

Physiology

Past paper

Conduction System of the Heart

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1-If the ventricular Purkinje fibers become the pacemaker of the heart, what is the expected heart rate?

A-30/min

B-65/min

C-75/min

D-50/min

E-85/min

ANS: A

2-Which of the following structures will have the slowest rate of conduction of the cardiac action potential?

A-Atrial muscle

B-Ventricular muscle

C-Purkinje fibers

D-Atrioventricular node

E-Sinoatrial node

ANS: D

3-Intracellular calcium homeostasis in cardiac muscle cell is characterized by:

A-Na⁺/Ca⁺⁺ exchanger is found in cardiac as well as in skeletal muscle B-Mitochondrial Na⁺/Ca⁺⁺ exchanger works in pathological states

C-Na⁺/Ca⁺⁺ exchanger exchanges one sodium for one calcium ions

D-Ca⁺⁺ pump in the cardiac muscle sarcolemma is low affinity but high capacity pump

E-Ca⁺⁺ pump of the sarcoplasmic reticulum is not found in the cardiac muscle cells

ANS: B

4-Parasympathetic stimulation of the heart leads to:

A-Negative chronotropic but almost no inotropic action

B-Negative chronotropic and negative inotropic effect

C-Negative chronotropic and positive inotropic effect

D-Positive chronotropic but negative inotropic effect

E-Positive chronotropic and positive inotropic effect

ANS:D

5-The sinoatrial (SA) node and atrioventricular (AV) are autorhythmic because:

A-Their cells are rounded instead of rectangular

B-Their cells are more permeable to Na⁺ at rest

C-Their cells have a lot of voltage-gated slow Ca⁺⁺ channels

D-Their cells are non-contractile

E-Their cells are leaky to anions

ANS: B

6-A drug that increases the permeability of cardiac cells to Na⁺ and Ca⁺⁺ but decreases its permeability to K⁺ and Cl⁻ would cause:

A-Negative chronotropic and negative inotropic effect on the heart

B-No effect since the effect of Ca⁺⁺ and Na⁺ would be counterbalanced by the effect of Cl⁻ and K⁺

C-Positive chronotropic and negative inotropic effect on the heart

D-Positive inotropic and Positive chronotropic effect on the heart

E-Positive inotropic and negative chronotropic effect on the heart

ANS: D

7-The cardiac tissue with the slowed auto-rhythmicity is the:

A-Atrioventricular bundle cells

B-Sino-atrial node

C-Purkinje fibers

D-Bundle branches cell

E-Atrioventricular node

ANS:C

8-Which of the following is caused by acetylcholine?

A-Decreased permeability of the S-A node to potassium ions

B-Depolarization of the A-V node

C-Increased permeability of the cardiac muscle to calcium ions

D-Increased heart rate

E-Hyperpolarization of the S-A node

ANS: E

9-About the absolute refractory (A.R.P) period in the heart, all the following is true EXCEPT:

a. It is longer than the A.R.P of neurons.

b. It lasts approximately as long as the cardiac contraction.

c. It is due mainly to phase 2 (plateau) of the contractile cardiac muscle action potential.

- d. During it, the heart cannot be stimulated.
- e. It corresponds in time with the whole duration of the action potential.

Answer : E

10-Sympathetic stimulation cause all of the following in the heart EXCEPT:

- a. It has a positive inotropic action on the heart.
- b. It decreases the conduction time in the atrioventricular (AV) node.
- c. It decreases the permeability of sinoatrial (SA) node to K^+
- d. It decreases the slope of phase 4 of the slow response potential of the SA node.
- e. It increases the heart rate.

Answer : D

11-Sympathetic stimulation of the heart normally causes which of the following conditions?

- a. Decreased force of contraction (negative inotropic) of the atria.
- b. Decreased rate of conduction (negative dromotropic effect) of the cardiac impulse.
- c. Acetylcholine release at the sympathetic endings
- d. Negative chronotropic effect on the heart rate
- e. Increased force of contraction (positive inotropic) of the ventricles

Answer : E

12-The SA node is the pacemaker of the heart because.

- a. Leakier to K^+ than other cells
- b. It is the only cells leaky to Na^+ in the heart.
- c. Its membrane property (reach threshold faster than any other cell)

- d. Its location in the right atrium between the venae cava
- e. It is connected to autonomic nervous system.

