STATE FEDERAL-FUNDED EDUCATIONAL INSTITUTION OF HIGHER EDUCATION "PIROGOV RUSSIAN NATIONAL RESEARCH MEDICAL UNIVERSITY" OF THE MINISTRY OF HEALTHCARE

GUIDELINE
ON FORENSIC MEDICINE

EDITED BY I.V. BUROMSKY AND E.M. KILDYUSHOV

4th Edition

INJURES BY HARD BLUNT AND SHARP OBJECTS

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This study guide is written in accordance with the federal educational standard of higher professional training for the degree (specialty) 31.05.01 – General Medicine, approved by the Ministry of Education and Science of the Russian Federation on February 9, 2016, No. 95, and degree (specialty) 31.05.02 – Pediatrics, approved by the Ministry of Education and Science of the Russian Federation on August 17, 2015, No. 853.

The guideline is intended for students as a study guide for preparation for practical trainings and independent work.

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Contents of Program Section

Injurious factors and types of injurious exposure. Classification of injures.

Mechanisms of injury formation from the impact of hard blunt objects, morphological properties and distinctive features of injuries. Thanatogenesis of various types of external exposure.

Determination of sharp objects. Injuring mechanisms of objects with cutting, stubbing, cutting – stubbing, hacking, sawing and other properties Morphological characteristics of the resulting injuries.

Possibilities of traumatic object identification based on properties and features of resulting injuries.

Requirements for Volume and Level of Knowledge Acquisition of the Program Section

The volume and level of knowledge acquired from the program section is intended to form soft skills, general and special professional skills (acquirement of knowledge, skills and competence), which are necessary for a doctor in case of being involved in an investigation to assist law enforcement in detection, withdrawal and recording of crime traces as well as making up issues, which are to be determined by expert evaluation; participation in the examination of medical records submitted for the expertise and making a conclusion about presented issues in frames of professional scope in case of suspected injures caused by hard blunt and sharp objects.

The criteria of acquiring a necessary scope of knowledge and achievement of a necessary level of knowledge acquisition are the following:

Gained apprehensions:

- About principles of physical interaction between injuring objects and human's body and its presentations in common types of mechanical injuries;
- About peculiarities of forensic investigation (expertise) of a corpse in case of presence of injuries caused by hard blunt and sharp objects; arising issues that challenge an expert and means to their solutions;
- About methods for determination of intra – vitality of injuries and sequence of their causing;
- About possibility of laboratory investigations used in an expertise of mechanical injuries.

Knowledge acquisition:

- Juridical and medical aspects of person's death pronouncement, determination of its cause and its causal relationships with injuries caused by hard blunt or sharp objects;
- Mechanisms of formation and features of external presentations of injuries caused by hard blunt or sharp objects;

- Order and methods of a corpse inspection at a place of its discovery, its specifics in case of suspected injuries caused by hard blunt or sharp objects;
- Means and methods for revealing material evidences of biological origin, their withdrawal, packing and submission to an expert investigation in case of suspected injuries caused by hard blunt or sharp objects;
- Order and methods of alive persons examination to record injuries caused by hard blunt or sharp objects and determine severity of health harm by them;
- Main means and methods of laboratory investigations of objects submitted to a forensic expertise in case of suspected injuries caused by hard blunt or sharp objects; diagnostic capabilities of such means and methods; structural forensic medical units where such investigations may be carried out.
- Principles of interpretation of the results of laboratory studies of forensic medical examination objects.

Skills acquisition:

- To evaluate and analyze data of medical records in case of injuries caused by hard blunt or sharp objects;
- To consistently present a case and defend own point of view, including in case of being involved in a trial as an expert or a specialist;
- To help law enforcement officials in statement of questions, which are to be resolved by a forensic expertise in case of suspected injuries caused by hard blunt or sharp objects, if necessary – offer law officials advice in frame of its competence scope.

Skills obtaining:

- Systematic expert evaluation of incident circumstances in case of injuries caused by hard blunt or sharp objects, evaluation of medical records and medical data contained in case's files;
- Description of pathomorphological changes occurring in case of impact caused by hard blunt or sharp objects, making a provisional conclusion about their intravital (post mortal) formation, their term, sequence and mechanisms of formation; the ability of a person after injury or the development of a pathological state to perform active targeted actions;
- Establishment of the severity of harm caused to human health as a result of injuries caused by hard blunt or sharp objects;
- Formulation of forensic diagnosis and making an expert's conclusion.

Essential knowledge to study the section

- Basic knowledge of normal and pathological anatomy, topographic anatomy and operative surgery, general surgery, normal and pathological physiology, histology, traumatology and orthopedics.

