horter wavelengths.
- Which of the following is not a potential benefit of cryotherapy?
A) causes vasoconstriction, leading to a decrease in local circulation
B) reduces the acute inflammatory response
C) decreases local blood viscosity
D) decreases local metabolic rate and secondary hypoxic tissue damage

42- The following are adverse effects of ultraviolet radiation Except
A) Burning
B) Premature aging of skin
C) Production of vitamin D
D) Carcinogenesis

43- As an ultrasound pulse moves through tissue in a patient's body it will not undergo a change in:
A) Frequency.
B) Amplitude (energy).
C) Physical size.
D) Intensity.

44- The opening of axon membrane voltage-gated potassium channels is responsible for which part of the action potential?
A) Depolarisation of the membrane
B) Repolarisation of the membrane
C) Contraction of the post synaptic muscle fibre
D) Signalling vesicular release of neurotransmitters

45- Which of the following is not a job of the fatty sheath?
A- Insulates the neuron from neighboring cells
B- Speeds up transmission of the impulse
C- Connects two neurons together

46- A stimulus can be caused by:
A) A change in the environment
B) Sensory deprivation
C) A constant environment

47- Which of the following statements about the central nervous system (CNS) and sensory neurons is true?
A- The CNS sends impulses along sensory neurons to receptors
B- Sensory neurons carry impulses from receptors to the CNS
C- Receptors receive impulses from the sensory neurons through the CNS

48- The peripheral nervous system includes the nerves, which are neurons with cell bodies that occur in the ....
A) sympathetic nervous system
B) motor system
C) brain, spinal cord, or in ganglia
D) autonomic system

49- The "sodium-potassium pump" pumps ....
A) sodium ions out and potassium ions in
B) sodium ions in and potassium ions out
C) sodium and potassium ions in
D) sodium and potassium ions out

50- What are the main divisions of the nervous system?
A) the sensory system and the motor system
B) the peripheral nervous system and central nervous system
C) the dendritic and the axonal systems
D) the sympathetic and parasympathetic systems

The End of exam

Dr. Kamal Reyad

25- Property of thermetic substances used by thermometer to measure temperature is
A) The chemical property.
B) The physical property.
C) The resistance property.
D) Repulsion property.

26- Transfer of thermal energy by means of currents in fluids is termed as
A) Conduction.
B) Convection.
C) Radiation.
C) Convection and radiation.

27- Maximum kinetic energy of photoelectron is .... Intensity of incident radiation
A) directly proportional to
B) inversely proportional to
C) independent of
D) directly proportional to square root of

28- Which of the following statement is incorrect
A) Photoelectric emission does not occur below the threshold frequency
B) The photoelectric current increases with the frequency of incident light
C) Threshold frequency does not depend on the metal used
D) The emission of photoelectrons is an instantaneous process

29- A medical assistant should include which of the following in preparing a patient for cryosurgery?
A) place a grounding pad somewhere on the patient's body
B) ask the patient to put on safety goggles
C) inform the patient that the initial sensation of cold will be followed by a burning sensation
D) position the patient for the administration of a general anesthetic

30- The lowest rate of ultrasound absorption occurs in:
A) Fat.
B) Air.
C) Bone.
D) Lung.

31- The photoelectric current depends upon
A) the frequency of incident photon only
B) the intensity and the frequency of incident radiation
C) the intensity of incident radiation only
D) the temperature of cathode

32- Photoelectric cells are used to convert
A) light energy into sound energy
B) electrical energy into light energy
C) light energy into electrical energy
D) light energy into heat energy

33- What is largely responsible for the negative resting membrane potential (around -70 mV) in a neuron?
A) Axonal insulation by Schwann cells.
B) Voltage-gated sodium channels opening.
C) The action potential.
D) Potassium leak currents.

34- This is the job of the nervous system:
A) To send messages to and from the brain and spinal cord to and from the body.
B) To break down food to be used by the body.
C) To remove wastes from the body.
D) All the above answers.
E) non of the above

35- Electrical impulses gather and accumulate in which part of a neuron, in order to initiate an action potential?
A) Dendrites
B) Axon hillock
C) Axon terminal branches
D) Node of Ranvier

36- When the frequency of the incident light is less than the threshold frequency
A) a little photoelectric current is produced
B) a large photoelectric current is produced
C) no photoelectric current is produced
D) the velocity of the photoelectrons is large

37- In a photon-electron collision, one photon can eject two or more electrons
A) True
B) False

38- Which of following statements related to waves is/are incorrect?
A) It provides a mechanism for transfer of energy from one point to another without transfer of material.
B) All waves have same speed i.e. equal to 3×10^8 m/s.
C) The source of any wave is vibration or oscillation.
D) All of above.

