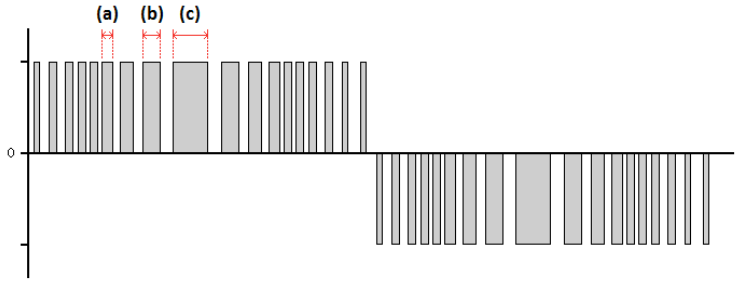
In order to produce a 50 Hz waveform, the [ ] ✖ pairs must switch the current [ ] ✖ times per second.

The direction of current flow changes twice during a single cycle, therefore the direction of current flow will change 100 times per second for a 50 Hz waveform. Refer to content page 4.2 for more information.

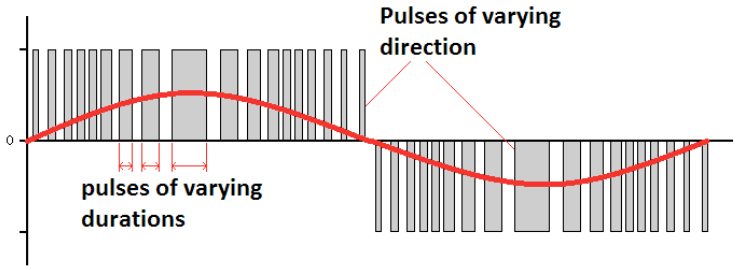
Question 3

Not answered

Marked out of 2.00



Values (a), (b) and (c) on the [ ] ✖ waveform diagram above, indicate variations in the [ ] ✖ of the trigger pulses.



In pulse width modulation, a pattern of triggering pulses that are varied in duration and direction, are sent to the SCRs, to produce a resultant true sine waveform. Refer to content page 5.1 for more information.

Started on	Tuesday, 25 March 2025, 5:34 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:34 PM
Time taken	8 secs
Grade	**0.00** out of 14.00 (**0**%)

Question 1

Not answered

Marked out of 1.00

A PV array consists of 9 modules connected as a single string. Each module has the following STC voltage characteristics:

- Nominal Voltage (V_{MPP}): 35.2 V.
- Open Circuit Voltage (V_{oc}): 43.8 V.
- Voltage Temperature Coefficient: -0.32%/^{0}C.

Determine the minimum and maximum nominal array voltages for an ambient temperature range of 0^{0}C to 45^{0}C.
Provide your answer in the units indicated, correctly rounded to three significant figures.

Array V_{MPP} @ 0^{0}C: ✖ V

Array V_{MPP} @ 45^{0}C: ✖ V

Array voltage at STC (25^{0}C)
35.2 x 9 = 316.8 V
Array voltage @ 0^{0}C
-0.32 x (0 – 25) = 8%
316.8 x 1.08 = 342.144 = 342 V
Array voltage @ 45^{0}C
-0.32 x (45 – 25) = -6.4%
316.8 x 0.936 = 296.5248 = 297 V

See worked example on content page 5.2 for further details.

Question 2

Not answered

Marked out of 1.00

Which of the following factors will affect the selection of a grid connected inverter?

a. The number of strings in the array

b. All of these are important factors

c. Whether the system incorporates batteries

d. The open-circuit voltage of the array

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: All of these are important factors

Question 3

Not answered

Marked out of 1.00

AS/NZS 4777.2:2020 requires that the THD for a grid-connected inverter must be:

a. less than 5%

b. greater than 5%

c. less than 2.5%

d. between 2.5% and 4.5%

Your answer is incorrect.

Refer to AS/NZS 4777.2:2020 Clause 2.7

The correct answer is: less than 5%

Question 4

Not answered

Marked out of 1.00

What does the surge rating of a GC inverter indicate?

a. The peak efficiency of the inverter
b. The maximum inrush current the inverter can withstand
c. The upper input and output voltage limits of the inverter
d. The peak inverter operating power

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: The maximum inrush current the inverter can withstand

Question 5

Not answered

Marked out of 1.00

A feature that distinguishes grid-connect inverters from standalone inverters is:

a. anti-islanding protection
b. a.c. transformation
c. d.c. boost
d. MPPT

Your answer is incorrect.

