單選題 共 40 題 (A) (B) (C) (D) (E) 5 選 1 答錯不倒扣

第 1 至 20 題 每題 2 分 第 21 至 40 題 每題 3 分 請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

1. Cytosolic proteins are anchored to the plasma membrane by ?

(1) prenylation

(2) S-nitrosylation

(3) farnesylation

(4) myristoylation

a. (1), (2) or (3)

b. (1), (2) or (4)

c. (1) (3) or (4)

d. (2), (3) or (4)

e. (1), (2), (3) or (4)

2. Which of the following statements regarding cytoskeleton is correct?

(1) The plasma membrane of eukaryotic cells is supported by microtubules.

(2) Within an actin filament, each actin subunit is surrounded by 4 neighboring actin subunits.

(3) In cells, the γ-tubulin ring complex is found at the microtubule (+) end.

a. (1)

b. (2)

c. (3)

d. (1) and (2)

e. (2) and (3)

3. Which of the following is a common intracellular second messenger?

a. adenosine triphosphate (ATP)

b. guanine monophosphate (cGMP)

c. 1,2 diacylglycerol (DAG)

d. Epinephrine

e. Serotonin

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4. Eukaryotic mRNA binding to the ribosomes is **facilitated** by?

a. Kozak consensus sequence

b. the Shine Dalgarno sequence

c. the 7-methyl guanosine cap

d. poly A tail

e. All of above facilitate mRNA binding to the ribosomes.

5. The resting membrane potential in animal cells depends largely on what channel?

a. nongated H^+

b. gated Na^+

c. nongated Na^+

d. gated K^+

e. nongated K^+

6. Which of the following statements regarding aquaporins is correct?

(1) Aquaporins are water-channel proteins.

(2) Aquaporins specifically increase the permeability of biomembranes to water- soluble salts.

(3) The level of aquaporin 2 is rate-limiting for water transport by the kidney and is essential for resorption of water in the kidney.

a. (1) and (2)

b. (1) and (3)

c. (2) and (3)

d. All of above are correct

e. None of above is correct

7. Which of the following statements regarding restriction enzymes is correct?

(1) Restriction enzymes are named for the bacterium they are derived from.

(2) Restriction enzymes protect bacteria from viral infection.

(3) In order to insert a foreign gene into a plasmid, both must be cut by the same restriction enzyme.

a. (1) and (2)

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b. (1) and (3)

c. (2) and (3)

d. None is correct

e. All is correct

8. Which of the following statements regarding a gene expression vector in E. coli is correct?

(1) always contains an origin of replication.

(2) usually contains a gene that confers antibiotic resistance to the bacterial host.

(3) always contains DNA segments for the regulation of mRNA production.

a. (1) and (2)

b. (1) and (3)

c. (2) and (3)

d. None is correct

e. All is correct

9. Which one is NOT a function of mitochondria?

a. ATP production

b. Autophagy

c. Apoptosis

d. Synthesis of lipid

e. Formation of synaptic vesicles

10. Which one is NOT a post-translational modification?

a. Ubiquitination

b. Transcription

c. Prenylation

d. Poly ADP-ribosylation

e. Phosphorylation

11. Which one is NOT involved in cell cycle machinery?

a. Cdk1

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b. E2F

c. APC/cdc20

d. RIPK1

e. p21

12. Which one is NOT required for microtubule assembly?

a. α-tubulin

b. β-tubulin

c. Polymerase

d. ATP

e. GTP

13. Which one can be directly used in detecting apoptosis?

a. Annexin V

b. Propodium iodide

c. Sodium vanadate

d. Trypsin

e. lipopolysaccharide

14. Which one is NOT involved in cell cycle checkpoint?

a. Cyclin D

b. Rb

c. ATR

d. ATM

e. Cdc20

15. What is not the function of SDS in SDS -PAGE (sodium dodecyl sulfate polyacrylamide gel electrophoresis)?

a. It is a detergent.

b. It dissociates protein complexes.

c. It coats the protein surface a negative charge.

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d. It destroys the disulfide bond.

e. It denatures proteins.

