

Nepal Engineering Council Registration Examination
Model Question for Biomedical Engineering (ABmE)

Section A (60*1 = 60)

1. Agglutination reaction is more sensitive than precipitation for the detection of
 - a) Antigens
 - b) Antibodies
 - c) Complement
 - d) Antigen-Antibody complexes

2. Haemopoiesis is a process of the production of
 - a) Blood plasma
 - b) Erythrocytes
 - c) Bone marrow
 - d) Haemoglobin

3. The corpus callosum is a
 - a) Source of hypothalamic hormones
 - b) Neural pathway that connects the right and left hemispheres
 - c) Part of the neocortex
 - d) Structure in the cerebellum

4. Which is true of the pulmonary circuit?
 - a) Blood oxygen content is higher in the pulmonary vein than in the pulmonary artery
 - b) Blood is pumped through it by the left ventricle
 - c) Resting blood pressure in the pulmonary artery is normally equal to that in the aorta
 - d) The cardiac output into the pulmonary circuit is approximately 1/6 of that into the systemic circuit

5. When substances move from the tubule into the surrounding afferent arteriole, this is known as
 - a) Re-absorption
 - b) Tubular secretion
 - c) Filtration
 - d) Excretion

6. The greatest source of elasticity in human skeletal muscle tissue is attributed to
 - a) The parallel elastic component
 - b) The series elastic component
 - c) The continuous elastic component
 - d) The active elastic component

7. Any material that once placed in the human body has minimal interaction with its surrounding tissue is called as
 - a) Membrane Lamination
 - b) Polysaccharides

- c) Bioinert Materials
 - d) Biomaterials
8. Collagen is best described as a
 - a) Helical structural protein
 - b) Coiled-coil found in hair
 - c) Cross-linked globular protein
 - d) Triple-helical fibrous protein
 9.is to obtain a smooth surface that stimulates natural tooth surface.
 - a) Condensation
 - b) Sintering
 - c) Glazing
 - d) Degassing
 10. The incorporation of which of the following peptide sequences, during surface modification, has been shown to specifically increase the attachment of neural cells?
 - a) REDV
 - b) KRSR and Osteopontin-1
 - c) VIPGIG and MEPE
 - d) YIGSR and IKVAV
 11. In which of the technique enzyme and polymer are bridged by the use of bi-functional reagent?
 - a) Covalent cross-linking
 - b) Adsorption
 - c) Physical Entrapment
 - d) Microencapsulation
 12. Von Willebrand factor is synthesized by ECs and secreted into sub endothelial matrix, where it is bound by.....
 - a) Collagen I, III, IV, VI.
 - b) Heparin I, III, IV, VI.
 - c) Collagen I, III, IV, V.
 - d) Collagen I, II, III, V.
 13. Which of the following is not an ideal indication for a bioprosthetic valve (compared to a mechanical prosthetic valve)?
 - a) Female planning pregnancy
 - b) Young adult male
 - c) Elderly female
 - d) History of endocarditis
 14. What is the disadvantage of ceramic bearings in THR?
 - a) Increased Wear
 - b) Lower Modulus of Elasticity

- c) More corrosion
 - d) High Cost
15. Which is a complication associated particularly with a urethral catheter?
 - a) More likely to cause urinary tract infections and bladder stones
 - b) Difficult to site the catheter for overweight people
 - c) The catheter site may produce a discharge
 - d) Mechanical irritation to the urethra provokes an intense, acute, and chronic inflammatory tissue response
 16. Which of the following is a limitation of using autologous fat as a biomaterial in plastic surgery?
 - a) It is expensive
 - b) It is difficult to obtain in sufficient quantities
 - c) It is prone to resorption and volume loss over time
 - d) It is associated with a high risk of infection
 17. What is the region enclosed by the optical cavity called in a LASER machine?
 - a) Optical region
 - b) Optical system
 - c) Optical resonator
 - d) Optical box
 18. Which one of the following statements best defines tissue engineering?
 - a) It is the replacement of tissues using techniques developed from a combination of biology and engineering principles.
 - b) It is the growth of tissue components in vitro that can be used to regenerate diseased or damaged tissue.
 - c) It is the implantation of scaffolds for the in situ repair of diseased or damaged tissue.
 - d) It is a form of bioactive fixation
 19. Which of the following is a characteristic of the photons produced by the bremsstrahlung method?
 - a) They have a single discrete energy level
 - b) They have a continuous range of energy levels
 - c) They have a negative charge
 - d) They are absorbed by atoms in the target material
 20. Which of the following is NOT true regarding dose in CT imaging?
 - a) Reducing slice thickness reduces patient dose.
 - b) Noise reduction often leads to an increased patient dose.
 - c) An obese patient requires an increased dose to produce an image with an acceptable noise level.
 - d) Good quality control is necessary to ensure the patient dose is as low as possible.
 21. Increasing the magnetic field
 - a) Produces less susceptibility artifacts.
 - b) Reduces the risk of tissue heating.
 - c) Increase the signal to noise.

