

Roll No:

Application No:

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Exam Date: 06-Oct-2020

Exam Time: 09:00-12:00

Examination: 1. Course Code - Ph.D.

2. Field of Study - Molecular Medicine (CMMH)

SECTION 1 - SECTION 1**Question No.1 (Question Id - 29)**Quorum Sensing was first reported in *Aliivibrio fischeri*. This is described as :

- (A) ☐ Cell to cell communication system in gram negative bacteria
- (B) ☐ A signaling system in biofilms
- (C) ☐ A process that helps bacteria sense quorum
- (D) ☐ **All of the above (Correct Answer)**

Question No.2 (Question Id - 45)

Increases in concentration of the second messenger cAMP may lead to the activation of :

- (A) ☐ cyclic nucleotide-gated ion channels
- (B) ☐ popeye domain containing proteins
- (C) ☐ protein kinase A
- (D) ☐ **all of the above (Correct Answer)**

Question No.3 (Question Id - 35)

Typical examples of human zymogens are :

- (A) ☐ Trypsinogen
- (B) ☐ Proelastase
- (C) ☐ Prolipase
- (D) ☐ **All of the above (Correct Answer)**

Question No.4 (Question Id - 9)

The phenol-chloroform method of DNA extraction depends on the fact that :

- (A) ☐ Water and phenol mixture create non-polar solvent
- (B) ☐ Phenol is lighter than water
- (C) ☐ **DNA is a polar molecule with a net negative charge (Correct Answer)**
- (D) ☐ None of the above

Question No.5 (Question Id - 27)

Q-cytochrome c oxidoreductase is also called :

- (A) ☐ **complex III (Correct Answer)**
- (B) ☐ cytochrome cII reductase
- (C) ☐ cytochrome bc3 complex
- (D) ☐ none of the above

Question No.6 (Question Id - 12)

Newton's second law states that :

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- (A) ☐ the acceleration of an object is dependent indirectly upon the net force acting upon the object
- (B) ☐ **the acceleration of an object is dependent upon the net force acting upon the object and the mass of the object**

(Correct Answer)

- (C) ☐ the acceleration of an object does not depend on the mass of the object
- (D) ☐ none of the above

Question No.7 (Question Id - 17)

The complete Freund's Adjuvant contains :

- (A) ☐ **inactivated *Mycobacterium tuberculosis* (Correct Answer)**
- (B) ☐ heat killed *Escherichia coli*
- (C) ☐ Lipopolysaccharides from *Escherichia coli*
- (D) ☐ None of the above

Question No.8 (Question Id - 41)

The linear magnification of eyepiece and objective lens of a microscope is 20x and 10x respectively. Therefore, the net magnification of the microscope will be

- (A) ☐ 20x
- (B) ☐ 30x
- (C) ☐ **200x (Correct Answer)**
- (D) ☐ 10x

Question No.9 (Question Id - 13)

Choose the statement that correctly applies to the Joule-Thomson effect :

- (A) ☐ The principle of Joule-Thomson effect helps explain the change in temperature that accompanies expansion of a gas without transfer of heat
- (B) ☐ The principle of Joule-Thomson effect is often utilized in liquefying gases
- (C) ☐ Joule-Thomson effect is also called as Kelvin-Joule effect or Joule-Kelvin effect
- (D) ☐ **All of the above (Correct Answer)**

Question No.10 (Question Id - 11)

The Brønsted-Lowry theory describes :

- (A) ☐ the law of constant proportions
- (B) ☐ **an acid is a molecule or ion that can donate a proton (Correct Answer)**
- (C) ☐ the pressure of a given mass of an ideal gas is inversely proportional to its volume
- (D) ☐ none of the above

Question No.11 (Question Id - 33)

Mitogen-activated protein kinases (MAPKs) are :

- (A) ☐ Serine/threonine kinases

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- (B) ☐ Respond to extracellular stimuli (mitogens). www.FirstRanker.com
- (C) ☐ Regulate various mitosis, differentiation and apoptosis.
- (D) ☐ **All of the above (Correct Answer)**

Question No.12 (Question Id - 50)

Cytochromes play important roles in electron transport chain. The following applies role of cytochromes during oxidative phosphorylation.

- (A) ☐ Globular Cytochrome C is important for complex III and complex IV
- (B) ☐ Complex III itself is composed of a b-type cytochrome
- (C) ☐ Complex III itself is composed of a a-type cytochrome
- (D) ☐ **All of the above (Correct Answer)**

Question No.13 (Question Id - 20)

RNA dependent RNA polymerase is NOT found in which of the following viruses ?

