Histology — tissues · Lab 8

Lymphatic organs

When Monday 4 January 2027, 12:00–13:30

Room A5/01

Teacher dr hab. prof. UR Agata Wawrzyniak

Group Lab group 2

What the lab covers

The lymphatic and immune system: the structure and functions of lymphatic nodules, the central lymphatic organs (a child's thymus and an involuted one) and the peripheral ones (the palatine tonsil, a lymph node, the spleen).

How it is graded

- Recognising histological slides
- Attendance
- Two tests (at least 15 single- or multiple-choice questions each, one resit) and a practical in the winter semester
- A correctly completed exercise notebook
- Activity

The final practical exam: 15 slides under the microscope, a minute each, 60% to pass.

Bring: the exercise notebook (it is graded)

In this pack

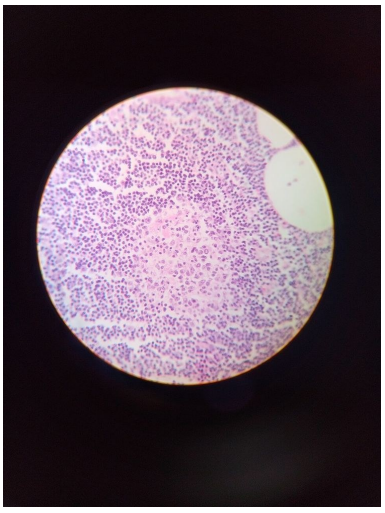
1 Recognising the slides (6) page 2
2 Practice figures: name each numbered structure (6) page 6
3 Key points page 12
4 Light-microscope checklist page 13
5 Self-test: 10 single-choice questions page 14
Answers: practice figures page 15
Answers: self-test page 15

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1 · Recognising the slides

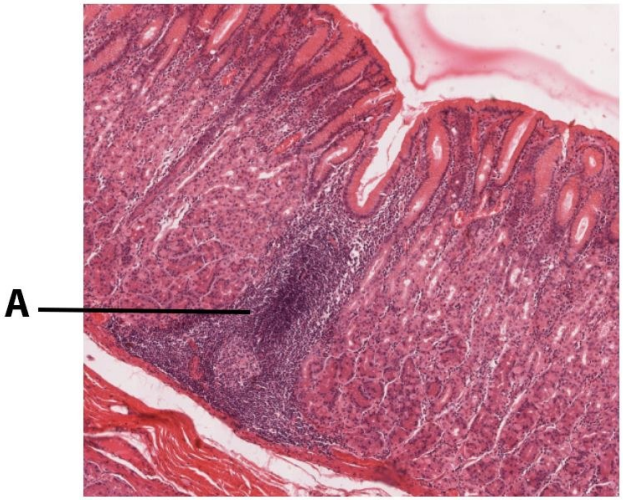
Each tissue as the Slide Box shows it: its slides, how to recognise it, and what not to confuse it with. Test yourself online: medicine.kazimiri.com/semester-1/slides/?lab=8&m=test

Lymphatic nodule · grudka chłonna



A lymphatic nodule (follicle) with a pale germinal centre, in a lymph node.

Sameem Arif · CC BY-SA 4.0 · commons.wikimedia.org/wiki/File:Lymph_node_follicle.jpg



Real slide (100x): MALT, a lymphatic nodule in the wall of the stomach, deep to the gastric glands. Shown, not asked: the gastric lining would also be a fair answer.

Jennifer Lange; slide: Regents of the University of Michigan Medical School · CC BY-NC-SA 4.0 · med.libretexts.org/Bookshelves/Anatomy_and_Physiology/Human_Anatomy_(Lange_et_al.)/19%3A_Lymphatic_System/19.05%3A_Anatomical_Atlas_-_Lymphatic_and_Immune_System

How to recognise it

- A round cluster of densely packed lymphocytes.
- Secondary nodules: a pale germinal centre inside a darker mantle.
- Found alone or in groups deep to mucosal epithelia (tonsils, Peyer's patches, appendix) and in lymph nodes and spleen.

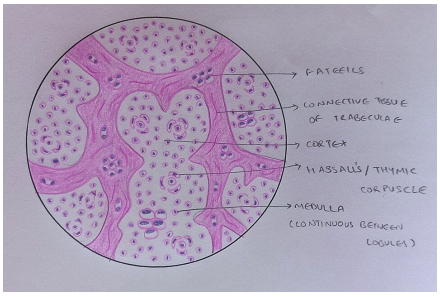
Don't confuse with: A germinal centre can look like a hole at low power; look for its dark rim.

Thymus (a child's) · grasica (dziecka)



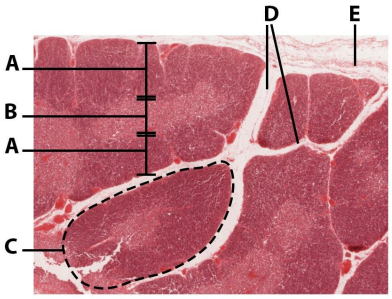
Thymus: a thymic (Hassall's) corpuscle, a whorl of epithelial cells among the lymphocytes of the medulla.

Nephron · CC BY-SA 3.0 · commons.wikimedia.org/wiki/File:Thymic_corpuscle.jpg



A labelled drawing of the thymus: lobules divided by connective-tissue trabeculae, each with a cortex and a medulla holding Hassall's corpuscles; fat cells between.

Bhuvana Syama · CC BY-SA 4.0 · commons.wikimedia.org/wiki/File:Histology_of_thymus_gland.jpg



Real slide (100x): a thymus, its lobules full, each with a dark cortex and a pale medulla, divided by trabeculae under the capsule.