- d) Reduces the danger from metallic projectiles.
22. Arrange from fastest to slowest according to penetration of ultrasound.
- a) Lung, fat, soft tissue, liver, blood, muscle, tendons, bone
 - b) Bone, tendons, muscles, blood, liver, fat, soft tissue, lung
 - c) Bone, tendons, muscles, blood, liver, soft tissue, fat, lung
 - d) Bone, Muscles, tendons, blood, liver, soft tissue, fat, lung
23. What color laser is typically used to stimulate the imaging plate in computed radiography?
- a) Red
 - b) Blue-green
 - c) Yellow
 - d) Infrared
24. The branch of radiology in which a chemical or compound containing a radioactive isotope is Called?
- a) Nuclear medicine imaging
 - b) Ultrasound
 - c) X-Ray
 - d) None
25. Montages refers to
- a) A pattern of electrodes on the head and the channels they are connected to
 - b) Asymmetrical electrodes placed on the forehead
 - c) Symmetrical electrodes placed on cheeks
 - d) The mathematical formula used to calculate EEG voltage differences
26. What is the purpose of an ambulatory monitoring system in healthcare?
- a) To monitor patients in critical care units
 - b) To monitor patient vital signs during surgeries
 - c) To monitor patients who are able to walk and move around
 - d) To monitor patients who are under anesthesia
27. What components are typically included in a wireless biotelemetry system?
- a) Sensors, transmitters, a radio antenna, and a receiver
 - b) Sensors, transmitters, a wire connection, and a receiver
 - c) Sensors, transmitters, a camera, and a receiver
 - d) Sensors, transmitters, a satellite dish, and a receiver
28. Which of the following instrument is most commonly used for measurement of blood flow?
- a) NMR Blood Flowmeter
 - b) Ultrasonic Blood Flowmeter
 - c) Electromagnetic Blood Flowmeter
 - d) Laser Doppler Blood Flowmeter

29. Modern day calorimeters and spectrophotometry instruments use light source.
- Tungsten-halogen lamp
 - Xenon-mercury lamp
 - Deuterium discharge lamp
 - Mercury arc
30. Which threshold of hearing is measured by a pure-tone audiometer?
- air-conduction thresholds of hearing
 - bone-conduction thresholds of hearing
 - speech reception thresholds for diagnostic purposes
 - air-conduction and bone-conduction thresholds of hearing
31. Which wave from ECG waveforms becomes widened when the self-triggering impulse does not arrive through the AV node?
- P wave
 - ST wave
 - QRS wave
 - T wave
32. What precaution is used in diathermy?
- Patient is made to lie on a soft pillow
 - Pads are used for grounding and completing the circuit
 - Patient is made to drink a large number of fluids
 - Wooden blocks are used for grounding
33. The types of therapeutic diathermy machines that exist are
- Short wave, microwave, and ultrasound
 - Cold compress, ultrasound, LASER
 - Electrical impulse, microwave, and ultrasound
 - Cold compress, microwave, and electrical impulse
34. Hemodialysis machine works on the principle of
- Diffusion and ultrafiltration
 - Osmosis and ultrafiltration
 - Reverse osmosis and ultrafiltration
 - Diffusion and osmosis
35. The type of ventilation that enables the patient to breathe on his or her own, at his or her respiratory rate, and with his or her depth between ventilator breaths is
- Mandatory Ventilation
 - Assist Control Mode
 - Pressure Control Mode
 - Synchronous Intermittent Mandatory Ventilation
36. Which is the “Can’t Let Go” range of current flow?
- 3-9 mA
 - 25-60 mA
 - 9-25 mA
 - 1-3 mA

