CAPITOLO 1

VERIFICA LE TUE CONOSCENZE

1 A
2 B
3 D
4 C
5 B
6 D
7 C
8 A
9 A
10 D
12 A

VERIFICA LE TUE ABILITÀ

13 A membrana, B desmosomi, C rivestimento, D monostratificati
14 A specializzati, B collagene, C lasso, D adiposo
15 A cellule bersaglio, B recettore, C membrana, D trasduzione
16 A B
18 A C

METTITI ALLA PROVA

34 B
35 C
36 A
37 A
40 C
41 C
42 A
43 B
44 A
45 B
46 C
47 A
48 D

Cool it!

- Why did Paula Radcliffe collapse 6 kilometers from the finish line?

She was overcome by heat stress.

- What is the heat extractor?

The heat extractor is a chamber that encases the hand and is sealed at the wrist. The hand is in contact with a cooled surface, but the critical component is a mild vacuum produced inside the chamber.

CAPITOLO 2

VERIFICA LE TUE CONOSCENZE

1 B
2 C
3 D
4 A
5 D
6 D
7 B
8 B
9 A
10 B
11 D
12 C

VERIFICA LE TUE ABILITÀ

13 A semilunari, B tricuspide, C bicuspide, D pressione
14 A monostratificato, B elastina, C arteriole, D vasocostrizione
15 A eritrociti, B nucleo, C eritropoietina, D milza
16 A B
17 C D
18 B C

METTITI ALLA PROVA

33 A
34 D
35 B
36 B
39 C
40 C
41 D
42 A
43 C
44 D
45 C
46 D
47 D
48 C
49 E

You gotta have heart

- What is the heart failure?

Heart failure is most commonly the result of blockage of the vessels that supply the heart muscle with blood. The risk of such heart failure tends to increase with age.

- Why does the heart of a young, fit athlete fail?

It is usually not due to vessel blockage, but to a mutation that affects the contractile proteins of heart muscle.

CAPITOLO 3

VERIFICA LE TUE CONOSCENZE

1 C
2 B
3 C
4 A
5 C
6 D
7 C
8 D
9 B
10 C
11 A
12 D

VERIFICA LE TUE ABILITÀ

13 A faringe, B epiglottide, C laringe, D cartilagine
14 A corrente, B morto, C residuo, D ventilazione
15 A diffusione, B parziale, C N_2, D minore
16 A B
17 C D
18 A D

METTITI ALLA PROVA

33 D
34 C
35 B
36 B
40 D
41 E
42 D
43 A
44 B
45 C
46 B
47 C
48 C
49 A
50 D

High fliers

- Why did three French scientists use a hot air balloon?

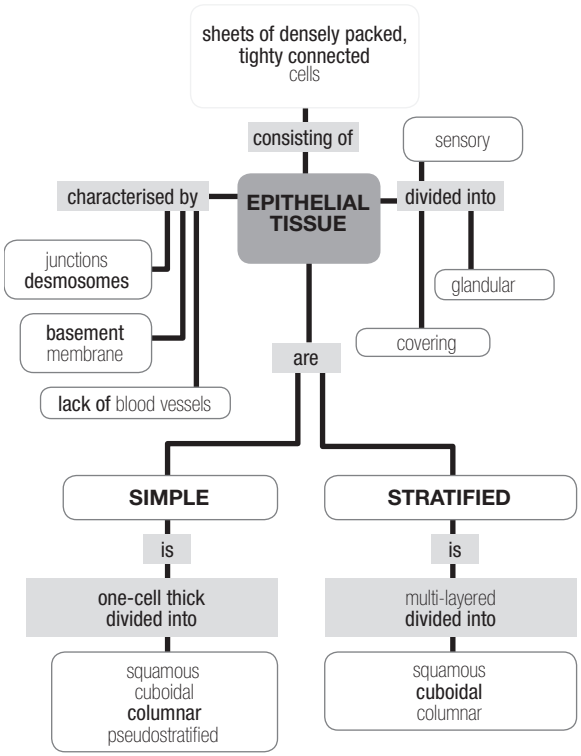
In 1875, three French scientists used the hot air balloon Zenith to study the effect of high altitude on humans - themselves. Intending to take physiological measurements on each other during the ascent, the three men loaded the Zenith with scientific apparatus and took off.

- What is the maximum known altitude a bird can fly?

The highest recorded altitude for a bird is for a vulture that collided with an airliner at 11 278 meters.

Biology in English (pages C79-C86)

1 a: atom; b: molecule; c: organelle; d: cell; e: tissue; f: organ; g: apparatus; h: organism.
2 a: cartilage; b: smooth muscle; c: epithelium; d: skeletal muscle; e: nervous.
3



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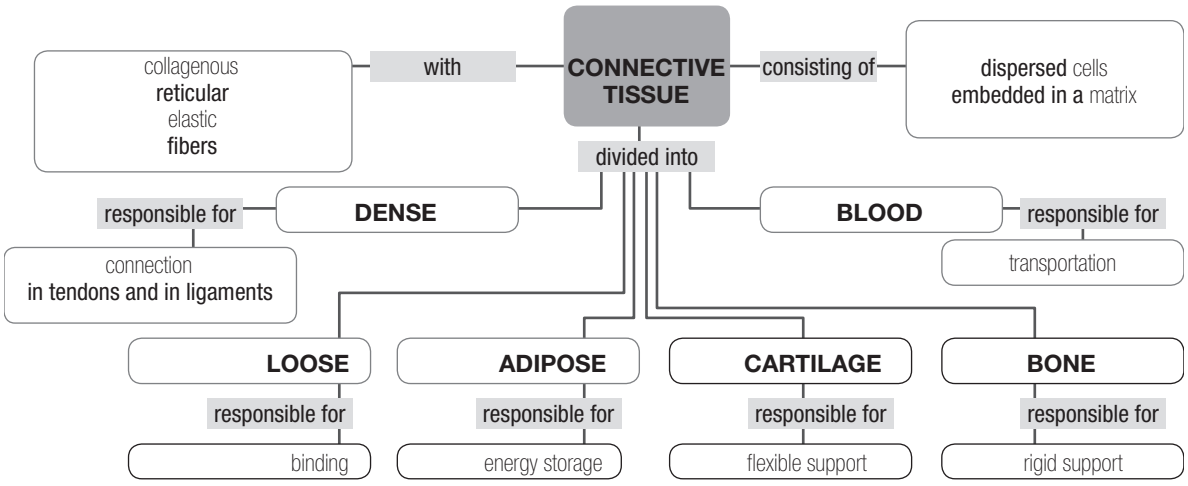


5 a: *epithelial tissue* (lining, transport, secretion and absorption); b: *connective tissue* (support, strength and elasticity); c: *muscle tissue* (strength); d: *nervous tissue* (information processing, communication and control).

6A a: epidermis; b: dermis; c: hypodermis; d: blood vessels; e: connective tissue; f: fat; g: sweat gland; h: hair follicle.

6B 1: Squamous stratified epithelium; 2: They divide repeatedly and when new cells form, the older ones get pushed towards the surface and die. 3: They produce melanin, which is the photoprotectant pigment. 4: The different color of the skin is the result of the amount of produced melatonin; it is controlled by a number of genes; one copy of each of the various genes is inherited from each parent. Each gene can come in several alleles, resulting in the great variety of human skin tones. 5: The sweat evaporation is accompanied by body cooling. 6: Fats are very good insulators.

7 a: evaporation; b: hyperthermia; c: infection; d: ectotherms; e: absorption.

8 a: This is the body's way of preserving its own heat by causing the hairs on the skin to stand up, thus reducing heat loss. It may be associated with shivering. This response to cold is vestigial in human beings since through evolution they have retained very little body hair.
b: As a response to cold, in birds covered with feathers, the erect feathers trap air to create a layer of insulation.
c: As a person's temperature increases, there is, in general, a feeling of cold despite an increasing body temperature: this occurs because the body temperature is rising, but it is still lower than the new hypothalamic thermostat regulation. A fever is the rise in body temperature in response to substances called pyrogens. The presence of a pyrogen in the body causes a rise in the hypothalamic set point for the metabolic heat production response. As a result you shiver and the body temperature rises until it matches the new set point. At the higher body temperature you don't feel cold anymore and you forehead is burning up.

9 a: hyperthermia; b: fever; c: homeostasis; d: hypothermia; e: thermoregulation.

