考生注意事項：所有考題務必在答案卷上作答，在問題卷上作答者不計分。

一、配合題（1-25 題，每題一分，均為單選，答錯倒扣 0.25 分）

MATCHING. Choose the one most appropriate answer for each.

1. Nucleus	A. is responsible for cell movements
2. Mitochondria	B. create intracellular compartments with different functions.
3. Chloroplasts	C. capture energy from sunlight.
4. Internal membranes	D. is the information store of the cell.
5. Cytoskeleton	E. generate energy from food to power the cell.

6. Ionic bonds	A. is the most abundant substance in cells.
7. Covalent bonds	B. form by the sharing of electrons.
8. Water	C. form by the gain and loss of electrons.
9. Amino acids	D. specify the precise shape of a macromolecule.
10. Noncovalent bonds	E. are subunits of proteins.

11. Membrane lipids	A. form bilayers in water.
12. The fluidity of a lipid bilayer	B. depends on its composition.
13. Membrane proteins	C. associate with lipid bilayer in various ways and can be solubilized in detergents.
14. The cell surface	D. are imperable to solutes and ions.
15. The lipid bilayer	E. is coated with carbohydrate.

（背面仍有題目，請繼續作答）

16.	The Na^+-K^+ pump	A.	is governed by membrane permeability to specific ions.
17.	Intracellular Ca^{++} concentrations	B.	are usually mediated by voltage-gated Na^+ channels.
18.	The membrane potential	C.	convert electrical signals into chemical signals at nerve terminals
19.	Action potential	D.	helps maintain the osmotic balance of animal cells.
20.	Voltage-gated Ca^{++} channels	E.	are kept low by Ca^{++} pump.

21.	Nitric oxide	A.	assemble a complex of intracellular signaling proteins.
22.	Ion-channel-linked receptors	B.	conert chemical signals into electrical ones.
23.	The pathway through phospholipase C	C.	can enter cells to activate enzymes directly.
24.	Activated receptor tyrosine kinase	D.	activate the GTP-binding protein, Ras.
25.	Receptor tyrosine kinase	E.	results in a rise in intracellular Ca^{++}.

II. 選擇題（26-40 題，每題一分，均為單選，答錯倒扣 0.25 分）

26. A hydrogen bond is

A. a sharing of a pair of electrons between a hydrogen and an oxygen nucleus.
B. a sharing of a pair of electrons between a hydrogen nucleus and either an oxygen or a nitrogen nucleus.
C. an attractive force that involves a hydrogen atom and an oxygen or a nitrogen atom that are either in two different molecules or within the same molecule.
D. all of the above.
E. none of the above.

27. Water is such an excellent solvent primarily because

A. it forms spheres of hydratioon around charged substances and can form hydrogen bonds with many nonpolar substances.
B. it has a high heat of fusion.
C. of its cohesive properties.
D. it is a ligand at room temperature.
E. all of the above.

28. The three most common atoms in the body are

A. hydrogen, oxygen and carbon.
B. carbon, hydrogen and nitrogen.
C. nitrogen, hydrogen and oxygen.
D. nitrogen, oxygen and carbon.
E. none of the above.

29. Which of the following is not a macromolecule?

A. Protein.
B. Starch.
C. Nucleotide.
D. Lipid.
E. Nucleic acid.

30. Which of the following statements is incorrect?

A. Many amino acids have hydrophobic side chains.
B. Nucleic acids contain sugar group.
C. Lipid bilayers are macromolecules that are made up mostly of phospholipid subunits.
D. The hydrophobic tails of phospholipid molecules are repelled from water.
E. DNA contains the four different bases A, G, T and C.

31. Glycogen is a polysaccharide used for energy storage by

A. animals.
B. plants.
C. fungi.
D. bacteria.
E. none of the above.

32. Plasma membranes are characterized by the presence of

A. triacylglycerol.
B. phospholipids.
C. steroids.
D. cholesterol.
E. none of the above.

(背面仍有題目,請繼續作答)

33. The phospholipid molecules of most membrances have

A. a hydrophobic head and a hydrophilic tail.
B. a hydrophobic head and a hydrophobic tail.
C. a hydrophilic head and two hydrophilic tails.
D. a hydrophilic head and two hydrophobic tails.
E. none of the above.

