Name: _____ Key _____   Section: _____

You have 10 minutes to complete the quiz. Please **show all work**, and then **circle your answer**.

1. Suppose that your experiment begins with 20 grams of Phosphorous-32. Looking in your reference book, you discover that the half life of Phosphorous-32 is 14 days.

   Find an equation that predicts the mass of Phosphorous-32 as a function of the time t in days since your experiment began.

$$P(t) = 20 \cdot e^{kt}$$

1pt   know $P(\boxed{14}) = 10 = 20 \cdot e^{k \boxed{14}}$

solve for k:

$$\frac{1}{2} = e^{k \cdot 14}$$

$$\ln(1/2) = k \cdot 14$$

2pt $$k = \frac{\ln(1/2)}{14}$$

$$\boxed{P(t) = 20 \cdot e^{\left(\frac{\ln(1/2)}{14} t\right)}}$$

1pt

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2. Use the laws of logarithms to rewrite the following as a single logarithm.

$$4 \cdot \ln(x) + 2 \cdot \ln(y)$$

2pt

$$= \ln(x^4) + \ln(y^2)$$

$$= \ln(x^4 \cdot y^2)$$

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3. Solve for x satisfying the equation

$$e^{x+3} = 10e^{4x}$$

method 1:

$$\ln(e^{x+3}) = \ln(10 \cdot e^{4x})$$

2pt $$x+3 = \ln(10) + \ln(e^{4x})$$

$$x+3 = \ln(10) + 4x$$

$$3 = \ln(10) + 3x$$

$$3 - \ln(10) = 3x$$

2pt $$x = \frac{3 - \ln(10)}{3} = 1 - \frac{\ln(10)}{3}$$

method 2:

$$\frac{e^{x+3}}{e^{4x}} = 10$$

$$e^{x+3-4x} = 10$$ 2pt

$$e^{3-3x} = 10$$

$$3 - 3x = \ln(10)$$

$$3 = \ln(10) + 3x$$

$$3 - \ln(10) = 3x$$

$$\frac{3 - \ln(10)}{3} = x$$ 2pt

21   1   *22.*