16. Which one of the following is not involved in steroid hormone action?

a. Cell surface receptors

b. Hormone-receptor complexes

c. Specific DNA sequences

d. Transcription activation and repression

e. Zinc fingers

17. Which technique is not used for protein structure determination?

a. X-ray crystallography

b. Circular dichroism (CD)

c. Nuclear magnetic resonance (NMR)

d. Confocal microscopy

e. Cryo-electron microscopy (Cryo-EM)

18. Which of the following is not known to be involved in transcription initiation by eukaryotic RNA polymerase II?

a. DNA helicase activity

b. DNA polymerase activity

c. Chromatin remodeling

d. Pol II pausing at about 30–50 nt downstream of the transcription start site

e. Protein phosphorylation

19. Which is not the loss-of-function method to study a gene function?

a. RNA interference

b. Clustered regularly interspaced short palindromic repeats

c. Zinc finger nuclease

d. Gene targeting

e. Finger printing

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20. What is incorrect about reverse transcriptase (RT)?

a. Telomerase is one kind of RT.

b. It is found in retrovirus.

c. It synthesizes DNA from 3' to 5'

d. It needs a primer and template.

e. It is essential for cDNA synthesis.

21. Which of the following statements regarding Vesicle transport is **incorrect**?

(1) Vesicle budding recruits proteins that are needed for subsequent selective vesicle targeting and fusion.

(2) Clathrin coated vesicles are pinched off in a dynamin-mediated process.

(3) Vesicle transport along actin filaments is driven by myosin II.

a. (1)

b. (2)

c. (3)

d. (1) and (2)

e. (2) and (3)

22. Which of the following statements regarding Golgi apparatus is correct?

(1) Each cisterna or region of the Golgi contains different protein modification enzymes.

(2) The Golgi enzymes catalyze the addition of sugars sulfate groups and the addition of phosphate groups onto cargo proteins.

(3) Some Golgi-mediated modifications act as signals to direct the proteins to their final destinations within cells, including the lysosome and the plasma membrane.

a. (1)

b. (2)

c. (3)

d. (1) and (2)

e. All are correct.

23. Which of the following statements regarding extracellular vesicles (EVs) is **incorrect**?

a. Exosomes and microvesicles both are extracellular vesicles (EVs) but differ in their cellular origin. The exosomes bud off from the cell membrane but MVs have endocytic origin.

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b. EVs contain mRNAs and miRNAs and those EV-associated mRNAs and miRNAs can be functionally transferred to recipient cells.

c. Tumor cells have been shown to exploit EVs to contribute to their progression by inactivating T lymphocytes or natural killer cells as well as promoting differentiation of regulatory T lymphocytes to suppress immune reactions.

d. Several pathogenic proteins such as prions and β-amyloid peptides have also been reported to exploit exosomes in order to propagate to other cells.

e. None is incorrect

24. Which of the following statements regarding stem cells is correct?

(1) Pluripotent stem cells have the potential to become an entire organism.

(2) Totipotent stem cells can form any of the three embryonic germ layers, but cannot give rise to an entire organism.

(3) Multipotent cells can develop into more than one cell type, but are more limited than pluripotent cells.

(4) *Totipotent, pluripotent or multipotent stem cells are cells* that have the capacity to self-renew by dividing asymmetrically.

a. (1) and (2)

b. (2) and (3)

c. (3) and (4)

d. (1) and (4)

e. (2) and (4)

25. Activation of the notch receptor by its ligand, delta, in neighboring cell populations defines patterns of distinct differentiated cell types among cells that have the potential to adopt the same fate. What is this process called?

a. Lateral inhibition

b. Neurulation

c. Invagination

d. Gastrulation

e. None of above

26. Which of the following statements regarding heterotrimeric G protein and G-protein-mediated signaling is correct?

(1) The alpha subunit of heterotrimeric G protein (G-alpha), belong to the larger group of enzymes called GTPase.

(2) There are several different classes of heterotrimeric G-proteins that are defined by their different G-alpha, G-beta or G-gamma subunits.

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(3) G-protein coupled receptors (GPCRs) associate with heterotrimeric G-proteins. Upon ligand binding to GPCRs, G-alpha hydrolyze bounded GTP to GDP and dissociate from the other subunits of heterotrimeric G-proteins.

a. (1) and (2)

b. (1) and (3)

c. (2) and (3)

d. All are correct

e. None is correct

27. Which of the following statements regarding immune response is correct?

(1) In cellular immunity, T lymphocytes, including cytotoxic T lymphocytes and killer T cells are responsible for the recognition and killing of foreign invaders.

(2) Killer T lymphocytes have an especially low count in a patient with advanced AIDS.

(3) Histamine is produced by host cells infected by viruses.

