Fractional & Negative Indices Exam Practice

Q1. Work out 3^{-2}

$\frac{1}{9}$

(1 mark)

Q2. Work out $144^{\frac{1}{2}} \div 1^{\frac{1}{2}}$

$12 \div 1 = 12$

(2 marks)

Q3. Work out $(49)^{-\frac{1}{2}}$

$\frac{1}{7}$

(1 mark)

Q4. Simplify the following expressions:

a) $(16t^6)^{\frac{1}{2}}$

$4t^3$

(2 marks)

b) $\sqrt[3]{27t^{12}}$

$3t^4$

(2 marks)

c) $3x^{-3} \times \frac{1}{6x}$

$= \frac{3x^{-3}}{6x} = \frac{1}{2x^4}$

(2 marks)

Q5. Find the reciprocal of $\left(\frac{3}{5}\right)^{-1}$

$= \frac{5}{3}$

(1 mark)

Q6. Work out the value of $\left(\frac{8}{125}\right)^{\frac{2}{3}}$

$= \left(\frac{2}{5}\right)^2$

$= \frac{4}{25}$

(2 marks)

Q7. Work out the value of $\left(\frac{1}{27}\right)^{\frac{4}{3}}$

$= \left(\frac{1}{3}\right)^4$

$= \frac{1}{81}$

(2 marks)

Q8. Work out the value of $\left(\frac{9}{4}\right)^{-\frac{3}{2}}$

$= \left(\frac{4}{9}\right)^{\frac{3}{2}}$

$= \frac{8}{27}$

(2 marks)

Q9. Find the value of d, given the equation:

$w^6 \div \sqrt{w^5} = w^d$

$w^6 \div w^{5/2} = w^d$

$\Rightarrow d = 6 - \frac{5}{2}, \; d = \frac{7}{2}$

(2 marks)

Q10. Simplify the expression fully: $\frac{(8a^3)^{\frac{2}{3}} \times 3b^{-4}}{45\sqrt[3]{a^6b^3}}$

$= \frac{8^{\frac{2}{3}} a^2 \times 3b^{-4}}{45a^2b}$

$= \frac{4a^2 \times 3b^{-4}}{45a^2b} = \frac{12b^{-4}}{45b} = \frac{4}{15b^5}$

(3 marks)

Q11. Write 32 as a power of 4. (2 marks)

Q12. Write the following expression as a power of 5: $\frac{10}{\sqrt{2500}}$ (2 marks)

Q13. Write the numbers below in order of size, starting with the smallest.
Show any working out which you do.

$100^{1/3}$, 0.2^{-3}, $5^{3/2}$, $(-1)^{10/3}$, $64^{2/3}$

(3 marks)

Problem Questions:

Q14. You are given that $5^{-2c} = 0.09$ where c is some non-zero number.
Work out the value of 5^{3c}, giving your answer in the form $\frac{a}{b}$ where a and b are integers. (3 marks)

Q15. a) Show that the equation $x^{\frac{1}{3}}\left(15 + 6x^{\frac{1}{3}}\right) = 9$ can be written in the form,
$2x^{2/3} + 5x^{1/3} - 3 = 0$ (2 marks)

b) Hence solve the equation $x^{\frac{1}{3}}\left(15 + 6x^{\frac{1}{3}}\right) = 9$ for x. (4 marks)

Q16. A scientist is observing a radioactive substance. At the start of the first day, there is N grams of the material. It then decays at a rate such that $\frac{2}{3}$ of its mass is lost each day.

(i) Find an expression for the amount of the material which is left after 27 complete days. (2 marks)

(ii) If there was 70kg of material to start with, work out to the nearest gram how much material there is left after 8 complete days. (2 marks)