



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-21, June 29, 2024

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 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 II 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. During cellular respiration breakdown of glucose occurs in
a) Vacuole b) Golgi complex c) Cytoplasm d) Mitochondria
2. The following rays can cause cancer:
a) X-rays b) Gamma rays c) Alpha and beta particles d) All of these
3. The hypothesis that stands the test of time are called:
a) Law b) Null Hypothesis c) Principle d) Theories
4. Electric intensity is a ----- quantity.
a) Vector b) Scalar c) Basic d) None of these
5. One coulomb is equal to the charge of-----electrons.
a) 6.25×10^{19} b) 6.24×10^{18} c) 6.24×10^{17} d) 6.25×10^{18}

OR

COMPUTER

1. Internet uses _____ to communicate between devices and networks.
a) HTTPS b) email c) internet protocol suite d) website
2. Which of the following creates user groups and assigns privileges to them?
a) Process management b) I/O management c) File management d) Network management
3. In C++, a pointer is
a) address of a variable b) constant value c) data type of an address variable d) variable for storing address
4. The programming technique where a function calls itself is known as
a) recursion b) encapsulation c) inline function d) it is a bug
5. Which of the following loop is always executed at least once:
a) for b) do while c) while d) counter loop

CHEMISTRY

6. The phenomenon of emission of light in a chemical reaction is known as
a) Chemiluminescence b) Photosensitization c) Luminescence d) None of these
7. Name the device used to measure the number of nuclear disintegration per minute
a) Cyclotron b) Geiger counter c) Cloud chamber d) Mass spectrograph
8. Which of the following bonds must be present in alkynes?
a) Single bond b) Double bond c) triple bond d) Hydrogen bond
9. When a solution contains equal concentration of hydroxyl and hydrogen ions its pH will be around
a) 0 b) 14 c) 7 d) 10
10. Which is the most reactive element in the given list?
a) Fluorine b) Oxygen c) Nitrogen d) Iodine

MATHEMATICS

11. A quadrilateral with vertices at $(0, -1), (3, 1), (3, -1), (0, 1)$ is a _____.
a) kite b) square c) parallelogram d) rectangle
12. The center of the circle, _____.
a) is a point on the circle b) lies outside of the circle c) lies inside of the circle d) none of these
13. What is the sum of all the divisors of 600?
a) 2060 b) 1860 c) 2160 d) 1890
14. What is the sum of the first nine prime numbers?
a) 100 b) 98 c) 80 d) 77
15. The equations $2x+7=3$ and $bx - 10 = -2$ have the same solution. What is the value of b?
a) -4 b) 6 c) 2 d) $3/2$

PHYSICS

16. A ball of mass m falls from rest onto a floor, from a height h . It makes elastic collisions with the floor repeatedly. The force exerted by it on the floor, averaged over a long time, is
a) mg b) $2mg$ c) $3mg$ d) proportional to m and h
17. While passing over an obstacle a light ray slightly bends round the corner. The phenomenon is known as____:
a) Scattering b) Polarisation c) Diffraction d) Refraction
18. What is the orbital velocity of geo stationary satellite?
a) 4.15 km/s b) 2.78 km/s c) 3.08 km/s d) 6.66 km/s
19. What is the direction of electric and magnetic fields in an electromagnetic wave?
a) parallel to each other, b) at 90° to each other, c) at 45° to each other, d) at 120° to each other
20. What is the time period of a seconds pendulum?
a) 0.5 second b) 1.0 seconds c) 1.5 seconds d) 2.0 seconds