Recommended literature

Main:

1) Forensic medicine: Students book / Edited by Yu.I. Pigolkin – 3rd edition, revised and enlarged. – M.: GEOTAR-Media, 2012. – 496 p.: ill.;
2) Forensic medicine: Students book / V.N. Kryukov, L.M. Bedrin, I.V. Buromsky et al.; edited by V.N. Kryukov. – 5th edition., revised and enlarged. – M.: Medicina, 2006. – 464 p.: ill. (Training literature for medical students);

Supplementary:

1) Federal law "On state forensic expertise in Russian Federation" No. 73-FZ dated May 31, 2001;
2) Procedure for organizing and conducting forensic medical examinations in state forensic institutions of the Russian Federation (approved by Order No. 346n of the Ministry of Health and Social Development of Russia dated May 12, 2010);
3) Forensic medicine and forensic expertise: national guideline / Edited by Y.I. Pigolkin. – M.: GEOTAR-Media, 2014. – 728 p.: ill.;
4) Guidelines for forensic medicine / Edited by V.N. Kryukov, I.V. Buromsky – M.: NORMA Publishing House, 2017. – 656 p.: ill.;
5) Solokhin Yu.A. General issues of forensic traumatology. – Study guide – M., RNRMU, 2004. – 28 p.;
6) Solokhin Yu.A. Forensic examination of injuries caused by hard blunt objects. – Study guide – M., RNRMU, 2004. – 28 p.;
7) Romodanovsky P.O., Barinov E.Kh. Forensic medicine in charts and pictures. – M.: GEOTAR-Media, 2016. – 336 p.

Purpose of practical classes

1. Correction and arrangement of knowledge, obtained during self-preparation for a classroom session in according with above mentioned requirements for the content and the level of the program apprehension.

2. Getting skills to describe and evaluate injuries of soft tissues, bones and inner organs, caused by hard blunt and sharp objects.

3. Getting skills to conclude a forensic diagnosis and make an expert conclusion in cases of death from injuries caused by hard blunt and sharp objects.

Procedure for the conduct of practical classes

The purpose of practical classes is achieved by means of discussion with a tutor the questions, which appeared during self-preparation for practical classes; acquaintance with bone and wet mounts, training models and charts; resolving a training task with making a forensic diagnosis and an expert conclusion.

The control of the initial level of knowledge (preparation for the classes) is carried out by completing the task using the test items of the initial level of knowledge (counted with the correct answer to 70% or more of the total).

Monitoring the achievement of the required scope and level of section's content apprehension (final control) is carried out by performing the following steps: tasks using test points of acquired level of knowledge (counted with the

correct answer to 70% or more of the total); participation in the discussion of the description of bone and wet preparations; defense of the solved situational problem and the subsequent interview with the tutor on the material section.

METHODICAL INSTRUCTIONS TO PRACTICAL CLASSES

Scheme for description of soft tissues injuries (bruises, abrasions, wounds)

1. Type of injury (bruise, abrasion, wound).
2. Exact anatomical site (anatomic area and its surface, distance from the injury to adjacent anatomical marks and, if necessary (stab wounds, etc.) the highness of the injury from feet to the lower margin of the injury.
3. Shape (described in reference to shapes of geometric figures).
4. Size (indicated only in the metric system of measures).

The shape and size of the wound are determined only after matching (bringing together) its edges!

5. Injury's orientation referred to a long axis of a body, limb or an organ.
6. Colour (primary colors and their tones are used).
7. Pattern of wound edges (even, uneven; abraded, non-abraded, crushed, etc.) and appearance of its ends (acute – angled, rounded, M -, U -, T-shaped, etc.); presence of supplementary injuries on wound edges and ends as well as around the wound (tears, cuts, scratches, abrasions, etc.); wound walls orientation referred to skin (bluff, slope, undermined); properties of wound walls (ground, even, etc.) and hair follicles on them (twisted, crossed); presence or absence of tissue intersections between wound walls; pattern of wound bed (what is a bed, its peculiarities).
8. Peculiarities of abrasion relief.
9. Signs of inflammation and healing.
10. Condition of adjacent tissues (presence or absence of edema (swelling), etc.).
11. Presence of foreign inclusions (foreign particles) in the injury itself and around it.
12. Presence or absence of bleeding from the injury, direction of blood stains.
13. Presence or absence of healing signs, its stage.

When describing sharp force injuries, next items also are to be described:

- Patterns of the edges, walls, ends of not only the main, but also additional cuts, tears, abrasions (in case of multiple injuries they should be numbered, quantified, characterized, their mutual location must be noted);
- Presence and direction of a wound canal throughout and in separate areas in clothing, tissues and organs;
- Correspodence of injuries number and location on clothes and on the body of a victim.

An example of a wound description: on the front chest wall at the level of 4 intercostals space and at 145 cm from the plantar line and at 10 cm from conventional front median body line, a gaping, spindle-shaped wound has been found, its sizes are 2.3 x 0.3 cm. Longitudinal axis aligns towards 11 and 4 of clock code. After bringing the edges together, the wound is of rectilinear shape, its length is 2.5 cm. Wound edges are even, non-abraded, ends are acute-angled, wound canal walls are bluff. Subcutaneous adipose tissue is visible at the wound bed. The skin around the wound has no injuries or impurities.

Conclusion: The pattern of the wound says that the wound is a stab one caused by a tool with stabbing – cutting property and having two blades. The width of the immersed part of the blade is approximately 2.5 cm, taking in consideration the length of cutaneous wound.