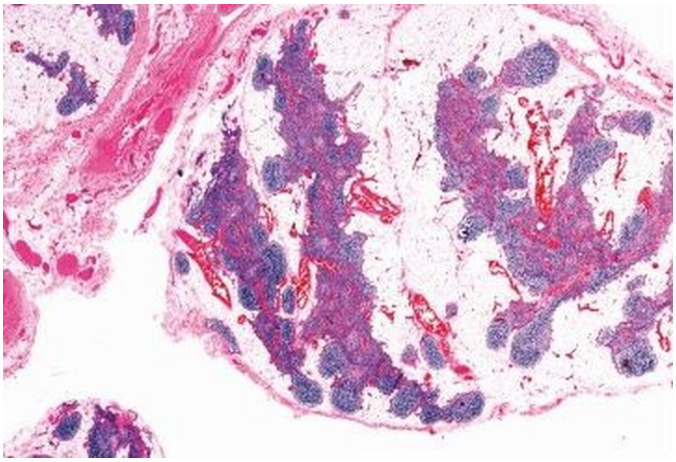
Jennifer Lange; slide: Regents of the University of Michigan Medical School · CC BY-NC-SA 4.0 · med.libretexts.org/Bookshelves/Anatomy_and_Physiology/Human_Anatomy_(Lange_et_al.)/19%3A_Lymphatic_System/19.05%3A_Anatomical_Atlas_-_Lymphatic_and_Immune_System

How to recognise it

- Lobules, each with a dark cortex (densely packed T cells) and a pale medulla.
- Hassall's corpuscles: pink whorls of epithelial cells in the medulla.
- No lymphatic nodules and no sinuses.

Don't confuse with: A lymph node: nodules with germinal centres and a subcapsular sinus.

Involuted thymus (an adult's) · grasica inwolucyjna (osoby dorosłej)



Real slide (H&E, low power): an involuted thymus. Adipose tissue fills the septa and replaces the parenchyma, leaving islands of thymic tissue.

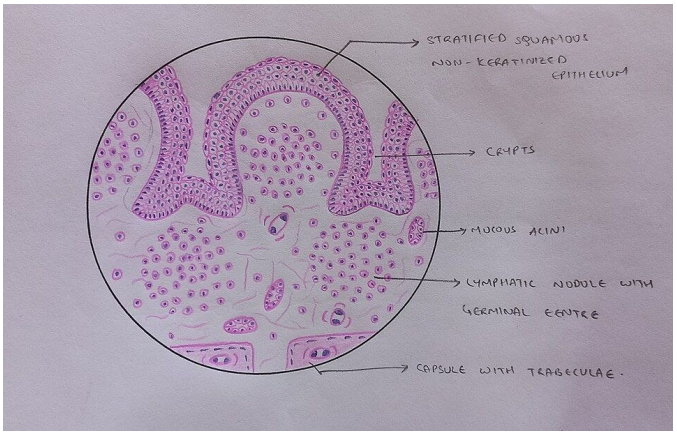
Mark A. Flomenbaum and Ryan C. Warner, Am J Clin Pathol 2022; © American Society for Clinical Pathology · CC BY-NC 4.0 · pmc.ncbi.nlm.nih.gov/articles/PMC9171574/

How to recognise it

- Mostly adipose tissue.
- Small islands of thymic tissue remain, still with Hassall's corpuscles.
- The cortex–medulla pattern is faint or lost.

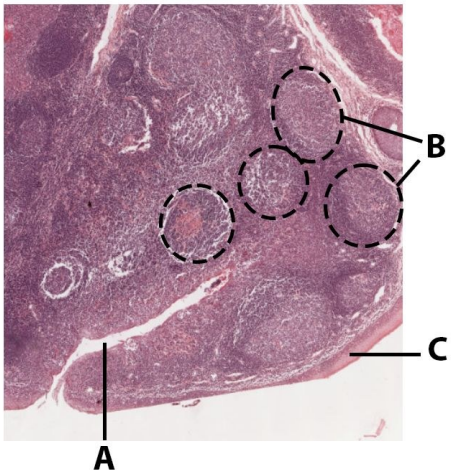
Don't confuse with: Plain adipose tissue: no islands of lymphocytes, no Hassall's corpuscles.

Palatine tonsil · migdałek podniebienny



A labelled drawing of a palatine tonsil: stratified squamous epithelium dipping into crypts, lymphatic nodules with germinal centres, mucous glands and the capsule.

Bhuvana Syama · CC BY-SA 4.0 · commons.wikimedia.org/wiki/File:Histology_of_palatine_tonsil.jpg



Real slide (100x): a tonsil, its stratified squamous epithelium dipping into a crypt, with lymphatic nodules deep to it. (The source does not say which tonsil, so it is shown, not asked.)

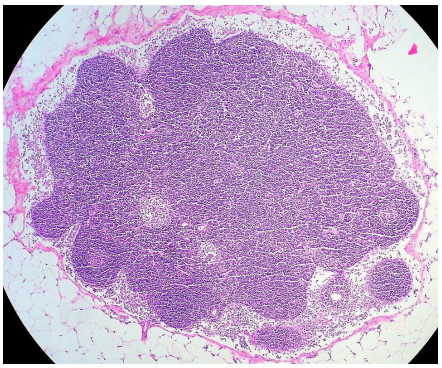
Jennifer Lange; slide: Regents of the University of Michigan Medical School · CC BY-NC-SA 4.0 · med.libretexts.org/Bookshelves/Anatomy_and_Physiology/Human_Anatomy_(Lange_et_al.)/19%3A_Lymphatic_System/19.05%3A_Anatomical_Atlas_-_Lymphatic_and_Immune_System

How to recognise it

- Covered by non-keratinised stratified squamous epithelium.
- The epithelium dips into deep crypts, lined by many lymphatic nodules with germinal centres.
- A connective tissue capsule on the deep side.

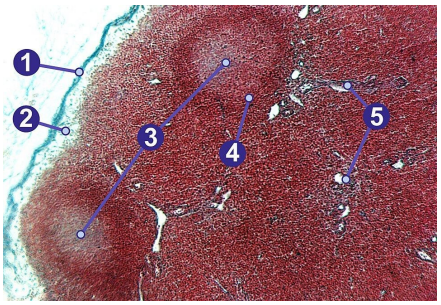
Don't confuse with: A lymph node: a capsule all round, a subcapsular sinus, no epithelium.