PART II – BIOLOGY

21	In which phase of Meiosis the homologous chromosomes separated from each other						
(a)	Prophase 1	(b)	Telophase 1	(c)	Anaphase 1	(d)	Metaphase 1
22	The shrinking of cytoplasm is called						
(a)	Plasmolysis	(b)	Cytolysis	(c)	Cytocompression	(d)	Cytodialation
23	Which chemical component has the greatest contribution in the total mammalian cell weight?						
(a)	Water	(b)	Carbohydrate	(c)	Proteins	(d)	Lipids
24	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
25	Cartilage and bones are----- tissues.						
(a)	Ground	(b)	Supporting	(c)	Connective	(d)	Socket
26	Deposition of uric acid in the joints results in:						
(a)	Osteoarthritis	(b)	Gout	(c)	Osteoporosis	(d)	Rheumatoid
27	Cellular respiration is-----reaction:						
(a)	Physical	(b)	Oxidation-reduction	(c)	reduction	(d)	oxidation
28	Group of living organisms of the same species living in the same place at the same time is called						
(a)	Community	(b)	Population	(c)	Phylotype	(d)	Biome
29	Halophytes grow in:						
(a)	Lake	(b)	Sea	(c)	Pond	(d)	Canal
30	The pores in the layers of the bark:						
(a)	Stomata	(b)	Small cavities	(c)	lenticles	(d)	hydrathodes
31	In animals, coordination is achieved by means of						
(a)	Respiratory system	(b)	Nervous system	(c)	Endocrine system	(d)	Both B and C
32	The tissues cover the outside of body and lines organs and cavities are called:						
(a)	Connective tissue	(b)	Epithelial tissue	(c)	Muscle tissue	(d)	Epidermis
33	-----are the most abundant species on planet Earth.						
(a)	Human	(b)	Protoza	(c)	Insects	(d)	Bacteria
34	Erythrocytes transport-----?						
(a)	Nerve impulse	(b)	food	(c)	water	(d)	oxygen
35	Blood carries the sugar and amino acids from intestine to liver by means of:						
(a)	Hepatic portal vein	(b)	Hepatic vein	(c)	Hepatic artery	(d)	Both b and c
36	Glucagon is produced by:						
(a)	Thyroid glands	(b)	Sweat glands	(c)	Gastric glands	(d)	Pancreas
37	Plants store large amount of water in their cells for:						
(a)	Turgidity	(b)	Dormancy	(c)	Flaccidity	(d)	Pollination
38	The trees which shed leaves annually remove -----from their body.						
(a)	Nutrients	(b)	Oil and bark	(c)	Harmless metabolites	(d)	Excretory products
39	Out of 92 naturally occurring chemical elements how many are considered as bio-elements:						
(a)	6	(b)	16	(c)	26	(d)	15
40	-----is considered a terrestrial ecosystem.						
(a)	Forest	(b)	Pond	(c)	Ocean	(d)	Cave
41	The alternate form of a gene is called:						
(a)	Allele	(b)	Sister chromosome	(c)	Replicate	(d)	Genovar
42	Coliforms are bacteria usually present in:						
(a)	Digestive track	(b)	Hot springs	(c)	Cold environment	(d)	water
43	The largest part of the brain is-----						
(a)	Cerebrum	(b)	Hind brain	(c)	Cerebellum	(d)	Midbrain
44	The study of external structural characterization is called:						
(a)	Cytology	(b)	Anatomy	(c)	Histology	(d)	Morphology

