STEM
Careers Project

STEM Careers Project is a joint venture of the Higher Education Commission and Pakistan Atomic Energy Commission, for grooming talented students for careers in Science, Technology; Engineering & Mathematics (STEM).

Screening TEST: Biology
NSTC-22, June 28, 2025

Maximum Marks: 100 Maximum Time: 3 hours

Check List: Before attempting this question paper please make sure that:

i) Paper contains 8 pages including this page and no page is torn or missing ☐
ii) Part I consists of 20 multiple choice questions, Part II contain 50 multiple choice questions and Part III contains descriptive questions ☐
iii) Answer Sheet for MCQs of Part-I & II, and Part III is to be solved on the question paper to be returned back. ☐

1. Part I has 5 multiple-choice questions (MCQs) from each of the subjects of Biology, Computer, Chemistry, Mathematics and Physics. There is a choice between Biology or Computer only, rest of the three subjects are compulsory for every candidate. For Biology or Computer one must blacken the corresponding circle in the answer sheet.
2. Part I has 20 MCQs and carries 20 marks. The MCQ portion of the relevant subject of Part II carries 50 Marks. Correct answer carries +1 mark; 1/3 mark will be deducted for each incorrect answer.
3. In Part I and Part II, there are four choices (a, b, c, d) corresponding to each multiple-choice question. Blacken one of these choices, which in your opinion is correct. Rough work may be done on the question paper.
4. The descriptive question(s) of Part III should be solved on the question paper to be returned back. This part carries 30 Marks.
5. You are recommended to give frank opinion about the test, including pointing out possible mistakes on the last page of the Answer Booklet. It is meant to motivate you to carefully read the question paper before attempting. It may be used to discriminate between candidates having similar scores.
6. Recommended time for Part I is about 30 minutes and for Parts II and III is about one hour each. The rest of the time is for carefully reading the paper and commenting on it.
7. No leaf from the question paper or Answer Booklet is to be torn out as all these must be handed over to the examiner, even if no question has been attempted. Anyone found using unfair means would be disqualified.
8. You may use non-programmable calculators.
9. No questions will be entertained and no clarification will be made during the test. In case of doubt, please write down your remarks/comments on the last page of the Answer Booklet.
10. You must attempt all Parts of the paper. To qualify screening test one should pass both Parts I and the portion of Parts II and III that are relevant to the discipline in which you have applied to appear.
11. The term 'estimate' if used in the descriptive portion of Part III means that only an approximate answer is expected from the students. Similarly the term 'sketch' in Part III means drawing a rough graph, which looks like what you might expect from more careful considerations.
12. **Possession of CELL PHONE or any IMAGING DEVICE in the Examination Hall will be treated as an offence under unfair mean rules.**
13. Please put your pen down as soon as you hear the announcement of 'stop writing'.

Students will be short-listed for a one-week Training Camp on the basis of their performance on this Screening Test. Results will be posted on NSTC web page: www.stem.edu.pk. Successful candidates will also be informed about their result in about two months after the exam. Please make sure that we have your correct phone/fax number and e-mail address.

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Name:_____ Roll No:_____

PART-I

[CANDIDATE MUST ATTEMPT THIS PART]

[It contains 20 MCQs, 5 from each biology/computer, chemistry, mathematics and physics, for selection to the next phase]

Choose either Biology or Computer and must blacken the correct option in the answer sheet.

BIOLOGY

1. Which gas is filled in an electric bulb?
   a) Argon b) Helium c) Nitrogen d) All of these
2. Cancer is disease of:
   a) Simple cell division b) Uncontrolled cell division c) Controlled cell division d) Accelerated cell division
3. Which of the following is a list of entirely abiotic factors?
   a) Soil, temperature, viral infection, pH of soil, predators b) viral infection, predators, competition for resources c) Sunlight, soil pH, number of species, Plant canopy d) Temperature, soil pH, oxygen, light
4. Malaria is an infectious disease caused by a single-celled eukaryotic organism, carried by female mosquitoes. The mosquito is the:
   a) Pathogen b) Vector c) Agent d) Virus
5. Cellular digestion is associated with which organelle?
   a) Lysosomes b) Mitochondria c) Golgi bodies d) Plastids

OR

COMPUTER

1. When _____ is encountered inside any loop, control automatically passes to the first statement after loop.
   a) Continue b) Goto c) Return d) Break
2. The speed of the laser printer is measured in.
   a) Lines per minute b) Page per minutes c) Characters per sound d) Word per minutes
3. Which unit in the CPU is responsible for fetching instructions from memory?
   a) ALU (Arithmetic Logic Unit) b) Register c) Cache Memory d) Control Unit
4. When a collection of various computers appears as a single coherent system to its clients, what is this called?
   a) mail system b) distributed system c) networking system d) computer network
5. In a hierarchical database model, data is organized in a:
   a) Tree-like structure b) Mesh structure c) Circular structure d) Linear structure

