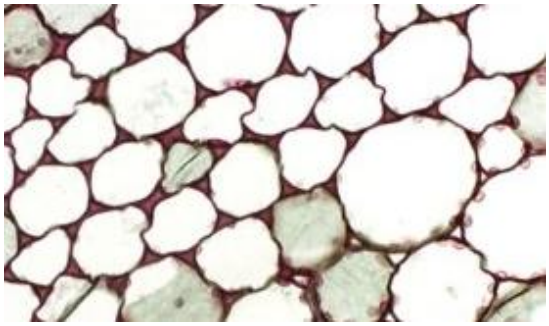
Part I : Each multiple choice Questions (A, B, C, D, E) is worth 2 points. (Total 30 points.)

1. The following micrograph shows plant tissue.



Which of the following is/are correct about the above tissue?

1. It provides flexible support.
2. The gritty texture of pear fruits belongs to this tissue
3. The cells are living at maturity
4. Photosynthesis mostly happens in this tissue.

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

2. Which row explains the correct conditions when ventricles pump the blood?

	Atrio-ventricular valves	Semilunar valves	Ventricles wall
A.	open	open	relaxes
B.	open	closed	contracts
C.	closed	open	relaxes
D.	closed	closed	contracts
E.	closed	open	contracts

3. One day, Andi see the Moon position is at west at 20.00. Why does this happen?

A. The moon rise at the west and set at the east.
B. The moon sometimes rise at the west and sometimes rise at the east.
C. On that day is a Lunar eclipse.
D. Moon doesn't always rise in the evening, it also rises at noon or morning.
E. In the tropics, the duration of Moon rise until it sets could be only 4 hours.

4. Nano has two identical 5 Ω resistors and a battery. How many volts battery should he use so the current flows in each resistor are 2 amperes?

A. 20 volt only
B. 10 volt only
C. 20 volt or 10 volt
D. 5 volt or 20 volt
E. 10 volt or 2.5 volt

5. A heater needs 3 minutes to heat 400 ml of water from 25°C temperature to 95°C. If we use the same heater to heat 1 litre of water with 10°C and raise the temperature to 70 °C, How much time will it take?

A. 45 seconds
B. 3 minutes
C. 4 minutes 30 seconds
D. 7 minutes 30 seconds
E. 12 minutes

6. Dry ice has a very cold sublimation point of about -70°C. What will be happened to a piece of dry ice when it is put into the 25°C water after a long time?

A. Dry ice is still in a solid state but the temperature is rising.
B. Dry ice will melt and dissolve into the water.
C. Dry ice will make the water vaporize.
D. Dry ice will become carbondioxyde gas.
E. Dry ice will become water vapor.

7. Lala experiments using two balloons. The first balloon is blown until it inflates, and the second balloon is filled with water then blown until it inflated.
When the first balloon is put on the candle flame, it pops. What happened to the second balloon if it put on candle flame right at the water.

A. The balloon pops because the heat will thin the rubber.

B. The balloon doesn't pop because the flame will go out.

C. The balloon pops because water will expand and make the air pressure inside the balloon increases.

D. The balloon doesn't pop because heat is absorbed by the water.

E. The heat will make a tiny hole in the balloon but it doesn't pop.

8. Kaka could give force 500 N to push the object. Which object that Kaka could not move? (g = 10 m/s^2)

A. Lift up 20 kg object vertically upward.

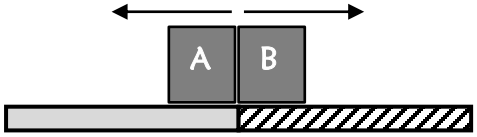
B. Lift up 60 kg object using a fixed pulley.

C. Lift up 70 kg object using a movable pulley.

D. Push 100 kg object horizontally on the frictionless floor.

E. Push 50 kg object on 45° angle inclined plane.

9. Two blocks slide on two different surfaces. Block A slides on the frictionless surface and block B slides on rough surface. See the picture.



Block A slides to the left, and block B slides to the right. Initially, both blocks have 10 m/s speed. After 5 second, block B is stop. So, when block B is stopping, what is the distance between block A and B?

