Objective 1 Quiz

1) Which of the following is not true about running Consul in `development` mode?
   a) Development mode is not secure
   b) Development mode is easily scalable
   c) Development mode allows you to easily experiment with most of Consul's functionality
   d) Development mode should never be used in a production environment

Answer: **Option b**

Explanation - Dev mode only runs on a single node, such as your desktop or laptop. Therefore, it is not a scalable solution when using it for Consul services.

2) Which of the following is responsible for managing membership and broadcasting messages within the Consul cluster?
   a) Serf Protocol
   b) Raft Protocol
   c) Prepared Queries
   d) Proxies

Answer: **Option a**

Explanation - Serf is the gossip protocol that is used across all servers and client members within a Consul cluster for broadcasting messages about server and client membership.

3) A Consul cluster containing five Consul server nodes can tolerate a maximum of how many node failures before Consul cannot establish a quorum and continue to operate?
   a) 1
   b) 2
   c) 3
   d) 4

Answer: **Option b**

Explanation - A Consul cluster with five server nodes requires a quorum of three nodes, therefore allowing the loss of up to two nodes without negatively impacting the Consul service.

4) Which nodes in a Consul datacenter do not participate in the LAN gossip pool?
   a) Consul server nodes
   b) Consul client nodes
   c) Consul non-voting server nodes
   d) Consul consumers (meaning any client accessing Consul, such as a user desktop)

Answer: **Option d**

Explanation - Consumers of the Consul service do not participate in the gossip pool. However, all members of the Consul do participate in the LAN and possibly WAN pool, when federated.

5) In order to provide high availability and ensure that Consul's state is preserved even if a server fails, HashiCorp suggests that Consul should be configured to run _____.
   a) In a cluster made of 3 to 5 servers
   b) On as many servers as needed to scale for performance

c) Only Kubernetes to provide scheduling for new Consul nodes
d) On a public cloud platform that can provide hardware redundancy

Answer: **Option a**

Explanation - This is the general recommendation from HashiCorp, although it's possible to go outside of these guardrails.

Objective 2 Quiz

1) What command can be used for new Consul agents to join an existing cluster?
   a) Consul connect
   b) Consul join
   c) Consul cluster -join
   d) Consul exec -join

Answer: Option b

Explanation - This is the only valid command for joining the cluster and is the proper way for a Consul agent to join an existing cluster.

2) Based on the following Consul agent configuration, what parameter will determine which interface Consul will use for internal cluster communications?

```
 1  {
 2      "log_level": "INFO",
 3      "server": true,
 4      "node_name": "node-a.example.com",
 5      "key_file": "/etc/consul.d/cert.key",
 6      "cert_file": "/etc/consul.d/client.pem",
 7      "ca_file": "/etc/consul.d/chain.pem",
 8      "verify_incoming": true,
 9      "verify_outgoing": true,
10      "encrypt": "xxxxxxxxxxxxxxxxxxxxxxxxx",
11      "data_dir": "/opt/consul/data",
12      "datacenter": "us-east-1",
13      "bind_addr": "10.0.30.186",
14      "client_addr": "0.0.0.0",
15      "retry_join": ["provider=aws tag_key=Environment-Name tag_value=consul
    region=us-east-1"],
16      "enable_syslog": true,
17      "acl": {
18        "tokens": {
19          "agent": "xxxxxxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
20          }
21      }
22  }
```

a)
```
"bind_addr": "10.0.30.186"
```

b)
```
"client_addr": "0.0.0.0"
```

c) ```"node_name": "node-a.example.com"```

d) ```"verify_outgoing": true```

Answer: **Option a**

Explanation - bind_addr is the parameter that determines what address clients should be bound to for internal cluster communications.

3) What command can be used to display the participating servers and clients within the local Consul cluster?
   a) Consul members
   b) Consul monitor
   c) Consul info
   d) Consul validate

Answer: **Option a**

Explanation - The 'consul members' command outputs the current list of members that a Consul agent knows about, along with their state. The state of a node can only be "alive", "left", or "failed".

4) True or False? When joining a new Consul agent to a cluster, the `consul join` command must include all the server nodes that make up the cluster.
   a) True
   b) False

Answer: **Option b**

Explanation - A new Consul agent reference any node in the existing cluster. After joining with one member, the gossip communication will propagate the updated membership state across the cluster.

