

## EMRS TGT Tier II Descriptive Science Sample Question Bank

- Q1.** Explain how the particle nature of matter accounts for diffusion in gases. Why is diffusion faster in gases than in liquids?
- Q2.** Describe the process of evaporation. Discuss the factors affecting evaporation and explain how evaporation causes cooling.
- Q3.** Differentiate between homogeneous and heterogeneous mixtures. Explain colloids and suspensions with suitable examples.
- Q4.** State the law of conservation of mass. Describe an experiment to verify it during a chemical reaction.
- Q5.** Explain oxidation and reduction reactions. Why are they said to occur simultaneously? Support with examples.
- Q6.** A metal carbonate on heating gives a metal oxide and carbon dioxide.  
(a) Name the type of reaction  
(b) Write a general equation  
(c) Explain the energy change involved.
- Q7.** Explain the importance of pH in everyday life with reference to digestion, tooth decay, and soil treatment.
- Q8.** Describe the preparation, properties, and uses of washing soda. Why is it called a cleaning agent?
- Q9.** Compare the properties of metals and non-metals based on physical and chemical behaviour.
- Q10.** Explain the process of corrosion of iron. Describe two methods to prevent rusting.
- Q11.** Describe reflex action with a suitable example. Why is it important for survival?
- Q12.** Explain Mendel's law of segregation with the help of a monohybrid cross.
- Q13.** A body starts from rest and accelerates uniformly at  $2 \text{ m/s}^2$  for 10 seconds.  
(a) Calculate the final velocity  
(b) Find the distance travelled  
(c) Explain the physical significance of uniform acceleration.
- Q14.** A force of 10 N acts on a body of mass 2 kg.  
(a) Calculate the acceleration produced  
(b) State which law of motion is applied and explain it.

- Q15.** Calculate the gravitational force between two masses of 5 kg and 10 kg placed 2 m apart. (Take  $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$ )
- Q16.** Explain how intermolecular forces influence the physical states of matter. Discuss why gases are highly compressible whereas solids are not.
- Q17.** Describe the role of heat energy in change of state of matter with reference to melting, boiling, and latent heat. Explain why temperature remains constant during phase change.
- Q18.** Differentiate between colloids and true solutions based on particle size, stability, and light scattering. Explain their importance in daily life.
- Q19.** Using the law of conservation of mass, analyze why balanced chemical equations are necessary for quantitative chemical calculations.
- Q20.** Explain the extraction of moderately reactive metals using carbon reduction with suitable reactions. Why is this method not applicable to highly reactive metals?
- Q21.** Compare the chemical behaviour of ethanol and ethanoic acid in oxidation and combustion reactions.
- Q22.** Describe the structure of a plant cell and explain how its components are adapted for photosynthesis.
- Q23.** Explain the mechanism of food transport in plants and its importance for growth and survival.
- Q24.** Analyze how the nervous system coordinates voluntary and involuntary actions in humans.
- Q25.** Explain the process of fertilization and embryo development in humans with emphasis on reproductive health.
- Q26.** Explain the working principle of an electric motor using electromagnetic effects.
- Q27.** Describe the process of electromagnetic induction and explain how electric generators convert mechanical energy into electrical energy.
- Q28.** Explain image formation by spherical mirrors using ray principles and discuss practical applications of concave and convex mirrors.
- Q29.** Analyze refraction of light through a glass prism and explain the phenomenon of dispersion.
- Q30.** Discuss the role of biodegradable and non-biodegradable wastes in environmental pollution and suggest sustainable solutions.

- Q31.** An elevator is moving downward in a shaft with a uniform speed of 4 m/s. A nut from the bottom of the elevator accidentally comes loose and strikes the bottom of the shaft after 1 second. Calculate the height of the elevator from the bottom of the shaft at the moment the nut gets detached.  
(Take acceleration due to gravity as  $10 \text{ m/s}^2$ )
- Q32.** A ball is dropped from rest and falls freely under gravity for 4 seconds before striking a horizontal glass plate. Due to the collision, the ball loses three-fourth of its velocity. If the ball reaches the ground 2 seconds after the collision, calculate the height of the glass plate above the ground.  
(Take  $g = 10 \text{ m/s}^2$ )
- Q33.** A bullet travelling at 160 m/s passes completely through a wooden plank and emerges with a speed of 140 m/s. Another bullet of the same mass and dimensions but travelling at 60 m/s is fired at the same plank. Assuming that the resistive force offered by the plank is constant, determine the speed of the second bullet after passing through the plank.
- Q34.** A body is projected vertically upward with a velocity of 50 m/s. After how much time will it return to the point of projection? Also calculate the maximum height attained by the body.  
(Take  $g = 10 \text{ m/s}^2$ )
- Q35.** A particle moves along a straight line with uniform acceleration. Its velocity increases from 10 m/s to 30 m/s while covering a distance of 200 m. Calculate the acceleration of the particle and the time taken for this change in velocity.
- Q36.** A force acting on a body of mass 4 kg increases its velocity from 2 m/s to 18 m/s in 8 seconds. Calculate the magnitude of the force and the impulse imparted to the body.
- Q37.** Two bodies of masses 5 kg and 15 kg are separated by a distance of 2 m. Calculate the gravitational force of attraction between them. If the distance is doubled, explain how the force changes quantitatively.  
(Take  $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$ )
- Q38.** A solid object of volume  $0.02 \text{ m}^3$  floats in water with half of its volume submerged. Calculate the density of the object and explain the condition of floatation involved.
- Q39.** A stone of mass 0.5 kg is thrown vertically upward with a kinetic energy of 100 J. Calculate the maximum height reached by the stone.  
(Take  $g = 10 \text{ m/s}^2$ )
- Q40.** A current of 2.0 A flows through a straight metal rod of length 2.0 m and diameter 0.20 cm. If the potential difference between its ends is 40 V, calculate the resistivity of the material of the rod.
- Q41.** Three resistors of resistances 4  $\Omega$ , 6  $\Omega$ , and 12  $\Omega$  are connected  
(a) in series and  
(b) in parallel  
across a 12 V battery. Calculate the total current drawn from the battery in each case.

