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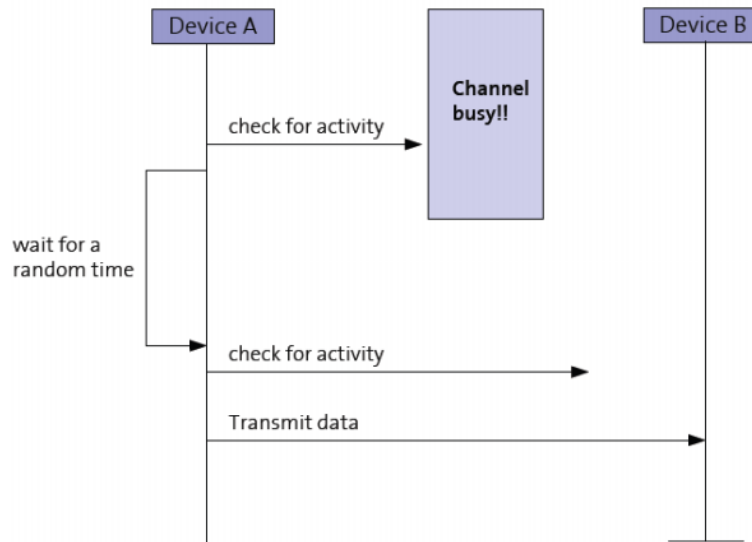
**Question 1** (7 points) ✓ Saved

ZigBee wireless technology can be deployed in the three ISM frequency band such as 2.4 GHz, 915 MHz, and 868.3 MHz. Match the following number of channels with corresponding frequency band.

- |   |                             |                |
|---|-----------------------------|----------------|
| 1 | ISM 915 MHz band in America | 1. 10 channels |
| 3 | ISM 2.4 GHz band Worldwide  | 2. one channel |
| 2 | ISM 868.3 MHz in Europe     | 3. 16 channels |

**Question 2** (4 points) ✓ Saved

Which one of the channel access methods is used for the ZigBee Network shown in the diagram?



- ☒ CSMA/CA
- ☐ CSMA/CA with RTS/CTS
- ☐ Random Channel Access
- ☐ CSMA/CD

**Question 3** (6 points) ✓ Saved

Which of the following is/are the advantages of ZigBee wireless technology?

- ☒ Reliable and self healing
- ☐ Support only a few number of nodes
- ☒ Low cost
- ☐ Very difficult to deploy
- ☒ Low power

**Question 4** (4 points) ✓ Saved

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**Question 4** (4 points) ✓ Saved

Which one of the modulation techniques is used in ZigBee Technology for 2.4 GHz frequency band?

- ☒ Offset Quadrature Phase Shift Keying (O-QPSK)
- ☐ Binary Phase Shift Keying (BPSK)
- ☐ Frequency Shift Keying (FSK)
- ☐ 16 Quadrature Amplitude Modulation (16QAM)

**Question 5** (8 points) ✓ Saved

ZigBee wireless technology can be deployed in the three ISM frequency bands such as 2.4 GHz, 915 MHz, and 868.3 MHz. Match the following maximum bitrate with corresponding frequency band.

- |   |                             |             |
|---|-----------------------------|-------------|
| 2 | ISM 2.4 GHz band Worldwide  | 1. 40 kbps  |
| 3 | ISM 868.3 MHz in Europe     | 2. 250 kbps |
| 1 | ISM 915 MHz band in America | 3. 20 kbps  |

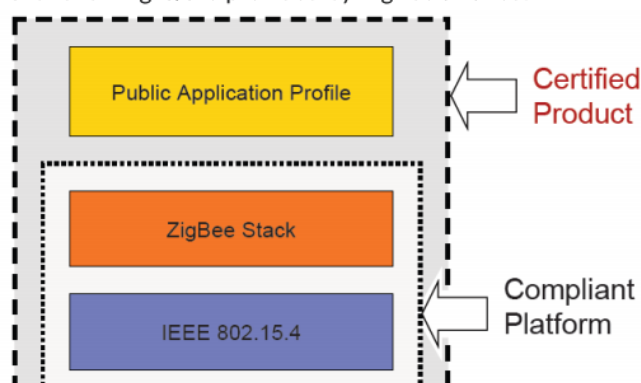
**Question 6** (4 points) ✓ Saved

Which one of the physical layer protocols is used in ZigBee Technology?