(4) Immunological memory is due to long lived B cells that secrete a specific antibody.

a. (1) and (2) are correct

b. (1) and (3) are correct

c. (1) and (4) are correct

d. (1), (2) and (4) are correct

e. (1), (3) and (4) are correct

28. The order for the construction of a cDNA fragment from mRNA is to:

a. treat with reverse transcriptase, digest with RNase, add G residues to the 3' end, bind oligo-dC, treat with DNA polymerase and bind oligo-dT.

b. digest with RNase, add G residues to the 3' end, treat with reverse transcriptase, add G residues to the 3' end and treat with DNA polymerase.

c. bind oligo-dT, treat with reverse transcriptase, digest with RNase, add G residues to the 3' end, bind oligo-dC, treat with DNA polymerase.

d. bind oligo-dC, treat with reverse transcriptase, digest with RNase, add G residues to the 3' end, bind oligo-dT and treat with DNA polymerase.

e. None of above is correct

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29. Which one is NOT involved in COPII vesicle formation?

a. GTPase Sar1 (GTP-bound state)

b. guanine nucleotide exchange factor (GEF) Sec12

c. Coat Sec23/Sec24 heterodimer.

d. Outer coat Sec13/Sec31 heterotetramer

e. From Golgi to lysosome

30. Which molecule is degraded by ubiquitination during sister chromatid separation?

a. Cohesin

b. Securin

c. Cyclin A

d. Cdk2

e. Cdk1

31. Which one CANNOT be used as a molecular "brake" for the immune system?

a. PD1

b. PD-L1

c. EGFR

d. NKG2A

e. CTLA4

32. Which one is NOT correlated with longevity?

a. high levels of plasma sphingomyelin

b. low levels of PUFA-containing triacylglycerols

c. high level of plasma cholesterol

d. tryptophan

e. high energy expenditure

33. Which one has asymmetric cell division?

a. Hepatocyte

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b. Splenocyte

c. Intestinal epidermal cell

d. Stem cell

e. Skin cell

34. Which molecule does NOT participate in autophagy?

a. ULK1

b. Beclin1

c. LC3

d. ATG7

e. Caspase

35. The results of human genome project show that more than 98% of the human genomes are composed of non-coding DNA (ncDNA) which are never represented within the amino acid sequence of expressed proteins. Which description is incorrect?

a. About 20,000 human proteins have been annotated in databases, which is significantly larger than that of the fruit fly.

b. The extensive use of alternative pre-mRNA splicing in humans provides the ability to build a very large number of modular proteins.

c. Some ncDNAs contain genes for RNA molecules with important biological functions.

d. Transposable elements belong to ncDNAs, which account for at least 50% of the human genome.

e. Some ncDNAs contain intron, 5' UTR and 3'UTR.

36. A microRNA (miRNA) is a small non-coding RNA, which can down-regulate mRNA expression levels. Please choose the correct statement about animal miRNA.

a. It is transcribed by RNA polymerase I.

b. It is 10-20 nucleotides in length single-stranded RNA.

c. It is perfectly complementary to its mRNA targets.

d. It is a ribonuclease.

e. It forms a RISC complex to destabilize its mRNA targets.

37. Post-translational modifications modulate a protein activity. To study the functional effect of a protein phosphoprylated at Ser/Thr, we generate a non-phosphorylatable mutant by changing to Ala. What amino acids are used for creating a phosphomimetic mutant?

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a. Asp and Glu

b. Lys and Arg

c. Leu and Ile

d. Gln and Arg

e. Tyr and Phe

38. Which description is incorrect for chromatin-immunoprecipitation (ChIP) experiment?

a. It is for DNA-protein interaction.

b. Formaldehyde is used to crosslink DNA-protein only.

c. The genomic DNA has to shear into smaller fragments by sonication or nuclease digestion.

d. The specific antibody against the interested protein is to immunoprecipitate cross-linked DNA fragments.

e. The precipitated DNA regions are examined by quantitative PCR.

39. Induced pluripotent stem (iPS) cells are a type of pluripotent stem cell that are obtained by reprogramming somatic cells through artificial expression of key transcription factors including OCT4, KLF-4, SOX2, and c-MYC. What is incorrect?

a. These transcription factors promote self-renew.

b. They suppress differentiation-related gene expression.

c. They alter DNA sequences to regulate gene expression.

d. DNA methylation inhibitor could facilitate iPS cell formation.

e. Histone deacetylase inhibitor could induce iPS cell formation.

40. We are studying a transcription factor. What is incorrect?

a. Its mRNA expression is determined by northern blot.

b. Its protein expression is monitored by western blot.

c. Its target gene promoter is cloned from a cDNA library.

d. The promoter is ligated with luciferase gene for reporter assay.

e. The electrophoretic mobility shift assay is performed to display DNA-protein interaction.

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