Part I : Each multiple choice Questions (A, B, C, D, E) is worth 2 points.

1. What are analogous structures in animals?

A. Body parts in different animals produced by the same gene

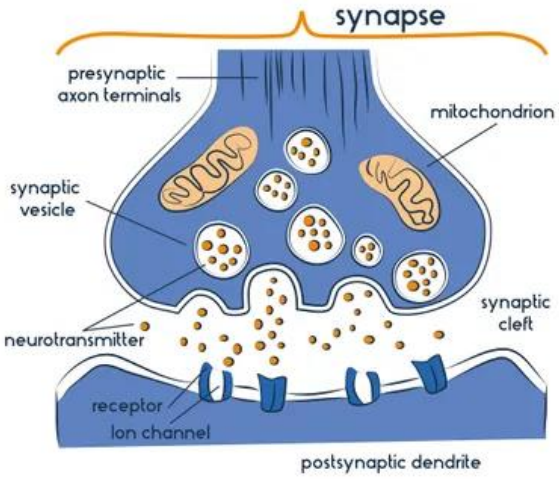
B. Structures that have a similar function but a different origin

C. A modification of the same structure in different animals

D. Structures found as part of the fossil record

E. The bones of the Horse's front legs are analogous to the bones of Penguins' front flippers

2. When an action potential in an axon reaches the presynaptic terminal, the depolarization opens ion channels allowing calcium into the cell. Calcium triggers the release of neurotransmitters to cross a synapse.



How do neurotransmitters cross the synapse to reach the postsynaptic membrane?

A. cotransport

B. osmosis

C. diffusion

D. endocytosis

E. proton pump

3. When Yuyun was 3, she got severe measles. Eight years later, her sister got measles but Yuyun was not severely infected. What type of leukocytes helps Yuyun not to get another severe recurrence of measles?

A. phagocytes
B. macrophages
C. natural killer cells
D. memory t cells
E. antigens

4. Zeze has five objects

Object	Mass (gram)	Volume (cm^3)
F	300	500
G	800	800
H	100	300
I	600	1000
J	2000	1500

All five objects are put into a big container filled with water
(water density = 1 kg/litre).
Which object has the greatest volume that is not immersed in water?

A. Object F
B. Object G
C. Object H
D. Object I
E. Object J

5. Dodo is standing in front of a big mirror. Dodo sees the image in the mirror as upright and bigger than him. If Dodo stands 1 meter in front of the mirror, the mirror that Dodo used is ...

A. A concave mirror with a focal length is more than 1 meter.
B. Convex mirror with focal length is more than 1 meter.
C. Plane mirror.
D. Convex mirror with focal length is less than 1 meter.
E. A concave mirror with a focal length is less than 1 meter.

6. Which of these statements could describe the effect of carbon monoxide in cigarette smoke?

1) It binds irreversibly to hemoglobin.
2) It causes mucus to accumulate in the bronchioles.
3) It results in more carbon dioxide being transported in the blood.
4) It temporarily increases the heart rate.

A. 1 and 2
B. 1 only
C. 2 and 3
D. 3 and 4
E. 2 and 4

7. What is the pathway taken by water as it travels through a plant?

A. mesophyll cells ⟶ xylem ⟶ root cortex cells ⟶ root hair cells
B. root cortex cells ⟶ root hair cells ⟶ mesophyll cells ⟶ xylem
C. root hair cells ⟶ root cortex cells ⟶ xylem ⟶ mesophyll cells
D. xylem cells ⟶ mesophyll cells ⟶ root cortex cells ⟶ root hair cells
E. root hair cells ⟶ xylem ⟶ root cortex cells ⟶ mesophyll cells

8. Handy makes an electric circuit using a battery, wires, and three resistors. Handy measure the current in each resistor and the results are all the resistors have the same amount of current. Which is the correct statement from the experiment?

A. All resistors have the same value of resistance.

B. All resistors are connected in series.

C. All resistors absorb the same electric power.

D. If all resistors are connected in series, the resistance values are all different.

E. If all resistors are connected in parallel, the resistance values are the same

9. A ball rolls without slipping up an inclined plane. The direction of friction on the ball is _____ .

A. up in the direction of the inclined plane

B. down in the direction of the inclined plane

C. initially up then down in the direction of the inclined plane

D. initially down then up in the direction of the inclined plane

E. cannot be determined

10. A metal cube is placed on top of a wooden cube. The wood is floating but completely submerged while half of the metal cube is underwater. Which of the following statements is correct?

