Name: _____ Date: _____ Score: ____ / 72

Practice A — Concept Check. English selected-topic practice for KSSM Core Science, Forms 4 and 5. Answer all 12 multiple-choice questions and all three multipart tasks. Practice total: 72 marks, comprising 12 objective marks and 60 structured marks. Show calculation steps and units. The two revision sections explain common errors. All numerical data and scenarios in this set are original or hypothetical.
Official Science 1511/1 contains 40 MCQs/40 marks in 75 minutes. Official 1511/2 is 80 marks in 150 minutes: Section A four questions/20 marks, Section B six/38, Section C one compulsory question/10 plus one of two questions/12. This shorter selection is not a complete official paper or a complete practical assessment. It covers selected Core Science topics and does not guarantee future examination topics.

1. Which item of personal protective equipment is intended to protect the eyes from laboratory splashes?

A Safety goggles

B A laboratory coat

C Closed laboratory shoes

D Protective gloves

2. In a simplified model, a diploid parent cell has 12 chromosomes. How many chromosomes does each gamete have after normal meiosis?

A 12

B 24

C 6

D 3

3. In a fictional single-gene model, allele A is completely dominant over a. What is the probability of an aa offspring from Aa × aa?

A 1/4

B 1/2

C 3/4

D 1

4. Why are many alloys harder than their corresponding pure metals?

A All alloy atoms have exactly the same size and form more regular layers

B Alloys contain no particles that can move

C Alloys gain hardness because their atoms become empty spaces

D Different-sized atoms disrupt the regular layers and make sliding more difficult

5. A student walks 12 m east, then 5 m west along the same straight path. What is the displacement from the starting point?

A 17 m east

B 7 m east

C 7 m west

D 17 m west

6. Which statement correctly distinguishes nuclear fission from nuclear fusion?

A Fission splits a heavy nucleus; fusion joins light nuclei

B Fission joins light nuclei; fusion splits a heavy nucleus

C Both involve only changes to the electrons outside the nucleus

D Both mean the same process of changing an atom into an ion

7. What is a useful role of yeast during bread making?

A It releases oxygen that replaces the flour

B It converts all the ingredients into water

C It removes every microorganism from the dough

D It produces carbon dioxide that helps the dough rise

8. A hypothetical reaction produces 36 cm^3 of gas in 30 s. What is the average gas-production rate during this interval?

A 0.83 $cm^3\ s^{-1}$

B 18 $cm^3\ s^{-1}$

C 1.2 $cm^3\ s^{-1}$

D 1080 $cm^3\ s^{-1}$

9. Which formula represents an alkene in the straight-chain hydrocarbon groups studied in Core Science?

A CH_4

B C_2H_6

C C_3H_8

D C_2H_4

10. Why can a molten ionic compound conduct electricity while the corresponding solid does not?

A Its electrons leave the nuclei and travel through the liquid

B Its ions can move in the molten state but are fixed in the solid lattice

C Melting removes all charged particles from the compound

D Only uncharged molecules carry current through the liquid

11. An object is placed beyond twice the focal length of a convex lens. What are the image characteristics?

A Virtual, upright and magnified

B Real, upright and magnified

C Real, inverted and diminished

D Virtual, inverted and unchanged in size

12. In an ideal hydraulic system with pistons at the same level, the larger piston has ten times the area of the smaller piston. Which statement is correct?

A The transmitted pressure is the same, and the larger piston exerts ten times the force

B The forces are the same because pressure and force are identical quantities

C The larger piston has ten times the pressure but the same force

D Pressure is transmitted only towards the smaller piston

Practice B — Written Tasks. Answer all tasks. Show working; use extra sheets for longer answers.

1. Task 1 — A fictional inheritance model

A hypothetical plant has a single gene controlling height. T gives the tall phenotype and is completely dominant over t, which gives the short phenotype. Both parents are Tt. Assume normal meiosis, random fertilisation and equal chances of the two gamete types. This simplified model is not a claim about a real human trait.

(a) State the gamete types from each parent and explain why a gamete carries only one allele of this gene. [4 marks]

(b) Complete a Punnett table in your answer for Tt × Tt. Label the gametes and show all four offspring combinations. [4 marks]

(c) State the genotype ratio and phenotype ratio. [4 marks]

(d) Calculate the expected number of short plants among 80 offspring. Explain why exactly that number is not guaranteed. [4 marks]

(e) Compare meiosis with mitosis in terms of chromosome number and their roles in reproduction or growth. [4 marks] [20 marks]

Practice B — Written Tasks. Answer all tasks. Show working; use extra sheets for longer answers.

3. Task 3 — An ideal hydraulic lift

An ideal enclosed system contains an incompressible liquid. The pistons are at the same level and friction is negligible. The input piston has area 4.0 cm^2 and the output piston has area 80 cm^2. A force of 60 N acts on the input piston.

Use P = F/A and F(output) = P × A(output). For a stroke without leakage, A(input) × d(input) = A(output) × d(output). Here d is the distance a piston moves. Use 1 cm^2 = 1 × 10^{-4} m^2.