A. 25 m

B. 50 m

C. 75 m

D. 125 m

E. 150 m

10. Lignin is a secondary metabolite found in plants.

Which of the following statement(s) about this biomolecule is/are true?

1) It is the most abundant organic compound of the earth

2) In many plants, lignin is sequestered in vacuoles in order to protect other compounds of the cell

3) It waterproofs the cell wall and helps in transportation of water in terrestrial plants

4) Lignin is structurally very similar to tannins and like tannins, it is also an important deterrent to herbivores

A. 1, 2 and 3 B. 2 and 4

C. 1 and 3 D. Only 3

E. 1, 3 and 4

11. Choose the correct statement regarding the hormones associated with men's reproduction!

A. LH secreted by anterior pituitary stimulates the production of testosterone

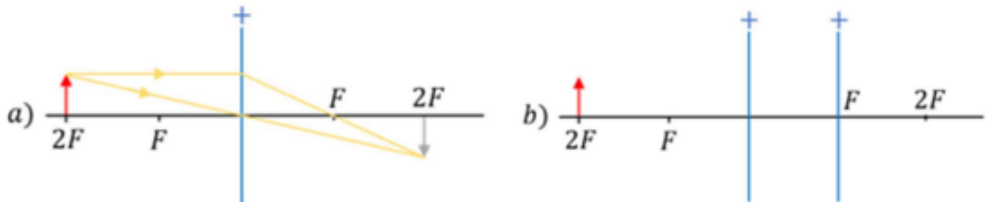
B. Inhibin produced by Sertoli cells inhibits LH production

C. Testosterone produced by Sertoli cells inhibits LH

D. FSH stimulates Leydig cells to produce testosterone

E. FSH produced by Leydig cells stimulates the production of sperm

12. Figure a) shows a diagram of image formation on a positive thin lens. In figure b), a second lens which is identical to the first lens is placed at the focal point of the first lens while their principal axes are coincident.



With respect to the object, the final image is _____ .

A. virtual, upright, and twice its size

B. real, inverted, and half its size

C. virtual, inverted, and half its size

D. real, upright, and half its size

E. virtual, inverted, and twice its size

13. Setup two experiments with similar situation. For the first experiment, an ice with an air cavity inside it, is floating on the surface of the water. In the second experiment, an ice with a small piece of metal is trapped inside the ice is floating on the surface of the water. If the ice melted, what will happen to the water surface of both experiments?

A. First experiment: stay the same, second experiment: stay the same

B. First experiment: stay the same, second experiment: water level rise

C. First experiment: stay the same, second experiment: water level drops

D. First experiment: water level down, second experiment: water level rise

E. First experiment: water level rise, second experiment: water level drops

14. A ball with a density half of the density of water is thrown vertically upward from the surface of the water. The ball return to the surface of the water 4 seconds later. Ignore drag force and assume the ball never reached the bottom. What is the maximum depth reached by the ball?

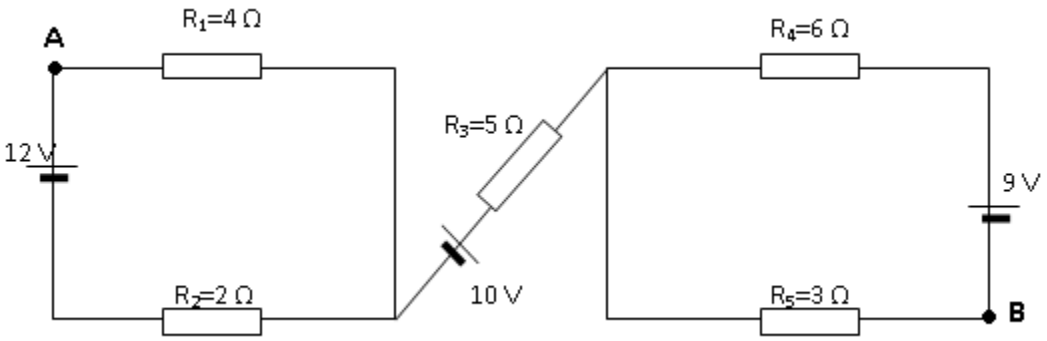
A. 20 m
B. 10 m
C. 40 m
D. 30 m
E. 5 m

15. Antibiotics are highly prescribed in some bacteria-caused diseases and penicillin are the most commonly used antibiotics.
Why is penicillin toxic to many bacteria?