Scheme for fractures discription

1. The exact anatomic site of a fracture with an indication of common anatomic marks, indication of a distance to a plantar surface expressed in cm.
2. Type of a fracture (complete, incomplete; comminuted, non-comminuted).
3. Morphological peculiarities attributed to a type of deformation and a pattern of breakdown:

- description of fracture edges features (even, uneven, wavy, fine-toothed, large-toothed; with or without of compact lay dislodging; well or poorly compatible; presence of compact plate split; crush or bending of compact plate, etc.);
- description of fracture edges orientation referred to a long axis of a long bone or to a surface of a flat bone;
- description of fracture texture (coarse, fine-toothed, toothed, step-like).

Edges and plane of a fracture pattern are to be described both from external and internal sides of flat bone plates (skull, ribs, pelvis), from the zone of origin of the destruction of bone tissue along the perimeter of the long tubular bones.

4. Other peculiarities:

- Fragments and splinters– shape and size;
- Cracks – location, course, length, edges patterns;
- Injuries of a compact plate in the form of cracking, barrel-like or roller-like "heaving", gutter collapse (like "green branch") with indication of localization and direction.

An example of a fracture description: an incomplete transversal fracture of the 4th right rib in the linea mediaclavicularis has been found. The fracture line goes oblique-vertical, top-down, right-to-left on the external compact bone plate. The fracture edges on the external compact bone plate are rather even, tightly put together with no flaws of compact plate. There is deformity on the internal compact bone plate in the form of a roller-like "heaving" of vertical localization. There are multiple cracks on the roller top, of length up to 0.3 cm. Along the upper and lower edges of the rib from the fracture on the external bone plate, linear cracks diverge in

the form of a Y-shape along the longitudinal axis of the rib and blindly ending in 1-1.5 cm.

The features of rib fracture allow us to draw the following conclusions.

1. On the outer surface of the rib there are signs of stretching of the bone tissue, on the internal – signs of its compression.

2. The interposition of these zones on opposite surfaces of the rib indicates that the formation of a fracture was preceded by bending deformation – the rib was subjected to bending (the radius of its natural curvature decreased).

3. For the occurrence of such a deformation, the traumatic force had to be applied at a distance from the place of formation of the overflow, i.e. fracture is structural.

Approximate scheme of drawing conclusions when examining injuries caused by hard blunt and sharp objects

General issues

1. Injuries nature and location.

In this item it is necessary to indicate only the nature of the injury (hurt wound, depressed fracture, hemorrhage, etc.) and localization — the area of the body and its surface, the anatomical line, the order number of the rib, etc. (eg, in the left parietal region, scales of the occipital bone, in the left breast soft tissues at the level of the 4^{th} rib along the midclavicular line).

In some cases, in order to substantiate the properties of the contact surface of a traumatic object, the duration of injury and other life-time formation, etc., it is advisable to indicate the size, shape, color, and other properties of the injuries detected on the corpse.

In case of multiple injuries, it is advisable to group them according to body parts, for example: on the head:……., on the trunk:……, on the limbs:……

2. Signs of intravital occurrence of injuries, tine since their occurrence and sequence of their infliction.

In this item, it is necessary to indicate whether the injuries have signs of intravital origin, if so, which ones.

The establishment of the intravital origin of injuries is based on the identification of hemorrhages in the adjacent tissues, signs of inflammation (edema, leukocyte marginal standing, leukocyte reaction, etc.), signs of healing, or so-called reverse development (change in the color of the bruise, change in the properties of the bed of the abrasion, the presence of granulation tissue, etc.).

3. The mechanism of formation of each injury individually and groups of injuries in general, including:

- type of traumatic impact (shock, squeezing, etc.) resulting in the formation of the injury;
- type of deformation (for fractures);
- number of traumatic impacts, place of force application (body region), direction of the impact (in three axes, e.g. front-to-back, left-to-right, top-to-bottom);

- the properties of the tool and (or) its trail-forming surface, displayed in the injury properties (if any).

If there are relevant signs, one should indicate the possibility of formation of the injury under certain conditions, e.g. in a traffic accident; when falling from a considerable height, etc.

4. Interposition of the body or its part and the traumatic object (the surface of the object).

5. Severity of harm to human health caused by the injury.

6. Cause of death (the cause of death and the injury (-ies) that led to it should be indicated); causal relationship between the injury and the death.

Particular issues

In case of finding on an injured person's body traces and injuries, specific for a sharp tool, a forensic doctor has right to answer particular issues. Based on such issues one can determine a type or even an exact exemplar of a tool or its part, an impact mechanism:

In case of a cutting object (tool) impact:

- Direction of a tool movement;
- Number of alternating (cutting) movements.

In case of a stubbing object (tool) impact:

- number of sharp ends;
- depth and direction of a wound tract;
- presence of impact signs of exposed face handle;
- presence of sharp tool edges (margins);
- probable thickness (diameter) and shape of a toll cross section at the level of its immerse.

In case of a stubbing – cutting object (tool) impact:

- number of blades and their sharpness grade;
- presence of back edge and its ribs;
- depth and direction of a wound tract;
- presence of spike incision traces, their location in relation to an edge or a blade;
- impact traces of tang end, blade barb, guard in the wound area;
- way of a blade withdrawal from a wound (with rotation, press, etc.).

In case of hacking object (tool) impact:

- presence of cuneiform tool expansion (axe - like) in an injury itself, grade of its expression;
- presence of separate parts impact (tang end, toecap) or a whole tool wedge;
- signs of cutting ribs presence in a tool.