39- The following is a deep heating modality
A) Infrared radiation.
B) Shortwave Diathermy
C) Hotpacks
D) Fango

40- Changing from a 2 MHz to a 5 MHz ultrasound transducer would generally produce:
A) Faster imaging.
B) Deeper penetration.

reflection.   B) refraction.
) diffraction.   D) superposition.
12- Waves that travel in a direction parallel to direction of vibration are known as
A) Transverse waves.   B) Longitudinal waves.
C) Water waves.   D) Electromagnetic waves.
13- ECGs are frequently ordered through computerized systems.

A) True   B) False

14- Regarding the electroencephalogram (EEG)

A) The normal EEG of an awake person is dominated by alpha waves

B) The EEG can be used to monitor the health of the brain

C) During deep sleep the EEG is always dominated by delta waves

D) The presence of theta waves in the EEG of an awake child is indicative of cerebral pathology.

15- Which is not a deep heat therapy
A) Short wave diathermy   B) Ultrasound therapy
C) Infrared therapy   D) Microwave therapy
16- Freezing point of ethyl alcohol is 156 K, which is equal to

$\frac{c}{100} = \frac{273 - 156}{180}$

A) 426°C.   B) 117°C

C) -426°C   D) -117°C

17- Incident ray, reflected ray and normal lie at same point' is a true statement of refraction.

A) Right.   B) Wrong.
C) May be right or may be wrong.   D) Neither right nor wrong.
18- Thermocouple thermometer is
A) less responsive.
B) very responsive.
C) least responsive thermometer.
D) unresponsive thermometer.
19- Steam point is equal to 100 °C, which is equal to
A) −373 K.   B) −173 K.
C) 373 K   C) 173 K
20- Regarding the regulation of body temperature:

A) As the skin possesses thermoreceptors, its temperature is regulated more closely than the core

temperature.

B) During water immersion, heat is mainly lost via radiation

C) The thalamus is the centre for integrating thermal information.

D) In a temperate climate under normal conditions, the greatest loss of body heat occurs through

radiation.

21- The maximum Kinetic Energy of photoelectrons increases with increase in frequency. It is
independent of intensity
A) True   B) False

22- The number of photoelectrons emitted per second (rate of photoelectrons emission) from a given
metal is directly proportional to intensity. It is independent of frequency
A) True   B) False

23- Maximum kinetic energy of photoelectron is …………….. Frequency of incident radiation
A) directly proportional to   B) inversely proportional to
C) independent of   D) directly proportional to square root of
24- Instrument used to measure temperature is termed as
A) Barometer.   B) Thermometer.
B) Manometer.   C) Galvanometer.

Kafrelsheikh University
Faculty of Science
Physics Department
Second level (Physics)
First Term 2017/2018

Time: 2h
Subject: Biophysics
Total Marks: 100 (70 Written, 10 Oral, 20 Exercises)
Date: 1/1/2018
Exam in 4 pages.

Answer all the following questions: (70 Marks)

Choose one answer per question:

1- Which of the following statements about the ECG are not true?
A) The P wave of the ECG reflects atrial contraction
B) The P-Q interval is normally about 0.1 s.
C) The QRS complex reflects the start of ventricular depolarization.
D) The T-wave reflects the repolarization of the ventricular fibres.

2- Which of the following statements concerning the action potentials of nerve cells is correct?

A) They result from a large increase in the membrane permeability to sodium ions

B) They can summate one with another

C) They may vary considerably in amplitude

D) They become larger as stimulus strength increases

3- Which of the following statements concerning the velocity of action potential propagation is correct?

A) Is independent of an axon's diameter

B) Depends on the thickness of the myelin around the axon

C) Will be unaffected if the axon becomes demyelinated

D) Is fastest in unmyelinated axons

4- Which of the following statements concerning the neuromuscular junction is correct?

A) The muscle membrane possesses muscarinic receptors

B) The motor nerve endings secrete acetylcholine

C) Curare leads to prolongation of neuromuscular transmission

D) The motor nerve endings secrete noradrenaline (norepinephrine).

5- Light can travel in
A) air only.
B) vacuum only.
C) both air and vacuum.
C) none of mediums.

6- Bend of light rays or image in denser medium is termed as
A) Reflection.
B) Opacation.
C) Refraction.
D) Transpiration.

7- Which of the following is poor conductor to heating?
A) Connective tissues.
B) Blood.
C) Muscles.
D) Fatty cells.

8- It is the treatment by using low temperature applied either locally or generally
A) Hydrotherapy
B) Electrotherapy
C) Manualtherapy
D) Cryotherapy

9- An ECG can only be performed with a physician's order to do so.
A) True
B) False

10- Clinical equipment that contains wires and cords in the same room with you and the patient will not affect the ECG tracing.
A) True
B) False

11- Spreading of wave as it passes through a gap or around an edge is called

Name.. Academic No. ....