Refer to content page 5.1

The correct answer is: anti-islanding protection

Question 6

Not answered

Marked out of 1.00

A PV array consists of 21 modules connected as three strings of seven modules.
Each module has the following STC voltage characteristics:

- Nominal Voltage (V_{MPP}): 34.5 V.
- Open Circuit Voltage (V_{oc}): 42.3 V.
- Voltage Temperature Coefficient: -0.35%/^{0}C.

Determine the minimum and maximum nominal array voltages for an ambient temperature range of 4^{0}C to 52^{0}C.
Provide your answer in the units indicated, correctly rounded to three significant figures.

Array V_{MPP} @ 4^{0}C: ✖ V

Array V_{MPP} @ 52^{0}C: ✖ V

Array voltage at STC (25^{0}C)
34.5 x 7 = 241.5 V
Array voltage @ 6^{0}C
-0.35 x (4 – 25) = 7.35%
241.5 x 1.0735 = 259.25025 = 259 V
Array voltage @ 52^{0}C
-0.35 x (52 – 25) = -9.45%
241.5 x 0.9055 = 218.67825 = 219 V

See worked example on content page 5.2 for further guidance.

Question 7

Not answered

Marked out of 1.00

What is meant by the 'operating window' of a grid connected inverter?

a. The maximum power for continuous operation
b. The upper and lower d.c. input voltage limits
c. The MPP power rating of the inverter
d. The upper and lower a.c. output voltage limits

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: The upper and lower d.c. input voltage limits

Question 8

Not answered

Marked out of 1.00

Which of the following factors will affect the selection of a grid connected inverter?

a. The time of year
b. The latitude of the installation
c. The number of strings in the array
d. The mounting system of the array

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: The number of strings in the array

Question 9

Not answered

Marked out of 1.00

According to AS/NZS 4777.2:2020 what is the voltage transient limit for an instantaneous line to neutral voltage of 420 V?

a. 0.02 seconds
b. 0.0002 seconds
c. 0.002 seconds
d. 0.2 seconds

Your answer is incorrect.

Refer to AS/NZS 4777.2:2020 Clause 2.9 and Table 2.4

The correct answer is: 0.02 seconds

Question 10

Not answered

Marked out of 1.00

Which of the following ratings indicates the operating window of a GC inverter?

- a. Peak efficiency
- b. d.c. voltage range
- c. a.c. nominal voltage
- d. Surge rating

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: d.c. voltage range

Question 11

Not answered

Marked out of 1.00

Grid-connected inverters should be located in a position that is:

- a. well ventilated
- b. suitable for the inverter IP rating
- c. All of these
- d. readily accessible

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: All of these

Question 12

Not answered

Marked out of 1.00

Which rating defines the ability of an inverter to withstand the ingress of water and dust?

a. Continuous rating
b. Surge rating
c. IP rating
d. Half-hour rating

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: IP rating

Question 13

Not answered

Marked out of 1.00

The continuous rating of a GC inverter is measured in:

a. watts
b. amperes
c. seconds
d. volts

Your answer is incorrect.

The continuous rating defines the maximum power at which the inverter can operate continuously without overheating. Refer to content page 5.2 for more information.

The correct answer is: watts

Question 14

Not answered

Marked out of 1.00

The continuous rating of a GC inverter is measured in:

a. amperes
b. seconds
c. watts
d. volts

Your answer is incorrect.

The continuous rating defines the maximum power at which the inverter can operate continuously without overheating.
Refer to content page 5.2 for more information.

The correct answer is: watts

Started on	Tuesday, 25 March 2025, 5:40 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:40 PM
Time taken	8 secs
Grade	**0.00** out of 11.00 (**0**%)

Question 1

Not answered

Marked out of 2.00

Grid-connected inverters use [ ] ✖ to produce a true sine wave at the inverter [ ] ✖ terminals.

Refer to content page 5.1

Question 2

Not answered

Marked out of 4.00

Use AS/NZS 4777.2:2020 and AS/NZS 3000:2018 to correctly complete the following statements.

- Single phase grid-connected inverters should be rated for a phase to neutral voltage of [ ] ✖ V a.c. with a tolerance of + [ ] ✖ % / - [ ] ✖ %.
- AS/NZS 4777.2:2020 states that the total harmonic distortion (THD) of a grid-connected inverter, up to the 50th harmonic, must be less than [ ] ✖ %.

Refer to AS/NZS 4777.2:2020 Clauses 2.5 and 2.7, and AS/NZS 3000:2018 Clause 1.6.2 (c) Note (a)

Question 3

Not answered

Marked out of 4.00

The voltage limits for passive protection are:

- A voltage of ≤70 V must be disconnected within ✖ seconds.
- A voltage of ≤180 V must be disconnected within ✖ seconds.
- A voltage of ≥265 V must be disconnected within ✖ seconds.
- A voltage of ≥275 V must be disconnected within ✖ seconds.

