

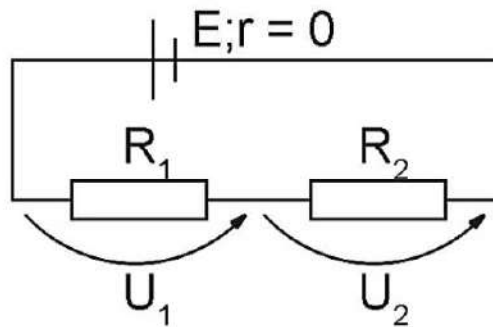
All questions worth 4 points.

1. Deforestation has the following consequences over the ecosystem:



- A) it increases rainfall
B) it increases soil erosion
C) it increases the amount of oxygen in the atmospheric air
D) it increases the species diversity from the ecosystem
E) it increases the amount of fertile layer of soil
2. Two conducting wires, whose lengths and cross sections satisfy the relationships: $l_1 = 2l_2$ and $S_2 = 2S_1$ are connected to a power supply. Knowing that the current through the wires is equal, which of the following is true? Here R_1, R_2 denote the electrical resistances of the wires and ρ_1, ρ_2 are the current resistivities of the wires.
- A) $R_1 = 4R_2$ B) $S_1 = S_2$ C) $\rho_2 = 4\rho_1$
D) $R_2 = 4R_1$ E) $R_2 = R_1$
3. **Person A**, aged 24, is 120 cm tall and has a normal intellectual development. **Person B**, aged 25, is 110 cm, but has a low intellectual development. The two people have in common:
- A) an impaired thyroid
B) an increased hormone secretion
C) an impaired pancreas
D) a reduced hormone secretion
E) an impaired adrenal gland

4. Which of the following relationships is true for the circuit in the figure:

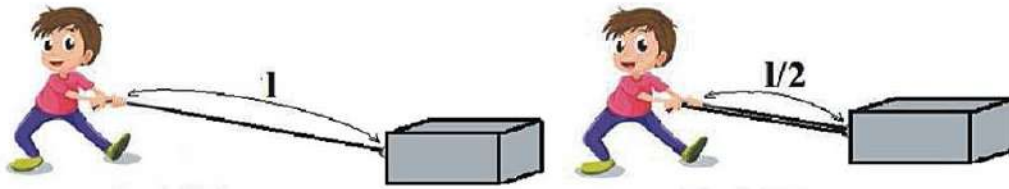


- A) $U_1 + U_2 = E$ B) $U_1 + U_2 > E$ C) $U_1 + U_2 < 0$
- D) $\frac{U_1 + U_2}{2} = E$ E) $U_1 - U_2 = E$
5. There are 5 ml of light red blood in a test tube. Dan inserts a straw in the test tube, blows powerfully through it and observes that the blood becomes dark-red. Indicate the cause of the color change of the blood:



- A) the formation of carboxyhemoglobin in the presence of carbon monoxide from the exhaled air
- B) the formation of carbohaemoglobin in the presence of carbon monoxide from the exhaled air
- C) the formation of oxyhemoglobin in the presence of oxygen from the exhaled air
- D) the formation of carboxyhemoglobin in the presence of carbon dioxide from the exhaled air
- E) the formation of carbohaemoglobin in the presence of carbon dioxide from the exhaled air

6. A child is uniformly moving an object by pulling it using an elastic band (figure 1) of length l which will increase its length by Δl . What would be the new elongation Δl_1 if the child will fold together the 2 halves of the band (figure 2)?



- A) $\Delta l_1 = \Delta l$ B) $\Delta l_1 = 2\Delta l$ C) $2\Delta l_1 = \Delta l$
 D) $\Delta l_1 = 4\Delta l$ E) $4\Delta l_1 = \Delta l$
7. Andrew is 29 years old and has a proper nutrition. The medical checkup revealed weight loss, 93 heartbeats per minute, and 24 breathing rhythms per minute. The cause of his disease is:

- A) the reduced production of thyroid hormones
 B) the increased production of thyroid hormones
 C) the reduced production of pituitary hormones
 D) the increased production of pancreatic hormones
 E) the reduced production of sex hormones



8. Kate has a boiler that consumes 40W and a radiator that consumes 60W. She wants to know in which of the following cases it is more expensive to bring water to the boiling point. The initial conditions are the same and heat losses are negligible.
- A) When she uses the boiler
 B) When she uses the radiator
 C) When she uses both devices connected in series
 D) The cost is the same in each case
 E) When she uses both devices connected in parallel

9. Ann is 1.60 m tall and Michael is 1.65 m tall, although they are of the same age (14 years old). Their differences in height and growth are caused by:

- A) pituitary hormones
- B) thyroid hormones
- C) sex hormones
- D) adrenal hormones
- E) pancreatic hormones

10. Knowing that levers are used to ease human labor, choose the figure that best describes this situation in the case of the lever of grade I (F denotes the force applied by the human and R the force that needs to be overcome):