5) Scenario: You are automating the deployment of a new three-node Consul cluster using Terraform, but not all the nodes are joining the cluster as expected. It seems some nodes are being provisioned faster than others. Because of this, a leader is never elected and the cluster is never established. You are using the Consul configuration that is shown here, but you continue to get the following error on multiple nodes.

```
1    [WARN] raft: EnableSingleNode disabled, and no known peers. Aborting election.
```

What can be changed in the configuration file in order to ensure the Consul cluster is bootstrapped and a leader is elected?

```
1    {
2      "acl": {
3        "enabled": true,
4        "default_policy": "allow",
5        "down_policy": "extend-cache"
6      },
7      "bind_addr": "0.0.0.0",
8      "bootstrap_expect": 3,
9      "client_addr": "0.0.0.0",
10     "datacenter": "primary",
11     "data_dir": "/var/consul/data",
12     "join": ["10.0.15.76, 10.0.15.35"],
13     "log_level": "INFO",
14     "node_name": "consul-node-a.example.com",
15     "performance": {
16       "raft_multiplier": 1
17     },
18     "server": true,
19     "ui": true,
20   }
```

a) change `join` to `retry_join`

b) update the node name to include numbers instead of letters

c) update `node_name` to `node_names` to indicate there is more than one node in the cluster

d) update the value of `node_name` to include the name of all three nodes being provisioned

Answer: **Option a**

Explanation - The key to this question is the phrase: "It seems some nodes are being provisioned faster than others." Nodes are spinning up faster than others, and as the configuration file only includes a join statement, the nodes being deployed faster cannot communicate with the other nodes, therefore the Consul agent fails. Join does not reattempt communication with the listed node(s), therefore the cluster is never bootstrapped.

Objective 3 Quiz

1) Which of the following is not a valid method of registering a new service in Consul?
   a) Create the definition as a part of the consul agent configuration
   b) Place a file alongside the Consul agent configuration file when using the `-config-dir` parameter
   c) Run the consul services register command while referencing a service configuration file
   d) Register the service in the consul UI using the service definition file

Answer: **Option d**

Explanation - This is wrong, as the Consul UI doesn't support registering a Consul service directly.

2) You have registered a new service using the service definition below. What DNS record can you query to get the results of healthy nodes hosting the service?

```
 1    {
 2    "service": {
 3    "id": "web-server-01",
 4    "name": "front-end-eCommerce",
 5    "tags": ["v7.05", "production"],
 6    "address": "10.3.13.112",
 7    "port": 8080,
 8    "checks": [
 9       {
10         "args": ["/usr/local/bin/check_mem.py"],
11         "interval": "30s"
12       }
13      ],
14     }
15    }
```

a) `front-end-eCommerce.service.consul`

b) `web-server-01.service.consul`

Answer: **Option a**

Explanation - This is correct, as the service being registered here is named front-end-eCommerce and the default address of a service is <name>.service.consul.

3) Which of the following is NOT a valid type of a Consul health check?
   a) Script Health Check
   b) Port Health Check
   c) TTL Health Check
   d) TCP Health Check

Answer: **Option b**

Explanation - This is not correct, as only a TCP health check can detect whether or not a connection can be established using an IP address and port.

4) A developer named Terry wants to query Consul and only retrieve the hosts providing the "eCommerce-web" service tagged with v7.5. What feature of Consul should Terry use?
   a) Failover policy
   b) Prepared query
   c) Health check
   d) Service definition

Answer: **Option b**

Explanation - Yes, this is correct. A prepared query allows you to create a more complex service query, including the ability to filter results based on tags.

5) You have deployed a virtual machine that hosts two different web applications named web-01 and web-02. You have multiple health checks configured, including two application (service-level) health checks and one host-level health check. The current status of the health checks is as follows:

Host-Level Health Check: `Failing`

Web-01 Health Check: `Passing`

Web-02 Health Check: `Failing`

When the services are queried, which of the following will be returned as part of the service query?

a) web-01 will be returned but not web-02

b) web-01 and web-02 will both be returned, but web-02 will be returned as failing

c) neither of the services will be returned

Answer: **Option c**

Explanation - This is correct, as the host-level health check is failing. Therefore, neither service running on that host will be returned in service query.

Objective 4 Quiz

1) Which of the following should NOT be stored in the Consul K/V store?
   a) Configuration parameters
   b) Metadata
   c) Database password
   d) Variables

Answer: **Option c**

Explanation - Remember that the Consul K/V is not an encrypted store, so sensitive credentials shouldn't be stored in the K/V. Use something like Vault instead.

2) Data in the Consul K/V is replicated across what type of node(s)?
   a) Across all Consul server nodes in the cluster
   b) Across Consul server nodes in all federated datacenters
   c) Across Consul server and client nodes
   d) Across all Consul client nodes

Answer: **Option a**

Explanation - Yes, data is replicated across all server nodes within a cluster.

3) You are using the Consul HTTP API to retrieve data from the Consul K/V. Instead of getting the expected value, you receive a value such as J2VuYWJsZWQn. Why do you not get the value in plain-text?
   a) The data is encrypted on the Consul K/V store

b) Consul K/V values are base64 encoded
c) Consul uses Vault to encrypt any data saved to the Consul K/V

Answer: **Option b**

Explanation – Yes, this is correct. You can easily decode this value to get the plain-text value.