Answer : C

13-At phase (2) of an action potential in a ventricular muscle cell which of the following is true?

- A) The chemical gradient for Ca^{++} tends to move this ion inside
- B) The electrochemical gradient for K^{+} tends to move this ion inside
- C) Na^{+} permeability greatly increases
- D) This phase is responsible for the short refractory period of cardiac action potential
- E) The chemical gradient for K^{+} tends to move this ion inside

ANSWER: A

14-Which of the following structures will have the slowest rate of conduction of the cardiac action potential?

- A) Atrial muscle
- B) Ventricular muscle
- C) Purkinje fibers
- D) Atrioventricular node
- E) Sinoatrial node

ANSWER: D

15-Slow response action potential (pacemaker potential) is characterized by?

- A) During phase 4 the transmembrane potential is closer to Ca^{++} equilibrium

- B) potential rather than to Na^+ equilibrium potential
- C) It has longer plateau phase than fast response potential of ventricular cells
- D) dV/dT (change in voltage per unit change in time)of phase 0 is much slower than ventricular cell potential phase 0
- E) Ca^{++} ions is responsible for phase 2
- F) It has more negative resting membrane potential than ventricular cell potential

ANSWER: C

16-Which of the following is NOT caused by Sympathetic stimulation:

- A) Increase in the heart rate
- B) Decrease of the permeability of the sinoatrial node to K^+
- C) Positive inotropic effect
- D) Decrease of the slope of the slow depolarization phase of the pacemaker potential
- E) Increase of the conduction of the atrioventricular phase

ANSWER: D

17-Parasympathetic stimulation of the heart leads to:

- A) Negative chronotropic but almost no inotropic action
- B) Negative chronotropic and negative inotropic effect
- C) Negative chronotropic and positive inotropic effect
- D) Positive chronotropic but negative inotropic effect
- E) Positive chronotropic and positive inotropic effect

ANSWER: A

18-A drug that increases the permeability of cardiac cells to Na^+ and Ca^{++} but decreases its permeability to K^+ and Cl^- would cause:

- A) Negative chronotropic and negative inotropic effect on the heart
- B) No effect since the effect of Ca^{++} and Na^+ would be counterbalanced by the effect of Cl^- and K^+
- C) Positive chronotropic and negative inotropic effect on the heart
- D) Positive inotropic and negative chronotropic effect on the heart

ANSWER: D

19. The cardiac tissue with the slowed auto-rhythmicity is the:

- A) Atrioventricular bundle cells
- B) Sino-atrial node
- C) Purkinje fibers
- D) Bundle branches cell
- E) Atrioventricular node

ANSWER: C

20- Which of the following are caused by acetylcholine ?

- a. Increased permeability of the cardiac muscle to calcium ions
- b. Depolarization of the atrioventricular node
- c. Decreased permeability of the sinoatrial node to potassium ions.
- d. Hyperpolarization of the sinoatrial node

e. Increased heart rate

Answer : D

21- The important function of cardiac Purkinje system is to :

- a. Increase the conduction of impulses.
- b. Has no function in conduction of the impulse.
- c. Increase the force of ventricular contraction.
- d. Amplify the cardiac impulses.
- e. Slow the conduction of impulses.

Answer : A

22- The SA node is the pacemaker of the heart because.

- a. Leakier to K^+ than other cells
- b. It is the only cells leaky to Na^+ in the heart.
- c. Its membrane property (reach threshold faster than any other cell)
- d. Its location in the right atrium between the venae cava
- e. It is connected to autonomic nervous system.

Answer : C

23- Which of the following conditions at the sinoatrial node will cause heart rate to decrease?

- a. Increased norepinephrine levels
- b. Increased calcium permeability
- c. Increased calcium sodium permeability
- d. Increased potassium permeability
- e. Decreased acetylcholine levels.

Answer : D

24- Myocardial contractility is best corrected with the intracellular concentration of :

- a. HCO_3^-
- b. Na^+
- c. Ca^{++}
- d. K^+
- e. Cl^-

Answer : C

25- Sinoatrial node cells are characterized by one of the following:

- a. Able to generate intrinsic and rhythmic impulses because their membrane potential is unstable.
- b. Unable to generate impulses when completely denervated.
- c. Innervated by the vagus (parasympathetic) only.
- d. Connected to the AV node by fine bundles of Purkinje tissue.
- e. Found in both atria.

Answer : A

THANK YOU