In addition, in the “Conclusions” the expert answers other issues within the limits of his/her professional competence put to him by the person who appointed the examination.

Example of Conclusions writing

On the basis of the forensic medical research of the corpse of Mr. N., 45 years old, the results of the forensic chemical, forensic histological and medical forensic studies, taking into account the circumstances of the case and the questions raised for resolution of the examination, I come to the following conclusions (during the study of the corpse - to the conclusion):

1. In a forensic examination of the corpse of Mr. N., the injuries were found:

- On the head – contused wound in the area of the right parietal tuber with hemorrhage in adjacent soft tissues; comminuted - suppressed fracture of the right parietal bone in the area of the right parietal tuber; a subdural hematoma (200 ml); secondary hemorrhages in the brain stem; multiple subarachnoid hemorrhages;
- on the body – local fracture on the left 4^{th} rib in the front axillaries line; multiple abrasions and bruises on chest, back and abdomen;
- on the limbs – abrasions and bruises on the left shoulder, right hip, both hands.

1. All mentioned above injuries have signs of intravital appearance in form of hemorrhages in soft tissues, adjacent fractures, under brain linings and in brain matter. The injuries formed short before the death.

2. The features of head injuries – angle-like shape of the wound, adjacent tissue crush and compressed fracture of triangle shape suggest that those injuries were caused by a blunt tool with bounded contact area of triangular shape. The mechanism of injuries formation was an impact force. The point of force applying was right parietal tuber area, direction of force applying – right – to left, partially up – to down, front – to back. Displaced bone fragments injured vessels of the brain linings that caused bleeding under the last ones. The subdural hemorrhage appeared as a result of the bleeding, which, in its turn, compressed the brain and leaded to blood flow disturbances.

Injuries on the chest, abdomen and back formed as a result of local exposure to hard blunt objects acting in different directions — front to back and back to front.

Limbs injuries also resulted from the local impact of hard blunt objects.

4. The death of Mr. N., 45 years old, was caused by squeezing of the brain substance by blood that poured into the cranial cavity as a result of a fracture of the right parietal bone. There is a direct causal link between the established head injuries and death. On the basis of life-threatening injury, damage to the head is classified as serious injury to health.

There is no causal link between injuries to the body, limbs and death. These injuries are not life-threatening health hazards and are classified according to the outcome of living persons.

5. During a forensic chemical study, ethanol was found in blood and urine from the corpse of Mr. N. in a concentration of 1.8 and 1.5, respectively.

QUESTIONS FOR CONTENT APPREHENSION SELF-ASSESMENT

1. Define “trauma” and “injuries” concepts.
2. Point environmental factors leading to injuries appearance.
3. What is “injury rate” and its classification?
4. What is “injuring tools”, “injuring weapon”?
5. Which types of external impact can lead to mechanical injuries appearance?
6. What is mechanism of injuries formation?
7. Which factors influence on injuries properties?
8. Point types of mechanical injuries.
9. Which injuries are “local” and which are “remote”?
10. How are solid blunt tools ranged?
11. What is a bruise (hemorrhage), which mechanism leads to its formation, bruise’s main features?
12. What is abrasion, mechanisms of its formation, its main features?
13. Wound classification?
14. What mechanism of wound formation due to solid blunt tools impact, main features of such wounds?
15. What mechanisms of wound formation due to cutting tools impact, main features of such wounds?
16. What mechanisms of wound formation due to stubbing tools impact, main features of such wounds
17. What mechanisms of wound formation due to stubbing – cutting tools impact, main features of such wounds?
18. What mechanisms of wound formation due to hacking tools impact, main features of such wounds?
19. Fractures classification, mechanism of their formation?
20. What is a scheme for injuries description?
21. What injuries can be caused by impact of humans and animals bodies parts?
22. Name the most frequent causes of death in mechanical injuries.
23. What issues can be resolved by conducting a forensic examination based on a study of the damage caused by the impact of hard blunt and sharp objects?

TEST ITEMS FOR ESSENTIAL KNOWLEDGE ASSESMENT

Instruction for the questions 01 – 09

Each question or incomplete statement is followed by 4 – 5 answers or statements. Choose ONE the most suitable answer.

01 Wound do not heal by:
A. biological tissues adhesion;
B. secondary intension;
C. primary intension;
D. under crust.

02 Sagittal plane separates:

A. lower body part from upper one;
B. front body part from back one;
C. plantar surface from ground;
D. right body part from left one.

03 The next bones are not flat ones:
A. pelvic bones;
B. ribs;
C. sternum;
D. metatarsal bones.

04 Bleeding from sinuses of dura mater has no tendency to spontaneous healing due to:
A. decreased blood clotting;
B. opening of sinuses lumen;
C. increased pressure of cerebrospinal fluid;
D. high venous pressure in a central system.

05 The next injuries are regarded as combined ones:
A. Fracture of hip, shank, forearm;
B. abdominal and skull gun – shot injuries;
C. burn of II grade of a face, front chest, abdomen, and a right hip;
D. mechanical and radiation damages of skin.