10 a: aorta; b: left pulmonary artery; c: right pulmonary veins; d: left atrium; e: descending aorta; f: inferior vena cava; g: right ventricle; h. right pulmonary veins; i: right pulmonary artery; j: superior vena cava.

11 a: 4, 1, 3, 5, 2: The pumping action of your heart is due to the regular and repetitive contractions and relaxations of the cardiac muscle.
b: 3, 5, 2, 6, 1: This constantly keeps the blood flowing around your body.
c: 6, 2, 3, 4, 7, 1, 5: When the heart muscles relax, blood enters the atria on both sides.

12 a: pulmonary vein; b: left atrium; c: pulmonary artery; d: aorta; e: vena cava; g: right atrium.

13A a: vein; b: capillary; c: artery.

13B

	Artery	Vein
Blood direction	**From heart**	**To heart**
Blood pressure	**high**	**low**
Transport of oxygenated/ deoxygenated blood	**deoxygenated blood in pulmonary arteries** **oxygenated blood in other ones**	**oxygenated blood in pulmonary veins** **deoxygenated blood in other ones**
Size of lumen	**narrow**	**large**
Wall thickness	**thick**	**thin**

14 a: closed; b: pulmonary; c: systemic; d: Arteries; e: capillaries; f: centrifugation; g: leukocytes; h: erythrocytes; i: Leukocytes; j: platelets; k: red; l: systole; diastole; m: forbid; n: is able; o: controls; p: ECG.

15A 1: brachial artery; 2: sphygmomanometer; 3: systolic pressure; 4: diastolic pressure; 5: cuff; 6: stethoscope.

15B 1e; 2h; 3d; 4g; 5a; 6c; 7b; 8f.

16 a: *lymphocytes* (to distinguish infected cells and tumors from normal and uninfected cells / to produce antibodies); b: *platelets/ thrombocytes* (blood coagulation); c: *erythrocytes/ red blood cells* (oxygen transport); d: *neutrophil granulocytes* (phagocytosis).

17 a: Blood serum; b: In the bottom of the test tube; c: Erythrocytes.

18A a: white blood cells; b: red blood cells; c: haemoglobin; d: hematocrit; e: neutrophil granulocytes; f: lymphocytes; g: monocytes; h: eosinophil granulocytes; i: basophil granulocytes; j: platelets.

18B Hematocrit high value → high concentration of red blood cells globuli → thicker blood → thrombus formation

19 a: Haemoglobin; b: Haem; c: To bond oxygen by its iron atom; d: *Being globular* means that the three-dimensional tertiary structure is globular. *Quaternary structure*: the arrangement of multiple protein chains in a multi-subunit complex.

20. **Across**
1. HEMATOCRIT, 6. SPLEEN, 8. THROMBUS, 9. COAGULATION, 10. PLASMA, 13. HYPERTENSION, 14. LEUKOCYTES, 15. PLATELETS.
Down
2. MACROPHAGES, 3. SPHYGMOMANOMETER, 4. ERYTHROCYTES, 5. HYPOTENSION, 7. LYMPHOCYTES, 11. ANEMIA, 12. HYPOXIA.

21. **Across**
2. VENTRICLES, 3. MYOCARDIUM, 7. ARTERY, 8. VEIN, 11. PULMONARYARTERIES, 12. ECG, 13. HEARTBEAT, 14. CAPILLARY.
Down
1. PACEMAKER, 4. LUBDUP, 5. SYSTOLE, 6. DIASTOLE, 7. AORTA, 8. VALVES, 9. PERICARDIUM, 10. ATRIA.

22 1c; 2f; 3b; 4g; 5e; 6j; 7i; 8h; 9a; 10d.

23 a: nose; b: tongue; c: oral cavity; d: larynx; e: trachea; f: broncus; g: lung; h: diaphragm muscle; i: bronchiole; j: pulmonary artery; k: capillary vessels; l: pulmonary vein; m: alveoli; n: intercostal muscle; o: rib; p: oesophagus; q: pharynx.

24A 1: oxygenated blood to heart; 2: deoxygenated blood from heart; 3: smooth muscle; 4: pulmonary venule; 5: pulmonary arteriole; 6: bronchiole; 7: alveoli; 8: capillaries; 9: oxygenated blood to heart; 10: red blood cell; 11: alveolus cell; 12: capillary; 13: alveolus interior; 14: deoxygenated blood from heart.

24B 1d; 2f; 3e; 4a; 5b; 6c; 7h; 8g.

24C H^+: hydrogen ion; HCO_3^-: bicarbonate ion; H_2O: water; Po_2: oxygen partial pressure; Pco_2: carbon dioxide partial pressure; CO_2: carbon dioxide; Hb: haemoglobin; RBCs: red blood cells; H_2CO_3: carbonic acid.

24D 1: $H^+ + HCO_3 \rightarrow H_2CO_3 \rightarrow H_2O + CO_2$; 2: It is carbonic anhydrase; 3: It is present in red blood cells and in the endothelial cells of the capillaries.

25 a: By diffusion; b: $C_6H_{12}O_6 + 6O_2 \quad 6CO_2 + 6H_2O$ + energy (38 ATP); glucose + oxygen → carbon dioxide + water + energy; c: By diffusion; d: Lactic fermentation (by diffusion); e: $C_6H_{12}O_6 \quad 2\ CH_3CHOHCOOH$ + energy (2 ATP); f: Lactobacillus; g: For the production of yoghurt, cheese, etc.

26 I. More exercise means more energy required, therefore more oxygen is necessary.
II. A diminished number of alveoli means fewer possibilities of exchange between the blood and the inhaled air.
III. The tissues are less elastic, so a smaller air volume is introduced.

27 I. The quantity of a gas that can be dissolved in a liquid is directly proportional to the partial pressure of the gas itself.
II. During the descent the inhaled nitrogen increases its partial pressure and it passes from

the lungs to the blood and tissues in a liquid form.
III. If you don't stop to decompress while going up to the surface, the nitrogen in excess comes back to its gaseous form again and it forms bubbles.
IV. Marine mammals don't breathe under the water, but they are in apnea.

28. **Across**
1. LARYNX, 3. BREATHE, 6. SURFACTANT, 8. TRACHEA, 9. HEMOGLOBIN, 10. NITROGEN.
Down
1. LUNGS, 2. DIAPHRAGM, 4. ASTHMA, 5. EXHALATION, 7. ALVEOLI.

CAPITOLO 4

VERIFICA LE TUE CONOSCENZE

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

VERIFICA LE TUE ABILITÀ

15 A canale, B esofago, C sfinteri, D piloro
16 A bolo, B epiglottide, C peristalsi, D scheletrico
17 A microvilli, B duodeno, C assorbimento, D ileo
18 A D
19 C D
20 A B

METTITI ALLA PROVA

35 D
36 A
37 B
38 C
43 C
44 C
45 E
46 C
47 A
48 B
49 D
50 B
51 D
52 D

An obesity epidemic

- What are thrifty genes?

The «thrifty genes» are particular alleles of the genes involved in digestion, absorption, and energy storage that result in greater-than-average efficiency in converting food into energy and into energy reserves, such as fat. Thrifty genes would give individuals a strong selective advantage when food is scarce.

- How is Pima's lifestyle involved in their obesity epidemic?

The abrupt change in their traditional lifestyle is involved in the Pima obesity epidemic. When food is plentiful and has high caloric content, thrifty genes contribute to obesity by maximizing fat storage. Today the Pima eat a modern Western diet that includes high-fat, high-calorie fast foods. In general, they also engage in less physical activity than their ancestors did.

CAPITOLO 5

VERIFICA LE TUE CONOSCENZE

1 A
2 A
3 D
4 D
5 D
6 B
7 A
8 B
9 D
10 A
11 D

VERIFICA LE TUE ABILITÀ

12 A urea, B renina, C tamponare
13 A glomerulo, B Bowman, C podociti, D midollare
14 A osmolarità, B isotonici, C gradiente, D disidratato
15 A B
16 B D
17 B C

METTITI ALLA PROVA

31 A
32 A
33 C
34 D

37 C
38 C
39 D
40 A
41 D
42 A
43 D
44 B
45 E
46 A
47 C
48 E

Blood, sweat, and tears

- How can animals such as desert insects and small mammals be able to live their entire lives without drinking?