A. The weight of the metal cube is larger than the Archimedes force on the metal cube.

B. The total weight of both cubes is equal to the total Archimedes force.

C. The metal cube pushes the wooden cube down with a larger force than Archimedes' force on the wooden cube.

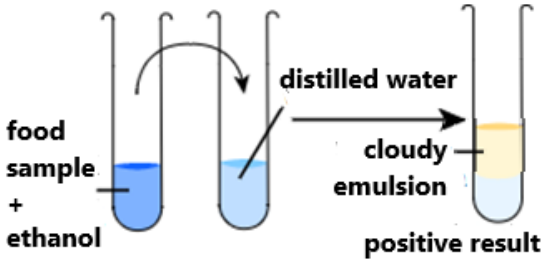
D. The wooden cube pushes the metal cube up with a larger force than the weight of the metal cube.

E. The weight of the metal cube is larger than the Archimedes force, while the weight of the wooden cube is equal to the Archimedes force.

11. A student performed the following experiment.

1. A small amount of unknown food was put in a very clean, dry test tube.
2. Some 95% ethanol was added into the test tube then it was shaken thoroughly.
3. Some distilled water was put into another test tube.
4. Some liquid was poured from the first test tube into the test tube filled with distilled water.

The result of the experiment is shown below.



Which of the following may have the above result?

A. Tofu
B. margarine
C. white egg
D. lemonade
E. syrup

12. Zeze has five objects:

Object	Mass (gram)	Volume (cm^3)
F	300	500
G	800	800
H	100	300
I	600	1000
J	2000	1500

All five objects are put into a big container filled with water (water density = 1 kg/litre).

Which object has the greatest volume that is not immersed in water?

A. Object F
B. Object G
C. Object H
D. Object I
E. Object J

13. This table is the result of the final round of Men's 100 meter athletics in the Tokyo Olympics.

Athlete	Time (second)
Marcell Jacobs	9.80
Fred Kerley	9.84
Andre De Grasse	9.88
Akani Simbine	9.93
Ronnie Baker	9.95
Su Bingtian	9.98

Which statement is correct according to the data?

A. The average speed of all athletes is less than 10 m/s

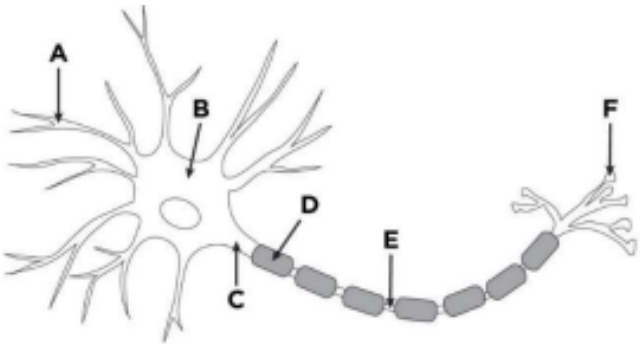
B. The average speed of Ronnie Baker is greater than Fred Kerley.

C. The maximum speed of Marcell Jacobs is $\frac{100}{9{,}80}$ m/s

D. If all athletes continue to run with that average speed, in 20 seconds, only Su Bingtian covers more than 19.90 meters distance.

E. If all athletes continue to run with that average speed, in 20 seconds, all athletes cover more than 200 meters distance.

14. The following diagram shows a neuron.



Which of the followings is/are correct about the neuron?

1) F forms junctions with other cells

2) E cannot pass the impulse

3) D covers the axon

4) C carries impulses towards the cell body

A. 1, 2, and 3 B. 1 and 3

C. 2 and 4 D. 4 only

E. 1, 2, 3, and 4

15. Why helium balloon can float in the air?

A. Helium is a kind of gas that has a negative weight, it will be pushed away by the Earth.

B. Helium is pulled by the earth as well as the extra-terrestrial objects, and the force by the extra-terrestrial objects are stronger.

C. Helium has lower density compared with other gases on earth, and therefore other gases will occupy lower position than the helium.

D. Helium gas has charges and therefore get pulled by the atmosphere.

E. Helium has higher temperature and therefore will move to higher position.

Part II : Each short answer is worth 3 points.