45	When the platelets count is too high, it can cause:						
(a)	Blood cancer	(b)	blood clots, arterio-sclerosis	(c)	Bleeding, trauma, heart attack	(d)	high cholesterol, heart attack
46	Which of following WBC is involved in preventing blood clotting						
(a)	Neutrophils	(b)	Eosinophils	(c)	Monocytes	(d)	Basophils
47	During day, O ₂ is produced in the mesophyll cells as a:						
(a)	By product	(b)	waste	(c)	Toxic product	(d)	End product
48	Carbon containing fossils fuels are?						
(a)	Minerals and carbonate	(b)	Peat, coal, petroleum	(c)	Biodiesel	(d)	Diamond
49	Seedless fruit plants are propagated by:						
(a)	Grafting	(b)	Cloning	(c)	Cutting	(d)	Binary fission
50	Hypotonic solution:						
(a)	High solute conc.	(b)	No water	(c)	Less solvent conc.	(d)	Less solute conc.
51	When the walls of any arteries become thick, narrow, hardened, the condition is:						
(a)	atherosclerosis	(b)	embolus	(c)	arteriosclerosis	(d)	thrombosis
52	The sensory layer of eye is:						
(a)	Retina	(b)	Iris	(c)	Cornea	(d)	Sclera
53	Night blindness can be avoided by taking----						
(a)	Lodosporin	(b)	Vitamin A	(c)	Vitamin B	(d)	Vitamin K
54	The lens found in human eye is:						
(a)	Concave	(b)	Biconvex	(c)	Progressive	(d)	Trifocal lens
55	The observable set of characteristics of an organism:						
(a)	Genotype	(b)	DNA	(c)	Phenotype	(d)	Genes
56	Pathogens contain proteins called:						
(a)	Lipoproteins	(b)	Histones	(c)	Antibodies	(d)	Antigens
57	Nitrogen fixation is conversion of nitrogen into:						
(a)	Nitric oxide	(b)	Nitric acid	(c)	Nitrate and ammonia	(d)	Nitrous oxides
58	The vector DNA and the inserted gene of interest are collectively called as:						
(a)	Transformed DNA	(b)	Transcript DNA	(c)	Recombinant DNA	(d)	Mutated DNA
59	In lactic acid fermentation pyruvic acid is reduced to:						
(a)	Tartaric acid	(b)	Lactic acid	(c)	Salicylic acid	(d)	Acetic acid
60	The study of fossils is called:						
(a)	Environmental Biology	(b)	Historical biology	(c)	Paleontology	(d)	Social biology
61	Oxygen accounts for ____ % of totals human body mass:						
(a)	65%	(b)	18%	(c)	10%	(d)	3%
62	It is possible to date the rocks by comparing the amount of specific radioactive isotopes they contain. Which of the statement is correct in this respect?						
(a)	Older sediment layers have an equal amount of these radioactive isotopes as that of the young ones	(b)	Older sediment layers have less amount of these radioactive isotopes as that of the young ones.	(c)	Older sediment layers have a greater amount of these radioactive isotopes as that of the young ones	(d)	Older sediment layers did not have these radioactive isotopes
63	Which disease can be controlled by vaccination?						
(a)	Measles	(b)	Cancer	(c)	Diabetes	(d)	Heart attack
64	Vaccine was first developed by?						
(a)	Louis Pasture	(b)	Jaber Ibn Hayan	(c)	Edward Jenner	(d)	Aristotle
65	Which of the following statement is incorrect about antibiotics?						

(a)	They are used against microorganisms	(b)	They are always effective against bacteria	(c)	They are used in diseases like tuberculosis and pneumonia	(d)	They are derived from bacteria only
66	Removal or degradation of environmental pollutants or toxic materials by living organisms is called:						
(a)	Bioremediation	(b)	Integrated disease management	(c)	Hydroponics	(d)	Pasteurization
67	Which of the following is not a viral disease?						
(a)	Cowpox	(b)	Mumps	(c)	Tetanus	(d)	Smallpox
68	The arrangement of _____ speaks of the division of labor within the cell:						
(a)	Molecule	(b)	Organelles	(c)	Subatomic particles	(d)	Atoms
69	Cellular digestion is associated with which organelle?						
(a)	Mitochondria	(b)	Lysosomes	(c)	Golgi bodies	(d)	Plastids
70	Mycoplasmas have been included in bacteria because:						
(a)	Do not have a cell wall	(b)	Are heterotrophic	(c)	Lack of membrane bounded organelles	(d)	Reproduce by binary fission

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.
- In first three questions, the answer is to be given by choosing correct option.
- 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.

=====

Name: _____

Roll No: _____

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. Which of the following plant movements uses a mechanism distinct from the others?

- (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

Question No 2: Three stages in bacterial 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?

- A. Only I
- B. Only II
- C. Only III
- D. Only I and II
- E. Only I and III
- F. I, II and III

Question 3: Which statement correctly describes the differentiation and development of cells and organs in flowering plants?

- A. Organo-morphogenesis involves cell movement as one of the important mechanisms.
- B. Post-embryogenesis is a growth process, as all of the plant organs are pre-formed during embryogenesis.
- C. Totipotency of plant tissues provides the original source of power to develop a complete plant by re-differentiation, without going through the de-differentiation process.
- D. The direction of cell division determines cell type and function.
- E. Lineage information obtained by genetic inheritance overrides environmental factors in determining the time for organ development.

Question 4: Why is shivering likely during the onset of a fever?

Answer:

Name: _____

Roll No: _____

Question 5: A drug for Leukemia is not broken down in the stomach and is well absorbed by the intestine. The traces/molecules of the drug found in the patient's blood do not match to the form that was swallowed by the patient. What is the possible explanation for this?

Answer:

Question 6: If a child were born without a thymus gland, what cells and functions of the immune system would be deficient? Explain.

Answer:

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

Name: _____

Biology

Roll No: _____

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