- ☐ Frequency Hopping Spread Spectrum (FHSS)
- ☐ Time Division Multiple Access (TDMA)
- ☐ Orthogonal Frequency Division Multiple Access (OFDMA)
- ☒ Direct Sequence Spread Spectrum (DSSS)

**Question 7** (6 points) ✓ Saved

Which of the following is/are provided by ZigBee alliance?

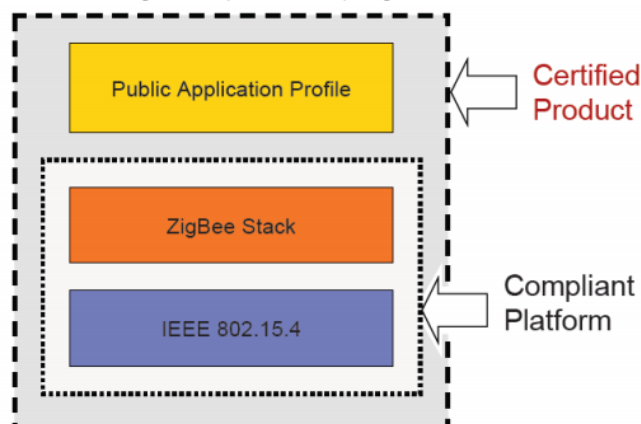


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### Question 7 (6 points) ✓ Saved

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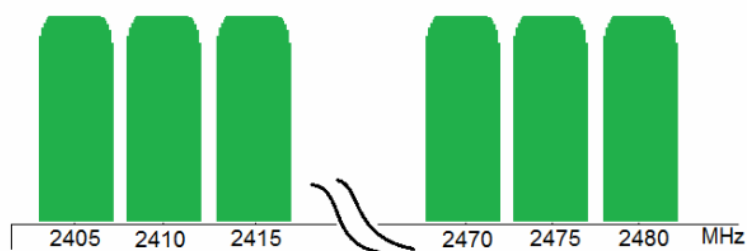


ZigBee Stack: Network Layer + Application Support Layer

- ☒ Branding
- ☒ Upper layer ZigBee stack and application profiles in the ZigBee platform
- ☐ Physical layer and MAC layer in the ZigBee platform
- ☒ Compliance and certification testing

### Question 8 (4 points) ✓ Saved

Figure shows the ZigBee frequency channels for 2.4 GHz ISM band. The bandwidth of each is 5 MHz wide. How many frequency channels are available for this frequency band?



ZigBee Frequency Range for  
2.4 GHz ISM Band from 2400 MHz to 2483.5 MHz

- ☒ 16 channels
- ☐ 10 channels
- ☐ 15 channels
- ☐ 26 channels

### Question 9 (6 points) ✓ Saved

Which of the following is/are applications of ZigBee wireless technology?

- ☒ Building and Home automation
- ☒ Active RFID and asset tracking
- ☒ Video streaming
- ☒ Remote metering

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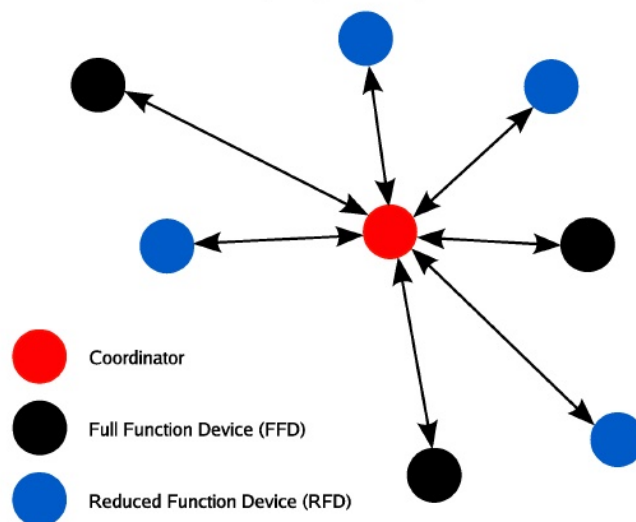
**Question 9** (6 points) ✓ Saved

Which of the following is/are applications of ZigBee wireless technology?