16. A muscle such as a biceps is made up of thousands of muscle fibres. Each muscle fibre is a very specialised 'cell'. The parts of the fibre are known by different terms. The cell surface membrane of a muscle fibre is called _____.

17. A scientist wants to cut a gene from human then paste it to a plasmid. State a group of enzymes which is used to cut a gene from DNA _____.

18. Rhizopus oligosporus is important in tempeh industry. This species belongs to _____ A type of fungi that produce zygospores.

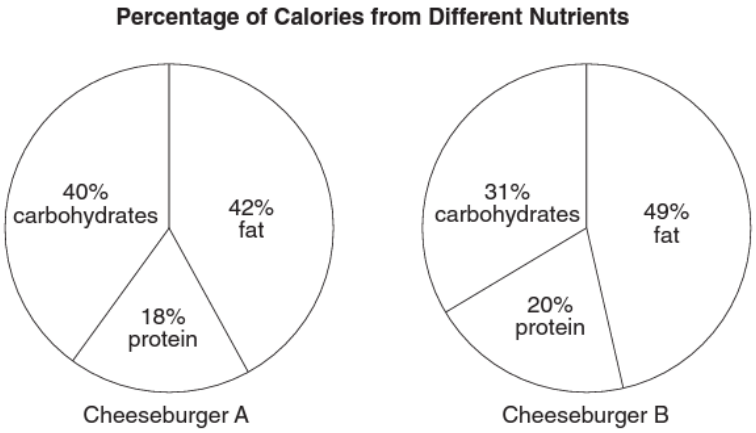
19. A plant tissue which function to produce phellem and phelloderm is called _____.

20. It takes 20 second for a boy to walk on a autowalk /trevellator from one end to the other end if he walks in the same direction of the travellator. If the boy walks in opposite direction of the trevellator, it takes him 80 second for moving from one end to the other. It will take him ___20.1___second from one end to the other, if he just stands still on the trevellator. If he walks on the floor parallel to the trevelator, it will take him ___20.2___ second from one end to the other.

21. An object is placed at distance 6 cm from a mirror and a virtual image at distance 4 cm from the mirror is created. The focus length of the mirror is ___21.1____ cm. If a positive lens of focal length 2 cm is placed exactly at the middle of the object and the mirror, the position of the final image is ___21.2____ cm from the mirror.

22. Mars revolution period around the sun is 1.88 Earth years. This means that the radius of the orbit of Mars is __22.1___ than the radius of the orbit of the Earth. The radius of Mars orbit is (1.88) y times the radius of the Earth orbit and the value of y is ___22.2___ The intensity of the sunlight received on Mars is (1.88) z times the intensity of the sunlight received on Earth, and the value of z is ___22.3___

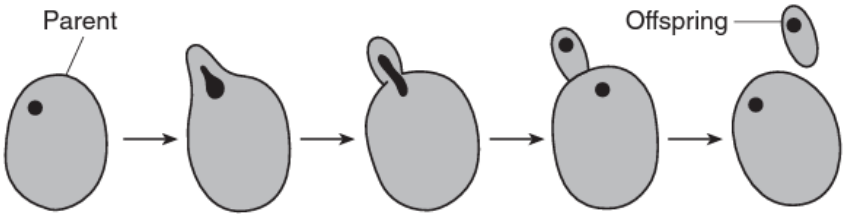
23. The graphs show the percentage of Calories from different nutrients found in two different cheeseburgers, A and B.



23.1 Determine the difference between the percentage of Calories that come from fat in cheeseburger A and the percentage of Calories that come from fat in cheeseburger B. _____ %

23.2 Cheeseburger Bcontains 600 total Calories. Calculate the number of these Calories that come from protein. _____ Calories

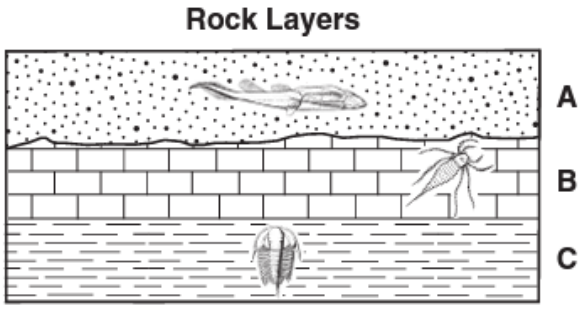
24. The diagram below represents a yeast cell budding during asexual reproduction.