Refer to content page 5.1

Question 4

Not answered

Marked out of 1.00

Additional features that distinguish GC inverters from standalone inverters include:

- a. A bridge
- b. Frequency synchronisation
- c. Anti-islanding protection
- d. The ability to convert d.c. to a.c.

Your answer is incorrect.

Refer to content page 5.1

The correct answers are: Anti-islanding protection, Frequency synchronisation

Started on	Tuesday, 25 March 2025, 5:40 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:40 PM
Time taken	9 secs
Grade	**0.00** out of 22.00 (**0**%)

Question 1

Not answered

Marked out of 7.00

Match each inverter rating to the inverter performance characteristic it describes.

The upper and lower output voltage limits.	Choose...
The maximum efficiency the inverter can achieve.	Choose...
The upper and lower input voltage limits.	Choose...
The ability of the inverter to withstand the ingress of water and dust.	Choose...
The maximum inrush current the inverter can withstand without damage.	Choose...
The maximum power at which the inverter can operate over a half hour period without overheating.	Choose...
The maximum power at which the inverter can operate continuously without overheating.	Choose...

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: The upper and lower output voltage limits. → a.c. voltage range, The maximum efficiency the inverter can achieve. → Peak efficiency, The upper and lower input voltage limits. → d.c. voltage range, The ability of the inverter to withstand the ingress of water and dust. → IP rating, The maximum inrush current the inverter can withstand without damage. → Surge rating, The maximum power at which the inverter can operate over a half hour period without overheating. → Half hour rating, The maximum power at which the inverter can operate continuously without overheating. → Continuous rating

Question 2

Not answered

Marked out of 3.00

The "operating window" of an inverter is the upper and lower [ ] ✖ voltage limits within which the inverter will operate.

If the [ ] ✖ voltage is outside of these limits, then the inverter [ ] ✖ will drop to zero.

Refer to content page 5.2

Question 3

Not answered

Marked out of 4.00

Input Parameters	
Max. d.c. power	3760 W
Max. d.c. voltage	500 V
d.c. voltage range	210 V – 410 V
Max. input current	22 A
MPP trackers	1
Max. number of strings	3
Output Parameters	
Nominal a.c. power	3250 W
Max. a.c. power	3640 W
Nominal a.c. voltage range	220 V – 240 V
Max. a.c. current	17 A
a.c. frequency / tol.	50 Hz / ±4 Hz
Power factor	1
Connection	Single phase
Efficiency	
Max Efficiency	95.7 %
Consumption: No Load / Standby	12 W / < 3.5 W
General	
International protection	IP66
Operating temperature range	-25 °C ... +60 °C
Dimensions (W x H x D)	400 x 600 x 240 mm
Weight	39 kg

Identify whether the following statements are true or false in relation to a GC inverter having the specifications above.

The inverter is suitable for the connection of a 3.2 kW array consisting of four 130 V strings.	✖
The inverter is suitable to operate continuously in an ambient temperature of 45 °C.	✖

The inverter specified is a micro-inverter.	✖
The array is suitable for the connection of an array with a short-circuit current of 20 A.	✖

Refer to content page 5.2

Question 4

Not answered

Marked out of 4.00

Identify how each of the following factors will affect the selection of a GC inverter.

Installation location for the inverter	Choose...
Array short circuit current	Choose...
Power output of the array	Choose...
Nominal array voltage	Choose...

Your answer is incorrect.

Refer to content page 5.2

The correct answer is: Installation location for the inverter → Required IP rating, Array short circuit current → Required inverter max input current rating, Power output of the array → Required inverter power rating, Nominal array voltage → Required inverter operating window

Question 5

Not answered

Marked out of 4.00

A PV array consists of 8 modules connected as a single string.

Each module has the following STC voltage characteristics:

- Nominal Voltage (V_{MPP}): 32 V
- Open Circuit Voltage (V_{oc}): 40.8 V
- Voltage Temperature Coefficient: -0.37%/^{0}C

Determine the minimum and maximum nominal array voltages for an ambient temperature range of 6^{0}C to 46^{0}C.
Provide your answer in the units indicated, correctly rounded to three significant figures.

