Science and Technology Part 2

SSC Board Exam March 2027 – Practice Paper

Model Answer Paper

Time: 2 hours **Max. Marks: 40**

Model answers show one correct method; any other correct method gets full marks.

Q.1 (A) Choose the correct alternative and write its alphabet against the sub-question number. **[5]**

(i) Which of the following animals is considered a connecting link between reptiles and mammals?

(A) Peripatus (B) Lungfish
(C) Duck-billed platypus (D) Archaeopteryx

Answer (1 mark)
(C) Duck-billed platypus
It lays eggs like reptiles but has hair and mammary glands like mammals. (Peripatus links annelids and arthropods, lungfish links fish and amphibians, Archaeopteryx links reptiles and birds.)

(ii) Which of the following molecules is called the 'energy currency' of the cell?

(A) Glucose (B) $NADH_2$
(C) ATP (D) Pyruvic acid

Answer (1 mark)
(C) ATP
Energy is stored in the bonds between the phosphate groups of ATP (adenosine triphosphate). Whenever the cell needs energy, these bonds are broken and energy is released, so ATP is called the energy currency of the cell.

(iii) A food factory near Nashik makes vinegar from alcohol. The micro-organism used for this conversion is _____.

(A) Lactobacillus (B) Acetobacter aceti
(C) Saccharomyces cerevisiae (D) Rhizobium

Answer (1 mark)
(B) Acetobacter aceti
This bacterium oxidises alcohol (ethanol) to acetic acid, which is vinegar.

(iv) Water vascular system and tube feet are characteristic of animals of phylum _____.

(A) Mollusca (B) Cnidaria
(C) Echinodermata (D) Annelida

Answer (1 mark)
(C) Echinodermata
E.g. starfish: tube feet worked by the water vascular system help in locomotion and capturing food.

(v) At the Koyna hydroelectric project, the correct sequence of energy conversion is _____.

(A) Kinetic energy → Potential energy → Electrical energy

(B) Potential energy → Kinetic energy → Electrical energy

(C) Chemical energy → Heat energy → Electrical energy

(D) Nuclear energy → Heat energy → Electrical energy

Answer (1 mark)
(B) Potential energy → Kinetic energy → Electrical energy
Water stored in the dam has potential energy; flowing down it gains kinetic energy which turns the turbine, and the generator produces electricity.

Q.1 (B) Answer the following questions. **[5]**

(i) Find the odd one out: Planaria, Tapeworm, Ascaris, Liver fluke

Answer (1 mark)
Ascaris. It is a roundworm (phylum Aschelminthes, pseudocoelomate); the others are flatworms of phylum Platyhelminthes.

(ii) Complete the correlation: Yeast : Budding :: Planaria : _____

Answer (1 mark)
Regeneration
(Yeast reproduces asexually by budding; Planaria by regeneration, in which each cut piece grows into a complete new organism.)

(iii) Name the biodiversity hotspot of India that passes through Maharashtra.

Answer (1 mark)
The Western Ghats (Sahyadri ranges).

(iv) State whether true or false: The Disaster Management Act was passed in India in the year 2005.

Answer (1 mark)
True.

(v) Name the process in which t-RNA brings amino acids according to the codons on m-RNA, so that a protein chain is formed.

Answer (1 mark)
Translation.
(t-RNA carries an anticodon complementary to the codon on m-RNA; the amino acids it brings are joined by peptide bonds to form the protein chain.)

Q.2 (A) Give scientific reasons. (Any two) **[4]**

(i) Leg muscles of a runner start aching after a fast 400 m race.

Answer (2 marks)
During a fast race the muscles need energy very quickly, but enough oxygen does not reach them.
So the muscle cells carry out anaerobic respiration, in which glucose is broken down without oxygen.
Lactic acid is formed in this process and gets accumulated in the muscles.
Hence the muscles get fatigued and start aching.
Marking: Insufficient oxygen, so anaerobic respiration – 1 mark · Lactic acid accumulates, causing fatigue/pain – 1 mark

Examiner tip: The words 'anaerobic respiration' and 'lactic acid' must both appear.

(ii) Solar energy is called a green (environment-friendly) source of energy.