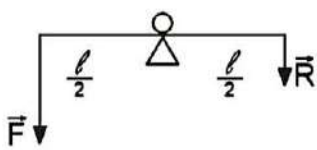


Fig.1

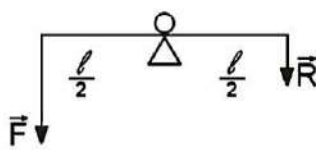


Fig.2

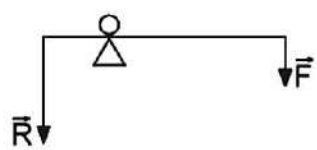


Fig.3

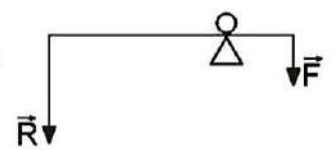


Fig.4

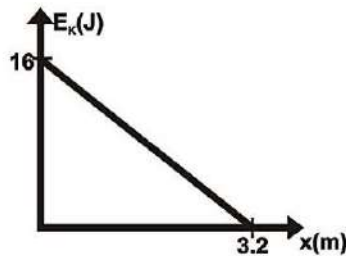
- A) Fig. 1
- B) Fig. 2
- C) Fig. 3
- D) Fig. 4
- E) All the figures describe this situation

11. The goalkeeper of a football team is watching a player who shoots to the football gate, catches the ball and hears the cheers from the supporters. The area of the cerebral hemispheres in which the sensations were not formed is represented by:



- A) Occipital lobes
- B) Temporal lobes
- C) Parietal lobes
- D) Frontal lobes
- E) Cerebellum

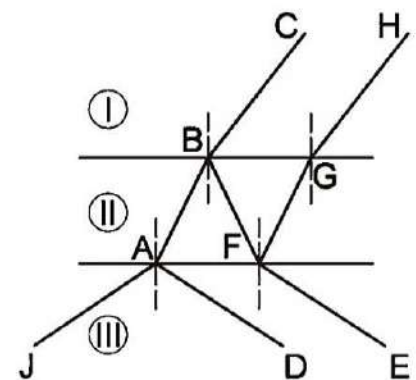
12. A ball is thrown straight up. The graph shows the dependence of the kinetic energy E_k and height x , neglecting the drag forces. Using the indicated values, and assuming the gravitational acceleration of 10 m/s^2 , find the mass of the ball.



- A) 0.5 kg
 B) 200 g
 C) 5 kg
 D) 2 kg
 E) 100 g
13. Select the correct statement about carnivorous plants:



- A) They have modified leaves which form urns or trapping mechanisms.
 B) They are unable of photosynthesis.
 C) Their leaves do not contain chlorophyll.
 D) They are unable to survive if there are no insects.
 E) They lack reproductive organs.
14. When a ray of light reaches the surface of separation between 2 different mediums, both reflection and refraction occur. Mary has to identify the incident ray and the order of the 3 optical mediums: water, air and glass from the next figure.



- A) JA, I-glass, II-water, III-air
 B) FE, I-water, II-glass, III-air
 C) CB, I-glass, II-air, III-water
 D) CB, I-air, II-water, III-glass
 E) JA, I-air, II-water, III-air

15. In 430 BC, during the Peloponnesian War, a plague epidemic decimated the ancient Athens. The only people considered apt for patient care were people who had the disease and survived. The reason is the following:

- A) The survived ones have antibodies in leukocytes.
- B) The survived ones have antibodies in blood plasma.
- C) The survived ones have pathogens in blood plasma.
- D) The survived ones have pathogens in leukocytes.
- E) The survived ones have pathogens in thrombocytes.

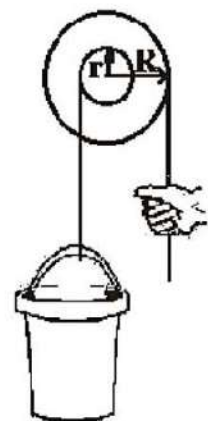
16. An aluminum cube ($\rho = 2700 \text{ kg/m}^3$) with the side length $l = 0.8 \text{ m}$ is rolled over a distance of $4l$. Considering the gravitational acceleration $g = 10 \text{ m/s}^2$ and neglecting friction, find the minimum value of the work done for this movement of the cube.

- A) 6990 J
- B) 6090 J
- C) 9906 J
- D) 9069 J
- E) 699 J

17. A frog used for experiments has its spinal cord destroyed, but the brain remains intact. If its reflexes are analyzed, there will be observed the disappearance of:

- A) head turning reflex to an auditory stimulus
- B) heart reflex and the cessation of heartbeat
- C) head turning reflex to a light stimulus
- D) the blink reflex when the cornea is touched
- E) the foot withdrawal reflex when the tegument is touched

18. The figure shows a method of pulling water out of a well. Knowing the mass m of the bucket, gravitational acceleration g and that $R = 2r$, what is the force required to lift the filled bucket?