Lymph node · węzeł chłonny



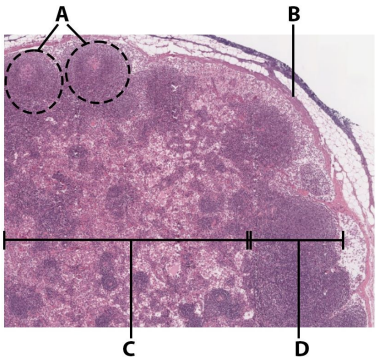
A lymph node: the capsule and subcapsular sinus over a cortex of lymphoid follicles.

Ed Uthman, MD · CC BY-SA 2.0 · commons.wikimedia.org/wiki/File:Normal_Lymph_Node.jpg



A pig's lymph node, numbered: (1) capsule, (2) subcapsular sinus, (3) germinal centres, (4) a lymphoid nodule, (5) trabeculae.

Gleiberg · CC BY-SA 2.0 de · commons.wikimedia.org/wiki/File:Lymphknoten_(Schwein).jpg



Real slide (100x): a lymph node, its capsule over a cortex of lymphatic nodules, and the medulla.

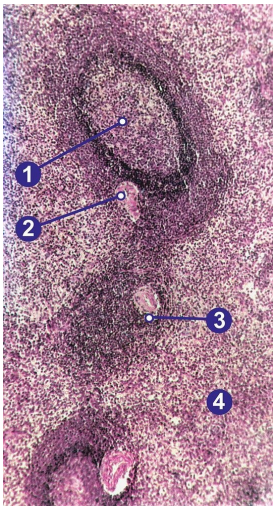
Jennifer Lange; slide: Regents of the University of Michigan Medical School · CC BY-NC-SA 4.0 · med.libretexts.org/Bookshelves/Anatomy_and_Physiology/Human_Anatomy_(Lange_et_al.)/19%3A_Lymphatic_System/19.05%3A_Anatomical_Atlas_-_Lymphatic_and_Immune_System

How to recognise it

- A capsule with a subcapsular sinus deep to it.
- Cortex with nodules (germinal centres), paracortex, and a medulla of cords and sinuses.
- A hilum where vessels leave; afferent lymphatics enter through the capsule.

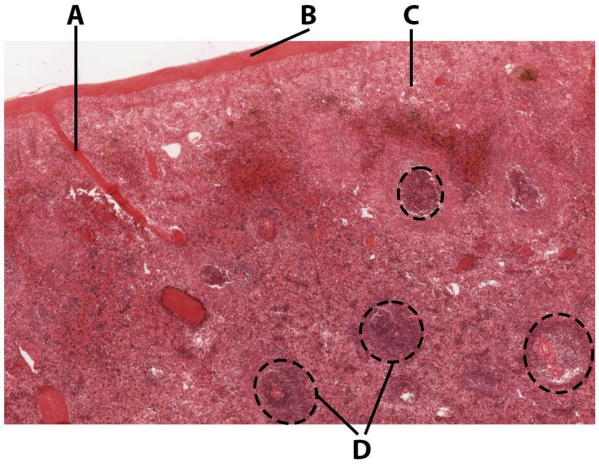
Don't confuse with: The spleen: no subcapsular sinus, no cortex and medulla, but red pulp and central arteries.

Spleen · śledziona



Human spleen (H&E): (1) a germinal centre and (3) the white pulp around (2) a central arteriole, surrounded by (4) red pulp.

Gleiberg · CC BY-SA 2.0 de · commons.wikimedia.org/wiki/File:Milz_(Mensch).jpg



Real slide (100x): the spleen under its capsule, a trabecula, red pulp, and white pulp gathered into lymphatic nodules.

Jennifer Lange; slide: Regents of the University of Michigan Medical School · CC BY-NC-SA 4.0 · med.libretexts.org/Bookshelves/Anatomy_and_Physiology/Human_Anatomy_(Lange_et_al.)/19%3A_Lymphatic_System/19.05%3A_Anatomical_Atlas_-_Lymphatic_and_Immune_System

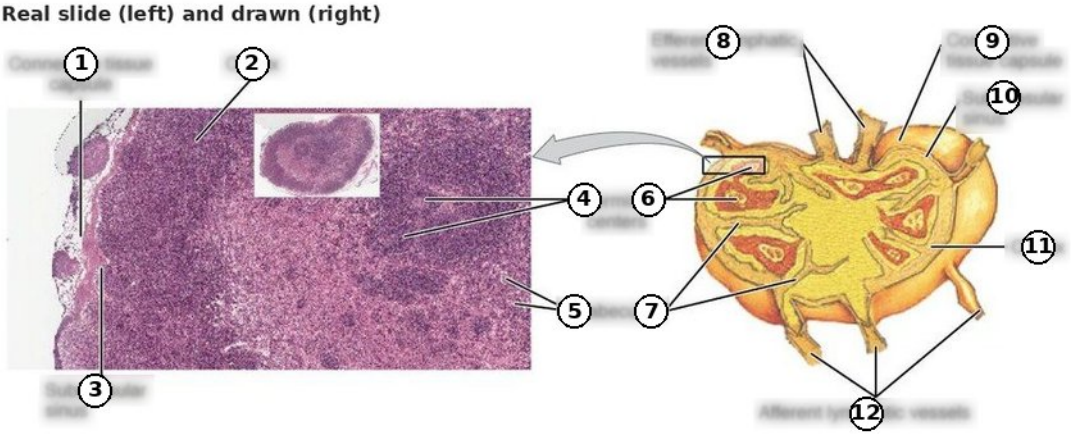
How to recognise it

- A capsule and trabeculae of dense connective tissue.
- White pulp: lymphatic sheaths and nodules, each with an off-centre central artery.
- Red pulp: blood-filled sinusoids and splenic cords fill the rest.
- No cortex/medulla and no subcapsular sinus.