Answer (2 marks)

Generating electricity from solar energy does not involve burning any fuel.
So no harmful gases such as carbon dioxide, sulphur dioxide or nitrogen oxides, and no ash, are produced; it does not cause air pollution or add to global warming.
Solar energy is also renewable – it will not get exhausted.
Hence solar energy is called a green source of energy.

Marking: No fuel burnt, so no polluting gases / ash – 1 mark · Renewable, does not get exhausted – 1 mark

Examiner tip: Give two separate points: 'no pollution' and 'renewable'.

(iii) Farmers who grow Bt cotton need to spray less pesticide.

Answer (2 marks)

Bt cotton is a genetically modified crop. A gene from the bacterium Bacillus thuringiensis has been introduced into the cotton plant.
This gene makes the plant produce a protein that is toxic to bollworms (pest insects).
When bollworms feed on the plant, they die. So the plant resists pests by itself.
Hence less pesticide needs to be sprayed.

Marking: Gene from Bacillus thuringiensis introduced – 1 mark · Produces toxin that kills bollworms, so less pesticide – 1 mark

Examiner tip: Write the full name Bacillus thuringiensis and name the pest (bollworm).

Q.2 (B) Answer the following questions. (Any three) **[6]**

(i) The flipper of a whale and the wing of a bat look very different and are used for different work (swimming and flying), yet the bones in them have a similar arrangement and joints.
(a) Which type of evidence of evolution does this show?
(b) What does this similarity indicate?

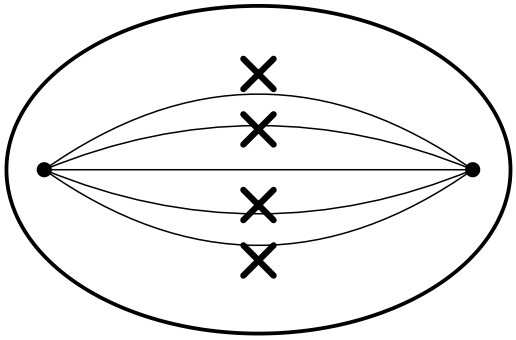
Answer (2 marks)

(a) It is anatomical evidence of evolution.
(b) Although these organs look different and do different work, the arrangement and joints of their bones are similar. This similarity indicates that these animals had common ancestors, i.e. they evolved from the same ancestor.

Marking: Anatomical evidence – 1 mark · Similar bone arrangement indicates a common ancestor – 1 mark

Examiner tip: Use the words 'anatomical evidence' and 'common ancestor'; just saying 'they are similar' gets no mark for (b).

(ii) Observe the figure of a dividing cell and answer:
(a) Identify the stage of mitosis shown.
(b) Write two events that take place in this stage.



Figure

Answer (2 marks)
(a) Metaphase of mitosis.
(b) 1. All chromosomes (each with two sister chromatids) get arranged on the equatorial plane of the cell.
2. Spindle fibres from both poles get attached to the centromere of each chromosome. (The nuclear membrane has completely disappeared.)
Marking: Correct stage – 1 mark · Any two events – ½ mark each
Examiner tip: 'Chromosomes at the equator' is the key clue; do not confuse with anaphase where chromatids move apart.

(iii) What are probiotics? Write two of their uses.

Answer (2 marks)
Probiotics are milk (dairy) or food products that contain live, useful micro-organisms such as Lactobacillus (e.g. Lactobacillus acidophilus, Lactobacillus casei) and Bifidobacterium; e.g. probiotic yoghurt/curd.
Uses (any two):
1. They maintain the colonies of useful bacteria in the alimentary canal and help in digestion.
2. They control the growth of harmful bacteria in the intestine and help to control diarrhoea.
3. After a course of antibiotics, which also destroys useful intestinal bacteria, probiotics help to restore them.
4. They increase the body's resistance (immunity).
Marking: Definition with example – 1 mark · Two uses – ½ mark each

(iv) Some teenagers start using tobacco products such as gutkha and cigarettes, and later become addicted to them.
(a) Write two reasons why teenagers start using such substances.
(b) Write two harmful effects of such addiction.

