Science and Technology Part 1

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. **[5]**

(i) If the distance between two bodies is doubled, the gravitational force between them becomes _____ of the original force F.

(A) 2F (B) F/2
(C) F/4 (D) 4F

Answer (1 mark)
(C) F/4
Gravitational force $F \propto 1/d^2$. When d becomes 2d, the force becomes $F/(2)^2 = F/4$.

(ii) An element has the electronic configuration 2, 8, 2. Its position in the modern periodic table is _____.

(A) Group 3, Period 2 (B) Group 2, Period 3
(C) Group 12, Period 2 (D) Group 2, Period 2

Answer (1 mark)
(B) Group 2, Period 3
Two valence electrons → group 2; three shells → period 3 (the element is magnesium).

(iii) Water has its maximum density at _____.

(A) 0 °C (B) 100 °C
(C) –4 °C (D) 4 °C

Answer (1 mark)
(D) 4 °C
Due to anomalous expansion, water contracts on heating from 0 °C to 4 °C, so its volume is minimum and density maximum at 4 °C.

(iv) The power of a convex lens of focal length 50 cm is _____.

(A) +2 D (B) –2 D
(C) +0.5 D (D) +50 D

Answer (1 mark)
(A) +2 D
P = 1/f (in metres) = 1/0.5 m = +2 D. Focal length of a convex lens is positive.

(v) The functional group present in ethanoic acid (vinegar) is _____.

(A) –OH (B) –CHO
(C) –COOH (D) >C=O

Answer (1 mark)
(C) –COOH
Ethanoic acid CH_3COOH contains the carboxylic acid group –COOH.

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

(i) Find the odd one out: Lithium, Sodium, Magnesium, Potassium

Answer (1 mark)
Magnesium.
Lithium, sodium and potassium are alkali metals of group 1 (one valence electron); magnesium is an alkaline earth metal of group 2.

(ii) Complete the correlation:
Myopia : Concave lens :: Hypermetropia : _____

Answer (1 mark)
Convex lens.
Hypermetropia (far-sightedness) is corrected by a convex (converging) lens of suitable power.

(iii) Match the column:
Column A: Electric fuse wire
Column B: (a) Tungsten (b) Alloy of lead and tin (c) Nichrome

Answer (1 mark)
Electric fuse wire – (b) Alloy of lead and tin.
It has a low melting point, so it melts and breaks the circuit when excess current flows.

(iv) State whether the following statement is true or false:
The escape velocity from the surface of the Earth is about 11.2 km/s.

Answer (1 mark)
True.
$v_{esc} = \sqrt{(2GM/R)} \approx 11.2$ km/s for the Earth.

(v) Write the name: The process of heating a carbonate ore strongly in a limited supply of air or in the absence of air.

Answer (1 mark)
Calcination.
Example: $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$ on strong heating.

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

(i) Tungsten metal is used to make the filament of an electric bulb.

Answer (2 marks)
1. The filament must become white hot (about 2500 °C) to give out light.
2. Tungsten has a very high melting point (about 3422 °C), so it does not melt at this temperature.
3. At such a high temperature tungsten glows brightly and emits light.
Hence tungsten is used to make the filament of an electric bulb.
Marking: Very high melting point (3422 °C) – 1 mark · Becomes white hot / emits light at about 2500 °C without melting – 1 mark
Examiner tip: Write at least two separate points; 'it does not melt' alone gets only 1 mark.

(ii) In very cold regions, water pipes sometimes burst in winter.

Answer (2 marks)

1. When the temperature falls below 4 °C, water expands instead of contracting (anomalous behaviour of water).
2. On freezing at 0 °C, its volume increases further (ice occupies more volume than the same mass of water).
3. This expanding water/ice exerts a large pressure on the walls of the pipe, so the pipe bursts.

Marking: Anomalous expansion below 4 °C / on freezing – 1 mark · Pressure on pipe walls → bursting – 1 mark

Examiner tip: Use the term 'anomalous behaviour of water' — examiners look for it.

(iii) Packets of potato chips are filled with nitrogen gas.

Answer (2 marks)

1. Fats and oils in potato chips react with oxygen of air (oxidation) and become rancid; their smell and taste change.
2. Nitrogen is an unreactive gas. Filling the packet with nitrogen removes oxygen.
3. Hence oxidation is prevented, rancidity is avoided and the chips stay fresh for a longer time.

Marking: Oxidation of fats → rancidity – 1 mark · Nitrogen is inert, prevents oxidation – 1 mark

Examiner tip: Name the process 'rancidity' and say 'oxidation' — both words carry marks.