37. The ($I_d - V_{gs}$) characteristics of a MOSFET in the saturation region is
- a) Exponential
 - b) Quadratic
 - c) Logarithmic
 - d) Hyperbolic
38. In a differentiator circuit, a capacitor is placed in
- a) Feedback loop
 - b) Input
 - c) Output
 - d) Feedback and input
39. In a three phase AC circuit, the sum of all three generated voltages is
- a) Infinite (∞)
 - b) Zero (0)
 - c) One (1)
 - d) One third ($1/3$)
40. Peak reverse voltage of bridge rectifier for input signal of peak value V_m is
- a) $2V_m$
 - b) $\frac{1}{2} V_m$
 - c) V_m
 - d) $4V_m$
41. A sudden increase in the total current into a parallel circuit may indicate
- a) A drop-in source voltage
 - b) An open resistor
 - c) An increase in source voltage
 - d) Either a drop in source voltage or an open resistor
42. A good voltage regulation of a transformer means
- a) Output voltage fluctuation from no load to full load is least
 - b) Output voltage fluctuation with power factor is least
 - c) Difference between primary and secondary voltage is least
 - d) Difference between primary and secondary voltage is maximum
43. For multi-input XNOR gate, the output is Logic High when the total number of Logic High in the inputs signals is
- a) Infinity
 - b) Zero
 - c) Odd
 - d) Even
44. A full binary subtractor has _____ input lines and _____ output lines
- a) 2, 2
 - b) 3, 3
 - c) 2, 1
 - d) 3, 2

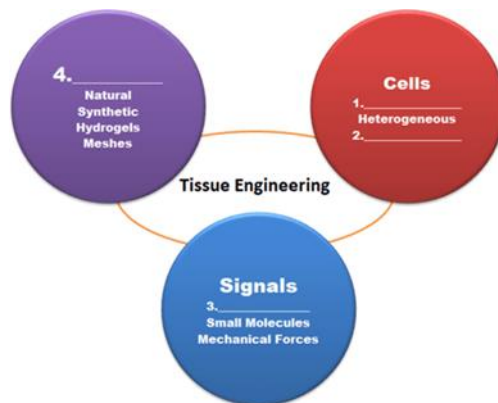
45. A 10-bit SISO mode needs clock pulses to load an 10-bit number into a register.
- 8
 - 10
 - 8
 - 2
46. Which of the following statement is true regarding PAL (Programmable Array Logic)
- Once a PAL has been programmed it cannot be reprogrammed.
 - Its outputs are only active HIGHS
 - Its outputs are only active LOWs
 - Its logic capacity is lost
47. The BCD number 1010111 has priority.
- Even
 - Odd
 - Both even and odd
 - Undefined
48. The centre frequency of a bandpass filter is always equal to
- The bandwidth
 - Geometric average of the cut-off frequencies
 - Bandwidth divided by Q
 - 3-dB frequency
49. Laplace transform of a step function shown below is
- 1
 - $1/s^2$
 - 0
 - $1/s$
50. A block of mass 10 kg is attached to a spring of stiffness 360 N/m. A velocity of 6 m/s is given to the mass when the spring is in unstretched condition. The block will come to rest after moving a distance of
- 0.5 m
 - 1.25 m
 - 0.75 m
 - 1.0 m
51. For a type-I system, the intersection of the initial slope of the bode plot with 0 dB axis gives
- Steady-state error
 - Error constant
 - Phase margin
 - Cross-over frequency
52. Role of the transmitter in the communication system is to
- Decode a signal to be transmitted
 - Convert one form of energy into other
 - Detect and amplify information signal from the carrier
 - Produce radio waves to transmit data