All animals derive water from the metabolism of food, but to make that amount of water do, desert animals must conserve it.

- Which animal can live without water during his lifetime? Why?

Kangaroo rats may never see free water during their lifetime. Their dry-adapted excretory systems allow these rodents to derive enough water to survive on from their food.

CAPITOLO 6

VERIFICA LE TUE CONOSCENZE

1 B
2 D
3 A
4 B
5 B
6 D
7 A
8 B
9 A
10 A
11 C

VERIFICA LE TUE ABILITÀ

12 A tolleranza, B delezione, C anergia, D dizigotici
13 A infettata, B MHC I, C fagocita, D CD4
14 A attenuati, B antigeniche, C subunità, D ricombinanti
15 A D
16 C D
17 B C

METTITI ALLA PROVA

33 C
34 B
35 D
36 A
41 E
42 B
43 A
44 B
45 E
46 E
47 C
48 A
49 D
50 D
51 A

The most dangerous foe

- What did inoculation in Washington's army mean?

Inoculation in Washington's army meant introducing a small amount of fluid obtained from a smallpox pustule on a recent victim to a healthy person.

- What did inoculation and vaccination stimulate?

Inoculation and vaccination against a pathogen stimulate the formation of these memory cells, which then protect the body against infection.

Biology in English (pages C163-C170)

1 a: macronutrients; b: peritoneum; c: peristalsis; d: bolus; e: pyloric sphincter; f: liver; g: gallbladder; h: villi; i: secretin; j: glucagon.

2A a: oral cavity; b: salivary glands; c: pharynx; d: oesophagus; e: stomach; f: spleen; g: pancreas; h: large intestine; i: small intestine; l: gall bladder; m: liver; k: rectum; j: anus.

2B 1: voluntary; 2: peristalsis; 3: involuntary; 4: Mechanical; 5: mouth; 6: enzymes; 7: macromolecules; 8: small; 9: Egestion; 10: anus.

3 a: Hydrolysis; b: Polysaccharide; c: Iodine test; d: Disaccharide; e: Two molecules of glucose; f: Pepsin; g: Trypsin; h: An organic acid molecule which –COOH group which is always present and identifies it.

4 1: epithelial; 2: connective (lamina propria); 3: smooth muscle; 4: loose connective; 5: neurons; 6: skeletal; 7: skeletal; 8: skeletal; 9: inner and circular smooth muscle; 10: outer and longitudinal smooth muscle; 11: skeletal; 12: connective; 13: epithelial.

5 a: intestinal glands – *location*: small intestine; b: salivary glands – *location*: mouth; c: pancreas – *location*: duodenum; d: liver – *location*: duodenum; e: gastric glands – *location*: stomach.

6 a: small intestine; b: peristalsis; c: lumen; d: trypsin; e: lipases; f: chyme; g: gastric pits; h: pyloric sphincter; i: micelles; j: parotids; k: gallbladder; l: villi; m: glucogen; n: insulin; o: Islets of Langerhans.

7A mucus – lubrication, lysozyme – antibacterial, amylase – breakDown of starch into sugars.

7B 1: Parotid gland; 2: Submandibular gland; 3: Sublingual gland.

8 1: saliva; 2: lysozime; 3: bolus; 4: soft; 5: Sensory; 6: pharynx; 7: epiglottis; 8: larynx; 9: contractions; 10: stomach; 11: cardioesophageal; 12: gastric; 13: inactive; 14: pepsin; 15: segmentation; 16: pyloric; 17: mouth; 18: carbohydrates; 19: fats; 20: large; 21: duodenum; 22: liver; 23: juice; 24: proteins; 25: ileum; 26: cecum; 27: water; 28: feces.

9 1: Amylase; 2: Monosaccharides; 3: Pepsin; 4: Amino acids; 5: Nucleotides; 6: Bile; 7: Fatty acids and glycerol.

10 a: peristalsis; b: villi; c: hydrolysis; d: pylorus; e: duodenum.

11 a: F; b: F; c: F; d: T, e: F; g: F.

12 a: large intestine; b: liver; c: liver.

13 1: 1,4; 2: right; 3: stomach; 4: lobes; 5: cholecyst; 6: gland; 7: metabolism; 8: cholesterol; 9: hepatic; 10: gallbladder; 11: lipids; 12: common; 13: pancreatic; 14: duodenum; 15: salts; 16: emulsifying; 17: lipases; 18: micelles.

14 Food (in particular sugars) rests between teeth. Bacteria use sugars and produce acid which can dissolve enamel, and sometimes a cavity develops.

15

A	X	V	Z	E	E	R	G	H	U	T	I	A	O	L	L	A	M	A	N	E
Z	C	A	E	I	N	M	K	C	J	H	L	A	R	C	B	G	E	I	L	N
D	D	G	V	U	I	P	E	R	I	S	T	A	L	S	I	S	E	U	L	A
A	E	F	B	N	I	O	S	O	A	L	L	S	T	U	N	A	R	E	Z	T
W	F	O	L	A	X	H	O	W	H	I	L	I	P	A	S	E	A	C	H	S
I	G	A	S	T	E	O	P	N	F	A	C	I	C	V	I	Y	G	I	X	E
D	T	O	N	G	U	E	A	R	I	E	U	F	V	C	A	G	A	M	N	O
E	D	E	A	W	C	E	F	R	B	L	N	C	A	P	O	M	L	I	N	X
D	A	S	E	I	A	E	F	R	E	L	I	B	J	A	I	C	D	E	R	H
N	C	O	D	L	X	R	T	E	R	A	S	V	O	N	K	L	O	E	R	T
O	C	P	F	O	D	I	T	O	R	A	P	X	E	C	W	F	A	E	R	O
H	E	H	I	C	Y	L	E	E	M	R	Y	M	N	R	S	A	V	E	R	O
K	G	A	L	L	B	L	A	D	D	E	R	E	D	E	E	G	H	U	I	L
O	S	G	I	S	A	X	F	E	I	C	T	R	V	A	A	S	F	E	R	T
I	E	U	H	A	G	S	L	S	S	T	O	T	I	S	W	G	R	I	O	A
L	R	S	F	Y	A	L	E	V	C	U	M	O	T	A	E	R	V	Y	A	R
M	T	E	D	U	A	I	M	U	A	M	Y	O	T	E	V	O	Y	A	I	U
E	B	D	S	H	G	L	A	I	V	I	H	A	U	Q	U	A	J	K	I	A
A	N	D	A	R	I	O	N	O	L	O	C	E	K	T	A	T	R	B	U	M
N	O	A	N	I	S	P	E	P	S	E	M	G	A	R	H	P	A	I	D	N
N	O	S	U	C	S	R	I	B	N	O	M	I	H	R	F	P	I	D	A	E

16A a: kidney; b: ureter; c: urinary bladder; d: urethra; e: cortex; f: medulla; g: renal artery; h: renal vein; i: pelvis; j: renal pyramid; k: ureter; l: glomerelus; m: Bowman's capsule; n: afferent arteriole; o: efferent arteriole; p: distal convoluted tubule; q: proximal convoluted tube; r: peritubular capillaries; s: cortical nephron; t: vasa recta; u: loop of Henle; v: collecting duct.

16B 1: Efferent arteriole; 2: Ureter; 3: Medulla; 4: Nephron; 5: Loop of Henle; 6: Bowman's capsule; 7: Vasa recta; 8: Distal convoluted tubule; 9: Urinary bladder; 10: Pelvis.

17 1: bean; 2: retroperitoneal; 3: fibrous; 4: fatty; 5: dropping; 6: medulla; 7: pyramids; 8: blood; 9: ureter; 10: bladder; 11: excreted; 12: sphincters; 13: urination; 14: branches; 15: artery; 16: cortex; 17: arterioles; 18: capillaries; 19: functional; 20: glomerulus; 21: Bowman's; 22: proximal; 23: Henle; 24: reabsorption; 25: filtrate; 26: proteins; 27: tubule; 28: cells; 29: water; 30: returned; 31: secretion; 32: acid.

18 1: Storage; 2: Bladder; 3: Renal artery; 4: Urethra; 5: Ureter; 6: Plasma; 7: Collecting duct; 8: Glucose.

19 The concentration of mineral salts (above all Na^+) increases so the osmoreceptors in the hypothalamus stimulate ADH release and water is reabsorbed. Eventually the thirst hypothalamic center is stimulated too and we feel the need to drink.