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CHEMISTRY

6. A mole of any substance is related to
   a) Number of particles b) Volume of gaseous substance c) Mass of a substance d) All of these
7. A drop of liquid acquires a spherical shape because of
   a) its tendency to maximize its surface area b) its tendency to acquire minimum surface area
   c) its viscous nature d) none of these
8. Some people add sodium chloride to water while boiling eggs. This is to
   a) decrease the boiling point of water b) increase the boiling point of water
   c) prevent breaking of eggs d) make egg tasty
9. A variety of water which contains soluble salts of Ca and Mg is known as
   a) Soft water b) Heavy water (c) Conductivity water d) Hard water
10. Milk is a colloid in which
   a) Liquid is dispersed in liquid b) Gas is dispersed in liquid c) Sugar is dispersed in water d) Solid is dispersed in liquid

MATHEMATICS

11. If $x + 1/x = 3$, then the value of $x^2 + 1/x^2$ is:
   a) 5 b) 7 c) 9 d) 3
12. Find the degree of the polynomial $5x^4y^2 + 3xy^5 + 7$?
   a) 4 b) 6 c) 7 d) 5
13. Number of real roots of $x^2 + 4x + 5 = 0$ is:
   a) 2 b) 0 c) 1 d) infinite
14. If $x^2 - 6x + 9 = 0$, the $x =$
   a) 0 b) 3 c) 9 d) ± 3
15. The set of all points, in a plane equidistant from a fixed point $A = (x, y)$, forms a
   a) Line b) Circle c) Sphere d) None of these

PHYSICS

16. A 1,200-kilogram car traveling at 10 meters per second hits a tree and is brought to rest in 0.10 second. What is the magnitude of the average force acting on the car to bring it to rest?
   a) 1.2×10^2 N b) 1.2×10^4 N c) 1.2×10^3 N d) 1.2×10^5 N
17. A spring scale reads 20 newtons as it pulls a 5.0-kilogram mass across a table. What is the magnitude of the force exerted by the mass on the spring scale?
   a) 49 N b) 20 N c) 5 N d) 4 N
18. When a neutral metal sphere is charged by contact with a positively charged glass rod, the sphere
   a) loses electrons b) gains electrons c) loses protons d) gains protons
19. A motor is used to produce 4.0 waves each second in a string. What is the frequency of the waves?
   a) 0.25 Hz, b) 25 Hz, c) 15 Hz, d) 4 Hz
20. One watt is equivalent to one
   a) N•m b) N/m c) J•s d) J/s

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PART II – BIOLOGY

21	The process in which the homologous chromosomes line up with each other and form a pair is called						
(a)	Synapsis	(b)	bivalent	(c)	Chiasmata	(d)	Crossing over
22	Round shape of red blood cell (RBC) facilitates the:						
(a)	Transmission of nerve impulse	(b)	Water transport	(c)	Food intake	(d)	Globular hemoglobin
23	Which one is an organic compound?						
(a)	CO_2	(b)	Water	(c)	Lipids	(d)	HCl
24	Which chemical component has the greatest contribution in the total mammalian cell weight?						
(a)	Water	(b)	Carbohydrate	(c)	Proteins	(d)	Lipids
25	Which organ is made up of air-carrying tubes and tiny sacs?						
(a)	The brain	(b)	The diaphragm	(c)	The lungs	(d)	The stomach
26	What is the shape of the rings present in trachea?						
(a)	C-shaped cartilaginous	(b)	U-shaped fibrous	(c)	B-shaped cartilaginous	(d)	D-shaped fibrous
27	The main cause of lung cancer include:						
(a)	Water contamination	(b)	Bacterial infection	(c)	Un-sterilized syringe	(d)	carcinogens
28	Which character differentiates living things from non-living organisms?						
(a)	They live in the same ecosystem	(b)	They are acted upon by the same environment	(c)	They are highly organized, complex multicellular, contain genetic material	(d)	Both a and b
29	Epiglottis is:						
(a)	A flap that covers trachea	(b)	A tissue that guards glottis	(c)	A tissue which guards pharynx	(d)	A membrane that separates larynx
30	Cartilage and bones are---------- tissues.						
(a)	Ground	(b)	Supporting	(c)	Connective	(d)	Socket
31	Cellular respiration is----------reaction:						
(a)	Physical	(b)	Oxidation-reduction	(c)	reduction	(d)	oxidation
32	Waste material of keekar plant is:						
(a)	gum	(b)	resins	(c)	bark	(d)	latex
33	The kidney works to:						
(a)	Remove water and CO_2	(b)	Maintain body temperature	(c)	Remove waste	(d)	Filter excess water, salts and urea
34	The process in which animals take oxygen from environment and give out air for getting rid of CO_2 is called?						
(a)	Cellular respiration	(b)	metabolism	(c)	exhalation	(d)	breathing
35	Gaseous exchange in leaf occurs through						
(a)	Lenticles	(b)	Stomata	(c)	epidermis	(d)	cuticle
36	Which one is a micromolecule?						
(a)	Protein	(b)	Polysaccharide	(c)	Nucleic acid	(d)	nucleotide
37	The nasal cavity opens into the:						
(a)	Oral cavity	(b)	Larynx	(c)	nasopharynx	(d)	lungs
38	In animals, coordination is achieved by means of						
(a)	Respiratory system	(b)	Nervous system	(c)	Endocrine system	(d)	Both B and C

