

Part I of II, General Comprehension and Scientific Terms
(3% each, a total of 60%)

※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. "Scientific ability consists of a series of knowledge structures, that is, knowledge of relevant facts and procedures"
The "that is" in the above sentence can be interpreted as:
 - (a) in fact
 - (b) in other words
 - (c) especially
 - (d) all of above
2. "More specifically, those results indicate protein A is indeed a protein kinase"
What does "more specifically" mean in the above sentence?
 - (a) it is very interesting
 - (b) it is very likely
 - (c) in simple terms
 - (d) none of above
3. "In contradiction to all previous studies, GPA1 is indeed a GTPase"
According to the above sentence, what all previous studies have concluded regarding GPA1?
 - (a) GPA1 is a GTPase
 - (b) GPA1 might be a GTPase
 - (c) GPA1 is not a GTPase
 - (d) none of above
4. "A signaling pathway can be turn on or turn off by a single protein, e.g., G-alpha subunit in G-protein system"
What does "e.g." mean here?
 - (a) but not
 - (b) for example
 - (c) to put it more simply
 - (d) none of above
5. "Microarray analysis provides additional evidence for unique function of this signaling pathway"
The "unique" in the above sentence indicates the function of this signaling pathway to be:
 - (a) useful
 - (b) powerful
 - (c) special and rare
 - (d) none of above
6. "It's better to make the wrong decision than to make no decision at all"
According to the description, what is the least preferred option:
 - (a) correct decision
 - (b) wrong decision
 - (c) no decision
 - (d) all of above
7. "The clinical results indicate no detrimental effects on increasing the dose of drug administration"
What does this mean?
 - (a) lower the drug dosage is suggested
 - (b) taking the drug is prohibited
 - (c) the drug causes no harmful effects
 - (d) none of above
8. "No synergistic effect of silibinin and morin in treating an epileptic mouse model is observed"
What can you deduce from the statement?
 - (a) silibinin is not able to treat the epileptic mouse
 - (b) morin is not able to treat an epileptic mouse
 - (c) silibinin and morin are showing cooperativity in treating the epileptic mouse
 - (d) silibinin and morin have no drug-to-drug interaction against the epileptic model in mouse

見背面

9. What is the meaning of "non-essential"?
- (a) redundant
 - (b) vital
 - (c) basic
 - (d) significant
10. "This research provides an invaluable insight towards understanding the catalytic mechanism of protein X"
What is the ANTOYM of "invaluable" in the sentence above?
- (a) hypothetical
 - (b) worthless
 - (c) important
 - (d) valuable
11. Which organelle is the power plant of a eukaryotic cell?
- (a) Golgi apparatus
 - (b) endosomes
 - (c) mitochondria
 - (d) ribosomes
12. "Pathogen" is usually a kind of:
- (a) artificial cells
 - (b) animal cells
 - (c) plant cells
 - (d) microbial cells
13. What is the procedure that DNA is processed into RNA?
- (a) transformation
 - (b) transfection
 - (c) translation
 - (d) transcription
14. What is the building block that an enzyme is commonly composed of?
- (a) nucleic acids
 - (b) fatty acids
 - (c) amino acids
 - (d) sugar acids
15. In this reference: "Nikolaev, M.; Round, E.; Gushchin, I.; Polovinkin, V.; Balandin, T.; Kuzmichev, P.; Shevhenko, V.; Borshchevskiy, V.; Kuklin, A.; Round, A.; et al. Integral membrane proteins can be crystallized directly from nanodiscs. Cryst. Growth Des. 2017, 17, 945–948.", which journal it was published?
- (a) Growth Des.
 - (b) Cryst. Growth Des.
 - (c) Cryst.
 - (d) none of above
16. "The release of the stored proton out of the proton-releasing group, PRG, to the extracellular bulk solvent has been observed experimentally to take place on a time scale of about 100 μ s"
The proton was released from the PRG to
- (a) inside the cell
 - (b) outside the cell
 - (c) another residue of this PRG
 - (d) none of above
17. "Chlorophylls (Chl) play pivotal roles in energy capture, transfer and charge separation in photosynthesis"
According to the statement above, the roles of Chl in photosynthesis is
- (a) very important
 - (b) an inhibitor
 - (c) not clear
 - (d) none of above

18. "Activation of the two-component system formed by CckA, ChpT, and CtrA (kinase, phosphotransferase, and response regulator, respectively) in *Rhodobacter sphaeroides*, does not occur under the growth conditions commonly used in the laboratory. It can be concluded that, to activate two-component system in this species, you can
- do laboratory culture
 - need to add CckA, ChpT and CtrA to the laboratory culture
 - the regular laboratory culture will not work
 - none of above
19. When performing a Western blotting experiment what reagent would you use for accessing the presence of target biomolecules?
- DNA primers
 - antibodies
 - RNA probes
 - polymerases
20. The type of experimental procedure performed within the animal models is often called:
- Ex vivo*
 - In vitro*
 - In vivo*
 - In silico*

Part II of II: Journal Article Reading Comprehension
(5% each, a total of 40%)