A. It interferes with DNA replication
B. It inhibits transcription
C. It blocks protein synthesis
D. It blocks the bacteria's growth or reproduction
E. It inhibits cell wall formation

Part II: Each short answer is worth 3 points. (Total 30 points.)

16. See the electric circuit below:

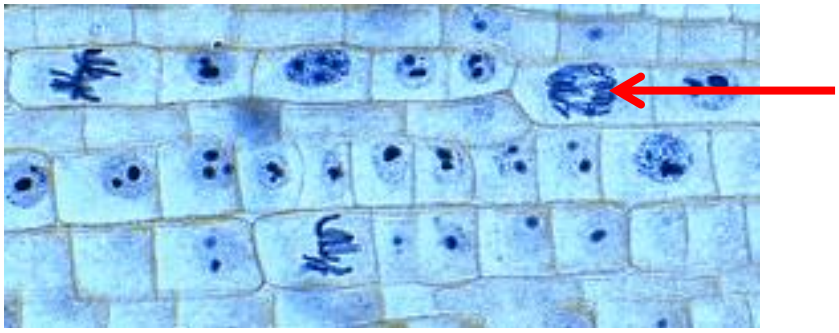


Find:

16.1 The current flow in every resistor (R_1, R_2, R_3, R_4, and R_5)!

16.2 The potential difference between Node A and B!

17. Look at the following diagram.



The above picture shows cells of onion root tip undergo mitosis in different stages.

17.1 What stage of mitosis is pointed by the arrow?

17.2 What is the main characteristic of the stage pointed by the arrow?

18. The processes which are involved in the protein synthesis are _____(18.1)_____ and ____(18.2)_____

19. **Germination of seeds**

Treatment	Length
Sunlight, water	10 cm
Dark, water	2 cm

From the table above, we can observe that water and light are needed by plant hormones to promote plant growth. Plant hormones which are important for germination are _____(19.1)_____ , _____(19.2)_____ , and _____(19.3)_____

20. Fill in the blanks in the table below

Enzymes of human digestive system

Enzyme	Produced in	Function
Amylase	Salivary gland, pancreas	_____(A)_____
Pepsin	_____(B)_____	Break down proteins into peptides
____(C)_____	Pancreas	Break down triglycerides into fatty acids and glycerol

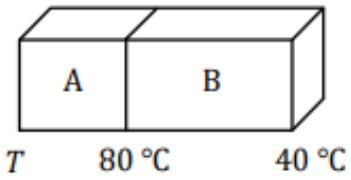
21. In deserts, it often looks as if there is water on the sand. This phenomenon is called a _____(21.1)_____ . This happens because the ____(21.2)_____ difference in the air layer causes a difference in the _____(21.3)_____ that results in refraction. Light from a lower to higher _____(21.4)_____ bends _____(21.5)_____ the normal in refraction.

22. Two resistors are connected in series with a battery and a 1.2 A current is flowing in the circuit. If the same resistors are connected in parallel with the same battery, a 5 A current is flowing in the circuit. If the smaller resistor has resistance of 4 Ohm, then the other resistor has resistance of _____(22.1)_____ Ohm and the battery has voltage of _____(22.2)_____ V.

23. Mercury is rotating around its axis once every 60 days. It will move around the Sun every 90 days. The direction of the rotation and revolution is the same. Let say at day 0 the Sun rise on Mercury, then at day _____(23.1)_____ the Sun will set. One day in Mercury is defined as the time for the sun rise to the sun rise again, then 1 day of Mercury is equal to ___(23.2)_____ days of Earth. One year of Mercury is the time when Mercury returns to its original position, then in one year of Mercury there are _____(23.3)_____ day of Mercury.