4) What feature can be used to protect access to the Consul K/V?
   a) Consul ACLs
   b) Encryption
   c) Mutual TLS
   d) Consul watch

Answer: **Option a**

Explanation – Yes, Consul ACLs provides an RBAC feature in Consul to restrict access to data.

5) You want to set up a watch to invoke an API if a specific value changes in the Consul K/V. What type of watch is the most specific for watching this value?
   a) Event
   b) Key prefix
   c) Key
   d) Services

Answer: **Option c**

Explanation – A key watch can watch a specific KV pair and alert on changes.

Objective 5 Quiz

1) Consul operators can take manual snapshots of the cluster using multiple Consul interfaces. Which Consul interface does not provide the ability to create a snapshot?
   a) API
   b) UI
   c) CLI

Answer: **Option b**

Explanation - Correct, User Interface does not offer a way to take a Consul snapshot.

2) A Consul snapshot saves all the information in Consul except which of the following?
   a) ACLs
   b) Key/Value data
   c) Consul agent configuration
   d) Prepared queries

Answer: **Option c**

Explanation – No, snapshots do not include the agent configuration.

3) By default, Consul snapshots are taken in _____ mode, meaning that the leader performs the snapshot.
   a) Stale

b) Consistent
c) Encrypted
d) Performance

Answer: **Option b**

Explanation – Yes, a consistent snapshot means that it was indeed taken by the leader node.

4) True or False? Data can be selectively restored from a Consul snapshot, meaning I can pick and choose what data needs to be restored to my Consul cluster.
   a) True
   b) False

Answer: **Option b**

Explanation – Correct, snapshot restore is an "all or nothing" type of action.

5) The Consul Snapshot Agent provides many different features. Which is NOT one of the features provided by the Consul Snapshot Agent?
   a) Failover
   b) High-availability
   c) Automated snapshots
   d) Automated recovery

Answer: **Option d**

Explanation – No, this is not a feature in Consul.

Objective 6 Quiz

1) Which of the following statement is **NOT** true regarding Consul Service Mesh architecture?
   a) Applications may not be aware that Consul service mesh is present
   b) Applications can be written for native support of Consul service mesh
   c) Service configuration files often declare the downstream service(s) that the local service relies on
   d) Intentions define access control for services

Answer: **Option c**

Explanation - Service files would include upstream services, not downstream.

2) True or False? Intentions follow a top-down ruleset and precedence cannot be overridden.
   a) True
   b) False

Answer: **Option a**

Explanation - Intentions follow a top-down ruleset using Allow or Deny intentions. More specific rules are evaluated first.

3) Which interface provides the most feature-rich options for creating a Service Intention?
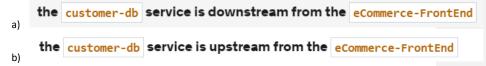   a) API
   b) CLI

    c) UI

Answer: **Option a**

Explanation - Yes, the API at /connect/intentions/exact should be used and provides the most features.

4) True or False? When registering a service proxy, Consul automatically starts a new service proxy if a custom one is not specified.
    a) True
    b) False

Answer: **Option b**

Explanation - Correct! Registration does not start the sidecar proxy—you must do that manually or programmatically.

5) The service named `eCommerce-FrontEnd` relies on a backend database service called `customer-db` in order to properly service customer orders. Select the correct statement from the following based on this configuration.

    a)

the `customer-db` service is downstream from the `eCommerce-FrontEnd`

    b)

the `customer-db` service is upstream from the `eCommerce-FrontEnd`

Answer: **Option b**

Explanation - Correct, the customer-db service is upstream from the eCommerce-FrontEnd service. The eCommerce-FrontEnd is downstream from the customer-db service.

Objective 7 Quiz

1) Which component of the Consul security model uses a pre-shared key to secure communications throughout the Consul cluster?
    a) Consul agent
    b) Gossip protocol
    c) Consul ACL system
    d) Consul Certificate Authority

Answer: **Option b**

Explanation - Yes, you can use Consul Keygen or Consul Keyring to manage the gossip encryption key.

2) Consul can create multiple types of certificates when it is configured as a certificate authority. Which is NOT one of the types of certificates you can create?
    a) server
    b) client
    c) API
    d) CLI

Answer: **Option c**

Explanation - Correct, Consul can create certificates types of server, client, and CLI.

3) True or False? Consul's flexibility allows you to use certificates from multiple internal certificate authorities.
   a) True
   b) False

Answer: **Option b**

Explanation - Correct, all certificates must be signed by the same certificate authority.

4) In order to ensure a Consul client cannot modify the agent configuration and restart as a server, enable what feature should organizations enable in the Consul configuration file?
   a) verify_incoming
   b) verify_server_hostname
   c) verify_outgoing
   d) encrypt<key>

Answer: **Option b**

Explanation - Yes! All outgoing connections will perform hostname verification. It ensures that servers have a certificate valid for server.<datacenter>.<domain>.