06 A rupture of medial meningeal artery is dangerous for:
A. hemorrhagic shock development;
B. disturbance of blood flow in dura mater;
C. disturbance of temporal lobe blood supplying;
D. disturbance of frontal lobe blood supplying;
E. compression of brain with epidural hematoma.

07 The next fractures are regarded as multiple ones:
A. fractures of sternum, II rib, spinous process of II vertebra;
B. traumatic decapitation;
C. left side hemopneumothorax, spleen rupture;
D. liver rupture, right hip fracture.

08 The number of serous cavities in the chest cavity:
A. 1;
B. 2;
C. 3;
D. 4;
E. 5.

09 The next injuries are regarded as combined ones:
A. craniocerebral injury, closed chest injury;
B. skull cap fracture, ruptures of dura mater and pia mater;
C. spleen rupture, liver rupture, kidneys ruptures;
D. thermal chest burn of 2 grade, closed fracture of right shoulder.

Instruction for the questions 10 – 24
There can be ONE or SEVERAL answers for each question or incomplete statement.

Choose:

A	B	C	D	E
If 1, 2, 3 are true	If 1, 3 are true	If 2, 4 are true	If 4 is true	If all answers are true

10 Endocardium is the following cardiac surface:
1. sterno-costal;
2. phrenic;
3. pulmonary;
4. inner.

11 Knee joint consists of:
1. upper surface of tibia;
2. articular surface of patella;
3. condyle and patellar surface of femoral bone;
4. surface of a head fibula.

12 Mitosis in cells, surrounding lesion, are diagnosed in:
1. 30-60 min;
2. 3-5 hours;
3. 6-12 hours;
4. 15 hours.

13 What cameras does the heart consist of:
1. upper;
2. right;
3. lower;
4. left.

14 Factors determining the size and shape of abrasions include:
1. properties of causative agent contact surface;
2. measure of impact angle;
3. longitude of dynamic contact of an object and a body;
4. movement direction of an injuring object.

15 Human liver consists of:
1. upper, lower lobe;
2. quadrate, caudate lobe;
3. round, oval lobe;
4. left, right lobe.

16 Abdominal cavity:
1. has average volume approximately 100 milliliters;
2. has average volume approximately 5 liters;
3. contains only serous fluid;
4. contains organs, fatty tissue, vessels and nerves.

17 Leucocytic bank around vessels in an injury area appears in:
1. 1-30 min;
2. 30-60 min;
3. 1-2 hours;
4. 3-5 hours.

18 Shape and size of a bruise are determined by:
1. properties of underlying tissue;
2. angle between an injuring tool impact and skin;
3. shape of an injuring tool contact surface;
4. size of a contact surface.

19 Bruises, which do not correspond to a site of an injuring tool impact (e.g. hypostatic ones) form, as a rule are located:
1. in eyelid area (panda sign);
2. on a neck;
3. in popliteal fossa;
4. on front thighs surface.

20 Bruises are to be differed from:
1. cadaveric spot;
2. skin pollution;
3. hemangioma;
4. erythema.

21 Pleural cavities:
1. are linked to each other behind sternum;
2. contain minimum amount of serous fluid;
3. contain fatty tissue;
4. separated with mediastinum.

22 The following are considered as initial signs of inflammation:
1. margination;
2. leukocytic bank formation;
3. inflammatory swelling;
4. mytosis in tissue cells.

23 Abrasion should be distinguished with:
1. electric mark;
2. wound;
3. parchment stain;
4. thermal burn of III grade.

24 The following may be determined based on abrasion pattern:
1. direction of traumatic impact;
2. material, which injuring tool is made of;
3. term of formation;
4. impact energy.

Instruction for the questions 25 – 30

The question consists of two statements, linked with conjunction "**BECAUSE**". First one has to decide whether each statement is true, then, if so, decide, whether causal relationship between them is true.

CHOOSE:

Answer	Statement 1	Statement 2	Relationship
A	True	True	True

B	True	True	False
C	True	False	False
D	False	True	False
E	False	False	False

25 Hemorrhagic tamponade can lead to death **BECAUSE** it causes pericardium overdistension.

26 Diagnostic sign of death due to acute bleeding is subendocardial hemorrhages (Minakov's spots), **BECAUSE** they form due to hypoxia.

27 Under death due to shock of III-IV grade prominent morphologic sings are revealed **BECAUSE** the negative reaction of "silver mirror" is an indirect shock evidence.

28 Irregular thickness of a bruise determines its irregular "blossom" – from periphery to centre, **BECAUSE** hemoglobin is exposed to series of changes.

29 In first 1-2 hours after occurrence a bruise is of purple color **BECAUSE** in first hours recovered hemoglobin converses in oxyhemoglobin.

30 The yellow color of the bruise appears on the 3 – 6th day, **BECAUSE** by this time the verdohemochromogen is replaced by biliverdin.

Instructions for the questions 31 – 72

There are numbered items in the left column and in the right one – marked with Latin letter items. Match each numbered item to one or more corresponding items marked with a letter. WARNING! Each item marked with a letter can be used once, several times or not at all in the course of the assignment.