20 a: It is a process of passive transport, from high to low concentration of a certain molecule, facilitated by integral proteins.
b: Active transport is an active transport, from low to high concentration.
c: In the lumen [Na+] is always higher than in cells, in fact the concentration of the ions is always kept low by the sodium-potassium pump while in the interstitial fluid is higher.
d: They are microvilli (brush border); they increase the absorption surface.
e: Small intestine.
f: They are mitochondria; they carry out cellular respiration and produce ATP for active transport.
g: Because the membranes of capillaries are not very selective.
h: We would have the same Na+ concentration between the cell and the lumen.
i: The water is reabsorbed in order to maintain the osmotic balance.

21A We can live with one kidney only, so it is frequently possible that one family member

(being a compatible live donor) may give one of his/her kidneys to a seeking patient.

21B Surgeons need only to make three connections: renal artery, renal vein and ureter.

22.

		1	R	E	N	A	L	V	E	I	N			
	2	U	R	E	T	H	R	A						
3	B	O	W	M	A	N	’	S	C	A	P	S	U	L	E
		4	N	E	P	H	R	O	N					
			5	L	O	O	P							
					6	U	R	E	T	E	R			
		7	B	L	A	D	D	E	R					
		8	D	I	A	L	Y	S	I	S				
9	G	L	O	M	E	R	U	L	U	S				
							10	K	I	D	N	E	Y	
						11	V	E	N	A	C	A	V	A

23A 1: Monocyte; 2: Basophils, eosinophils, neutrophils, mast cells, macrophages, dendritic cells. 3: Dendritic cells and macrophages; 4: Macrophages; 5: B cells, T cells, Natural killer cells.

23B *Function of B cells*: They play a large role in the humoral immune response.
They make antibodies against antigens, they perform the role of antigen-presenting cells and eventually develop into memory B cells after activation by antigen interaction.
Function of T cells: They play a central role in the cell-mediated immune response. They present a special receptor on their cell surface called T cell receptors.
Function of natural killer cells: They represent a major component of the innate immune system. They attack tumors and cells infected by viruses. They kill cells by releasing small cytoplasmic granules of proteins called perforin and granzyme that cause the target cell to die by apoptosis.

24 a: both; b: B cell; c: T cell; d: B cell; e: both; f: T cell; g: T cell; h: both; i: T cell; j: both; k: B cell; l: both.

25 a: Fever; b: Platelets; c: T cell receptors; d: Cholera; e: Cascade; f: Cytokinesis; g: Erythrocytes; h: Liver; i: T cells; j: B cells.

26A a: interstitial fluid; b: fluid entrance; c: cell; d: endothelium; e: lymph.

26B The capillary endothelian cells slightly overlap at the edges; when the liquid pressure is higher than the lymph pressure, the cells slightly open inward like a valve and let the interstitial liquid enter. Vice versa if the lymph pressure is higher, this, pressing against the cells, closes the spaces.

27 a: Bone marrow; b: Antibodies/receptors; c: antigens; d: Lymph nodes; e: Plasma cells; f: They produce antibodies; g: Antibodies; h: Memory cells; i: They are a B cell subtype that are formed following primary infection. They produce specific antibodies which will provide an immediate answer in case of a second exposure to the same antigen.; j: Bacteria, viruses, non-self molecules such as proteins, nucleic acids, polysaccharides.

28A a: passive; b: passive; c: active; d: passive; e: active; f: passive; g: passive; h: passive; i: active; j: active.

28B Active immunity (the production of antibodies against a specific agent by the immune system) can be acquired by contracting an infectious disease or by receiving a vaccination and it is permanent. Passive immunity is the immunity produced by the transfer to a person of antibodies that were produced by another person. Protection from passive immunity diminishes in a relatively short time, usually a few weeks or months.

29 a: **Normal flora**, because it is not a **surface defense barrier**.
b: **Mast cells**, because they are not **lymphocytes**.
c: **Thymus**, because it is not **a secondary lymphatic organ**.
d: **Replicant**, because it is not **a kind of vaccine**.
e: **Bleeding**, because it is not **a symptom of inflammation**.
f: **Long chain**, because it is not **a part of the structure of immunoglobulins**.
g: **Hepatitis B**, because it is not **an autoimmune disease**.
h: **Histamine**, because it is not **involved in clonal selection**.

CAPITOLO 7

VERIFICA LE TUE CONOSCENZE

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

VERIFICA LE TUE ABILITÀ

14 A posteriore, B adenoipofisi, C neuroipofisi, D tropine
15 A tireoglobulina, B iodio, C tiroxina, D triiodotironina
16 A ipofisari, B luteinizzante, C ipotalamico, D GnRH
17 A B
18 A B
19 A C

METTITI ALLA PROVA

35 D
36 C
37 B
38 B
42 B
43 B
44 B
45 A
46 B
47 E
48 E
49 D
50 E
51 C
52 C

Testosterone abuse

- What is testosterone?

Shortly before puberty, the male reproductive system increases its production of an important chemical signal—testosterone, the male sex hormone. Testosterone enters cells, where it binds to certain receptors and alters gene expression. The cells that have these receptors are those involved in the development of male secondary sex characteristics such as deep voice, facial and body hair, and increased muscle mass

- What happens to woman bodybuilders when they use anabolic steroids?

When women body builders use anabolic steroids they develop male muscle patterns. They also develop deep voices and body and facial hair, and because these steroids generate negative feedback in the control of the female reproductive system, their breast tissue diminishes, they stop menstruating, and they become infertile.

CAPITOLO 8

VERIFICA LE TUE CONOSCENZE

1 B
2 B
3 A
4 A
5 C
6 B
7 A
8 D
9 B
10 D
11 D
12 D

VERIFICA LE TUE ABILITÀ

13 A epididimo, B deferente, C prostata, D bulbouretrali
14 A oogonio, B primari, C riserve, D polare, E luteo
15 A disco, B epiblasto, C amniotica, D ipoblasto, E vitellino
16 B C
17 B D
18 A C

METTITI ALLA PROVA

33 C
34 A
35 B
36 D
41 D
42 B
43 A
44 A
45 D
46 D
47 D
48 D
49 C
50 D
51 A

Explosive sex

- How many queens can you find a in bee hive?

At any given time, there is only one queen in a bee hive.

- What happens when a honeybee colony swarms?

The queen leaves the hive and takes a retinue of workers with her. A new queen will emerge to take over the old hive and a few males will get to perform their one brief function—fertilizing a virgin queen—before they die.

Biology in English (pages C229-C236)

1 a: *True*; b: *False* – Steroid and some amine hormones are lipid-soluble; c: *False* – It can cause different responses in different types of

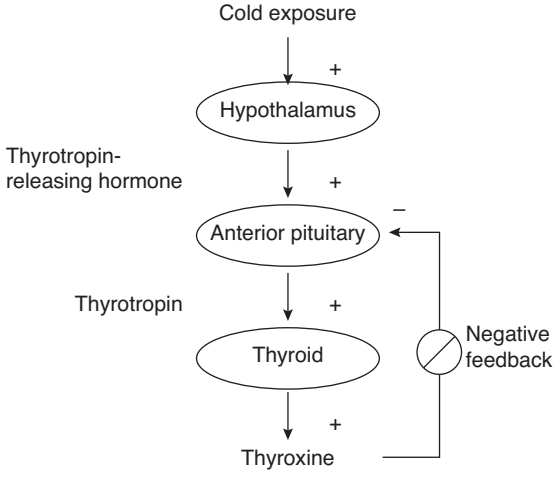
cells; d: *True*; e: *False* – They are hypothalamus, the posterior epituitary gland and the pineal gland; f: *False* – Receptors for water-soluble hormones are on the cell surface; g: *True*; h: *False* – The cytoplasmic domain activates protein kinases or phosphatases; i: *False* – There are also isolated endocrine cells within a tissue (e.g. in the digestive tract); j: *True*; k: *False* – Endocrine glands don't have this system of ducts, they secrete their products into the interstitial fluid; l: *False*, hormones are secreted as a response to various stimuli: hormones from other glands, the concentration of some substances in the blood, an electric impulse; m: *False*, there are always some variations.

2 a: Thyroxine; b: Glucagon; c: Pituitary gland; d: Testosterone; e: Vasopressin; f: PTH; g: Epinephrine; h: PTH.