Answer (2 marks)
(a) Any two:
1. Peer pressure – friends insist, and teenagers like to imitate the habits of friends of their age.
2. Imitating elders around them.
3. Thinking of it as a symbol of a high (stylish) standard of living.
4. Curiosity to taste it.
(b) Any two:
1. Tobacco products cause cancer of the mouth and lungs.

2. Such substances permanently damage the nervous system, muscles and heart.
3. An addicted person cannot think rationally; along with poor physical health, he or she faces mental, social and family problems.

Marking: (a) Two reasons – ½ mark each · (b) Two harmful effects – ½ mark each

(v) Many wind turbines (windmills) have been set up on the Chalkewadi plateau in Satara district.
(a) Write the energy conversions that take place in a wind power plant.
(b) Wind energy is a clean source of energy, yet its use is somewhat limited. Why?

Answer (2 marks)
(a) Kinetic energy of the flowing wind → kinetic energy of the rotating blades of the turbine → (generator) electrical energy.
(b) Wind of a particular (sufficient) speed is needed to generate electricity with a wind turbine. Wind of this speed is not available everywhere (and not at all times); it depends on the geographical conditions of the place. So wind power plants can be set up only at certain places such as sea coasts and plateaus / hill tops. Hence the use of wind energy is limited.

Marking: (a) Energy conversions in the correct order – 1 mark · (b) Wind of the required speed is not available everywhere – 1 mark

Examiner tip: In (a) both the first and second forms are kinetic energy; do not write potential energy for wind.

Q.3 Answer the following questions. (Any five) **[15]**

(i) A surgeon removed the swollen vermiform appendix of a patient and the patient later lived a normal, healthy life.
(a) What type of organ is the appendix in human beings? Explain the term.
(b) Name two other such organs in the human body.
(c) How do such organs support the idea of evolution?

Answer (3 marks)
(a) The appendix is a vestigial organ in human beings. Vestigial organs are organs present in the body in a reduced, non-functional (useless) form, whereas the same organs are well developed and functional in some other animals.
(b) Any two: coccyx (tail bone), wisdom teeth, muscles of the ear pinna, body hair, nictitating membrane (semilunar fold of the eye).
(c) The appendix is large and functional in herbivores such as the rabbit, where it helps in digesting cellulose. Its presence in a non-functional form in humans shows that humans and these animals had common ancestors; the organ became useless as food habits and way of life changed during evolution.

Marking: (a) Vestigial organ with meaning – 1 mark · (b) Two other examples – ½ mark each · (c) Explanation as evidence – 1 mark

Examiner tip: In (b) do not repeat the appendix, and do not write 'tail'; humans have only the coccyx.

(ii) Explain the process of double fertilization in flowering plants.

Answer (3 marks)
1. After pollination, the pollen grain on the stigma germinates and forms a pollen tube, which grows through the style and enters the ovule.
2. The pollen tube carries two male gametes and releases them into the embryo sac.
3. One male gamete fuses with the egg cell (female gamete). This is fertilization (syngamy) and forms a diploid zygote, which develops into the embryo.
4. The second male gamete fuses with the two polar nuclei (secondary nucleus) of the central cell. This is triple fusion and forms the triploid endosperm, which provides food to the

developing embryo.
As fertilization takes place twice in the same embryo sac, it is called double fertilization.

Marking: Pollen tube with two male gametes – 1 mark · Syngamy → zygote/embryo – 1 mark · Triple fusion → endosperm – 1 mark

Examiner tip: Name both fusions: syngamy and triple fusion.

(iii) Many villages in the Sahyadri region of Pune and Ratnagiri districts protect a patch of forest called 'Devrai'. What are Devrais? How do they help in conservation of biodiversity?

Answer (3 marks)

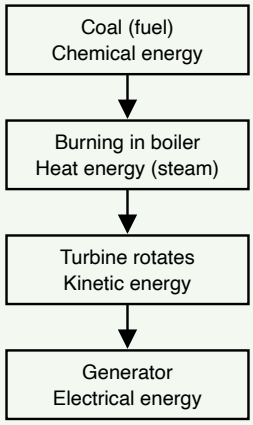
Devrais (sacred groves) are patches of forest protected by local people in the name of a local deity. Cutting trees or hunting in them is traditionally not allowed.
Role in biodiversity conservation:
1. Many rare plants, medicinal herbs and old trees survive in them because they are not cut.
2. They provide shelter and food to birds, insects and other animals, so they act as natural habitats.
3. They protect springs and water sources and prevent soil erosion.
4. The community itself conserves the forest, so it is a good example of people's participation in conservation.