Array V_{MPP} @ 6^{0}C: ✖ V

Array V_{MPP} @ 46^{0}C: ✖ V

Array voltage at STC (25^{0}C)

32 x 8 = 256 V

Array voltage @ 6^{0}C

-0.37 x (6 – 25) = 7.03%

256 x 1.0703 = 273.9968 = 274 V

Array voltage @ 46^{0}C

-0.37 x (46 – 25) = -7.77%

256 x 0.9223 = 236.1088 = 236 V

See worked example on content page 5.2 for further guidance.

Started on	Tuesday, 25 March 2025, 5:34 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:35 PM
Time taken	8 secs
Grade	**0.00** out of 20.00 (**0**%)

Question 1

Not answered

Marked out of 1.00

The d.c. cables used for low voltage PV array cabling should be:

a. fixed in position using PVC cable ties where the cables are accessible
b. double insulated with a minimum c.s.a of 4 mm^2
c. solid-core X-90 SDI with a minimum c.s.a of 6 mm^2
d. V90 TPS with a minimum c.s.a of 10 mm^2

Your answer is incorrect.

Refer to AS/NZS 5033:2021 Clauses 4.4.2.1 (d) and 4.4.2.3

The correct answer is: double insulated with a minimum c.s.a of 4 mm^2

Question 2

Not answered

Marked out of 1.00

Which rating defines the ability of switchgear to withstand the ingress of water and dust?

a. Nominal current rating
b. IP rating
c. Voltage rating
d. kA rating

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: IP rating

Question 3

Not answered

Marked out of 1.00

Which of the following is an example of an economic/financial factor that can influence the design of a PV system?

a. All of these
b. The feed-in tariffs offered by the local Network Provider
c. The presence or absence of government rebates
d. The cost of string inverters compared to micro-inverters

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: All of these

Question 4

Not answered

Marked out of 1.00

The actual yearly energy output of a PV system is referred to as the:

a. total yearly irradiance
b. performance ratio
c. specific yield
d. energy yield

Your answer is incorrect.

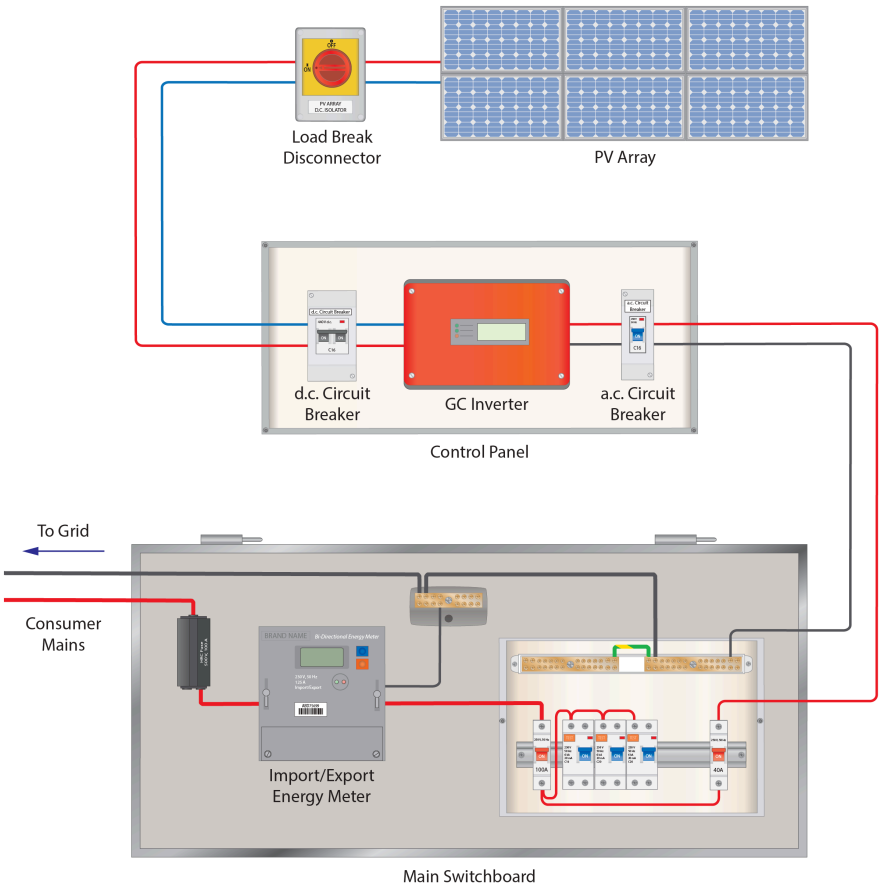
Refer to content page 6.2

The correct answer is: energy yield

Question 5

Not answered

Marked out of 1.00



For the installation above, the a.c. circuit breaker in the control panel needs to have a nominal current rating that is less than or equal to:

- a. the array short-circuit current
- b. the inverter maximum a.c. current rating
- c. the current carrying capacity of the connected cables
- d. the nominal current rating of the grid-supply main switch

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: the current carrying capacity of the connected cables

Question 6

Not answered

Marked out of 1.00

Calculate the performance ratio of a 5.2 kW PV system if the total irradiation at the site is 1440 kWh/m^2, and the energy yield of the array is 5,160 kWh.