- (A) ☐ Dengue virus
- (B) ☐ Chikungunya virus
- (C) ☐ SARS-COV 2 virus
- (D) ☐ **Human Immunodeficiency virus (Correct Answer)**

Question No.14 (Question Id - 34)

Glia, also called glial cells in the central nervous system are :

- (A) ☐ non-neuronal cells
- (B) ☐ do not produce electrical impulses
- (C) ☐ important since they supply nutrients and oxygen to neurons
- (D) ☐ **all of the above (Correct Answer)**

Question No.15 (Question Id - 43)

T helper type 2 (Th2) cells are a distinct lineage of CD4⁺ effector T cells, which secretes :

- (A) ☐ **IL-4 (Correct Answer)**
- (B) ☐ IL-1
- (C) ☐ IL-6
- (D) ☐ All of the above

Question No.16 (Question Id - 32)

Angiogenesis is the physiological process which is important in :

- (A) ☐ generation of new blood vessels
- (B) ☐ wound healing
- (C) ☐ tumor progression
- (D) ☐ **all of the above (Correct Answer)**

Question No.17 (Question Id - 38)

Chromatin immunoprecipitation (ChIP) is used to study interaction between proteins and DNA. The following statement correctly applies to the assay :

- (A) ☐ In cross-linked ChIP (XChIP) chromatin sheared by sonication is used (Correct Answer) www.FirstRanker.com www.FirstRanker.com
- (B) ☐ In cross-linked ChIP (XChIP) purified whole chromatin is used
- (C) ☐ In Native ChIP (NChIP) native chromatin sheared by sonication is used
- (D) ☐ All statements are correct

Question No.18 (Question Id - 23)

The mechanisms of resistance to chloramphenicol are :

- (A) ☐ reduced membrane permeability
- (B) ☐ mutation of the 50S ribosomal subunit
- (C) ☐ elaboration of chloramphenicol acetyltransferase
- (D) ☐ all of the above (Correct Answer)

Question No.19 (Question Id - 37)

The subunits of human NF-KB (nuclear factor kappa-light-chain-enhancer of activated B cells) are :

- (A) ☐ c-Rel (Correct Answer)
- (B) ☐ Rel D
- (C) ☐ b-Rel
- (D) ☐ e-Rel

Question No.20 (Question Id - 30)

What volume of 0.05 M H_2SO_4 will be required to completely neutralize 15 ml of 0.2 N NaOH solution ?

- (A) ☐ 30 ml of 0.05 M H_2SO_4 (Correct Answer)
- (B) ☐ 0.1 ml of 5 M H_2SO_4
- (C) ☐ 3 ml of 1 M H_2SO_4
- (D) ☐ 30 ml of 0.5 M H_2SO_4

Question No.21 (Question Id - 2)

Chromatin immunoprecipitation is :

- (A) ☐ commonly abbreviated as ChIP assays (Correct Answer)
- (B) ☐ used for RNA-protein binding assays
- (C) ☐ used for karyotyping assays
- (D) ☐ all of the above

Question No.22 (Question Id - 48)

Sumoylation of proteins is a post-translational modification where proteins are conjugated with :

- (A) ☐ ubiquitin
- (B) ☐ small ubiquitin-like modifiers (Correct Answer)
- (C) ☐ secretory ubiquitin methylation
- (D) ☐ none of the above

Question No.23 (Question Id - 4)

One nanometer (nm) is equal to :

- (A) ☐ one millionth of a millimeter (mm)
(B) ☐ one-billionth of a meter (m)
(C) ☐ one thousand picometer (pm)
(D) ☐ **all of the above (Correct Answer)**

Question No.24 (Question Id - 25)

Succinate-Q oxidoreductase is characterized by :

- (A) ☐ the term complex III
(B) ☐ being the first entry point to the electron transport chain
(C) ☐ **being the only enzyme that is part of both the citric acid cycle and the electron transport chain**
(Correct Answer)
(D) ☐ all of the above

Question No.25 (Question Id - 18)

Two proteins of the same molecular weight, size, shape and charge can still be separated by :

- (A) ☐ Gel filtration chromatography
(B) ☐ **Affinity chromatography (Correct Answer)**
(C) ☐ Ion-exchange chromatography
(D) ☐ Thin layer chromatography

Question No.26 (Question Id - 14)

The Second Law of Thermodynamics states that :