24. Researchers recently discovered Teixobactin that was identified as an effective agent against some Gram-Positive bacteria like *Mycobacterium tuberculosis*. It inhibits cell wall synthesis by binding to two lipids cell wall precursors while most of other antibiotics work by binding to proteins. This means that it is unlikely that bacteria will quickly develop resistance to teixobactin.
why bacteria are unlikely to quickly develop resistance to teixobactin?

25. Two metal rods A and B is connected as shown below



If the thermal conductivity of B is twice the thermal conductivity of A, and the length of A is half the length of B, Determine the temperature of the left end of rod A (T)

Part III: Essay (Total 40 points.)

26. A scientist wants to know how depth is a well. He has a very precise device to measure time. He sets this measurement device exactly at the top of the well. Then he released a rock from rest on the top of the well and he record a splash sound
2.7 s later. Keeping the same position of the measurement device, he released a second rock from rest 5.4 m above top of the well. The measurement device start measuring the time as the rock fall, and measure the splash sound 2.9 s later. He does not know the speed of sound. Assume the gravitational acceleration of the Earth is 10 m/s^2.

26.1 Using the information given above, determine the depth of the well, h. (4 points)

26.2 Determine the speed of sound, v_s. (4 points)

27. A block of mass 2 kg resting on a frictionless horizontal surface and is pushed with a force of 5 N for 3 seconds. (8 points)

27.1 What is the acceleration of the block?

27.2 What is the final speed of the block?

27.3 What is the total distance covered by the block in this time?

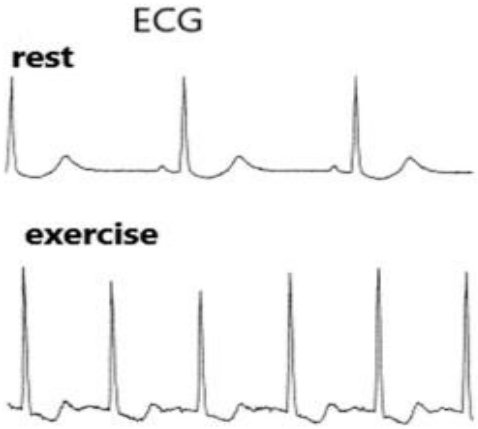
27.4 What is the final momentum of the block?

27.5 What is the final kinetic energy of the block?

27.6 What is the total work done by the force of 5 N?

28. ECG (Electrocardiogram) can be used to to monitor the activity of the heart includes the heart's rhythm and electrical activity.

28.1 The following diagram shows two ECG traces. One trace was recorded when the person was at rest and the second trace was recorded during exercise.

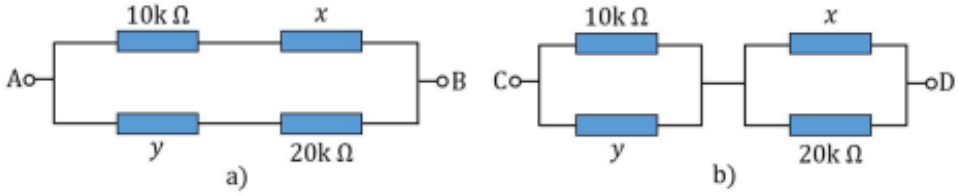


Explain why the ECG trace recorded during exercise differs from the ECG trace recorded at rest. (3 points)

28.2 State one other way to monitor the activity of the heart. (2 points)

28.3 Oxygen debt is formed when we do very intense exercise. Explain how the body removes oxygen debt. (3 points)

29. Four resistors: 10 kΩ , 20 kΩ , **X** , and **Y** are arranged as in picture a) and picture b).



The equivalence resistance is the same for both arrangements, $R_{AB} = R_{CD} = 12$ kΩ

What is the resistance value of **X** and **Y**? (8 points)

30. A man had symptoms including excessive thirst and urination, weight loss, and aching in the lower abdomen. Urine sample from the patient was tested. The results are shown in the following table.