53. Carrier swing is defined as
- a) Total variation in frequency from the lowest to the highest point
 - b) Frequency deviation above or below the carrier frequency
 - c) Width of the sideband
 - d) None of the above
54. A single tone 4 kHz message signal is sampled with 9 kHz, 7 kHz and 5 kHz. The aliasing effect will be seen in the reconstructed signal when the signal is sampled with
- a) 9 kHz
 - b) any of 9 kHz, 7 kHz, or 5 kHz
 - c) Both 9 kHz and 7 kHz
 - d) Both 7 kHz and 5 kHz
55. Standard dimensions (mm x mm) of A3 drawing sheet is
- a) 11.69×16.54
 - b) 29.7×42
 - c) 297×420
 - d) 420×280
56. Which of the following methods of charging depreciation of an asset has increased amount of depreciation as the age of asset increases
- a) Sum-of-year digit
 - b) Sinking fund
 - c) Diminishing balance
 - d) Straight line
57. The process of optimizing the project's limited resources without extending the project duration is known as
- a) Project crashing
 - b) Resource levelling
 - c) Resource smoothing
 - d) Networking
58. The process of composing/raising the required fund from different sources such as equity, preferred stock, bond and debenture is known as
- a) Capital structure planning
 - b) Project financing
 - c) Capital budgeting decision
 - d) Deducing earning per share
59. In which of the following society, people used to seek their existence on growing plants for their cattle and domestic animals
- a) Pastoral society
 - b) Tribal society
 - c) Horticultural society
 - d) Agricultural society

60. According to Nepal Engineering Council Act, 2055 (Revised, 2079), all engineering academic institutions shall be in the Council.
- Affiliated
 - United
 - Recognized
 - Associated

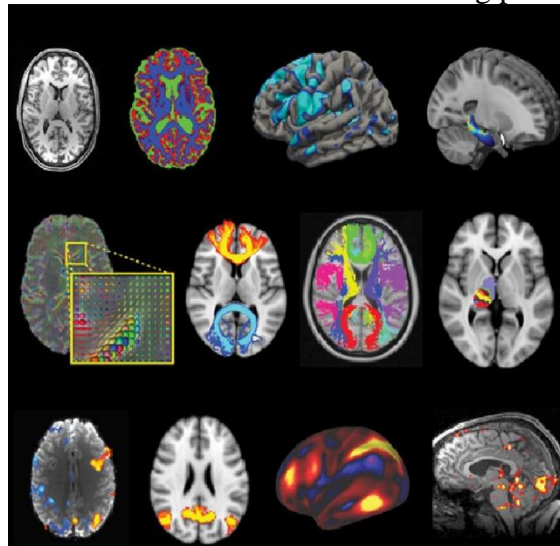
Section-B (20*2 = 40)

61. In the motor end plate, all the following are TRUE EXCEPT
- The acetylcholine receptors are similar to those in smooth muscle.
 - Lack of Ca diminishes the release of acetylcholine.
 - There is a high concentration of the cholinesterase enzyme.
 - There is a delay of neuromuscular transmission of 0.5 millisecond
62. Which of the following statements describe endothelial cells the most accurately?
- Flat, polygonal, elongated in the direction of blood flow
 - Irregular, prone to overlap with other endothelial cells
 - Cuboidal, regular, with radial symmetry
 - Flat, with long processes
63. A patient is scheduled to have a chronic abscess incised and drained. What would you expect a microscopic examination of the contents of the abscess to most likely show?
- Lymphocytes and macrophages
 - Any area of coagulative necrosis
 - Neutrophils, lymphocytes, & plasma cells
 - An acute inflammatory infiltrate of PMNs
64. Which of the following is the appropriate option?