Marking: Meaning of Devrai – 1 mark · Any two roles – 1 mark each

(iv) Chandrapur in Maharashtra has a large coal-based thermal power station. Draw a flow chart showing the energy conversions in a thermal power plant and write one environmental problem caused by it.

Answer (3 marks)

Flow chart:
Coal (chemical energy) → burnt in boiler: heat energy converts water into high-pressure steam → steam rotates the turbine: kinetic energy → generator: electrical energy.
Environmental problem (any one): Burning coal releases carbon dioxide (greenhouse gas), sulphur dioxide and nitrogen oxides causing air pollution and acid rain; fly ash pollutes air, water and land.



Marking: Correct flow chart with four stages – 2 marks · One environmental problem – 1 mark

Examiner tip: Write the form of energy in every box, not just the name of the machine.

(v) Write four characteristics of class Amphibia and give two examples.

Answer (3 marks)

Characteristics (any four):
1. They live in water as well as on land (dual life).
2. Their skin is soft, moist and without scales; it helps in respiration.

3. Larvae (tadpoles) respire by gills; adults respire by lungs and skin.
4. The heart is three-chambered.
5. They are cold-blooded; fertilization is external.
6. They have two pairs of limbs; the digits have no claws.
7. There is no external ear (pinna), but a tympanum (eardrum) is present; there is no neck.
Examples: frog, toad, salamander (any two).

Marking: Four characteristics – ½ mark each · Two examples – ½ mark each

Examiner tip: Do not give tortoise or crocodile as examples; they are reptiles.

(vi) Explain how milk is converted into curd. Name the micro-organism involved and write one benefit of eating curd.

Answer (3 marks)

1. A small amount of curd (containing lactobacilli) is added to lukewarm milk.
2. The lactobacilli multiply and ferment lactose (milk sugar) into lactic acid.
3. Lactic acid lowers the pH of milk; the milk protein casein coagulates and the milk sets into curd, which has a sour taste and pleasant flavour.

Micro-organism: Lactobacillus (lactic acid bacteria).
Benefit: Curd is easy to digest and acts as a probiotic, helping to maintain useful bacteria in the intestine.

Marking: Lactose → lactic acid by fermentation – 1 mark · Coagulation of casein / setting – 1 mark · Name of microbe ½ + benefit ½ – 1 mark

Examiner tip: Warm (not boiling) milk is needed; mention 'lactose' and 'lactic acid' clearly.

(vii) What are stem cells? Write their two types and two uses.

Answer (3 marks)

Stem cells are undifferentiated cells in the body which can divide repeatedly and can develop into different types of specialised cells.
Types:
1. Embryonic stem cells – obtained from the early embryo (blastocyst); they can form any type of cell of the body.
2. Adult stem cells – found in bone marrow, umbilical cord blood, fat tissue etc.; they form limited types of cells.

Uses:
1. Treatment of diseases like blood cancer (leukaemia) and thalassaemia by bone marrow / stem cell transplantation.
2. Regeneration of damaged tissues or organs (e.g. skin, heart muscle, nerve cells); umbilical cord blood can be stored in stem cell banks for future use.

Marking: Definition – 1 mark · Two types – ½ mark each · Two uses – ½ mark each

(viii) What is cyber crime? Give two examples of cyber crime and write two precautions to avoid becoming its victim.

Answer (3 marks)

Cyber crime is a criminal act carried out using a computer, mobile phone or the internet.
Examples (any two): hacking of accounts, stealing personal data or passwords (identity theft), online financial fraud, spreading viruses, cyber bullying or posting obscene/defaming material on social media.
Precautions (any two):
1. Never share passwords, OTP or bank details with anyone; use strong passwords.
2. Do not open links or download files from unknown sources.