34. Movement of a molecule against a concentration difference is a characteristic of

A. simple diffusion.
B. facilitated diffusion.
C. osmosis.
D. active transport.
E. bulk flow.

35. The sodium-potassium pump is an example of

A. simple diffusion.
B. facilitated diffusion.
C. osmosis.
D. active transport.
E. bulk flow.

36. Which of the following statements is **INCORRECT**?

A. Cell membrane enable a cell to create barriers that confine particular molecules to specific compartments
B. Cell membrane consist of a continuous double layer of lipid molecules in which protein are embedded.
C. The lipid bilayer is impermeable to all small nonpolar molecules, but permeable to all ions and polar molecules.
D. Cells adjust their membrane fluidity by modifying the lipid composition of their membrane.
E. The lipid bilayer provides the basic structure and barrier function of all cell membranes.

37. Which of the following statements is **INCORRECT** ?

A. Endocrine signaling is relatively slow because it depends on diffusion and blood flow.
B. Water-soluble hormones interact with cell-surface receptors, whereas lipid-soluble hormones usually bind to intracellular receptors.
C. Hormones are rapidly removed from the blood stream by hydrolytic enzymes.
D. The specificity of hormone depends on responsive cells prossessing receptors that binds the hormone.
E. None of the above.

38. Which of the following statements is **INCORRECT** ?

A. All receptors of steroid homone isolated so far are DNA-binding proteins.
B. The first step of response by steroid hormone is caused by the binding of the receptor-hormone complex to DNA.
C. Steroid receptors have separate domains for ligand binding and for DNA recognition and the gene activation.
D. The receptors for estradiol, cortisol, and progesterone is encoded by a single gene.
E. None of the above.

39. Which of the following statements is **INCORRECT** ?

A. The synthesis of cyclic AMP in response to hormones stimulation requires GTP as well as ATP.
B. When Gs proteins bind GTP, they dissociate into α and $\beta\gamma$ subunits.
C. Adenylate cyclase remains activated until the Gs protein hydrolyzes its bound GTP to GDP and dissociates.
D. Inositol triphosphates acts by direct stimulation of protein kinase C.
E. None of the above.

40. The amount of cAMP generated in the cell is dependent on

A. the activity of adenylate cyclase.
B. the length of time the GTP remains bound to the Gα protein.
C. the activity of the phosphodiesterase.
D. all of the above.
E. none of the above.

(背面仍有題目,請繼續作答)

III. 選擇題（41-50 題，每題二分，均為單選，答錯倒扣 0.5 分）

Answer the following questions using the key outlined below:

(A) if 1, 2, and 3 are correct
(B) if 1 and 3 are correct
(C) if 2 and 4 are correct
(D) if only 4 is correct
(E) if all four are correct

41. Which of the following statements about the chemiosmotic hypothesis is correct?
    1. The proton motive force drives protons back across the membrane via F_0F_1ATP synthase.
    2. Electron transfer in mitochondria is accompanied by the translocation of protons from the matrix to the intermembrane space.
    3. An intact inner membrane is required for oxidative phosphorylation.
    4. Uncouplers acts by direct inhibiting F_0F_1ATP synthase.

42. Which of the following contributes to the large negative free-energy change upon hydrolysis of the "high-energy" compounds?
    1. Electrostatic repulsion in the reactant.
    2. Input of a large energy to cleave the unusually stable bond in the reactant.
    3. Stabilization of products by more resonance forms.
    4. Stabilization of reactants by isomerization.

43. A diffusible electron carrier in mitochondrial electron transport chain is
    1. cytochrome b.
    2. cytochrome c.
    3. iron-sulfur protein.
    4. ubiquinone.