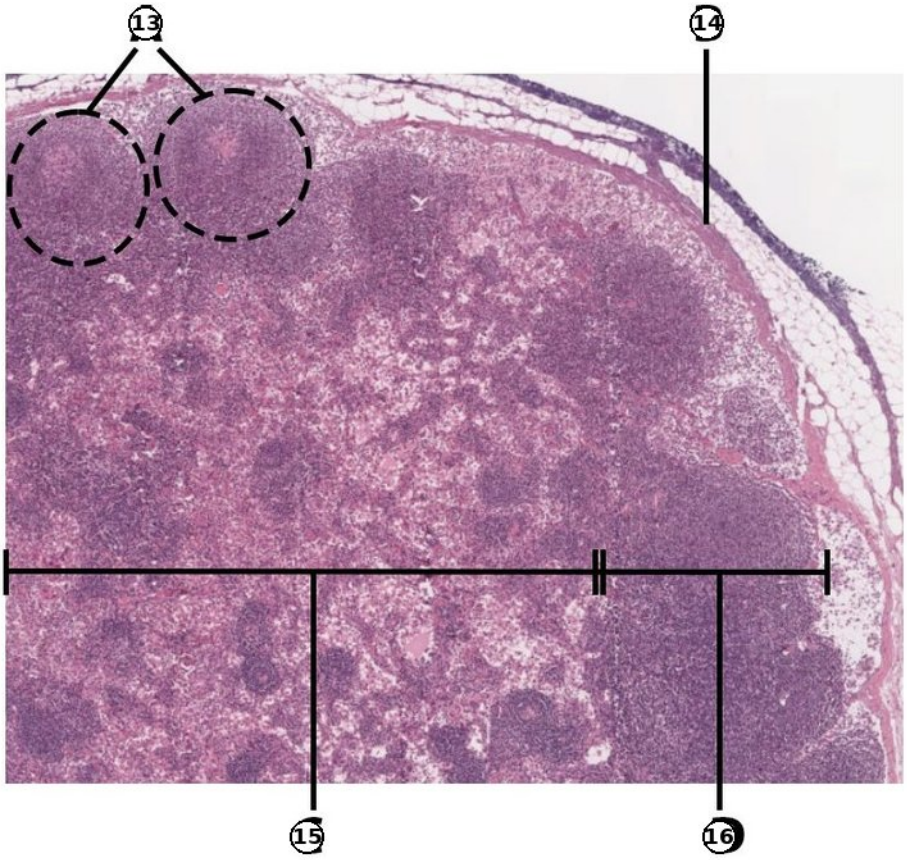
Don't confuse with: A lymph node: subcapsular sinus, cortex and medulla, no red pulp.

A lymph node, drawn and on two real slides

Real slide (left) and drawn (right)



Another real slide (light microscope)

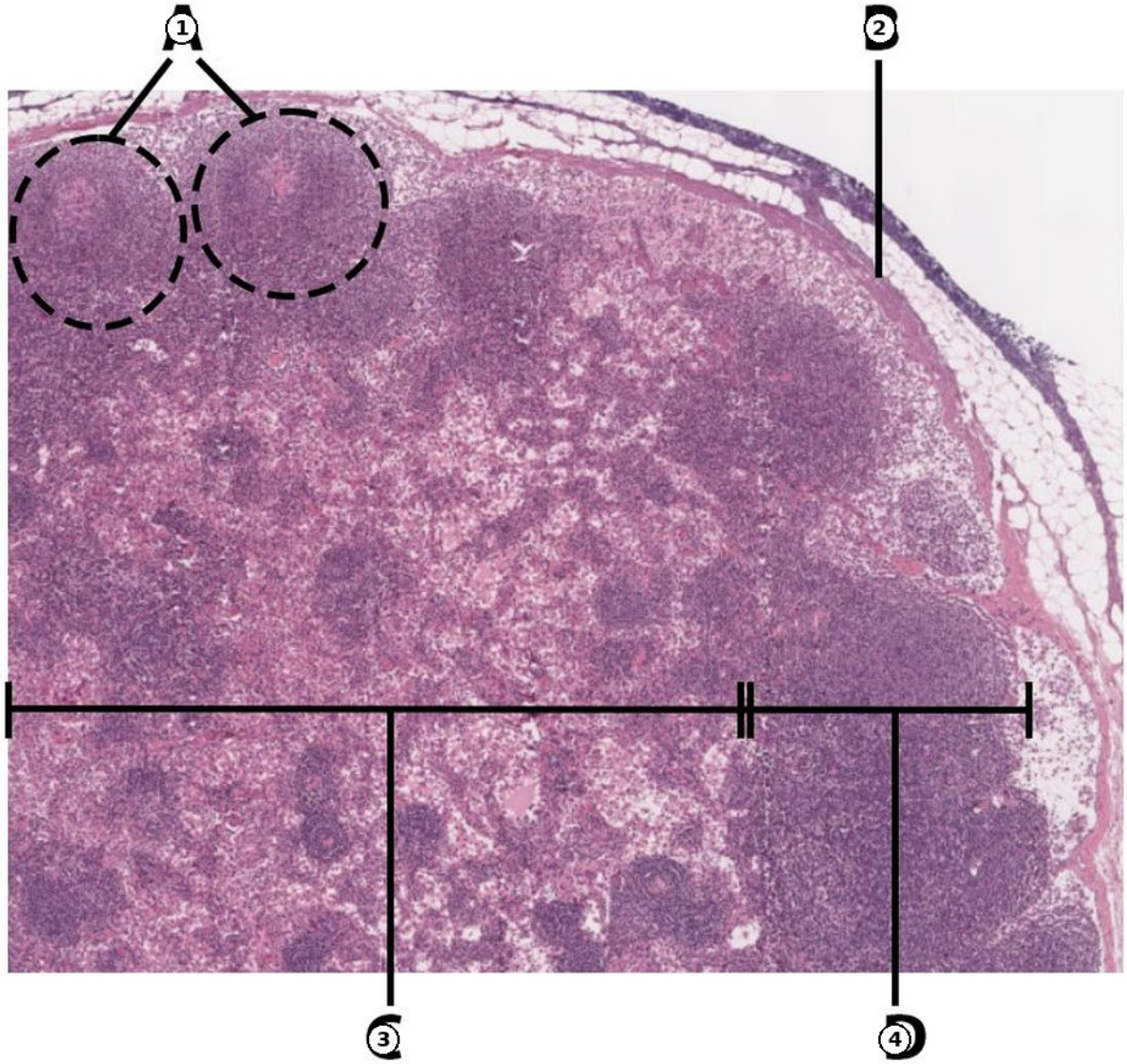


1		**2**	
3		**4**	
5		**6**	
7		**8**	
9		**10**	
11		**12**	
13		**14**	
15		**16**	