3 a: T3, T4 – overproduction; b: Insulin – underproduction; c: Estrogens, testosterone – underproduction; d: Androgens (testosterone) – overproduction; e: Estrogens, progesterone – underproduction; f: PTH – overproduction; g: PTH – underproduction; h: ADH – underproduction; i: Growth hormone – overproduction; j: T3, T4 – underproduction.

4 a: posterior; b: anterior; c: posterior; d: anterior; e: posterior; f: anterior; g: posterior; h: anterior; i: anterior; j: posterior; k: posterior; l: anterior.

5 a: Negative feedback mechanisms control any change or deviation from the normal range of function activating responses that bring the function back to within the normal range; b:



6A 1: It controls the reabsorption of water in the kidneys; 2: It stimulates the contraction of the uterus, the flow of milk and bonding; 3: It stimulates breast development and the production of milk; 4: In females, it stimulates the maturation of follicles; in males, it stimulates spermatogenesis; 5: In females, it triggers ovulation and the production of estrogens and progesterone; in males, it stimulates the production of testosterone. 6: It activates the thyroid gland; 7: They act as neurotransmitters in the control of pain; 8: It stimulates protein synthesis and growth; 9: It stimulates adrenal cortex to secrete cortisol.

6B a: The kidneys produce a large volume of dilute urine; b: Probably their production of oxytocin, which also promotes bonding, is insufficient or blocked; c: Overproduction causes gigantism, underproduction causes pituitary dwarfism; d: Because tropic hormones are hormones which have other endocrine glands as their target. TSH, ACTH, LH and FSH regulate the activity of other glands.

7A 1: Calcitonin; 2: Reduces; 3: deposition; 4: lowers; 5: 9-11; 6: High; 7: Low; 8: PTH; 9: Stimulates; 10: release; 11: Increases; 12: rises.

7B a: Calciferol increases Ca^{2+} absorption in the digestive tract; in the kidneys, it works in coordination with PTH to reduce Ca^{2+} loss in the urine; it promotes the formation of bone matrix; it provides a negative feedback on parathyroid cells reducing PTH production. b: Because a vitamin is a substance that can't be synthesized by our body, whereas vitamin D is synthesized in skin cells where cholesterol is turned into vitamin D thanks to ultraviolet radiation.

8A Calcitonin and parathyroid hormone (or PTH).

8B 1: If calcium level rises above set point; 2: Thyroid gland releases calcitonin; 3: Blood calcium level falls; 4: If calcium level falls below set point; 5: Parathyroid glands release parathyroid hormone; 6: Blood calcium level rises.

8C Insulin and glucagon.

9 1: throat; 2: lobes; 3: iodine-containing; 4: metabolism; 5: homeostasis. 6: diminishes; 7: therapeutically; 8: TSH; 9: hypothalamus; 10: increased; 11: decreased; 12: nodules; 13: goiter; 14: protruding.

10A Down.

10B a: Non-steroid hormone (first messenger); b: Receptor protein; c: Activated enzyme; d: Effect on cellular function; e-Such as glycogen breakDown; f: Plasma membrane; g: Steroid hormone; h: Receptor protein; i: Hormone receptor complex; j: mRNA, k: New protein.

10C cAMP or cyclic AMP.

10D Water-soluble hormones can't enter the target cells. They bind to receptors situated on the plasma membrane of the target cell (1) and use a second-messenger system. The activated receptor starts a series of reactions (2) activating an enzyme, which catalyzes the reactions (3) that produce cAMP. Cyclic AMP supervises additional intracellular changes (4) that promote the typical response to the hormone.
Since the steroid hormones are lipid-soluble molecules, they can diffuse through the plasma membranes (1) of their target cells. Then they enter the nucleus (2) and (3) bind to specific receptor proteins; the complex hormone-receptor (4) binds to specific sites on the cell DNA, (5) and activates certain genes to transcribe mRNA. The mRNA is translated in the cytoplasm (6) and results in the synthesis of new proteins.

11 a: Bladder; b: Prostate; c: Penis; d: Epididymus; e: Urethra; f: Testis; g: Vas deferens; h: Seminal vesicles; i: Ureter.
1: Testosterone; 2: It is primarily secreted in the testes by interstitial cells of Leydig; 3: Growth of muscle mass and strength; increased bone density and strength; deepening of the voice; growth of a beard and axillary hair; 4: Vasectomy; 5: They must indicate that the vasa deferentia are cut.

12 a: Fallopian tube; b: Ovary; c: Endometrium; d: Vagina; e: Cervix; f: Uterus.

13 a: *Fallopian tube*, because it is not part of the male reproductive apparatus;
b: *ADH*, because it is not a sex hormone;
c: *Cystitis*, because it is not a sexually transmitted disease;
d: *Endometrium*, because it is not a germ layer formed during gastrulation;
e: *Sertoli cell*, because it is not a stage of spermatogenesis;
f: *Amnion*, because it is not a phase of human development after fecundation;
g: *Clitoris*, because it is not involved in the ovarian cycle;
h: *Blastula*, because it is not involved in organogenesis.

14 a: Sperm cells; b: Both, c: Sperm cells; d: Oocytes; e: Oocytes; f: Sperm cells; g: Both; h: Sperm cells, i: Both; j: Oocytes; k: Oocytes; l: Sperm cells.

15 a: Ovarian cycle.
b. 1: Primary oocytes; 2: Estrogens production by follicular cells; 3: Secondary oocytes; 4: Ovulation; 5: Progesterone production by corpus luteum.

16A 1. Egg production is stimulated by hormone therapy; 2. Then eggs are retrieved from the ovary; 3. In the meantime sperm samples are prepared; 4. Eggs and sperm are combined to allow fertilization; 5. Once the eggs are fertilized, embryos are introduced in the uterus.

16B 1. IVF is advisable when there are problems with the fallopian tube or there are sperm quality defects, e.g. sperm have difficulty penetrating the egg, or sperm numbers are very low. IVF can also be used in case of egg or sperm donation.
2. The most common complication of IVF is the risk of multiple births.
3. It is possible to carry out a pre-implantation genetic diagnosis to discover possible embryo chromosomal abnormalities.

17 a: Magnetic resonance imaging (MRI); b: Pap smear (test); c: Chorionic villus sampling (CVS); d: Semen analysis; e: Amniocentesis; f: Colposcopy; g: Mammography; h: Digital rectal examination; i: Ultrasound imaging; j: Biopsy.

18A a: cervix; b: cervix, hypothalamus; c: hypothalamus, posterior pituitary, oxytocin; d: Oxytocin, uterus, contractions, cervix.

18B a: 3; b: 1; c: 2, 3; d: 2, 3; e: 4; f: 4; g: 2, 3; h: 1; i: 4; j: 1.

18C 1: expulsion; 2: minutes; 3: contractions; 4: compress; 5: limit; 6: detach; 7: wall; 8: membranes; 9: pulling; 10: umbilical cord; 11: prevent; 12: continued.

19 1: monozygotic; 2: dizygotic; 3: blastocyst; 4: genetic material; 5: hereditary; 6: Monochorionic; 7: diamniotic; 8: monoamniotic; 9: dichorionic; 10: cleavage; 11: very little; 12: chromosomal; 13: genetic; 14: mother; 15: increase.

20 a: Secondary oocyte; b: Fertilization; c: Sperm; d: Zygote; e: Polar body; f: Cleavage; g: Morula; h: Trophoblast; j: Blastocyst; k: Implantation.

21A 1: Ectoderm; 2: Mesoderm; 3: Endoderm.

21B a: 2; b: 2; c: 2; d: 1; e: 3; f: 1; g: 3; h: 3; i: 1; j: 1; k: 3; l: 2.