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39	Erythrocytes transport----------?						
(a)	Nerve impulse	(b)	food	(c)	water	(d)	oxygen
40	Ground tissues are simple tissues made up of----------cells						
(a)	Parenchyma	(b)	Collenchyma	(c)	Sclerenchyma	(d)	All of these
41	Which blood vessel contain valves?						
(a)	arteries	(b)	veins	(c)	capillaries	(d)	arteriolos
42	After the production of ATP in light reaction, the hydrogen ions of water is used for:						
(a)	Reduction of NADP	(b)	oxidation of NADP	(c)	Reduction of FAD	(d)	Oxidation of FAD
43	Kidney failure is treated by:						
(a)	Bypass surgery	(b)	lithotripsy	(c)	dialysis	(d)	injection
44	Which is NOT present in the filtrate entering the Bowman's capsule of nephron?						
(a)	Urea	(b)	glucose	(c)	Proteins	(d)	water
45	The trees which shed leaves annually remove ----------from their body.						
(a)	Nutrients	(b)	Oil and bark	(c)	Harmless metabolites	(d)	Excretory products
46	----------is responsible for chemical co-ordination.						
(a)	Central nervous system	(b)	Endocrine system	(c)	Autonomous nervous system	(d)	Peripheral nervous system
47	Cells involved in photosynthesis and respiration during day are:						
(a)	Epidermal cells	(b)	Pericycle cells	(c)	Mesophyll cells	(d)	Cortical cells
48	Which of the following movement is involuntary?						
(a)	Jumping	(b)	Heart beat	(c)	Walking	(d)	thinking
49	Contraction of atria pushes the blood toward ventricles, this is called.....						
(a)	atria systole	(b)	ventrica diastole	(c)	atria diastole	(d)	ventrica systole
50	----------is the functional unit of environment.						
(a)	Genus	(b)	Ecosystem	(c)	Community	(d)	Biome
51	The alternate form of a gene is called:						
(a)	Allele	(b)	Sister chromosome	(c)	Replicate	(d)	Genovar
52	Expired drugs can cause damage to:						
(a)	Brain	(b)	Kidney	(c)	Heart	(d)	Stomach
53	The blood vessels are not present in ----------?						
(a)	Dermis	(b)	Epidermis	(c)	endodermis	(d)	mesodermis
54	The study of external structural characterization is called:						
(a)	Cytology	(b)	Anatomy	(c)	Histology	(d)	Morphology
55	Peritoneum contains:						
(a)	Somatic and visceral afferent nerves	(b)	Celiac, superior and inferior mesenteric vessels	(c)	Stomach, liver, pancreas	(d)	All of these
56	The study of internal structural characterization is called:						
(a)	Cytology	(b)	Anatomy	(c)	Histology	(d)	Morphology
57	Sucker fish attaches to the surface of sharks by?						
(a)	Sucker	(b)	flagella	(c)	Fins	(d)	Pseudopodia
58	Tricuspid valve is located between----------						
(a)	left atrium and left ventricle	(b)	right atrium and left atrium	(c)	right ventricle and left ventricle	(d)	right atrium and right ventricle
59	The most rapidly dwindling resource in the world is _____						
(a)	Air	(b)	Water	(c)	Forests	(d)	Sunlight
60	The thin layer of fat cells in the dermis:						
(a)	Maintain temp.	(b)	Insulates the body	(c)	Provide protection	(d)	Reduce sweating