Test	Result	Normal Range
albumin	17 mg/dl	0-3 mg/dl
glucose	215 mg/dl	0-130 mg/dl
pH	4	5-7
leucocytes	3	42
urea	12 mg/dl	6-24 mg/dl

30.1 A doctor analysed the results and asked the man to have further tests for type 2 diabetes. Give two reasons why the doctor came to this conclusion. (2 points)

30.2 Explain why the doctor also concluded that the person had a kidney infection (2 points)

30.3 Urine contains urea. State how urea is formed in the human body. (2 points)

30.4 Describe how a student could test a sample of urine for the presence of glucose. (2points)

National Selection : ASMOPSS Thailand 2023 (2nd Round – Science Secondary)

Answers Key :

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

No.	Answers	No.	Answers	No.	Answers
1	C	6	D	11	A
2	E	7	D	12	B
3	D	8	B	13	C
4	C	9	C	14	A
5	D	10	D	15	E

Part II : Each short answer is worth 3 points. (Total 30 points.)

No.	Answers
16	16.1 The current flow in every resistor (R_1, R_2, R_3, R_4, and R_5)! $I_{R1} = I_{R2} = 12/(2+4) = 2$ A $I_{R4} = I_{R5} = 9/(3+6) = 1$ A $I_{R3} = 0$ A (no current flows) (each correct answer, if all correct: 2 points) 16.2 The potential difference between Node A and B! $V_{AB} = (I_{R1} \cdot R_1) - 10 + (I_{R5} \cdot R_5) = 8 - 10 + 3 = 1$ V (1 points)
17	17.1 Anaphase (1 points) 17.2 Chromatids separate/move/are pulled to the different (opposite) poles (2 points)
18	18.1 Transcription 18.2 Translation (สลับตำแหน่งกันได้)

No.	Answers
19	19.1 Auxins 19.2 Cytokinin 19.3 Gibberellins (สลับตำแหน่งกันได้)
20	20.1 Hydrolyze complex carbohydrates/starch into simple sugar 20.2 pancreas 20.3 lipase
21	21.1 Mirage 21.2 temperature 21.3 refractive index 21.4 refractive index 21.5 towards
22	A) 6 B) 12
23	23.1 90 23.2 180 23.3 0.5
24	A) Teixobactin binds to a lipid rather than to a protein. B) The structure of a lipid is not encoded by DNA.
25	120 °C

Part III : Essay (Total 40 points.)

No.	Answers
26	26.1 33.8 m
	26.2 338 m/s
27	27.1 The acceleration is force over mass: 5N/2kg = 2.5 m/s^2. 27.2 The final velocity is acceleration times time: 2.5 m/s^2 x 3s = 7.5 m/s. 27.3 The distance cover is total area under the graph: 11.25 m or use ½ at 2 = 0.5 x 2.5 m/s^2 x $(3s)^2$ = 11.25 m. 27.4 The final momentum is its mass times its final velocity: 2 kg x 7.5 m/s = 15 kg m/s. 27.5 The final kinetic energy is ½ mv^2 = 0.5 x 2 kg x (7.5 m/s) 256.25 J. 27.6 The work by force F is F times distance: 5 N x 11.25 m = 56.25 J.
28	28.1 Frequency of heart beats / pulse rate during exercise is increased because exercising muscles need more energy for muscle contraction; the increased need of energy requires increase in respiration so the blood flow to muscle also increases to supply more oxygen/glucose and to remove carbon dioxide. 28.2 listening to the valves of the heart shutting / count pulse rate. 28.3 Breathing rate and or heart rate is / remains high, to provide oxygen to muscle cells to breakdown / to remove lactic acid, lactic acid removed by aerobic respiration to carbon dioxide (and water), lactic acid is also broken down in the liver.
29	29.1 X = 5 Y = 40
	29.2 x = 5 kΩ y = 40Ω
30	30.1 1) excessive thirst and urination/weight loss 2) excessive glucose in urine 30.2 Because leucocytes were above the normal range (42) indicating

	pathogens/bacteria. Or because protein level is above the normal range indicating pathogens/bacteria 30.3 Urea is from the breakdown of amino acids in the liver/ the deamination of amino acids 30.4 Add Benedict reagent/solution to the urine sample in a test tube, heat the test tube in water bath, color change (from blue) to yellow/orange/brick red indicates the presence of glucose in the urine.