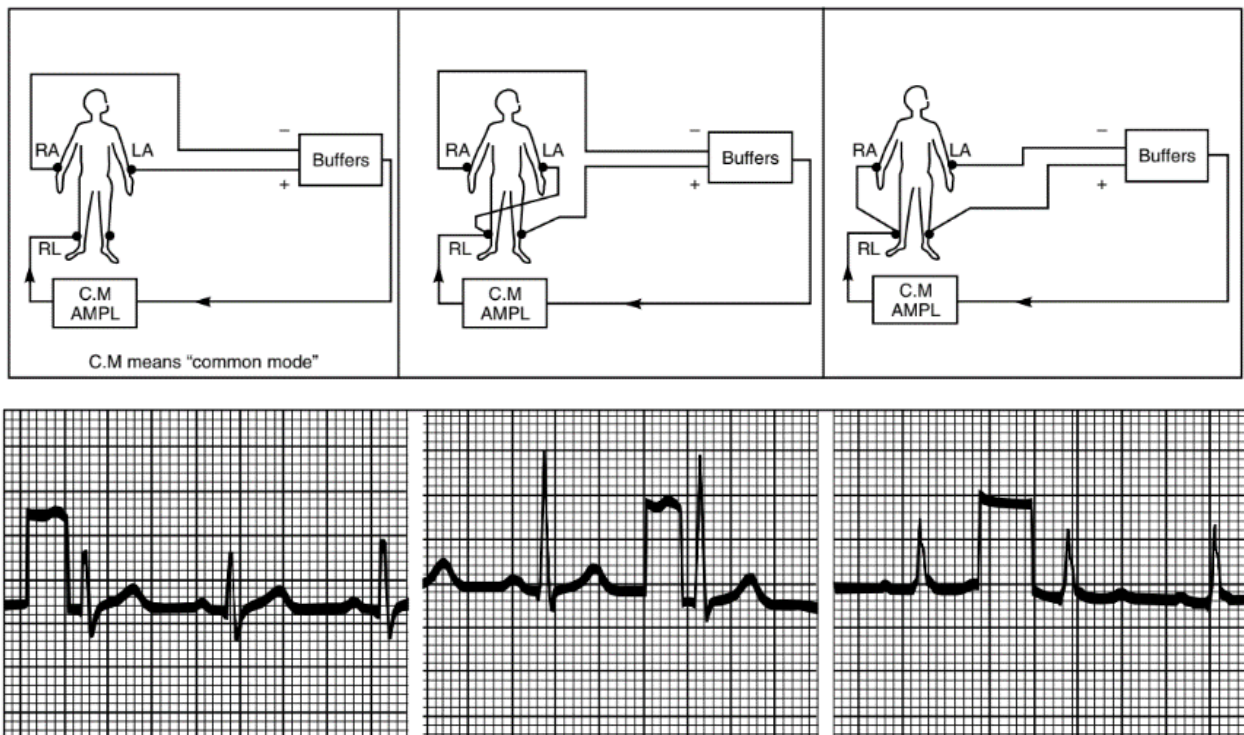
1. Differentiated Stem Cells; 2. Biomaterials; 3. Growth Factors; 4. Autologous
 1. Autologous; 2. Differentiated Stem Cells; 3. Biomaterials; 4. Growth Factors
 1. Autologous; 2. Differentiated Stem Cells; 3. Growth Factors; 4. Biomaterials
 1. Autologous; 2. Growth Factors; 3. Differentiated Stem Cells; 1. Autologous
65. What is the role of stem cells with regard to the function of adult tissues and organs?

- a) Stem cells are undifferentiated cells that divide asymmetrically, giving rise to one daughter that remains a stem cell and one daughter that will differentiate to replace damaged and worn-out cells in the adult tissue or organ.
- b) Stem cells are embryonic cells that persist in the adult, and can give rise to all of the cell types in the body.
- c) Stem cells are determined cells that reside in fully differentiated tissues and can, when needed, differentiate to supply new cells for the growth of the tissue.
- d) Stem cells are differentiated cells that have yet to express the genes and proteins characteristic of their differentiated state, and do so when needed for repair of tissues and organs.
66. What is the difference between a pacemaker and the total artificial heart (TAH)?
- a) A pacemaker is smaller in size and completely embedded in the body as compared to TAH in which some system lies outside the body
- b) A pacemaker replaces only the ventricles but a TAH replaces the whole heart
- c) A pacemaker is an assistive device which helps the original heart to generate impulses but a TAH completely replaces the heart
- d) A pacemaker is made out of organic polymers while the TAH is metallic
67. A 20-year-old man visits his doctor, worried about his worsening diarrhea, abdominal pain and blood in his stool. The doctor wonders if he may have an inflammatory bowel disease. Which kind of diagnostic imaging technology should the doctor use first to test his theory?
- a) Ultrasound of his abdomen
- b) Positron Emission Tomography (PET) scan of his abdominal area
- c) MRI three-dimensional reconstruction of his colon
- d) Colonoscopy
68. What type of imaging modalities are shown in the following picture?