31	Pelvic bones	**A.** long bone
32	Elbow bone	**B.** flat bone
33	Body of vertebra	**C.** neither long, nor flat bone
34	Radial bone	
35	Ribs	
36	Metacarpal bones	
37	Skull cap bones	

38	Humerus	**A.** long bone
39	Upper jaw	**B.** flat bone
40	Thigh bone	**C.** neither long, nor flat bone
41	Metacarpal bones	
42	Finger bones	
43	Clavicula	
44	Sternum	

45	Vomer	**A.** skull cap bones
46	Hyoid	**B.** face bones
47	Cheekbone	**C.** neither skull cap, nor face bones
48	Squama of frontal bone	
49	Large wings of cuneiform bone	
50	Parietal one	

51	Palatal bone	

52	Squama of occipital bone	**A.** skull cap bones
53	Lower jaw	**B.** face bones
54	Squamous part of temporal bone	**C.** neither skull cap, nor face bones
55	Nasal part of frontal bone	
56	Body of cuneiform bone	
57	Ethmoidal bone	
58	Lacrimal bone	

59	Lunate bone	**A.** upper limb bones
60	Talus	**B.** lower limb bones
61	Metacarpal bones	**C.** neither upper, nor lower limb bones
62	Ribs	
63	Pisifrom bone	
64	Metatarsal bones	
65	Radial bone	

66	Sacrum	**A.** upper limb bones
67	Cuboid bone	**B.** lower limb bones
68	Trapezoidal bone	**C.** neither upper, nor lower limb bones
69	Hallux	
70	Vertebra	
71	Pollex	
72	Ethmoidal bone	

TEST ITEMS FOR KNOWLEDGE APPREHENSION ASSESMENT

Instructions for the questions 01 – 14

Next question or incomplete statements are followed by 4 – 5 answers or statements. Choose ONE the most suitable answer.

01 Skin injury of which localization has the shortest time of healing:
A. head;
B. hand;
C. chest;
D. abdomen;
E. leg.

02 What coloration does a bruise have in the first hours:
A. violet:
B. purple;
C. red with brownish tone;
D. brownish-yellowish;
E. brownish-greenish.

03 In the first hours after occurrence a bruise color is determined by:
A. oxyhemoglobin;
B. recovered hemoglobin;
C. methhemoglobin;
D. verdochromogen;
E. biliverdin.

04 To detect metal traces on skin one must perform:
A. investigation in ultraviolet emission;
B. investigation in infrared emission;
C. contact – diffusion investigation;
D. trace investigation;
E. photographic investigation.

05 The formation of an abrasion against the background of a bruise is most likely if the angle of impact of the traumatic object is:
A. 90 grades;
B. 70-90 grades;
C. 30-70 grades;
D. 10-30 grades;
E. less than 10 grades.

06 To establish intravital (post-mortem) wound formation, it is necessary to direct tissues to the following laboratory:
A. chemical;
B. physico-technical (medical forensic);
C. spectral;
D. histological;
E. biological.

07 Connective tissue intersections between edges are typical for:
A. cut wound;
B. chopped wound;
C. contused – lacerated wound;
D. stab wound;
E. gunshot wound.

08 There can be supplementary cut at:
A. chopped wound;
B. stab wound;
C. stab – cut wound;
D. bite wound;
E. contused – lacerated wound.

09 Distinguishing sing of main and supplementary cuts is:
A. length of a main cut is superior to a supplementary one;
B. evert edges of supplementary cut;
C. superiority of supplementary cut lenght;
D. presence of one end at a supplementary cut;
E. presence of two ends at supplementary cut.

10 Maximal width of immersed part of a stubbing – cutting blade:
A. does not correspond to wound length;
B. as usual is equal to wound length;
C. as usual is not shorter than wound length;
D. as usual is not longer than wound length.

11 With the location of the stubbing – cutting wound in the chest area and the absence of traces of the impact of the limiter blade length:
A. does not correspond to wound depth;
B. is equal to wound depth;

C. is less or equal to wound depth;
D. is more or equal to wound depth.

12 With the location of the stubbing – cutting wound in the area of the anterior abdominal wall and in the presence of one of the wound ends of the wake of the impact of the limiter blade length:
A. does not correspond to wound depth;
B. is equal to wound depth;
C. is less or equal to wound depth;
D. is more or equal to wound depth.

13 Which impact leads to a hacking wound formation:
A. axe head;
B. saber spike;
C. broadsword handle;
D. spade blade;
E. margin of solid blunt object.

14 Subendocardial hemorrhages (Minakov's spots) are diagnostic sign for:
A. massive bleeding;
B. acute bleeding;
C. fat embolism;
D. shock;
E. air embolism.

Instruction for the questions 15 – 50
For each question or incomplete statement there can be ONE or SEVERAL true answers.

CHOOSE:

A	B	C	D	E
If 1, 2, 3 are true	If 1, 3 are true	If 2, 4 are true	If 4 is true	If all answers are true

15 Cutaneous flap with an injury should be kept for subsequent medical – forensic investigation:
1. formalin - fixed;
2. alcohol fixed;
3. acetone fixed;
4. dried.

16 Cartilage with an injury should be kept for subsequent trace investigation in:
1. formalin solution;
2. alcohol;
3. dried form;
4. glycerin.