(Not drawn to scale)

Give one reason why this type of reproduction is considered to be asexual.

25. The diagram represents a cross section of rock layers A, B, and Cand some fossils found within them. The rock layers have not been overturned.



(Not drawn to scale)

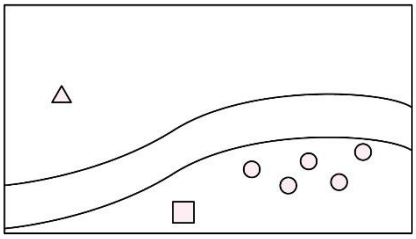
Are the rock layers shown most likely igneous, metamorphic, or sedimentary? Circle your answer below and describe one piece of evidence in the diagram that supports your answer.

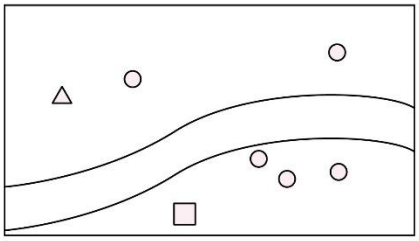
Circle one : igneous metamorphic sedimentary

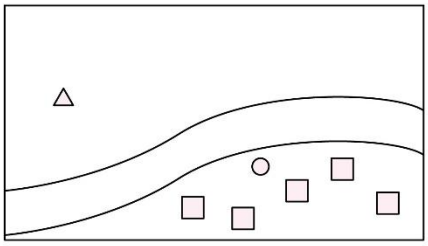
Evidence :

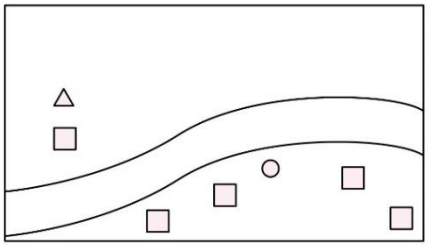
Part III : Essay

26. The wind has been blowing from the west direction for several weeks. If only the seeds from the plant that were dispersed by the wind grew into new plants, which of the following shows the most likely distribution of the new plants?

(1) 

(2) 

(3) 

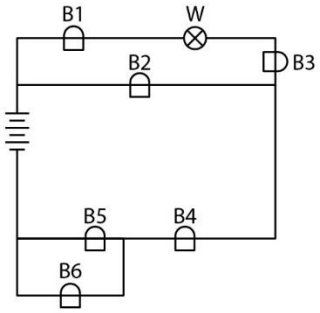
(4) 

26.1 Answer : .....

26.2 Explanation :

.....

27. Study the circuit below.

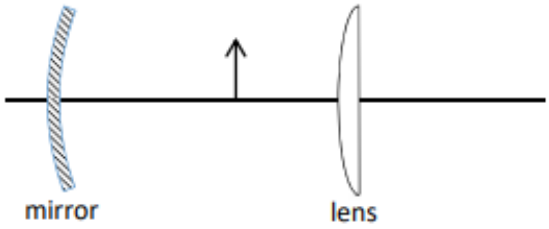


Which of the following buzzers will continue to sound when bulb W fuses?

27.1 Answer : .....

27.2 Explanation : .....

28. An object is placed between a positive mirror and a positive lens. The focal of the mirror is 4 cm and the focal length of the lens is 3 cm. The distance between the object and the mirror is 6 cm, and the distance between the object and the lens is 4 cm. There will be two images created by this arrangement. Determine the distance between these images



29. In a water power plant, water flows 1000 kg per second. The height of the dam waterfall is 50 meters above the surface.

29.1 What is the speed of water before hit the generator (at the water surface)

29.2 What is the mechanical energy of water to turn the generator for 1 hour?

29.3 If the efficiency of the generator is 25%, what is the electric power generated by the generator?

30. Answer the following questions.

30.1 The revolution of the Moon orbiting the Earth is about 27 days and 8 hours. And the Lunar cycle from the new moon until the next new moon is about 29 days and 12 hours. Why the time of both conditions is different?

30.2 A hollow metal ball has an outer diameter is 22 cm and an inner diameter is 20 cm. Then the ball is heated. How about the outer and inner diameter? Is it increase, decrease or stay the same? Explain your answer!