Provide your answer correctly rounded to three significant figures.

Performance Ratio: ✖

E_{ideal} = 5,200 x 1,440 = 7,488,000 Wh

PR = 5,160,000 / 7,488,000 = 0.689

Refer to worked examples on content page 6.2 for further guidance.

Question 7

Not answered

Marked out of 1.00

Calculate the performance ratio of a 9.4 kW PV system if the total irradiation at the site is 1510 kWh/m^2, and the energy yield of the array is 11,230 kWh.

Provide your answer correctly rounded to three significant figures.

Performance Ratio: ✖

E_{ideal} = 9,400 x 1,510 = 14,194,000 Wh

PR = 11,230,000 / 14,194,000 = 0.791

Refer to worked examples on content page 6.2 for further guidance.

Question 8

Not answered

Marked out of 1.00

A pair of 300 V d.c. array cables need to be run down a wall cavity of a brick veneer home.
Which of the following wiring systems is suitable for this part of the installation?

a. TPS cable clipped directly to the timbers
b. Any of these
c. TPI cables enclosed in corrugated PVC conduit
d. Flexible cables enclosed in HDPVC conduit

Your answer is incorrect.

Refer to content page 6.1, and AS/NZS 5033:2021 Clause 4.4.5.2.2 (a)

The correct answer is: Flexible cables enclosed in HDPVC conduit

Question 9

Not answered

Marked out of 1.00

Where the d.c. cabling running from the PV array to the GC inverter is installed in a ceiling cavity, the cabling shall:

a. All of these are correct
b. be securely fastened to the building structure using PVC cable ties
c. have a temperature rating of no less than 110^0C
d. be enclosed in a metal or heavy-duty insulating conduit

Your answer is incorrect.

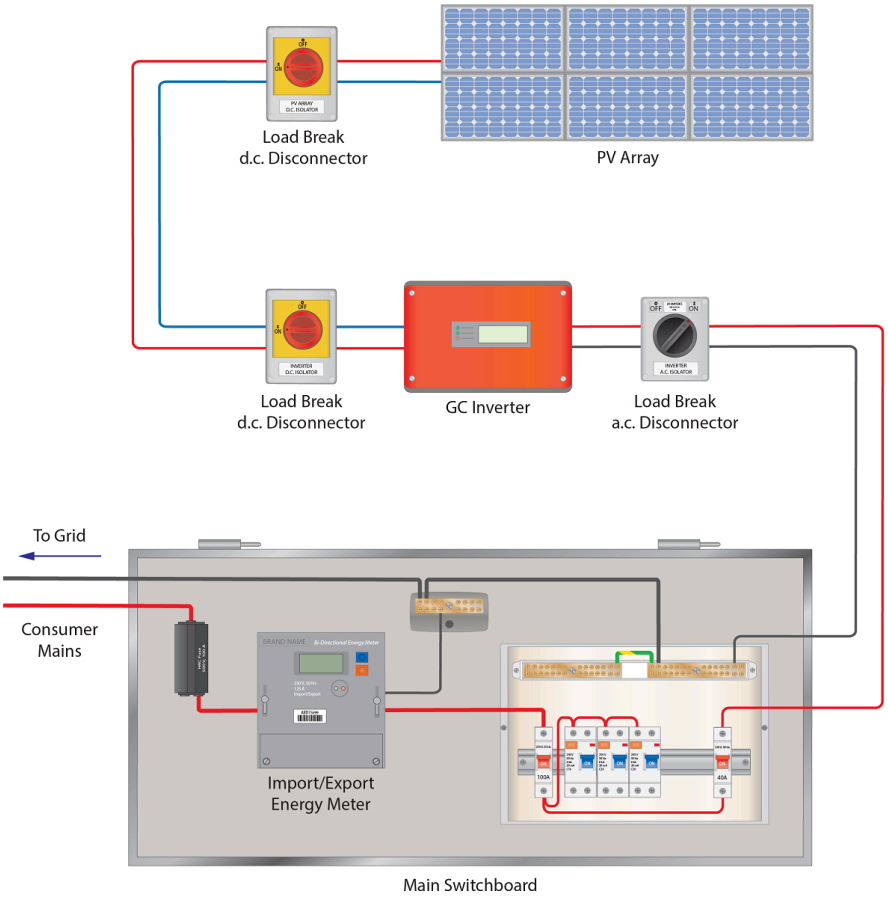
Refer to AS/NZS 5033:2021 Clause 4.4.5.2.2

The correct answer is: be enclosed in a metal or heavy-duty insulating conduit

Question 10

Not answered

Marked out of 1.00



Which of the following factors will directly affect the required voltage rating for the d.c. disconnectors pictured above?