- ☒ Building and Home automation
- ☒ Active RFID and asset tracking
- ☒ Video streaming
- ☒ Remote metering
- ☒ Passive RFID for secure payment
- ☐ Web surfing and sending email
- ☒ Industrial and commercial monitor, control and automation

**Question 10** (4 points) ✓ Saved

Which of the network topologies is implemented for the ZigBee shown in Figure.



- ☐ The multi-cluster tree topology
- ☐ The bus topology
- ☐ The mesh topology
- ☒ The star topology

**Question 11** (6 points) ✓ Saved

Which are the advantages of ZigBee over proprietary solutions?

- ☒ Vendor independence
- ☒ Product interoperability
- ☐ ZigBee requires membership fees for promoter, participant and adopter.
- ☐ ZigBee is not OpenSource.
- ☒ Increased product innovation as a result of industry standardization

**Question 12** (7 points) ✓ Saved

Figure shows the Cluster Tree Routing of frames (messages) when a designated device comes and joins into the cluster tree ZigBee network with a cluster head. Match the following message number with their name.

Multi Cluster Network:

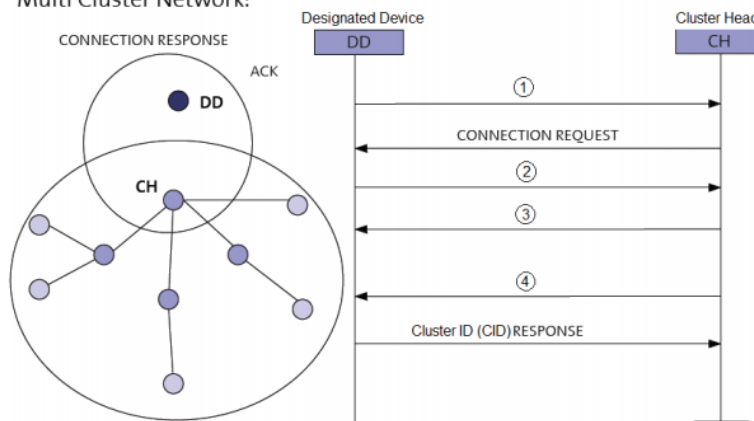
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**Question 12** (7 points) ✓ Saved

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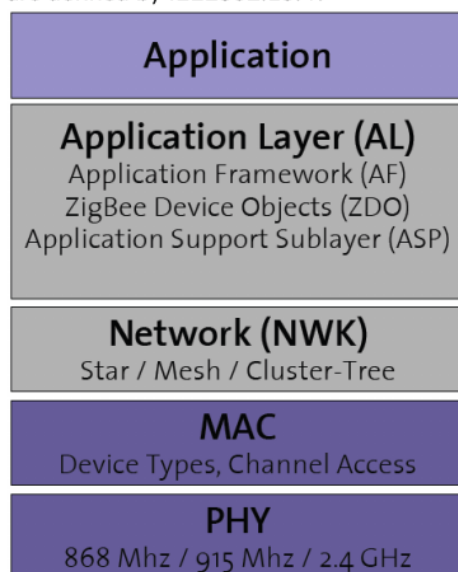
Multi Cluster Network:



- |   |                  |                        |
|---|------------------|------------------------|
| 3 | Message number 1 | 1. CID REQUEST         |
| 4 | Message number 3 | 2. CONNECTION RESPONSE |
| 2 | Message number 2 | 3. HELLO               |
| 1 | Message number 4 | 4. ACK                 |

**Question 13** (6 points) ✓ Saved

Figure shows the protocol stack for ZigBee wireless technology. Which of the layers are defined by IEEE802.15.4?



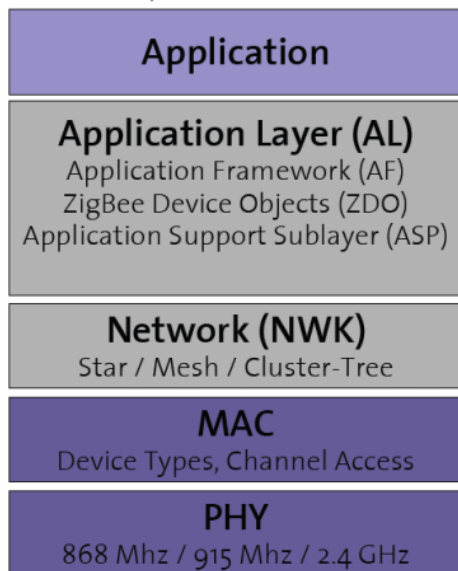
- ☒ Physical layer
- ☐ Network layer
- ☒ MAC layer
- ☐ Application layer