Answer Key

Part 1 : Multiple Choice

1.	B	6.	B	11.	B
2.	C	7.	C	12.	D
3.	D	8.	E	13.	E
4.	D	9.	A	14.	B
5.	A	10.	B	15.	C

Part 2 : Short Answer

16.	sarcolemma
17.	restriction enzymes
18.	Zygomycota
19.	Cork cambium
20.	20.1 53.33 20.2 32
21.	21.1 12 21.2 3.67
22.	22.1 further/larger 22.2 2/3 22.3 -4/3, note the minus sign
23.	23.1 7% 23.2 120 Calories.
24.	Acceptable responses include, but are not limited to: —There is only one parent. —There was no fertilization. —Neither sperm nor egg is needed to complete asexual reproduction. —The offspring is genetically identical to the parent. —All the genes come from one parent

25.	Allow credit for circling sedimentary andan acceptable response. Acceptable responses include, but are not limited to: —They contain fossils. —Sedimentary rocks are always layered. —Fossils are found mainly in sedimentary rock. —The symbols in the diagram represent sedimentary rocks. Note:Allow credit if the student does notcircle any rock type, but gives an acceptable response that includes the term “sedimentary rock.”

Part 3 : Essay

26.	26.1 Answer : (3) 26.2 Explanation : Since the wind-dispersed seeds come from plants represented by a square, we can see from the diagrams that Option (3) is the answer. We should see more squares in the diagram and only one triangle and one circle.
27.	27.1 Answer **:** B2, B4, B5 and B6 only 27.2 Explanation **:** The pathway that includes B1, W and B3 will be open when bulb W fuses. Therefore, no current flows through it. Only buzzers B2 , B2, B4 , B5 and B6 will continue to sound because the circuit is closed.

28.

The first image is formed directly from object to the lens.

$$\frac{1}{s_1}+\frac{1}{s_1'}=\frac{1}{f_l}$$

with $s_1 = 4$ cm dan $f_l = 3$ cm. So the distance from the lens is $s_1' = 12$ cm. **(2 points)**

The second image is formed through 2 processes, from object to the mirror, and then from the mirror to the lens. First process:

$$\frac{1}{s_2}+\frac{1}{s_2'}=\frac{1}{f_m}$$

with $s_2 = 6$ cm, $f_m = 4$ cm. So $s_2' = 12$ cm. This image become an object form the lens. The distance between the lens and the mirror is 6 cm + 4 cm = 10 cm. So the distance for the second process is 10 cm – 12 cm = -2 cm from the lens. The minus sign indicates that the object is virtual for the lens. So $s_3 = -2$ cm. **(2 points)**

$$\frac{1}{s_3}+\frac{1}{s_3'}=\frac{1}{f_l}$$

So the distance of the image from the lens is $s_3' = 1.2$ cm.

Distance between the first and the second image is 12 cm – 1.2 cm = 10.8 cm. **(2 points)**

29.

29.1 Potential energy of water at the top of the dam = Kinetic energy of water on the ground (water surface)

$$m.g.h=\frac{1}{2}mv^2$$

$$v = \sqrt{2gh} = \sqrt{2.10.50} = \sqrt{1000} = 10\sqrt{10}\ m/s$$

29.2 In 1 second:

ME = m.g.h = (1000).(10).(50)

ME= 500000 J

In 1 hour:

ME = (500000)(3600)

ME = 1.8×10^9 J

29.3 Power is energy in one second.

Mechanical Power = 500000 = 5×10^5 Watt

Electric power = (0.25).(5×10^5) = 1.25×10^5 Watt

30.	30.1 The revolution of the Moon is the period of Moon to make one full circle rotating the earth. **(1 points)** Earth also move rotating the Sun while the Moon rotating the Earth **(1 points)**. So make one Lunar cycle according to the observer on Earth, the Moon rotating more than one full circle, so the Lunar cycle period is longer than the period revolution of Moon. **(2 points)** 30.2 Both inner and outer diameter will increase. **(1 points)** Object (metal) will expand when it heated. If the object is hollow sphere, the outer surface will expand and the diameter is increase. **(1 points)** The inner surface will also expand when it heated. So the diameter of inner surface is increase. **(2 points)**