- (A) ☐ **entropy constantly increases in a closed system (Correct Answer)**
(B) ☐ energy can neither be created nor destroyed: it can only change form
(C) ☐ entropy constantly decreases in a closed system
(D) ☐ none of the above

Question No.27 (Question Id - 31)

The function of adrenocorticotrophic hormone is to :

- (A) ☐ Stimulate secretion of pepsin
(B) ☐ Stimulate neuro-transmission
(C) ☐ **Stimulate secretion of steroid hormones (Correct Answer)**
(D) ☐ None of the above

Question No.28 (Question Id - 22)

Nalidixic acid is a synthetic quinolone antibiotics. It functions as :

- (A) ☐ Protein synthesis inhibitor in gram negative bacteria
(B) ☐ Membrane disruption agent in gram positive bacteria
(C) ☐ Inhibitor of bacterial motility
(D) ☐ **None of the above (Correct Answer)**

Question No.29 (Question Id - 28)

Toll like Receptors (TLRs) are fundamental determinants of innate immunity. A possible ligand for TLR is :

- (A) ☐ Teichoic acids of gram negative bacteria

- (B) ☐ **Pathogen Associated Molecular Patterns (Correct Answer)**
 (C) ☐ Viral Lipopolysaccharides
 (D) ☐ All of the above

Question No.30 (Question Id - 46)

The theoretical maximum yield of ATP through oxidation of one molecule of glucose in glycolysis, citric acid cycle, and oxidative phosphorylation is :

- (A) ☐ 36
 (B) ☐ **38 (Correct Answer)**
 (C) ☐ 40
 (D) ☐ 28

Question No.31 (Question Id - 15)

Reverse Phase High Performance Liquid Chromatography (RP-HPLC) commonly uses C18 and C8 columns. Select the incorrect statement about these columns :

- (A) ☐ C18 has a longer carbon chain while C8 has a shorter carbon chain
 (B) ☐ **C18 has a lower retention while C8 has a higher retention (Correct Answer)**
 (C) ☐ **C18 has a higher hydrophobicity, then C8 (Correct Answer)**
 (D) ☐ **Both columns use organic solvents in their mobile phase (Correct Answer)**

Question No.32 (Question Id - 3)

Streptavidin and Biotin are widely used in molecular biology assays. This is because :

- (A) ☐ Streptavidin homo-tetramers bind to vitamin B₇ with high affinity
 (B) ☐ The dissociation constant (K_d) of Streptavidin-biotin binding is on the order of $\approx 10^{-14}$ mol/L
 (C) ☐ Streptavidin-biotin complex is relatively resistant to organic solvents
 (D) ☐ **All of the above (Correct Answer)**

Question No.33 (Question Id - 16)

Nonsteroidal anti-inflammatory drugs (NSAIDs) are members of a drug class that :

- (A) ☐ **inhibit cyclooxygenase enzymes (COX-1 or COX-2) (Correct Answer)**
 (B) ☐ upregulate the synthesis of prostaglandins
 (C) ☐ decrease risk of gastrointestinal ulcers upon prolonged use
 (D) ☐ all of the above

Question No.34 (Question Id - 21)

Cycloheximide is a naturally occurring fungicide produced by the bacterium *Streptomyces griseus*. It is used in molecular biology experiments because it can be used to :

- (A) ☐ Interfere with eukaryotic translational elongation
 (B) ☐ Ribosome profiling/translational profiling
 (C) ☐ Study the half-life of a protein

Question No.35 (Question Id - 47)

The measure of the total binding strength of an antibody at every binding site is termed as :

- (A) ☐ Affinity
 (B) ☐ **Avidity (Correct Answer)**
 (C) ☐ Titer
 (D) ☐ None of the above

Question No.36 (Question Id - 7)

Choose the number of moles of the product formed in the following chemical reaction :



- (A) ☐ Al_2OH_2
 (B) ☐ 4AlO_2
 (C) ☐ $4\text{Al}(\text{OH})_2$
 (D) ☐ **None of the above (Correct Answer)**

Question No.37 (Question Id - 10)

Curcumin, the primary bioactive substance in turmeric is :

- (A) ☐ made by Curcuma longa plants
 (B) ☐ a natural polyphenol
 (C) ☐ a phyto-medicine with anti-inflammatory properties
 (D) ☐ **all of the above (Correct Answer)**

Question No.38 (Question Id - 6)

EDTA is a chemical that chelates minerals and metals. The full form of EDTA is :