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**Question 13** (6 points) ✓ Saved

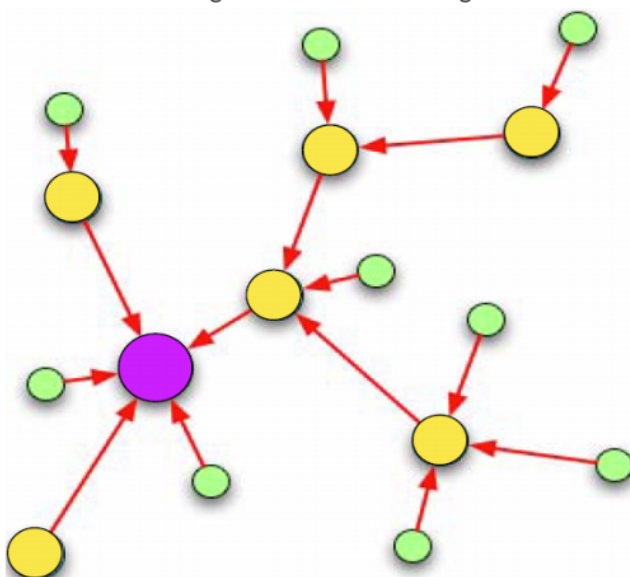
Figure shows the protocol stack for ZigBee wireless technology. Which of the layers are defined by IEEE802.15.4?



- ☒ Physical layer
- ☐ Network layer
- ☒ MAC layer
- ☐ Application layer

**Question 14** (7 points) ✓ Saved

Match the following in accordance with ZigBee wireless technology.



- 1 ▼ ZigBee Router (ZR)
- 3 ▼ ZigBee Coordinator (ZC)

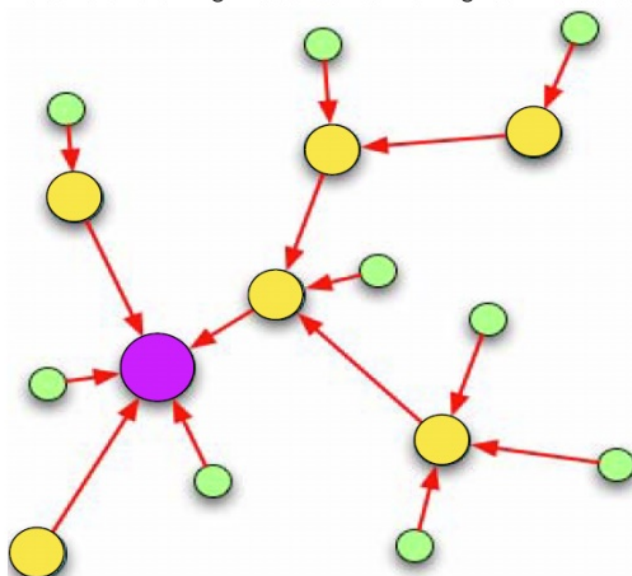
1. A logical device that participates in multihop routing of messages.
2. A device that defined by IEEE 802.15.4 and able to act as a coordinator or a router.
3. A logical device that one and only one required for each ZigBee Network

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**Question 14** (7 points) ✓ Saved

Match the following in accordance with ZigBee wireless technology.



- 1 ▼ ZigBee Router (ZR)
- 3 ▼ ZigBee Coordinator (ZC)
- 4 ▼ ZigBee End Device (ZED)
- 5 ▼ Reduced Function Device (RFD)
- 2 ▼ Full Function Device (FFD)

1. A logical device that participates in multihop routing of messages.
2. A device that defined by IEEE 802.15.4 and able to act as a coordinator or a router.
3. A logical device that one and only one required for each ZigBee Network
4. A logical device that allows to operate low power and able to perform monitoring function.
5. A device that defined by IEEE 802.14 and is less memory required due to a reduced stack size. It is low cost, very low complexity and very low power. It is generally battery powered and able to last very long battery life.

**Question 15** (6 points) ✓ Saved

Which of the following companies is/are the promoter companies for ZigBee technology?