Practise online: medicine.kazimiri.com/semester-1/label/?map=subj-histology-pair-lymph-node

Credit: Real slide: OpenStax College (CC BY 3.0); Another real slide: Jennifer Lange; slide: Regents of the University of Michigan Medical School (CC BY-NC-SA 4.0); combined for this drill · CC BY-NC-SA 4.0 ·

A lymph node, on a real slide



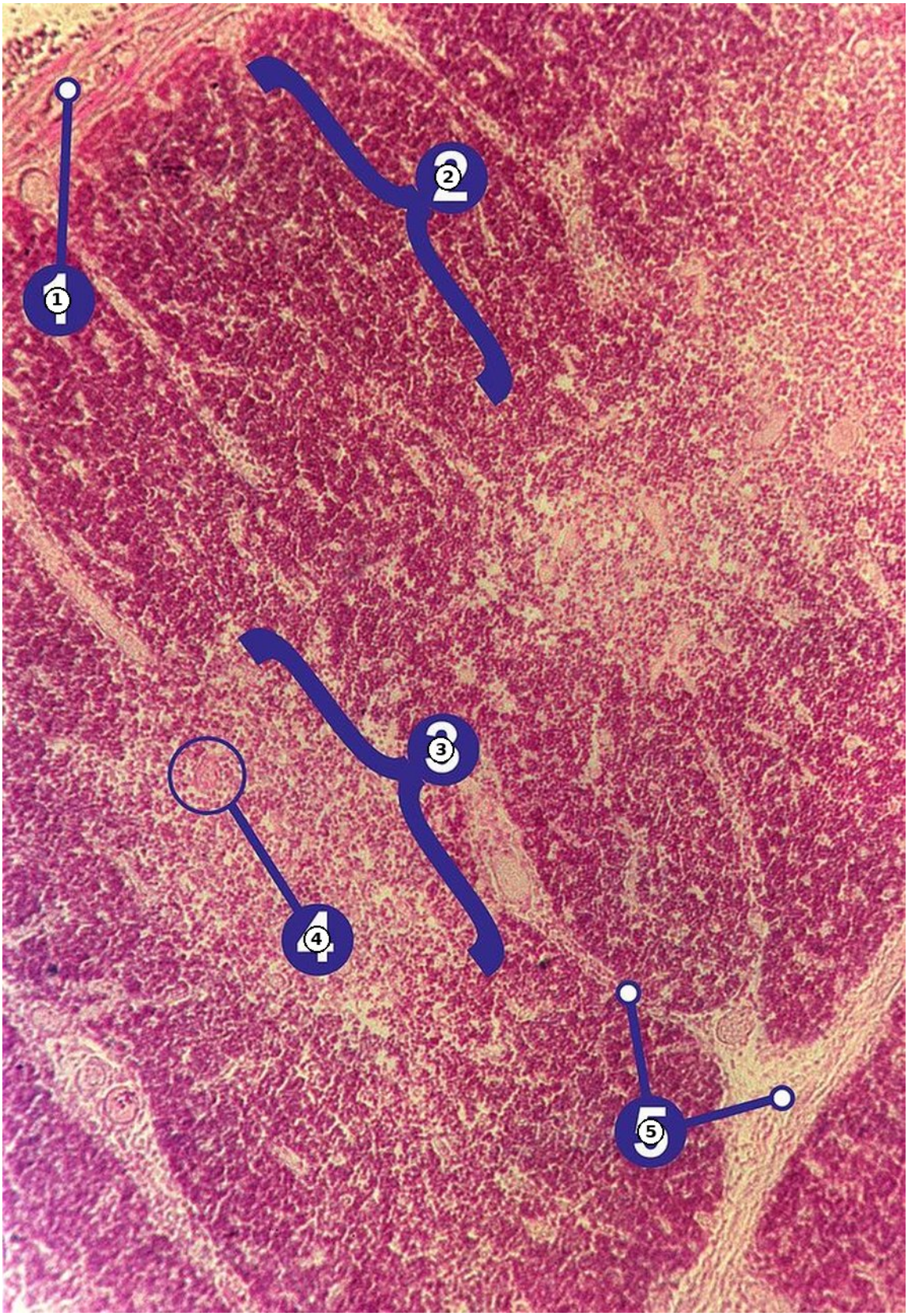
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Credit: Jennifer Lange; slide: Regents of the University of Michigan Medical School · CC BY-NC-SA 4.0 ·
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A lymphoid organ of the chest, on a real slide