17 The shape and size of the bruise are due to:
1. properties of underlying tissue;
2. angle between skin and injuring object impact;
3. shape of a contact surface of the injuring object;
4. size of contact surface.

18 Bruises which do not correspond to a site of injuring impact (e.g. hypostatic swelling) as usual are located at:
1. eyelid area (panda sign);

2. neck;
3. popliteal fossa;
4. frontal thigh surface.

19 Bruise shall be differentiated from:
1. cadaveric spot;
2. skin pollution;
3. hemangioma;
4. erythema.

20 The following can be assessed based upon bruise pattern:
1. angle of impact of the object with the body;
2. contour of the damaging surface of the object;
3. duration of the formation of injury;
4. energy of the impact of the injuring object.

21 Duration of abrasions healing depends on:
1. injury location;
2. spread of an injury;
3. age of an injured person;
4. properties of an injuring object.

22 The following can be assessed based upon abrasion pattern:
1. place of impact of the injuring object;
2. impact direction of the injuring object;
3. duration of the formation of injury;
4. material of the contact surface of the injuring object.

23 The following can be determined based upon an abrasion:
1. direction of injuring impact;
2. material, from which the injuring object is made;
3. duration of formation;
3. impact energy.

24 Abrasion should be distinguished with:
1. electric mark;
2. burn;
3. parchment spots;
4. frostbite.

25 Diagnostic signs of contused wound are:
1. abraded edges;
2. twisted hair bulbs;
3. crushed tissue in walls and bed of wound;
4. intersections of connective tissue.

26 The following can be determined based upon contused wound:
1. impact direction of an injuring object;
2. properties of a contact surface of an injuring object;
3. approximate impact angle between a body and an injuring object;
4. energy of the impact of a injuring object on the body.

27 Direction of the impact of the injuring object can be established using the following signs of a hurt wound:
1. more expressed abrading of one edge of a wound;

2. skewness of one edge of a wound;
3. detachment of one edge of a wound;
4. presence of connective tissue bridges between the walls at the ends of the wound.

28 Cut wound has following features:
1. even edges;
2. one end is sharp-pointed;
3. both ends are sharp-pointed;
4. significant depth.

29 Cut wound can be:
1. straight line;
2. roundish;
3. arc - like;
4. stellular.

30 Depth of cut wound depends on:
1. blade length;
2. garde of blade sharpness;
3. direction of blade movement;
4. measure of pressure applied onto a blade.

31 Stab wound is featured with:
1. small area;
2. presence of precipitation edges;
3. prevalence of depth over length;
4. tissue defect.

32 Cut and stab – cut wound are distinguished by:
1. pattern of wound ends;
2. pattern of wound edges;
3. relationship between wound length and depth;
4. mutual location of wound walls.

33 Based on stab – cut wound the following can be determined:
1. blade width;
2. number of cutting edges at the blade;
3. thickness of the edge of the blade;
4. blade length.

34 Over corpse investigation, the depth of stab – cut wound is measured by:
1. layer – by layer dissection;
2. digital probing;
3. priming of a wound with a plastic compound;
4. investigation with probe.

35 Hacked wound are caused by object, which have:
1. significant weight;
2. relatively sharp blade (edge);
3. cuneiform cross section;
4. butt.

36 Investigation of cleaving surface of bone or cartilage makes it possible to determine:
1. only group properties of the injuring object;
2. only specific properties of the injuring object;

3. only peculiarities of the injuring object;
4. group, specific properties and peculiarities of the injuring object.

37 The next is features of fractures in childhood:
1. subperiosteal pattern of fractures;
2. fracture is located only along line of compression zone (“atypical” fracture);
3. fracture in bone growth plate (epiphysiolysis);
4. comminuted fracture.

38 Signs of a compression zone for fractures in childhood include:
1. spindle-shaped “bulging” of compact plate;
2. even edges of fracture;
3. crush of spongy bone;
4. presence of multiple bone fragments.

39 Misinterpretations of X-ray pictures of fractures in children can be contributed to:
1. incomplete fractures formation (bent fractures);
2. localization of fractures in synchondrosis zones (epi-, apophyseolysis);
3. subperiosteal localization of fractures;
4. predominance of damage to the spongy layer over the compact.

40 The following can be determined based upon linear fracture of skull bones:
1. site of injuring object application;
2. shape and sizes of the injuring object;
3. impact direction of the injuring object;
4. impact energy of the injuring object.

41 Multi - fragment fracture (“spade -like”) of skull bones is formed by an impact of:
1. objects with a bounded injuring surface, which impact at straight angle;
2. objects with a bounded flat injuring surface which impact at oblique angle;
3. objects with a bounded spherical injuring surface;
4. objects with a dominate injuring surface.

42 Comminuted-depressed (“terraciform”) fracture is formed by:
1. objects with a spherical surface of big radius;
2. objects with a bounded injuring surface, which impact at straight angle;
3. objects with bounded injuring surface, which impact at oblique angle;
4. objects with dominating injuring surface, which impact at straight angle.

43 Penetrating depressed (perforated) fracture of skull bones is formed by:
1. objects with a dominating injuring surface;
2. objects with a cylindrical injuring surface;
3. objects with an injuring surface in the form of a dihedral angle;
4. objects with a limited flat injuring surface.