22 a: **Semen analysis**. This test checks sperm count, motility and morphology, shape and maturity, semen volume, pH and fructose content. A sperm count lower than 20 million per milliliter makes impregnation improbable.
b: **Prostate digital examination through the anterior rectal wall**. Prostate hypertrophy

which strangles the urethra making urination difficult. He risks bladder infections and kidney damage.
c: **Amniocentesis or chorionic villus sampling (CVS)**. These tests are forms of prenatal diagnosis to determine chromosomal or genetic disorders in the fetus. CVS usually takes place 10-12 weeks after the last period, earlier than amniocentesis (which is carried out as early as 14–16 weeks). It is the preferred technique before 15 weeks, so she can have amniocentesis.
Amniocentesis is used to detect nearly all chromosomal disorders (including Down syndrome), trisomy 13, trisomy 18, and sex chromosome abnormalities. Amniocentesis is more than 99 percent accurate in diagnosing these conditions; several hundred genetic disorders, such as cystic fibrosis, sickle cell disease, and Tay-Sachs disease; neural tube defects such as spina bifida and anencephaly. An amniocentesis cannot, however, detect other structural birth defects — such as heart malformations or a cleft lip or palate.
CVS is used to detect Down syndrome, hemoglobinopathies, Tay-Sachs disease, cystic fibrosis. Chorionic villus sampling does not detect neural tube defects.
d: Toxoplasmosis is an infection caused by a parasite called *Toxoplasma gondii*. The infection is most commonly acquired from the contact with cats and their feces or with raw or undercooked meat. The following situations potentially expose a person to the toxoplasma parasite and increase the risk of acquiring toxoplasmosis: touching her hands to her mouth after gardening, cleaning the cat's litter box, or anything coming into contact with cat feces; eating raw or partly cooked meat, especially pork or lamb; touching her hands to her mouth after contact with raw or undercooked meat. The woman may not have symptoms, but there can be severe consequences for the fetus, such as diseases of the nervous system and eyes. The baby born with toxoplasmosis can be afflicted with encephalitis, myocarditis, mental retardation, deafness, and severely impaired vision, etc.
e: The probable cause is **hepatitis B**. Most hepatitis B infections clear up in one to two months. When the infection lasts more than six months, it can develop into chronic hepatitis B, which can lead to: chronic inflammation of the liver, cirrhosis, liver cancer, liver failure, death. Hepatitis B is caused by the hepatitis B virus (HBV). This virus is spread through contact with body fluids of an infected person, such as: blood, semen, vaginal fluids, saliva. A woman infected with hepatitis B can pass the virus on to her baby during childbirth.
f: She should undergo a **mammography**, that is an X-ray examination, and additional tests such as ultrasound and magnetic resonance imaging (MRI). A biopsy is the definitive diagnostic test. The probable cause could be breast cancer.
Breast cancer is usually treated with surgery and then possibly with chemotherapy or radiation, or both. Treatments, however, are given with increasing aggressiveness according to the prognosis and risk of recurrence. Surgery involves the physical removal of the tumor and include mastectomy, that is the removal of the whole breast, quadrantectomy that is the removal of one quarter of the breast, lumpectomy, that is the removal of a small part of the breast. Today breast reconstruction surgery, a type of cosmetic surgery, is generally performed to give an aesthetic appearance.

23.

	Amniocentesis	**Chorionic Villus Sampling**
Sample analyzed	Amniotic fluid	Chorionic villi
Kind of cells analyzed	Cells that have been shed by the fetus	Cells of chorionic villi
Weeks of pregnancy	15-19	10-12

a: To discover abnormalities in the fetus;
b: The main advantage of chorionic villus sampling is that it can be done much earlier in the pregnancy than amniocentesis;
c: Because the risk of some abnormalities (e.g. Down syndrome) is much higher if the mother is not very young;
d: It contains the amniotic fluid which cushions the developing baby from jolts and bumps, allows easier fetal movement, promotes muscular/skeletal development and helps protect the fetus from heat loss;
e: They are projections developed by the trophoblast which combine with the tissue of the mother's uterus to form the placenta.

They give maximum area of contact with maternal blood.

24. **Across**
1. SPERMATOGENESIS, 3. SCROTUM, 5. MEIOSIS, 9. ENDOMETRIUM, 10. VULVA, 11. EPIDIDYMIS, 13. ECTODERM, 14. BLASTOCYST, 15. LABOR, 16. SEMEN.
Down
1. SEMINALVESICLES, 2. GASTRULATION, 3. SERTOLICELL, 4. OOCYTE, 6. UMBILICALCORD, 7. PLACENTA, 8. CERVIX.

CAPITOLO 9

VERIFICA LE TUE CONOSCENZE

1 B
2 D
3 A
4 D
5 C
6 B

VERIFICA LE TUE ABILITÀ

7 A voltaggio, B messaggero, C membrana
8 A acetilcolina, B amminoacido, C gamma-amminobutirrico, D azoto
9 C D

METTITI ALLA PROVA

18 B
20 B
21 E
22 D
23 D
24 C

Can our brain be full?

- When was the birth of new neurons first seen?

The birth of new neurons was first seen in adult rats, as they were injected with radioactively labeled thymidine, which is incorporated into new DNA when cells divide.

- What structures of the adult mammalian brain can acquire new neurons?

Two structures of the adult mammalian brain can acquire new neurons: the olfactory bulb and the hippocampus.

CAPITOLO 10

VERIFICA LE TUE CONOSCENZE

1 D
2 D
3 B
4 A
5 A
6 D

VERIFICA LE TUE ABILITÀ

7 A lobi, B parietale, C bianca, D associativa
8 B D
9 A B

METTITI ALLA PROVA

17 C
18 C
19 C
23 B
24 C
25 C

Fear and survival in the brain

- What is amygdala?

The amygdala (Latin for «almond», which describes this structure's shape) is the brain's center for the emotion and memory of fear.

- What could happen to people with damage to amygdala?

People with damage to the amygdala frequently have trouble engaging in normal social relationships. They cannot «read» the nature, mood, or intentions of other people by looking at their faces.

CAPITOLO 11

VERIFICA LE TUE CONOSCENZE

1 C
2 A
3 B
4 B
5 A
6 C

VERIFICA LE TUE ABILITÀ

7 A trasduzione, B interpretati, C recettoriali, D potenziale
8 A postura, B fusi, C tensione, D Golgi, E strappi
9 B C
10 A B

METTITI ALLA PROVA

18 C
19 B
21 C
22 D
23 B

Out of range

- How can a rattlesnake strike and kill a running rodent in complete darkness?

Rattlesnake bilateral pit organs detect infrared radiation from their preferred prey—small rodents—with unerring precision, even in total darkness.

- Why loud pulses do not «drown out» the weak echoes for the bat?

Small muscles in the bat's ears contract to dampen their hearing sensitivity while the sounds are being emitted, but relax in time for the bat to hear the echo—a truly remarkable ability, since the pulses are emitted at rates of 20–80 per second.

CAPITOLO 12

VERIFICA LE TUE CONOSCENZE

1 B
2 A
3 C
4 A
5 D
6 D

VERIFICA LE TUE ABILITÀ

7 A tendini, B bande, C volontari, D respiratori
8 B D

METTITI ALLA PROVA

18 D
19 B
21 C
22 E
23 A
24 B
25 E
26 A

Champion jumpers

- Which animal can jump 200 times its body lenght? And how is it possible?

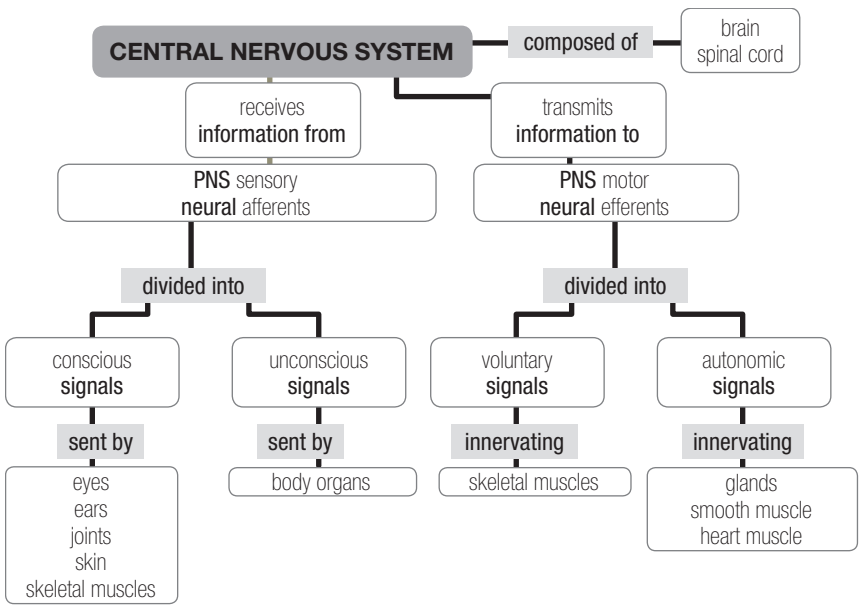
The flea, but this performance is not due to feats of leverage, because no muscle can contract fast enough. A different effector mechanism evolved in the flea, a kind of slingshot action. At the base of the flea's jumping legs is an elastic material that is compressed by muscles while the flea is resting. When a trigger mechanism is released, the elastic material recoils and «fires» the flea into the air.