- A) mg
- B) $mg/2$
- C) $2mg$
- D) $4mg$
- E) $3mg$

19. A crustacean which lives in cave water has the following specific characteristics:

- A) reduced body pigmentation
- B) reduced antennae and legs
- C) well-developed eyesight
- D) breathing gills
- E) limestone crust



20. We know that the Archimedes force acts on any object submerged in a fluid. Which of the following statements is true?

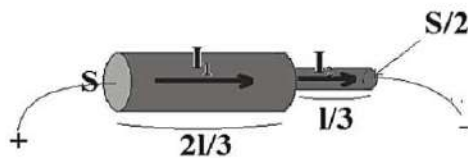
- A) When a boat goes from fresh water to salty water it sinks.
- B) For two identical balls, one made of iron and the other of glass, submerged in a liquid, the modulus of the Archimedes forces are different.
- C) A balloon filled with oxygen rises through the atmosphere because of the Archimedes force.
- D) The Archimedes force acts only on specific fluids.
- E) The Archimedes force doesn't act on objects that are only partially submerged.

21. After an accident, the doctor noticed the disappearance of a patient patellar reflex. The organ from the central nervous system which was affected is represented by:



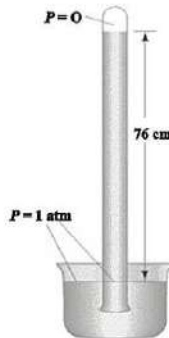
- A) cerebral hemispheres
- B) cerebellum
- C) spinal cord
- D) brainstem
- E) nerves

22. About the thermal agitation we can say that:
- A) It represents the ordered movement of the molecules of a substance
 - B) It stops at the temperature of 273 K
 - C) It can only be observed in liquids
 - D) It increases with temperature
 - E) It requires an external action in order to happen
23. The biology teacher inserted a chicken bone in a solution of hydrochloric acid. After 12 days, he observed that the bone kept its shape, but could easily be bent. The elasticity of bones is due to:
- A) ossein
 - B) fats
 - C) mineral salts
 - D) sugars
 - E) lipides
24. A conducting wire of length l and cross section S is processed on a third of its length, like in the following picture, and is connected to the power supply. The correct relationship between intensity of currents through the two parts of the wire is:

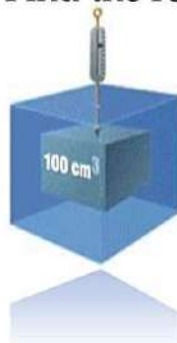


- A) $I_1 = 2I_2$
 - B) $I_1 = I_2$
 - C) $I_1 = 6I_2$
 - D) $I_1 = 3I_2$
 - E) $I_1 = 4I_2$
25. Alex is 25 years old and his ocular axis is 22 mm long. Because he could not see clearly, he went to the doctor. Choose the correct statement about his vision problem:
- A) The image is formed in front of the retina.
 - B) The defect can be corrected by wearing biconvex lenses.
 - C) He has myopia.
 - D) His crystalline makes the light rays focus on the retina.
 - E) His crystalline lens is too curved.

26. Mike fills a Torricelli tube with mercury and then flips it with the open end down in a vessel full of mercury. Which of the following statements is true?



- A) This way, Mike can measure the hydrostatic pressure of the mercury in the vessel.
 B) The height of the mercury in the tube depends on its tilt.
 C) The height of the mercury doesn't depend on the altitude.
 D) This way, Mike can measure the atmospheric pressure.
 E) The height of the liquid in the Torricelli tube would be the same if we used water.
27. A radiography of a teenager shows the growth cartilages between the central part and the bone extremities. This means that this person's bones:
- A) Are growing in length.
 B) Contain only compact bone.
 C) Are fractured.
 D) Contain a canal with bone marrow in the extremities.
 E) Contain only cancellous bone.
28. Kate weighed an object of density $\rho = 2.5\text{g}/\text{cm}^3$ when it is submerged in water and she obtained the value $m = 24\text{g}$. Find the real weight of the object.



- A) 48 g
 B) 12 g
 C) 98 g
 D) 36 g
 E) 40 g

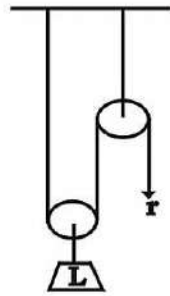
INTERNATIONAL KANGAROO SCIENCE CONTEST 2017

Time Allowed: 60 minutes

29. After medical tests a person observed that he has 1.5 g of glucose per liter of blood. Help him to find the affected organ.

- A) the liver B) the pancreas C) the stomach
D) the small intestine E) the kidney

30. The mechanism below is formed of a fixed pulley of efficiency 80% and a mobile pulley of efficiency 60%. The overall efficiency is:



- A) 40% B) 72% C) 48%
D) 84% E) 32%

————— Good Luck —————