Answer the following questions:

Q1: a- Define and verify Kirchhoff's law.　　　　(10 marks)

b- Define: Clousuis's theory, entropy, Carnot principle, Thermal conductivity, 1st law and 2nd law of thermodynamics.

(10 marks)

Q2: a- Deduce the equation of state for an ideal gas at adiabatic process.

(15 marks)

b- Verify Dalton's law using the postulates of the kinetic theory of gases-
Show that the enthalpy is a state function .　　　(15 marks)

Q3: a- Calculate the change in the entropy when 5 gm of ice in $0\ ^0C$ becomes water in $50\ ^0C$. Does the entropy increase or decrease in this process? (Latent heat for melting =80 cal /gm, $C_P = 1\,cal/gm.^0C$).　　(10 marks)

b- A Carnot engine work between 400 and 200 ^0C reservoirs: calculate the quantity of heat rejected to low reservoir.　　　(10 marks)

❀　——End——　❀

BEST OF LUCK: Prof. Dr. M. R. Eraky & Dr. M. Saad

20. According to the first law of thermodynamics, applied to a gas, the increase in the internal energy during any process equal to the:

a. heat input minus the work done on the gas
b. heat input plus the work done on the gas
c. work done on the gas minus the heat input
d. is independent of the heat input

21. The same energy Q enters four different substances as heat; Which substance has the greatest specific heat if the temperature of.
a. 4 g of substance A increases by 4 K
b. 3 g of substance B increases by 10 K
c. 6 g of substance C increases by 15 K
d. 8 g of substance D increases by 6 K

22. What is the change in entropy when 50.g of ice melts at 0°C?[lattent heat of fusion = 333 kJ/kg

23. Assuming that $\Delta H°$ and $\Delta S°$ are independent of temperature. What is $\Delta G°$ at 500K.
$$4NH_3(g) + 3 O_2 (g) \rightarrow 2 N_2(g) + 6 H_2O(g)$$

	$\Delta H°$	$\Delta G°$	$S°$	C_p
$NH_3(g)$	+ 294.1	+ 328.1	239	99
$O_2(g)$	0	0	205	29
$N_2(g)$	0	0	192	29
$H_2O(g)$	- 241.8	- 228.6	189	33

Terms and short answers

24. A system that can exchange neither matter nor energy with its surroundings is called -----

25. Which of the following statements is **FALSE**?
a) ΔS must be +ve to be spontaneous.
b) ΔG always +ve for nonspontaneous.
c) If ΔS -Ve; ΔH must be -Ve for a spontaneous.
d) ΔG is always -Ve for spontaneous processes.

26. Process that releases heat into surroundings is called

27. Law of work of isothermal compression of an ideal gas can be calculated by ----------

28. What is the internal energy ?

29. Work needed to raise a mass m through a height h on the surface of the Earth is given by equation

30. Indicate which one of the following reactions result in a positive ΔS_{sys}.
a. $AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$
b. $H_2O (g) + CO_2 (g) \rightarrow H_2CO_3 (aq)$
c. $H_2(g) + I_2(g) \rightarrow 2 HI(g)$
d. $C_2H_2O_2(g) \rightarrow 2 CO(g) + H_2(g)$

31. Which of the following must be true for a spontaneous exothermic process?
a.only that $\Delta S_{sys} < 0$
b.only that $\Delta S_{sys} > 0$
c.both $\Delta S_{sys} < 0$ and $\Delta S_{sys} < \Delta S_{surr}$
d.either $\Delta S_{sys} > 0$, or else $\Delta S_{sys} < 0$ but $\Delta S_{sys} < \Delta S_{surr}$

32. Any reaction will be spontaneous if _____
a. $\Delta G_{sys} > 0$ b. $\Delta G_{sys} < 0$
c. $\Delta S_{sys} > 0$ d. $\Delta S_{sys} < 0$

33. Which statements about equilibrium are true?
I. $\Delta G_{sys} = 0$ II. $\Delta S_{sys} = 0$ III. $\Delta S_{universe} = 0$
a. I only
b. II only
c. III only
d. Both I and III

34. A reaction with a low enthalpy of reaction value is not spontaneous at low temperature but becomes spontaneous at high temperature. What are the signs for $\Delta H°$ and $\Delta S°$, respectively?
a. +, −
b. −, −
c. −, +
d. +, +

35. Identify the **INCORRECT** statement below:
a) In spontaneous changes the universe tends toward a state of greater disorder.
b) ΔG of a system at constant T and P in any spontaneous process increases.
c) Entropy of a pure crystal at T = 0 K is zero.
d) ΔS_{sys} can decrease in a spontaneous process, if S_{surr} is increasing even more.