44 Fractures of cervical vertebras accompanied by their height decrease along back surface are formed in:
1. twist of cervical spine;
2. sharp side bend of head;
3. sharp flexion of cervical spine;
4. sharp extension of cervical spine.

45 Compression of the chest in the anteroposterior direction, as a rule, leads to the formation of symmetric rib fractures along the following anatomical lines:
1. parasternal;

2. paravertebral;
3. scapular;
4. axillar.

46 The next is typical for extension (local) rib fracture:
1. even edges on inner bone plate;
2. rapture of parietal pleura at fracture zone;
3. lung injury due to ribs fragments;
4. even edges on outer bone plate.

47 Bending (constructive) fracture of a rib has the following features:
1. even edges on inner bone plate;
2. rupture of parietal pleura at fracture zone;
3. skin bruise at fracture zone;
4. even edges on outer bone plate.

48 The condition for the formation of a helical fracture of the bones of the lower extremities is:
1. fixation of a standing leg;
2. high energy of the injuring object;
3. impact onto a bone of a pair of forces with equal magnitude and opposite directions;
4. upright position of a body.

49 The following can lead to a death in mechanical injuries:
1. blood loss;
2. aspiration of blood;
3. air or fat embolism;
4. cardiac hemotamponade.

50 Diagnostic sign of death due to acute bleeding is:
1. prominent anemia of inner organs;
2. relative congestion of inner organs;
3. subpleural hemorrhages (Tardieu's spots);
4. subendocarial hemorrhages (Minakov's spots).

Instruction for the questions 51 – 56

The question consists of two statements, linked with conjunction "**BECAUSE**". First one has to decide whether each statement is true, then, if so, decide, whether causal relationship between them is true.

Choose:

Answer	Statement 1	Statement 2	Causal relationship
A	true	true	true
B	true	true	false
C	true	false	false
D	false	true	false
E	false	false	false

51 The abrasion heals with the formation of a scar on the skin, **BECAUSE** the abrasion is a damage that is accompanied by a violation of the integrity of all layers of the skin.

52 The ends of the cut wound are acute-angled, **BECAUSE** the ends of the cut wound are formed only by cutting a tissue with a blade.

53 In cut wounds on a neck it is necessary to perform the test for air embolism of the heart,

BECAUSE in cut wounds of such localization jugular veins often get injured.

54 The depth of cutting-stabbing wounds on a corpse is advisable to explore with a grooved probe, **BECAUSE** the sounding of cutting-stabbing wounds on a corpse with a grooved probe always allows you to establish the true length of the wound canals.

55 The development of abdominal bleeding in case of damage to parenchymal organs is possible and in the long-term periods of the post-traumatic period, **BECAUSE** if the parenchymal organs are damaged, their two-stage ruptures are possible.

56 It is advisable to direct the cartilage damaged by the chopping tool for a trace study, **BECAUSE** the cartilage damaged by the chopping tool may reflect its individual characteristics.

Instruction for the questions 57 – 85

There are numbered items in the left column and in the right one – marked with Latin letter items. Match each numbered item to one or more corresponding items marked with a letter. WARNING! Each item marked with a letter can be used once, several times or not at all in the course of the assignment.

57	Bluff edges of a fracture	**A.** diagnostic sign of bone tissue distension
58	Even edges of a fracture	
59	Crush of fracture edges	**B.** diagnostic sign of bone tissue compression
60	Scalloped edges of a fracture	
61	Fragment of pyramidal shape	**C.** neither sign of bone tissue distension nor compression
62	Rough (fine – grain) fracture surface	

63	Grooved crush of compact plate	**A.** diagnostic sign of bone tissue distension
64	Skewness of fracture plane	
65	Cuneiform thinning of one edge of a bone fragment	**B.** diagnostic sign of bone tissue compression
66	Tight opposition (without defects of compact plate) of bone fragments	**C.** neither sign of bone tissue distension nor compression
67	Step-like fracture surface	
68	Spindle-shaped “bulging” of compact plate	
69	Y-shaped bifurcation of “main” fracture line	

70	Bluff wound walls	**A.** diagnostic sign of a stab – cut wound
71	Marginal crush of tissues	
72	Hair cross in area of acute-angle end of wound and its absence in area of U-shaped end	**B.** diagnostic sign of a cut wound
		C. Neither diagnostic sign of a stab – cut nor cut wound
73	Acute-angle ends of a wound along with even edges and superiority of wound length to its depth	

74	Stellar shape of a wound	
75	Uneven, abraded edges of a wound along with superiority of wound depth to its length	
76	Linear shape of a wound	

77	Twisted hair bulbs at wound walls	**A.** diagnostic sign of a stab-cut wound
78	Superficial skin cuts at wound ends along with wound depth decrease towards its ends	**B.** diagnostic sign of a cut wound
		C. neither diagnostic sign of a stab – cut nor cut wound
79	Superiority of wound length to its depth along with even edges and acute – angled ends	
80	U-shaped wound ends along with superiority of wound depth to its length	
81	Expressive abrasions along wound edges	
82	Connective tissue intersections between wound walls	
83	Round shape of a wound	
84	Superiority of wound depth to its length along with even edges and acute – angled ends	