3. Do not accept friend requests from strangers or share personal photos and information on social media.
4. Report any cyber crime to the cyber police (Information Technology Act, 2000 provides punishment).

Marking: Definition – 1 mark · Two examples – ½ mark each · Two precautions – ½ mark each

Q.4 Answer the following questions. (Any one) **[5]**

(i) Read the following paragraph and answer the questions.

In August 2019, continuous heavy rainfall in the catchment areas of the Krishna and Panchganga rivers, along with the release of large quantities of water from the dams, caused severe floods in Kolhapur and Sangli districts. Thousands of houses were submerged, roads were cut off and drinking water supply stopped. Teams of the NDRF, the Army and local volunteers rescued people with boats and shifted them to relief camps.

(a) Is a flood classified as a natural or a man-made disaster? Name one other disaster of the same category.
(b) Write two reasons for the floods mentioned in the paragraph.
(c) Suggest two preparedness measures a family living near a river should take before the monsoon.
(d) Write two precautions people should take regarding health after the flood water recedes.
(e) Write the full form of NDRF.

Answer (5 marks)

(a) A flood is a natural disaster (geophysical / climatic type). Another natural disaster: earthquake, cyclone, drought, landslide or cloudburst (any one).
(Human actions such as release of dam water or construction on river banks can make its effects worse.)
(b) 1. Continuous heavy rainfall in the catchment areas of the rivers.
2. Release of large quantities of water from the dams.
(c) 1. Keep an emergency kit ready: drinking water, dry food, torch, battery, first-aid box, important documents in a waterproof bag.
2. Know the safe higher place / relief camp and evacuation route; follow weather warnings and keep emergency phone numbers.
(d) 1. Drink only boiled or purified (chlorinated) water to avoid diseases like cholera, typhoid and jaundice.
2. Do not allow water to stagnate; clean and disinfect the house and surroundings to prevent malaria, dengue and leptospirosis.
(e) NDRF – National Disaster Response Force.

Marking: (a) Natural ½ + one other natural disaster ½ – 1 mark · (b) two reasons – ½ mark each · (c) two measures – ½ mark each · (d) two precautions – ½ mark each · (e) full form – 1 mark

Examiner tip: Answer each sub-question separately with its letter; take reasons in (b) from the paragraph itself.

(ii) Cellular respiration releases energy from food.

(a) Write the three stages of aerobic respiration and the place in the cell where each takes place.
(b) Write the end products of glycolysis.
(c) Write the overall chemical equation of aerobic respiration.
(d) Draw a neat labelled diagram of the cell organelle in which the Krebs cycle takes place.

Answer (5 marks)

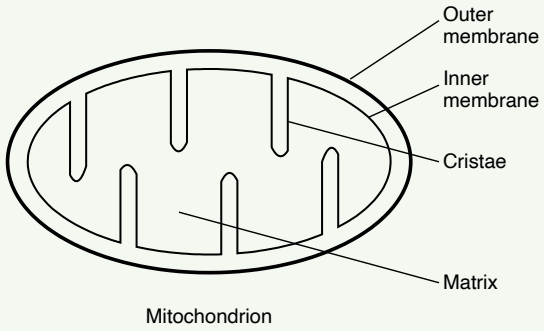
(a) 1. Glycolysis – in the cytoplasm.
2. Krebs cycle (tricarboxylic acid cycle) – in the matrix of the mitochondria.

3. Electron transfer chain – on the inner membrane (cristae) of the mitochondria.

(b) One molecule of glucose is oxidised step by step to give two molecules each of pyruvic acid, ATP, $NADH_2$ and water.

(c) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + energy (38 ATP)

(d) Diagram of mitochondrion showing outer membrane, inner membrane, cristae and matrix.



Mitochondrion

Marking: (a) three stages with places – ½ mark each (1½) · (b) end products – ½ mark · (c) balanced equation – 1 mark · (d) diagram 1 mark + labels 1 mark (any four labels)

Examiner tip: Balance the equation ($6O_2$, $6CO_2$, $6H_2O$). In the diagram, show cristae as folds of the inner membrane.

All the best for your exam!