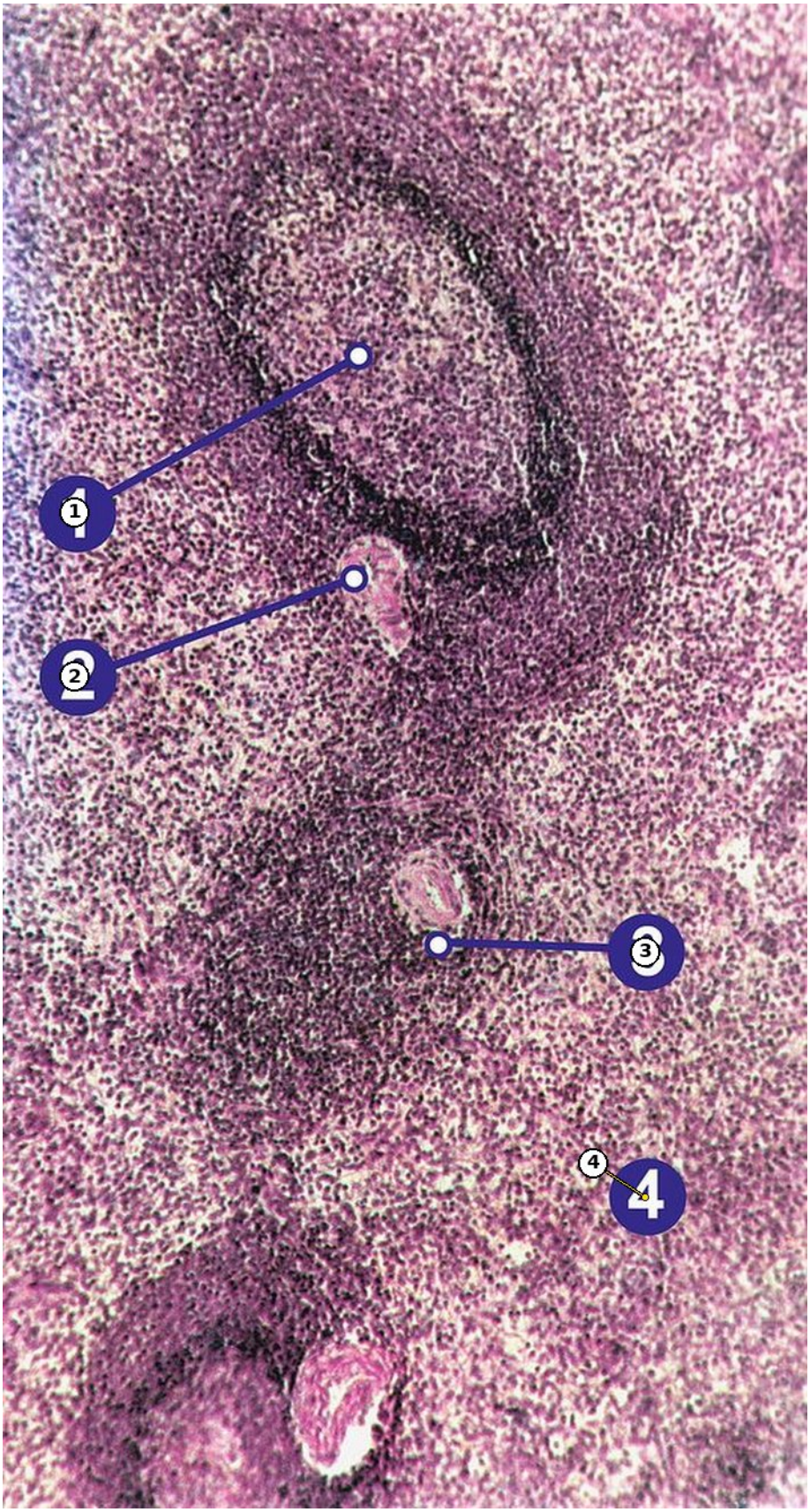
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Credit: Gleiberg · CC BY-SA 2.0 de · commons.wikimedia.org/wiki/File:Thymus_(Mensch).jpg

A lymphoid organ of the upper abdomen, on a real slide

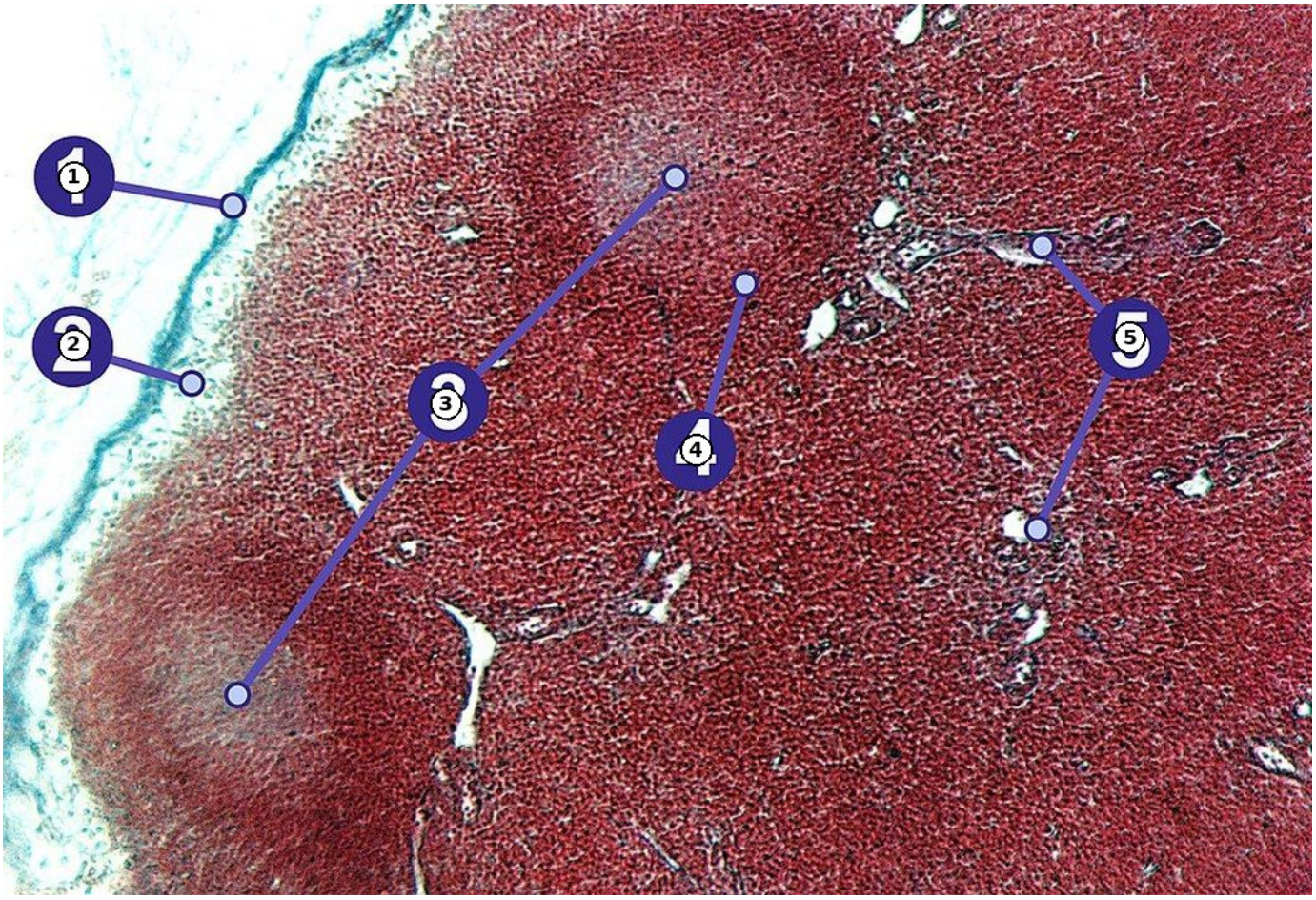


1 _____ **2** _____

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Practise online: medicine.kazimiri.com/semester-1/label/?map=subj-histology-8c55d5ba86
Credit: Gleiberg · CC BY-SA 2.0 de · commons.wikimedia.org/wiki/File:Milz_(Mensch).jpg

