Grade 10 Optional Science Model Paper 1

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 crossing over?

b. What is plasmolysis?

c. What is a test cross?

d. State the ten percent law.

e. What is DNA fingerprinting?

f. Define electronegativity.

g. What is a coordinate covalent bond?

h. Define oxidation in terms of electrons.

i. State Hückel's rule.

j. What is an ore?

k. What is a seconds pendulum?

l. Define the specific latent heat of fusion.

m. What is the power of a lens?

n. What is a shunt?

o. What is a ferromagnetic substance? Give one example.

p. What is an index fossil?

Section B

13 × 2 = 26

Write short answers to the following questions.

2. Write any two differences between mitosis and meiosis. **[2]**

3. A pyramid of numbers or of biomass can be inverted, but a pyramid of energy can never be inverted. Why? **[2]**

4. A crop grown only from clones of one plant can be wiped out by a single disease. Why? Give an example. **[2]**

5. In gel electrophoresis, DNA moves towards the positive electrode, and small pieces travel farther than large ones. Why? **[2]**

6. Aluminium comes after magnesium in period 3, but its first ionization potential (578 kJ/mol) is lower than magnesium's (738 kJ/mol). Why? **[2]**

7. Write the electronic configurations of Fe (Z = 26) and Fe^{3+}. Why is Fe^{3+} more stable than Fe^{2+}? **[2]**

8. Ethene decolorizes bromine water, but benzene does not, though both have double bonds in their formulas. Why? **[2]**

9. Gold dissolves in aqua regia but not in concentrated nitric acid alone. Why? **[2]**

10. A body moving in a circle at constant speed is said to be accelerating. Why? **[2]**

11. A burn from steam at 100 °C is more severe than one from boiling water at 100 °C. Why? **[2]**

12. In a compound microscope the object is placed just beyond the focus of the objective, and the first image falls just inside the focus of the eyepiece. Why? **[2]**

13. Write any two differences between a real image and a virtual image. **[2]**

14. Carbon dating cannot be used to find the age of a dinosaur fossil. Why? **[2]**

Section C

7 × 3 = 21

Answer the following questions.

15. A human cell has 46 chromosomes. How many chromosomes and chromatids does a cell have: **[3]**

i. at metaphase of mitosis, (1)

ii. in each cell after meiosis I, (1)

iii. in each cell after meiosis II? (1)

16. Rachana put a potato strip of mass 2.50 g in distilled water and another of mass 2.40 g in strong sugar solution. After an hour the first weighed 2.80 g and the second 2.04 g. Calculate the percentage change in mass of each, and say which solution was hypotonic and which hypertonic to the potato cells. **[3]**

17. For 22 g of carbon dioxide, calculate the number of moles, the number of molecules and its volume at STP. (C = 12, O = 16) **[3]**

18. 3.4 g of hydrogen peroxide is decomposed completely with a little manganese dioxide: $2H_2O_2 \rightarrow 2H_2O + O_2$. Calculate the mass and the volume at STP of the oxygen given off. (H = 1, O = 16) **[3]**

19. Calculate the heat needed to change 200 g of ice at 0 °C into water at 30 °C. (Specific latent heat of fusion of ice = 336,000 J/kg; specific heat capacity of water = 4,200 J/(kg °C)) **[3]**

20. A galvanometer has a resistance of 40 Ω and gives a full-scale deflection for 5 mA. What shunt is needed to turn it into an ammeter reading up to 2 A, and how is it connected? **[3]**

21. A piece of charcoal from an old hearth has one quarter of the carbon-14 that the same mass of carbon in a living tree has. How old is it? (Half-life of carbon-14 = 5,730 years) **[3]**

Section D

3 × 4 = 12

Write long answers to the following questions.

22. In a garden pea, round seed (R) is dominant over wrinkled (r) and yellow (Y) over green (y). Ishwori crosses a pure round yellow plant with a pure wrinkled green plant, then lets the F_1 plants self-pollinate. **[4]**

i. Write the genotype and phenotype of the F_1 plants. (1)

ii. Write the kinds of gametes an F_1 plant makes. (1)

iii. Write the phenotypic ratio of the F_2 generation. (1)

iv. Out of 1,600 F_2 plants, about how many are wrinkled yellow, and how many of those will breed true? (1)

23. Abdul's teacher gives the molecular formula C_5H_{12} and asks how many different compounds it can stand for. **[4]**

i. Write the condensed formula and IUPAC name of each of its three isomers. (2)

ii. Their boiling points are 36 °C, 28 °C and 9.5 °C. Which one boils lowest, and why? (1)

iii. What kind of isomerism do they show? (1)

24. To find g, Sudip hangs a bob of radius 2.0 cm on a thread 98.0 cm long. He finds that 20 oscillations take 40.2 s. **[4]**

i. What is the effective length of the pendulum? (1)

ii. Calculate g. (1)

iii. Why does he time 20 oscillations rather than one? (1)

iv. A pendulum clock that keeps time at sea level is taken up a high mountain. Will it run fast or slow? Why? (1)