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

(i) An astronaut has a mass of 60 kg on the Earth. Find his weight on the Earth and on the Moon. (g on Earth = 9.8 m/s^2, g on Moon = g/6)

Answer (2 marks)

Given: m = 60 kg, g = 9.8 m/s^2, $g_M = g/6$

Weight on Earth W = mg = 60 × 9.8 = 588 N

Mass remains the same (60 kg) on the Moon.

Weight on Moon $W_M = m \times g/6 = 588/6 = 98$ N

Ans: Weight on Earth = 588 N; weight on Moon = 98 N.

Marking: W = mg and Earth weight 588 N – 1 mark · Moon weight 98 N – 1 mark

Examiner tip: Write the unit newton (N) for weight; writing 'kg' for weight loses marks.

(ii) Write the balanced chemical equation, with physical states, for the reaction of zinc granules with dilute sulphuric acid, and identify the type of reaction.

Answer (2 marks)

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)\uparrow$

Type: Displacement reaction (zinc, being more reactive, displaces hydrogen from the acid).

Marking: Balanced equation with states – 1 mark · Type: displacement (single displacement also accepted) – 1 mark

(iii) State the laws of refraction of light.

Answer (2 marks)

1. The incident ray and the refracted ray are on opposite sides of the normal at the point of incidence, and the incident ray, the refracted ray and the normal all lie in the same plane.
2. For a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant: sin i / sin r = constant = n_{21} (refractive index of medium 2 with respect to medium 1). This is Snell's law.

Marking: First law – 1 mark · Second law (Snell's law) with formula – 1 mark

(iv) State Fleming's right hand rule. Name one device that works on electromagnetic induction.

Answer (2 marks)

Fleming's right hand rule: Stretch the thumb, index finger and middle finger of the right hand so that they are mutually perpendicular. If the index finger points in the direction of the magnetic field and the thumb points in the direction of motion of the conductor, then the middle finger shows the direction of the induced current.

Device: Electric generator (dynamo).

Marking: Correct statement of the rule – 1 mark · Generator / dynamo – 1 mark

Examiner tip: Do not mix up with the left hand rule (motor).

(v) Lithium, sodium and potassium form a Döbereiner's triad. The atomic masses of lithium and potassium are 6.9 and 39.1 respectively. Find the atomic mass of sodium.

Answer (2 marks)

In a Döbereiner's triad, the atomic mass of the middle element is about the mean of the other two.

Atomic mass of Na = (6.9 + 39.1)/2 = 46.0/2 = 23.0

Ans: Atomic mass of sodium ≈ 23.0

Marking: Statement of the triad rule – 1 mark · Calculation 23.0 – 1 mark

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

(i) A stone is dropped from the top of a building in Pune that is 19.6 m high. ($g = 9.8\ m/s^2$)

(a) How long does it take to reach the ground?

(b) With what velocity does it hit the ground?

(c) What distance does it fall in the first second?

Answer (3 marks)

Given: $u = 0$, $h = 19.6$ m, $g = 9.8\ m/s^2$

(a) $h = ut + \frac{1}{2}gt^2 \rightarrow 19.6 = \frac{1}{2} \times 9.8 \times t^2 \rightarrow t^2 = 4 \rightarrow t = 2$ s

(b) $v = u + gt = 0 + 9.8 \times 2 = 19.6$ m/s

(c) $s = \frac{1}{2} \times 9.8 \times (1)^2 = 4.9$ m

Ans: (a) 2 s (b) 19.6 m/s (c) 4.9 m

Marking: (a) 2 s with formula – 1 mark · (b) 19.6 m/s – 1 mark · (c) 4.9 m – 1 mark

Examiner tip: Write u = 0 for a body 'dropped'; many students forget and get stuck.

(ii) An electric iron of resistance 55 Ω is connected to a 220 V supply.

(a) Find the current through it.

(b) Find its power.

(c) How many units of electrical energy will it consume in 2 hours?

Answer (3 marks)

Given: $R = 55\ \Omega$, $V = 220$ V, $t = 2$ h

(a) $I = V/R = 220/55 = 4$ A

(b) $P = VI = 220 \times 4 = 880$ W $= 0.88$ kW

(c) Energy $= P \times t = 0.88$ kW $\times 2$ h $= 1.76$ kWh $= 1.76$ units

Ans: (a) 4 A (b) 880 W (c) 1.76 units

Marking: (a) 4 A – 1 mark · (b) 880 W – 1 mark · (c) 1.76 units (kWh) – 1 mark

Examiner tip: 1 unit = 1 kWh. Convert W to kW before multiplying by hours.

(iii) An object 3 cm high is placed 12 cm in front of a convex lens of focal length 8 cm. Find the position, nature and height of the image. Draw the ray diagram.