44. Which of the following statements concerning free energy is correct?
    1. An energetically favorable reaction has a negative ΔG.
    2. ΔG and ΔG°' mean the same thing.
    3. The value of ΔG is denpendent on the concentrations of reactants and products.
    4. When ΔG°' is positive, $K'_{eq} > 1$.

45. Which of the following reactions will occur only if it is coupled to a second, energetically favorable reaction?
    1. nucleoside triphosphate ⟶ DNA
    2. nucleotide bases ⟶ nucleoside triphosphate
    3. ADP + Pi ⟶ ATP
    4. glucose + O_2 ⟶ CO_2 + H_2O

46. Which of the following statements concerning the oxidation of a glucose molecule by the cell is correct?
    1. All of the energy produced by oxidation of glucose is in the form of heat.
    2 None of the produced energy is in the form of heat.
    3. Many steps in the oxidation of glucose molecule involve reaction with oxygen.
    4. In cells the reaction takes place in more than one step.

47. Which of the following statements concerning protein structure is correct?
    1. Noncovalent bonds are too weak to influence the three-dimensional structure of a protein molecule.
    2. The polar amino acids Ser, Lys, His, and Glu are more likely to be found on a protein's surface.
    3. Disulfide bonds are usually found on a protein's surface.
    4. The hydrophobic amino acids Leu, Phe, Val, Ile, and Met are more likely to be found in the interior of a protein.

48. Which of the following statements concerning immunoglobulins is correct?
    1. All chains are linked by disulfide bonds.
    2. Carbohydrate is covalently bound to the protein.
    3. All chains are linked by disulfide bonds.
    4. IgG is found primarily in mucosal secretions.

(背面仍有題目,請繼續作答)

49. Which of the following statements concerning the control of enzyme activity is correct?

1. A conformational change can be driven by protein phosphorylation.
2. Protein phosphorylation always activates an enzyme.
3. Binding of the effector changes the conformation of the enzyme molecule.
4. The binding of a nucleotide never changes the conformation of an enzyme.

50. Which of the following is accomplished by the citric acid cycle in mammals?

1. generation of NADH and $FADH_2$.
2. formation of α-keotglutarate for amino acid synthesis.
3. oxidation of acetyl-CoA.
4. net synthesis of oxaloacetate from acetyl-CoA.

IV. 選擇題（51-55 題，每題二分，均為單選，答錯倒扣 0.5 分）

51. Complex II

A. receives electrons from NADH and passes them to coenzyme Q.
B. receives electrons form coenzymes Q and passes them to cytochrome c.
C. receives electrons from succinate and passes them to coenzyme Q.
D. receives electrons from cytochrome c and passes them to O_2.
E. transports protons and synthesizes ATP.

52. In tightly coupled mitochondria, the rate of NADH consumption will

A. decrease if 2,4-dinitrophenol is added to the mitochondrial suspension.
B. decrease if mitochondrial ADP is depleted.
C. increase if mitochondrial Pi is depleted.
D. increase if ATP synthase is inhibited.
E. none of the above.

53. If intact mitodhondria were incubated with antimycin A, excess NADH, and an adequate supply of O_2, which of the following would be found in the oxidized state?

A. cytochrome b
B. cytochrome a
C. coenzyme Q
D. FMN
E. none of the above.

54. Which of the following cofactors are required in the oxidative decarboxylation reaction of both pyruvate and α-ketoglutarate?

A. Lipoic acid, Coenzyme A, FAD
B. Thiamine pyrophosphate, NAD^+, ATP
C. Coenzyme A, Coenzyme Q, lipoic acid
D. NAD^+, lipoic acid, biotin
E. none of the above

55. The citric acid cycle is stimulated by

A. high ratio of [NADH]/[NAD^+].
B. high ratio of [ATP]/[ADP].
C. high concentration of succinyl-CoA.
D. high concentration of oxaloacetate.
E. none of the above.

IV. 問答題（56-58 題，每題十分）

56. Please describe a modern method that can be used to analyze thousands of genes at the same time. (10%)

57. How do you block a protein function from gene level.? (10%)

58. How do you isolate embryonic stem cell and describe its biological properties and potential applications ? (10%)