A small lymphoid organ, on a real slide



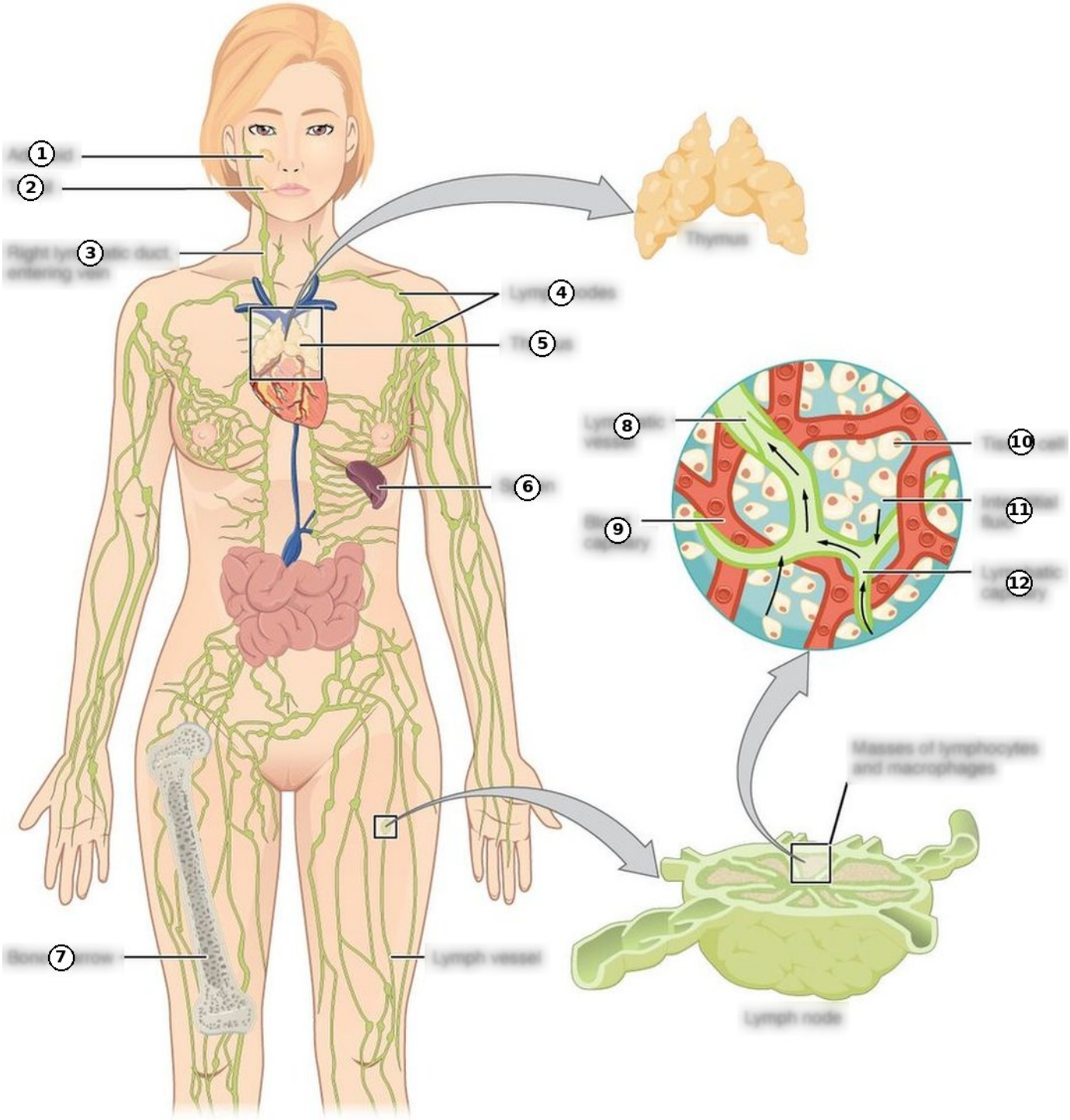
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Credit: Gleiberg · CC BY-SA 2.0 de · commons.wikimedia.org/wiki/File:Lymphknoten_(Schwein).jpg

How tissue fluid returns to the blood



1 _____ **2** _____

3 _____ **4** _____

5 _____ **6** _____

7 _____ **8** _____

9 _____ **10** _____

11 _____ **12** _____

Practise online: medicine.kazimiri.com/semester-1/label/?map=subj-histology-bfe878d891
Credit: OpenStax College · CC BY 3.0 · commons.wikimedia.org/wiki/File:2201_Anatomy_of_the_Lymphatic_System.jpg

3 · Key points

The site's key points for these classes, word for word.

Lab 8 · Lymphatic organs

Immune system and lymphoid organs

- Primary: bone marrow and thymus (T cells mature there, from the cortex to the medulla; Hassall's corpuscles lie in the medulla).
- Lymph node: cortex with B-cell follicles, T-cell paracortex, medulla; lymph enters on the convex side and leaves at the hilum.
- Spleen: white pulp (lymphoid, around central arterioles) and red pulp (cords and sinusoids that remove old red cells).
- Lymphocytes: B cells (antibodies, as plasma cells), helper T cells (CD4), cytotoxic T cells (CD8), regulatory T cells and NK cells. Dendritic cells, macrophages and B cells present antigen on MHC molecules.
- Lymphoid nodules: primary (resting) and secondary, with a pale germinal centre where B cells multiply after meeting antigen. MALT: the tonsils, Peyer's patches of the ileum, the appendix.
- In a lymph node lymph passes from afferent vessels through the subcapsular, cortical and medullary sinuses to the efferent vessel at the hilum; lymphocytes enter from the blood through high endothelial venules in the paracortex.
- The spleen filters blood, not lymph: T cells in the periarteriolar lymphoid sheath, B cells in follicles, and a marginal zone that traps antigens. Without a spleen, encapsulated bacteria are a danger.
- Thymus: lobules with a dark cortex full of developing T cells and a pale medulla, on a framework of epithelial reticular cells. It is relatively largest in infancy, grows until puberty, then involutes and fills with fat.
- Positive selection in the cortex keeps T cells that recognise self-MHC; negative selection, mostly in the medulla, removes those that react strongly to self.
- The palatine tonsil is covered by non-keratinised stratified squamous epithelium that dips into crypts, with lymphoid nodules deep to it.