- Q42.** An electric heater is rated 1000 W, 220 V.  
(a) Calculate the current drawn by the heater  
(b) Determine the resistance of the heating element  
(c) Calculate the electrical energy consumed in 30 minutes.
- Q43.** A solenoid of length 0.5 m has 2000 turns and carries a current of 2 A. Calculate the magnetic field produced near its centre.  
(Take  $\mu_0 = 4\pi \times 10^{-7}$  H/m)
- Q44.** A straight conductor of length 0.5 m carrying a current of 4 A is placed perpendicular to a magnetic field of strength 0.2 T. Calculate the force acting on the conductor.
- Q45.** A coil of 100 turns and area  $0.01 \text{ m}^2$  is placed in a magnetic field of 0.5 T. The coil is rotated through  $90^\circ$  in 0.05 s. Calculate the average induced emf produced in the coil.
- Q46.** Calculate the percentage composition of carbon, hydrogen, and oxygen in ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ).
- Q47.** How many grams of sodium hydroxide are present in 500 mL of a 1 M NaOH solution? Explain the concept of molarity used.
- Q48.** Calculate the mass of calcium carbonate required to produce 11 g of carbon dioxide on complete thermal decomposition.
- Q49.** A reaction requires 5 g of hydrogen to completely react with oxygen. Calculate the mass of oxygen required and explain the law used.
- Q50.** Calculate the amount of heat required to raise the temperature of 2 kg of water from  $20^\circ\text{C}$  to  $80^\circ\text{C}$ .  
(Specific heat capacity of water =  $4200 \text{ J/kg}^\circ\text{C}$ )
- Q51.** Explain the causes, transmission, and prevention of HIV/AIDS. Why is awareness important in controlling its spread?
- Q52.** Explain Mendel's law of independent assortment. Under what conditions does this law fail?
- Q53.** Describe the process of evolution with reference to variation and natural selection.
- Q54.** Explain the structure and function of an ecosystem. Describe the flow of energy through different trophic levels.
- Q55.** Discuss the problems associated with non-biodegradable wastes. Suggest scientifically sound methods for waste management.
- Q56.** Explain how absorption of digested food takes place in the small intestine. Discuss the role of villi in increasing efficiency.

- Q57.** Describe the mechanism of transpiration pull and its significance in upward movement of water in tall trees.
- Q58.** Explain the pathway of blood circulation in humans and analyze how oxygenated and deoxygenated blood remain separate.
- Q59.** Compare aerobic respiration, anaerobic respiration in muscles, and fermentation in microorganisms with respect to energy release.
- Q60.** Explain hormonal coordination in humans using thyroid and adrenal glands as examples.
- Q61.** A solenoid produces a magnetic field of  $4 \times 10^{-3}$  T when a current of 2 A flows through it. Calculate the field produced when the current is increased to 5 A and explain the proportionality involved.
- Q62.** A straight conductor of length 1 m is suspended horizontally by two flexible leads and carries a current of 10 A in a magnetic field of 0.5 T. Calculate the force acting on the conductor and determine whether it will move upward or downward.
- Q63.** A rectangular coil of 150 turns and area  $0.01 \text{ m}^2$  is rotated in a uniform magnetic field of 0.4 T at right angles in 0.05 s. Calculate the induced emf produced.
- Q64.** An object is placed between two positions where a convex lens forms real images of the same size. If the distance between the two positions is 40 cm, determine the focal length of the lens.
- Q65.** A concave mirror produces an image of equal size to the object when the object is placed 30 cm from the mirror. Calculate the focal length of the mirror and explain the mirror position involved.
- Q66.** Explain Bronsted–Lowry and Lewis concepts of acids and bases. How do they differ from classical definitions?
- Q67.** Describe the concept of ionic equilibrium. Explain how pH, pOH, and pK<sub>w</sub> are related in aqueous solutions.
- Q68.** Explain hybridization in carbon compounds. Discuss the shapes of methane, ethene, and ethyne molecules.
- Q69.** Describe isomerism in organic compounds. Explain its significance with suitable examples.
- Q70.** Explain IUPAC nomenclature rules for naming organic compounds containing alcohol and carboxylic acid functional groups.
- Q71.** Using displacement–time and velocity–time graphs, explain how the equations of uniformly accelerated motion can be derived graphically. Discuss the physical significance of the area under a velocity–time graph.

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- Q72.** Explain uniform circular motion. Why is a body moving with constant speed in circular motion considered accelerated? Support your answer mathematically.
- Q73.** Derive an expression for centripetal force acting on a body performing uniform circular motion. Explain its role in daily-life applications.
- Q74.** Explain why passengers feel pushed outward when a vehicle suddenly takes a circular turn. Relate your answer to inertia and circular motion.
- Q75.** Using Newton's laws of motion, derive the principle of conservation of linear momentum. Illustrate the principle with a practical example.