5) If you are using your own private certificate authority (CA) to issue certificates for Consul, what additional subject alternative name (SAN) should you add to the certificate to ensure you don't receive errors when configuring the most secure Consul environment?
   a) server.<datacenter>.<domain>
   b) Add a SAN for the IP address
   c) Add a SAN for the DNS friendly name of the Consul cluster
   d) Add a SAN for each DNS name of all nodes in the cluster

Answer: **Option a**

Explanation - Yes, nice job! This ensures a client cannot modify the Consul Agent config and restart as a server.

Objective 8 Quiz

1) True or False? Before the ACL system can be used, it must be enabled in the agent configuration file and bootstrapped.
   a) True
   b) False

Answer: **Option a**

Explanation - Correct, it must be enabled in the configuration file and bootstrapped before policies or tokens can be created.

2) Julie is working on a Consul cluster with ACLs enabled, but she is able to create new Service Mesh Intentions using the command line without providing an ACL token. What could be the reason that her commands are successful?
   a) The ACL system has not yet been bootstrapped

b) The default_policy is set to "allow"
c) The token is being sent using the X-Consul-Token header
d) Consul intention creation doesn't require an ACL token

Answer: **Option b**

Explanation - Correct, the ACL system can be enabled and working but if the default_policy is set to allow, any requests to Consul would not require a token.

3) You have completed the configuration of Consul ACLs, the default_policy is set to Deny, and you created a new policy for your end-users to query Consul for a critical service they depend on to perform their job. How can the end-users successfully query Consul using DNS without providing them with an ACL token?
   a) Disable the ACL system for those specific users
   b) Configure a policy for node_prefix to allow all local nodes to query Consul
   c) Update the anonymous token with the new policy that you created
   d) Configure the policy to allow queries from all nodes in the Consul datacenter

Answer: **Option c**

Explanation - Correct, any request to Consul that does not specifically include a token will try and use the anonymous token for authentication.

4) You have created a token for a consultant that should permit access to the Consul cluster until the end of the week. What built-in feature of Consul can you use to automatically ensure that the token is no longer valid at the end of the week?
   a) Sign in and manually revoke the token at the end of the week
   b) Set the optional expiration time when creating the token
   c) Set up a CRON job that runs at the end of the week and revokes the token
   d) Restart the Consul service at the end of the week

Answer: **Option b**

Explanation - Correct, the optional configuration sets the duration on how long the token is valid. After that time, it will be automatically revoked.

5) James is making some changes using the Consul CLI and has been provided a token for authentication. Which of the following is NOT a valid way that James can provide the token when executing Consul CLI commands?
   a) set the environment variable `CONSUL_HTTP_TOKEN` with the value of the token
   b) save the token in a local file and reference that file using the `-consul-token-file` parameter
   c) use the -token parameter as part of the command
   d) set the environment variable CONSUL_HTTP_TOKEN_FILE to the path of a file where you have saved the token

Answer: **Option b**

Explanation - Correct, this is not a valid parameter; you could use token-file instead. (Sorry, I'm being a little tricky here.)

Objective 9 Quiz

1) You need to create a gossip encryption key. What Consul built-in tool/command can you use to easily create one or many keys?
   a) Consul keyring -create
   b) Consul keygen
   c) Consul tls cert create -server
   d) Consul keyring -install

Answer: **Option b**

Explanation - Correct, Consul Keygen will quickly create a new encryption key for you.

2) True or False? By default, Consul automatically encrypts gossip communication/messages using a self-signed certificate.
   a) True
   b) False

Answer: **Option b**

Explanation - Correct, gossip encryption is not enabled by default.

3) Gossip uses what type of security method for encryption?
   a) mTLS certification from a trusted CA
   b) A self-signed cert minted from the built-in Consul certificate authority
   c) A symmetric key
   d) An ACL using the gossip resource

Answer: **Option c**

Explanation - Yes, nice job. Remember it uses a 32-byte, Base64 encoded key.

4) Which of the following functions/actions can the consul keyring command NOT perform?
   a) List the keys installed on the cluster
   b) Create a new key to be used for the cluster
   c) Remove a key from the cluster
   d) Distribute a new key across the cluster

Answer: **Option b**

Explanation - Correct, the Consul Keyring command does not have key creation functionality. Use Consul Keygen instead.

5) You run a consul keyring -list command and notice that the gossip encryption key being used doesn't match the key displayed in the configuration file. How can this be?
   a) The key has been rotated since the initial configuration
   b) Gossip encryption has been disabled
   c) The consul agent was loaded using a different configuration file
   d) The key displayed in the consul keyring command resulted in the creation of a new key and doesn't show the current keys

Answer: **Option a**

Explanation - Correct, the key being used may not always match the one displayed in the configuration file, as Consul only reads that key one time during the initial configuration of a Consul agent.