- a) T1, DTI, FLAIR
- b) T1, DTI, fMRI
- c) T1, FLAIR, fMRI
- d) FLAIR, DTI, fMRI

69. Which of the following statement is true?
- Impedance pneumography is an indirect technique of measurement which measures rate through relation between respiratory depth and thoracic impedance change
 - Impedance pneumography is a direct technique of measurement which measures rate through difference in temperature between inspired and expired air
 - Thermistor method is an indirect technique of measurement which measures rate through difference in temperature between inspired and expired air
 - Thermistor method is a direct technique of measurement which measures rate through relation between respiratory depth and thoracic impedance change
70. Which type of lead in the figure below along with its waveform denotes?



- Unipolar limb leads
 - Polar limb leads
 - Augmented chest leads
 - Bipolar limb leads
71. The proper placement of an AED (automated external defibrillator) is:
- One pad on upper right side of the chest, and the other on lower left side of the chest.
 - One pad on lower right side of the chest, and the other on upper left side of the chest.
 - One pad on lower right side of the chest, and the other on lower left side of the chest.
 - One pad on upper right side of the chest, and the other on upper left side of the chest.
72. Which statement is true?
- With positive-pressure ventilation (PPV), the transpulmonary pressure is increased by making the alveolar pressure more positive; in contrast, with negative-pressure ventilation (NPV), the transpulmonary pressure is increased by making the pleural pressure more negative
 - With positive-pressure ventilation (PPV), the transpulmonary pressure is decreased by making the alveolar pressure more negative; in contrast, with negative-pressure

ventilation (NPV), the transpulmonary pressure is increased by making the pleural pressure more negative

c) With positive-pressure ventilation (PPV), the transpulmonary pressure is increased by making the alveolar pressure more positive; in contrast, with negative-pressure ventilation (NPV), the transpulmonary pressure is decreased by making the pleural pressure more positive

d) With positive-pressure ventilation (PPV), the transpulmonary pressure is increased by making the alveolar pressure more negative; in contrast, with negative-pressure ventilation (NPV), the transpulmonary pressure is increased by making the pleural pressure more positive

73. A Norton circuit with 10 A current source and 15 Ω resistance is connected across a resistance of 5 Ω . The current in 5 Ω resistance will be
- a) 5 A
 - b) 2.5 A
 - c) 7.5 A
 - d) 10 A
- ans) c
74. In a non-inverting op-amp based amplifier, $R_f = 10K$ and $R_1 = 1K$. If V_{in} is sine wave with 10 mv amplitude and 100 Hz frequency. The output wave form will be
- a) -100 mv, 100 Hz
 - b) -100mv, 200 Hz
 - c) 110 mv, 100 Hz
 - d) 110mv, 200 Hz
75. How many 3×8 line decoders with an enable input line are needed to construct a 6×64 line decoder without using any other logic gate?
- a) 7
 - b) 8
 - c) 9
 - d) 0
- ans) c
76. Which of the following Boolean algebraic expressions is incorrect?
- a) $A + A'B = A + B$
 - b) $A + AB = B$
 - c) $(A+B)(A+C) = A + BC$
 - d) $(A + B')(A+B) = A$
77. Find the function $f(t)$ for the following function $F(s)$: $F(s) = 1 / [s(s+1)(s+5)]$
- a) $0.25e^{-t} + 0.05e^{-5t}$
 - b) $-0.2 - 0.25e^{-t} + 0.05e^{-5t}$
 - c) $-0.2 + 0.25e^{-t} + 0.05e^{-5t}$
 - d) $0.25e^{-5t} + 0.05e^{-t}$

78. What will be the bandwidth occupied by a DSB signal when the modulating frequency lies in the range from 100 Hz to 10KHz.
- a) 28 KHz
 - b) 24.5 KHz
 - c) 38.6 KHz
 - d) 19.8 KHz

79. Effective monthly interest rate will be, if nominal interest rate of 10% accounted for continuous compounding
- a) 1%
 - b) 0.84%
 - c) 1.2%
 - d) 2%

80. By considering following activities of a project, the project duration will be

Activity	A	B	C	D	E
Immediate predecessors	-	-	-	C	A, B, D
Duration (days)	4	5	3	7	5

- a) 9 days
- b) 10 days
- c) 15 days
- d) 24 days