Grade 10 Optional Science Model Paper 3

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 the G_0 phase of a cell?

b. What is a semipermeable membrane?

c. Who is a carrier of a genetic disease?

d. What is a biogeochemical cycle?

e. What is an isograft?

f. Define ionization potential.

g. What is vapor density?

h. What is a photochemical reaction?

i. What is an elimination reaction?

j. What is roasting?

k. What is escape velocity?

l. What is latent heat?

m. Define the magnification of a lens.

n. What is a semiconductor?

o. What is the Curie temperature?

p. What is a planetarium?

Section B

13 × 2 = 26

Write short answers to the following questions.

2. Red blood cells burst in distilled water, but plant cells do not. Why? **[2]**

3. Only the mature cyst of *Entamoeba histolytica*, not its trophozoite, can infect a new person. Why? **[2]**

4. A color-blind man cannot pass color blindness to his son. Why? **[2]**

5. Energy flows in only one direction in an ecosystem, but matter goes round and round. Explain. **[2]**

6. In the ammonium ion, one N–H bond is a coordinate bond, yet all four N–H bonds are identical. Why? **[2]**

7. A solution of ammonium chloride in water is acidic, but a solution of sodium chloride is neutral. Why? **[2]**

8. Bromoethane boiled with aqueous KOH gives ethanol, but with alcoholic KOH it gives ethene. Write the two equations. **[2]**

9. How can bromine water be used to tell ethane from ethene? Explain. **[2]**

10. Astronauts float in the Space Station though the Earth's gravity there is still about 8.7 N/kg. Why? **[2]**

11. The Moon has no atmosphere. Why? **[2]**

12. The objective of an astronomical telescope has a long focal length and the eyepiece a short one. Why? **[2]**

13. In a projector the slide is placed upside down, a little beyond the focus of the lens. Why? **[2]**

14. Write any two differences between relative dating and absolute dating. **[2]**

Section C

7 × 3 = 21

Answer the following questions.

15. Aakriti counted 1,000 cells in a slide of an onion root tip: 880 in interphase, 70 in prophase, 15 in metaphase, 10 in anaphase and 25 in telophase. The cell cycle takes 20 hours. **[3]**

i. Calculate the mitotic index. (1)

ii. Calculate the time spent in metaphase. (1)

iii. Which stage of mitosis is the longest? How do you know? (1)

16. A kidney patient needs hemodialysis 3 times a week, 4 hours each time, and spends 1½ hours travelling each way. Calculate how many hours a year this takes, and how many whole days that is. From your answer, give one reason why a kidney transplant is better for such a patient than dialysis. **[3]**

17. Propane burns: $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$. For 2 L of propane, calculate the volume of oxygen needed, the volume of carbon dioxide formed, and the volume of air needed (air has 21% oxygen). All volumes at the same temperature and pressure. **[3]**

18. Copper reacts with dilute nitric acid: $3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$. Calculate the volume of nitric oxide at STP given off when 9.525 g of copper dissolves. (Cu = 63.5) **[3]**

19. 50 g of ice at 0 °C is dropped into 300 g of water at 40 °C in an insulated flask. Find the final temperature, assuming no heat is lost. (L of ice = 336,000 J/kg; s of water = 4,200 J/(kg °C)) **[3]**

20. A galvanometer of resistance 50 Ω gives a full-scale deflection for 2 mA. What resistance is needed to turn it into a voltmeter reading up to 10 V, and how is it connected? **[3]**

21. A zircon grain contains equal numbers of uranium-238 and lead-206 atoms. Assume all the lead came from the uranium. **[3]**

i. How old is the grain? (Half-life of uranium-238 = 4,470 million years) (2)

ii. Why is uranium–lead, not carbon-14, used to date the oldest rocks? (1)

Section D

3 × 4 = 12

Write long answers to the following questions.

22. A piece of double-stranded DNA has 1,000 base pairs, and 30% of its bases are adenine. **[4]**

i. What percentage of its bases are thymine, guanine and cytosine? (1)

ii. How many of each base does it have? (1)

iii. How many hydrogen bonds hold its two strands together? (1)

iv. Find its length and the number of turns of its helix. (1)

23. Three elements A, B and C have atomic numbers 11, 13 and 17. **[4]**

i. Write their electronic configurations and their period. (1)

ii. Which of them has the largest atoms? Why? (1)

iii. Write the formula of the compound of A and C, and the kind of bond in it. (1)

iv. What is the nature of the oxide of B? (1)

24. The thermostat of Salim's rice cooker has a strip of brass and iron riveted together, which touches a contact when cold. Brass expands about 1½ times as much as iron. **[4]**

i. What happens to the strip when it is heated, and which metal is on the outside of the curve? (1)

ii. How does this switch the heater off at the set temperature? (1)

iii. What happens to the strip if it is cooled below room temperature? (1)

iv. A circular hole is cut in an iron plate and the plate is heated. Does the hole get bigger or smaller? Why? (1)