Final Practice Exam

1) In order to provide high availability and ensure that Consul's state is preserved even if a server fails, HashiCorp suggests that Consul should be configured to run _____.
   a) In a cluster made up of three to five servers
   b) On as many servers as needed to scale for performance
   c) Only Kubernetes to provide scheduling for new consul nodes
   d) On a public cloud platform that can provide hardware redundancy

Answer: **Option a**

Explanation - In order to make sure that Consul's state is preserved even if a server fails, you should always run either three or five servers in production. The odd number of servers (and no more than five of them) strikes a balance between performance and failure tolerance. When scaled beyond (7) servers, the network requirements needed to maintain replication between the clusters may negatively impact the performance of Consul.

2) Based on the following file, in what directory would you place the consul.hcl configuration file in order to start the Consul service?

```
1    [Unit]
2    Description="HashiCorp Consul - A service mesh solution"
3    Documentation=https://www.consul.io/
4    Requires=network-online.target
5    After=network-online.target
6
7    [Service]
8    Type=notify
9    User=consul
10   Group=consul
11   ExecStart=/usr/local/bin/consul agent -config-dir=/etc/consul.d/
12   ExecReload=/usr/local/bin/consul reload
13   ExecStop=/usr/local/bin/consul leave
14   KillMode=process
15   Restart=on-failure
16   LimitNOFILE=65536
17
18   [Install]
19   WantedBy=multi-user.target
```

   a) /etc/consul.d/
   b) /usr/local/bin
   c) /etc/system/system/
   d) /opt/services/consul

Answer: **Option a**

Explanation - Based on the executable statement in the service file, all .hcl configuration files for Consul would be placed in /etc/consul.d/. You can break up your desired Consul configurations across multiple .hcl files if you wish. It's common to put the actual Consul configuration in a consul.hcl file while putting node_meta data into a node_meta.hcl file, therefore both will be read upon starting or refreshing the Consul service. This is because the executable statement in the service file is using config-dir rather than pointing to a single file using config-file.

1) True or False? The Consul UI and the API can only be accessed from a Consul server itself.
   a) True
   b) False

Answer: **Option b**

Explanation - This is false. The UI and API are intended to be consumed from remote systems, such as a user's desktop or an application looking to discover a remote service in which it needs to establish connectivity. In addition, most consumers of the Consul service wouldn't normally have access to connect (SSH) to a Consul server anyway.

3) In most organizations, a service will be run on multiple nodes to provide redundancy and high availability. In the following example, what is the name of the Consul service that this service definition will create?

```
1  | {
2  |    "service": {
3  |      "id": "web-a",
4  |      "name": "web-frontend",
5  |      "port": 80,
6  |      "tags": [
7  |            "web",
8  |            "green"
9  |       ],
10 |      "enable_tag_override": false,
11 |      "checks": [
12 |            {
13 |                "interval": "10s",
14 |                "name": "web-server-health",
15 |                "tcp": "localhost:80",
16 |                "DeregisterCriticalServiceAfter": "60s"
17 |            }
18 |      ]
19 |    }
20 | }
```

   a) Web-a
   b) Web-frontend
   c) Green
   d) Web-server-health

Answer: **Option b**

Explanation - The preceding service definition will create a service named web-frontend, and will register a new node named web-a that will host the web-frontend service. As long as the health check passes, web-a will register as healthy and traffic destined to the web-frontend service will be directed to this node.

4) Complete the sentence:
   The main restriction on Consul's K/V store is an object's size, which can be a maximum of_____?
   a) 512KB
   b) 64KB
   c) 8KB
   d) 1MB

Answer: **Option a**

Explanation - The main restriction on an object is size—the maximum is 512 KB. Due to the maximum object size and main use cases, you should not need extra storage.

5) Scenario: You are storing configuration settings for your application in Consul's K/V store, and each setting is critical to the successful implementation of the application. A developer recently updated the value for app1, causing the deployment to fail.
   What Consul feature can be used to monitor the K/V store for updates and automatically take action to remediate the issue?
   a) Set up health checks to monitor for changes to the K/V store
   b) Configure a watch and execute a script to update the application
   c) Set up an ACL to automatically restart the Consul service when a value is changed
   d) Use the raft consensus protocol to replicate the changes from the other nodes when a value is changes

Answer: **Option b**

Explanation - Watches are a way of specifying a view of data (for example, list of nodes, KV pairs, health checks), which is monitored for updates. When an update is detected, an external handler is invoked. A handler can be any executable or HTTP endpoint. As an example, you could set up a key watch type that executes a Python script when the value of a key changes.