- Who can win a contest of jumping endurance?

Kangaroos: the muscles used to jump are attached to bones by tendons, that can be elastic. The kangaroo's tendons stretch when it lands, and their recoil helps power the next jump. In order to move faster, the kangaroo simply increases the length of its stride, thereby increasing the stretch on its tendons each time it lands and the magnitude of the recoil at the initiation of each jump.

Biology in English (pages C317-C326)

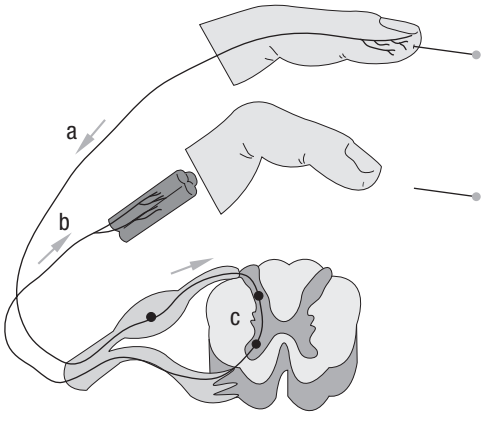
1.



2 a: *False* – Only one, the nervous tissue; b: *False* – It is the dendrite; c: *False* – They are more; d: *True*; e: *False* – They are produced by oligodendrocytes; f: *False* – Not all axons are myelinated; g: *False* – It is permeable to fat-soluble substances such as anesthetics and alcohol; h: *True*; i: *True*; j: *False* – The propagation is saltatory; k: False – In only one direction; l: *False* – The inside is negative and the outside is positive.

3 a: It is the cell membrane potential at rest and it is caused by the different ion concentration between the cell and the interstitial fluid.
b. Above all Na+ and Cl– in the interstitial fluid, while, inside the cell, K+ and negatively charged amino acids and phosphates linked to organic molecules.
c. 2 and 3.
d. As a result of a stimulus, the cell membrane becomes a little depolarized and this depolarization can spread by local current flow to the axon hillock at the base of the axon where voltage-gated Na+ channels are concentrated.
e. They rush into the axon.
f. Because the voltage-gated K+ channels stay open longer than the voltage-gated Na+ channels, allowing K+ to carry excess positive charges out of the axon.

4 a: A reflex arc; b: "a" = a sensory neuron, "b" = a motor neuron, "c" = an interneuron;
c:



d: Neuronal cell bodies; e: It sends information to the brain resulting in the conscious sensation of pain; f: It allows reflex actions to occur relatively quickly by activating spinal motor neurons without the delay of routing signals through the brain so they can answer very quickly in case of hazard.

5 a: Membrane potential; b: Sodium-potassium pump; c: Resting potential; d: Ion channels; e: Hyperpolarization; f: Nodes of Ranvier; g: Action potential; h: Gated ion channels; i: Depolarization; j: Acetylcholine (ACh); h: Neurotransmitters; i: Synapse.

6A 1: Action potential; 2: Neurotrasmitter in vesicle; 3: Voltage-gated Ca^{++} channel; 4: Presynaptic cell; 5: Neurotransmitters; 6. Neurotransmitter receptor; 7: Action potential; 8: Postsynaptic cell.

6B a: An action potential travels along the membrane of the presynaptic cell, until it reaches the synapse (1). The electrical depolarization of the membrane at the synapse causes Ca^{++} channels to open (2). Calcium ions flow through the presynaptic membrane, rapidly increasing the calcium concentration in the interior. The high calcium concentration activates a set of calcium-sensitive proteins attached to neurotransmitter vesicles, which fuse with the membrane of the presynaptic cell and diffuse their neurotransmitter contents into the synaptic cleft (3).
b: Some molecules escape, but some bind to chemical receptors located on the membrane of the postsynaptic cell (4); this causes the receptor molecules to be activated and to depolarize the postsynaptic membrane (5). The spreading depolarization activates an action potential in the postsynaptic cell (6). The action of neurotransmitters can be turned off in several ways: molecules may be destroyed by enzymes, they may be reabsorbed by the presynaptic cell, and then repackaged for future release, or else they may be actively transported or may diffuse away from the cleft.
If neurotransmitter molecules remained in the synaptic cleft the postsynaptic membrane would become saturated with neurotransmitter, and receptors would be constantly activated. Consequently the postsynaptic cell would remain hyperpolarized or depolarized and would not respond to short-term changes.

7 a: electrical; b: chemical; c: electrical; d: chemical; e: neuromuscular junctions, chemical, electrical; f: neuromuscular junctions, chemical; g: chemical; h: neuromuscular junctions, chemical; i: electrical; j: neuromuscular junctions, electrical; k: neuromuscular junctions, chemical; l: electrical; m: neuromuscular junctions; n: electrical; o: electrical; p: electrical.

8 a: nerve; b: dendrites; c: cervical nerves; d: meninges; e: brain stem; f: pituitary gland; g: Na^+ leaves the cell; h: cranial nerves; i: medulla; j: cerebral cortex.

9 a: autonomic; b: somatic; c: somatic; d: somatic; e: autonomic; f: autonomic; g: autonomic; h: autonomic; i: somatic; j: somatic; k: somatic; l: electrical; m: somatic; n: autonomic; o: somatic.

Question a: An autonomic reflex is one that involves the response of an organ, such as the peristaltic contraction of the smooth muscle of the intestines, that is not controlled consciously. Somatic reflexes involve a response that involves a skeletal muscle contraction in response to a stimuli. Sensory nerves send signals through an afferent pathway to the central nervous system for processing. If a quick response is needed, the spinal cord will send out a signal back out the efferent pathway to the appropriate skeletal muscle. The signal is also sent up the spinal cord to the brain for further processing. This 'splitting' of the signal allows the reflex to happen quicker than if the signal were sent only to the brain for processing before a response could be initiated.

The autonomic reflex is associated with one branch of the peripheral nervous system that regulates the sympathetic and parasympathetic divisions; these include internal organs and glands. A somatic reflex is part of the other branch of the peripheral nervous system that controls skeletal muscle movements, including the reflexes, like the knee jerk test that a doctor would give you.

Question b: Meaning: an automatic response to something.

Origin: from the tendency of the knee to jerk involuntarily when hit sharply, properly called the patellar reflex. That was recorded by Sir Michael Foster in his *Text-book of physiology*, 1877: "Striking the tendon below the patella gives rise to a sudden extension of the leg, known as the knee-jerk." The term began to be used figuratively from the early 20th century onwards.

10 1: brain; 2: covering; 3: cerebellum; 4: four; 5: matter. 6: convoluted; 7: gyri; 8: sulci; 9: white; 10: axons; 11: left; 12: right; 13: exception; 14: hemisphere; 15: functions; 16: auditory; 17: touch; 18: parietal; 19: reasoning; 20: personality; 21; ability; 22: junction; 23: strip; 24: central; 25: motor; 26: move; 27: occipital; 28: translating.

11 Diagram A: 1: Frontal lobe; 2: Central sulcus; 3: Parietal lobe; 4: Olfactory bulb; 5: Cerebellum; 6: Temporal lobe; 7: Olfactory bulb.

Diagram B: a: Speech; b: Primary motor cortex; c: Central sulcus; d: Primary somatosensory cortex; e: Body awareness; f: Language; g: Primary visual area; h: Reading; i: Face recognition; j: Hearing; k: Taste; l: Smell.

12 a: parietal lobe – somatosensory cortex; b: temporal lobe; c: frontal lobe; d: parietal lobe; e: frontal lobe – primary motor cortex; f: frontal lobe; g: frontal lobe – Broca's area; h: parietal lobe – somatosensory cortex.

13 0a: Spina bifida; b: Huntington's disease; c: Multiple sclerosis (MS); d: Arteriosclerosis; e: Cerebral palsy; f: Cerebrovascular accident (CVA); g: Parkinson's disease; h: Alzheimer's disease (AD).