- a. The IP rating of the inverter
- b. The open-circuit voltage of the array
- c. The short-circuit current of the array
- d. The nominal grid supply voltage

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: The open-circuit voltage of the array

Question 11

Not answered

Marked out of 1.00

The specific energy yield of a PV system indicates:

a. the peak energy produced over a 12 month period
b. the actual efficiency of the PV modules
c. the energy yield of the system without derating applied
d. the average kWh produced per rated kW

Your answer is incorrect.

Refer to content page 6.2

The correct answer is: the average kWh produced per rated kW

Question 12

Not answered

Marked out of 1.00

The performance ratio of a PV system is the ratio of:

a. the initial energy yield to the energy yield of the system after 12 months
b. the ideal energy yield to the specific energy yield
c. the actual energy yield to the ideal energy yield
d. the actual energy yield to the total yearly irradiation

Your answer is incorrect.

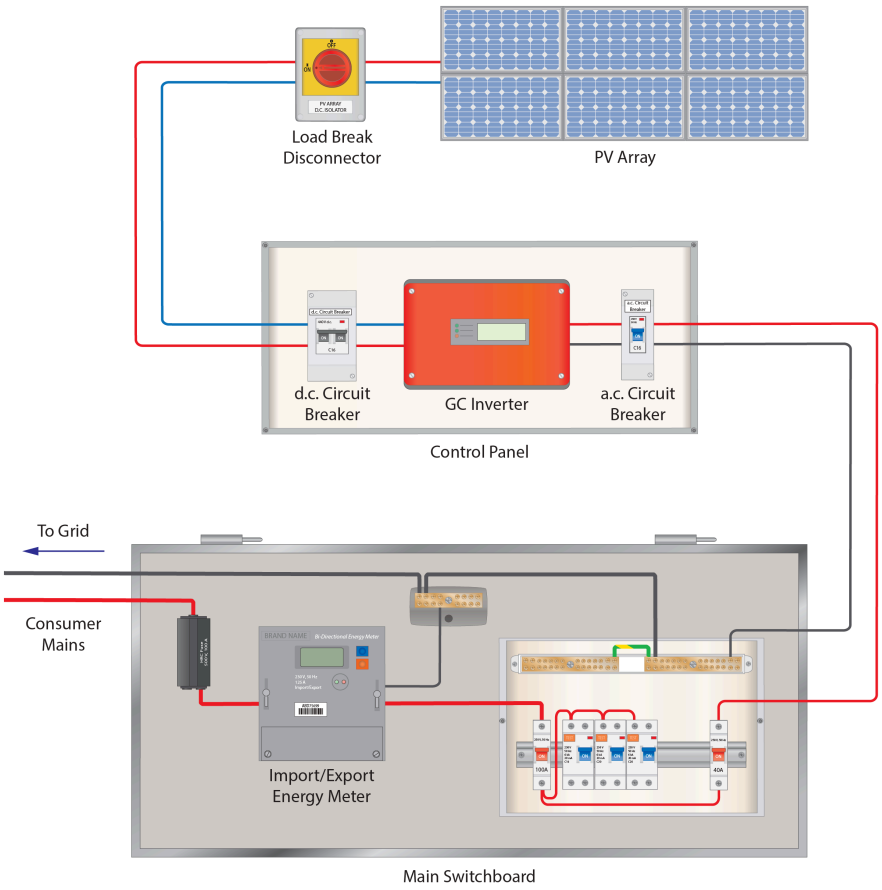
Refer to content page 6.2

The correct answer is: the actual energy yield to the ideal energy yield

Question 13

Not answered

Marked out of 1.00



Which of the following requirements applies to the d.c. circuit breaker in the control panel pictured above?

- a. Must be suitable for both a.c. and d.c.
- b. Must not be polarised
- c. Must be polarised
- d. Must be at least IP56

Your answer is incorrect.