6) True or False? The open-source tools Consul Template and Envconsul require a Consul cluster to operate.
   a) True
   b) False

Answer: **Option b**

Explanation - Consul Template can retrieve secrets from Vault and manage the acquisition and renewal lifecycle. Envconsul can launch a subprocess that dynamically populates environment variables from secrets read from Vault.

7) Which of the following Consul features is responsible for securing inter-service communication with mutual TLS using sidecar proxies?
   a) Envoy
   b) Consul ACLs
   c) Consul Gossip

d) Consul Connect

Answer: **Option d**

Explanation - Consul Connect provides service-to-service connection authorization and encryption using mutual Transport Layer Security (TLS). Applications can use sidecar proxies in a service mesh configuration to establish TLS connections for inbound and outbound connections without being aware of Connect at all. Applications may also natively integrate with Connect for optimal performance and security. Connect can help you secure your services and provide data about service-to-service communications.

8) Complete the following sentence with the proper order of answers:
   Consul uses two types of certificates for encryption. Consul agent communications are secured by _____ and Consul Connect uses _____ between registered services.
   a) Mutual TLS, TLS
   b) TLS, mutual TLS
   c) SSL, TLS
   d) Mutual TLS, SSL

Answer: **Option b**

Explanation - Consul agent communications are done using TLS certificates that can be created by the built-in CA or an external CA if you need more control over certificates. Consul Connect uses mutual TLS for authorization and encryption.

9) Which token is always assigned the Accessor ID of 00000000-0000-0000-0000-000000000002, regardless of what cluster you are working on?
   a) Master token
   b) The second token created by the user
   c) Anonymous token
   d) Consul DNS token

Answer: **Option c**

Explanation - The anonymous token is used when a request is made to Consul without specifying a bearer token. The anonymous token's description and policies may be updated but Consul will prevent this token's deletion. When created, it will be assigned 00000000-0000-0000-0000-000000000002 for its Accessor ID and anonymous for its Secret ID.

10) Your colleague has deployed a new Consul cluster, and you want to double-check the encryption key used for gossip communication. You open up an SSH session to a Consul node and type the command, `consul keyring -list` but receive the following error. From the error message, what is missing from the Consul Agent configuration file?

```
1   $ consul keyring -list
2
3   ==> Gathering installed encryption keys...
4   error: Unexpected response code: 500 (12 errors occurred:
5          * WAN error: 5/5 nodes reported failure
6          * CONSUL-NODE-D.dc-1: Keyring is empty (encryption not enabled)
7          * CONSUL-NODE-C.dc-1: Keyring is empty (encryption not enabled)
8          * CONSUL-NODE-A.dc-1: Keyring is empty (encryption not enabled)
9          * CONSUL-NODE-E.dc-1: Keyring is empty (encryption not enabled)
10         * CONSUL-NODE-B.dc-1: Keyring is empty (encryption not enabled)
11         * dc-1 (LAN) error: 5/5 nodes reported failure
12         * CONSUL-NODE-E: Keyring is empty (encryption not enabled)
13         * CONSUL-NODE-D: Keyring is empty (encryption not enabled)
14         * CONSUL-NODE-B: Keyring is empty (encryption not enabled)
15         * CONSUL-NODE-A: Keyring is empty (encryption not enabled)
16         * CONSUL-NODE-C: Keyring is empty (encryption not enabled)
```

    a) The `gossip` parameter and a value of `true`
    b) The `encrypt` parameter and the corresponding value
    c) The `encryption` parameter with a valid of `true` or `1`
    d) Configuration for the TLS certificate, the private key, and the CA bundle

Answer: **Option b**

Explanation - In the configuration file, the encrypt parameter must be used to enable gossip encryption and set the gossip encryption key. The provided key is automatically persisted to the data directory and loaded automatically whenever the agent is restarted. The fact that the key is persisted in the data directory means that in order to encrypt Consul's gossip protocol, this option only needs to be provided once on each agent's initial startup sequence.

11) During leadership election, which members in the local datacenter get a vote to elect a new leader?
    a) Consul servers, read-only server nodes, and clients
    b) Consul servers and clients
    c) Consul clients
    d) Consul server nodes

Answer: **Option d**

Explanation - The consensus protocol is only used on Consul server nodes, therefore clients do not participate in voting for a new cluster leader. Furthermore, read-only nodes are also known as non-voting nodes and do not participate in voting for a new leader (hence the name).

12) Consul uses a gossip protocol that is powered by Serf. How is this communication protected between all participating servers and clients?
    a) Mutual TLS
    b) TLS
    c) Username and password
    d) Shared secret

Answer: **Option d**

Explanation - Consul's gossip protocol is protected by a symmetric key, or a shared secret, that is configured as part of the configuration file or in a separate file that is read when the Consul service starts. For example, you can add the parameter "encrypt" to the configuration file with 32-byte, Base64 encoded shared secret. All nodes in the Consul cluster, including WAN joined datacenters, must use the same encryption key. An example of this key would be pUqJrVyVRj5jsiYEkM/tFQYfWyJIv4s3XkvDwy7Cu5s= Furthermore, you can generate this 32-byte, Base64 encoded shared secret using the built-in command.