4 · Using the light microscope: checklist

- ☐ Carry the microscope with both hands, one on the arm and one under the base. Lamp at minimum before switching on.
- ☐ Start with the lowest-power objective (4× or 10×) clicked into place. Slide coverslip up, label to the side, held in the mechanical stage.
- ☐ Centre the section over the light with the naked eye first.
- ☐ Watching from the side, raise the stage close to the objective with the coarse focus. Then, looking through the eyepieces, focus by moving the stage AWAY from the objective. Set the eyepiece distance for your eyes.
- ☐ Light: lamp brightness and the condenser's aperture diaphragm. Close the diaphragm for more contrast, open it for more resolution.
- ☐ Higher power: turn the nosepiece; at 40× use the fine focus only.
- ☐ Oil immersion (100×), only when the teacher allows it: a drop of oil on the coverslip, swing in the 100× objective, fine focus only. Never let the 40× objective touch the oil. Wipe oil off the lens and the slide with lens paper afterwards.
- ☐ Total magnification = objective × eyepiece (40 × 10 = 400×). The light microscope resolves about 0.2 µm.
- ☐ At the end: lowest objective in place, stage down, slide out, lamp at minimum and off, dust cover on.

5 · Self-test: 10 single-choice questions

From the site's Histology — tissues quiz (Immune system and lymphoid organs). One answer is right in each; circle it. Give yourself about a minute a question. The answers are on the last page.

1. T cells mature in the:

A spleen
B lymph node
C tonsil
D thymus

2. The white pulp of the spleen is:

A lymphoid tissue around central arteries
B blood-filled sinusoids
C the capsule
D fat

3. Lymphocytes enter a lymph node from the blood through:

A the afferent lymphatics
B high endothelial venules
C the capsule
D the efferent vessel

4. Germinal centres are where:

A T cells are selected
B red cells are destroyed
C fat is stored
D B cells multiply

5. Hassall's (thymic) corpuscles lie in the:

A cortex of a lymph node
B red pulp of the spleen
C medulla of the thymus
D crypts of the tonsil

6. The palatine tonsil is covered by:

A pseudostratified ciliated epithelium
B non-keratinised stratified squamous epithelium dipping into crypts
C simple columnar epithelium
D transitional epithelium

7. The red pulp of the spleen is made of:

A lymphoid sheaths round central arteries
B splenic cords and venous sinusoids
C a cortex and a medulla
D Hassall's corpuscles

8. Which organ filters blood rather than lymph?

A a lymph node
B a tonsil
C the spleen
D a Peyer's patch

9. The paracortex of a lymph node is rich in:

A B cells
B plasma cells
C T cells
D red cells

10. Unlike a lymph node, the normal thymus has no:

A lymphoid follicles with germinal centres
B cortex
C medulla
D epithelial reticular cells

Answers · practice figures

Figure 1 · A lymph node, drawn and on two real slides

1 Capsule
2 Cortex
3 Subcapsular sinus
4 Germinal centre
5 Trabecula
6 Germinal centre
7 Trabecula
8 Efferent lymphatic vessel
9 Capsule
10 Subcapsular sinus
11 Cortex
12 Afferent lymphatic vessel
13 Lymphatic nodule
14 Capsule
15 Medulla
16 Cortex

Figure 2 · A lymph node, on a real slide

1 Lymphatic nodule
2 Capsule
3 Medulla
4 Cortex

Figure 3 · A lymphoid organ of the chest, on a real slide

1 Capsule
2 Cortex
3 Medulla
4 Hassall corpuscle
5 Connective tissue septum

Figure 4 · A lymphoid organ of the upper abdomen, on a real slide

1 Germinal centre
2 Central arteriole
3 White pulp
4 Red pulp

Figure 5 · A small lymphoid organ, on a real slide

1 Capsule
2 Subcapsular sinus
3 Germinal centre
4 Lymphoid nodule
5 Trabecula

Figure 6 · How tissue fluid returns to the blood

1 Adenoid
2 Tonsil
3 Right lymphatic duct
4 Lymph nodes
5 Thymus
6 Spleen
7 Bone marrow
8 Lymphatic vessel
9 Blood capillary
10 Tissue cell
11 Interstitial fluid
12 Lymphatic capillary

Answers · self-test

1 D thymus — The thymus is a primary lymphoid organ.

2 A lymphoid tissue around central arteries — The red pulp filters old red cells.

3 B high endothelial venules — High endothelial venules of the paracortex let blood lymphocytes out; afferent lymphatics bring lymph and antigen-presenting cells.

4 D B cells multiply — In the germinal centres of lymphoid follicles, B cells multiply and are selected after meeting antigen; T cells are selected in the thymus.

5 C medulla of the thymus — Whorls of epithelial reticular cells in the thymic medulla: the mark of the thymus on a slide.

6 B non-keratinised stratified squamous epithelium dipping into crypts — The pharyngeal tonsil (adenoid) is the one with respiratory epithelium.

7 B splenic cords and venous sinusoids — Red cells squeeze from the cords into the sinusoids; old, stiff ones are caught and eaten.

8 C the spleen — The spleen filters blood, and its red pulp removes old red cells; lymph nodes filter lymph, and tonsils and Peyer's patches guard mucosae.

9 C T cells — T cells gather in the paracortex round high endothelial venules; B cells in the follicles; plasma cells in the medullary cords.

10 A lymphoid follicles with germinal centres — The thymus makes T cells; follicles with germinal centres are where B cells respond, in nodes, spleen and tonsils.