- (A) ☐ Ethyldimethyltetraacetic acid
 (B) ☐ Ethylenediaminetriacetic acid
 (C) ☐ Ethoxydioxytriacetic acid
 (D) ☐ **Ethylenediaminetetraacetic acid (Correct Answer)**

Question No.39 (Question Id - 24)

Choose which of the following events occur during oxidative phosphorylation :

- (A) ☐ electrons are transferred from electron donors to electron acceptors such as oxygen in redox reactions
 (B) ☐ redox reactions release the energy stored in the relatively weak double bond of O_2
 (C) ☐ reactive oxygen species such as superoxide and hydrogen peroxide is formed
 (D) ☐ **all of the above (Correct Answer)**

Question No.40 (Question Id - 42)

Koch's postulates for infectious disease states that :

- (A) ☐

The microorganism must be found in the organism suffering from the disease, but should not be found in healthy organism.

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(Correct Answer)

- (B) ☐ The microorganism must be isolated from the asymptomatic and symptomatic organisms suffering from the disease
- (C) ☐ The cultured microorganism should not cause disease when infected in an organism resistant to the disease
- (D) ☐ All of the above

Question No.41 (Question Id - 36)

A leucine zipper is a common three-dimensional structural motif in proteins. The following statement that best apply to these proteins :

- (A) ☐ Leucine zippers are α -helices that contain a leucine residue every seventh amino acid.
- (B) ☐ This motif is found in many eukaryotic transcription factors.
- (C) ☐ Zing fingers are not leucine zipper proteins
- (D) ☐ **All of the above statements are correct (Correct Answer)**

Question No.42 (Question Id - 1)

An endospore forming bacteria may be isolated from a mixture of non-sporulating bacteria in solution using the following technique :

- (A) ☐ exposing the solution to sunlight for 15 min.
- (B) ☐ **boiling the sample at 80°C for 20 min. (Correct Answer)**
- (C) ☐ incubating the sample in 10% formaldehyde for 1 h.
- (D) ☐ exposing the solution to gamma-radiation for 15 min.

Question No.43 (Question Id - 19)

Post-translational modifications of a biological molecule in a living cell can be studied by :

- (A) ☐ Nexgen sequencing
- (B) ☐ **Proteomics (Correct Answer)**
- (C) ☐ Transcriptomics
- (D) ☐ Polymerase Chain Reaction

Question No.44 (Question Id - 26)

The type II secretion system is a membrane bound protein complex found in Gram-negative bacteria. The following apply to this complex :

- (A) ☐ It has an outer membrane complex made up by the secretin GspD.
- (B) ☐ GspD are β -barrels shaped structures in the bacterial membrane
- (C) ☐ GspD creates a pore in the outer membrane of the bacterial cell
- (D) ☐ **All of the above (Correct Answer)**

Question No.45 (Question Id - 40) www.FirstRanker.com www.FirstRanker.com

The amount of a peptide with molecular weight 300 daltons required to make a 10mM solution in 1mL water is :

- (A) ☐ 3 μ g
(B) ☒ 3 mg (Correct Answer)
(C) ☐ 300 mg
(D) ☐ 10 mg

Question No.46 (Question Id - 8)

A Grignard reagent has a generic formula R-Mg-X, where X is a halogen and R is an organic group. These reagents are :

- (A) ☐ widely used in organic synthesis for creating new carbon-carbon bonds
(B) ☐ good nucleophiles
(C) ☐ normally handled as solutions in solvents like diethyl ether or tetrahydrofuran
(D) ☒ all of the above (Correct Answer)

Question No.47 (Question Id - 49)

Escherichia coli Strain Nissle 1917 is :

- (A) ☒ a probiotic strain (Correct Answer)
(B) ☐ an EPEC strain
(C) ☐ an EHEC strain
(D) ☐ none of the above

Question No.48 (Question Id - 44)

A person with fever checks at 39°C. This means the temperature of this person is :

- (A) ☒ 102.2°F (Correct Answer)
(B) ☐ 103.4°F
(C) ☐ 101°F
(D) ☐ None of the above

Question No.49 (Question Id - 39)

The natural antibiotic present in mother's milk of homo sapiens is :

- (A) ☐ Granzyme
(B) ☐ Lipid A
(C) ☒ Lactoferrin (Correct Answer)
(D) ☐ Hepcidin

Question No.50 (Question Id - 5)

What is 98.6 °F in degrees Celsius ?

- (A) ☒ 37.0°C (Correct Answer)
(B) ☐ 30.0°C
(C) ☐ 100.0°C
(D) ☐ None of the above

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