13) A user is defining a new prepared query named web-app for an application that includes a failover policy for providing high availability for a service. However, when the user accesses the app using the DNS name web-app.service.consul, access to the application isn't failing to the secondary datacenter as expected. What could be the issue?
    a) Consul federation isn't supported for web applications
    b) Prepared queries don't support failover policies
    c) The user needs to use `web-app.query.consul` instead
    d) Prepared queries are only accessible by API, and not DNS

Answer: **Option c**

Explanation - When defining a prepared query, the default endpoint for using the prepared query is <name>.query.consul. If the user is trying to access it using web-app.service.consul, the user may be hitting the service directly and not taking advantage of the prepared query at all. Therefore, if the local service were to go down, the failover policy would not be used, as you must hit the DNS name of the prepared query to take advantage of a failover policy.

14) A Consul cluster containing five Consul server nodes can tolerate how many failures before Consul cannot establish a quorum and continue to operate?
    a) 1
    b) 2
    c) 3
    d) 4

Answer: **Option b**

Explanation - https://www.consul.io/docs/internals/consensus.html#deployment-table

15) Using the following service configuration, what service will be registered, and what port will the service run on?

```
 1 | {
 2 |     "service": {
 3 |       "ID": "watermark_web_a",
 4 |       "name": "picture_app",
 5 |       "tags": ["front-end", "watermark"],
 6 |       "port": 8080,
 7 |       "check": {
 8 |         "id": "picture_app_check",
 9 |         "name": "Check Counter health 80",
10 |         "tcp": "localhost:80",
11 |         "interval": "10s",
12 |         "timeout": "1s"
13 |       }
14 |     }
15 | }
```

a) `watermark_web_a` **running on port** `8080`

b)

c) `watermark_web_a` **running on port** `80`

d) `picture_app` **running on port** `80`

Answer: **Option b**

Explanation - The service definition has a port defined of 8080, so that is the port the service will run on. The health check is checking that a service is running on port 80 on the same host, but that is not the port that the picture_app will be registered on.

16) Based on the following Consul agent configuration, what parameter will determine which interface Consul will use for internal cluster communications?

```
1  | {
2  |    "log_level": "INFO",
3  |    "server": true,
4  |    "node_name": "node-a.example.com",
5  |    "key_file": "/etc/consul.d/cert.key",
6  |    "cert_file": "/etc/consul.d/client.pem",
7  |    "ca_file": "/etc/consul.d/chain.pem",
8  |    "verify_incoming": true,
9  |    "verify_outgoing": true,
10 |    "encrypt": "xxxxxxxxxxxxxxxxxxxxxxxxx",
11 |    "data_dir": "/opt/consul/data",
12 |    "datacenter": "us-east-1",
13 |    "bind_addr": "10.0.30.186",
14 |    "client_addr": "0.0.0.0",
15 |    "retry_join": ["provider=aws tag_key=Environment-Name tag_value=consul
       region=us-east-1"],
16 |    "enable_syslog": true,
17 |    "acl": {
18 |       "tokens": {
19 |          "agent": "xxxxxxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxx"
20 |       }
21 |    }
22 | }
```

a) `"verify_outgoing": true`

b) `"bind_addr": "10.0.30.186"`

c) `"client_addr": "0.0.0.0"`

d) `"node_name": "node-a.example.com"`

Answer: **Option b**

Explanation - The parameter bind_addr is used to determine the address that should be bound to for internal cluster communications. This is an IP address that should be reachable by all other nodes in the cluster. By default, this is "0.0.0.0", meaning Consul will bind to all addresses on the local machine and will advertise the private IPv4 address to the rest of the cluster.

17) Assuming Consul default configurations, which of the following DNS records would be used to access the service referenced by the following configuration?

```
 1  {
 2      "Name": "retail-app",
 3      "Service": {
 4          "Service": "inventory-app",
 5          "Tags": ["v1.2.3"],
 6          "Failover": {
 7              "Datacenters": ["dc2", "dc3"]
 8          }
 9      }
10  }
```

a) **inventory-app.query.service.consul**

b) **inventory-app.query.consul**

c) **retail-app.service.consul**

d) **retail-app.query.consul**

Answer: **Option d**

Explanation - The name of the prepared query is retail-app, therefore the DNS record used to query this prepared query is retail-app.query.consul as all prepared queries use the query namespace.

18) True or False? Using the / character, Consul organizes the data in a directory structure, similar to a file system.
   a) True
   b) False

Answer: **Option b**

Explanation - character / will be treated like any other character and is not fixed to the file system. Meaning, including / in a key does not fix it to a directory structure. This model is similar to Amazon S3 buckets. However, / is still useful for organizing data and when recursively searching within the data store.