Refer to AS/NZS 5033:2021 Clause 4.3.4.2.2 (g) and content page 6.1

The correct answer is: Must not be polarised

Question 14

Not answered

Marked out of 1.00

Estimate the energy yield of a 8.6 kW PV system with the following characteristics:

- Total yearly irradiation of 1,650 kWh/m^2.
- Manufacturing tolerance of 3%.
- Inverter efficiency of 94%.
- Derating factor for operating temperature: 0.87.
- Derating factor for system cables: 0.97.
- Derating factor for dirt build-up: 0.95.

Provide your answer in the units indicated, correctly rounded to three significant figures.

Energy Yield: ✖ kWh

E_{sys} = 8,600 x 0.97 x 0.95 x 0.87 x 1650 x 0.94 x 0.97

E_{sys} = 10,372,813.64 Wh

E_{sys} = 10,400 kWh (to three significant figures)

Refer to worked example on content page 6.2 for further guidance.

Question 15

Not answered

Marked out of 1.00

What type of PV system can be configured to allow for monitoring of the individual parameters at each module within an array?

a. Multiple mode inverter system

b. String inverter system

c. Micro-inverter system

d. Standalone inverter system

Your answer is incorrect.

Refer to content page 6.2

The correct answer is: Micro-inverter system

Question 16

Not answered

Marked out of 1.00

Which of the following factors will directly affect the required c.s.a. for the d.c. cables of a PV system?

a. Inverter efficiency
b. Maximum array current
c. Maximum array voltage
d. Inverter operating window

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: Maximum array current

Question 17

Not answered

Marked out of 1.00

Which of the following is an example of a 'regulatory factor' that could influence the design of a domestic PV system?

a. The environmental awareness of the home owner
b. All of these
c. The square metreage of spare roof space
d. Local council rules regarding the placement of PV arrays on residential homes

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: Local council rules regarding the placement of PV arrays on residential homes

Question 18

Not answered

Marked out of 1.00

Which of the following is an example of an 'institutional factor' that can influence the design of a PV system?

a. All of these
b. The square metreage of spare roof space
c. The environmental policies and awareness of the customer
d. The presence or absence of government rebates

Your answer is incorrect.

Refer to content page 6.1

The correct answer is: The environmental policies and awareness of the customer

Question 19

Not answered

Marked out of 1.00

Estimate the energy yield of a 6 kW PV system with the following characteristics:

- Total yearly irradiation of 1,525 kWh/m^2.
- Manufacturing tolerance of 2.8%.
- Inverter efficiency of 92%.
- Derating factor for operating temperature: 0.86.
- Derating factor for system cables: 0.97.
- Derating factor for dirt build-up: 0.95.

Provide your answer in the units indicated, correctly rounded to three significant figures.

Energy Yield: ✖ kWh

E_{sys} = 6000 x 0.972 x 0.95 x 0.86 x 1525 x 0.92 x 0.97

E_{sys} = 6,484,387.757 Wh

E_{sys} = 6,480 kWh (to three significant figures)

Refer to worked example on content page 6.2 for further guidance.

Question 20

Not answered

Marked out of 1.00

Calculate the specific energy yield of a 5.5 kW PV system with an energy yield of 5,640 kWh:

Provide your answer in the units indicated, correctly rounded to three significant figures.

Specific Energy Yield: ✖ kWh/kW

SY = 5,640,000 / 5,500 = 1,025.45 kWh/kW

SY = 1,030 kWh/kW (to three significant figures)

Refer to worked example on content page 6.2 for further guidance.

Started on	Tuesday, 25 March 2025, 5:40 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:40 PM
Time taken	7 secs
Grade	**0.00** out of 14.00 (**0**%)

Question 1

Not answered

Marked out of 4.00

Identify how each of the following factors affects the selection of PV system switchgear.

Exposure to the weather: Choose...

PV array prospective fault current: Choose...

Current carrying capacity of system cables: Choose...

PV array open-circuit voltage: Choose...

Your answer is incorrect.

Refer to content page 6.1.

The correct answer is: Exposure to the weather: → Required IP rating of switchgear, PV array prospective fault current: → Required breaking capacity (kA rating) of switchgear, Current carrying capacity of system cables: → Required nominal current rating of switchgear, PV array open-circuit voltage: → Required voltage rating of switchgear

Question 2

Not answered

Marked out of 3.00

When selecting overcurrent protection devices for the d.c. cables between an array and a GC inverter:

- ✖ .
- The protection device must ✖ .
- The nominal current rating of the protection device must be ✖ or equal to the nominal current rating of the array.

Refer to AS/NZS 5033:2021 Clause 4.3.4.2.2 and content page 6.1.

Question 3

Not answered

Marked out of 3.00

Identify how each of the following factors affects the selection of PV system wiring.

Operating current and voltage drop Choose...