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61	Approximate weight of a human kidney is-------grams						
(a)	10-20	(b)	50-100	(c)	100-120	(d)	120-150
62	The organ responsible for blood filtering?						
(a)	Intestine	(b)	Lungs	(c)	Pancreas	(d)	Kidney
63	During day, O_2 is produced in the mesophyll cells as a:						
(a)	By product	(b)	waste	(c)	Toxic product	(d)	End product
64	The metabolic wastes removed in sweat are:						
(a)	Few nitrogen compounds	(b)	Urea, salts and water	(c)	Excessive water	(d)	Salts
65	Flowers of wind pollination produce?						
(a)	Allergens	(b)	No color or nectar	(c)	Pollen grains	(d)	All of these
66	Seedless fruit plants are propagated by:						
(a)	grafting	(b)	cloning	(c)	cutting	(d)	Binary fission
67	Hypotonic solution:						
(a)	High solute conc.	(b)	No water	(c)	Less solvent conc.	(d)	Less solute conc.
68	What do seminal vesicles add to the semen?						
(a)	Proteins	(b)	Sugar Fructose	(c)	Sperm	(d)	Both a and b
69	During exercise or hard work the breathing rate may increase upto----------times per minute.						
(a)	40-50	(b)	10-15	(c)	50-60	(d)	20-30
70	Elastic cartilage is found in:						
(a)	trachea	(b)	Pinna, epiglottis	(c)	spine	(d)	Hip joint

Part III: Biology-Descriptive Questions
[30 Marks]

Instructions:

- Attempt any FIVE questions. The questions carry 6 marks each.
- Only five questions will be marked, so do not attempt extra questions.
- Answer the questions to the point. Do not write irrelevant details.
- Plz read solved examples for better understanding.

Solved example:

Question 0: You want to get high yield of potato. One fertilizers "Brand-A" in market claims to produce high potato yield than a generic "Brand-B" fertilizer. How will you test the claim of "Brand-A"?

Answer: Treat potato seeds the same way in two plots by sowing in similar soil, water and climate condition. One group will be applied with "Brand-A" fertilizer while other with "Brand-B". At the end of the growing season, harvest the potato and compare the yields of both groups by counting the total number of potatoes and weighing the total yield in each group.

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Question No 1: Plant movement occurs when plant organs change their spatial distribution after being exposed to stimuli, and may be caused either by differential growth or by differential turgor change among cells within the organs. Using the above information, please state whether the following are true or false. Mark your answer (T/F) in the table below.

(A) The gravitropic movement of corn roots

(B) The closure of soybean leaflets during night time

(C) The tendrils of cucumber moving along the trellis

(D) The phototropic movement of mung bean seedlings

(E) The downward bending of the tomato leaves after flooding treatment

A	B	C	D	E	F

Question No 2: In animals, gas exchange, the process of taking in oxygen and releasing carbon dioxide, occurs through specialized organs or body surfaces. These include lungs, gills, tracheae, and in some cases, the skin. Lungs are used by terrestrial animals like mammals and birds, gills are used by aquatic animals like fish, and tracheae are used by insects. Some animals, like flatworms, use their body surface for gas exchange. Which of the following statements is correct concerning gas exchange organs in animals? Mark your answer (√) in the table below.

A. In starfish, the gill plays a role in gas exchange, but the tube feet do not play a role in that process.

B. In grasshoppers, well-developed muscles surrounding the tracheae control movement of air inward and outward through an external opening.

C. In fish, blood flows through the gill-filament capillaries in the same direction as that of water exiting from the mouth and pharynx to the outside.

D. In birds, during exhalation both air sacs deflate, forcing air to the outside, whereas the lung is filled with air.

A	B	C	D

Question No 3: Penicillin is an antibiotic used to treat bacterial infections. It primarily disrupts bacterial cell wall synthesis, specifically targeting the cross-linking of peptidoglycan, a major component of bacterial cell walls. This inhibition weakens the cell wall, leading to osmotic pressure buildup within the bacterial cell, eventually causing the cell to burst and die. Three stages in bacteria growth are:

I. Lag phase II. Log phase III. Stationary phase

In which phase or phases can penicillin inhibit the synthesis of the bacterial cell wall? Mark your answer (√) in the table below.

A. Only I

B. Only II

C. Only III

D. Only I and II

E. Only I and III

A	B	C	D	E

Question 4: If a child were born without a thymus gland, what cells and functions of the immune system would be deficient? Explain.

Answer:

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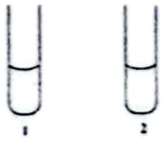
Question 5: The cell goes through a cycle that consists of four stages: G1, S, G2, and M. After DNA is duplicated in eukaryotes, it must be bound to histones. This required the synthesis of hundreds of millions of new protein molecules. When in the cell cycle stage (G1, S, G2, or M) histones are produced?

Answer:

Question 6: A student recorded the events of a reaction using an enzyme at 37^{oC} in his lab book. Into test tube 1, he put 10 mL of a boiled egg-white solution. This was cloudy in appearance. Then he added 2mL of an enzyme solution and stirred the solution. Ten minutes later, the solution had turned clear as shown in test tube 2. Mark your answer (√) in the table below to find the best answer regarding at which condition the suspension might have become clear more quickly.

A. More egg protein had been used.
B. The mixture had not been stirred.
C. The pH of the mixture had been changed.
D. The temperature had been raised to 75°C.
E. Iodine had been added to the test tube.



A	B	C	D	E

-------End of paper-------

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