21. "Epigenetics refers to changes in phenotype that are not rooted in DNA sequence. This phenomenon has largely been studied in the context of chromatin modification. Yet many epigenetic traits are instead linked to self-perpetuating changes in the individual or collective activity of proteins. Most such proteins are prions, which have the capacity to adopt at least one conformation that self-templates over long biological timescales. This allows them to serve as protein-based epigenetic elements that are readily broadcast through mitosis and meiosis." [Modified from *Molecular Cell*. 2018, 69(2):195-202]
- What is the main message of this paragraph?
- epigenetics is solely associated with altered gene expression
 - epigenetic traits are non-inheritable
 - phenotypical changes via genetic mutations is called epigenetics
 - prions are also found to be epigenetic elements
22. "Fundamental changes of agriculture and food production are inevitable. Biotechnological manufacturing of acellular products for food has already been successfully demonstrated but the full profit of cellular agriculture is just beginning to emerge. For example, cultured meat is a promising source for animal-based proteins while cultured plant cells could serve as a food alternative with healthy and nutritionally-balanced diet." [Modified form *Current Opinion in Biotechnology*. 2020, 61:128-134]
- What is the take-home message?
- the demand for agriculture and food production is not urgent
 - current development of food processing is hampered by the biotechnological bottleneck
 - cellular food production is gaining potential
 - cultured meat is substituted by plants
23. A recently study has identified a natural protein called Sestrin, an exercise-inducible mediator, that is found to mimic many exercise effects. In both fly and mouse models, genetic ablation of Sestrin prevents organisms from acquiring metabolic benefits of exercise and improving their endurance through training. Conversely, Sestrin upregulation mimics both molecular and physiological effects of exercise, suggesting that it could be a major effector of exercise metabolism. [source: *Nature Communications*. 2020, 11: 190]
- What is "NOT" true about the paragraph?
- exercise promotes Sestrin expression
 - Sestrin positively regulates the exercise metabolism
 - exercise inhibits Sestrin expression
 - Sestrin knockout animals can't experience exercise metabolism

24. Cancers can easily escape from the immune surveillance by releasing some natural brakes, immune checkpoints, on our immune systems so that immune cells can't attack tumors. To tackle such medical crisis, a new form of cancer therapy named "immune checkpoint blockage" is developed. This therapy retrieves the immunity against tumors in which the checkpoints produced from the cancers are blocked by the administration of drugs.

What is the main scheme that the paragraph discusses about?

- (a) the limit of cancer immunotherapy
- (b) the concept of immune checkpoint blockage
- (c) a new drug that can enhance immune checkpoint inhibition
- (d) tumors suppress the immunity through immune checkpoint blockage

25. According to the Australian government, the enormous fires, which are being amplified by climate change, have killed up to a billion animals and may drive species to extinction due to direct death, starvation, predation, and habitat loss aftermath.

What does this sentence tell us?

- (a) the fire helps to rebuild the ecology in Australia
- (b) the Australian fires cause an ecological catastrophe
- (c) Australian government has set a fire to prevent the animals from extinction
- (d) the extinction of animals has nothing to do with the fires

26. A new virus from the same family as the deadly SARS disease has spread beyond China's borders for the first time with a case emerging in Thailand. Thai doctors diagnosed a Chinese traveller with mild pneumonia on 8 January which was later confirmed to have been caused by the same SRAR-like coronavirus - which has already given rise to 41 pneumonia-like cases and one death in China. [source: Google news]

What is the main idea of this piece of news?

- (a) China reported the first case of SAR-like virus infection originated from Thailand
- (b) Thailand government assisted China to fight against SARS-like virus
- (c) mystery SARS-like virus spreads as first confirmed case outside China
- (d) Chinese government has been developing the cure against the SARS-like virus infection

Please read the following article and answer the questions [DOI: 10.1088/1758-5082/1/2/022001].

Biofabrication can be defined as the production of complex living and non-living biological products from raw materials such as living cells, molecules, extracellular matrices, and biomaterials. Cell and developmental biology, biomaterials science, and mechanical engineering are the main disciplines contributing to the emergence of biofabrication technology. The industrial potential of biofabrication technology is far beyond the traditional medically oriented tissue engineering and organ printing and, in the short term, it is essential for developing potentially highly predictive human cell- and tissue-based technologies for drug discovery, drug toxicity, environmental toxicology assays, and complex in vitro models of human development and diseases.

In the long term, biofabrication can also contribute to the development of novel biotechnologies for sustainable energy production in the future biofuel industry and dramatically transform traditional animal-based agriculture by inventing animal-free agricultural synthesis and production. Thus, the broad spectrum of potential applications and rapidly growing "arsenal" of biofabrication methods strongly suggests that biofabrication can become a dominant technological platform and new paradigm for innovating in manufacturing and industrial applications.

27. What is the best title for this topic?

- (a) the medical advancement as a result of biofabrication
- (b) biofabrication as a future biomanufacturing paradigm
- (c) biofabrication taking the place of bioengineering
- (d) the role of biofabrication in biomimicry

28. What does "arsenal" mean in the context of the article?

- (a) power
- (b) bullets
- (c) debt
- (d) speed