Answer (3 marks)

Given: u = –12 cm, f = +8 cm, h_1 = 3 cm

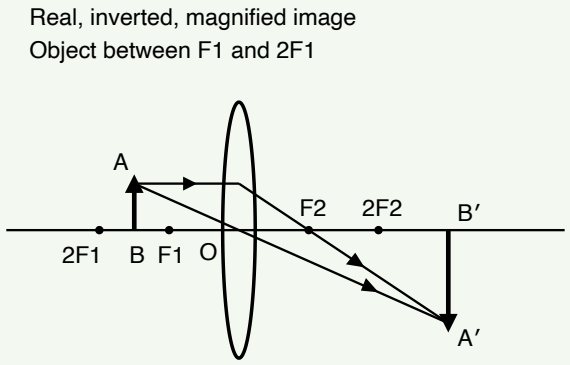
Lens formula: 1/v – 1/u = 1/f

1/v = 1/f + 1/u = 1/8 – 1/12 = (3 – 2)/24 = 1/24 → v = +24 cm

Magnification M = v/u = 24/(–12) = –2

$h_2 = M \times h_1 = -2 \times 3 = -6$ cm

Ans: Image is formed 24 cm on the other side of the lens; it is real, inverted and magnified (6 cm high).



Marking: v = 24 cm using lens formula – 1 mark · M = –2, h_2 = –6 cm, nature – 1 mark · Ray diagram – 1 mark

Examiner tip: Follow the Cartesian sign convention: u is negative, f of a convex lens is positive.

(iv) Zinc is extracted from zinc blende (ZnS) and calamine ($ZnCO_3$). Write balanced chemical equations for:

(a) Roasting of zinc blende

(b) Calcination of calamine

(c) Reduction of zinc oxide with carbon

Answer (3 marks)

(a) $2ZnS(s) + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)\uparrow$ (heat)

(b) $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)\uparrow$ (strong heat)

(c) $ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)\uparrow$ (heat)

Marking: Each balanced equation – 1 mark (×3)

Examiner tip: Balance roasting carefully: $2ZnS + 3O_2 \rightarrow 2ZnO + 2SO_2$.

(v) Ethanoic acid reacts with ethanol in the presence of concentrated sulphuric acid.

(a) Write the chemical equation.

(b) Name the reaction and the product formed.

(c) Give one use of the product.

Answer (3 marks)

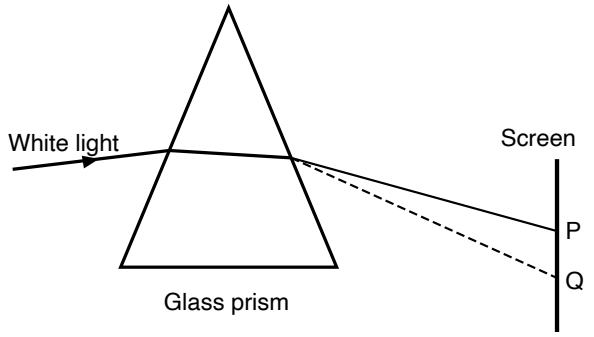
(a) $CH_3COOH + C_2H_5OH \xrightarrow{\text{(conc. } H_2SO_4\text{, heat)}} CH_3COOC_2H_5 + H_2O$

(b) Esterification; the product is ethyl ethanoate (an ester).

(c) Esters have a sweet fruity smell, so they are used in perfumes and flavouring agents.

Marking: Equation – 1 mark · Esterification + ethyl ethanoate – 1 mark · Use – 1 mark

(vi) Observe the figure and answer the questions.
(a) Name the phenomenon shown.
(b) Which colours reach points P and Q on the screen?
(c) Why do different colours bend through different angles?



Answer (3 marks)
(a) Dispersion of light – white light splits into its seven component colours.
(b) P – red (least deviated); Q – violet (most deviated).
(c) The refractive index of glass is different for different colours (it is least for red and greatest for violet), so different colours travel with different speeds in glass and bend through different angles.
Marking: (a) Dispersion – 1 mark · (b) P red, Q violet – 1 mark · (c) Different refractive index / speed – 1 mark

(vii) Explain the three types of satellite orbits on the basis of their height above the Earth's surface. Give one use of satellites in each orbit.

Answer (3 marks)
1. Low Earth orbit: height about 180 km to 2000 km. Used for weather/remote sensing (Earth observation) satellites and scientific studies; the International Space Station is also in this orbit.
2. Medium Earth orbit: height about 2000 km to 35780 km. Used for navigation satellites (e.g., GPS satellites).
3. High Earth orbit: height 35780 km and above. Satellites at about 35780 km above the equator move with the Earth's rotation (geostationary) and appear fixed; used for communication satellites (e.g., INSAT/GSAT series of ISRO).
Marking: Each orbit with height range and use – 1 mark (×3)
Examiner tip: Heights must be stated; just names of the orbits get half credit.