(a) State Pascal's principle and identify two ideal-system assumptions given in the question. [4 marks]

(b) Convert the input area to m^2 and calculate the transmitted pressure in Pa. [4 marks]

(c) Convert the output area to m^2 and calculate the output force. [4 marks]

(d) The input piston moves 12 cm. Calculate the output-piston movement and explain why it is smaller. [4 marks]

(e) If the output area becomes 160 cm^2 while input force and input area remain unchanged, calculate the new ideal output force. Give one reason why a real system may produce less force than this prediction. [4 marks]

[20 marks]

Practice A — Concept Check

Science	1 **A**	2 **C**	3 **B**	4 **D**	5 **B**	6 **A**
	7 **D**	8 **C**	9 **D**	10 **B**	11 **C**	12 **A**

Practice B — Written Tasks

Science

1. (a) Each parent produces T and t gametes [1 per parent]. The allele pair separates during meiosis [1], so each gamete receives one allele of this gene [1].
(b) Columns: T | t; rows: T | t.
Row T: TT | Tt
Row t: Tt | tt
Award 1 for each correct labelled offspring cell, maximum 4. Both row and column gamete labels must identify the cross.
(c) Genotype ratio TT:Tt:tt = 1:2:1 [2]. Phenotype ratio tall:short = 3:1 [2]. Tt is tall because T is completely dominant in the stated model.
(d) P(short) = P(tt) = 1/4 [1]. Expected number = 80 × 1/4 = 20 plants [1]. Each offspring results from random fertilisation [1], so an observed sample can differ from the theoretical expected ratio [1]. “20 expected” does not mean a fixed allocation of 20.
(e) Meiosis halves the chromosome number and produces haploid gametes [2]. Mitosis normally maintains chromosome number and produces cells for growth or repair [2]. Accept suitable mention of asexual reproduction for the role of mitosis.
Practice rubric: 4 + 4 + 4 + 4 + 4 = 20. Ratios must have their categories labelled; a bare 1:2:1 does not fully explain which genotypes are compared.

2. (a) Hypothesis: increasing temperature increases the early rate of gas production [1]. Manipulated: reaction temperature [1]. Responding: gas volume produced per unit time [1]. Control: amount of solid, its surface size, or volume/concentration of excess solution [1; one required].
(b) L: (27 – 0)/(30 – 0) = 0.90 $cm^3 s^{-1}$ [1 method + 1 value/unit]. H: (39 – 0)/30 = 1.30 $cm^3 s^{-1}$ [1 + 1].
(c) L: (27 – 15)/(30 – 15) = 12/15 = 0.80 $cm^3 s^{-1}$ [1 + 1]. H: (39 – 24)/15 = 15/15 = 1.00 $cm^3 s^{-1}$ [1 + 1]. Subtract both the volumes and times for an interval that does not start at zero.
(d) Both trials reach 48 cm^3 [1]. H first reaches the recorded plateau at 45 s, whereas L reaches it at 90 s [1]. The higher early rates show faster production [1]; equal final volumes with the same reactant amounts do not show a larger final gas yield [1]. These observations apply to the supplied data.
(e) Horizontal axis: time/s; vertical axis: gas volume/cm^3 [1 for both]. Final horizontal sections show no further measured increase in collected gas [1]. Example limitation: some gas may escape through a leaking connection [1]; check the apparatus for leaks before readings [1]. Accept another specific limitation with a matching improvement.

2 (continued). Practice rubric: 4 + 4 + 4 + 4 + 4 = 20. A horizontal volume curve means zero measured rate during that interval, not zero collected volume.

3. (a) Pressure applied to a liquid in an enclosed system is transmitted uniformly throughout the liquid [2]. Any two given assumptions: incompressible liquid, pistons at the same level, negligible friction [1 each].
(b) Input area = 4.0×10^{-4} m^2 [1]. P = F/A [1] = $60/(4.0 \times 10^{-4})$ [1] = 150000 Pa, or 1.5×10^5 Pa [1]. Do not divide by an area still expressed in cm^2 and label the result Pa.
(c) Output area = $80 \times 10^{-4} = 8.0 \times 10^{-3}$ m^2 [1]. F = PA [1] = 150000 × 0.008 [1] = 1200 N [1]. The same pressure acts over a larger area; equal pressure does not mean equal force.
(d) 4.0 × 12 = 80 × d(output) [1]. d(output) = 48/80 = 0.60 cm [1]. The output area is 20 times the input area [1], so the output travels one-twentieth as far when equal liquid volume is displaced [1]. Consistent cm units are valid in this volume ratio.
(e) The output area doubles with pressure unchanged [1], so the new force = 150000 × 0.016 = 2400 N [1]. Example: friction opposes piston motion [1] and reduces the useful output force [1]. Accept leakage causing pressure loss with its explanation.
Practice rubric: 4 + 4 + 4 + 4 + 4 = 20. The larger output force does not mean extra energy is created; the ideal output piston moves through a smaller distance.

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