True - False Question

1. For an adiabatic process, ΔS_{svs} can never decrease.
   - (A) True   (B) False

2. Any process that spontaneously causes a decrease in the entropy of the system must be must be exothermic.
   - (A) True   (B) False

3. For an isothermal compression of an ideal gas $\Delta G > 0$.
   - (A) True   (B) False

Multiple Choice Questions

4. In a generator, kinetic energy is transformed into:
   - (A) Motion   (B) Potential energy
   - (C) Electricity   (D) Solar power

5. Heat absorbed during a transition from liquid to gas is latent heat of:
   - (A) fusion   (B) vaporization
   - (C) sublimation   (D) specific heat

6. For ideal gases, the internal energy is a function of:
   - (A) the volume   (B) the pressure
   - (C) the temperature   (D) all the above

7. A reaction with a $\Delta G° = -30$ kJ/mol has:
   - (A) $K = 0$ (B) $K < 1$
   - (C) -Ve K   (D) $K > 1$

8. When a gas expands adiabatically.
   - (A) ΔE decreases.   (B) ΔE increases.
   - (C) no work done.   (D) heat flows out.

9. A certain gas is compressed adiabatically. The amount of work done on the gas is 800 J. What is the change in the internal energy of the gas?
   - (A) 800 J   (B) - 800 J
   - (C) 400 J   (D) 0 J

10. What occurs when $\Delta E = 0$, so that the first law of thermodynamics takes the form of $Q = W$?
    - (A) isochoric process   (B) isothermal process
    - (C) adiabatic process   (D) isolated system
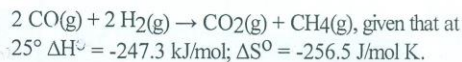
Long Answer Question

11. A process **CANNOT** be spontaneous if it is
    - a) the entropy of the universe increases.
    - b) endothermic, and a decrease in disorder.
    - c) endothermic, and an increase in disorder.
    - d) exothermic, and an increase in disorder.

12. There are two properties of a reacting system that determine whether a process at constant pressure and temperature can occur spontaneously. These are:
    - a) kinetic and potential energy change
    - b) heat and work
    - c) energy change and enthalpy change
    - d) enthalpy change and entropy change

13. Identify the **INCORRECT** statement below:
    - a) The symbol H refers to the enthalpy, or "heat content" of the system.
    - b) The ΔH of a reaction tells one the heat liberated or absorbed under constant pressure reaction conditions.
    - c) The internal energy change of a system equals the heat absorbed minus the work done by the system.
    - d) The second law states that ΔS of a system increases in any spontaneous process.

14. Determine $\Delta G°$ at 25° for the reaction in kJ/mol

    $2\ CO(g) + 2\ H_2(g) \rightarrow CO_2(g) + CH_4(g)$, given that at 25° $\Delta H° = -247.3$ kJ/mol; $\Delta S° = -256.5$ J/mol K.

15. At 25°C $\Delta H = 128.9$ kJ and $\Delta G = 33.5$ kJ for a reaction. Above what minimum temperature will this reaction become spontaneous?

16. What is the change in (ΔE) of the system if 36 kJ of heat energy is absorbed by the system and 84 kJ of work is done by the system for a certain process?

17. If two objects are in thermal equilibrium:
    - a. they cannot be moving
    - b. they cannot be undergoing collision
    - c. they cannot have different pressures
    - d. they cannot have different temperatures

18. The latent heat of fusion of H_2O is 333 kJ/kg. This means that 333 kJ of heat energy are required to:
    - a. raise the temperature of 1kg of water by 1K
    - b. turn 1 kg of water to steam
    - c. raise the temperature of 1 kg of ice by 1 K
    - d. melt 1 kg of ice

19. A Carnot engine has an efficiency of 83.0% and performs 4500 J of work every cycle. How much energy is discharged?

Answer the following questions:

Q1: a- Define the simple harmonic motion and illustrate the displacement, the velocity and the acceleration as a function of the time. **(10 marks)**

b- Deduce the deferential equation for free LC circuit and damped LC circuit. **(15 marks)**

Q2: Show that the total energy for free harmonic mechanical motion is constant or conservative in time and position, verify that truth for physical pendulum along one period of motion. **(25 marks)**

Q3: A system of simple pendulum with length equal 1 m move with a weak damped motion .

Calculate the logarithmic damping coefficient δ , if the energy of the system reduced to 95% of its initial value after 10 min . **(20 marks)**

⊛ ——End ——— ⊛

BEST OF LUCK: Prof. Dr. M. R. Eraky & Prof. Dr. K. R. Mahmoud

Answer Sheet

Question no.	Answer	Question no.	Answer
1		26	
2		27	
3		28	
4		29	
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