Operating voltage and temperature Choose...

Installation in the ceiling space of a building Choose...

Your answer is incorrect.

Refer to content page 6.1.

The correct answer is: Operating current and voltage drop → Required cable size, Operating voltage and temperature → Required insulation type, Installation in the ceiling space of a building → Requirement to be enclosed

Question 4

Not answered

Marked out of 1.00

AS/NZS 5033:2021 requires that flexible cables are used for the ✖ that is directly connected to plugs sockets or connectors of a PV system.

Refer to AS/NZS 5033:2021 Clause 4.4.2.1 and content page 6.1.

Question 5

Not answered

Marked out of 3.00

Rules set by local councils regarding the placement of PV arrays on structures is an example of ✖ that can affect PV system design.

The environmental policies and awareness of a customer organisation is an example of ✖ that can affect PV system design.

Reductions in the cost of PV panels is an example of ✖ that can affect PV system design.

Refer to content page 6.1.

Started on	Tuesday, 25 March 2025, 5:41 PM
State	Finished
Completed on	Tuesday, 25 March 2025, 5:41 PM
Time taken	9 secs
Grade	**0.00** out of 16.00 (**0**%)

Question 1

Not answered

Marked out of 3.00

Identify each of the following terms used to describe different aspects of PV system performance.

An indication of overall system performance — Choose...

A measure of how many kWh are produced per rated kW of the PV system — Choose...

The average yearly energy output that can be realistically expected from the system — Choose...

Your answer is incorrect.

Refer to content page 6.2.

The correct answer is: An indication of overall system performance → Performance ratio, A measure of how many kWh are produced per rated kW of the PV system → Specific energy yield, The average yearly energy output that can be realistically expected from the system → Energy yield

Question 2

Not answered

Marked out of 3.00

Estimate the energy yield of a 3.6 kW PV system with the following characteristics:

- Total yearly irradiation of 1,720 kWh/m2.
- Manufacturing tolerance of 2.5%.
- Inverter efficiency of 91%.
- Derating factor for operating temperature: 0.84.
- Derating factor for system cables: 0.96.
- Derating factor for dirt build-up: 0.95.

Provide your answer in the units indicated, correctly rounded to three significant figures.

Energy Yield: ✖ kWh

E_{sys} = 3600 x 0.975 x 0.95 x 0.84 x 1720 x 0.91 x 0.96 E_{sys} = 4,208,730.14 Wh

E_{sys} = 4,210 kWh (to three significant figures)

Refer to worked example on content page 6.2 for further guidance.

Question 3

Not answered

Marked out of 2.00

Calculate the specific energy yield of a 4 kW PV system with an energy yield of 4,942 kWh:

Provide your answer in the units indicated, correctly rounded to three significant figures.

Specific Energy Yield: ✖ kWh/kW

SY = 4,942,000 / 4,000 = 1,235.5 kWh/kW

SY = 1,240 kWh/kW (to three significant figures)

Refer to worked example on content page 6.2 for further guidance.

Question 4

Not answered

Marked out of 4.00

Calculate the performance ratio of a 6 kW PV system if the total irradiation at the site is 1620 kWh/m^2, and the energy yield of the array is 6,175 kWh.

Provide your answer correctly rounded to three significant figures.

Performance Ratio: ✖

E_{ideal} = 6,000 x 1,620 = 9,720,000 Wh

PR = 6,175,000 / 9,720,000 = 0.635

Refer to worked examples on content page 6.2 for further guidance.

Question 5

Not answered

Marked out of 1.00

What are the benefits of monitoring the operating conditions and parameters of a PV power system?

- a. Helps to reduce soiling and component wear and tear
- b. Reduces the need for periodic maintenance
- c. Data can be used for promotional and educational purposes
- d. Assists with the identification of system faults
- e. Helps consumers to optimise their energy usage
- f. Assists with the identification of poor system performance

Your answer is incorrect.

Refer to content page 6.2

The correct answers are: Assists with the identification of system faults, Assists with the identification of poor system performance, Helps consumers to optimise their energy usage, Data can be used for promotional and educational purposes

Question 6

Not answered

Marked out of 3.00

Identify each of the following PV system monitoring features from the descriptions provided.

Real-time read-outs of voltage, current and power. Choose...

Recording and storage of performance data for analysis. Choose...

Identification and notification of system errors/problems. Choose...

Your answer is incorrect.

Refer to content page 6.2

The correct answer is: Real-time read-outs of voltage, current and power. → Operating parameters, Recording and storage of performance data for analysis. → Data logging, Identification and notification of system errors/problems. → Fault detection