19) True or False? You want to restore a Consul from a snapshot. On a five-node Consul cluster, the `consul snapshot restore filename.snap` command must be run on each individual node before starting the Consul service.
   a) True
   b) False

Answer: **Option b**

Explanation - The restore process should be straightforward. However, there are a couple of actions you can take to ensure the process goes smoothly. First, make sure the datacenter you are restoring is stable and has a leader. You can see this using consul operator raft list-peers and checking server logs and telemetry for signs of leader elections or network issues. You will only need to run the process once, on the leader. The Raft consensus protocol ensures that all servers restore the same state.

20) After Consul ACLs have been enabled in the configuration file, what is the next step to begin using ACLs in your environment?
    a) Create new ACL tokens
    b) Create new ACL policies
    c) Bootstrap the ACL system
    d) Disable the anonymous token

Answer: **Option c**

Explanation - ACLs have been enabled; you must first bootstrap the ACL system in order to begin using it. To do this, you would run the command, `consul acl bootstrap`, and Consul will return the bootstrap token.

21) You need to determine the leader node for the Consul cluster. What command allows you to quickly identify the nodes and their current roles within the cluster?

Example of the command's output:

```
1 │  Node           ID                                    Address           State
       Voter  RaftProtocol
2 │    CONSUL-NODE-A  121abb4c-16fb-c8ec-2e2b-9595925de4dc  10.0.10.238:8300  follower
       true    3
3 │    CONSUL-NODE-C  4bead426-4471-0924-598f-cd6ce0015ebc  10.0.10.48:8300   follower
       true    3
4 │    CONSUL-NODE-E  c44e8ab1-1132-1b22-9501-479c690c9e1b  10.0.10.105:8300  leader
       true    3
5 │    CONSUL-NODE-D  ba86541f-cd93-6ada-b763-709b0fc6c09f  10.0.11.163:8300  follower
       true    3
6 │    CONSUL-NODE-B  2528cba1-06ea-4837-fc7b-13e44af19b0d  10.0.11.141:8300  follower
       true    3
```

    a) Consul members
    b) Consul nodes -leader
    c) Consul raft- list
    d) Consul operator raft list-peers

Answer: **Option d**

Explanation - Specifically, the list-peers command will display the current Raft peer configuration, which shows the state of each node, being either a leader or follower.

22) Based on the following configuration file, how would a new Consul agent discover other Consul datacenter members in order to join the Consul datacenter?

```
 1 | {
 2 |     "server": false,
 3 |     "node_name": "web-app-01",
 4 |     "datacenter": "DC1",
 5 |     "data_dir": "/opt/consul/data",
 6 |     "bind_addr": "10.0.42.84",
 7 |     "client_addr": "10.0.42.84",
 8 |     "retry_join": ["provider=aws tag_key=consul tag_value=true"],
 9 |     "log_level": "INFO",
10 |     "enable_syslog": true,
11 | }
```

a) Using auto-discovery information through DNS
b) Discover other members using the DC1 name
c) Using cloud auto-join
d) Using the information provided by a DHCP

Answer: **Option c**

Explanation - In the preceding configuration file, the retry_join parameter states that the Consul agent should query AWS and discover instances that have a tag of Consul with a value of true.

23) What is one of the benefits of deploying non-voting servers in a Consul Enterprise cluster environment?
    a) They can write data to the cluster to reduce write latency
    b) They can expand the number of nodes to take part in the quorum election operations
    c) They do not receive data from cluster replication, therefore reducing latency
    d) They provide enhanced read scalability

Answer: **Option d**

Explanation - Consul Enterprise provides the ability to scale clustered Consul servers to include voting and non-voting servers. Non-voting servers still receive data from the cluster replication, however, they do not take part in quorum election operations. Expanding your Consul cluster in this way can scale reads without impacting write latency.

24) Based on the following payload, what Consul feature is being created with the API?

```
 1 | {
 2 |    "Name": "db-service",
 3 |    "Service": {
 4 |       "Service": "redis",
 5 |       "Failover": {
 6 |          "NearestN": 3,
 7 |          "Datacenters": ["dc1", "dc2"]
 8 |       },
 9 |       "Near": "node1",
10 |       "OnlyPassing": false,
11 |       "Tags": ["primary", "!experimental"],
12 |       "NodeMeta": { "instance_type": "m3.large" },
13 |       "ServiceMeta": { "environment": "production" }
14 |    },
15 |    "DNS": {
16 |       "TTL": "10s"
17 |    }
18 | }
```

a) Prepared query
b) Service
c) Consul agent
d) Service mesh intention

Answer: **Option a**

Explanation - The payload in the question is the configuration of a prepared query. You can immediately tell that it's a prepared query as it includes a failover policy as well. Failover policies are only configured in a prepared query.