- ☒ Samsung
- ☒ Freescale
- ☒ Philips
- ☒ Mitsubishi
- ☐ BEST Denki
- ☒ Chipcon
- ☒ OSIM

**Question 16** (4 points) ✓ Saved



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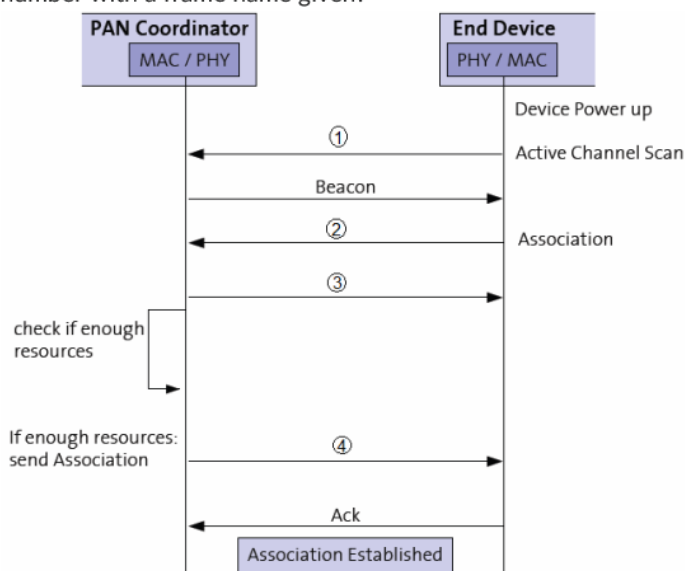
**Question 16** (4 points) ✓ Saved

Which one of the following wireless technologies has the lowest bitrate?

- ☐ Bluetooth
- ☒ ZigBee
- ☐ WLAN
- ☐ UWB

**Question 17** (7 points) ✓ Saved

Figure shows the MAC layer function on Association between a ZigBee PAN coordinator and an End device in a beacon enabled network. Match the frame number with a frame name given?



- |     |                      |            |
|-----|----------------------|------------|
| 4 ▾ | Beacon Request       | 1. frame 3 |
| 2 ▾ | Association Response | 2. frame 4 |
| 3 ▾ | Association Request  | 3. frame 2 |
| 1 ▾ | ACK                  | 4. frame 1 |

**Question 18** (4 points) ✓ Saved

Which one of the IEEE 802 standards has the maximum bitrate?

- ☐ IEEE 802.15.1
- ☐ IEEE 802.15.3a
- ☒ IEEE 802.11a

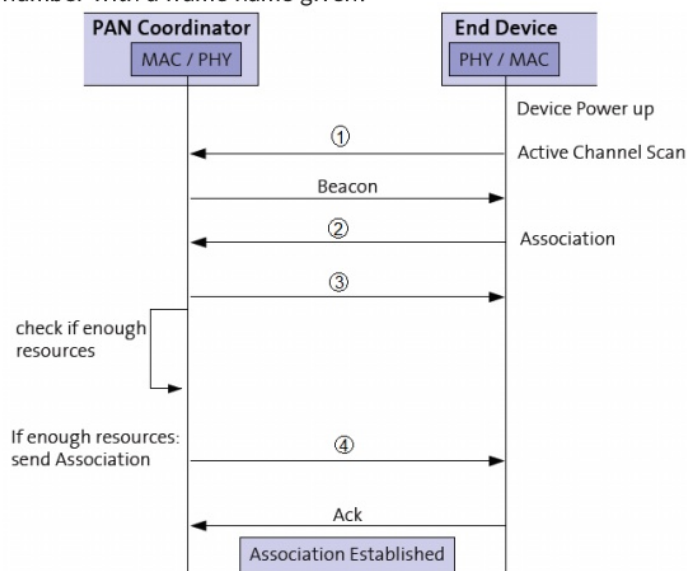


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**Question 17** (7 points) ✓ Saved

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- |     |                      |            |
|-----|----------------------|------------|
| 4 ▾ | Beacon Request       | 1. frame 3 |
| 2 ▾ | Association Response | 2. frame 4 |
| 3 ▾ | Association Request  | 3. frame 2 |
| 1 ▾ | ACK                  | 4. frame 1 |

**Question 18** (4 points) ✓ Saved

Which one of the IEEE 802 standards has the maximum bitrate?

- ☐ IEEE 802.15.1 Bluetooth
- ☒ IEEE 802.15.3a UWB
- ☒ IEEE 802.11a Wifi 54 Mbps
- ☐ IEEE 802.15.4 Zigbee