14 a: The part of the brain is cerebellum: it controls body balance and equilibrium. This condition is called *ataxia*: victims suffering a cerebellum damage due to a blow to the head, a tumour, a stroke cannot keep their balance because of the loss of muscle coordination.

b: The primary motor area in the frontal lobe has been damaged. The parts of the body are the trunk, the hip and the lower limb region of the primary motor cortex. The paralyzed area is on the left side: the motor pathways are crossed.

c: The probable cause is Alzheimer's disease (AD), a progressive degenerative disorder of the brain. It is associated with a shortage of acetylcholine and structural changes in the brain areas involved with thought and memory. The consequences are dementia, irritability, eventual language loss, confusion, even hallucinations and finally death. At the moment there is no cure for this disease.

d: Broca's area, which is at the base of the gyrus anterior to the central sulcus in the frontal lobe and is involved with the ability to speak properly, has been damaged. This deficit is called *aphasia*.

e: Wernicke's area, the language area at the junction of temporal, parietal and occipital lobes which is involved in the understanding of written and spoken language has been damaged by the stroke.

f: Jogging, walking, brushing his teeth, etc, are involved in the *somatic* division, while salivary reflex and stomach gurgling are caused by the *autonomic* division.

15. **Across**
1. WHITEMATTER, 3. AXON, 7. MENINGES, 10. DIENCEPHALON, 12. REFLEXARC, 14. AFFERENT, 15. DENDRITES, 16. GANGLIA, 17. MYELINSHEATH.
Down
2. EFFERENT, 4. NEURON, 5. SYMPATHETIC, 6. SPINAL, 8. SPINALCORD, 9. GLIALCELLS, 11. CEREBELLUM, 13. CRANIAL.

16A 1: photoreceptors; 2: rod cells; 3: cone cells; 4: retina; 5: mostly the fovea. 6: equilibrium; 7: mechanoreceptors; 8: hair cells; 9: cochlea; 10: macula of utricle and saccule; 11: chemoreceptors; 12: olfactory receptor cells; 13: nasal cavity epithelium; 14: chemoreceptors; 15: taste buds; 16: papillae; 17: mechanoreceptors; 18: Merkel's discs; 19: Meissner's corpuscles; 20: Ruffini endings; 21; Pacinian corpucles; 22: superficial parts of dermis; 23: deep inside dermis; 24: the deepest part of dermis; 25: pain; 26: nociceptors; 27: thermoreceptors; 28: naked nerve endings; 29: between dermis and epidermis; 30: postural control; 31: mechanoreceptors; 32: muscle spindle; 33: Golgi tendon organs; 34: muscles and tendons.

16B a: When a receptor protein on a receptor cell detects a stimulus, it either directly opens/closes ion channels or it releases a neurotransmitter to fire action potentials.
b: It depends on the synapses made by the axons that get into the CNS and their pathways of transmission.
c: Intensity is given by the frequency of the action potentials.

17 a: *Golgi organs*, because they are not tactile mechanoreceptors found in the skin.
b: *Warm*, because it is not one of the tastes that humans can perceive.
c: *Pinna*, because it is not one of the ossicles in the middle ear.
d: *Tympanic membrane*, because it is not in the cochlea.
e: *Lens*, because it is not one of the layers around the eye.
f: *Cataract* because it is not an eye-focusing disorder.
g: *Round window* because it is not in the semicircular canal.
h: *Vertical cell* because it is not a layer of transparent neurons in the retina.

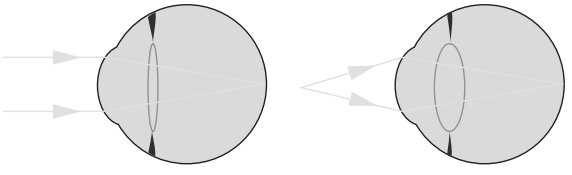
18.

Letter	Term
D	Cornea
A	Ciliary muscle
C	Iris
H	Retina
B	Suspensory ligament
L	Optic nerve
K	Central artery and vein
J	Sclera
F	Lens
M	Blind spot
G	Vitreous humor
N	Fovea
I	Choroid
E	Pupil

19A.

	a)	b)
Ciliary muscles	**relax**	**contract**
Suspensory ligaments	**are pulled tight**	**are pulled on**
Lens curvature	**is thinner**	**is fatter**
Focal length	**increases**	**decreases**

1. Using corrective concave (with negative optical power) lenses or by refractive surgery which use excimer lasers to reshape curvature of the cornea.
2.



19B The pupillary reflex is the reduction/~~increase~~ of pupil size in response to light. In bright light, the retina receptors detect light intensity and by optic/~~motor~~ nerve impulses are sent to the brain/~~eye~~. The brain/~~eye~~ returns impulses to the circular/~~radial~~ muscles of the iris/~~pupil~~ which contract while the circular/~~radial~~ ones relax.

20A 1: Pinna; 2: Lobule; 3: External auditory canal; 4: Tympanic membrane; 5: Malleus; 6: Incus; 7: Stapes; 8: Eustachian tube; 9: Round window; 10: Vestibular cochlear nerve; 11: Cochlea; 12: Semicircular canals.

20B a: Cochlea; b: Pinna; c: Eustachian tube; d: Stapes; e: Round window: f: Vestibular cochlear nerve.

20C Pinna → **External auditory canal** → **Tympanic membrane** → Ossicles → **Oval window** → **Cochlear canals** → Basilar membrane → **Organ of Corti** → **Hair cells** → Auditory nerve
Sound waves are collected by the pinna, transmitted along the auditory canal to the tympanic membrane, then through the ossicles they reach the oval window. The movements of the oval window create pressure waves which displace the fluid along the canals, cross the basilar membrane and eventually reach the organ of Corti, where hair cells transduce them into action potentials that reach the auditory nerve.

20D a: C; b: N; c: C; d: C; e: N; f: N; g: N; h: C; i: C; j: N.

21.

1	R	U	F	F	I	N	I	E	N	D	I	N	G
2	E	Q	U	I	L	I	B	R	I	U	M		
3	C	O	R	N	E	A							
4	E	F	F	E	R	E	N	T					
5	P	A	P	I	L	L	A						
6	T	Y	M	P	A	N	I	C	M	E	M	B	R	A	N	E
7	O	L	F	A	C	T	O	R	Y	B	U	L	B			
8	R	E	I	S	S	N	E	R								
9	S	E	M	I	C	I	R	C	U	L	A	R				

22 a: long; b: long; c: irregular; d: long; e: short; f: flat; g: irregular; h: short; i: short; j: flat; k: flat; l: irregular; m: long.

23A Stage numbers: 4 – 2 – 1 -5 – 3.

23B a: Epiphyses; b: It is a smooth surface that decreases friction at joint surfaces; c: It is red marrow and it forms blood cells; d: It is the area that causes the lengthwise growth of long bones in youth and it is ossified when growth is completed.

24 a: *Rough*, because it is not a kind of muscle cell; b: *Fibula*, because it is not a bone in the arm; c: *Cancellous*, because it is not a type of joint; d: *Multiple sclerosis*, because it is not a bone disorder; e: *Scapula*, because it is not a bone of the Pelvic girdle; f: *Equilibrium maintenance*, because it is not a function of the skeleton; g: *K band*, because it is not a part of a sarcomere; h: *Pelvis*, because it is not a part of the axial skeleton.

25A a: Pivot; b: Ball-and-socket; c: Hinge; d: Ellipsoid, e: Saddle; f: Plane.

25B 1: They work in antagonistic pairs: when one contracts, the other relaxes; 2: The joint becomes rigid; 3: Ligaments, which are flexible bands of connective tissue.

26 1: Tendon; 2: Biceps (contracted); 3: Triceps (relaxed); 4: Humerus; 5: Ulna; 6: Radius; 7: Biceps (relaxed); 8: Triceps (contracted).

27 a-5; b-9; c-6; d-2; e-7; f-8; g-1; h-10; i-3; j-4.

28 **Across**
2. OSTEOCLAST, 6. SHORTBONE, 8. SCAPULA, 11. CALCITONIN, 12. SKULL, 13. OSTEON, 15. MYOSIN, 16. SARCOMERE, 17. OSTEOGENESIS.
Down
1. VERTEBRALCOLUMN, 3. COMPACTBONE, 4. GLYCOGEN, 5. EPYPHYSIS, 6. SARCOPLASM, 7. OSTEOPOROSIS, 9. COLLAGEN, 10. ACTIN, 14. JOINT.