# Grade 10 Optional Science Model Paper 2

MODEL PAPER

Full marks 75 · 2.25 hours

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 75

**All questions are compulsory. Time: 2.25 hours.**

A practice paper by Science Playground, made to CDC's Specification Grid 2076, Science (Optional); not an official CDC or NEB paper. Mark it yourself online: the QR code below opens the paper with its answers.

A full practice run of the SEE Optional Science paper: 75 marks in 2 hours 15 minutes, 39 questions, every one compulsory, in four sections. Section A asks for very short answers (1 mark each), Section B short answers (2 marks), Section C answers of 3 marks and Section D long answers (4 marks). Write your answers on paper as in the exam hall, then open each answer and give yourself the marks its scheme allows.

## Section A

**16 × 1 = 16**

**1. Write very short answers to the following questions.**

**a.** What is a bivalent?

**b.** What is transpiration?

**c.** What is a codon?

**d.** What is nitrogen fixation?

**e.** What is a plasmid?

**f.** State the modern periodic law.

**g.** What is molar volume?

**h.** What is hydrolysis?

**i.** What is a heterocyclic compound?

**j.** What is a flux?

**k.** What is centripetal force?

**l.** What is a bimetallic strip?

**m.** Define the principal focus of a convex lens.

**n.** What is doping?

**o.** Of what is the positive plate of a lead-acid cell made?

**p.** What is half-life?

## Section B

**13 × 2 = 26**

**Write short answers to the following questions.**

**2.** Write any two differences between aerobic and anaerobic respiration. **[2]**

**3.** Write any two differences between DNA and RNA. **[2]**

**4.** Growing legumes such as beans or lentils in a field means it needs less nitrogen fertilizer the next season. Why? **[2]**

**5.** In some seas the pyramid of biomass is inverted: the zooplankton weigh more than the phytoplankton they eat. How is this possible? **[2]**

**6.** Fluorine is the most electronegative element, but chlorine has the highest electron affinity. Why? **[2]**

**7.** Write any two differences between a sigma bond and a pi bond. **[2]**

**8.** Write any two differences between addition and substitution reactions. **[2]**

**9.** Cyclopentadiene ($C_5H_6$) is not aromatic, but its anion $C_5H_5^-$ is. Why? **[2]**

**10.** Roads are banked (raised on the outer edge) at sharp bends. Why? **[2]**

**11.** Ice at 0 °C cools a drink better than the same mass of water at 0 °C. Why? **[2]**

**12.** A liquid cools as it evaporates. Why? **[2]**

**13.** A concave lens always forms a virtual, upright and diminished image of a real object. Why? Explain using the lens formula. **[2]**

**14.** Fossils of ammonites (shaligrams) are found high in Mustang. What do they tell us? **[2]**

## Section C **7 × 3 = 21**

**Answer the following questions.**

**15.** In a potometer the capillary tube has a radius of 1 mm, and the air bubble moves 70 mm in 10 minutes. Calculate the volume of water taken up and the rate of uptake. What does a potometer actually measure? (π = 3.14) **[3]**

**16.** In a DNA test, a sample from a crime scene matches a suspect at three places on different chromosomes. At these places, 1 person in 5, 1 in 12 and 1 in 20 have the same repeat pattern. What is the chance that a person picked at random matches at all three? Why can the chances be multiplied? What if a fourth place, shared by 1 person in 10, also matches? **[3]**

**17.** The first four ionization potentials of an element X of period 3 are 738, 1,451, 7,733 and 10,543 kJ/mol. **[3]**

i. In which group is X? Give a reason. (2)

ii. Write the formula of its chloride. (1)

**18.** Calculate the percentage of iron in hematite ($Fe_2O_3$), and the mass of iron that can be extracted from 2 tonnes of an ore containing 80% hematite. (Fe = 56, O = 16) **[3]**

**19.** Nabin whirls a stone of mass 0.2 kg in a horizontal circle of radius 0.5 m on a string, making 2 revolutions every second. Calculate its time period, its speed and the tension in the string. (π = 3.14) **[3]**

**20.** An inverter battery of 12 V and 150 Ah runs three 20 W LED bulbs and a 60 W fan during a power cut. Calculate the current drawn from the battery and how long the battery can run them. **[3]**

**21.** A piece of charcoal from a cave in Mustang has one eighth of the carbon-14 of living wood. **[3]**

i. How old is it? (Half-life of carbon-14 = 5,730 years) (2)

ii. Could carbon dating be used for a Siwalik fossil 5 million years old? Why? (1)

## Section D **3 × 4 = 12**

**Write long answers to the following questions.**

**22.** A fruit fly's body cells have 8 chromosomes (2n = 8). **[4]**

i. How many chromosomes are in each cell after meiosis I, and in each gamete? (1)

ii. How many kinds of gamete can one fly make by independent assortment alone? (1)

iii. In which stage of meiosis does crossing over happen, and why is it important? (1)

iv. If one pair of homologs fails to separate at anaphase I, how many chromosomes will the gametes have? (1)

**23.** Januka puts a clean iron nail into blue copper sulphate solution and leaves it for an hour. **[4]**

i. What does she see on the nail and in the solution? (1)

ii. Write the ionic equation and the two half equations. (1)

iii. Name the oxidizing agent and the reducing agent. (1)

iv. Will a copper wire placed in iron(II) sulphate solution give a reaction? Why? (1)

**24.** Yangchen places an object 2 cm tall 15 cm in front of a convex lens of focal length 10 cm. **[4]**

i. Find the power of the lens. (1)

ii. Find the position of the image and say whether it is real or virtual. (1)

iii. Find the magnification and the height of the image. (1)

iv. Where should she place the object to use the lens as a magnifying glass, and what image will she see? (1)