(viii) How much heat is needed to convert 50 g of ice at 0 °C into water at 20 °C?
(Specific latent heat of fusion of ice = 80 cal/g, specific heat of water = 1 cal/g °C)

Answer (3 marks)
Given: m = 50 g, L = 80 cal/g, c = 1 cal/g °C, $\Delta T = 20 - 0 = 20$ °C
Step 1: Ice at 0 °C → water at 0 °C: $Q_1 = mL = 50 \times 80 = 4000$ cal
Step 2: Water at 0 °C → water at 20 °C: $Q_2 = mc\Delta T = 50 \times 1 \times 20 = 1000$ cal
Total heat $Q = Q_1 + Q_2 = 4000 + 1000 = 5000$ cal
Ans: 5000 cal (5 kcal)
Marking: $Q_1 = mL = 4000$ cal – 1 mark · $Q_2 = mc\Delta T = 1000$ cal – 1 mark · Total 5000 cal – 1 mark
Examiner tip: Do not forget the latent heat step; temperature does not change while ice melts.

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

(i) Read the information and answer the questions.

Five elements A, B, C, D and E have atomic numbers 3, 11, 12, 17 and 18 respectively. (A, B, C, D, E are not the chemical symbols.)

(a) Which two elements belong to the same group? Why?

(b) Which element is a noble gas?

(c) Write the electronic configuration and valency of D.

(d) Out of B, C and D, which has the largest atomic radius? Why?

(e) Write the molecular formula of the compound formed between C and D.

Answer (5 marks)

Electronic configurations: A (3) = 2, 1; B (11) = 2, 8, 1; C (12) = 2, 8, 2; D (17) = 2, 8, 7; E (18) = 2, 8, 8

(a) A and B belong to the same group (group 1), because both have 1 valence electron.

(b) E (2, 8, 8 – complete octet; group 18).

(c) D: 2, 8, 7; valency = 8 – 7 = 1.

(d) B. B, C and D are in the same period (period 3). Across a period, the nuclear charge increases, so electrons are pulled closer and atomic radius decreases from left to right. B is on the extreme left, so it has the largest radius.

(e) C has valency 2 and D has valency 1, so the formula is CD_2.

Marking: (a) A and B with reason – 1 mark · (b) E – 1 mark · (c) 2, 8, 7 and valency 1 – 1 mark · (d) B with reason – 1 mark · (e) CD_2 – 1 mark

Examiner tip: Write the electronic configuration of every element first; all answers follow from it.

(ii) A 13-year-old student can clearly see the vehicles on a distant road, but he cannot read his textbook clearly when it is held close to his eyes.

(a) Name the defect of vision.

(b) Where is the image of a nearby object formed in his eye?

(c) Give two possible causes of this defect.

(d) What type of lens is used to correct it?

(e) Draw labelled diagrams showing the defect and its correction.

Answer (5 marks)

(a) Hypermetropia (far-sightedness).

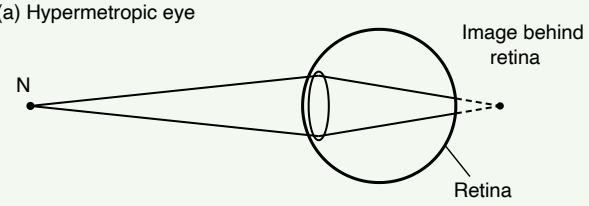
(b) The image of a nearby object is formed behind the retina.

(c) Causes: (1) the curvature of the cornea and eye lens decreases, so the focal length of the eye lens becomes too long; (2) the eyeball becomes flattened (shortened) from front to back, so the distance between the eye lens and the retina decreases.

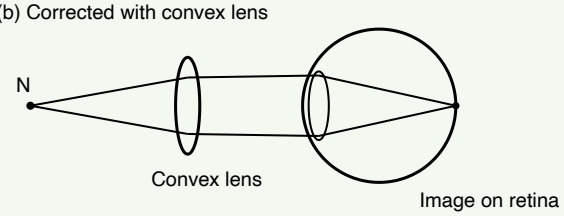
(d) A convex (converging) lens of suitable focal length; it brings the image back onto the retina.

(e) Diagrams as shown: (a) rays from the near point N converge behind the retina; (b) with a convex lens in front of the eye, the image is formed on the retina.

(a) Hypermetropic eye



(b) Corrected with convex lens



Marking: (a) Hypermetropia – 1 mark · (b) Behind the retina – ½ mark · (c) Two causes – 1 mark · (d) Convex lens – ½ mark · (e) Two labelled diagrams – 2 marks

Examiner tip: Label N (near point), retina and the convex lens; unlabelled diagrams lose half the marks.

All the best for your exam!